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***IEEE 1692 Section 5.2 AC Power Isolation:
A New Solution to an Old Problem***

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IEEE 1692 Section 5.2 AC Power Isolation: A New Solution to an Old Problem

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IEEE Guide for the Protection of Communication Installations
from **Lightning** Effects©

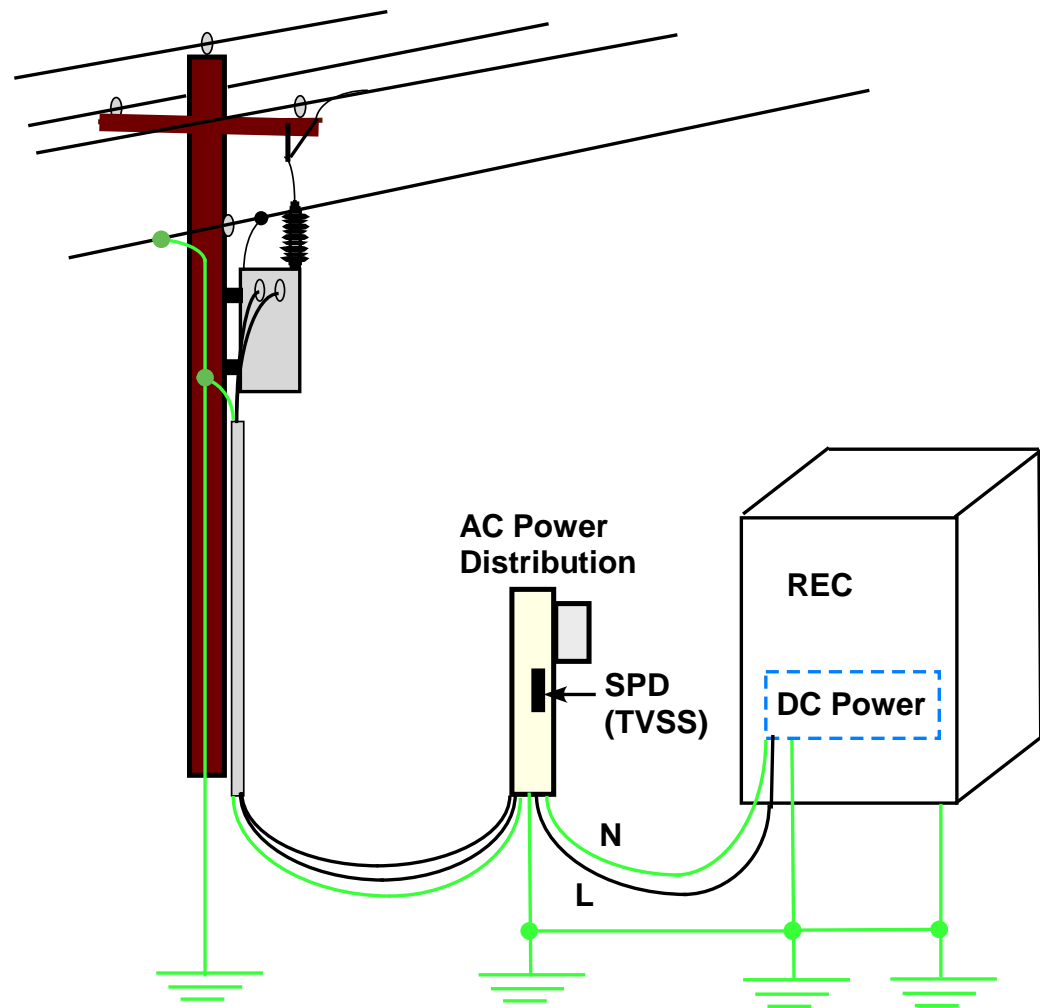
- **5.2.2 AC service isolation**
- Additional protection for the conditions listed at the beginning of 5.2 can also be offered through complete ac isolation where the ac utility is temporarily disconnected via automatic methods. Note that AC disconnect isolation requires protected equipment to have reliable power back-up systems such as battery or generator equipment for uninterrupted operation during ac isolation.



AC Power Isolation: A New Solution to an Old Problem.

A quick overview

Here we see a typical remote electronic cabinet (REC) site electrical configuration (120 Volt AC). Most transient voltage surge suppressors (TVSS) provide a path between line and neutral (ground) for surge currents that enter the remote electronics cabinet from the commercial power source.

