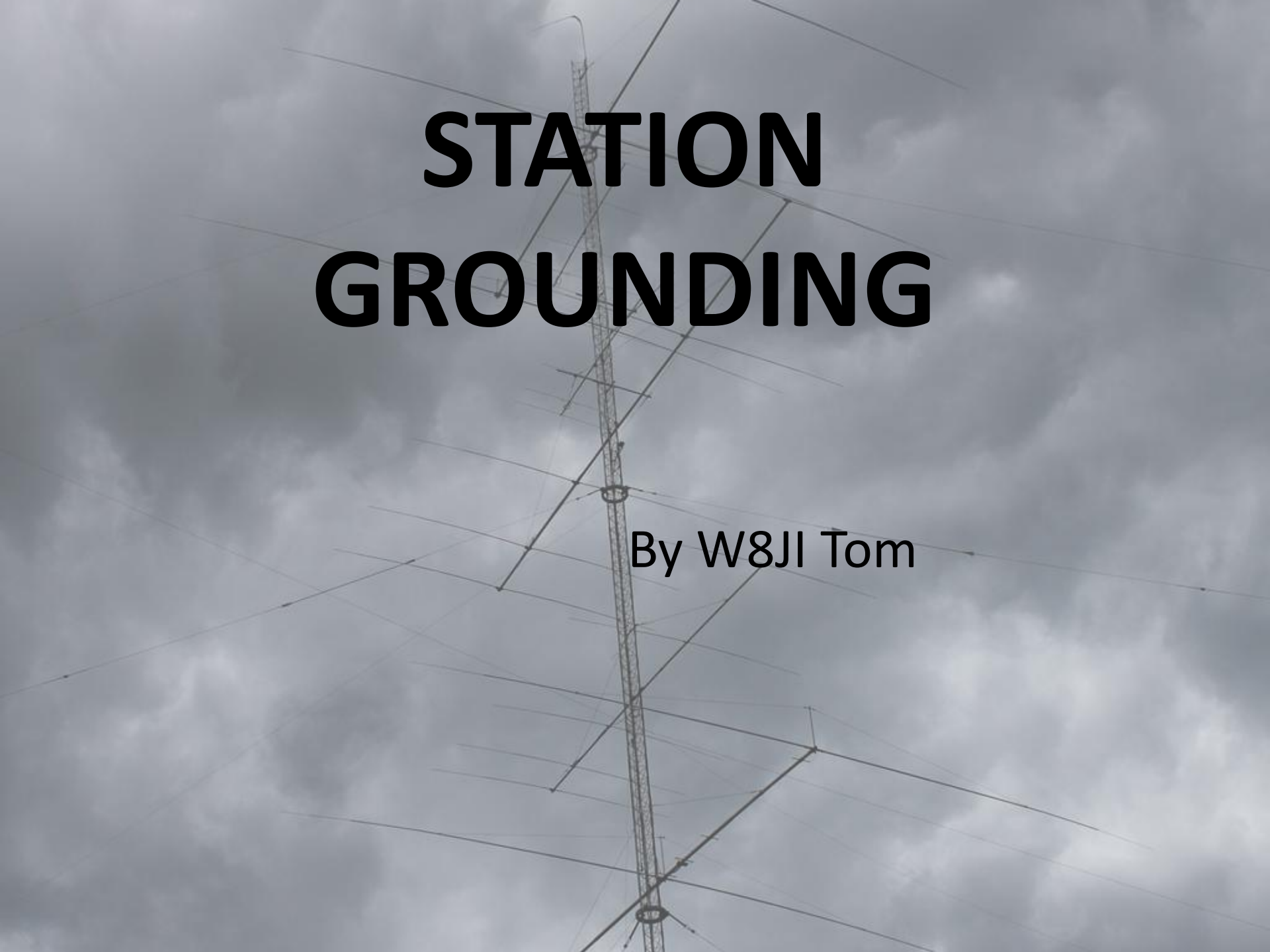


STATION GROUNDING

By W8JI Tom

Two Basic Types of Grounds

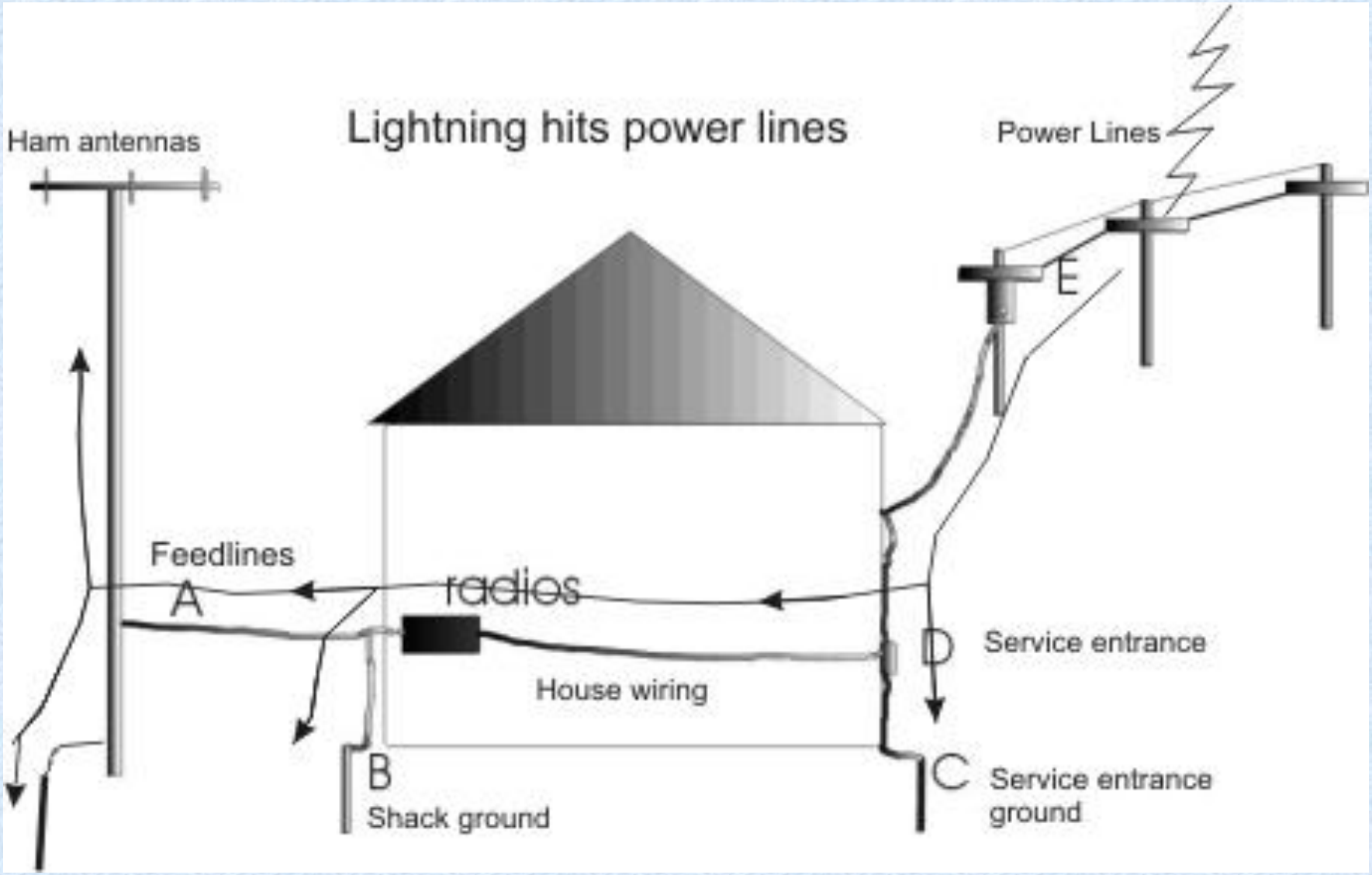
- RF and signal grounds
  - Give antennas or equipment a low impedance signal ground
  - Give Marconi antennas something to “push against” (the other missing load terminal)
- Lightning and Safety Grounds
  - Prevent or minimize shock hazard
  - Provide an earth path for lightning

