

LIGHTNING AND THE RADIO AMATEUR

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Lightning: This Could Be Your Station!



Lightning Areas of the World

- Hotspots with at least 1000 people living nearby
 - Las Lagunitas, Lake Maracaibo, Venezuela
(lightning storms 297 out of 365 days per year)
 - Kabare, Democratic Republic of the Congo, Africa
 - Kampene, Democratic Republic of the Congo, Africa



Tampa Bay: Lightning Capital of the US?



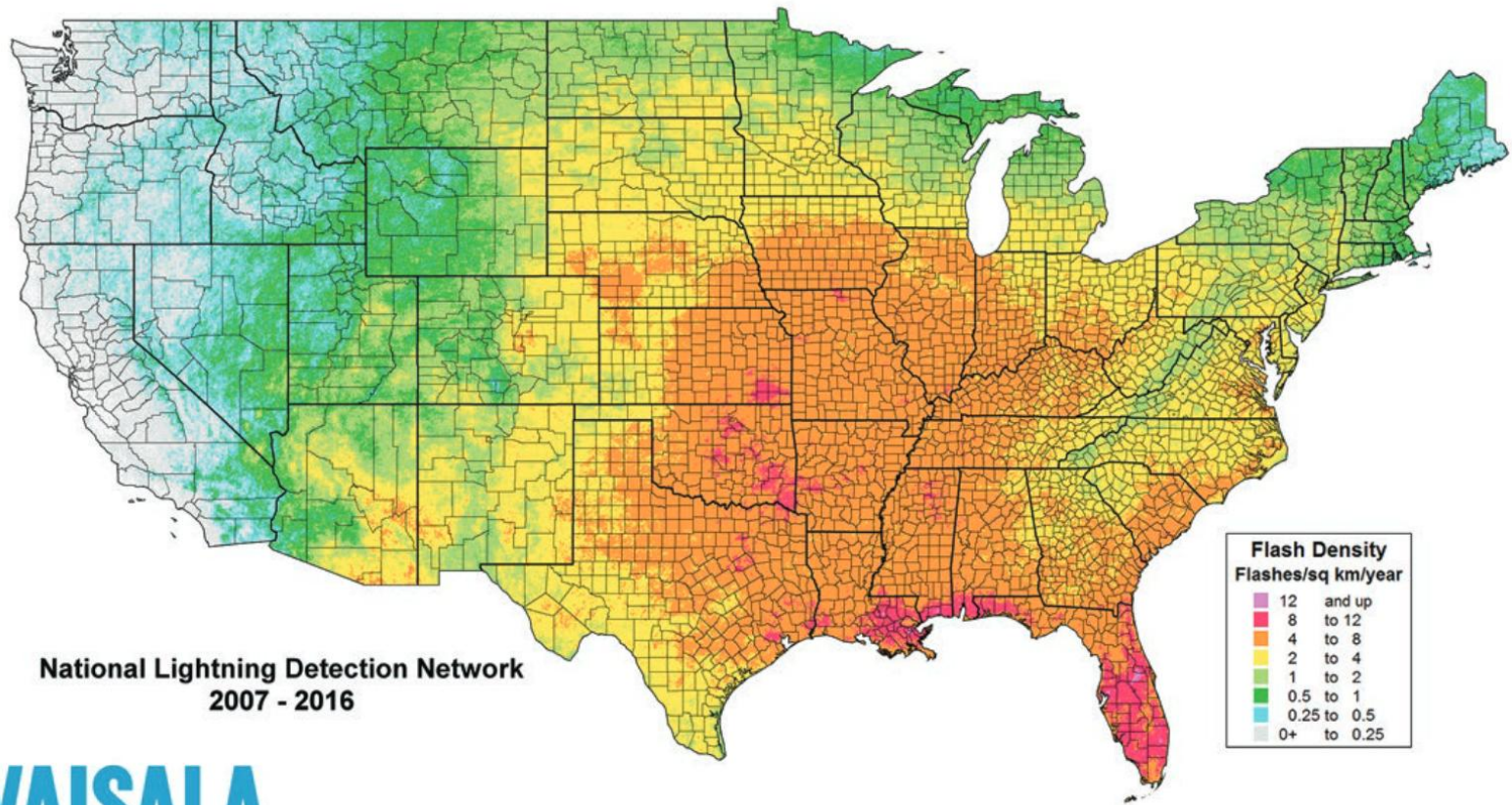
Tampa Bay: Lightning Capital of the US?



