BreezeAIR AXE

Installation and Operation Instructions

December 2024

Telrad Networks Ltd.
1 Bat Sheva Street
P.O.Box 6118
Lod 7120101, ISRAEL
Tel: 1-844-4-TELRAD
marketing@telrad.com

Notices

Radio Frequency Statement

BreezeAIR has been tested and found to comply with part 15 of the FCC rules and EN 301 489-1 rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment notwithstanding use in commercial, business and industrial environments. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT! The device must be installed only for fixed, Point-to-Point or Point-to-Multipoint operations per 15.247(c)(1)(iii)

IMPORTANT! It is the responsibility of the installer to ensure that when using the outdoor antenna kits in the United States (or where FCC rules apply), only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden in accordance to FCC rules CFR47 part 15.204.

IMPORTANT! Outdoor units and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may void the product warranty and may expose the end user or the service provider to legal and financial liabilities. Telrad Networks and its resellers or distributors of this equipment are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.

(i) This device shall not be used for control of or communications with unmanned aircraft systems.

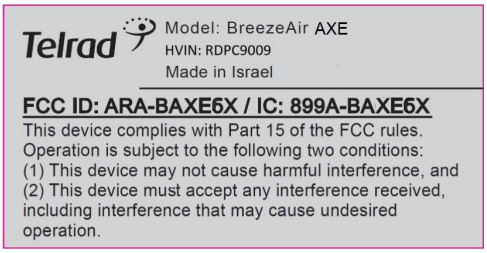
(ii) This device shall not be used on oil platforms.

(iii) This device shall not be used on aircraft.

(iv) This device shall not be used on automobiles.

(v) This device shall not be used on trains.

(vi) This device shall not be used on maritime vessels.



This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference that may be received or that may cause undesired operation.

Le present appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisee aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

R&TTE Declaration on Conformity

Hereby, Telrad Networks Ltd, declares that BreezeAIR is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. The declaration of conformity may be consulted through Telrad Networks Ltd., 1 Bat Sheva Street, Lod 7120101, ISRAEL.

Compliance with European Union WEEE Directives

In January 2003, the European Union adopted an important environmental directive -- the Directive on Waste Electrical and Electronic Equipment (WEEE). It represents an important milestone in providing a safer environment for future generations.

The WEEE label and instructions for disposal are as follows:

Instructions for Disposal of Waste Equipment by Users in the European Union

This symbol on the product or its packaging indicates that this product must not be disposed of with other waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact Telrad Networks.

Caution! Hot surface – Instructional safeguard

BreezeAir is designed to operates also in high temperature environment. On such conditions, do not touch the device without taking care.

Warranty

Telrad Networks warrants that this product shall be free from defects in workmanship and materials for a period of one year from the date of original purchase. If the product should fail to operate correctly in normal use during the warranty period, Telrad Networks will replace or repair it free of charge. No liability can be accepted for damage due to misuse or circumstances outside Telrad Networks's control. Telrad Networks will not be responsible for any loss, damage or injury arising directly or indirectly from the use of this product. Telrad Networks's total liability under the terms of this warranty shall in all circumstances be limited to the replacement value of this product.

If any difficulty is experienced in the installation or use of this product that you are unable to resolve, please contact Telrad Networks.

TABLE OF CONTENTS

TABLE OF FIGURES

1. Introduction

Thank you for purchasing BreezeAIR solution. Telrad Networks's BreezeAIR series is a carrier-grade point-to-point and Point-to-multipoint broadband wireless solution that sets a benchmark of unrivaled performance, reliability, capacity, latency and RF robustness, making it the ultimate choice for future-proof wireless system.

1.1 BreezeAIR applications

Point-to-Point (PTP):

The basic subsystem is composed of a Master Unit (MU) and a Slave Unit (SU).

Typical applications:

- Broadband IP data backhaul for:
  - PTMP base stations
  - Cellular and 4G
  - Metro WiFi Networks
- Private network connectivity (Video surveillance, mission critical applications, campuses, mining, etc)
- Multi-hop solutions
- Backup for fiber networks

Point-to-Multipoint (PTMP):

The basic subsystem is composed of one Master Unit (MU) and multiple Slave Units (SUs). Typical applications:

- Multiple backhauls solutions
- IP video surveillance and security networks
- Business grade wireless access
- Backbone for Metro WiFi Networks
- High bandwidth campus solutions

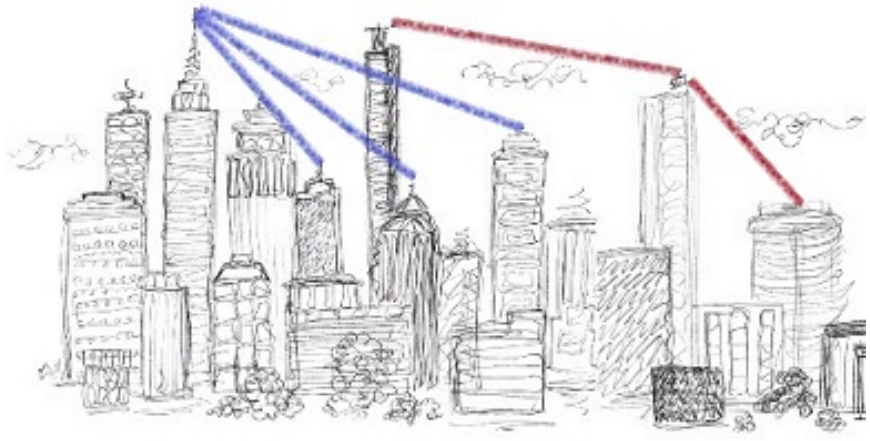


Figure 1-1: BreezeAIR PTMP (blue) and PTP (red)

2. Installation

2.1 Packing list

When you first open the package, verify that the unit is complete with the following components:

1. Outdoor Unit – BreezeAIR MU or SU.
2. Indoor PoE power supply.
3. Pole mounting kit (will not be added for units that require advanced mounting kit).

