Association of Communication Engineers/USDA Rural Development Seminar

Wireless Equipment Grounding

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Wireless Equipment Grounding

- Revision of bulletin 1753F-801,"*Service Installations at Customer Access Locations (PC-5A*) to include a grounding practice conforming to NEC for wireless CPE
- In line with Agency construction units for compliance with NEC
  - Bulletin 1753F-153, *Specifications and Drawings for Service Entrance Installations at Customers*, requires that the latest revisions of the NEC and NESC be followed, unless local regulations are more stringent.

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- BICSI, *Telecommunications Distribution Methods Manual*, Vol. 2, Issue 3 of June 1991
  - Many states and local jurisdictions adopted the NEC as their standard. Some States has added more stringent requirements.
  - The NEC is used by lawyers and insurance companies to determine liability.

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- Chapter 800 of NEC –communications
  - 810 – radio and television receiving equipment
  - 810.15 requires antennas, mast and supporting structures to be grounded per 810.21
  - 810.20 requires each lead conductor from an outdoor antenna to be provided with a lightning arrestor, unless the cable is shielded and the shield is grounded.

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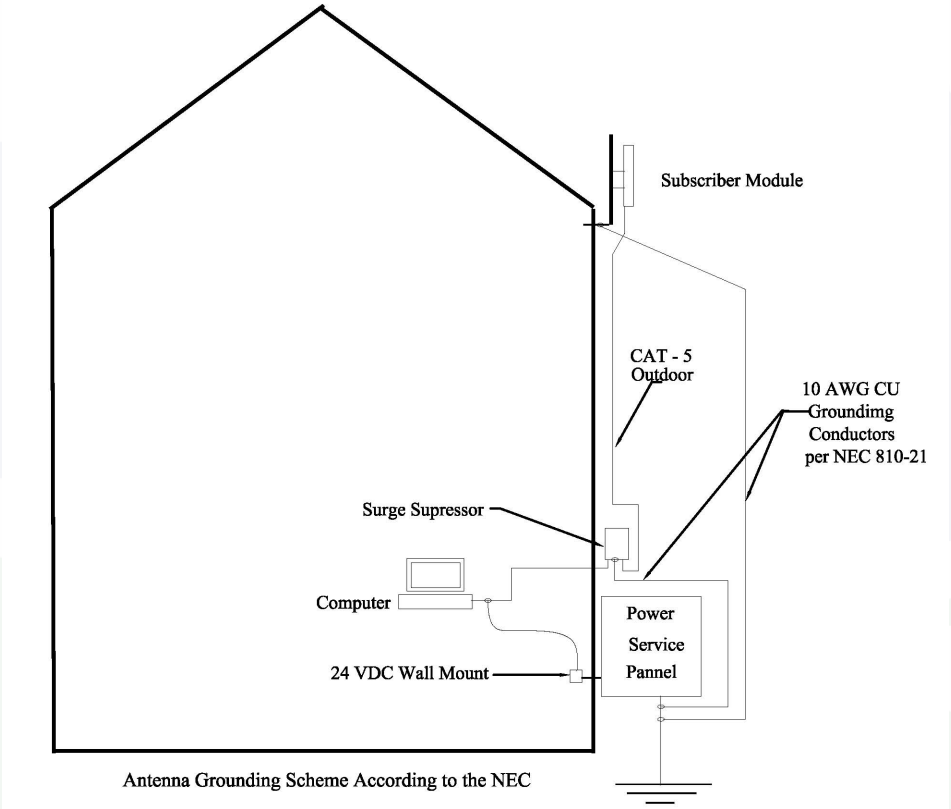
NEC Article 810-21



Antenna Grounding Scheme According to the NEC

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- Chapter 800 of NEC – Communications
  - 821(H) – Minimum size ADU grounding conductor
    - 10 AWG copper conductor
    - or 17 AWG copper-steel or bronze
    - or 8 AWG aluminum

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- 10 AWG copper vs. 16 AWG copper-steel using a microsecond rise by 65 microsecond fall lightning surge
  - fusing current
    - 220,000 A vs. 35,000 A
  - peak at a temperature just below paper ignition point, 454° F)
    - 133,000 A vs. 21,000 A

