



**BreezeACCESS IF
BA-II, MMDS, XL**

**Recommendations for Protection Against Lightning
Electromagnetic Impulse (LEMP)**

BASE STATIONS ONLY

For information in Subscriber Unit protection,
see White Paper;
“Recommendations for Protection Against
Lightning
Electromagnetic Impulse (LEMP)
Subscriber Units (CPE) Only”

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Introduction

“Direct and indirect lightning strikes are mainly accompanied by resistive and magnetic coupling processes of their electrical energy. Capacitive coupling effects of surge energy by the high and fast changing electrical field just before the lightning strike occurs are negligible, if the system is well bonded to earth (electrical charge equalization).”¹

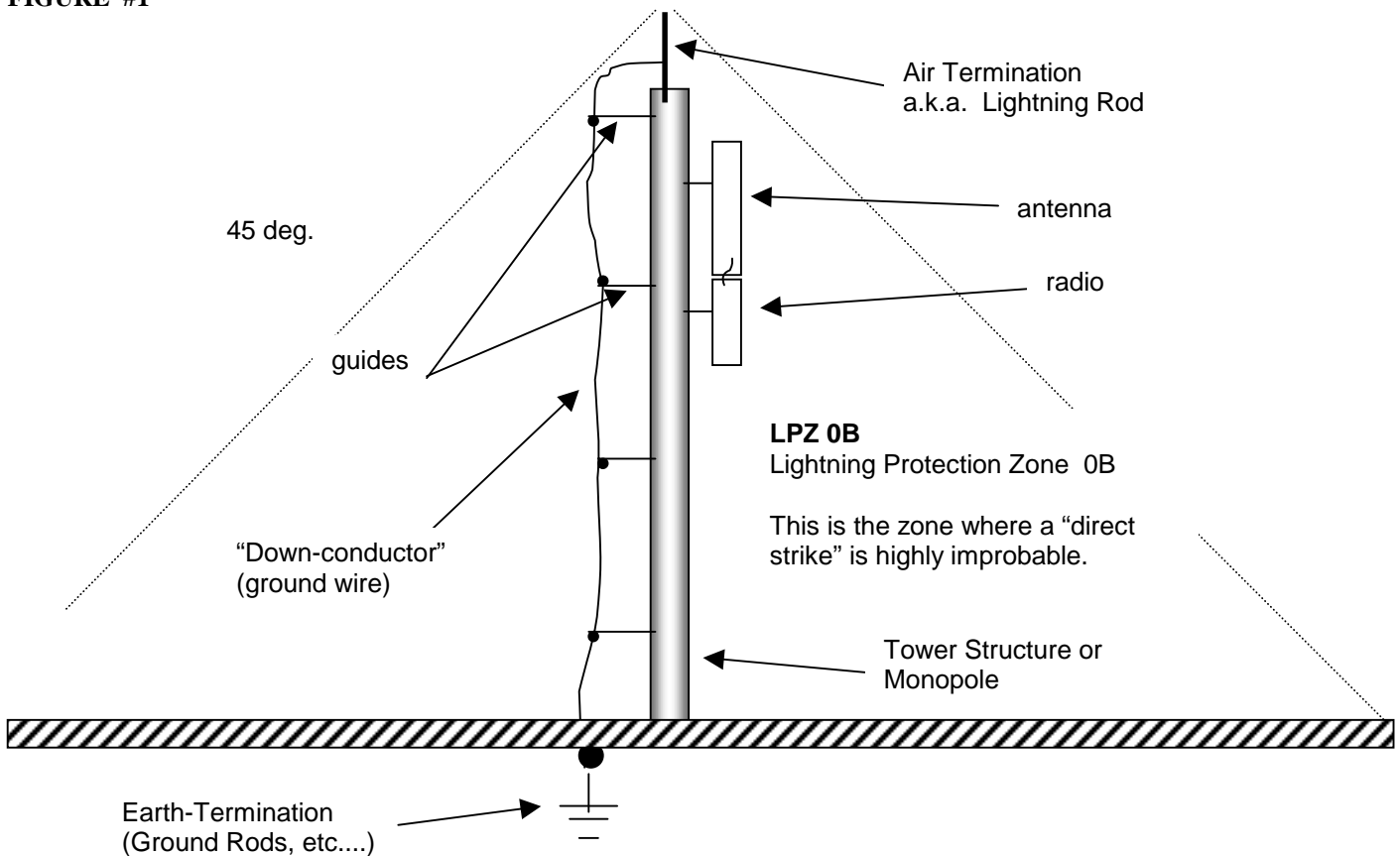
The following recommendations are provided to enhance the lightning protection of BreezeACCESS IF units currently deployed in areas where lightning strikes are more prone to occur.