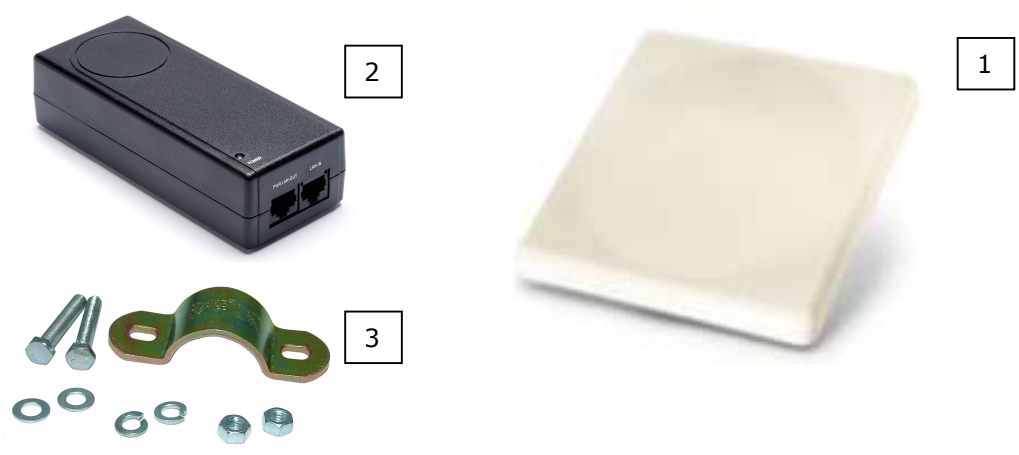


Figure 2-1: General System View

2.2 Additional part list – required for installation

- Outdoor Unit grounding cable
- Outdoor-to-Indoor shielded CAT5 cable (up to 100 meters).
- Indoor CAT5 cable.
- RJ-45 - Installation KIT.
- RJ-45 - Crimping tool.
- Adjustable wrench + screwdriver.

2.3 Installation overview

This section provides installation information for BreezeAIR system.

Note: Outdoor units and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may void the product warranty and may expose the end user or the service provider to legal and financial liabilities. Telrad Networks and its resellers or distributors of this equipment are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.

Typical installation scheme:

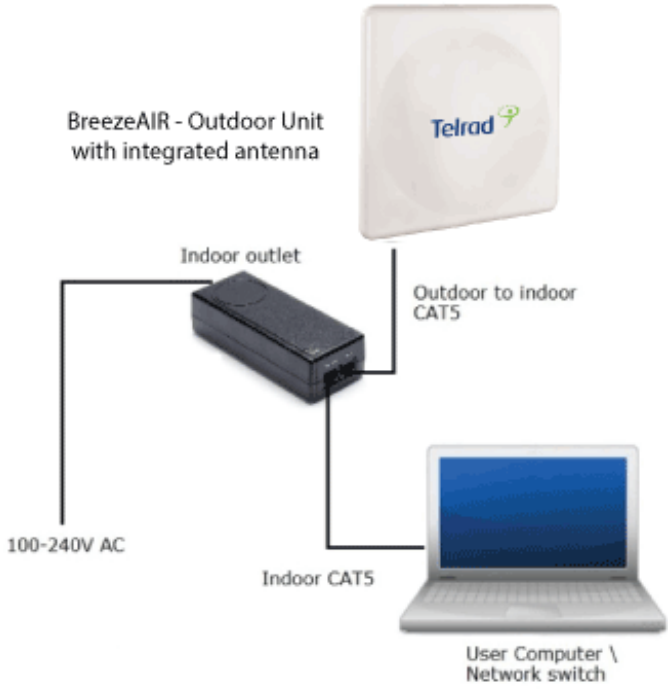


Figure 2-2: BreezeAIR - General Installation Scheme

Installation process summary:

1) Select the appropriate location for the Outdoor unit and the indoor PoE Outlet.
2) Mount the Outdoor unit (RJ-45 ports facing down). When using external antenna, mount the antenna and connect it to the Outdoor unit.
3) Connect a ground cable between the Outdoor unit and an appropriate grounding point.
4) Connect the Outdoor-to-Indoor shielded CAT5 cable to the Outdoor unit and route it to the selected location of the PoE. Assemble the enclosed connector on the cable.
5) Mount the Indoor POE and connect:

- Outdoor-to-Indoor cable to the *'PWR LAN-OUT'* port.
- CAT5 Ethernet cable (from network) to the *'LAN-IN'* port.
- AC Input to the power (100-240VAC).

6) Align the antenna and secure the unit by fastening the mounting screws.

2.3.1 Select the best location

Select the best location for the outdoor unit using the following guidelines:

- The outdoor unit can be pole or wall mounted.
- The location should allow easy access to the unit for installation.
- When using an external antenna, the unit should be installed as near as possible to the antenna.
- Make sure clear Line of Sight between the sites.

Path of clearest propagation

A propagation path is the path that signals traverse between the antennas of any two bridges. The "line" between two antenna sites is an imaginary straight line, which may be drawn between the two antennas. Any obstacles in the path of the "line" degrade the propagation path. The best propagation path is, therefore, a clear line of sight with good clearance between the "line" and any physical obstacle.

Physical obstacles

Any physical object in the path between MU and SU may cause signal attenuation.
Common obstructions are buildings, trees and hills located in the path between the two sites. Install outdoor antennas high enough to avoid any obstacles, which may block the signal.