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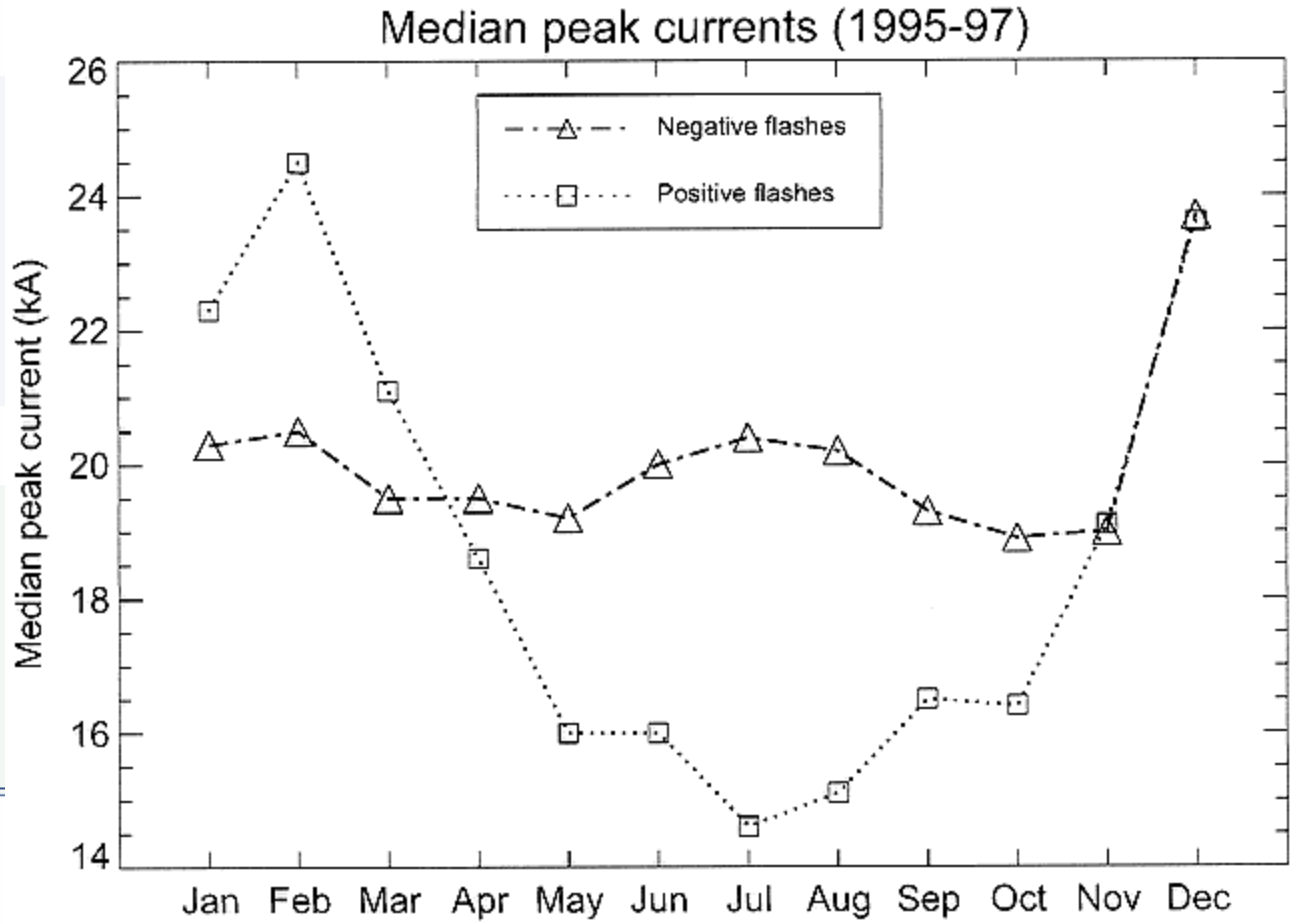
- 10 AWG copper vs. 16 AWG copper-steel using one microsecond rise by 65 microsecond fall lightning surge
  - Since about ½ of lightning strikes ground strikes exceed 20,000 A & 25% exceed 35,000 A, a 10 AWG copper wire is better choice as a grounding conductor.