Basic Recommendations for Cell Sites

Lightning Protection Zone

Antennas should be protected against a “Direct Strike” by making sure the entire antenna and radio are under the “Protection Zone” generated by the tower structure itself. This can be thought of as a “cone” with the top of the cone at the top of the structure’s air termination (lightning rod or similar). The sides of cone extend outward at a 45 degree angle. In this manner, the radios and antennas are protected against a direct strike with a probability of 80 to 90 percent. This is referred to as PL III (protection level 3) in IEC 61312-1.

FIGURE #1 ²



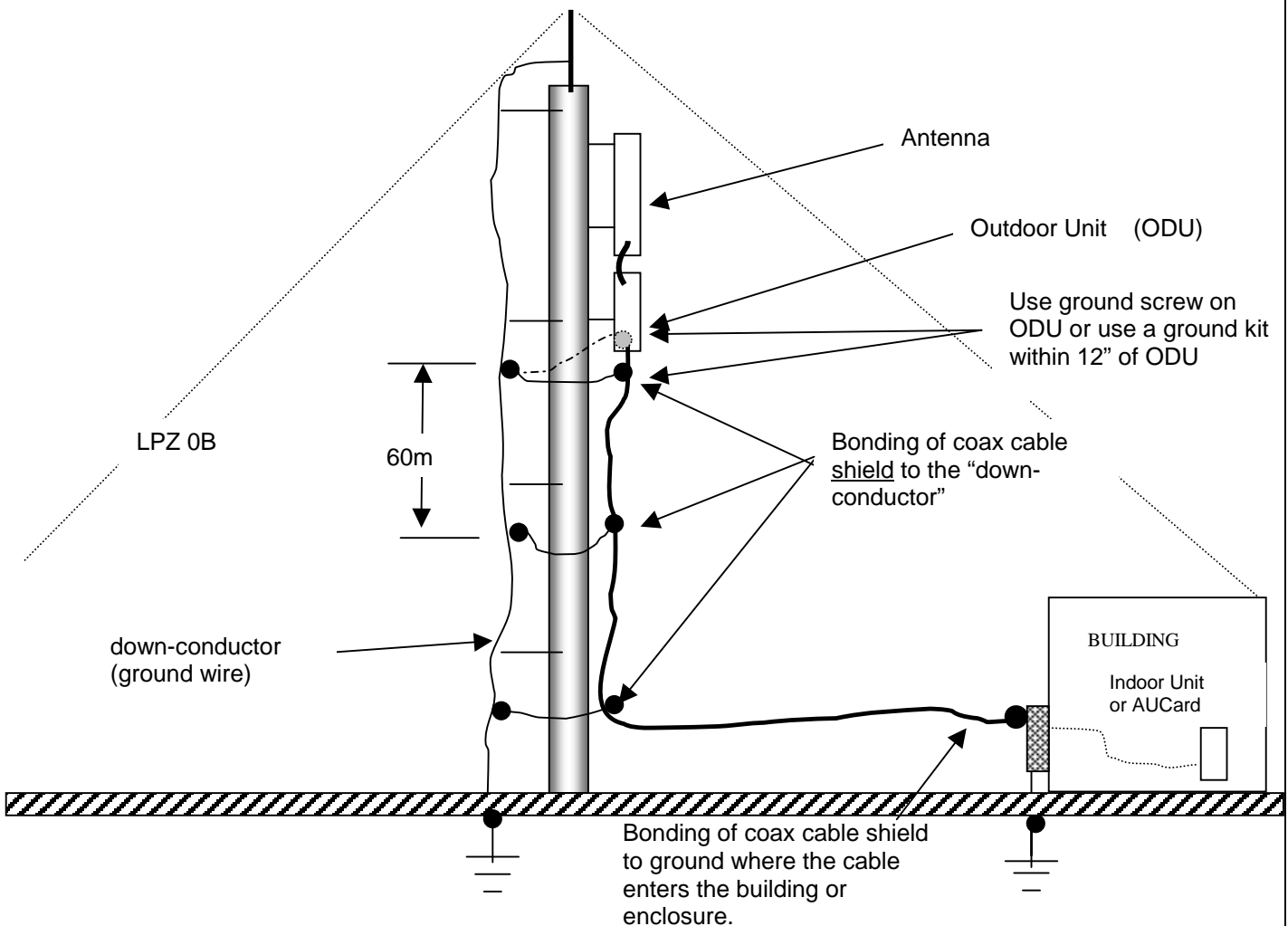
¹ “Shunner Lightning protectors”, Huber + Shuner pg. 146