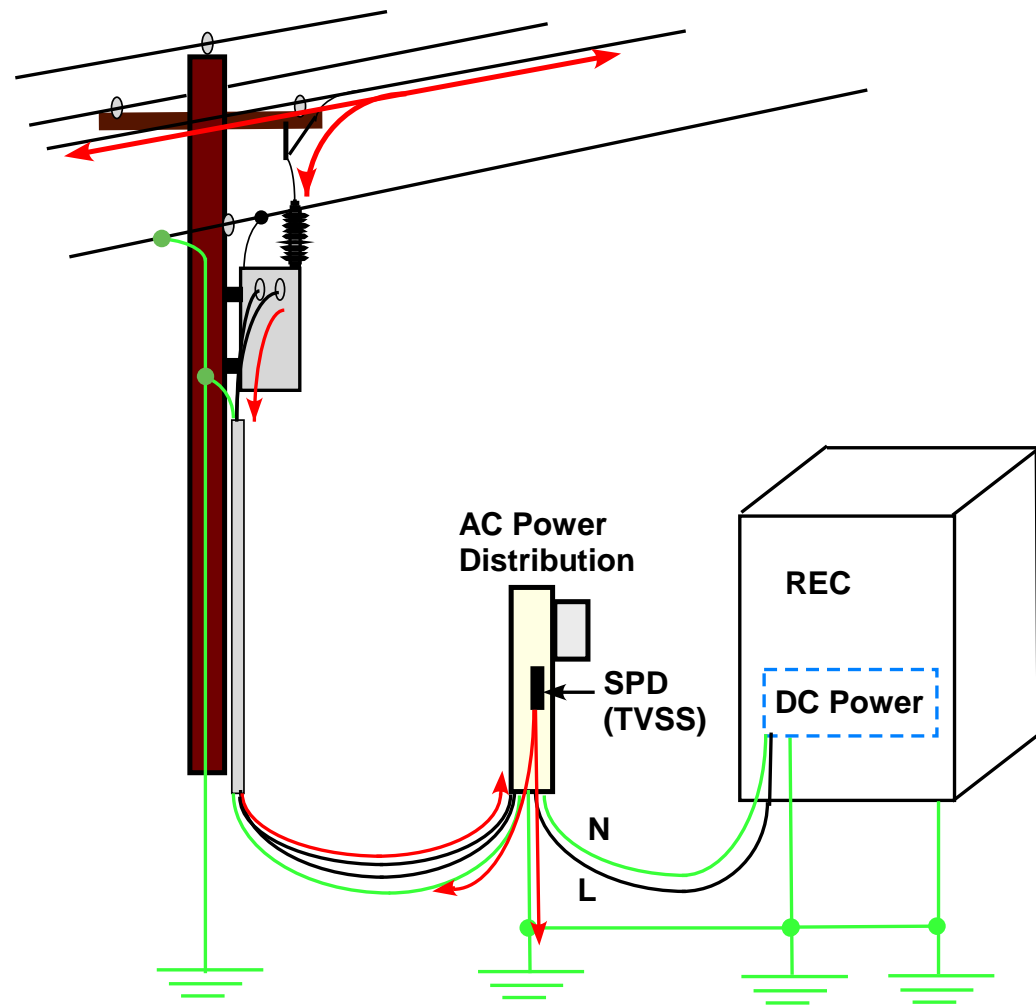




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A quick overview

Generally, AC surges are controlled by a well maintained TVSS and damaging surge currents are kept out of the remote electronics cabinet/ DC power plants.

