

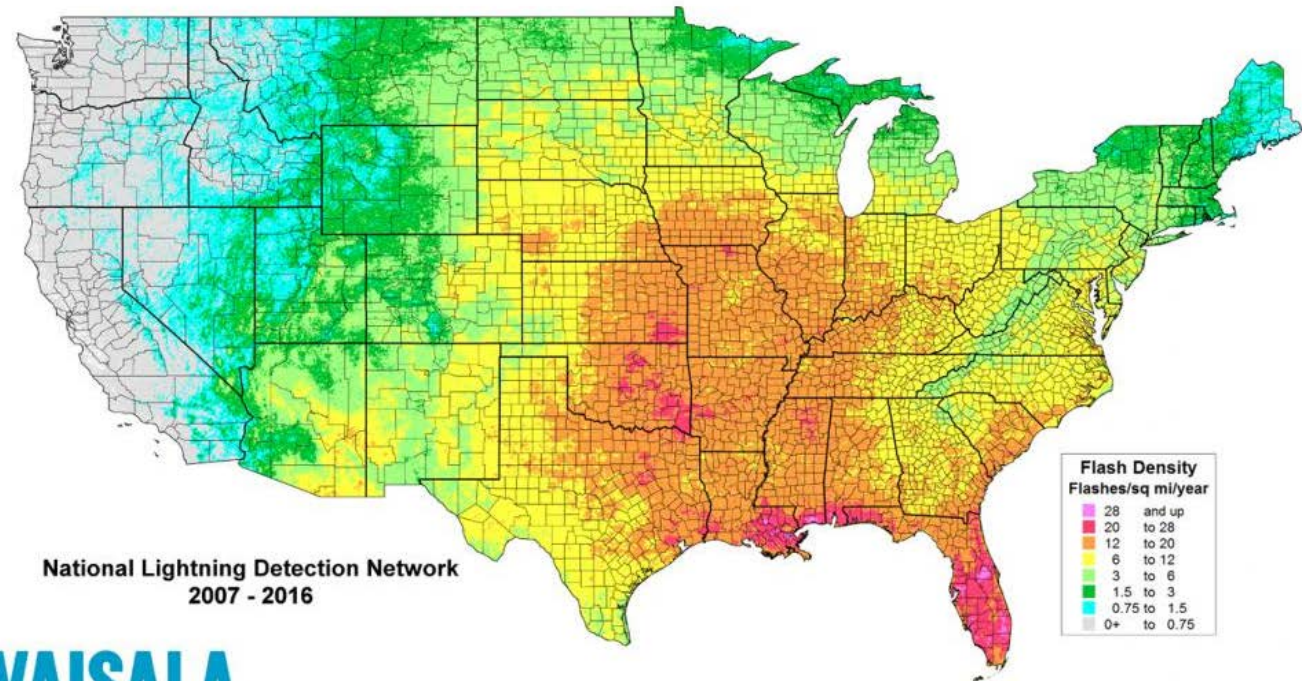


Lightning and Amateur Radio

Thoughts on keeping you and your rigs safe!

Useful Facts About Lightning

- Lightning is extremely hot – air around a strike is 5xs hotter than the surface of the Sun.
- On average 2,000 people are killed worldwide by lightning each year. The odds of being struck are 5,000:1.
- Lightning will cause trapped water in an object to rapidly turn into steam. This is why trees (and sometimes *tower foundations*) are blown apart or cracked by an lightning event.



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Just this year, Harrison County (Mississippi) became the area having the most lightning strikes – surpassing S. FL.

Useful Facts About Lightning

- Diameter of a lightning channel is just one to two *inches*.
- Typical strike can have a peak current of 30,000 Amperes and over 100KV. Thankfully, for just a few of micro-seconds...
- It is hugely unwise to operate during a lightning storm....besides, the static level/noise will make it near impossible to hear anything worth talking to anyway!
- Yes, broadcast and public safety radio towers operate during storms, but Today's tower sites are normally unmanned.