Tampa Bay: Lightning Capital of the US?

1. Mississippi
2. Orange/Seminole Counties, FL
3. Tampa Bay/Daytona/Palm Beach





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Your Location
 closest strike in last 30 minutes:
 ● 0.0 miles
 Seek Shelter Now

Mapbox



Lightning: What is it?

- **Lightning** *The series of electrical processes taking place continuously by which charge is transferred along discharge channels between electric charge centers of opposite sign.*
(American Meteorological Society)



Lightning: Pulse, Stroke, Flash

- **Pulse:** lightning discharge within cloud or multiple clouds
- **Stroke:** (or cloud-to-ground stroke): lightning discharge in a cloud to the ground
- **Flash:** one or more cloud pulses and/or cloud-to-ground strokes that occur in 1 second



Lightning: Hotter Than the Sun?

- Lightning is 53,500 F
- Surface of the sun is 10,300 F



Lightning Can Be Found In...

- Thunderstorms
- Tornadoes
- Hurricanes
- Volcanic eruptions



Lightning Records

- Longest duration: 7.7 seconds
- Farthest horizontal distance: 200 miles



Lightning Energy

- Voltage: 40,000 to 120,000 V
- Amperage: 5000 to 200,000 A
- Wattage: 1×10^{10} W or 10 billion W



Lightning: It's Dangerous!!!



Lightning: It's Dangerous!!!

- <https://www.youtube.com/watch?v=8ny3N-smAUc>
- After video—what stories do you have of lightning and ham radio? (brief)











Lightning Protection

- What can I do to protect my ham shack against lightning strikes?



Lightning Protection

- Move!!! Relocate your ham station to:
 - Los Angeles, CA
 - Or Egypt
 - Or Antarctica
 - These places have *only* 0-0.75 lightning flashes per square mile/year!
 - Contrast Tampa Bay: over 28 flashes per year!



Lightning Protection

- Move!
- Disconnect EVERYTHING in your ham shack!
 - Outdoor antennas (and ground them!)
 - ALL indoor equipment including radios, power supplies, chargers, etc....ALL radio shack equipment



Lightning Protection

- Move!
- Disconnect EVERYTHING in your ham shack!
 - Outdoor antennas (and ground them!)
 - All indoor equipment (radios, power supplies, chargers, etc....ALL radio shack equipment)
- Design/install a good ham radio grounding system in your shack



Grounding Design

- ARRL “Grounding and Bonding”
 - Where to locate (or relocate) your station
 - Identify what to protect (xcvrs, tuner, p/s, computer, CATV, telephone, electrical panel)
 - SPGP (Single Point Ground Panel)
 - Ground rod system
 - Think Like Lightning !

