Automatic Transfer Switch (ATS) Surge Protection

The Effects of Transients on ATS and the SPD Solutions

Automatic Transfer Switch (ATS) surge protection is critical for the operation of the switch. The modern ATS has circuit boards, electronic controls, relays and sensors that are sensitive to transients.

Transient damage to an ATS switch and/or controller can result in failure of the ATS to perform during an electrical crisis. Cumulative damage level transients can cause minor problems in the programming or logic controls for the switch resulting in the false operation of the transfer switch and operation of the generator when no problem exists, or the failure to make the transfer in the event of an actual crisis. Catastrophic damage can destroy the switch and/or controller and take the entire system off-line.

There are four main sources of potential transient damage that can impact an ATS. The first, and most common, is the utility power line. Lightning, generator switching at the utility power station or sub-station, capacitor bank switching on the grid, or nearby facilities producing their own large transients can cause catastrophic as well as cumulative level transients at the ATS. A properly installed Surge Protective Device (SPD) at the power utility line side of the ATS can prevent the damage from this source.

The second source of transients is the generator, or back-up power source line. The quality of the power produced by a back-up generator is dependent on many factors. The age of the generator and motor, the quality and frequency of the maintenance performed on the motor and generator, the load to capacity ratio of the generator, how frequently the generator is run and for how long, the quality and maintenance of the connections from the generator to the ATS, and more all have an impact on the ability of the generator to provide clean quality power to the electrical system during a power utility outage. Problems in any of these areas can result in the generator producing transients with the capability of causing everything from a minor nuisance to catastrophic failure. A properly installed SPD at the generator line side of the ATS can prevent the damage from this source.

The third source of transients is the down line electrical system. Internally generated transients can travel back up line to the ATS and cause cumulative as well as catastrophic damage to the switch and controller. A properly installed SPD at the load side line of the ATS can prevent the damage from this source.

The last source of transients is the actual physical switch within the ATS itself. The blades that switch from the power utility line input to the generator line input will cause arcing and transients when they disconnect from one and make contact with the other. A properly installed SPD at the blades of the ATS can prevent the damage from this source.

Obviously, installing four separate SPDs on a transfer switch would not be practical or cost effective. The most cost effective solution is to place one properly sized SPD at a location on the ATS that will provide the best "path of least resistance" for any transients coming from any of the four sources. This best location is usually the load side output terminals of the ATS. Their proximity to the switching blades, sensors and electronics in the ATS, as well as the power utility and generator lines, will usually make them the closest common junction point to connect the SPD.

Because the ATS is controlled with electronics, the use of a true sine wave tracking SPD is required. The oscillatory ring wave transients that are generated by the operation of electronic equipment on the system can have a particularly damaging effect on the controller, sensors and relays within the ATS. A true sine wave tracking SPD will provide protection from these oscillatory ring wave transients as well as providing brute force protection from the generally stronger, but less frequent electrical switching, impulse type transients. The SPD should have the ability to provide both impulse and oscillatory ring wave protection in every mode, i.e. line-to-neutral, line-to-ground, neutral-to-ground and line-to-line.

Proper sizing of the SPD for the correct peak surge current is essential to ensuring the survival of the SPD and its ability to protect the ATS over time. Even if there is a properly sized SPD at the service entrance up line from the ATS, the SPD at the ATS will effectively become the service entrance protection from the time the power is switched from the power utility line to the generator line, to the time it is switched back to the power utility line. Because this increases the potential for catastrophic surge activity at this point on the system, the SPD should be "up-sized" one level of peak surge current to ensure continued operation under all but the most severe, direct strike type situations.

Installation of the SPD should be accomplished with the device positioned to provide the shortest, straightest leads to the load side buss or output terminals of the ATS. For this reason, an integral type SPD installed inside the ATS cabinet may be the best solution. The integral unit, having no exposed metal parts, can be installed in close proximity to the buss or lugs and allow for extremely short leads. The use of an external remote light kit mounted to the front of the ATS will alert the user of any problems with the SPD.

By following these recommendations, the ATS switch and controller can be provided with a reasonable, practical and cost effective level of surge protection.