- This deals mostly with lightning and safety, but good lightning grounds help with RF problems

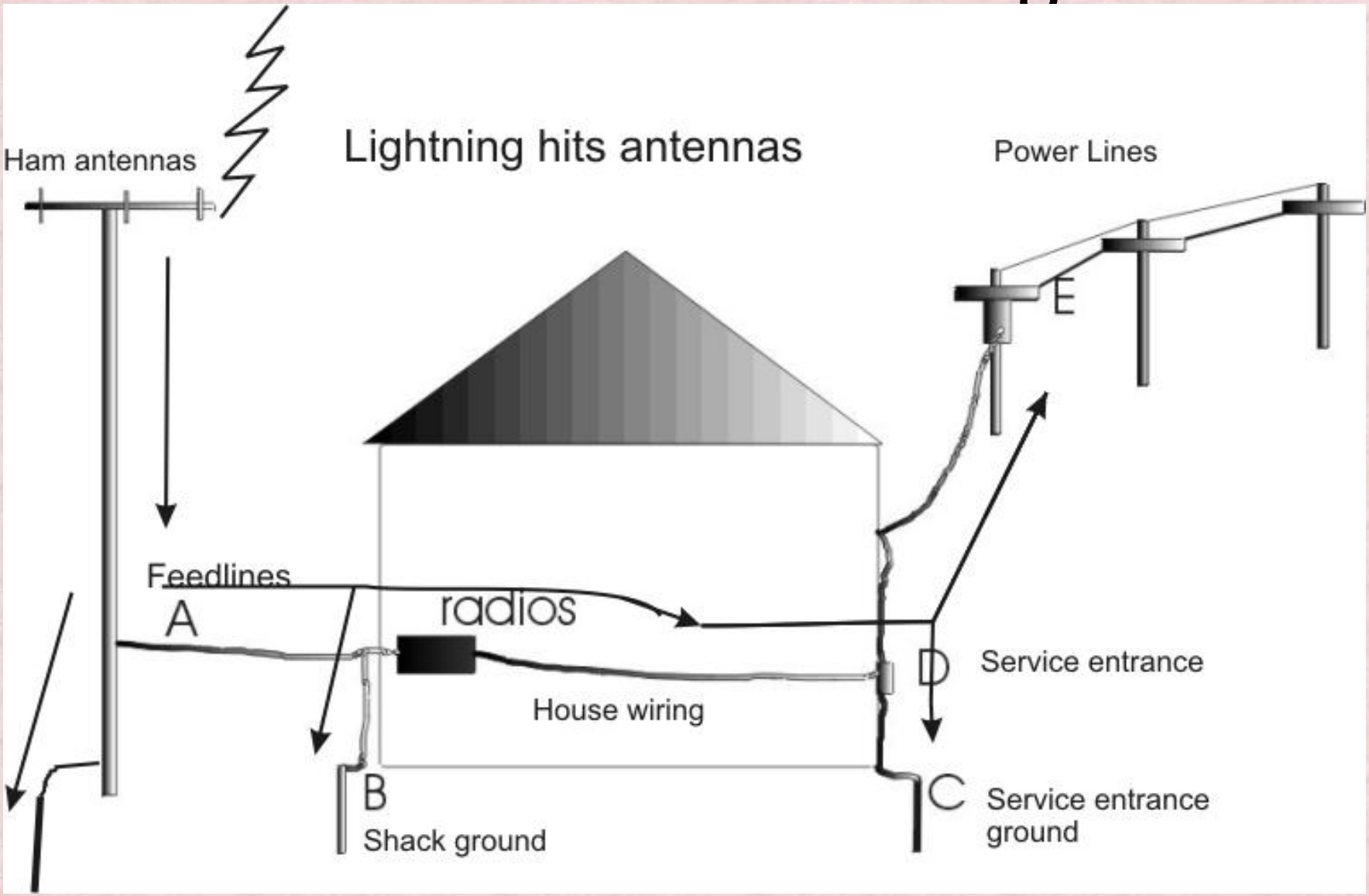
Ground = Electrical Mass

- A ground usually refers to a large “electrical mass”
- This “electrical mass” has an abundance of neutral or balanced charges
- An ideal ground has so much “electrical mass” it can supply or absorb balancing charges or currents without greatly changing electrical potential at the ground terminal
- A heat sink is to heat as a ground system is to charges