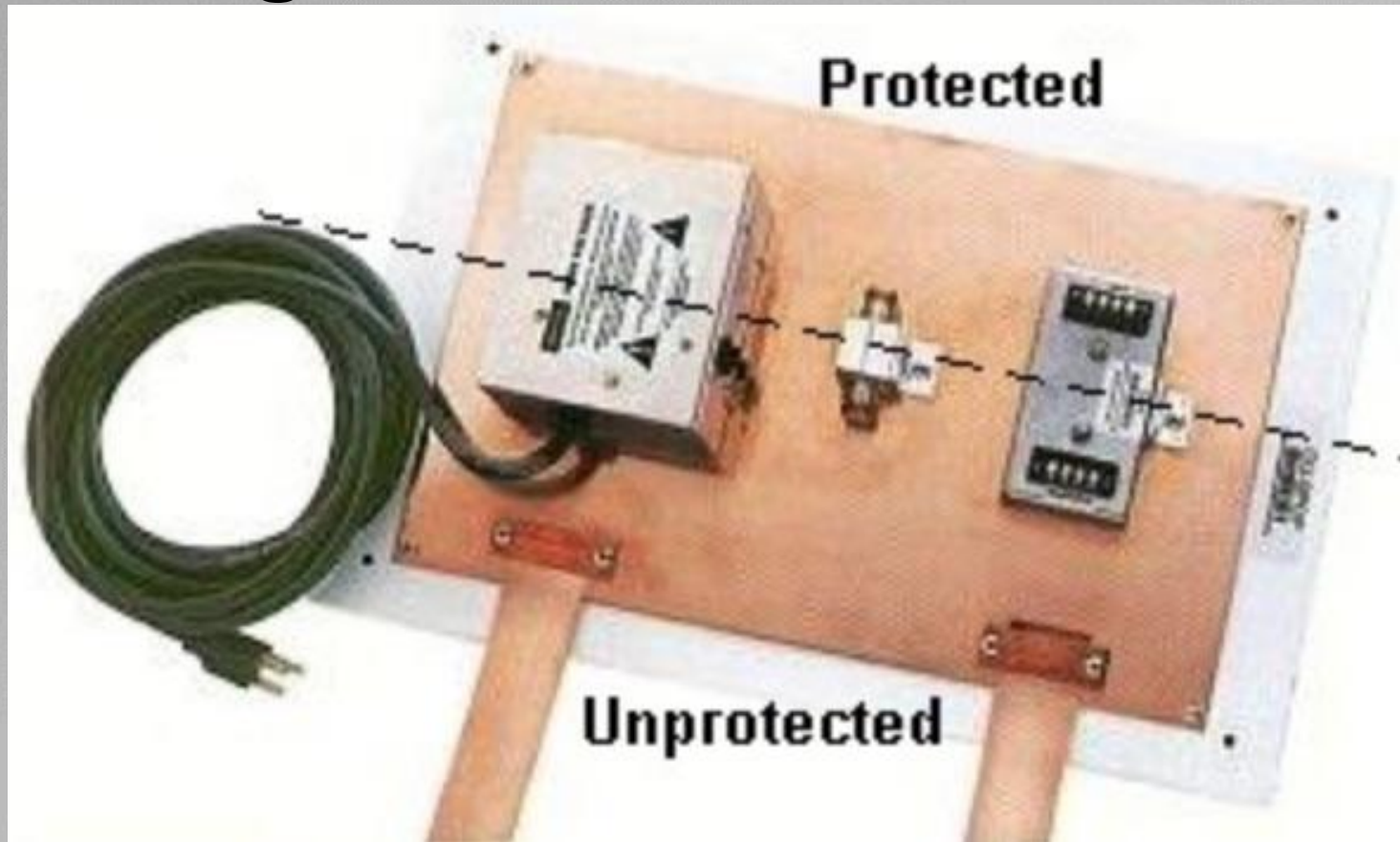


SPGP (Single Point Ground Panel)

- Single point where ALL antenna feed lines, control lines, equipment power are brought together to share a common ground connection
- SPGP is the one and only point where direct connection to lightning ground system is made
- CATV, telephone connects here also
- Close as possible to AC power service entry



Single Point Ground Panel



Use Copper Strap (not wire)

- Copper strap: 2 to 3 inch width
- Low resistance AND low impedance (skin effect) Lightning RF is 10 - 100 MHz.
- More surface area in ground to sink current
- More surface area when attached to ground rods
- Keep copper strap runs as straight as possible with no sharp bends