Antennas have a Hard Life

Key elements for proper protection of equipment and YOU from lightning

- Use a voltage-difference mitigation strategy. By bonding all equipment to a single point ground while using large low-inductance conductors, all equipment will assume an equal potential during a lightning strike. Equal potential = no damaging current flow or sparking!
- Separate an antenna tower from an equipment building (shack) if at all possible. Ideally, by 30 or so feet. Use DC-grounded antennas and ground the shield of each transmission line where it exits the tower.
- Use a bulkhead panel for all coaxial cable entering an equipment building. Install gas tube protectors HERE! (Note: Also at the tower if your antenna is not at DC ground.)
- Install multiple ground rods at the tower and every 20ft along the journey to the bulkhead entry. Incorporate utility ground into RF ground system. Use buried bare copper conductors and direct-bury connectors.
- Use AC power surge protection at main electrical power entry and critical secondary panels.

Key elements for proper protection of equipment and YOU from lightning

- Use large-surface ground conductors...ideally strap or large-gauge wire (#2AWG)
- Conductor bends should be minimized and gradual.
- Use only bronze-type ground clamps that are approved for direct burial...not that “el-cheapo” China stuff that falls apart before your very eyes! Best is exothermic (CAD) welding.
- Construct a coax/twinlead entry panel that allows disconnection of antennas whenever off-air.
- Eye every cable or wire that enters your home with suspicion – Each could become a sneak path into your home for lightning.
- Re-evaluate your electrical grounding system annually. Repair broken or damaged connections IMMEDIATELY. Lightning is a Big Time event for South Louisiana!

Proper Tower Grounding Methods

Flat copper strap secured to tower legs with bronze clamps.

Multiple 8ft ground rods (4)



Make sure tower legs are paint-free at ground system attachment points.

Transient Voltage Suppressors

A transient voltage surge suppresser (TVSS) should be installed on the electrical service entrance to protect against surges generated from outside the facility. And, install surge-protected outlet strips for your equipment. These are inexpensive, but essential.