Minimal path loss

Path loss is determined by several factors:

- **Distance between sites** – Path loss is lower when distance between sites is shorter.
- **Clearance** – Path loss is minimized when there is a clear line of sight. The number, location, and size of obstacles determine their contribution to path loss.
- **Antenna height** – Path loss is lower when antennas are positioned higher. Antenna height is the distance from the imaginary line connecting the antennas at the two sites to "ground" level. "Ground" level in an open area is the actual ground. In dense urban areas, "ground" level is the average height of the buildings between the antenna sites.

Minimizing path loss maximizes link's signal strength, throughput and availability.

2.3.2 Mounting

Note: A distance of at least 250cm between the equipment and all persons should be maintained during the operation of the equipment.

Une distance d'au moins 250cm entre l'équipement et toutes les personnes devraient être maintenues pendant le fonctionnement de l'équipement

2.3.2.1 Basic mounting kit

BreezeAIR basic mounting kit features:

- Azimuth Adjustable Mount
- Suitable for pole mounting 1-2"
- Made of galvanized steel
- Heavy duty

Packing list

Item	Qty	Description
1	1	Mounting Bracket 1.25”
2	2	Spring Lock Washer 5/16”
3	2	Plain Washer 5/16”
4	2	Hex Nut 5/16”
5	2	Hex Cap Screw 5/16-18 x 2"

Basic mounting kit installation

- Place the bracket on the pole, as illustrated in the picture
- Attach the bracket to the radio’s enclosure using the screws and washers.

Note: The depth of the enclosure’s threads is about 1cm. Do not use excessive force when tightening the screws. you may damage the enclosure.

- In case of narrow pole, the screws might be too long. In such case, use the Hex Nuts prior to securing the screws into the enclosure.

Figure 2-3: BreezeAIR basic mounting kit

2.3.2.2 Advanced mounting kit

BreezeAIR advanced mounting kit features:

- Azimuth and Elevation Adjustable Mount
- Suitable for pole or wall mounting
- Made of Die Cast Aluminum
- Heavy duty

Packing list

Item	Qty	Description
1	1	MK1 (End Mounting Member)
2	1	MK2 (Middle Mounting Member)
3	1	MK3 (base Member)
4	1	MK4 (Back Member)
5	1	Pole 1"-4" (not supplied)
6	6	Helical Spring Lock Washer 5/16
7	6	Plain Washer 5/16
8	4	Hex Cap Screw 5/16-18 x 1"
9	2	Hex Cap Screw 5/16-18 x 5"

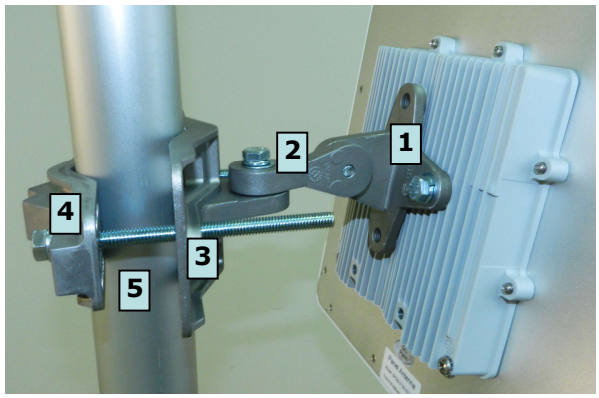


Figure 2-4: BreezeAIR advanced mounting kit

Advanced mounting kit installation

- Place MK1 (1) on the unit, as illustrated in the picture. Align the holes with the screw studs.
- Connect MK1 (1) to the unit with spring washers (6), plain washers (7) and screws (8). Tighten the screws at a torque of 30 Lbs·In.
- Connect MK2 (2) to MK1 (1) with spring washer (6), plain washer (7) and screw (8). Leave the screw slightly loose.
- Connect MK3 (3) to MK1 (2) with spring washer (6), plain washer (7) and screw (8). Leave the screw slightly loose.
- Attach MK3 (3) and MK4 (4) to the pole (5) as illustrated, and connect them using spring washers (6), plain washers (7) and screws (9). Close screws (9) together (in turns), up to tightening torque of 30 Lbs·In.
- Distance between ends of MK3 (3) and MK4 (4) on both sides must be equal. No skewness is allowed.
- Adjust the desired angle, and fully tighten the loose screws (of MK2) at a torque of 30 Lbs·In.

2.3.3 Antennas

2.3.3.1 General

BreezeAIR system supports two types of antennas:

- Integrated antenna
- External antenna

Selecting the antenna model is according to the required range and performance.

Note: To comply with the regulation EIRP limits, the outdoor unit-transmit power needs to be adjusted according to the installed antenna gain. Therefore, a professional installation of the transmitter is required. The outdoor unit must be configured at the time of installation by qualified personnel. Fail to comply with regulation rules may expose the installer to legal liabilities.

IMPORTANT! On lab/office tests of links with external antennas, connection should be done via the antennas. In case direct connection is required (with RF cables), make sure to have a minimum of 50dB attenuation on the RF cables to avoid any damage to the radios.

2.3.3.2 Tx power

The outdoor unit transmit power is configurable. The unit limits the max transmit power according to the antenna gain, the regulation and the frequency band. The installer, if needed, can select a lower power.

The unit supports two levels of privilege password: regular user and administrator user. Since Tx power level affect compliance of the unit with regulation rules, precautions are built into the system to keep the end user from adjusting the Tx power level above the regulation limits. Therefore, the following parameters are Configurable only by administrator user:

- Antenna gain and cable loss.
- Tx Power.

Please refer to BreezeAIR_configuration_manual.pdf for more information.

2.3.3.3 Antenna polarization

BreezeAIR transmission is polarized according to the antenna:

- Dual polarization (Vertical + Horizontal)
- Dual slant (+/- 45 degrees)

The MU and its SUs must be on the same polarization.

To verify antenna polarization, please refer to the assembly instructions supplied with the antenna set.

The polarization of integrated antenna is marked on its backside.