² “Shunner Lightning protectors”, Huber + Shuner pg. 146

Bonding of Coax Shield

The shield (outside conductor) of the coax cable should be connected to the “down-conductor” at the base of tower and up the tower every 60 meters. The coax cable shield should also be connected to a “Bulk Head” plate (usually made of ¼” thick copper), and “bulkhead” head type RF connectors are mounted on the copper plate. The copper plate is then connected to earth ground using a ground wire that has a cross-sectional area of 16mm² or higher as shown in Figure 2 below.

FIGURE #2³



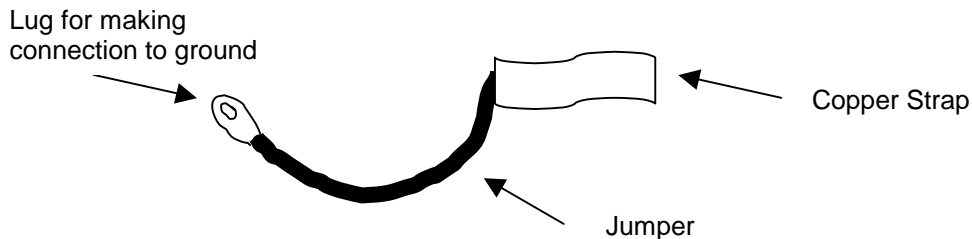
NOTE: It is important for the BreezeACCESS IF product line that only the shield inside the cable be bonded to the grounding points. Since, there is a DC current flowing on the center conductor of cable, any connection to the center conductor would interfere with this DC current. This includes the insertion of any lightning protection device other than those recommended in Section 3, “Advanced Recommendations” of this document.

³ “Shunner Lightning protectors”, Huber + Shuner pg. 147

Ground Kits

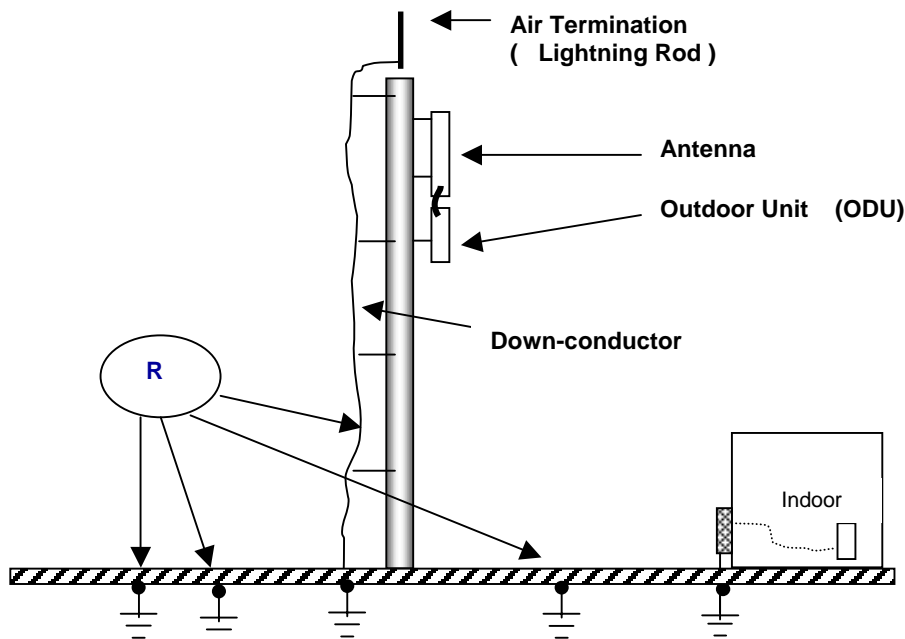
Andrew Corporation makes a very good ground kit for 1/2" size coax cables. The ground kit comes with a 2' foot long pigtail 16mm² ground cable bonded to a copper strap. It also comes with a simple weather proofing tape. Installation is relatively easy, the jacket from the coax is removed, and the strap is wrapped around the bare shielding and clips together. Then the weatherproofing is applied. The other end of jumper cable is bonded to the down conductor on the tower. The part number is: 223 158

Ground kits for larger cables are also available through Andrew Corp.



