Manage Inrush Current with GU2 Smart Relays

A Vertiv Application Brief

The Challenge

Installing a new server into an existing rack causes a breaker to trip. After completing the calculations, you confirm what you suspected – the circuit was overloaded. However, after disconnecting the new server and re-establishing the original system load condition, the upstream branch breaker continues to trip.

Why is this happening and what can be done to resolve it?

The Why

The re-establishment of the original system load condition is not enough to resolve the upstream breaker from tripping because the subsequent trip condition is due to a separate electrical condition, commonly referred to as “input surge current”, or “inrush current”.

The breaker initially tripped because the load draw was higher than the maximum rated load current. The secondary trip condition occurred due to a current draw that was higher than the rated instantaneous current. Circuit breakers are designed to respond differently to overload and instantaneous current draw conditions. The breaker trip characteristics are provided by the breaker manufacturer in the form of a trip current curve (TCC).

Inrush current events present whenever equipment is initially powered. When data centers experience brown-out (voltage sag/dip) and black-out (full power loss) conditions, upon the restoration of power, there is a significant amount of initial energy required to reactivate all the equipment. In some cases, branch circuit breakers are not able to withstand the associated instantaneous current draw. The only solution is to sequentially activate the equipment to ensure that the breakers’ maximum inrush current limit is not exceeded.

The Resolution: Time Sequenced Power Loading

While the current overload condition is best monitored with a data center infrastructure management (DCIM) software package, the inrush current trip event can only be managed with time sequenced power loading. There are three primary ways to accomplish time sequenced power loading.

1. **Manually Powering Equipment**

This option requires that a technician physically powers the equipment off and on. This process works well when technicians are already on-site. However, it can be time consuming even when resources are available. It is also a costly way to accomplish time sequenced power loading for remote, unmanned sites.

2. **Remotely Powering Equipment**

As more and more unmanned edge sites are established, having a technician travel to the location becomes costly. A better solution is to remotely turn the equipment off and back on. This saves resource time and data center budget, but it requires power distribution equipment that supports power cycling at the outlet level.

3. **Automated Self-Managed Smart Switching System with Remote Capability for Powering Equipment**

An automated, self-managed smart switching system is an ideal solution. This type of system uses smart relays and power state sensing to ensure relays are de-latched if power fails and allows for proper power sequencing when power is reapplied. Coupling this with the ability for data center personnel to remotely manage the equipment provides the ultimate solution.

Manage Inrush Current with GU2 Smart Relays

A Vertiv Application Brief

How Intelligent Switching Rack Power Distribution Units (rPDUs) Help

Rack PDUs designed with network cards and smart relay outlet switching technology enable remote access and per outlet power control. These rPDUs are configurable to automatically, and sequentially, deactivate and reactivate the rack equipment based on a user defined time sequence. Additionally, rPDUs designed with bi-stable magnetic latching relays are exempt from the typical relay power usage penalty as the relay's coil is only powered during a very short relay state transition time. Without the need for continuous power to hold contacts in position, this type of rPDU saves significant energy compared to traditional switching rPDUs. These rPDU products are typically referred to as Intelligent Switched rPDUs and offer the ultimate customer solution for prevention of breaker trips resulting from high inrush current events.

The Vertiv™ Geist™ Solution: GU2

The Geist Upgradeable second-generation rack PDU (GU2) embodies a broad spectrum of features in support of the automated, self-managed smart switching solution. The GU2 relay drive circuit is designed to automatically detect loss of power and turn off input power to outlets. The relays are designed for self-managed, sequential activation upon restoration of rack input power. The relay activation sequence is pre-configured per user parameters via the embedded web GUI or the Geist Application Programming Interface.

The GU2 Intelligent PDU boasts a rich data center tool set that includes the following features:

- Network device management using simple network management protocol (SNMP)
- Billing grade accuracy of +/- 1%
- USB port for configuration backup/restore and extended logging
- Per outlet alternating input power phases
- L-L / L-N user definable per outlet wiring
- Geist patented U-Lock power cord retention
- Colored coded chassis and outlets
- Energy saving bi-stable relay outlet switching
- User settable outlet power-up sequence
- Remote outlet power control
- Mass device configuration and firmware updating with Geist Device Director utility
- No touch air gap data uploading and exporting
- Dual Ethernet fault-tolerant daisy chain connection
- Hot swappable field replaceable monitoring and control module
- Geist web application programming interface (API)
- Input, phase, circuit and outlet metering and alarming
- Web accessible graphical user interface (GUI)

- Highly visible scrolling LED display with Vertiv mobile Visible Light Communication (VLC)
- Data center infrastructure management (DCIM) compatibility
- Plug-n-Play environmental monitoring sensor port
- Maximum operating temperature of 60°C (140°F)

For additional information, please visit us at www.vertiv.com or call us at +1.800.432.3219.