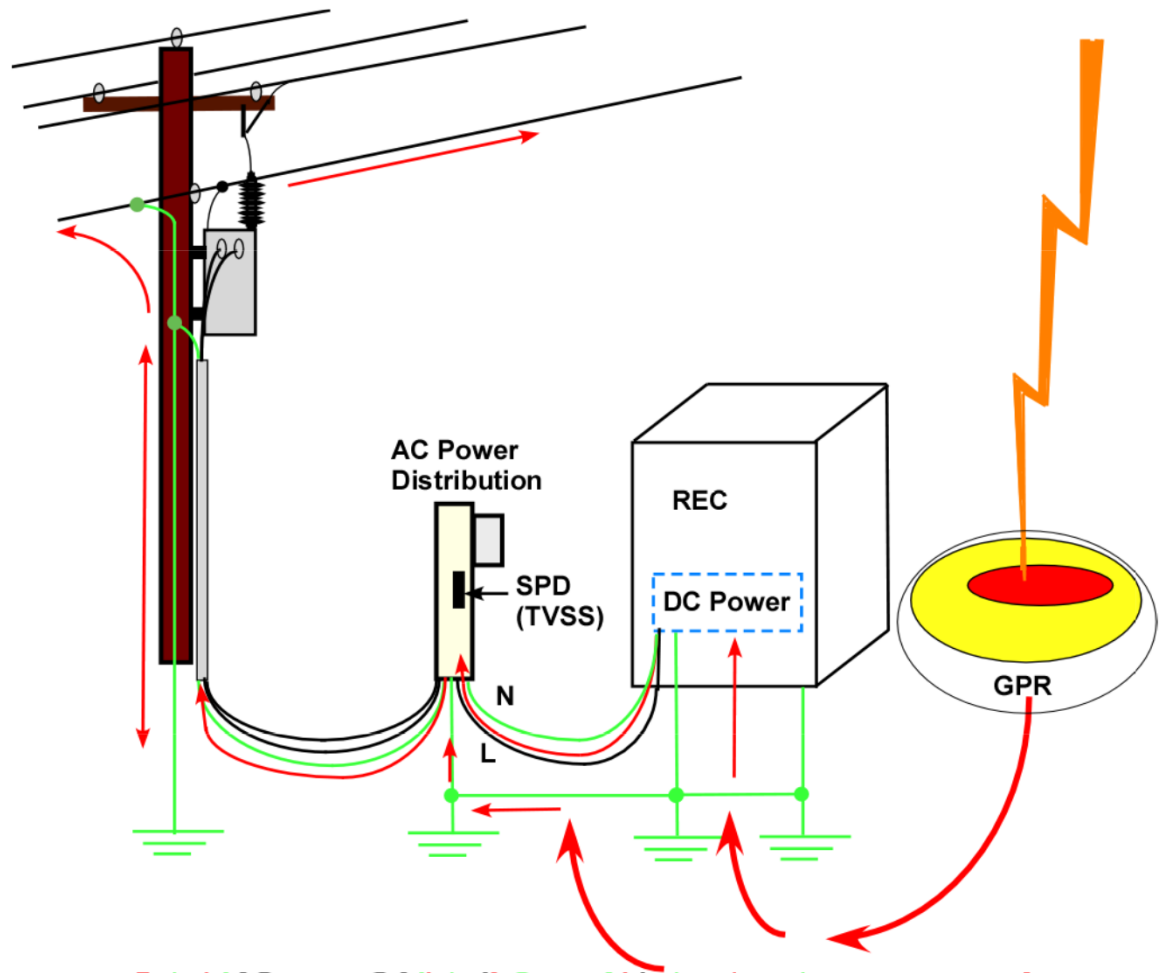




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A quick overview

A lightning Ground Potential Rise (GPR), especially a ground strike event, can cause a voltage rise through the grounding system of a RE cabinet. Lightning surge current can follow multiple paths including back firing of the primary protection associated with the copper cable facilities terminated in the remote electronics cabinet, damage to the DC power rectifiers, ring generators and electronic equipment can occur.

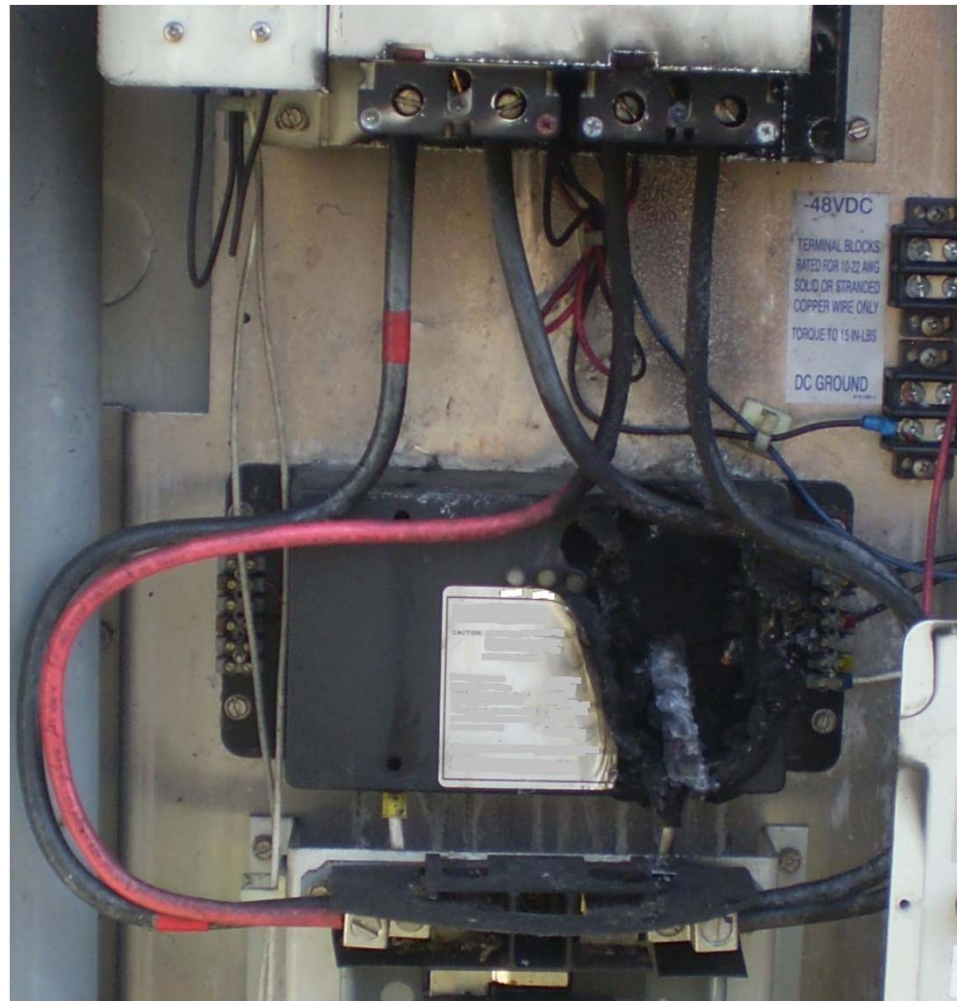




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A quick overview

SPD's can be subject to failures from ground strike lightning events.

