2011 WISPAPALOOZA

Tower Grounding and Mounting – Best Practices

Radio Protection

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Overview

About Trango

- Leading Manufacturer of Wireless IP Backhaul Solutions
- Focused on Licensed/Unlicensed Bands 6-40 GHz
- Based in San Diego, California
- Delivering wireless solutions since 1996

Overview

- Why grounding/surge protection is so important
  - Tower sites are struck by lighting more often than any other site
  - Lightning related damage is responsible for most RMAs for tower mounted radios
  - Proper grounding/surge protection reduces the probability of damage dramatically

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Grounding Considerations

Keys to reducing risk of damage

1) Radio Placement
2) Radio Grounding
3) Cable Grounding
4) Signal/Power Surge Protection
5) Tower Grounding

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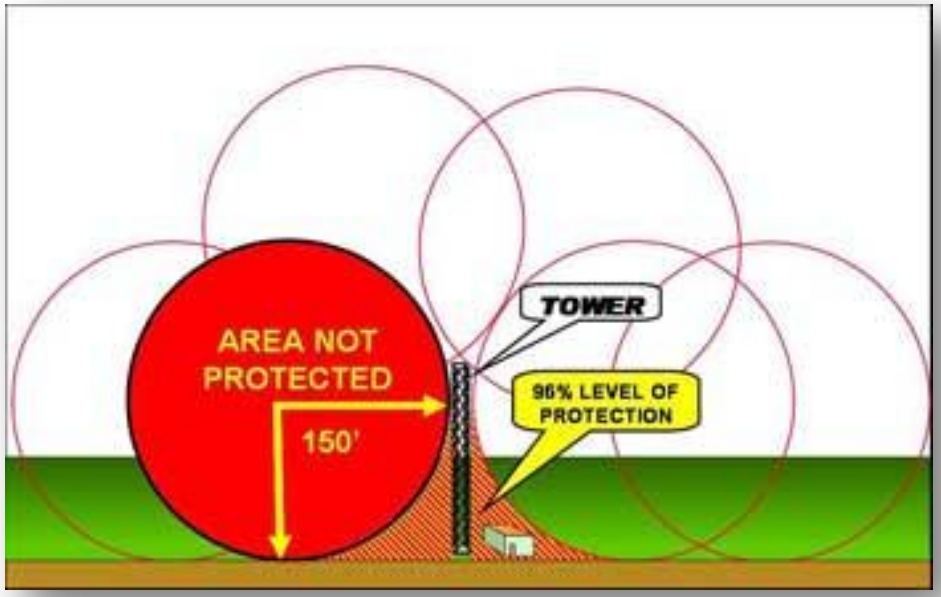
Lightning

- The “Rolling Sphere” model for lightning
  - Imagine a sphere with 150 foot radius
  - As the sphere rolls anything it touches could be hit by lightning
  - If the ball rolls against a tower, there is a sheltered area that the ball will not touch
  - This is the best place to mount electronic equipment on a tower.



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Radio Placement

- Place radio under 100 ft above the tower base if possible
- Mount radio as far below the top of tower as possible – NOT at the very top
- If equipment must be mounted above 100 feet make sure the tower has radial grounds spaced along the tower
  - The radials should protrude farther than the radio

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Radio/Equipment Grounding

- Radio must be grounded to the tower leg
  - Use large conductor larger that 6 AWG
  - Scrape away tower paint/corrosion
  - Use conductive grease over the connection to the tower
- Indoor Equipment must be grounded
  - Rack ground bus must be grounded to master ground at shelter entry point.
  - Avoid grounding the equipment directly to rack which may have low conductivity paint.