Power Line Strike Damage



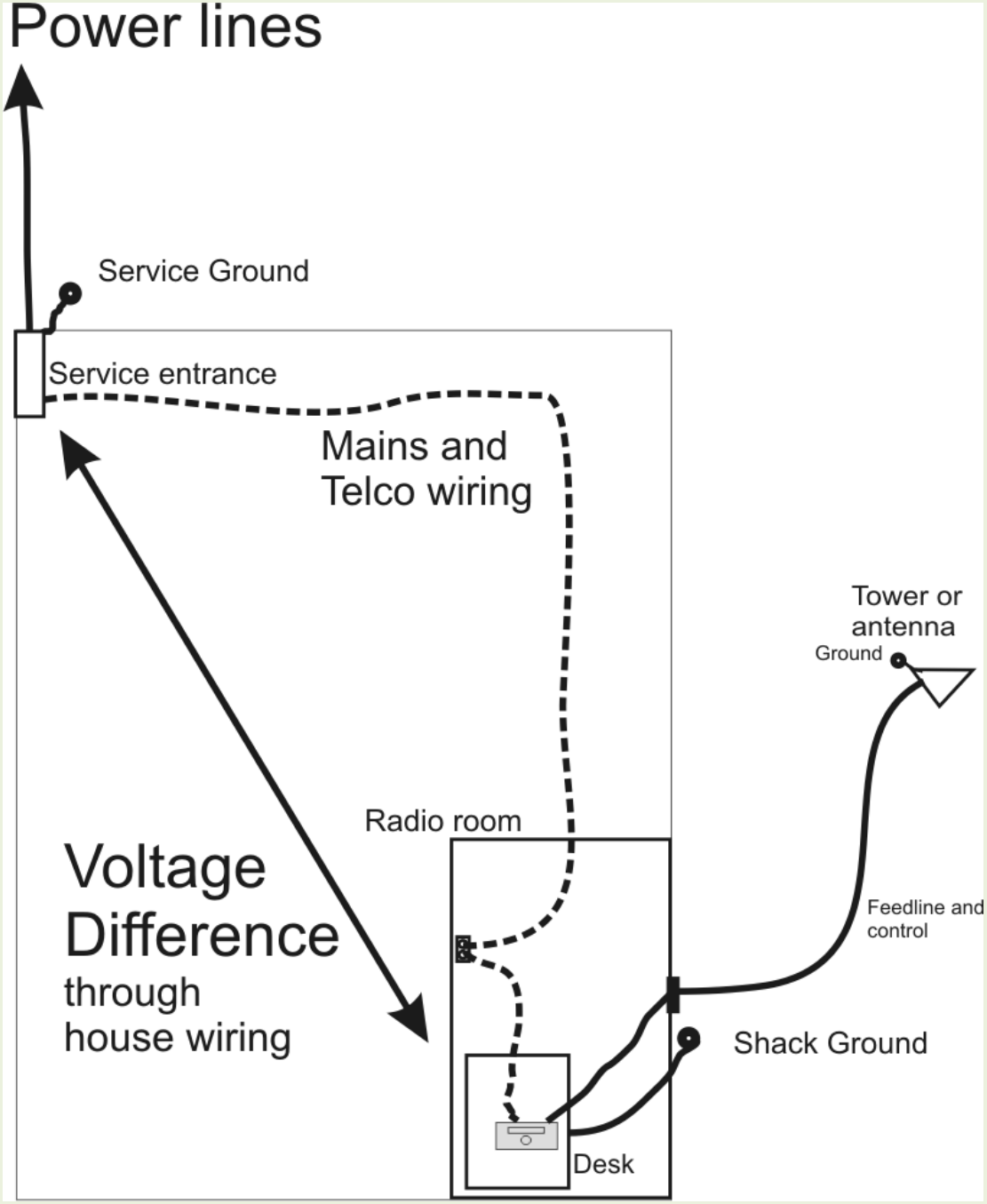
Antenna Strike Damage



Most Common Ground Mistake

- Shack ground should always be connected to power mains ground rod with low impedance
  - Not connecting together can even increase danger over no ground at all
  - This is a national fire safety code, and why all CATV, Telco, and power mains are at one point!
  - Ideally all wires and cables should enter at same point of the dwelling, and share a common grounding terminal

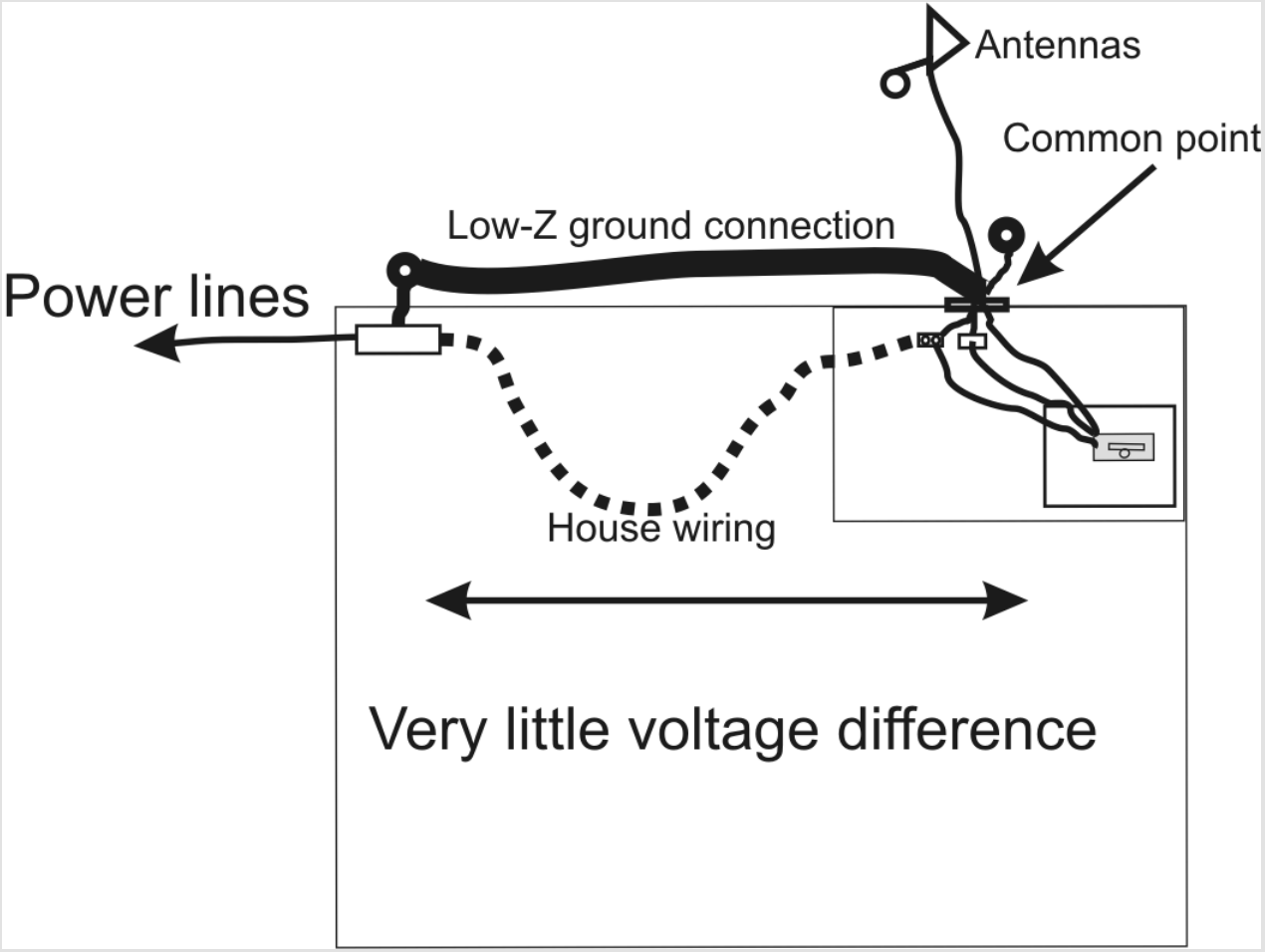
Potential difference between grounds causes current to flow in one entrance and out the other. Flows through equipment, desk area, and house wiring.