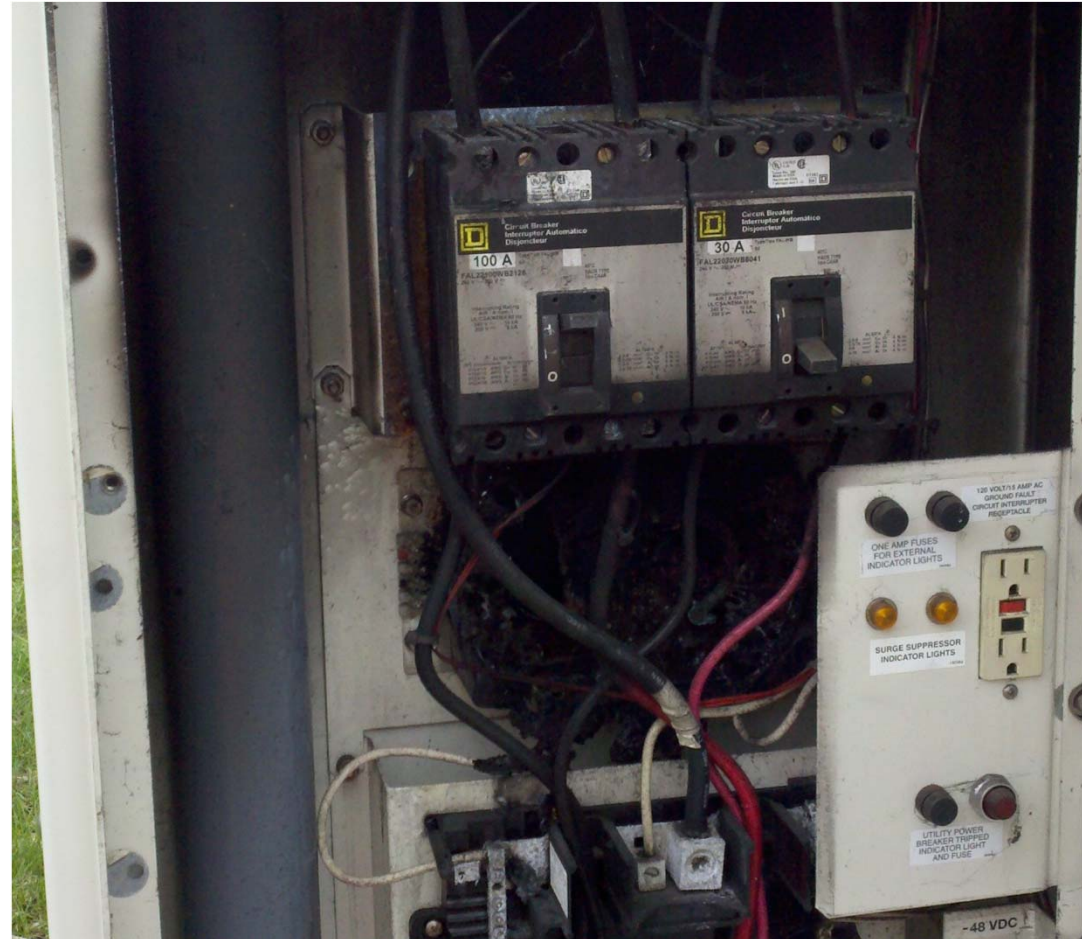




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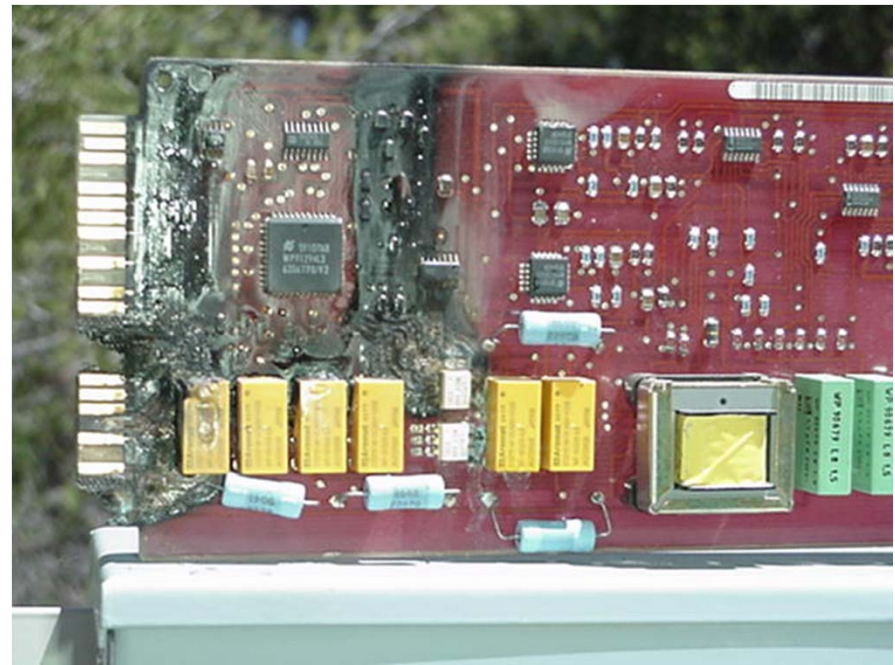
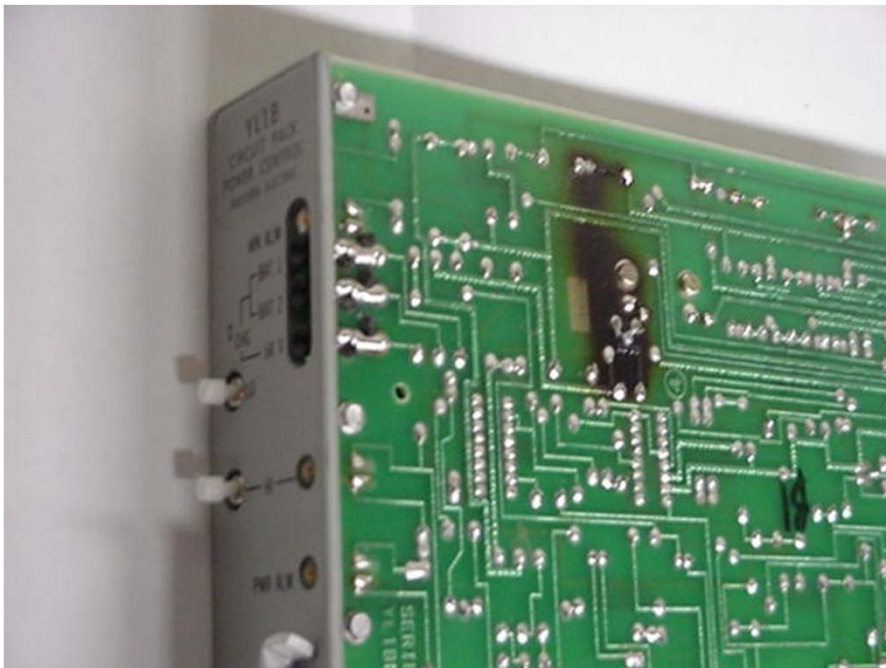
A quick overview

