

# Lightning Protection for the Ham Shack

Orange Park Amateur Radio Club – Jan. 2007 – Dick Bennett K2LJZ

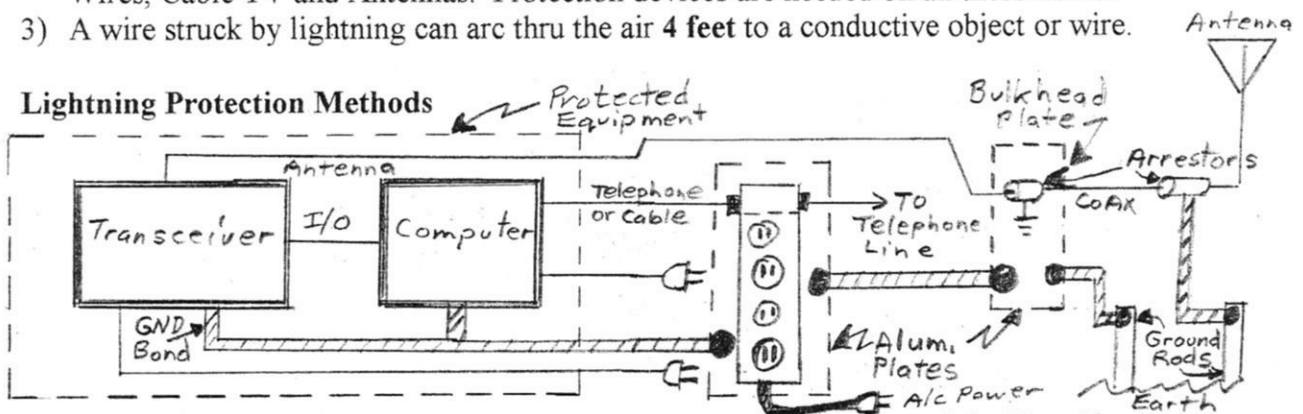
## I. Lightning - What is it??

- 1) Caused by static electric charges in a thunderstorm by convective air currents.
- 2) Lightning strikes average current is 18,000 amps with a 2 micro second rise time.
- 3) Thunder is caused by the air heated to 50,000 degrees which expands into a sonic boom.
- 4) Jacksonville has an average of 80 thunderstorms a year, more than any other state.
- 5) A 25 foot tower can expect 1 hit every 5 years, and a 50 foot tower can expect 1 hit per year.

## II. Actual Lightning Damage

- 1) Direct strikes are very difficult to protect. Protection from a nearby strike is possible.
- 2) Nearby strikes cause induced voltages and currents into wires like: Power Lines, Telephone Wires, Cable TV and Antennas. Protection devices are needed on all these items.
- 3) A wire struck by lightning can arc thru the air **4 feet** to a conductive object or wire.

## III. Lightning Protection Methods



- 1) Provide lightning voltage protectors for all wires going into or out of the Ham Shack.
- 2) Bond all Grounds together in the Ham Shack and using wide copper straps to plates that mount the Lightning Arrestors. Aluminum plates are commonly used at the external wall antenna input and another one used on the desk to bond the protectors for the equipment.
- 3) Bond your antenna wire to ground at the tower or to a ground wire close to the antenna. Also provide a ground rod and arrestor where the antenna wire will be entering the building.

## IV. Protection Device Details

- 1) Arrestors generally use a device to short out high voltages like a simple spark gap, or a Gas Tube, or an MOV (Metal Oxide Varistor).
- 2) Gas tubes can handle high current and give good reliable breakdown voltage and clamp at a low voltage once triggered, but have a lag time to fire of a few microseconds.
- 3) MOV's have a reliable voltage turn on and a fast response time, but their clamping voltage rises with current flow.
- 4) Spark gaps do not have a good reliable trigger point since it varies with temperature and humidity, but can handle large current.
- 5) An arrestor that blocks D.C. will give much better protection in an antenna circuit. Usually a high voltage capacitor is used for this purpose and with a Gas Tube gives good protection.

Gas Tube



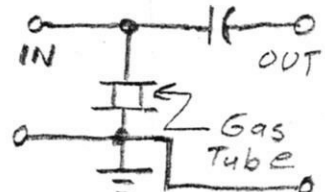
MOV



SPARK GAP



D.C. Block



## V. Required Reading – HA! Internet Sites that are good

- 1) ARRL Site – Lightning Protection by Ron Block, KB2UYT, 6/02
- 2) Polyphaser.com - - Technical Notes