Bonded Entrances

- The better all wire and cable entrances are bonded, the less important grounds become
- This is because most of the current stays outside the equipment

Proper Grounding Method



- Everything entering or leaving the TV set and stereo comes from one outlet
- The antenna system grounds there also
- This reduces TVI and RFI as well as lightning
- Never any damage to entertainment equipment from strikes

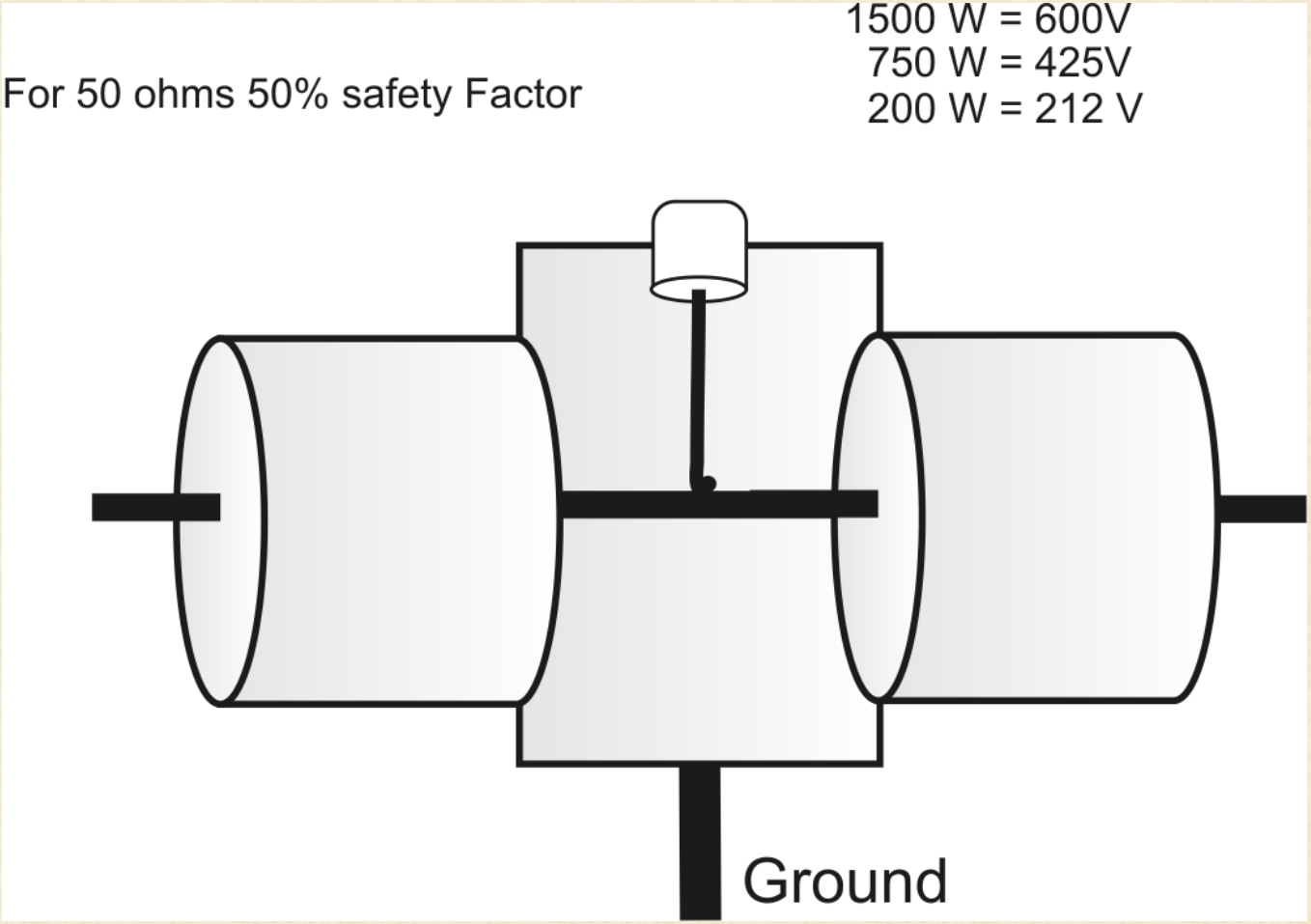
Radio Room Wiring

- Most lightning energy and all unwanted RF energy is common mode on wires and cables.
  - Damaging currents are mostly on ***outside*** of shielded cables or parallel on all conductors of unshielded lines
  - Most voltage difference and current flow is between building wire or cable entrances, between isolated grounds, or between different “electrical masses”
  - A dipole insulated from ground can still be an electrical mass, and it is a different mass than earth or power lines

Lightning Arrestor

- Because most damage is from common mode “shield current”:
  - Most protection from lightning arrestor is from the grounding of the shield
    - belongs at house entrance
  - Ground only helps when arrestor ground is bonded to power mains ground
  - An isolated ground at the house can make things worse