Some failures can be catastrophic.



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A quick overview



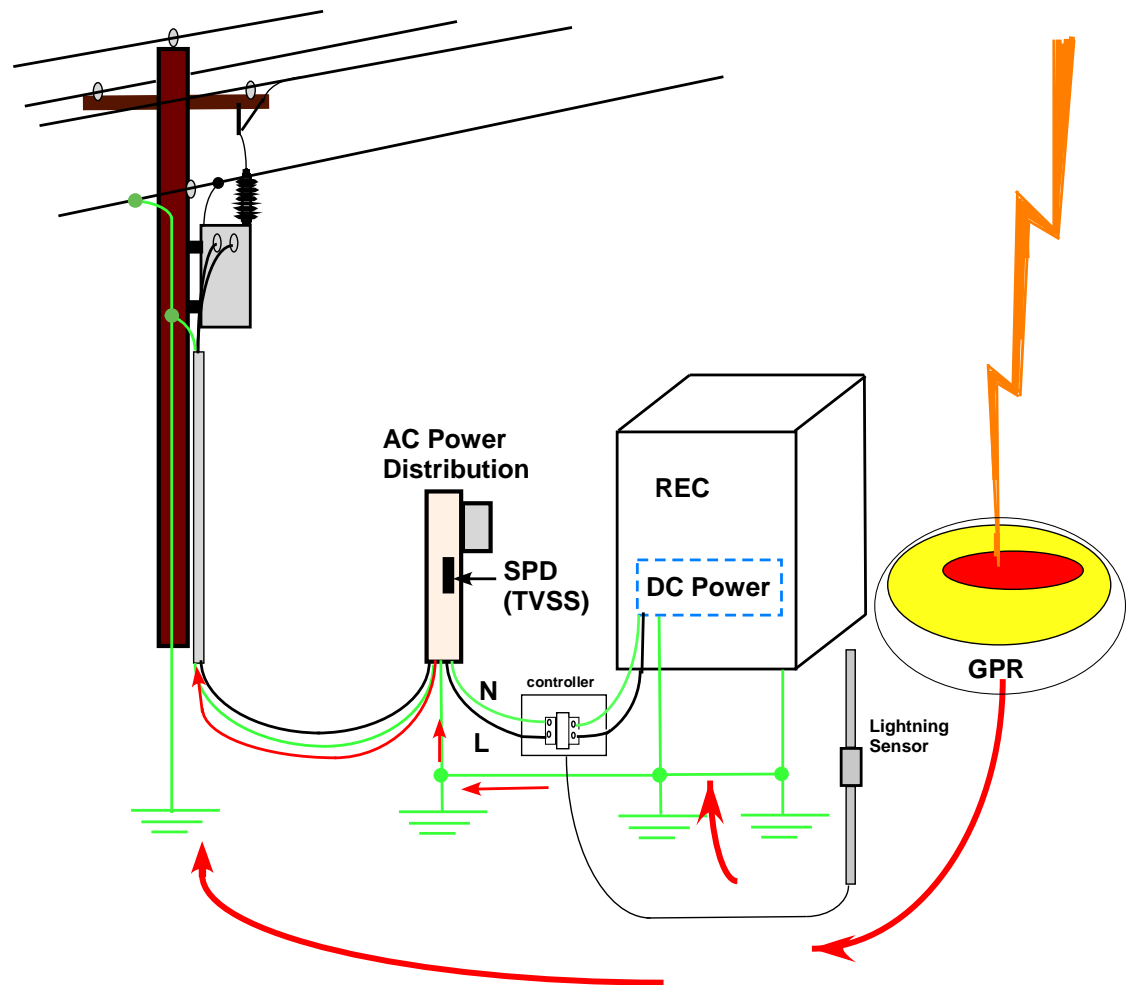
Loop Electronics can also be damaged by lightning surge currents entering through the ground system of the REC. Primary protection may “back fire” allowing those currents to pass into system components.



