



Lightning Mitigation For Amateur Radio Antennas

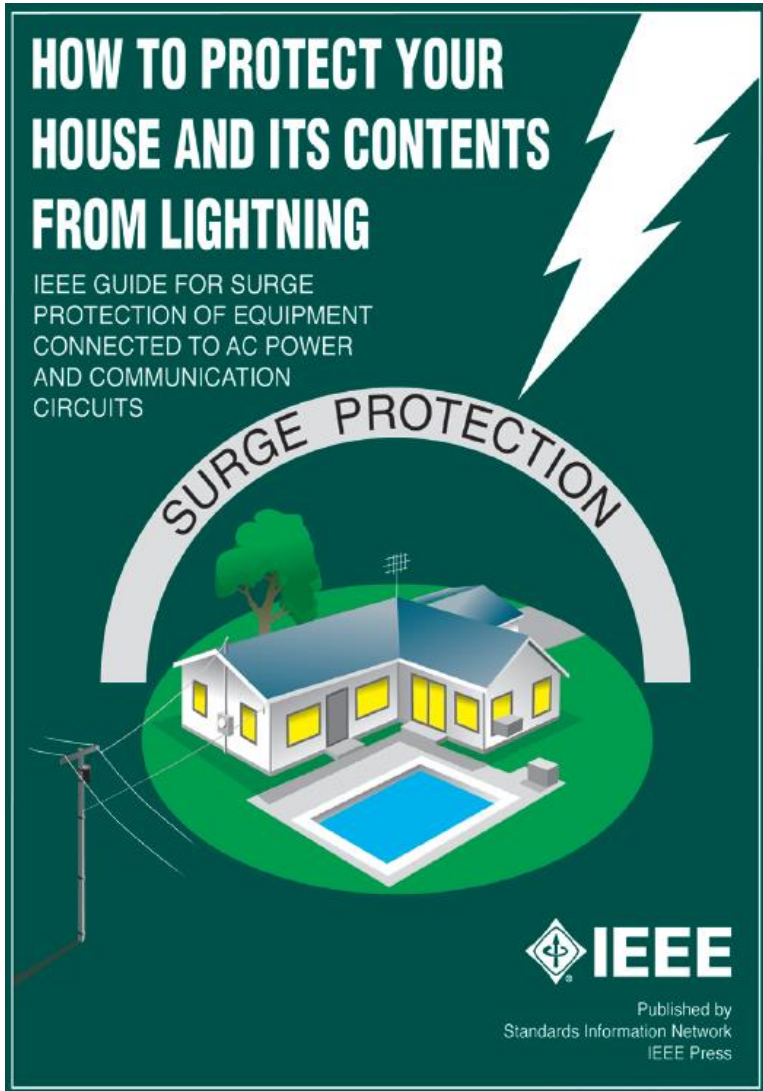
Lew Thompson, W5IFQ

6 AUG 2024

Purpose

- Provide realistic lightning protection based on personal experience.
- Lightning mitigation for structures (lightning rod structures) will not be discussed in detail.
- I refer you to “lightning Protection Resources” seen on page 3.

Lightning Protection Resources



HOW TO PROTECT YOUR HOUSE AND ITS CONTENTS FROM LIGHTNING

IEEE GUIDE FOR SURGE PROTECTION OF EQUIPMENT CONNECTED TO AC POWER AND COMMUNICATION CIRCUITS

SURGE PROTECTION

IEEE

Published by Standards Information Network
IEEE Press

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CIVIL ENGINEERING

GROUNDING & ELECTRICAL
SYSTEMS



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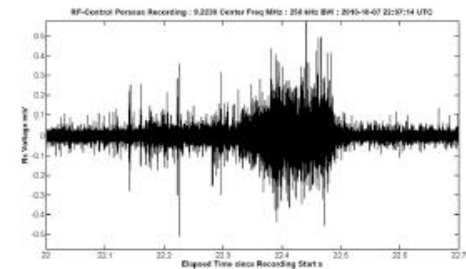
Pages: 103



