3621 Saunders Avenue
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Why Automatic Transfer Switches Need Surge Protection

With evolving information technology and automated processes/services, the world is a more complex and power demanding marketplace. Many industrial, commercial, and service businesses have become dependent on a continuous supply of electric power. Accordingly, the use of backup power control systems and generator control switchgear has grown and is forecast to continue growing in number of systems, capacity, and complexity. With increasing needs and options available for alternate power sources, Automatic Transfer Switches (ATS) have become an essential element in providing the growing alternative power requirement.

Ref. Standards:
- ***UL 1449 4th Ed.***
- ***UL 1283 5th Ed.***
- ***C62.41.1: 2002 IEEE***
- ***C62.41.2: 2002 IEEE***
- ***C62.45: 2002 IEEE***
- ***C62.62: 2010 IEEE***
- ***C62.72: 2007 IEEE***
- ***NEMA***
- ***NEC 2014***
- ***NFPA 70***
- ***FIPS 94***
- ***MIL-STD 220A***

The ATS is vital in the control and transfer from the normal utility power source to the alternative power source (normally a backup generator). The ATS has sensitive electronic control logic to constantly monitor the normal power source, sense utility power failures, signal the generator to start, control the transfer from normal utility source to generator power source and re-transfer when the utility power returns.

Protecting the sensitive electronic controls in the ATS is crucial to having an effective and dependable solution of transferring electrical power sources. Surge protection is an important and often overlooked consideration in the application of ATS. There are multiple sources of transients having the potential to cause hardware and logic card failures, which could disable the ATS function.

Sources of poor power quality include:

- **Externally Generated Transients**, such as lightning, utility grid switching, high winds causing power line arcing, and electrical accidents. These sources represent a low percentage (less than 20%) of all transient activity but can be of typically higher magnitude causing immediate hardware damage to electrical systems and destroying sensitive electronic equipment.
- **Internally Generated Transients** are created by changes in electrical demand, involving inductive and capacitive loads (starting and stopping of electrical motors, machine processes, pumping equipment, HVAC systems, etc.). These internal transients are typically smaller in magnitude but a far greater number of such transient events account for 80% of all voltage transient problems (i.e., hardware failures for no apparent reasons, time and material losses caused by inability to transfer power sources). If surge protective devices (SPDs) are not installed providing a low impedance path to divert these transient events, the lowest impedance path will be the sensitive electronic controls within the ATS.

There are two basic configurations of ATS, as shown in Figure 1 (3-Pole Switch) and Figure 2 (4-Pole Switch).

Each of these figures has surge protection applied on the utility side, generator side, and the load side of the ATS. The three SPDs provide maximum power reliability. This is the suggested protection for essential applications. In less essential applications the generator side SPD may not be required or the generator may be inside the facility within close proximity to the ATS. If only one SPD is to be used it is recommended on the utility side of the ATS, as the worst potential, high magnitude transients will come from the external sources.