2.3.4 Alignment

Power up the unit:

1. Plug the Power Supply into a wall outlet or other standard AC power source. This is only for use prior to permanent mounting, so any available wall outlet in close proximity to your mounting location is suitable.
2. Connect the Outdoor-to-Indoor cable to the PoE *'PWR LAN-OUT'* port (this port supplies 48 VDC in addition to the Ethernet data).

BreezeAIR is aligned using 2 methods:

2.3.4.1 Using the WEB interface

1. Connect a CAT5 Ethernet cable from a PC to the PoE *'LAN-IN'* port.

Note: Do not attach standard CAT5 cable from the Outdoor Unit directly to the PC. Connecting the PC directly to the Outdoor Unit may cause damaged to the PC Ethernet NIC.

---

2. Connect to the radio's WEB interface, monitoring tab.
3. Set Monitoring Rate to 1 second.
4. Rotate the antenna for maximum RSSI with zero PER. To avoid saturation, make sure the RSSI level does not exceed –25 dBm.

Note: Do not stand in front of transmitting antenna. Rotate the antenna from the rear side.

---

5. Mount and secure the unit by fastening the mounting screws.

2.3.4.2 Using the built in RSSI buzzer

BreezeAIR units have a built in RSSI buzzer that indicates the best mounting location.
The buzzer is beeping at four tone levels:

- Fast – highest signal obtained so far.
- Medium – the current RSSI is lower than the highest signal obtained so far.
- Slow – the current RSSI is much lower than the highest signal obtained so far.
- No sound – no reception of the base station at all (or the buzzer is off).

To align the unit using the RSSI buzzer, please perform the following steps.

1. When the unit is first connected to power, the buzzer will be automatically activated in one of the following modes:
   - No sound – there is no reception.
   - Fast beep – there is a reception (which is currently the maximum signal obtained).
2. Set the MU at fixed modulation of BPSK ½ in both uplink and downlink.

3. Take the unit to the selected location and align the antenna in the link's direction. Listen to the buzzer tone level. Any sound (fast, medium or slow) indicates a reception.
4. Change and rotate the antenna to the left, right, up and down, scanning for the maximum reception point.
5. After the scan is complete, align the antenna to the location where the buzzer beeps at the fast rate, indicating the maximum reception.
6. Mount and secure the unit by fastening the mounting screws.
7. Set the MU back to adaptive modulation (AUTO) for both uplink and downlink.
8. Disable the RSSI buzzer.

To activate/deactivate the buzzer manually, use the Link Manager advanced window.

Note: During this procedure, do not disconnect the unit from power.

2.3.5 Sealing

The outdoor unit must be sealed against rain with the metal glands.
RJ-45 ports of the outdoor unit must be facing down.

Note: All Units are factory sealed, seal needed only on Ethernet ports. Opening the unit will void BreezeAIR product warranty.

RJ-45 ports must be facing down. If installed to the side, the bending of the CAT5 cable damages BreezeAIR sealing and voids product warranty.

2.3.6 Cables

The outdoor unit is connected to straight CAT5 Gauge 24-shielded outdoor rated cable. The cable should be UV resistant, flame retardant, **UL listed** and contain at least 4 twisted pairs.

The outdoor cables scheme is indicated in Appendix A – Outdoor Cables Scheme.

The Indoor PoE Outlet side and Outdoor Unit side are crimped using RJ-45 tool.

Note: Total length of the CAT5 cables must not exceed 100 meters for 10/100Mbps connection and 75m for 1000/2500Mbps connection

---

The Outdoor Unit side is assembled according to the following steps (figure 2-5):

- Insert sealing nut on the cable.
- Insert claw and rubber seal on the cable.
- Crimp the RJ-45 Plug.

Figure 2-5: Cable preparation for Outdoor Unit

- Insert the RJ-45 to the Outdoor Unit (Figure 2-6).
- Fasten the seal nut to the gland Body
- The unused port should be left sealed.

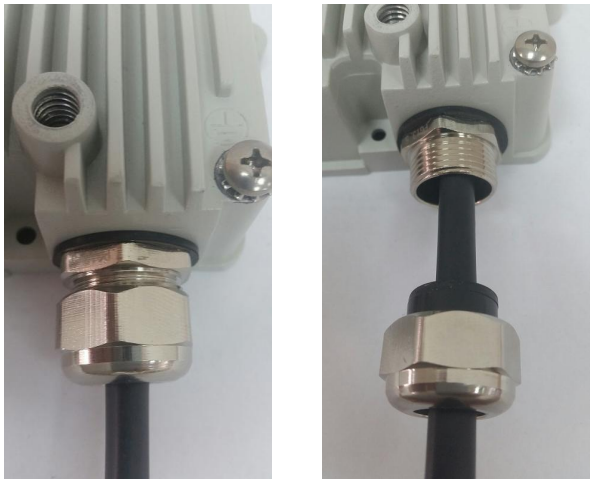


Figure 2-6: Cable connection to Outdoor Unit

2.3.7 Indoor POE installation

The indoor PoE is assembled as follows:

1. Crimp the RJ-45 Plugs on cable ends to form the Outdoor Unit cable.
2. Plug the Outdoor Unit cable to the RJ-45 Jack marked *"POE"*.
3. Plug standard CAT5 cable from the PC to the RJ-45 Jack marked *"LAN".*
4. Plug the AC Input to the power (100-240VAC).

Note: Do not attach standard CAT5 cable from the PC (or other network device) to the Indoor Unit RJ-45 jack marked *"POE"*. It may damage the PC's Ethernet interface.

