TwinSource
32333 Aurora Road, Suite 50, Solon, Ohio 44139
Phone: 440-248-6800 Fax: 440-349-2678
www.twinsource.net

Protection of Super Critical Dual Cord Loads Using TwinSource Rack Mounted Static Transfer Switches

Rack Mounted Static Transfer Switches (RM STSs) provide maximum protection against electrical system failures that can cause very costly down time in mission critical data processing environments. This technology is replacing the application of larger static transfer switches (STSs) to data and telecom centers with a 2N grid (powered by UPSs A & B) because the tendency is to move toward more flexible and robust configurations as well as to maximize the zone of protection (the closer the protection device is to the load, the more protection against failure and the farther away the device is, the less the protection as many elements between the distant switch and the load can fail but the switch can't do anything about it). A switch right at the rack itself covers everything including all human error failures as well. The application of rack mount switches to **single cord loads** is already well established. Also, some users power **standard dual cord loads** from two sources and leave them at that assuming "two UPSs won't ever fail at the same time." For 2 UPSs standing alone and isolated on their own this may be a safe assumption but in a 2N set up it is not as safe as one may think because it ignores the human factors involving both (humans can fail either or both) as well as dozens of distribution devices (transformers, breakers, panels, cables and the people operating them) past both UPSs as well as the perhaps the most important problem being a connectivity issue where when one UPS fails, the other and all its distribution devices are suddenly step loaded by 2X. It is therefore evident that there is a lot more dynamic interaction between 2 UPSs in a 2N arrangement than most would ordinarily assume. So the question is not would two UPSs fail at the same time, which is unlikely, but many more realistic operational scenarios of what if one fails but this happens while people are working on a part of the other UPS's distribution? Or what if one UPS fails while the other was shut down or isolated for an emergency or routine maintenance? Or what if one UPS fails and no activities were going on the other side but because of the sudden 2X step load, previously unknown weaknesses in the form of loose connections or faulty breakers are suddenly revealed. There also common mode issues when there is a utility transient coming into the building that takes down both UPSs by getting into their logic or traveling through the ground. In most all these cases both UPSs did not fail due to random component issues (the original safe assumption) but at the racks both sources are indeed gone.

There are certain loads at every data center that are considered **"super critical dual cord loads"** and cannot go down under any circumstances including any of the above listed conditions. Up until now no solutions were available to truly protect these loads in a differentiable manner over the rest of the loads if they are truly so much more critical that if they went down, it didn't much matter if any of the rest of the data center remained on line. The following configuration is suggested for these super critical loads:

Feed such dual cord racks with 3 feeder of power from: UPS A, UPS B and Bus C. Bus C is the utility bus which is taken over by the generators when either UPS A or UPS B fails. When UPS A or any part of the distribution from the UPS A to the rack fails, side A of the dual cord loads goes down but the loads continues to operate while being fed by UPS B fed through a TwinSource rack mounted static switch. Any disturbance at this point will drop the source fed from UPS B but there is no concern because the second source of the rack mount switch is fed from Bus C that in turn is fed from either the utility or the generators. Bus C need not be any special additional bus at added expense but can be a part of the existing bus that normally feeds the inputs of the UPSs. At these UPS input buses there is usually an ATS or equivalent arrangement so the bus is fed by generators upon utility failure. Generators can be set to come on line automatically when either UPS A or UPS B drop out or are isolated for maintenance. This provides a super reliable configuration. Lets go through the possible events and how they are all circumvented through the following sequences of operations:

a) UPS A or any of its distribution (such as a PDU or a RPP) fails first - No problem. The load stays on fed from the TwinSource static switch which in turn is fed from UPS B. Generators come on line as well and take over Bus C. The system has regained its dual source redundancy.
b) UPS B or any of its distribution fails after UPS A has failed (after the events in "a" above) - No problem. The load stays on fed from the switch which has now transferred from UPS B to Bus C fed from the generators. Now both UPSs are down but the loads remain running.
c) UPS B or any of its distribution fails first - No problem. The switch transfers from UPS B to Bus C fed from the utility. The loads are fed from UPS A. A few seconds later the generators come on line and feed Bus C and now the loads are fed from both UPS A and the generators and the system has regained dual source redundancy again.
d) Utility or Generators fail - No problem. The loads are fed from UPS A and through the switch from UPS B and system is still enjoying dual source redundancy.

It is therefore evident that every possible form of power failure in either UPS or either of their output distribution systems or the utility or the generators are covered here.