Lightning Protection Standards & Practice



Dr. Gus K. Lott
KR4K NNN05EJ



ARRL Lightning Protection

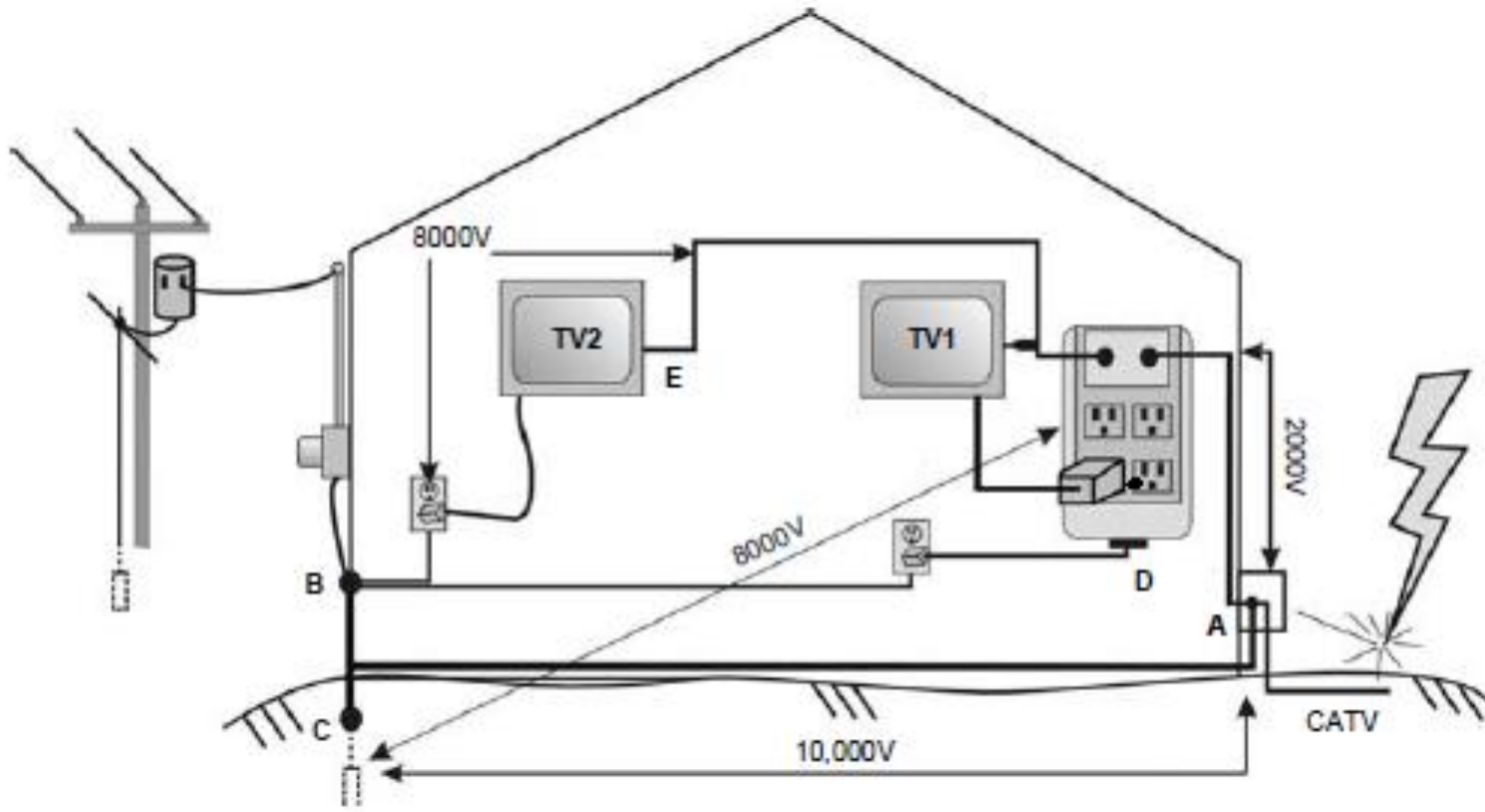
See: [Lightning Protection \(arrrl.org\)](http://arrrl.org)