Cable entrance common point ground

Entrance panel
200 A

control

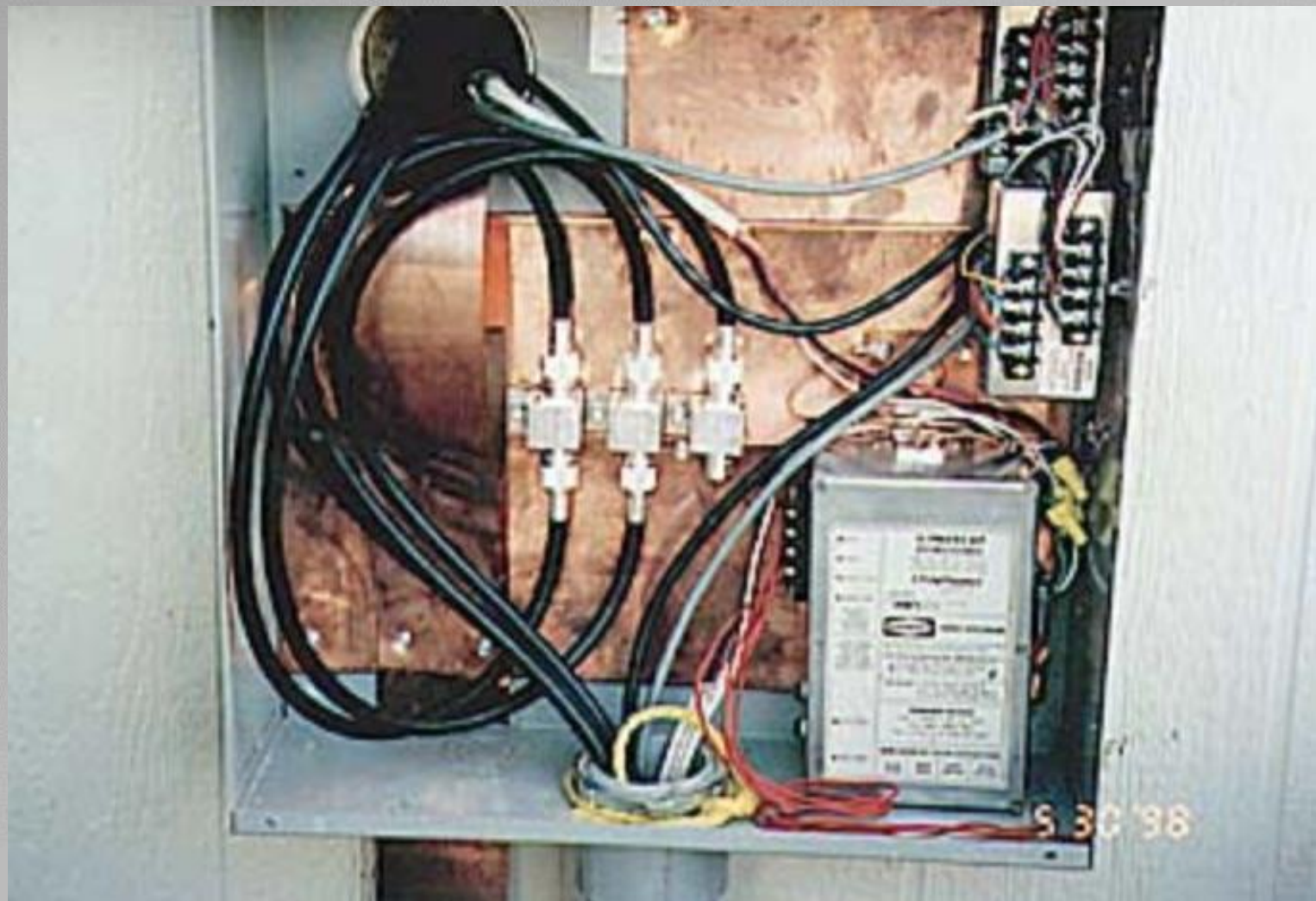
Receiving

Transmitting



















Ground Rods-How Many?