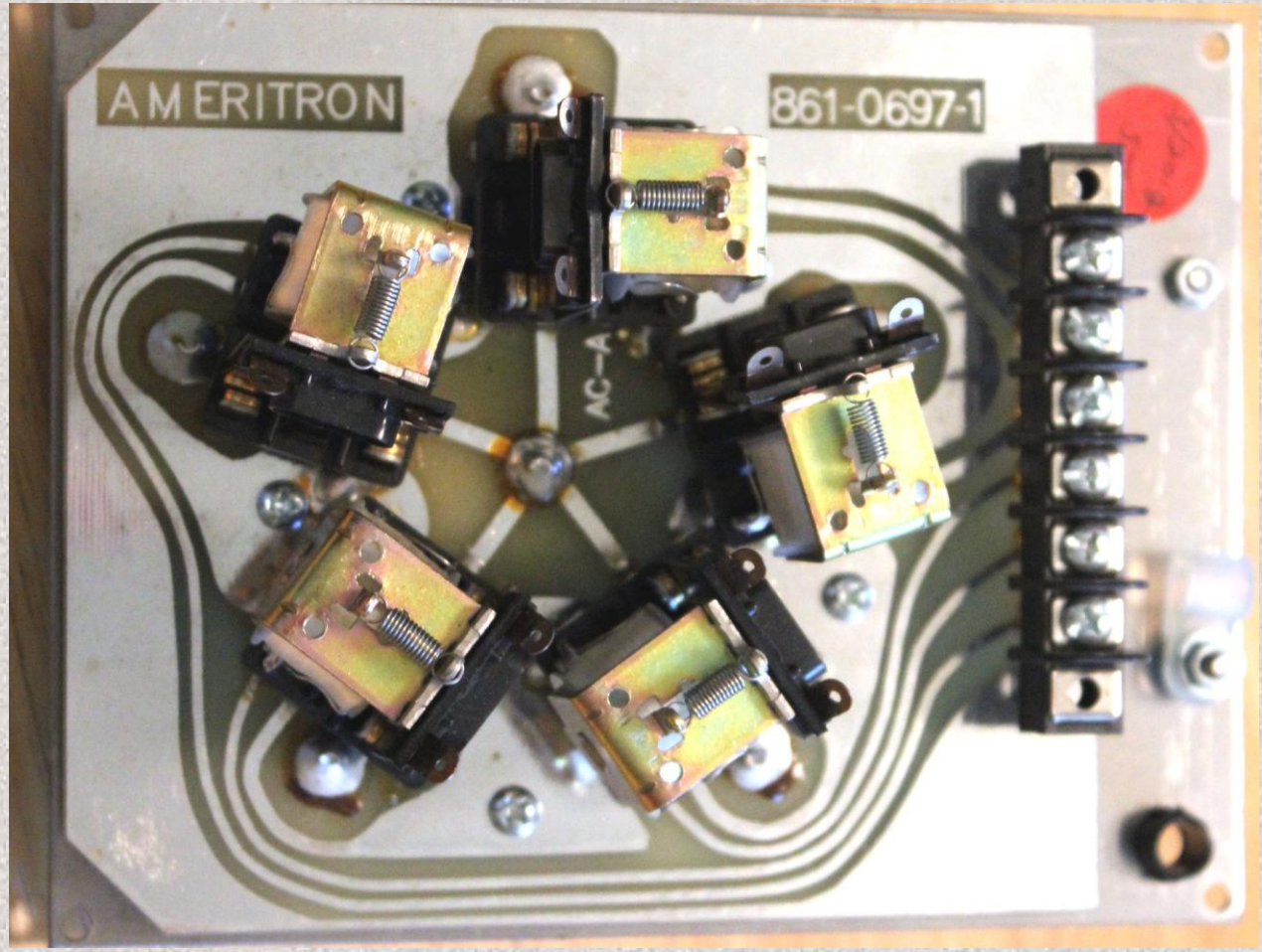
Lightning Arrestor



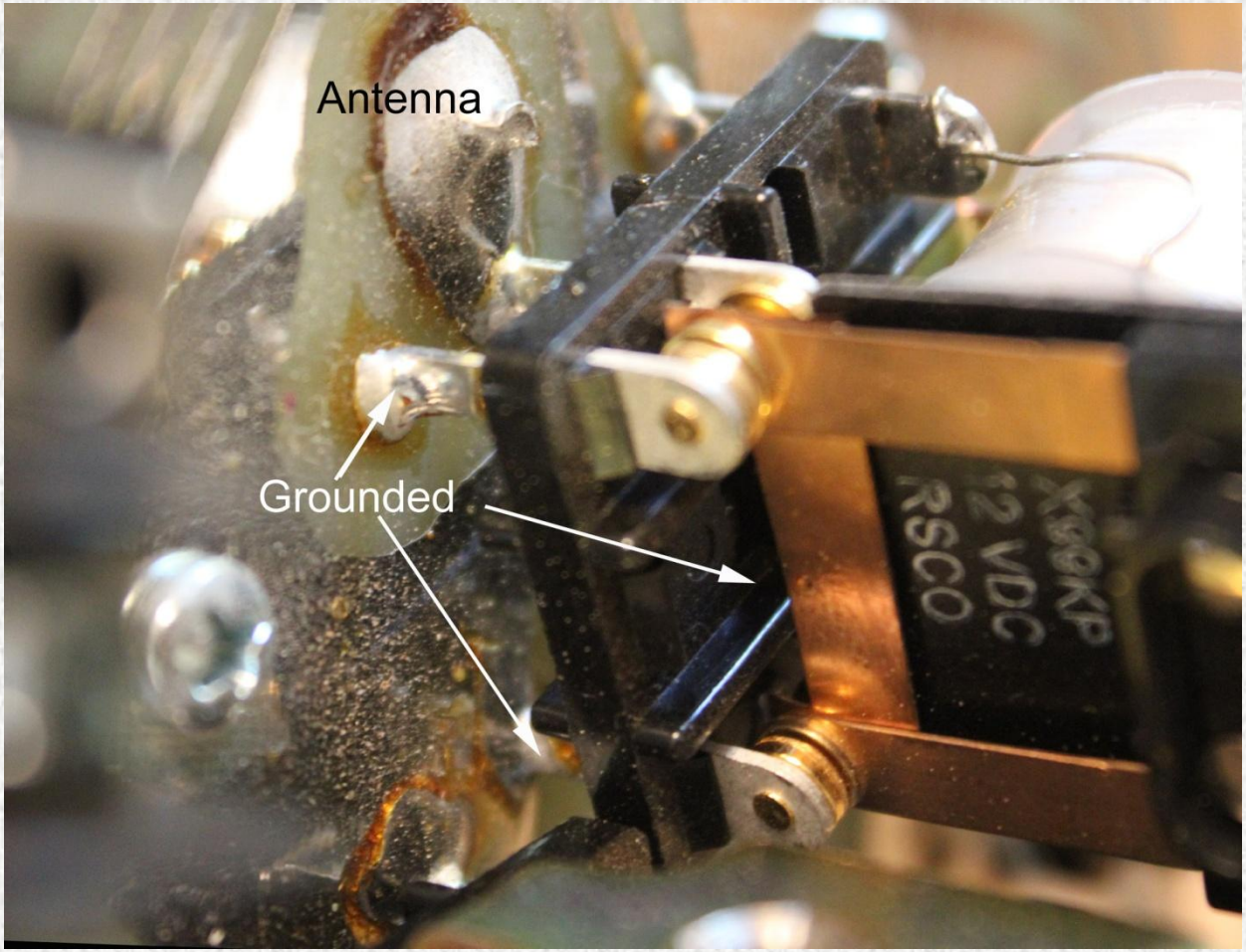
Lightning Arrestor Use

- Use in low SWR systems only!
  - Never use with high SWR
  - False triggering can damage amplifiers and tuners
- Will not protect higher power systems nearly as well as disconnect
  - At 1500 watts will pass several hundred volts
  - Even at 200 watts, will pass over 200 volts
  - Best for protecting very low power systems