- [Lightning Protection for the Amateur Radio Station – Part 1](#)
QST June 2002, pp. 56-59
A three part series that develops a plan for protection the amateur station.
- [Lightning Protection for the Amateur Radio Station – Part 2](#)
QST July 2002, pp. 48-52
- [Lightning Protection for the Amateur Radio Station – Part 3](#)
QST August 2002, pp. 53-55

Damage Paths

- Direct lightning Hit to antenna(s)
- Ground Potential rise or Ground Surge to all household appliances. This does not require a direct hit to antennas (nearby tree or power pole).

Ground Surge or Potential Rise



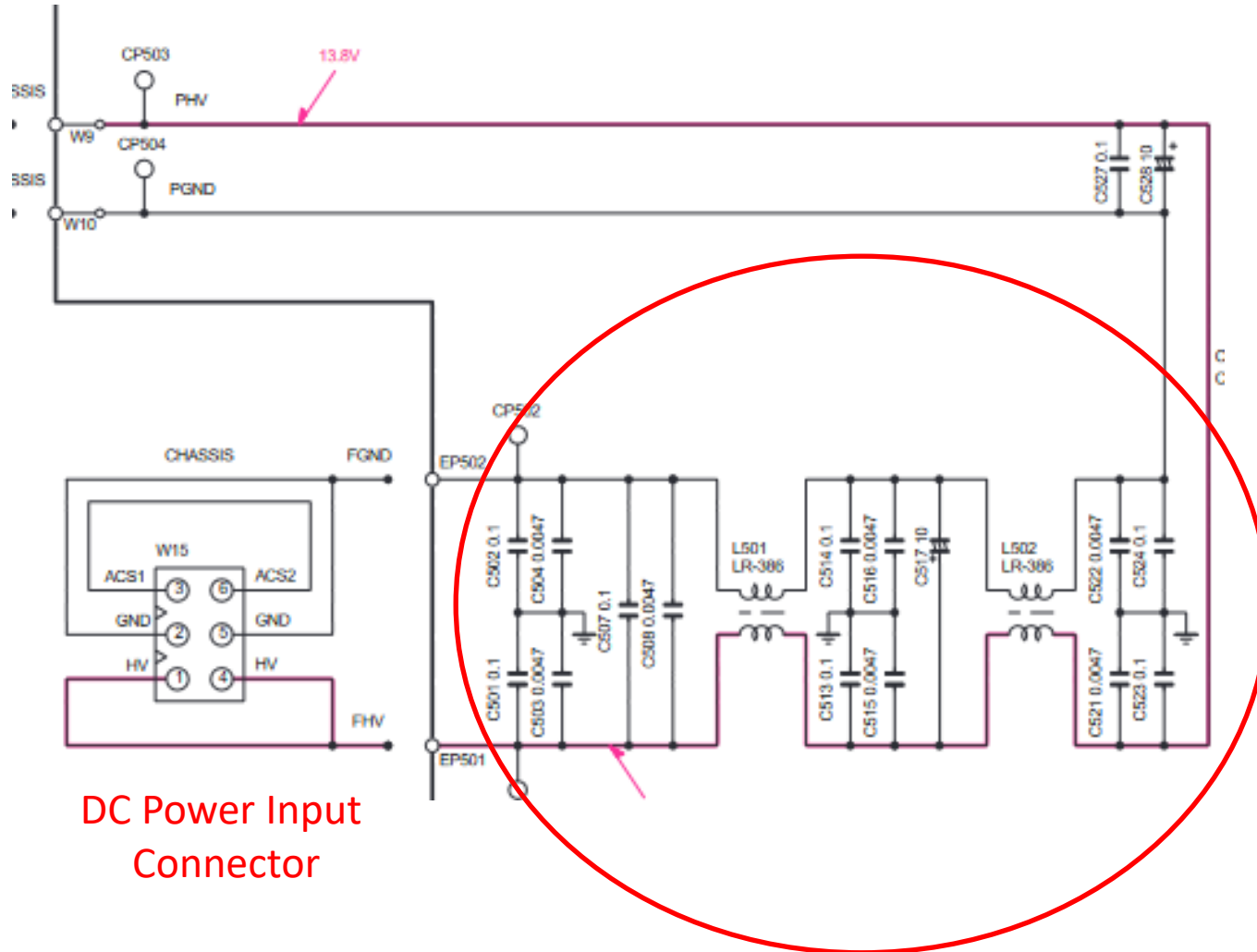
Example – page 1

- Antennas – 60 ft. Rohn 25G
 - 3 element trap Yagi (no damage)
 - 6m beam (no damage)
 - 2m vertical (destroyed)
- Lightning protection
 - Tower well grounded
 - Lightning arrestors on all cables at entrance into attic. Arrestors connected to tower ground.
- Surge suppressors (UPS) on two computers

Example – page 2

- All radio equipment's antenna inputs were **not damaged**. (For example, IC-756Pro3...)
- AC power supplies, and DC conditioning circuits for all radios **damaged**. For example see page 10.
- No damage to computers on UPS's.
- Even an AC powered wall mounted clock was damaged!