Site Resistance

Site Resistance relative to ground mass is one of the most important parameters in an effective Lightning Protection System (LPS). You can provide a LPS according to the standards and fail to provide a proper ground path, which blocks the flow of lightning current. The standards (IEC61024, IEC61312 and NFPA-78) define the required resistance differently. We recommend that the Site Resistance be 5 ohms or less. A tower site consultant can be hired to measure the site resistance for you.



Down-conductor Size

We recommend that the "down conductor" from the air terminal (lightning rod) at the top of tower to the earth termination be at least 50mm² or AWG 0.

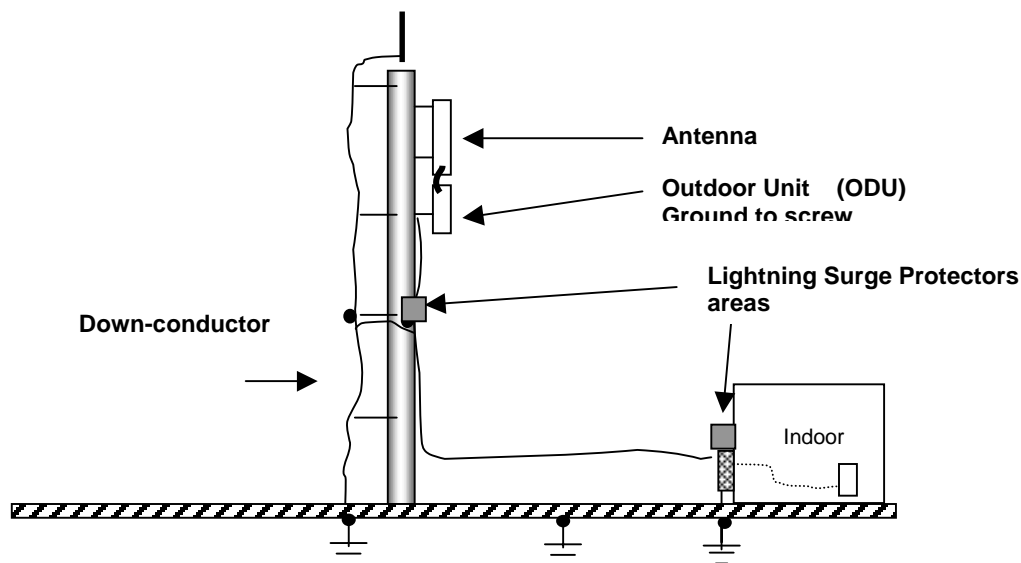
Please see APPENDIX for more details on sizes of material used in the protection system.

Advanced Recommendations for Cell Sites

This section is for equipment installed in areas of known “high probability” of lightning strikes.

Lightning Protector on IF cable

A lightning surge protector can be installed at the “bulkhead” mounting plate where the coax cable enters the building or enclosure. This lightning protector will “clip” and excessive surge voltage that may be present on the center conductor. A protector that can be used for BreezeACCESS IF solutions is one that has been designed for 400 MHz operation and can provide DC pass thru. This type of lightning protector should be installed at the entrance to the building and should be mounted on a “bulkhead” plate that is properly grounded. Proper ground should be applied to the ODU unit using the ground screw available with the unit. A second lightning protector shall be installed up on the tower near the ODU as additional protection.



Alvarion IF Lightning Arrestor

Triple Mode Protector – 440MHz and 20MHz operation. TNC female connector on both sides. Bulkhead mount.

1. IF Triple Mode Lightning Arrestor P/N : 872945
2. 6 Position IF Lightning Arrestor Ground Bar P/N : 872935

Use of IF Lightning Arrestor

Product Breeze ACCESS	Hardware Revision	Install IF Lightning Arrestor @Indoor Unit (IDU)	Install IF Lightning Arrestor @Outdoor Unit (ODU)
AU-E-NI-2.4	C/S: C	YES	Not Required*
AU-E-BS-2.4	C/S: C	YES	Not Required*
ALL AU UNITS	PRE C/S: C	YES	Not Required*

Note:

- * It is suggested for cable runs longer than 100m (300ft), and in lightning prone areas that an IF Lightning Arrestor be installed at the Outdoor unit (ODU).