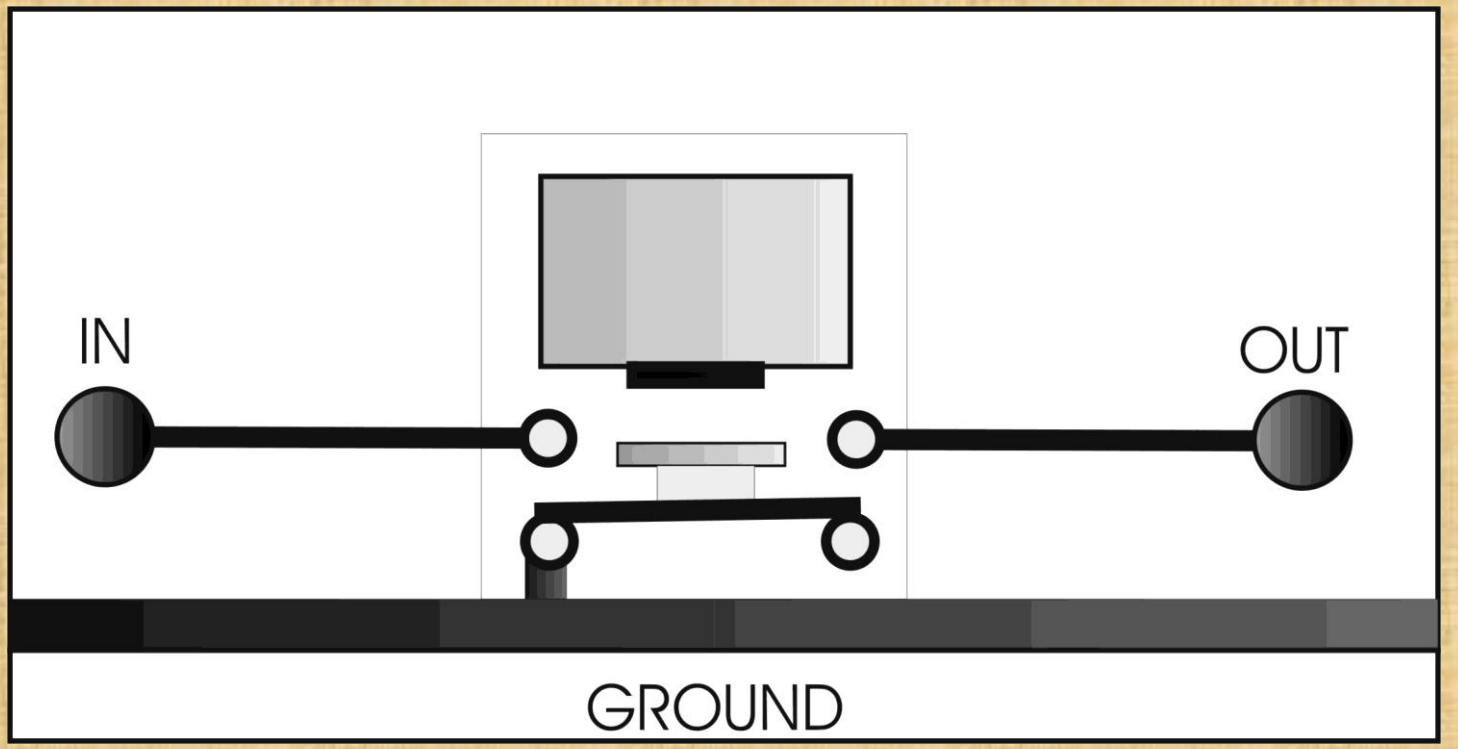
Best Protection on Coaxial Lines



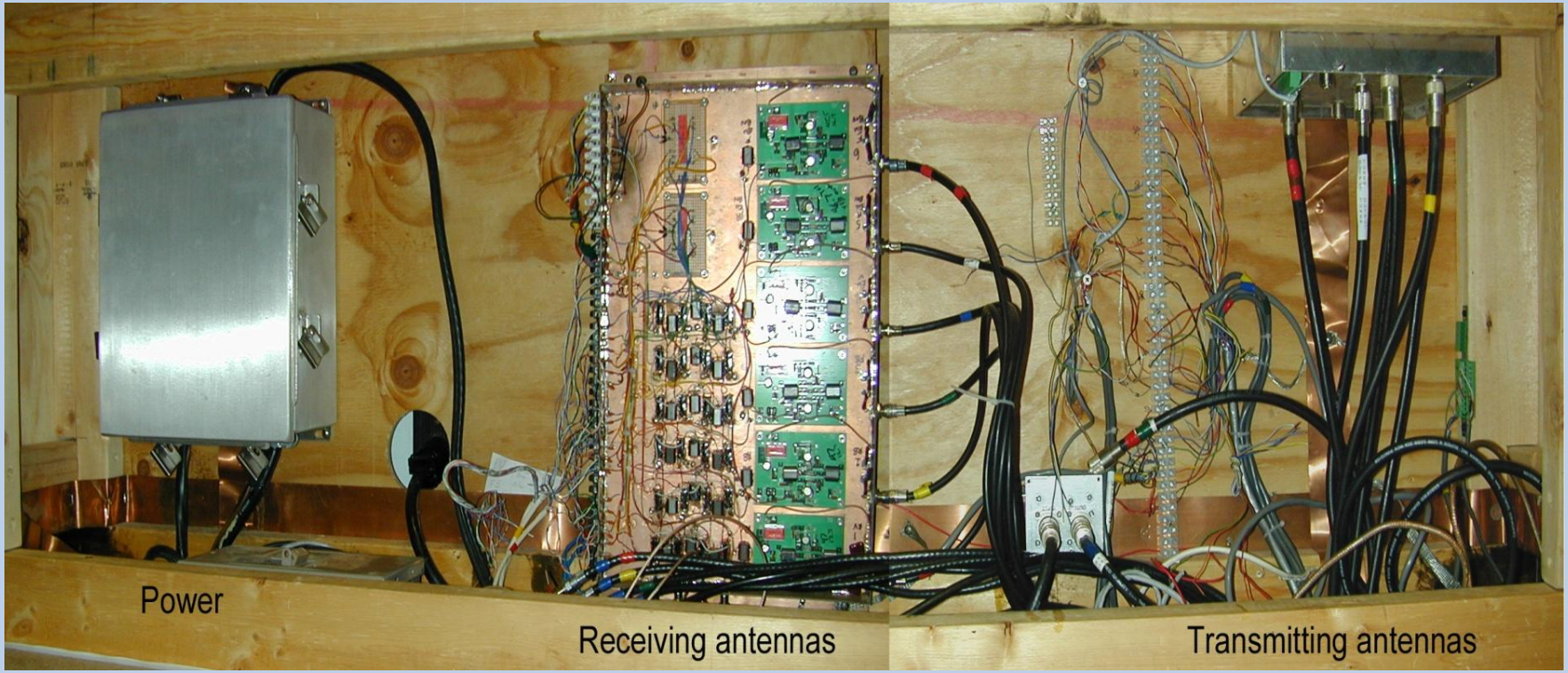
Isolates center conductor when off
Grounds shield at all times
The most center can do, when off, is arc to ground