- Conclusion – all damage was due to Ground Surge, lightning was properly routed to tower ground but potential difference between tower ground and utility ground caused the damage.
- Lightning passed through AC to DC power supplies!

756 ProII Input Voltage Conditioning (Rebuilding this circuitry fixed radio)



General Rules

- Keep lightning outside of structure. i.e. route all antenna cables directly to lightning arrestors on **outside** of residence.
- Protect all “critical appliances” using high quality surge suppressors at each “appliance”.
- Install whole house surge suppressor at utility entrance.
- Connect all grounds (ground rods, tower, etc.) together then route to your utility ground location.

Lightning Arrestor - DC Block (PolyPhaser)

UHF F/F Bulkhead Coaxial RF Surge Protector, 1.5MHz - 700MHz, DC Block, 2kW, 10mJ, 50kA, Blocking Cap, Hole Mount



IS-B50LU-C0

Impedance 50 Ohm
Connector In Series UHF
Connector In Gender Female
Connector Out Series UHF
Connector Out Gender Female
Minimum Frequency 1.5 MHz
Maximum Frequency 700 MHz
Maximum Input Power 2,000 Watts
Direction Directional
Throughput Energy 10,000 μ J

Price Table

1 - 9	\$113.99
10 - 24	\$107.15
25 - 99	\$102.59
100 +	Call Us

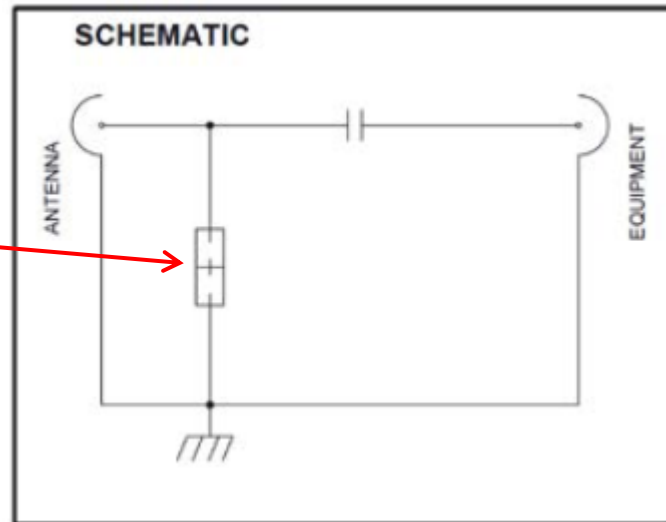
Add to Cart

Available Quantity: **61**

Quantity:

 ADD TO CART

Gas Discharge Tube



Lightning Arrestor - DC Pass (Alpha Delta)

Alpha Delta UHF Connector Coaxial Cable Surge Protectors ATT3G50UHP

★★★★★ (71) Part Number: ALF-ATT3G50UHP



\$69.99

Alpha Delta UHF Connector Coaxial Cable Surge Protectors

>

Surge Protector, Coaxial, DC pass, UHF Female, SO-239, Stud Mount, 2,000 W Power Rating, Each

[See More Specifications](#)

In Stock (more than 10 available)

Estimated Ship Date: **Monday 7/22/2024**

Would you rather pick it up? [Select Location](#)

1

Add To Cart

[Wish List](#) [Compare](#)

PayPal Pay in 4 interest-free payments of \$17.50. [Learn more](#)



Alpha Delta 3G50HP -
Alpha Delta Surge
Protector Replacement...

★★★★★ (16)

Estimated Ship Date:
Monday 7/22/2024

\$15.99

2000 Watts



Alpha Delta 3G50 - Alpha
Delta Surge Protector
Replacement Arc-Plug@...

★★★★★ (9)

Estimated Ship Date:
Monday 7/22/2024

\$15.99

200 Watts

Note: This type of Arrestor is used when Bias-T's are used to power remote tuners and preamplifiers located at the antenna.

Lightning Arrestor – Rotor Cable



DX Engineering Rotator Control Line Protectors DXE-IS-RCT

Control Line Surge Protector, 8-Terminal Shunt Type, 2 A, 60 Vac or 70 vdc max., Each

\$189.99

Part Number: DXE-IS-RCT

1

Add To Cart

★★★★★ (7)

In Stock (more than 10 available)

Compare Wish List

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[Free Shipping](#) [Documentation](#) [Multiple Images](#)

Note: Grounding stud on end of box.

Arrestor Mounting Options (Direct Ground Rod Attachment)



Direct Ground Rod Attachment Hardware

DX Engineering UCGC-Z Universal Copper Grounding Clamps DXE-UCGC-Z

★★★★★ (26) Part Number: DXE-UCGC-Z



\$59.99

DX Engineering UCGC-Z Universal Copper Grounding Clamps >

Ground Rod Clamp, Copper Z Mount for Coaxial Surge Protectors, Stainless Steel Hardware, Each

[See More Specifications](#)

In Stock (more than 10 available)

Estimated Ship Date: Monday 7/22/2024

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[Wish List](#) [Compare](#)

PayPal Pay in 4 interest-free payments of \$15.00. [Learn more](#)

Arrestor Mounting Option (Enclosure)



Metal arrestor
Mounting plate

DX Engineering Utility Enclosure Kits DXE-UE-2P

Utility Enclosure Package, Outdoor, Aluminum Grounding Plate for Protectors, Cable Feed-throughs, Screws, (color of plastic parts may vary), Kit

\$92.99

Part Number: DXE-UE-2P

★★★★★ (64)

In Stock (more than 10 available)

Estimated Ship Date: **Monday 7/22/2024**

 [Documentation](#)  [Multiple Images](#)

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Example 1 – Personal Station



