

Improving Data Center Performance

Addressing Equipment Failure and Performance Problems Through Ground Bonding

ItascaPoint was hired to design a pair of data centers for a large financial institution. The client had been experiencing intermittent equipment failure and performance problems that required resolution before designing and building the new data centers. ItascaPoint undertook a forensic review of the clients existing data centers as a basis for establishing new design-build standards.

In evaluating the equipment performance problems, ItascaPoint took over 800 field measurements in the existing data centers to review ground bonding impedance. Analysis of the findings identified inconsistent ground bonding performance throughout the data center. The data centers had been relying on the equipment chassis and server racks and cabinet rails to provide ground bonding to the ground grid instead of the dedicated chassis ground points. The performance of the equipment and racks generally varied by the equipment manufacturer, with some manufacturers' equipment providing a poor ground path to the ground grid network. We speculate that the quality of materials and manufacturing process impacts the grounding performance of equipment.

Our research found inconsistencies in ground bonding installation practices were also contributing to equipment performance problems. While many electricians understand the importance of ground bonding and are capable of fabricating ground bonding cables, many data centers rely on technicians of various training and skill levels to install, ground and maintain the equipment in racks and cabinets.

The Need for Ground Bonding

TIA-607-C states that a computer room should contain a supplementary bonding network grounded to either the primary or a secondary bonding busbar. With metallic

components in need of bonding include racks, cabinets, ladders, cable trays, routers, switches, and patch panels.

Telecommunications equipment is sensitive to electrical disturbances. While minimum grounding requirements within the power distribution system are designed for personal safety purposes, data center downtime and damage to equipment as a result of inadequate grounding can lead to equipment damage and downtime. According to the IEEE, power distribution grounding is almost never sufficient to prevent damage to network equipment. Proper grounding is the most critical factor in reliable network equipment performance.

Our analysis shows that relying on rack rails and equipment chassis as ground bonding points were leading to equipment performance problems. Also, a growing number of equipment manufacturers require direct ground bonding of their equipment to validate their warranties.

The Problem: Incomplete and inconsistent grounding practices are leading to equipment performance problems

To guarantee optimal performance of network and server equipment, ItascaPoint needed an easy-to-use, accessible, streamlined ground bonding solution that consistently achieved the desired results. The solution must offer a reliable ground bonding option for all equipment in the rack or cabinet and must meet the standards as set by TIA-607-C.

Successful ground bonding required easy access and easy installation. Without easy access to ground bonding, we feared the data centers would bypass this necessary step and rely on the equipment and racks as their path to ground. Ease of installation is crucial since you don't know who might be asked to install the ground bonding conductors, we wanted the kits to be complete and simple enough to be installed by anyone assigned.

The Solution: Supplemental ground bonding in every rack and cabinet

ItascaPoint worked with a customer to implement complete bonding and grounding system for both new and retrofit data center facilities.

ItascaPoint's search for a ground bonding solution led them to PDU Cables. PDU Cables is a leading manufacturer of pre-fabricated power distribution cables for the data center industry and has been producing ground bonding conductor kits for many years. Working with



ItascaPoint is a professional services firm specializing in data center and cloud technologies. ItascaPoint works with customers to develop rationalization, resiliency and management of data center and cloud environments.

Don Patnode is a senior advisor with ItascaPoint. Don has over 30 years of experience solving challenging situations in data center environments. Grounding and bonding within data centers is an area he has had to deal with and brings real world experience to problem solving.

Keith Meierhofer is the founder and owner of ItascaPoint. A veteran of the U.S. Airforce where he started his career in I.T., Keith has been developing strategies, building, migrating and optimizing data centers and data center operations for over 25 years.

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PDU Cables, ItascaPoint was able to address all of its concerns about ease-of-access, easy-to-use and the need for "complete" kits and adherence to TIA-607-C standards.

For ItascaPoint's on-site contractors, PDU Cables supplies both horizontal and vertical busbar kits that include insulators and a set of self-tapping screws for fast and easy installation. They also manufacture a line of ground bonding conductor kits used to bond the telecommunications equipment to the busbars, racks to busbars, busbars to the ground grid and for bonding cable tray sections and other metallic bodies found within the data center space.

Each ground bonding conductor utilizes pneumatically crimped tinned copper dual hole slotted lugs to accommodate various hole spacing and prevent them from working loose over time. Conductor lugs are available in any combination of 45-degree, 90-degree, straight, or captive strip options. Each kit includes a tube of antioxidant and a complete set of self-tapping screws to provide a variety of thread options.

Ground bonding conductors are available in standard lengths at 6" increments, with custom lengths available upon request. PDU Cables also offers a selection of termination hardware used to bond conductors to the ground grid.

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PDU Cables is a leading supplier of pre-fabricated power distribution cable assemblies and exclusive distributor of AirGuard cable seal floor grommets. PDU Cables team of cable technicians are experts at working to understand customer needs and find the best product solutions possible.

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