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A quick overview

By adding AC isolation of the line and neutral conductors to the total protection scheme, any damage from ground strike lightning surge current can be greatly reduced or eliminated.



AC Power Isolation: A New Solution to an Old Problem.

- How many remote electronic cabinets and wireless provider transmitter sites are placed in, next to or in close proximity to commercial power plants or substations? Hundreds? Thousands?
- Damaged to the DC power equipment at a remote electronic cabinet, located at or close to a substation, from a power line to ground fault produced ground potential rise is no different than lightning produced GPR damage.



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Here are three separate remote electronic cabinet locations that were all placed in relatively close proximity to substations. All three sites had chronic damage to the one or more component such as DC rectifiers, ring generators and mother boards of the power shelves.





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“And then you have these types of installations.” This has the potential for being a service outage. Remote electronic cabinet placed 15 feet from the fence / 10 feet from the grounding system of a substation. It has it’s own grounding system not bonded to the substation. Difference in electrical potential?





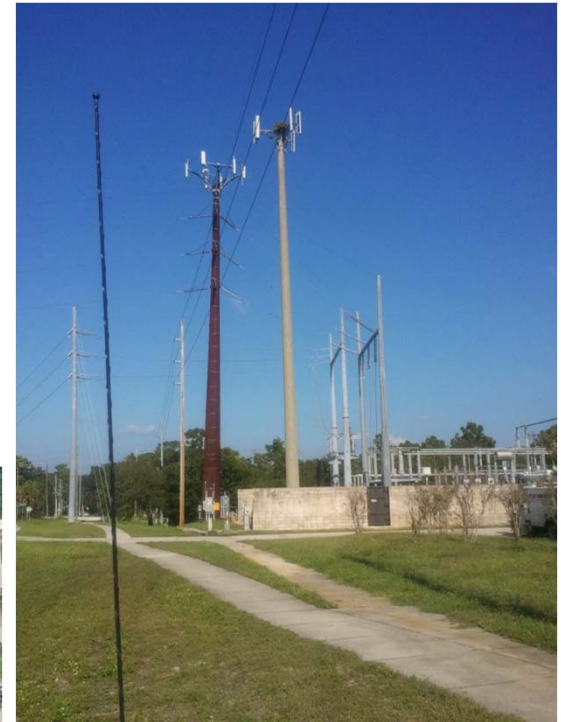
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The wireless industry places their equipment in any number of high voltage locations. Some are integrated into the grounding system of a substation (right hand picture) and some are placed in close proximity to substations (left hand pictures).

The (peak) ground potential rise voltage for this substation calculated to be 39537 volts.

I calculated the GPR from a line to ground fault at the cell site to be 4000 V AC (peak).

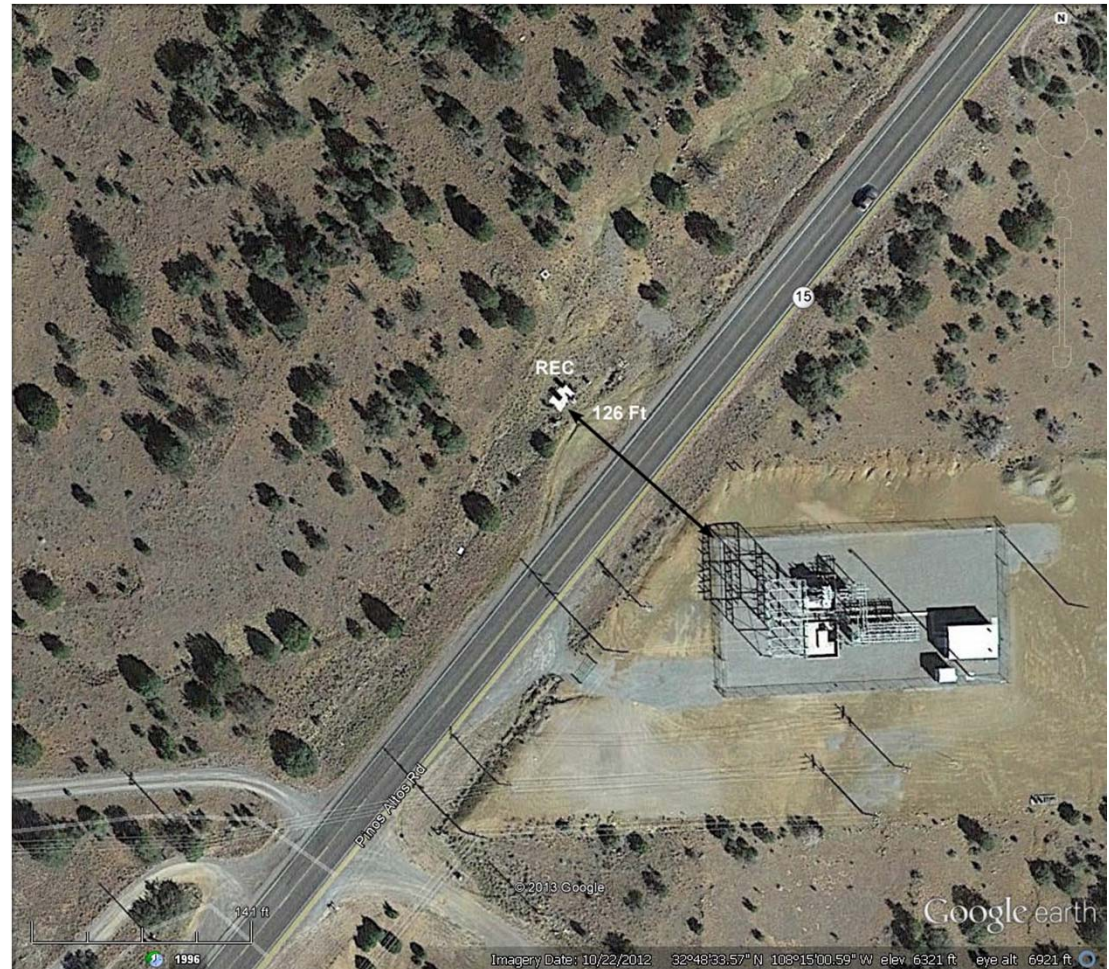
Is damage possible?