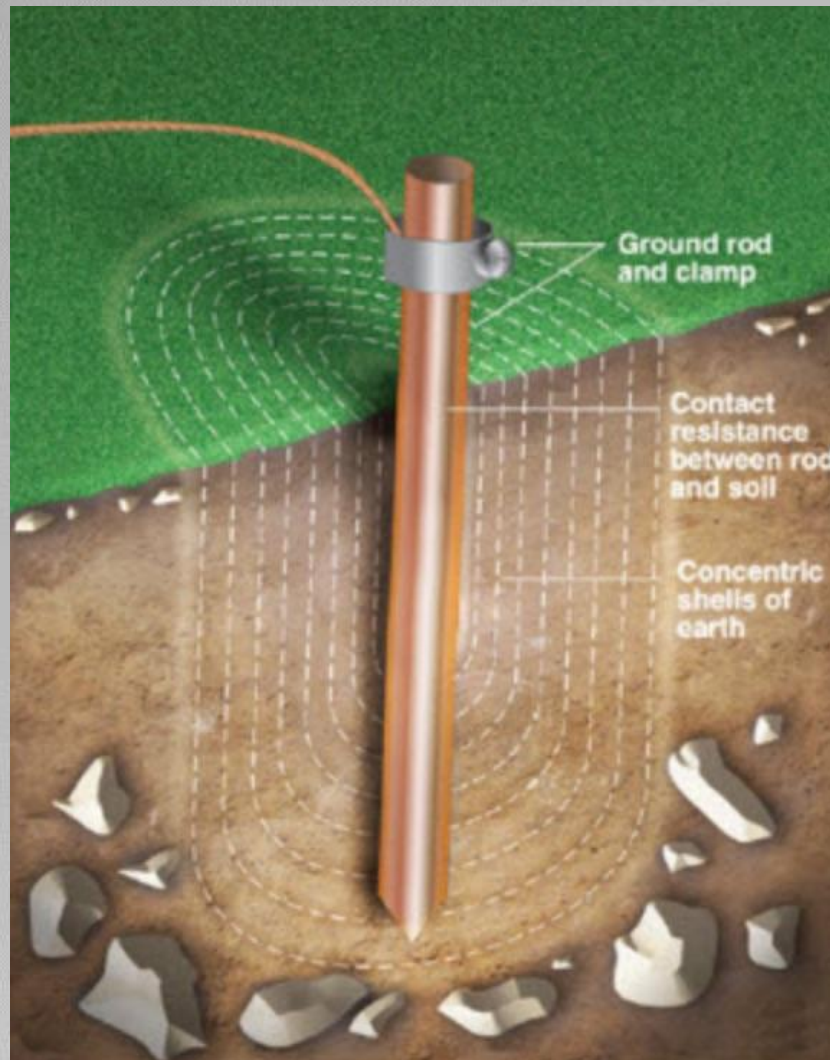


Ground Rods-How Many?

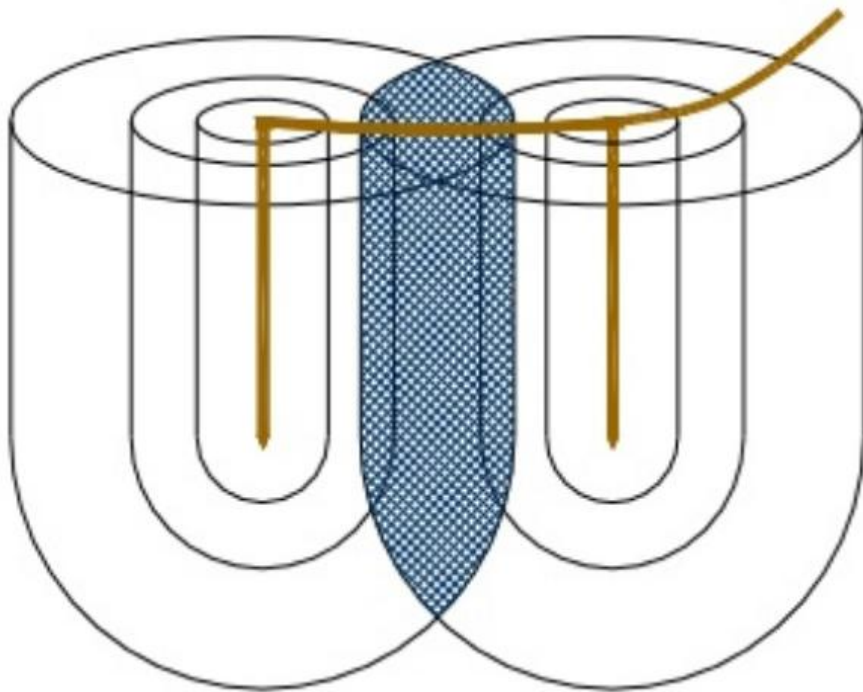
- One is better than none!
- Suggestion is 4-5 ground rods as a minimum
- Eight foot, 5/8 inch, copper plated (usually 10 mil thick copper plating)
- Place ground rod every 16 feet
- Perimeter ground is best if possible



Ground Rods



Ground Rods



Concentric Shell
Overlap Decreases
Efficiency of
Ground Rod
Resistance

Ground Rods

- Use Cadweld or other exothermic process to weld ground wire to rod.
- Or braze strap to rod.
- Prefer to use 2 to 3 inch copper strap
- Use mechanical plates or weld strap to ground rod—DO NOT SOLDER!
- Use Copper “Goop” for ALL mechanical connections!