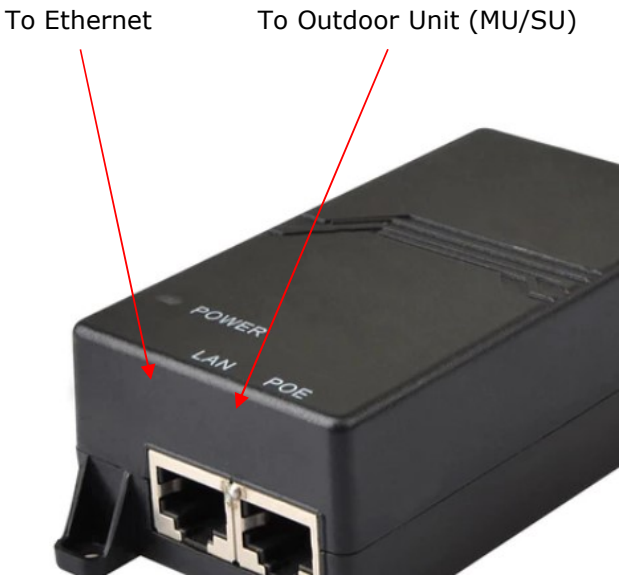


Figure 2-7: BreezeAIR PoE

2.3.8 Grounding

2.3.8.1 Grounding the outdoor unit (MU /SU)

The outdoor unit shall be connected to a protective earth with not less than 10 AWG conductors having green-yellow insulation. The following figure shows the grounding cable from outdoor unit external screw to adjacent grounding rod. The cable should be long enough to reach from the mounting pole to the grounding rod with 3 to 6 feet extra to allow for strain relief.

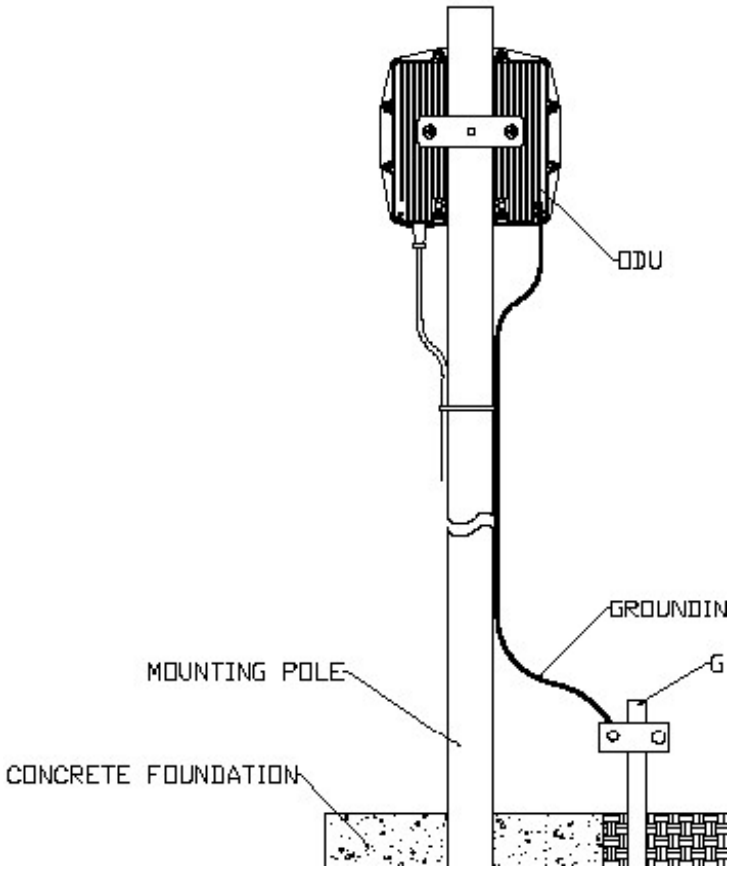


Figure 2-8: Ground Connection to Outdoor Unit

Protection from lightning

US National Electric Department of Energy Handbook 1996 specifies that radio and television lead-in cables must have adequate surge protection at or near the point of entry to the building. The code specifies that any shielded cable from a detached antenna must have the shield directly connected to a 10 AWG wire that connects to the building ground electrode.

The ground wire shall be terminated with **UL listed** lug with a diameter of 0.2 inch (5.2 mm).

The ground lug will need to be suitable for terminating on aluminum materials, such as the use of an aluminum connector and aluminum ground conductor.

FCC Notice

This equipment has been tested and found to comply with the limits for Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

This device must accept any interference received including interference that may cause undesired operation. Any unauthorized modification or changes to this device without the express approval of Telrad Networks may void the user's authority to operate this device. Furthermore, this device intended to be used only when installed in accordance with the instructions outlined in this manual. Failure to comply with these instructions may also void the user's authority to operate this device and/or the manufacturer's warranty

2.4 Synchronization

BreezeAIR is designed to work with co-located radios. This means that two or more units can be mounted close to each other.

Time synchronization allows reusing frequencies between co-located links and configured with the Link Manager advanced window.

The synchronization signal is generated by an external GPS (1 PPS) when synchronizing multiple towers, or by a master MU when synchronizing units on the same tower.

External synchronization:

Synchronize multiple towers with one GPS unit per tower.

Figure 2-9: External time synchronization

Internal synchronization:

Synchronize multiple MUs on one tower without any external device.

Figure 2-10: Internal time synchronization

Please refer to BreezeAIR_configuration_manual.pdf for more information.

Note: The distance between any two antennas should be at least 50 cm.