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Cable Grounding

- Coaxial Cable
  - Ground every 25-75 feet along run down tower leg
  - Ground at lowest point on tower if possible, close to tower leg ground using 6 AWG ground strap
  - Ground at master ground bar just outside shelter entry point using 6 AWG ground strap
- Ethernet cable for PoE
  - Use double shielded cable to improve immunity to noise, reduce resistance
  - Ground every 25-75 feet along run down tower leg
  - Ground cable at base of tower if possible to reduce resistance
  - Ground at shelter master ground bar using PoE Surge Suppressor

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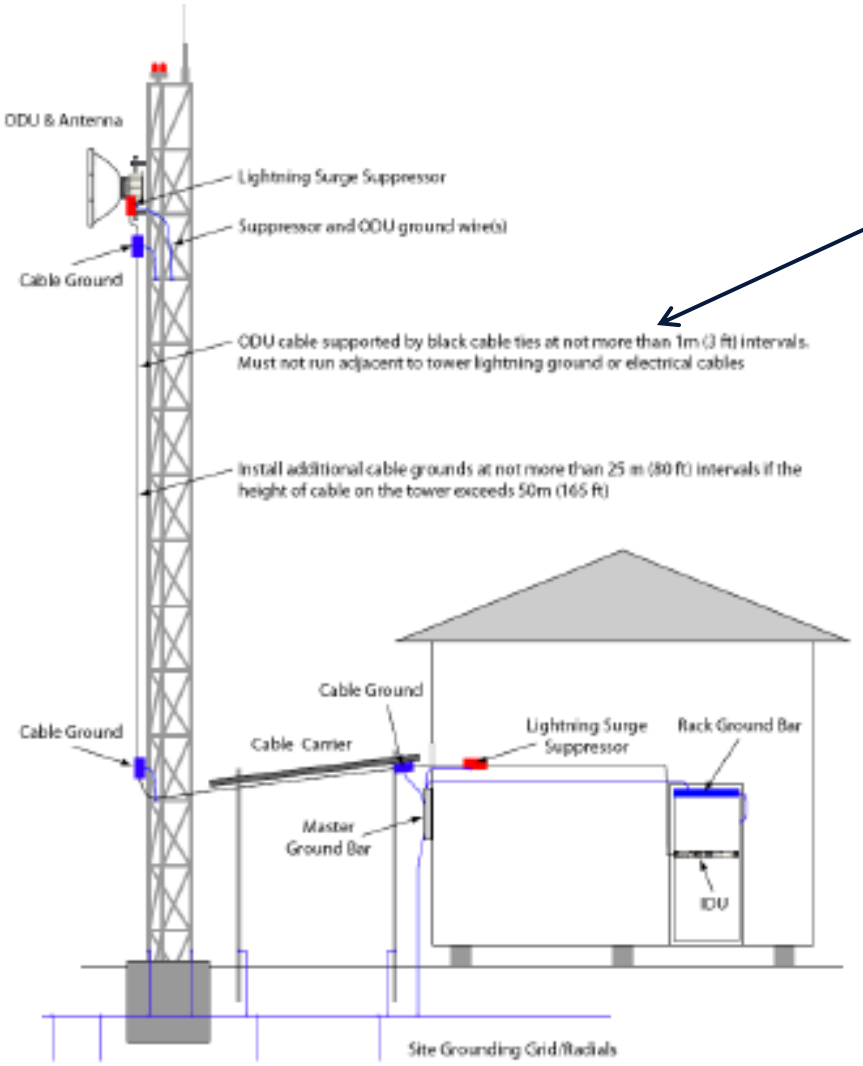
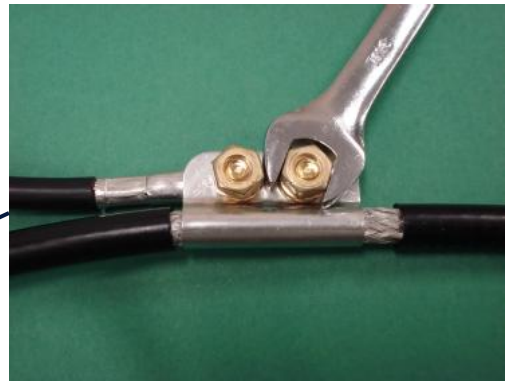
System Grounding (Split System)





