



Technical Bulletin

## **Modern Lightning Protection for Radio Facilities: RF Entry Ports**

Lightning is one of Nature's most destructive forces. It has the power of a good-sized explosive and cannot be avoided if you're connected to antennas that are high and in the clear. And it's not just lightning: On one memorable evening at the original I.C.E. factory and test facility, a 160 Meter dipole (260 foot wire span) strung between towers at 180' exhibited several hundred volts of charge from a light rain shower enough to shock one of the technicians working with the cable outside. During an electrical storm with overhead discharges many thousands of volts have been measured on this wire, respective to earth ground terminals.

In installations employing coaxial feed lines the measures used to protect station equipment are simple but critically important. Here is a list of observations and our recommendations...

1. Always bring coaxial cables to ground level before entering equipment area. Never bring coaxial lines into the building at an elevated height directly. Lightning currents induced into the cables will be forced through the equipment chassis on the way to ground, and that's what causes extensive damage. Even if your equipment is on the second floor, always bring coax to ground level first and insert appropriate lightning protection, then route the cable to the station gear.
2. Absolutely, positively ground coaxial cable shields with as short an earth terminal connection as possible. Use a commercial shield grounding block if possible, or fashion your own. In most cases as much as 80% of an induced or direct lightning blast comes in on the shield. This is because of the external exposed nature of the shield and its larger metallic mass. Always make sure that grounding of the shields occurs before the cable enters the building or reaches equipment chassis. Multiple shield grounding (such as once at the tower base and once more before building entry) is an excellent, low cost idea.
3. Use lightning arrestors on lines that feed sensitive electronics. But beware: Don't use so-called lightning arrestors that offer nothing more than a gas discharge device to ground. These units are DC-passive and only activate when the potential voltage between conductors reaches hundreds of volts. By that time in most cases the radio gear has already been damaged before the arrestor attacks, leaving you with an arrestor

that did mostly nothing and a damaged rig. Also, gas discharge tubes are very low power rated, typically only about 1 watt dissipation. They may be "rated" for 20,000 amps or more, but only if a lightning bolt starts and ends in a few billionths of a second. Few bolts ever do, and blasts that are slowed down coming through transmission lines almost never do. That's why gas discharge arrestors require repair or replacement so often. They're overpriced and offer little, if any, protection from induced voltages.

If arrestors are used always specify a blocking-type arrestor - a unit that has no DC continuity from input port to output port and some means to handle current besides or in addition to a gas tube.

4. Establish a bulkhead grounding system near the radio equipment where the distance from the bulkhead to coax entry is short - preferably less than a foot. Use this bulkhead for lightning protection as well as RF neutral for interference filters and similar items. The bulkhead can be a bar, metal sheet or just heavy wire. But remember - the length of ground leads is far more significant to good grounding performance than the specific materials or even wire size used.

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