BreezeACCESS ODU Units

Connecting the Ground and IF Cables

The Ground terminal marked \perp (and the IF cable connector marked IF) are located on the bottom panel of the Outdoor unit, shown in Figure 5 and in Figure 6. ⁴

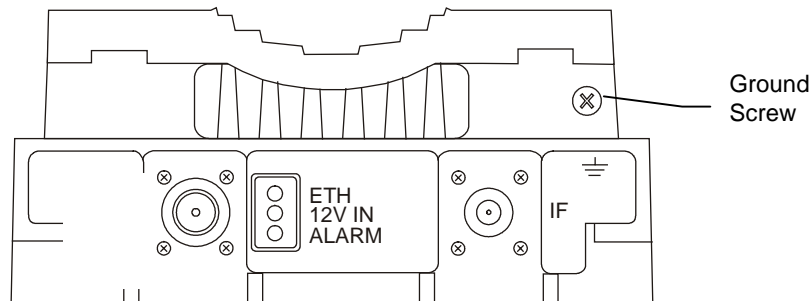


Figure 5. BreezeACCESS II and BreezeACCESS MMDS AU-RA/AU-RE Radio Unit Bottom Panel

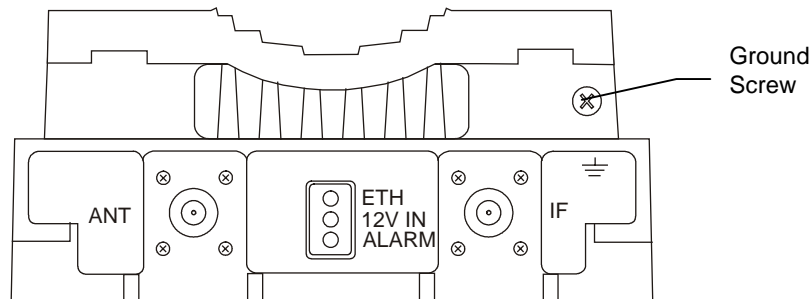


Figure 6. BreezeACCESS XL AU-RE Radio Unit Bottom Panel

Note: The bottom panel of the BreezeACCESS AU-RA radio unit is identical to the one shown in Figure , but does not have the ANT connector.

1. Connect one end of the grounding cable to the Ground terminal and connect the other end to a good ground connection.
 2. Connect the coaxial cable to the IF connector. Verify that the length of the IF cable is sufficient and that it can easily reach the Indoor unit.
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Note: Make sure to switch OFF the power of the indoor unit prior to connecting/disconnecting the IF cable.

⁴ BreezeACCESS Installation Manual

References

- “Protection Against Electromagnetic Impulse,” IEC (International ElectroTechnical Commission.) Document # IEC 61312: (<http://www.iec.ch>)
- “Protection of Structures Against Lightning,” IEC (International ElectroTechnical Commission.) Document # IEC 61024
- Huber+Shuner. Lightning Protectors, Wireless Division: (<http://www.hubershuner.com>)
- MIL-HDBK-419A, Grounding, Bonding, and Shielding for Electronic Equipments and Facilities (DoD, 21 January 1982).
- MIL-STD-188-124A, Grounding, Bonding, and Shielding (DoD, 2 February 1984).

Further Reading

- Lightning Protection Institute: <http://www.lightning.org>
- National Lightning Safety Institute: <http://www.lightningsafety.com>
- Telematic Lightning Protection, Inc.: <http://www.lightning-protection.com>
- Polyphaser, Inc.: http://www.polyphaser.com/ppc_technical.asp

APPENDIX

The values in these tables were determined by the IEC and others. See IEC document #61024

Minimum Dimensions of LPS Materials* (cross-section area)

Material	Air Termination (mm ²)	Down-conductor (mm ²)	Earth-termination (mm ²)
Copper	35	16	50
Aluminum	70	25	N/A
Iron	50	50	80

We recommend using 50mm² or AWG 0 down conductor.

N/A = NOT RECOMMENDED

Minimum Dimensions for Bonding Conductors Carrying a Substantial Part of Current*

Material	Cross section (mm ²)
Copper	16
Aluminum	25
Iron	50

Minimum Thickness of sheet metal or metal piping for Air Termination Systems (lightning rod)

Material	Thickness (mm ²)
Copper	4
Aluminum	5
Iron	7