RCS-8V path



All power and all cables at “wire hider”
All grounds are common

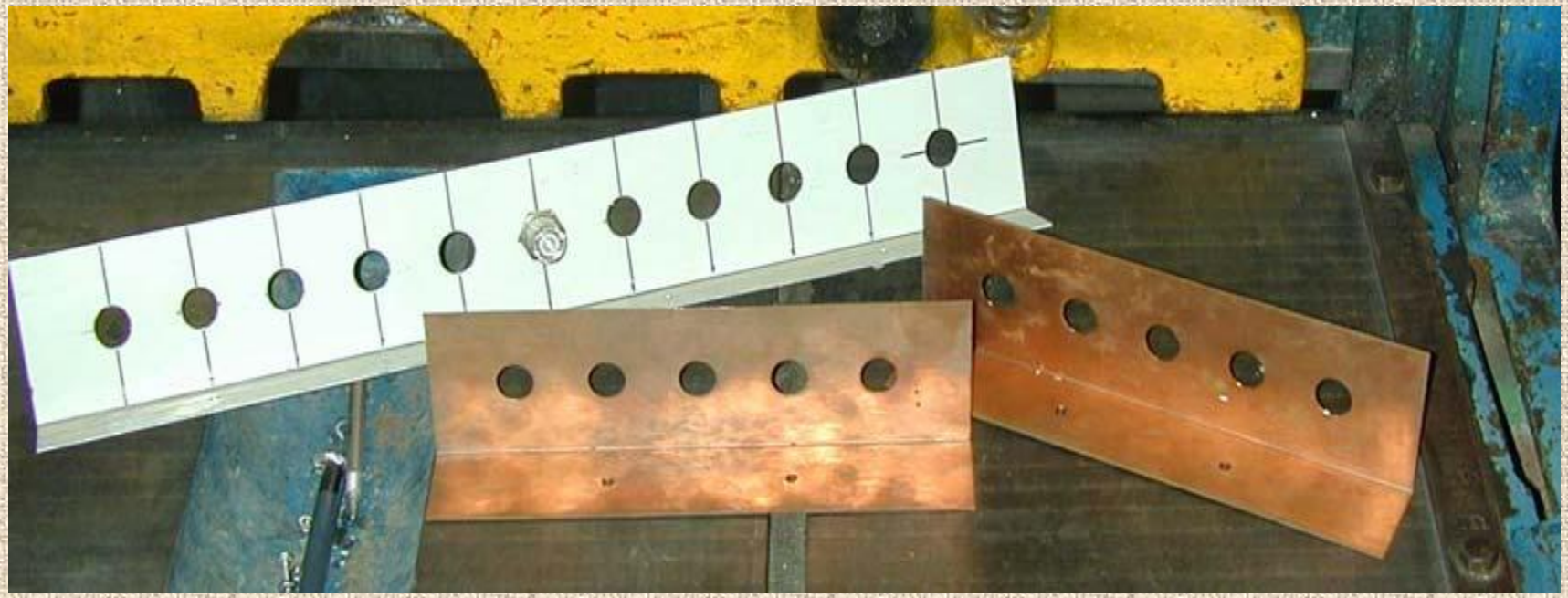


Every wire comes from wire hider!

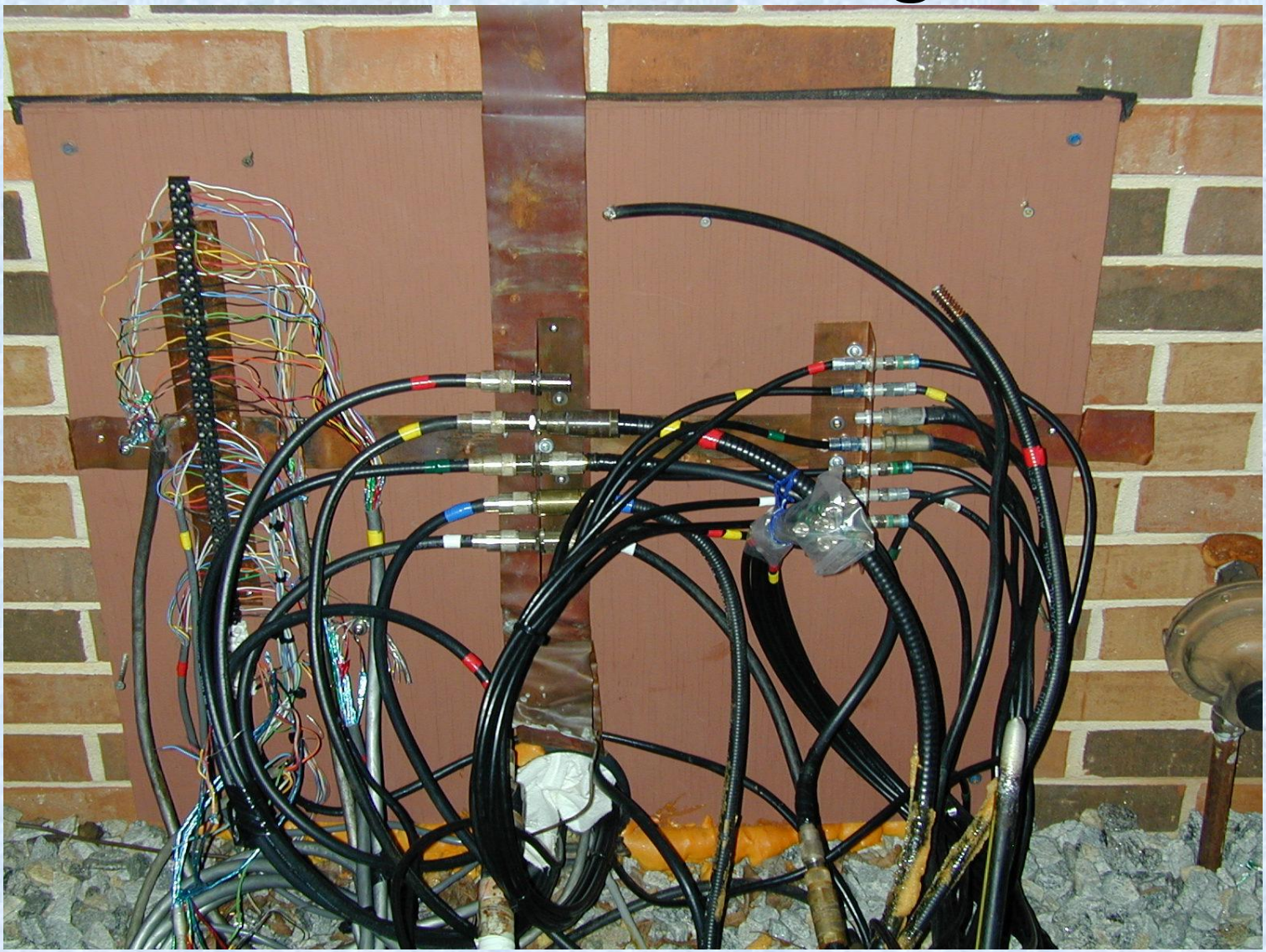
I usually have one or more direct hits per storm

