Application Note

Why you should not daisy chain UPSs

Many customers ask Eaton if UPSs should be daisy-chained or plugged into one another. For plug-n-play UPS systems, that is a UPS with an input plug and output receptacles, **UPSs should never be daisy-chained**. Let's look at a few reasons why someone might be looking at daisy-chaining and explore alternative approaches that can better address the target.

Redundancy
Added redundancy or reliability is a good target especially when considering a single UPS can be a single point of failure. A mathematically-based probability study shows that placing UPSs in series increase the chance of failure, as failure rates are combined to present the new failure rate. A more practical way of thinking about it is if the UPS closest to the load fails or has a catastrophic failure then the remaining UPS provides no value even if it is still operating.

For customers desiring a redundant solution, an architecture utilizing dual power supplies is recommended. A dual power supply solution allows for two UPS that are isolated from one another so a failure in one does not effect the other. Of course, dual power supplies are not always available, which is where an automatic transfer switch (ATS) may be used. The ATS automatically selects between two different sources, whether that is two direct-utility sources, two UPS sources, or combination thereof. More on redundancy and system level design can in our Eaton network closet white paper.

Runtime
Batteries are stored energy and the bigger and larger the battery bank, the more runtime provided. But for customers looking for more runtime from an existing UPS, there are no shortcuts. Plugging a UPS into another UPS is likely to prevent one or both of the UPSs from working correctly due to inverter compatibility issues. In this type of scenario, the UPS closest to the load doesn't recognize the first UPSs' power as sufficient and both UPSs go to battery, defeating the intent.

Eaton and other manufacturers make a wide variety of UPS products with varying sizes, and many larger models have accessories called extended battery modules (EBMs), that provide a pluggable battery extension for longer runtime.

Surge Protection
Every UPS should have an adequate level of surge protection for most applications. But some customers may be in difficult environments where thunderstorms are frequent or industrial equipment within their building wreaks havoc on their electrical system. In either case, putting UPSs in series does not help mitigate, *or clamp*, incoming surges. In fact, putting the UPS in series could create some new challenges to the system. Note that the UPS is designed to be *self-sacrificing* in regards to surges. That means if the surge is too much for the first UPS, that UPS will take itself offline and the system will go down regardless.

For sites with known issues, it is best to consult with your electrician to develop a multi-stage approach. Surge protection at the UPS is best when paired with surge protection at the panelboard and customers worried about lighting should explore if lightning arrestor solutions are appropriate.

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