

## Lightning Protection and Grounding Systems Part II

In the last part we started our discussion of lightning protection and grounding systems. In this part we will continue that discussion. We will begin with ground rods for our lightning protection and grounding system.

Ground rods should be eight feet long and at least five eighths inch diameter and should be copper plated iron. Smaller rods cannot dissipate sufficient energy in most soils. The iron provides needed strength while the copper coating provides needed conduction and is not easily affected by various soil types. Never use stainless rods or wiring as its resistance is high enough to have a detrimental effect.

Typically guyed towers afford better protection than unguyed especially those where the lowest section of the guys are grounded. Induction between insulated guy sections on the same guy can dissipate a large quantity of energy. Again, observe all the above information for ground rods when grounding guys.

Crank up towers and push up poles should have each section bonded to adjacent sections with copper ribbon connectors. Without bonding adjacent sections the towers joints or the joints of push up polls can afford a high impedance path to lightning's energy and thereby forcing more energy into other parts of the grounding system.

The entrance point of all coaxes, rotor and other control cables should go through a large metal plate at their entrance to your shack. This serves two purposes. First it provides another opportunity to ground at least the outer shields of coaxes. Second, the metal plate can reduce induced voltages from lightning traveling on conductors. The metal plate effectively acts as a large chock to attenuate magnetic fields accompanying any lightning or surges on your cables. This plate should be grounded to your ground system as described earlier.

Ideally your ham shack should be located in the basement. The higher the location the more chance there is for it to be damaged by lightning. In the basement grounds are typically closer and surges including magnetic fields from lightning are attenuated by soil and concrete. However, remember that concrete is a good conductor and you should insulate your equipment from it by the use of plastic or other insulating material.

Disconnecting your equipment from lead ins such as coax and rotor cables may be counter productive. Remember it is still connected to other parts of your ground system such as you AC power. There is most likely still a path to it from these other sources. If you decide to disconnect your coaxes be sure to connect them through electrically solid connectors to your ground system. There is nothing worse than have lightning entering your shack and home and arcing several feet to a ground. This can cause a fire or other catastrophic event. Just what you were trying to avoid. Throwing them out the window so to speak still leaves your equipment connected to other parts of your ground system.

After any lightning event and at least monthly check all parts of your ground system for grounding and mechanical condition. Coax switches only last through a very few lightning strikes. After every event they should be checked and replaced as necessary. Also, check coaxes for burns and for pin holes in insulation. Lightning arrestors that have been damaged by lightning will usually exhibit an SWR of greater than 1.5:1 when terminated in a known good 50 ohm impedance dummy load. Repair or replace any items that appear less than new. Special care should be given to the parts of the ground system that is underground.

How many lightning rods should be used? There is no set answer. The impedance of parallel lightning rods is similar to impedance of parallel inductance's. That is when two are in parallel and the impedance of each is the same then the total impedance of both is one half that of each. Each tower leg should have at least one lightning rod. Two per leg located 16 feet apart would be better and especially for towers over 30 or 40 feet. Two or more should be used for your system ground. Remember it is best to interconnect all ground rods with heavy copper ribbon or large gauge wire. It is not unusual to have five or six ground rods or even more in a ground system.

We hope these two sessions on lightning protection and grounding systems has gave you enough knowledge to begin to perform a comprehensive evaluation of your grounding. Much more information is available on the internet. Polyphaser Corp. has a large amount of technical information available on their site that you should become knowledgeable of when planning your ground systems.