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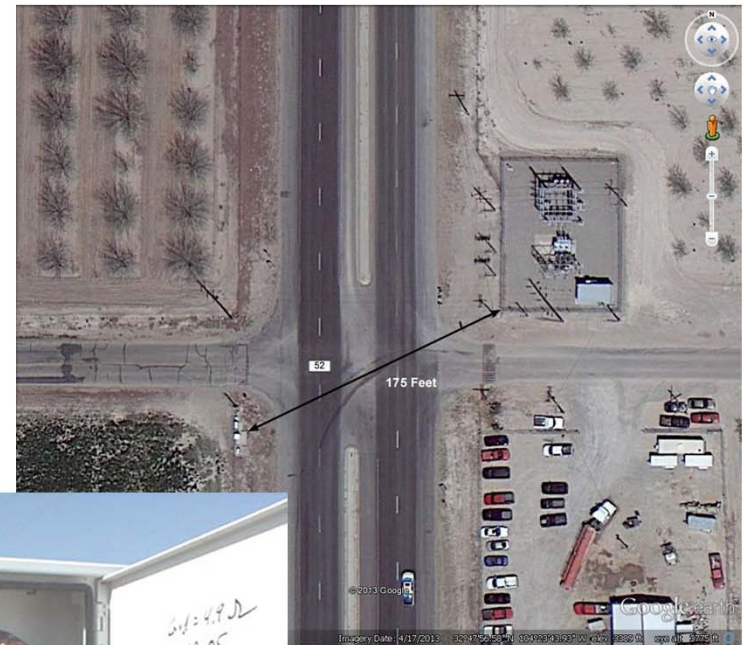
Remote electronic cabinet location placed directly across street from a substation. This site had chronic damage to every component of the DC power plant. DC Rectifiers and AC ring generators were routinely damaged and in less than one year the mother board of the power shelf was damaged twice requiring the replacement of the entire DC power plant. No damage has occurred since installation of power isolation technology.





AC Power Isolation: A New Solution to an Old Problem.

Remote electronic cabinet location placed directly across street from a substation. This site had chronic damage to the DC Rectifiers. No damage has occurred since installation of power isolation technology.





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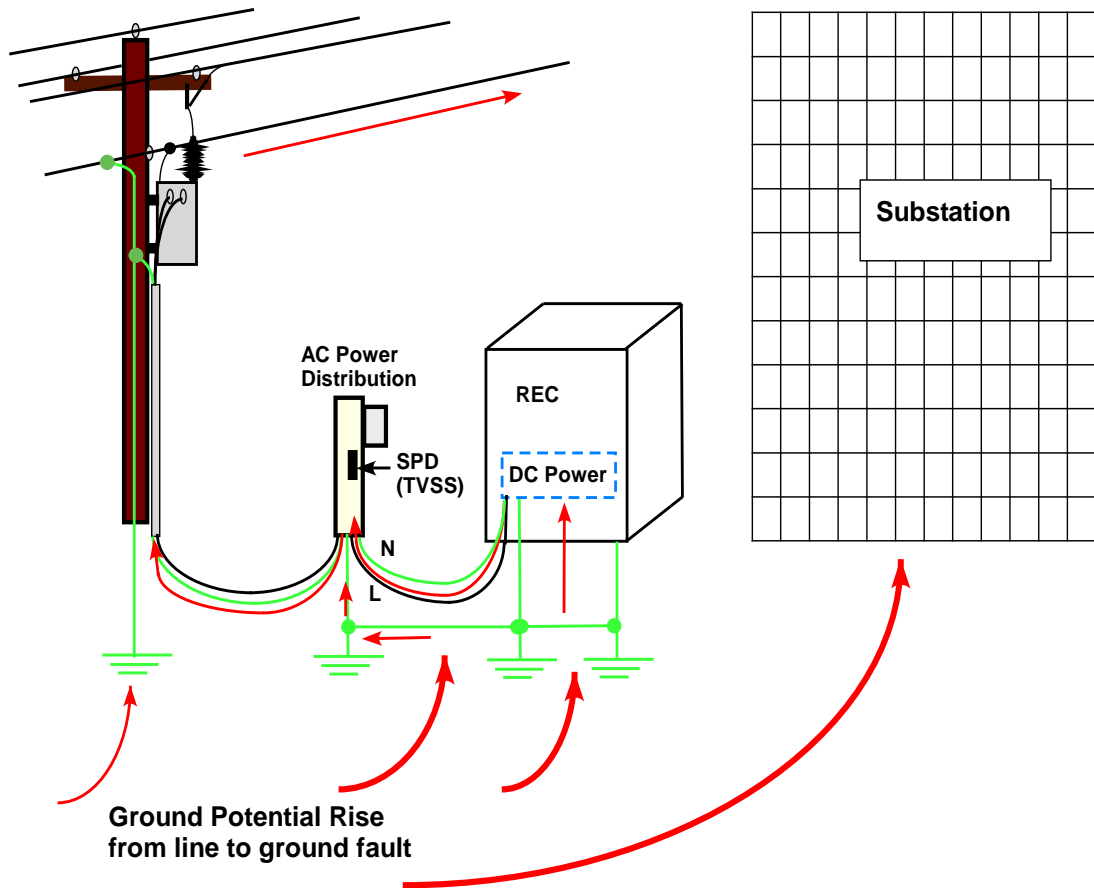
This remote electronics cabinet was placed in close proximity to this 112,450 square foot substation. The GPR at the substation calculated to be 11,116 volts (peak). GPR at the REC calculated to be 1360 volts (peak). This site had chronic damage to the DC Rectifiers. No damage has occurred since installation of power isolation technology.