- The only antennas protected by lightning arrestors are receiving antennas with 60-volt GDT tubes
- DXE RR8HD and Ameritron RCS-8V's protect TX lines when power is off
- Control cables shielded and shields grounded
- All cables arrive underground at buildings
  - Never any damage in house
  - Never disconnect cables

Homebrew Grounding Plates



All cables common ground



318 ft. tower ground

- Eight #6 AWG deep buried radials
- Fifty or so #16 shallow radials
- Silver soldered connections

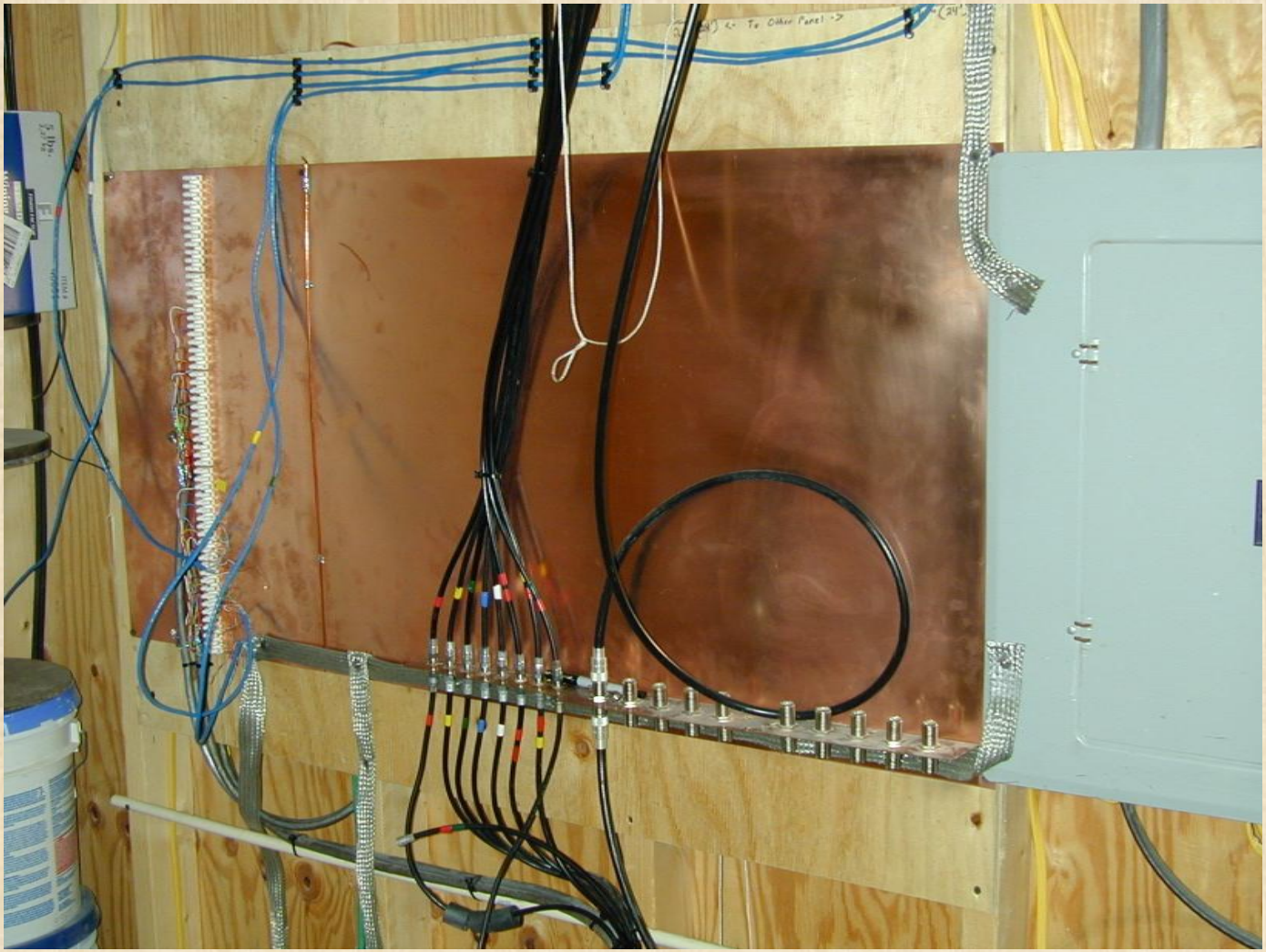
Tower Rules

- Bring all cables to ground level
- Bond cable shields to tower ground on tower
- Do not attach conductive guy lines to buildings
- Highest antenna most likely to take hits
- Nothing will discourage a hit except another taller object nearby
- If possible, use a good heavy radial ground with tall towers to spread energy out

Most Important:

- Always bond shack ground to powerline entrance ground
- Best protection is to disconnect center conductors and have ground barrier on center
- Use shielded control lines, or have low voltage MOV entrance block
- All wires and cables entering shack have common ground point ***before*** going to desk

Contest barn entrance before wiring



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