3. BreezeAIR AXE Technical Specifications

Radio	
Radio Frequency	4.9-5.9 GHz, 6.1 -7.1GHz
Net Throughput	Up to 2 Gbps, 2x2 MIMO
Range	More than 130Km NLOS up to 5Km* *actual range depend on multipath/reflections/insertion-loss at the specific location
Channel Size	20/40/80/160 MHz
Modulation	12 levels - BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM, 4096QAM* * In roadmap – Future availability via firmware upgrade
Output Power	Up to 28dBm, configurable TPC and ATPC
Time Synchronization	3 modes - Internal / external GPS / on-board GPS* * Not included in the default HW (special P/N)
Handling Interference	AIS – Automatic Interference Sensibility ACM – Adaptive Coding & Modulation ACS – Automatic Channel Selection FEC – Forward Error Correction, k = 1/2, 2/3, 3/4, 5/6 Fastest ARQ – Automatic Retransmit reQuest
Encryption & Security	256-bit AES & MAC level authentication
Networking & Management	
Topology	Point-to-Point (PTP), Point-to-Multipoint (PTMP)
Access Technology	Time Division Duplex (TDD), Time Division Multiple Access (TDMA)
Asymmetric TDD	Dynamic & Automatic (according to real time traffic) or Fixed
Typical Data Latency	2-5ms (PTP)
MTU Size	9600 Bytes Jumbo frames
Network Modes	Layer 2 Bridge, VLAN, 802.1ad QinQ, tagging, VLAN / broadcast filters
Authentication	Via username + password, RADIUS/TACACS authentication supported
QoS	8 priority queues based on 802.1q, 802.1p, TOS, DiffServ and DSCP
Management	IPv4/IPv6 dual stack, ViewAir NMS, Cloud-based NMS, WEB (HTTP/HTTPS), SNMPv1, SNMPv2, SNMPv3, Telnet, SSH, EMS (BreezeManager), TFTP
Analysis Tools	Built in throughput test, RF Analyzer and path profiling tools
Performance Data	Real time & history – logs and counters of traffic and radio data
Physical & Environmental	
Physical Interface	1x 10/100/1000/2500 Base-T RJ-45 POE
SFP Support	1000Mbps* * Not included in the default HW (special P/N)
Mechanical	19 x 19 x 4 cm, <1Kg (connectorized) 21 x 21 x 7 cm, <2Kg (17.5dBi @ 5.xGHz) 30 x 30 x 7 cm, <2.5Kg (23dBi @ 5.xGHz, 24dBi @ 6.xGHz) 37 x 37 x 8 cm, <3.5Kg (16dBi, 90 degrees @ 6.xGHz)
Power Consumption	<13Watt
Power Adapter AC-DC	48-55VDC POE - Input power 100-240VAC, 47-63Hz
Power Adapter DC-DC	48-55VDC POE - Input power 10-60VDC
IP rating	IP67
Operating Temperature	-40°C to 60°C
Operating Humidity	100% non condensing (Rainproof)

4. BreezeAIR AXE NET Throughput (Mbps)

	20MHz	40MHz	80MHz	160MHz
BPSK 1/2	11	28	60	124
QPSK 1/2	27	58	120	250
QPSK 3/4	42	88	182	375
16QAM 1/2	57	118	245	502
16QAM 3/4	85	178	370	755
64QAM 2/3	115	238	494	1000
64QAM 3/4	130	268	555	1130
64QAM 5/6	145	298	617	1260
256QAM 3/4	175	358	741	1520
256QAM 5/6	195	398	823	1650
1024QAM 3/4	220	448	930	1850
1024QAM 5/6	250	500	1033	**>2000 Mbps**

Figure 4-1: BreezeAIR AXE 2x2 net capacity

5. Appendix A – outdoor cables scheme

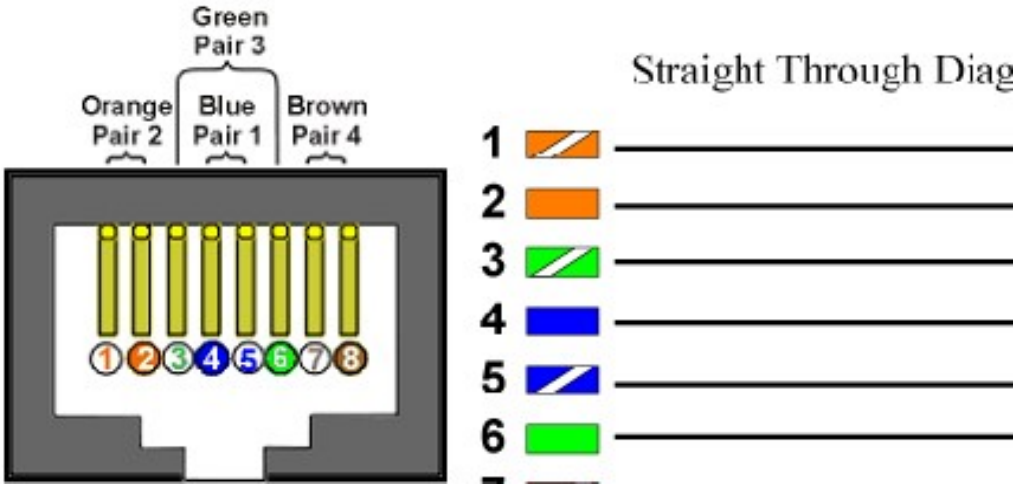


Figure 5-1: Outdoor Cables Scheme

Note: In order to comply with 100 meter CAT5 cable

- Pins 1,2 must be a twisted pair wire.
- Pins 3,6 must be a twisted pair wire.
- Pins 4,5 must be a twisted pair wire.
- Pins 7,8 must be a twisted pair wire.

Recommended cable length:

- 10/100/1000/2500Base-T – 75m.
- 10/100Base-T – 100m.

6. Appendix B – Lightning Protection

All outdoor wireless equipment is susceptible to lightning damage from a direct hit or induced current from a near strike. A direct lightning strike may cause serious damage even if these guidelines are followed. Lightning protection and grounding practices in local and national electrical codes serve to minimize equipment damage, service outages, and serious injury.
Possible reasons for lightning damage:

1. Poorly grounded antenna sites that can conduct high lightning strike energy into equipment.
2. Lack of properly installed lightning protection equipment can cause equipment failures from lightning induced currents.