Ground Rods-Exothermic Weld



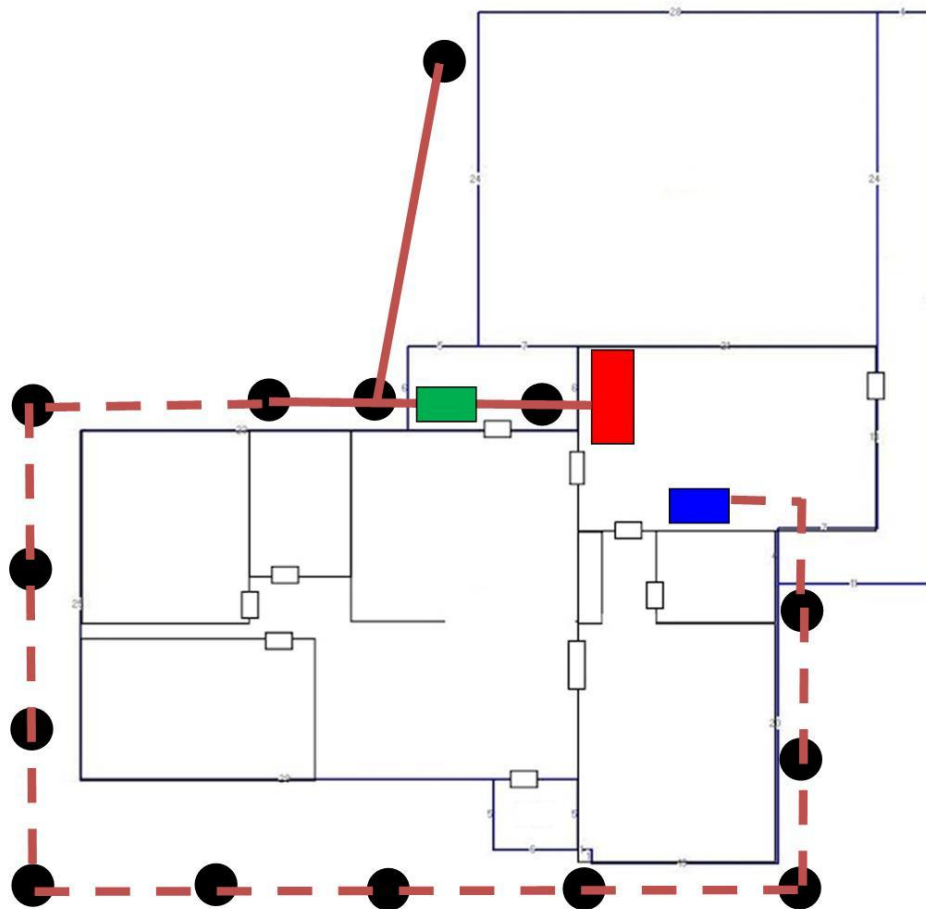
Ground Rods-Exothermic Weld



- <https://www.youtube.com/watch?v=oNDdVIWhBqA>
- <https://www.youtube.com/watch?v=ealSEITHwKk>









