

Limiting Systems Damage From Lightning — the Controversy Continues

Here comes another lightning season. As with seasons in the past, some dealers will take grounding precautions when installing systems, while others will not. Replacing lightning-damaged panels can generate additional revenue, but it can be offset by new and ever-increasing false alarm fines, ill will from customers and, in some cases, no municipality alarm response at all.

The installation of lightning suppression for low-voltage systems still remains an area of technical controversy and misunderstanding.

Lightning Can Damage Many System Parts

Living in central Florida, I have experienced some very severe lightning storms. It is not uncommon when conducting an annual inspection to find a magnetic reed contact from a door alarm or window alarm that has been welded shut by a secondary lightning strike. Check out alarm loop suppressors, such as the GRI CS-1 (www.grisk.com).

Residential and commercial low-voltage systems are becoming larger and more diverse. This provides increased risk to equipment damage from lightning. Security equipment manufacturers continue to express concerns about these risks, which have also recently been reflected in a new addition to NEC 2002, Article 800.40 (A)(4), communication circuit section of the National Electrical Code, on primary residential grounding.

Another area that installers should become familiar with is NEC Article 250 on grounding. This information, however, can be confusing in that NEC does not specifically require the grounding of systems less than 50VDC. This has been the excuse that many use for not grounding alarm systems. We should, at least, allow the customer the opportunity to look at the big picture here (*see table*).

Know Thy Enemy: The Facts Behind Lightning

Some lightning facts: A typical strike delivers between 10,000A and



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BOB'S TIPS

- Consider using an alarm loop suppressor to prevent magnetic reed damage.
- The impedance between your equipment and ground should not exceed 25 ohms
- When there are multiple ground locations in a system, they all should be bonded.
- The best lightning protection of all is to completely disconnect your equipment just before a lightning storm hits.
- Each lightning strike can contain as many as 45 ground strikes. An average region in the U.S. can expect 2 to 30 strikes within a square mile.

40,000A, generates temperatures as high as 50,000 degrees C, has voltage levels of 6,000V to more than 100,000V and causes billions of dollars in property and equipment damage annually.

This can lead to the misconception that it is better to have a floating system instead of a grounded system. It sounds like a good argument, but it is flawed.

Other lightning facts that system installers should be aware of include: A lightning surge can travel as far as 40 miles. Lightning will find many paths to ground. Within milliseconds, these pulses can induce energy that can cause additional circuit damage. Each lightning strike can contain as many as 45 ground strikes. An average region in the United States can expect two to 30 strikes per year within a square mile.

Don't leave your customers rolling the dice on these dangers. You should take the lead, inform them of what can be expected and what current technologies can help to prevent this dam-

The Low-Voltage Grounding Controversy

Reasons to ground

- Better overall system reliability
- Manage nearby lightning surges
- Better life safety
- Value-added services for customer
- Required by Authority Having Jurisdiction
- Required by false alarm programs
- Required by equipment manufacturers
- Added installation and recurring revenue

Excuses NOT to ground

- Small chance of getting hit
- Nothing survives a direct lightning hit
- Easier installation
- Added installation and equipment costs
- Not required by National Electrical Code
- More revenue from repairs
- I lose fewer panels with floating ground
- Makes my bids lower

There are many pros and cons to system grounding. You have to ask yourself, "Which direction should my company take when installing low-voltage systems?"

Tech Talk

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age, and even possible loss of life.

Find Solutions That Work for Your Clients

Many Authorities Having Jurisdiction (AHJs) now require the installation of aftermarket lightning suppression technology. False alarm ordinances, including the National Burglar and Fire Alarm Association (NBFAA) model fire alarm ordinance, now require that systems be grounded at least per the manufacturer's instructions.

Suppose you have convinced your customer to purchase additional lightning suppression. To make this work, you need a good ground. There are several good sources for acceptable grounds. As a guideline, the impedance between your equipment and ground should not exceed 25 ohms, and ideally, should be recording at below 5 ohms.

Good ground sources include a building or structural grounding electrode system. This can involve the steel building structure bonded to the metal rebar in the concrete foundation. This is sometimes referred to as "Ufer Ground".

A metal water pipe that is buried at least 10 feet in the ground is another good option. Connect to the pipe within 5 feet of it exiting the ground. Be careful to avoid pipe sections using nonconductive PVC. Make sure that service meters have a bonding strap across them. Be sure not to use gas pipes.

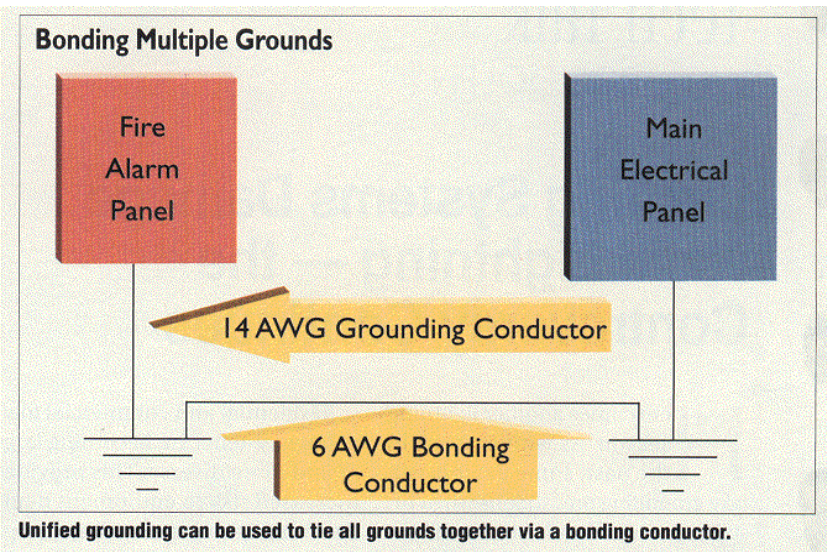
Electrical service equipment enclosures and metal service raceways can also be useful. A ground ring encircling a facility made from at least a No.2 conductor and at a depth of at least 2.5 feet works well.

A "made electrode" is typically, a copper-clad steel ground rod of at least 0.5 inch diameter and at least 8 feet in

length, driven vertically at or below the ground surface. The distance between rods should be twice the rod's vertical length. Doubling the rod's length can reduce resistance by 40%. Tow rods can reduce resistance by 60%.

Disconnect the System to Foil Lightning

The best lightning protection of all is to completely disconnect all equipment just before a lightning storm hits. Several companies offer products and services that can do just that.



Take Proper Measures to Ground Systems

Grounding system equipment should be done with at least a No. 14 solid conductor. Make sure runs are short and straight with smooth bends. Lightning likes to jump out of sharp wire bends. Any ground connections must be made with either exothermic welds, UL-Listed clamps, lugs or straps.

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When there are multiple ground locations in a system, they all should be bonded. Bonding connects multiple grounds with at least a No. 6 conductor. This forces all the equipment to be at the same voltage level when hit by a light-