Bird Tests Transient Propagation Theory

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A review of the article "Protection Zoning" by Tony Bird

For the past three years PATTON ELECTRONICS, INC. has been talking about the need for surge protectors on the data lines of LANs and data comm systems. We have contended that partial protection of a network can be more damaging than no protection. The cost effectiveness of UPS systems has made available to many users, protection not previously known. Unfortunately UPSs and AC surge protectors, when used independently may do more harm than good! This is despite the fact that the perception of the market is that a UPS is the panacea for all electrical ills.

Anthony Bird, Director of Engineering at Atlantic Scientific has published the results of several site tests that were performed to test his theories. A small unoccupied manufacturing facility provided the test bed to simulate the effects of AC transients and AC power switching on networked equipment. In these tests two of the AC outlets in different rooms were selected for the connection of simulated network equipment. A data cable (twisted pair), was also installed between the two devices.

At the main AC panel (servicing the two AC outlets) surge waveforms were injected onto the neutral wire of AC system. This simulates AC surges entering the building from the outside. The magnitude of the injected transients were limited to 2kV. Measurements of the voltage stress and current flowing through the data line were then taken to determine how the transient propagated through the building. Measurements were taken in several different scenarios: 1) Without any surge protection, 2) With AC outlet surge protectors on one workstation. 3) With building entrance protection and with AC outlet protectors on one workstation. 4) And finally with building entrance protection and complete AC outlet protection.

1) Without any surge protection. The first test was to look at the voltage stress and current of the data line when a surge was introduced at the building entrance AC system. As expected the voltage stress across an open data line was quite significant. In fact they were large enough to damage even the most robust Network Interface Cards.

2) With an AC outlet protector on one of the workstations. The next test was to look at the same data line after adding an AC outlet protector to one receptacle. Surprising results! The voltage stress across the data line increased greatly over no protection at all.

3) With building entrance protection and with AC outlet surge protection on one workstation. This third test was to see the effect of installing building entrance protection (a primary protection zone) on the data line when AC protectors are installed on one workstation. The result was that the voltage stress on the data line was reduced, but damaging currents still managed to propagate onto the data line.

4) With building entrance protection and with AC outlet protection on every workstation. The final test was to see what happens on the data line after a comprehensive AC protection approach is utilized. The result was that the voltage on the current across the data line was reduced to a non-threatening level. However, the author noted that data line protectors would still be needed in cases where data lines exceed 50 meters in length. This is due to the fact that large buildings typically have multiple power entry points. A surge entering at one entry point can cause very fast ground potential differences between workstations which source power from different panels.

These tests confirm that UPSs and AC surge protectors, when used independently do more harm than good! These devices should be used in conjunction with data line and building entrance protection.

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