Mid-Span Test

- *Lightning Ground Flash Measurements over the Contiguous United States: 1995–97*
- http://ams.allenpress.com/perlserv/?request=get-document&doi=10.1175%2F1520-0493(1999)127%3C2693%3ALGFMOT%3E2.0.CO%3B2&ct=1



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- ***Lightning Ground Flash Measurements over the Contiguous United States: 1995–97 (Coop. Institute for Applied Meteorological Studies, Department of Meteorology, Texas A&M University, College Station, Texas)***
  - The authors (Richard E. Orville and Gary R. Huffines) examined cloud-to-ground lightning data for the years 1995–97 for the contiguous United States: 75.8 million flashes: 22.7 million (1995), 26.2 million (1996), and 26.9 million (1997).
  - The highest flash densities occur in Louisiana and Florida, typically exceeding 11 flashes km−2 on a grid scale of 0.2°. Positive flash densities exceed 1.1 flashes km−2 in Florida, Louisiana, and an area overlapped by the states of Tennessee, Mississippi, and Kentucky. The monthly percentage positive lightning ranges from 6.5% (July 1995) to 24.5% (January 1996).

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- *Lightning Ground Flash Measurements over the Contiguous United States: 1995–97*
  - The median negative peak currents (MNPCs) are ~ 20 kA from Jan. through Nov., jumping to 24 kA in Dec. The median positive peak currents (MPPCs) are highest in Feb. (25 kA) and decrease to a minimum in Jul. (15 kA). MNPCs are high along continental coastal areas, particularly the West Coast. Mountainous regions appear to have lower MNPCs, on the order of 18 kA. MPPCs exceed 40 kA in the upper Midwest, but are < 10 kA in Louisiana and Florida. The mean flash multiplicity appears to increase with decreasing latitude in the eastern half of the United States.
  - The annual % of positive lightning is 9.3% (1995), 10.2% (1996), and 10.1% (1997). Areas of positive lightning greater than 25% occur from the Canadian border as far south as Kansas, along the West Coast, as well as Maine.

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- Cianos, N. and Pierce, E.T., *A ground Lightning Environment for Engineering Usage*, Technical Report 1. Stanford Research Institute. 1972

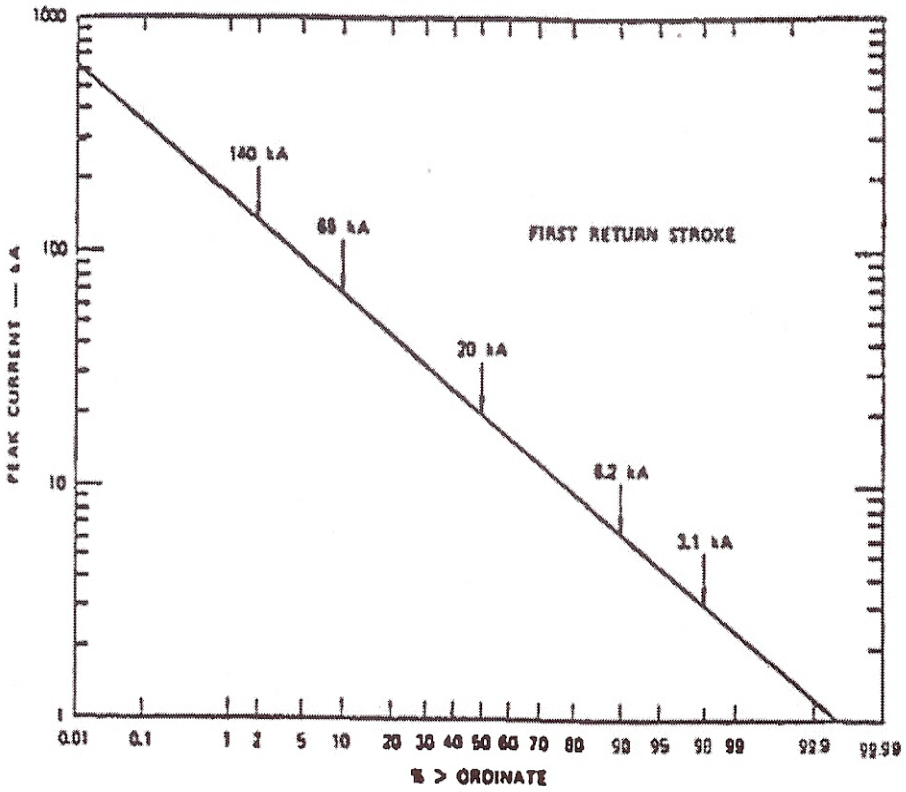

Figure 2. Cumulative Probability Distribution for Lightning Current[1]