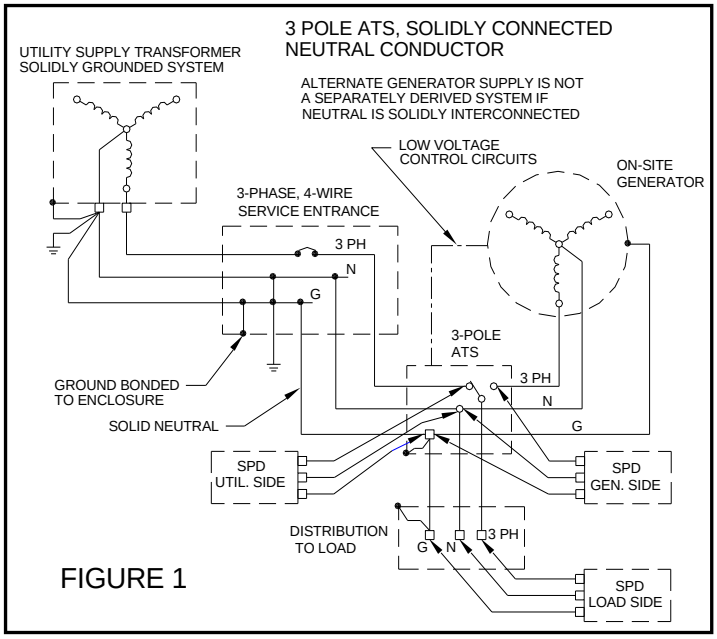

FIGURE 1

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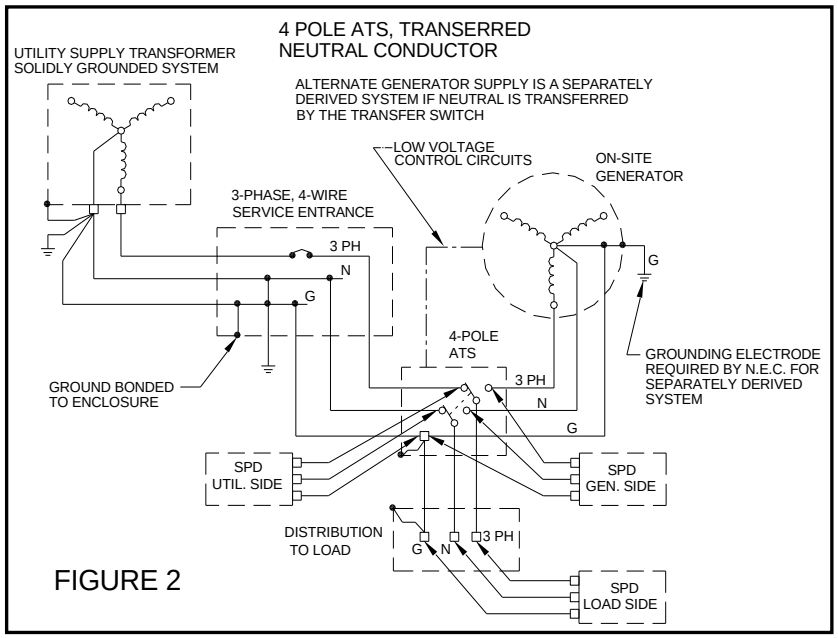
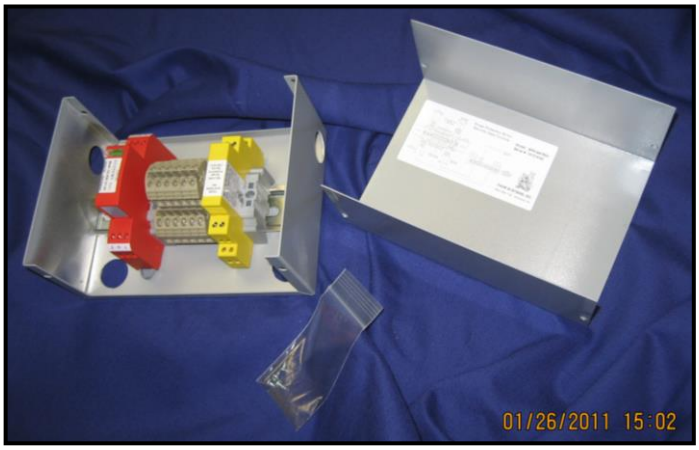


FIGURE 2

Further consideration are the low voltage control logic circuits from the ATS to the generator and paralleling equipment used with multiple gensets. If these control circuits are run from the ATS/Paralleling Cabinet outside the facility to the Generator, these circuits should have surge protection applied. An assembly of DIN Rail surge protection is the preferred method to address the various control voltages and the generator start/battery charge circuits. An example of a DIN Rail mounted surge protection is pictured below.



DIN Rail Surge Protection Assembly

We would like to become an information resource for your surge protection applications. THOR SYSTEMS offers products and services that provide protection from the more *obvious external* to the more *frequent internal* transient voltage sources.

Ref. Documents:

SA-001	***Why THOR SYSTEMS' Surge Protection***
SA-002	***Bottom Feed SPDs***
SA-004	***Risk Assessment – Sizing SPD***
TSI 107	***Design/Build Spec***
TSI 099	***Bid Spec***

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Should you have any questions, please feel free to contact us (804.355.1100) or visit our Web site, www.ThorSystems.us.