A lighting protection system provides a means by which the energy may enter earth without passing through and damaging parts of a structure. A lightning protection system does not prevent lightning from striking, and instead provides a means for preventing damage to equipment by providing a low resistance path for the discharge of energy to travel safely to ground. Improperly grounded connections are also a source of noise that can cause sensitive equipment to malfunction.
A good grounding system disperses most of the surge energy from a lightning strike away from the building and equipment. The remaining energy on the Ethernet cable shield and conductors can be directed safely to ground by installing a lightning arrestor in series with the cable.
If you have determined that it is appropriate to install lightning protection for your system, the following general industry practices are provided as a guideline only:

1. The AC wall outlet ground for the indoor POE adapter should be connected to the building grounding system.
2. Install a lightning arrestor in series with the Ethernet cable at the point of entry to the building. The grounding wire should be connected to the same termination point used for the tower or mast.
3. Provide direct grounding from the unit, the mounting bracket, the antenna, and the Ethernet cable surge protection to the same ground bus on the building. Use the grounding screws provided for terminating the ground wires.

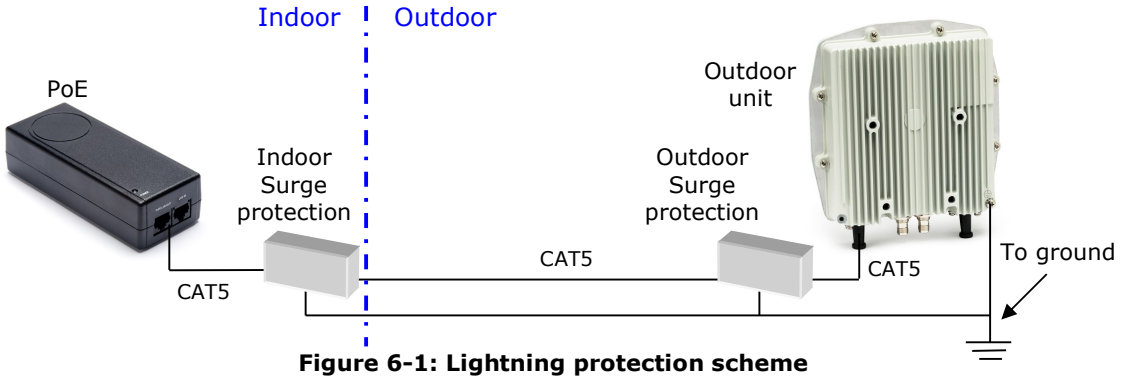


Figure 6-1: Lightning protection scheme

Note: BreezeAIR wireless equipment should be installed by a qualified professional installer who is knowledgeable of and follows local and national codes for electrical grounding and safety. Failure to meet safety requirements and/or use of non-standard practices and procedures could result in personal injury and damage to equipment.

6.1 BreezeGuard lightning protection

Telrad Networks BreezeGuard is 1000Mbps PoE Outdoor Surge Protector, is designed to protect BreezeAIR PoE network from lightning over-voltage, transient over-voltage and static discharge. The protector implements multi-level protection circuit with advanced manufacturing process, and has excellent performance on discharge current, limiting voltage, response time, stability and over-all reliability.

BreezeGuard features

- 10/100/1000Base-T PoE Gigabit Ethernet protection
- Multi protection circuits - Gas-Tube + TVS technology
- Dual protection - Common and differential modes
- TVS array technology, low capacitance
- Multi-Strike Capability
- IP67 enclosure - full outdoor solution
- CAT6, CAT5e and CAT5 compatible

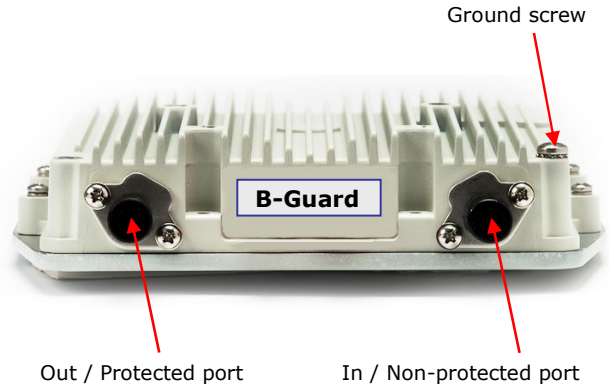


Figure 6-2: BreezeGuard ports

BreezeGuard Specifications	
Nominal operating voltage	48V
Max. continuous operating voltage	57V
Nominal discharge current (8/20us) In	3kA
Max. discharge current (8/20us) Imax	5kA
Limiting voltage: • Line-line (@6kV, 10/700us) • Line-line (@3kV, 8/20us)	 ≤150V ≤150V
Transmission rate	10/100/1000Mbps
Insertion loss	≤0.5dB
Protection line	1-8
Response time	1ns
Load current	350mA
Protection grade	IP67
Dimensions	19x19x4 cm
Weight	<1Kg
Temperature	-40°c to 85°c
Relative humidity	100% non condensing (rainproof)

7. Appendix C – Connecting to the AFC server

As part of its FCC certification, BreezeAir AXE 6GHz supports AFC protocol.

AFC is a protocol between radio (MU and SU) and an external server which is mandatory in US and Canada to operate in 6GHz frequency range.

Basically, the radio asks the AFC server for permission to transmit in a specific channel.

It is recommended to select a 'clear' channel using RF Analyzer to get the best performance.

The radio will automatically find an allowed channel if the current required channel is not available.

The following configuration steps are required to configure the radio for AFC operation.

The steps are identical for MU and SU.

