PolyPhaser

# Technical Note

## Lightning Protector Location

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## Protector Location, Location!

One of the basic ideas in developing a protection strategy is not allowing stray energy to flow through the equipment. There are several ways to accomplish this. One is to totally disconnect the equipment! Another is to provide some form of impulse protector for each of the equipment's Input or Output (I/O) ports. These ports are usually the ac power connection, a telephone, control, or data line, and an antenna transmission line. A protector on each of the I/O's will protect that path from damage. However, it is also necessary to be careful about voltages that may exist between the I/O's during a strike event.

For example, if each of the protected I/O's of a remote transmitter are connected to a different ground, which could happen very easily in the best of installations, the following situation will exist during a strike event that could damage the transmitter.

The transmission line is grounded at its protector as the line enters the building. The power line to the transmitter is protected and grounded at the distribution panel where the power line enters the building. The telephone line is also protected and grounded where it enters the building. Protection on each of the I/O's at the building service entrance is good practice and has the advantage of keeping the strike energy toward the outside of the building and away from the transmitter.

Each of the I/O's are an entrance point for strike event energy. During a strike event, the energy will propagate along a conductive path (power line, transmission line, or telephone line) until it meets the protector.

The protector will shunt the majority of the strike energy to the earth ground. The earth immediately surrounding the ground point will begin to take up the energy charge and dissipate the energy by propagation outward within its "sphere of influence" (see ground systems topic). The local earth ground will rise in potential (see GPR) for a few microseconds. For a brief instant, one port of the transmitter is elevated above ground while the other ports are at ground potential due to other protector connections not yet elevated.

As the surge energy attempts to go to earth ground using the transmitter as a connecting path to the other grounds, it is likely to also use the internal circuitry as current carrying conductors and cause equipment damage. A complicating factor is that the other I/O protectors are at a greater distance with respect to the equipment. The greater the distance between the protectors, the more serious the problem.

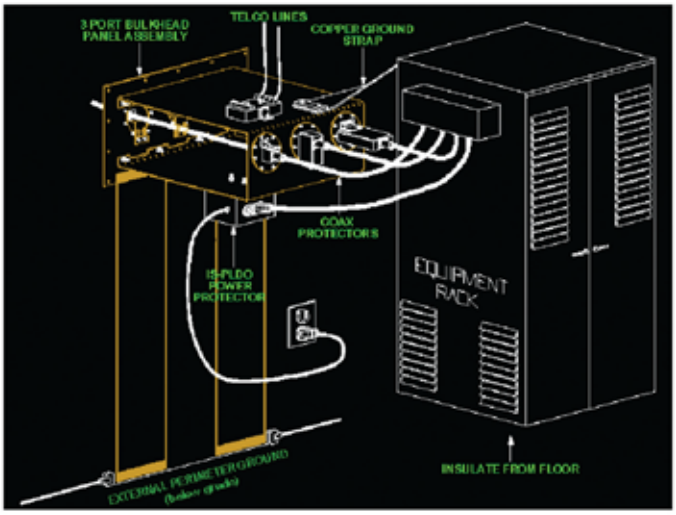
Another complication in this scenario is the inductance of the conductor between the I/O protector and the ground system. The inductance will determine how much of the strike energy is conducted into the ground system and how much is left to elevate the transmitter chassis. Since strike energy is a high frequency pulse and dc, a low inductance path to ground becomes a critical factor. Copper strapping is preferred over large diameter wire as an inter-connecting conductor. Copper strap has a large circumference and low inductance per unit length. The strike energy, like water, will follow the easiest (least inductive) path to ground. In the above example, each of the I/O protectors is connected to separate grounding points. This can be corrected, but will require some physical rearrangement of the transmitter installation.

First and foremost, there should be only one ground system . Second, the individual I/O protectors need to be co-located on the same electrical ground plane. This means establishing a single point ground system within the equipment building. An ideal way is the PolyPhaser Bulkhead Panel, PEEP, or Single Point Ground Panel. The single point ground system will keep all the I/O protectors at the same level with respect to each other. Previously installed protectors at the ac power and telephone entrance can be retained, but wiring will have to be rerouted, and another protector bonded to the single point ground

installed. (see “Ac Power Retrofit” topic)

Third, the transmitter equipment chassis must be insulated from conductive flooring and connected to the ground plane at the top of the rack using a low inductive connector.

### Single Point Bulkhead Ground System with Protectors applied to all “IO” Ports

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Please contact us for questions or further information on this topic.

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