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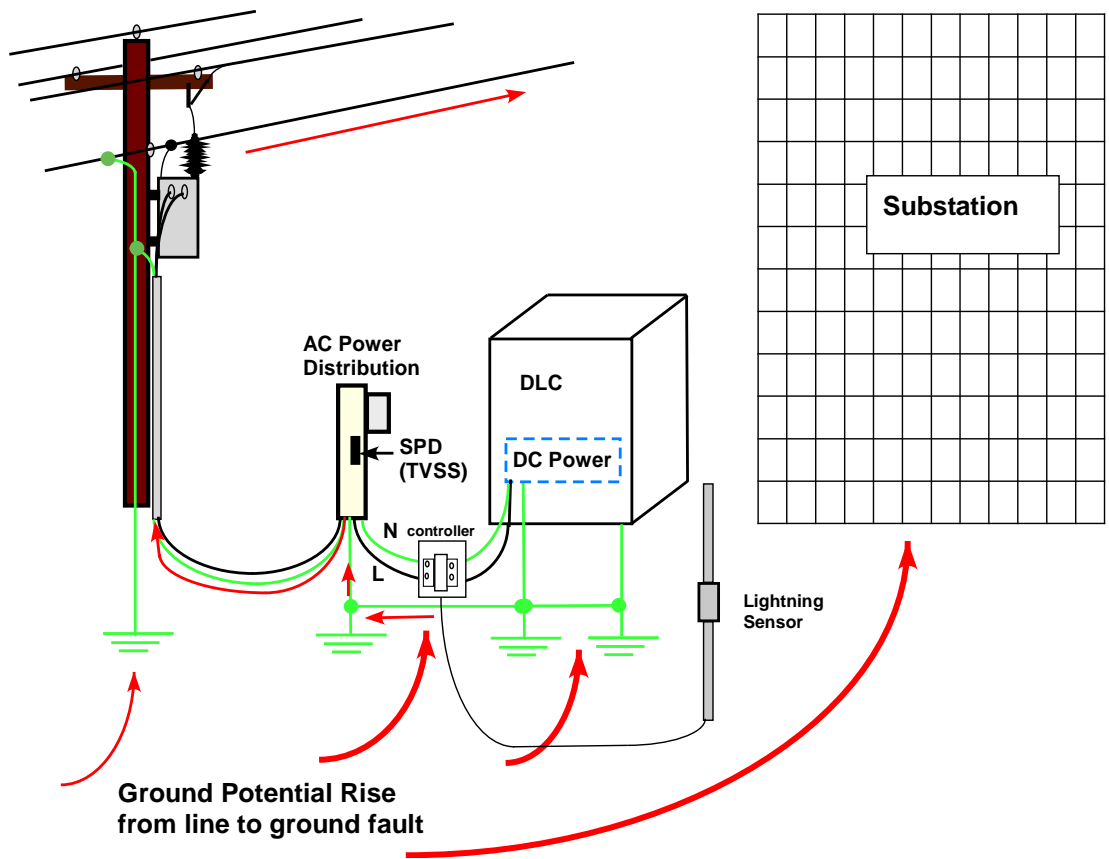
During a line to ground fault, the fault current will travel along any low impedance path back to the source. This can cause a voltage rise and current flow into the grounding system of the remote electronics cabinet and subsequently through electronic equipment and the DC power shelf to the AC neutral.





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The lightning detector of the AC isolation system will detect a line to ground fault generated, GPR voltage, in the same way it detects lightning GPR. By isolating the line and neutral to the remote electronics cabinet, any voltage rise and current flow through the grounding system will only occur through the ground bonding connections and the local AC ground back into the power system neutral.



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to an Old Problem.*

Questions?