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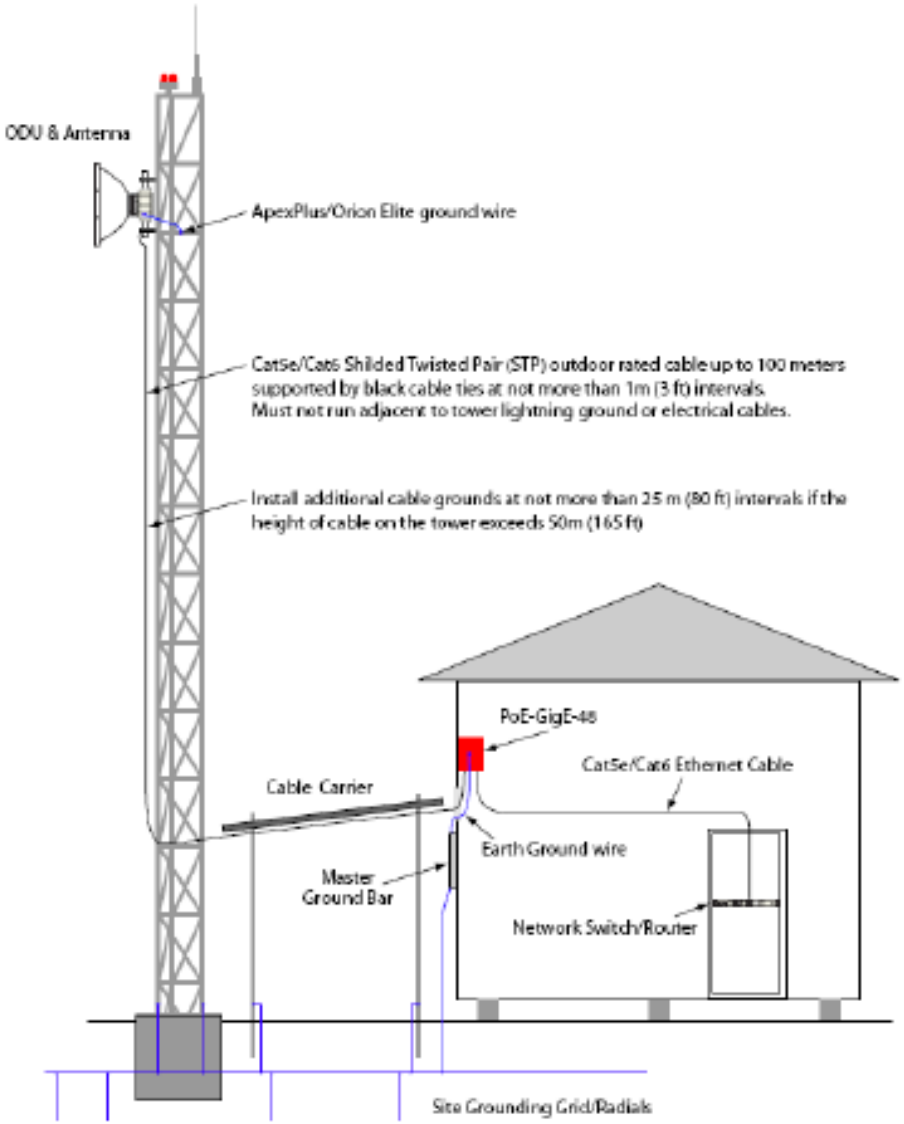
System Grounding (PoE System)



Equipment Surge Suppression

- Protect Signal lines against voltage surges
  - Standard method is to use gas tubes in conjunction with diodes
    - Transient Voltage Suppression (TVS) diodes can clamp voltage to a set limit and respond very quickly, but cannot handle large voltage spikes with large amounts of energy.
    - Gas Discharge Tubes protect against large voltage spikes and can handle large currents (several kAmps)
- For split systems, locate gas discharge tubes at Radio and at shelter entrance.