Example 1 – Personal Station



Example 2 – MARS Customer

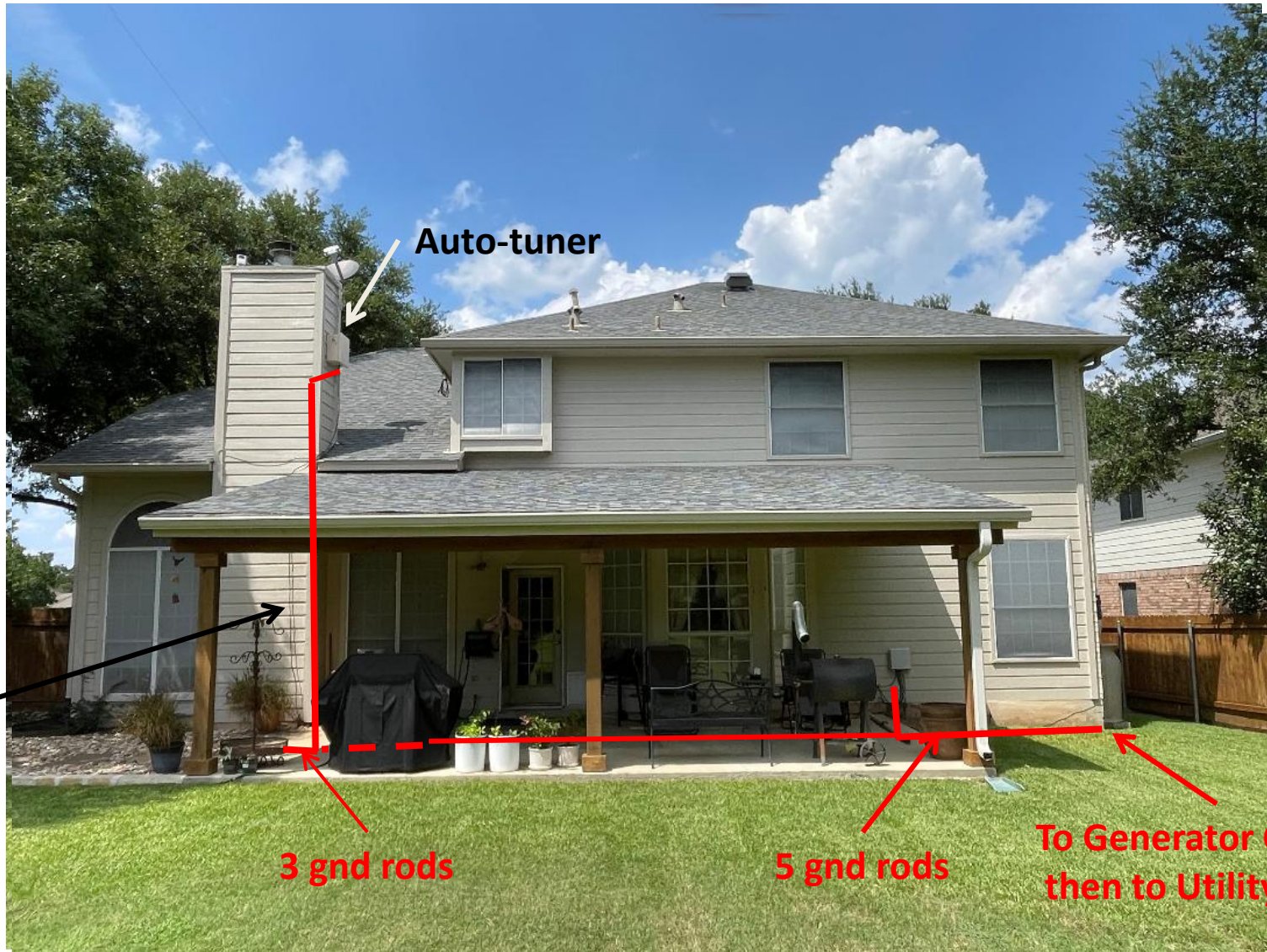
**Three cables:
Hex Beam
Dipole (balun)
Rotor Cable**

**Enclosure is grounded
to tower and tower
is grounded to several
ground rods.**

**Station ground is
connected to same
ground rods.**



Distributed Antenna Grounding System (Personal Station)