7.1 AFC Configuration

Before setting up the AFC server parameters in the radio, you will need 3 things:

a. **AFC server URL** (the depicted example uses 'fake' server with URL **hellfish.test**)
b. **AFC server port** – in the example **5001**
c. **X509 certificate issued by the AFC server CA** – in the example **myCA.pem**

7.1.1 Configure AFC server URL and port

Click on the **Radio** tab and fill the relevant fields (AFC URL & AFC Port) in the AFC section.

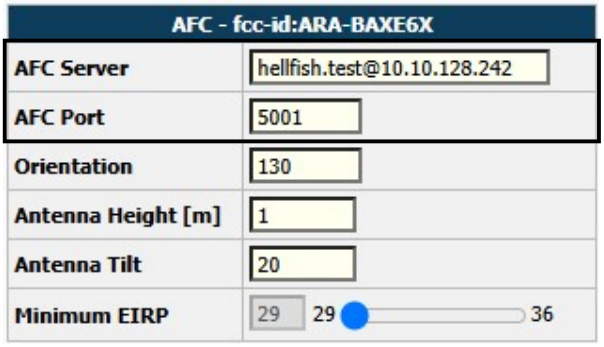


Figure 7-1: Radio tab – AFC

Note: For the radio to communicate with the AFC server it needs to issue a DNS request to resolve the AFC server IP address. If a DNS server is not configured (see **Network** tab) or the AFC server is local (for testing purposes), add the AFC server IP address after @ character.

The example above shows an explicit IP address **10.10.128.242. Normally, only the URL is required**.

7.1.2 Setting Antenna parameters

The AFC server requires radio information including:

- Location - retrieved automatically using the on-board GPS module.
- Antenna orientation – azimuth between 0-360
- Antenna Height in meters
- Antenna tilt – between -90 to 90

Those parameters affect the max **EIRP** that will be approved.

Network Tab - Set the DNS IP address.

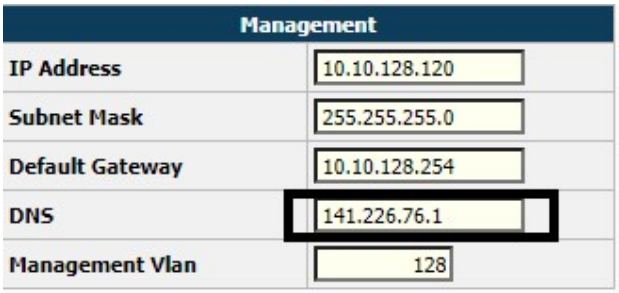


Figure 7-2: Network tab – DNS configuration

7.1.3 Installing the AFC server certificate

The radio authenticates the server using the supplied certificate. It is essential to install the specific **pem** file issued by the AFC server in the radio Admin tab.

Admin Tab - Install the pem file.

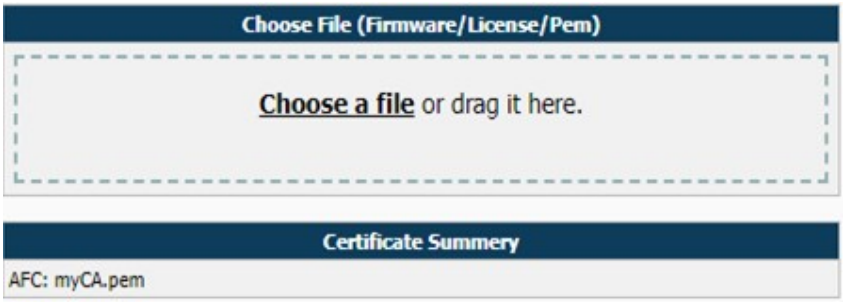


Figure 7-3: Admin tab – load the pem file

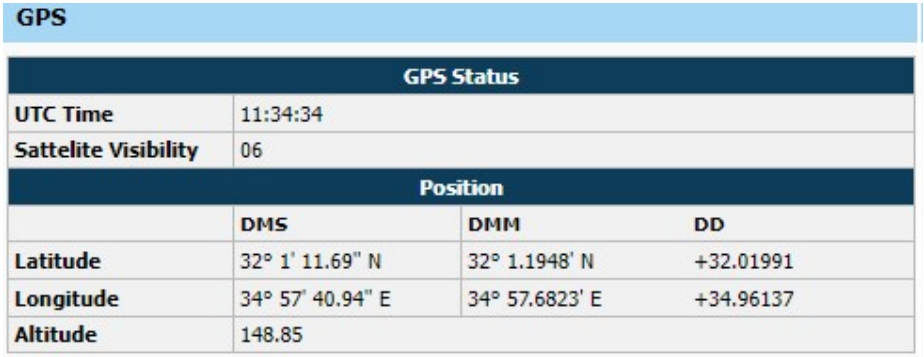
7.1.4 Radio GPS location

The radio location is critical information that is passed to the AFC server.
As such, please make sure the **GPS antenna** is installed, and verify that you have Satellite Visibility of 3 satellites or more in the GPS tab.

The GPS tab presents the GPS status & position.

Click on **Import from GPS** button to load the coordinates.

Note: The GPS location is **enforced** and requires a functioning GPS on board, if the location is unavailable, the imported co-ordinates will be zeroed.



GPS

GPS Status			
UTC Time	11:34:34		
Sattelite Visibility	06		
Position			
	DMS	DMM	DD
Latitude	32° 1' 11.69" N	32° 1.1948' N	+32.01991
Longitude	34° 57' 40.94" E	34° 57.6823' E	+34.96137
Altitude	148.85		

Figure 7-4: Admin tab – load the pem file

8. Appendix D – 6GHz approved antennas

Antenna Type	Model	Gain [dBi]	Dimension [mm]	Maximum uptilt [deg]
Flat panel	RDAN9040	24	305x305x15	0
Dish	B-6X32D003P	32	3ft	20

Figure 8-1: 6GHz integrated/external antennas

IMPORTANT! The device must be installed according to the worst case uptilt angle to remain compliant with the EIRP elevation mask requirements