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Equipment Surge Suppression

- For PoE Based Systems:
  - Locate Surge Suppression at shelter entrance AND
  - At tower base for long Ethernet cable runs from tower to shelter.
- Make sure all Ethernet cables have surge suppression
  - Data ports
  - Management Ports

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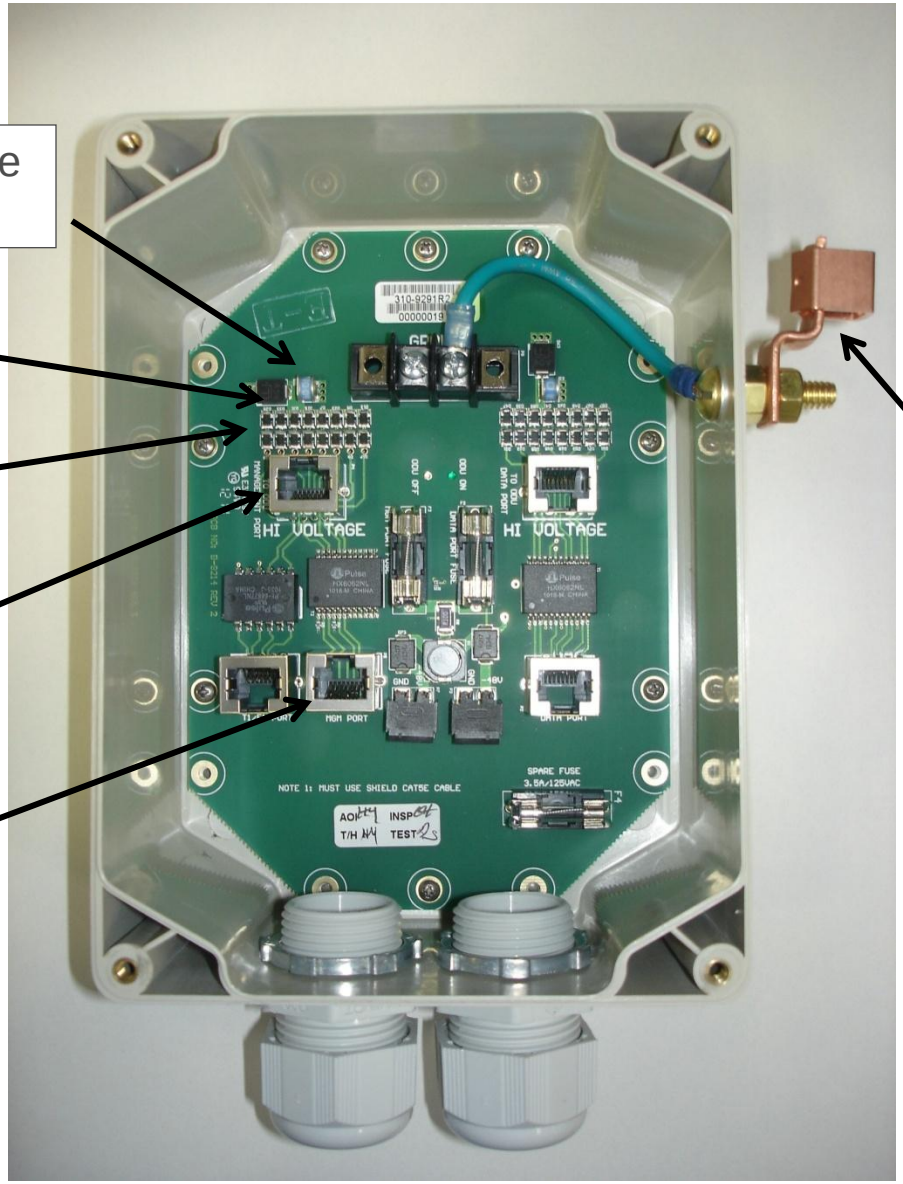
PoE Surge Suppression

- Example



Gas Discharge Tube

Zener Diode (High Current)

TVS Diodes for Each Signal Line

Ethernet with 48 VDC

Network Side Ethernet

Ground connection

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Tower Grounding

- Tower must be properly grounded
  - All other protection is useless without a good tower/shelter grounding system
- Some Key Points
  - Simply grounding the four corners of the tower is NOT enough
  - Single point grounding design between tower and shelter
  - Guyed towers reduce the resistance of the tower ground
  - Radials in ground to dissippate the current
  - Ufer ground for dry areas

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Thank You!

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