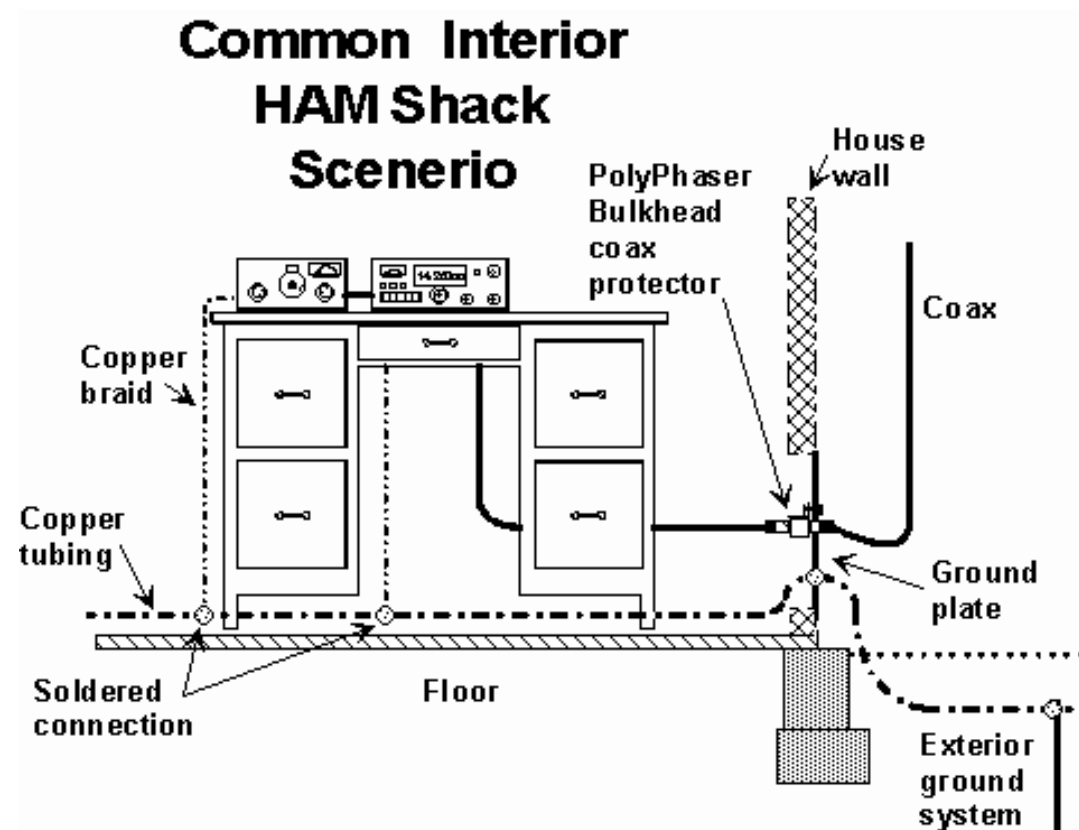
Typical AC Panel Protector

- Clamps to 325V
- Can sustain 60KA surge line-line/line/neutral
- Includes fault indicators to alert if unit has failed..very important.

MOV surge protectors do wear out as "hits" are absorbed. Plan for replacement every seven-ten years.

Use Gas-Tube RF Transmission Line Protectors

The most effective type of gas tube lightning arrestor is “dc blocked.” There is no center conductor continuity from connector pin to pin. This allows the gas tube to fire as the voltage reaches the turn-on threshold while providing DC/low frequency path resistance to your sensitive radios!



RF Transmission Line Entry Concept



Note how lightning protectors are attached to copper plate to facilitate single-point grounding.

Typical Gas-Tube RF Line Protector

- Designed for specific frequency ranges and power levels.
- Note “Antenna” versus “Equipment” connectors. The “Antenna” port sees the shunt gas tube. The “Equipment” port has a ceramic disc capacitor installed in-series with the center pin. This blocks the DC connection!
- **DO NOT reverse the installation** as then the gas tube will not fire soon enough; the capacitor will likely have an untimely death; and your equipment will take up “smoking” in a costly way!



In my professional opinion, the best on the market. Don't go cheap here!

Don't Stop with the Antenna Coax!

Rotator Cable Protector



Standard 2-Wire Telco Protector



You can "roll your own" using appropriate MOVs on eBay/Mouser and some ingenuity!

And, Finally.....

Let's Not Forget the TV System



Or, the Internet!



*If it has wires that are long in length, consider protectors. Far less costly than replacing big-screen TVs or computer systems in the shack. What would **you** do if your DX logs went up in a "poof"??*

Keep in Mind: Antenna Grounding is all About Energy Control

- A good low-ohmic ground system will help your tower dissipate static charge, which will make your receiver happy and far less noisy.
- If struck, the ground system – *when integrated with your electrical and shack system as described* – will minimize potential differences between bonded equipment..which reduces or eliminates sparking.
- Every lightning strike will cause an instantaneous rise in voltage level between points...but if well bonded, all equipment will rise and fall in voltage level together, thereby eliminating those potential differences that kill semiconductor gear.

Yes, folks...vintage tube gear can take a lickin' and keep on tickin' far better than Today's modern stuff. It's just the physics of things.

Use Common Sense!

The typical ham can make these improvement himself or with the help of fellow hams. It is mostly about installing ground rods, ground clamps and digging shallow trenches.

Quality Materials: May cost a bit more, but saves thousands.

Think Big: Big Wire; Many Ground Rods; Wide Copper Straps; Big Hardware.

Make it Last: Avoid Lead-Tin Solder on outdoor ground connections (low melting point and corrodes when in contact with soil/moisture). Silver-solder or CAD-weld.