-  Radio Shack
-  Ground Rods
-  SPGP
-  Copper Strap
-  Electric Panel

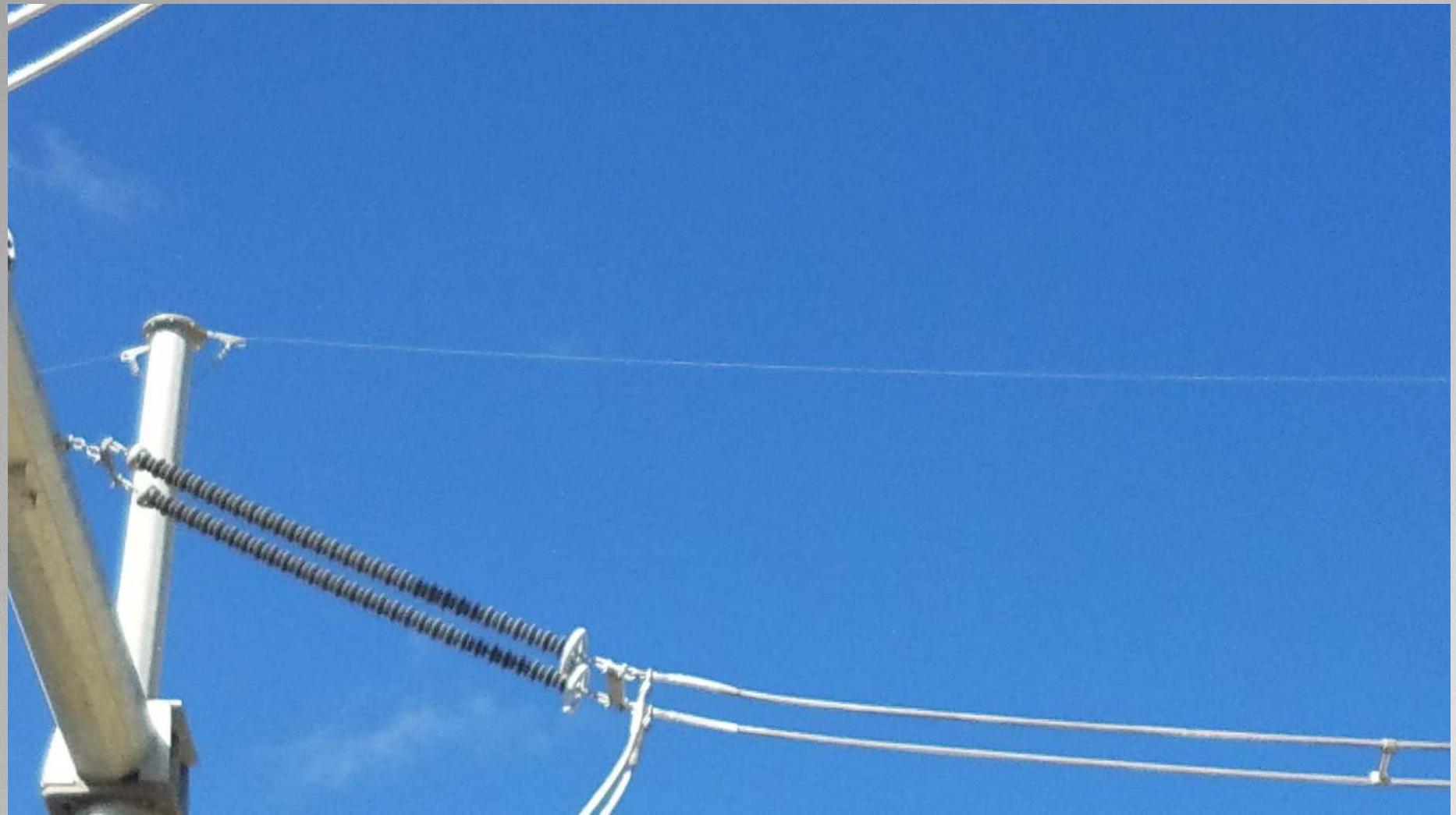




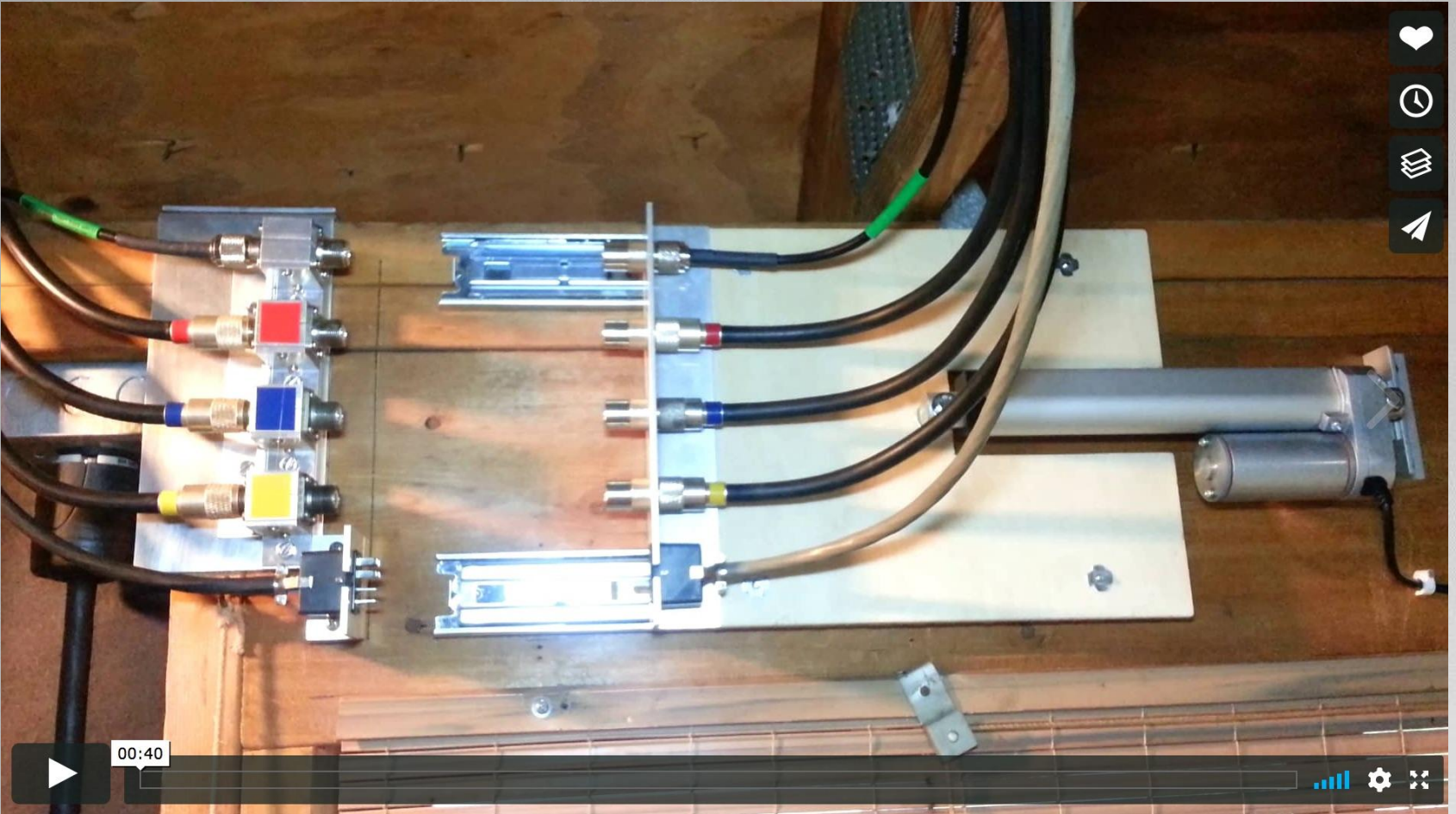






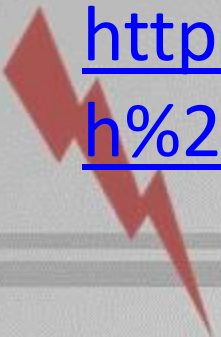






Lightning References

- List of Lightning Protection Links (ARRL):
<http://www.arrl.org/lightning-protection>
- Grounding and Bonding for the Radio Amateur (ARRL): <http://www.arrl.org/shop/Grounding-and-Bonding-for-the-Radio-Amateur/>
- Lightning Protection for the Amateur Radio Operator's Home (ARRL):
<http://www.arrl.org/files/file/QST/This%20Month%20in%20QST/June2017/Chusid-Morgan.pdf>



Lightning References

- So You Think You Know Lightning? (Vaisala)
<https://www.vaisala.com/sites/default/files/documents/Lightning-Booklet.pdf>
- Lightning Explorer (Vaisala)
<http://thunderstorm.vaisala.com/explorer.htm>
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Lightning References

- ARRL “The Doctor Will See You Now” – Grounding
<http://www.arrl.org/files/file/DoctorPodcast/April%2013%202017%20-%20Grounding.mp3>
- Erico Lightning Protection.
<https://www.erico.com/catalog/literature/E1147C-WWEN.pdf>



Lightning: Final Thoughts

- It's just a matter of time when your home (and radio shack) will be hit by lightning
- Protect your shack every time you leave QTH or go QRT
- Disconnect/ground all antennas not in use.
- Invest in SPGP/perimeter ground of your shack-your *new* ICOM IC-7610 will thank you!



Lightning: Questions



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