Auto-tuner

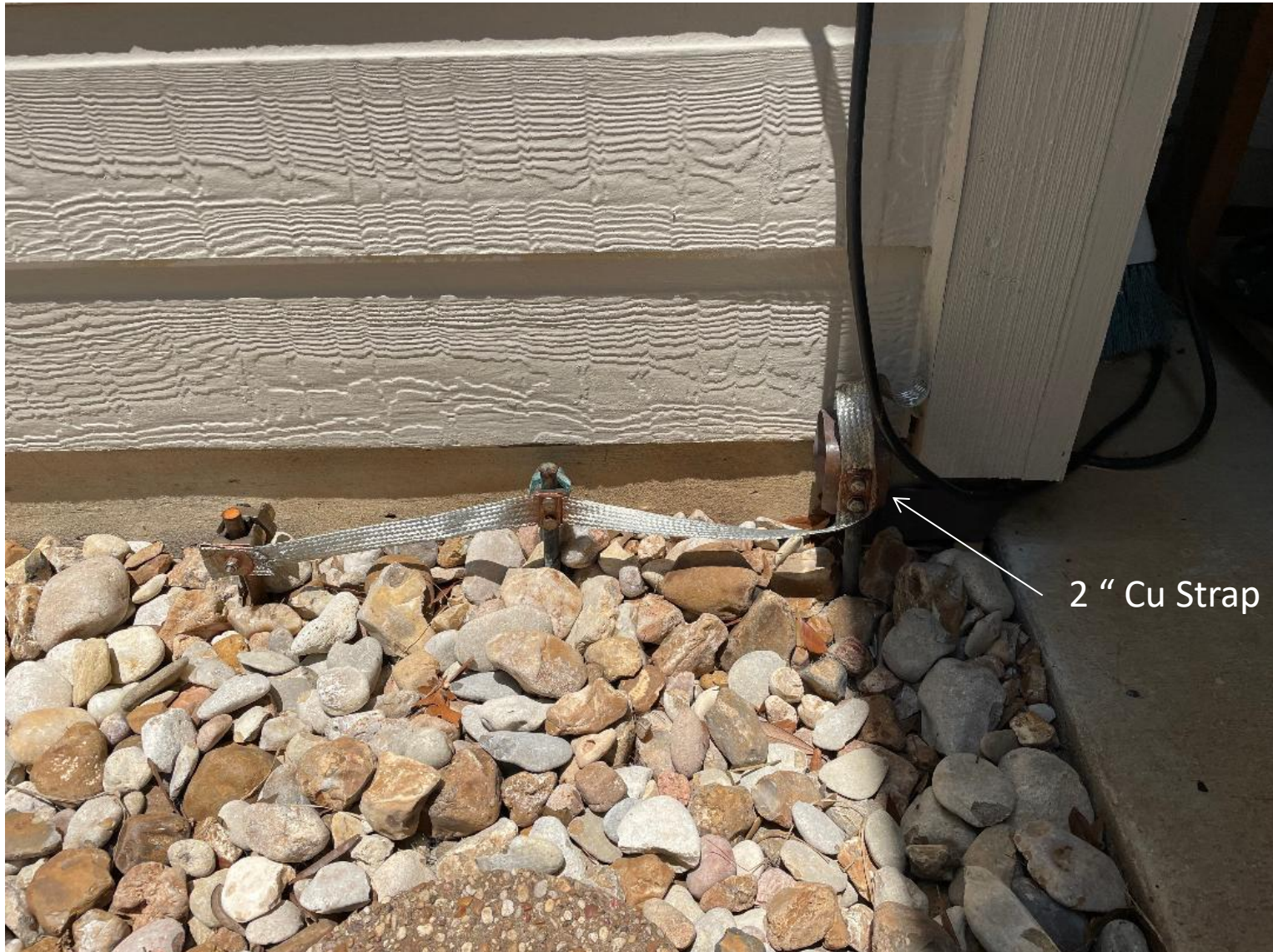
External Coaxial Cable

3 gnd rods

5 gnd rods

To Generator Conduit then to Utility gnd.

West Ground Rod Attachments



East Ground Rod Attachments

Coax cables
House entrance

To lightning arrester Gnds

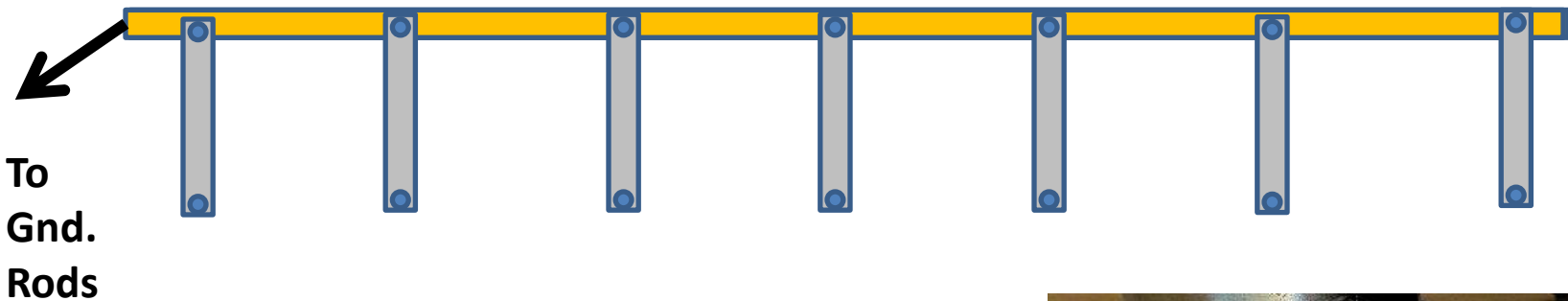
2" Cu Strap

Ground Rod Depth - 3-4 ft. each



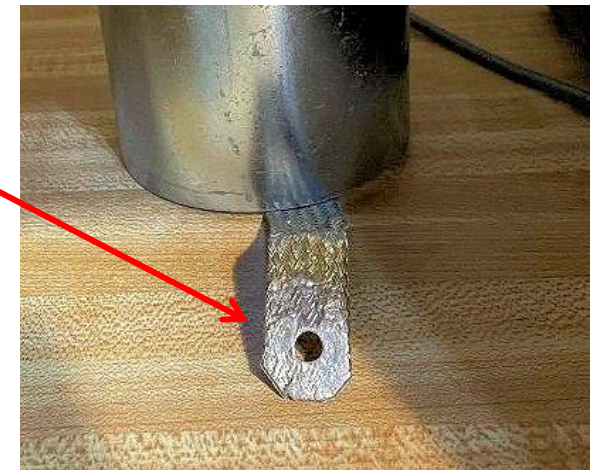
Equipment Ground Connections

1/8" X 3/4" Brass or Copper bar stock, Length=table length



1/2" Ground Braid – 12" length

Note: All equipment including computer, surge protector (s) and power supplies connected to ground bar.



Flatten, fill with solder then drill hole

AC Surge protection



Tripp Lite ISOBAR8ULTRA Isobar 8 Outlet Surge Protector Power Strip, 12ft Cord, Right-Angle Plug, Metal Lifetime Limited Warranty & Dollar 50,000 Insurance White

[Visit the Tripp Lite Store](#)

4.7 ★★★★★ 4,522 ratings | [Search this page](#)

500+ bought in past month

\$87⁷⁸

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[Extra Savings](#) [Amazon Music offer with this purchase](#) [1 Applicable Promotion](#)



Surge Strip chassis should be connected to the station ground.

Whole House Surge Protector

- Must be installed by a licensed electrician.
- Recommend - External display to check status (water tight case).
- Installed “down stream” of a circuit breaker, so a “short” failure of Arrestor will result in breaker blowing.



Conclusions

- Prevent Lightning from entering your home.
- Install lightning arrestors on all antenna leads before cables enter home. This includes rotor cables and other signaling cables.
- Connect antenna grounds to utility ground.
- Install surge strips on all valuable appliances.
- Install a whole house surge protector on outside breaker box.
- Purchase ARRL equipment insurance.