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**TVSS Products**

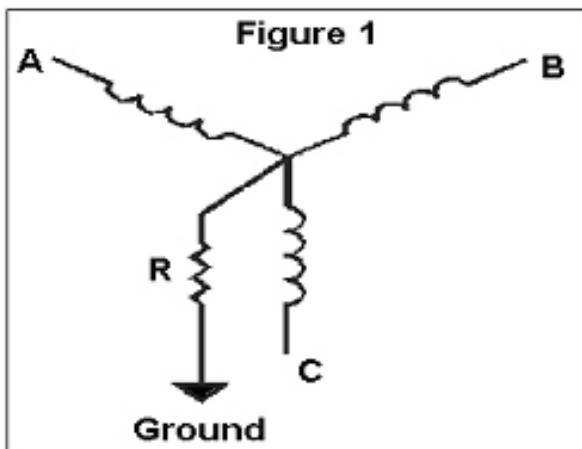
Technical Document

**High Resistance Grounding and Wye  
or Delta SPDs**

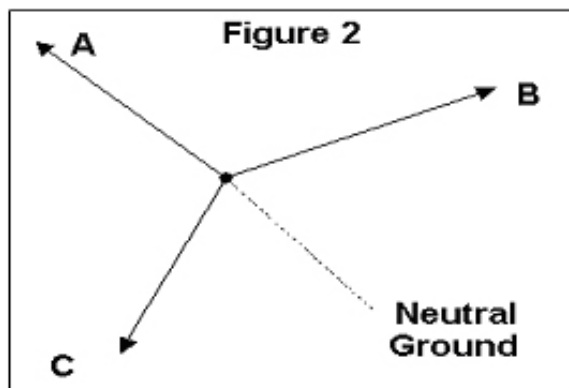


## HIGH RESISTANCE GROUNDING AND WYE OR DELTA SPDS

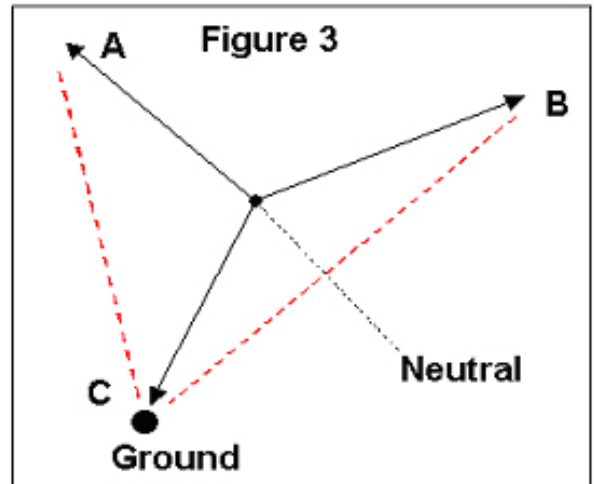
In today's manufacturing facilities ground faults can wreak havoc on production and process equipment. These manufacturing facilities may have a high resistance grounding (HRG) system. In a HRG system, a resistance, which is connected between the neutral of the transformer secondary and earth ground, is used that effectively limits the fault current to a low value current under ground fault conditions. Usually, the current is limited to 10A or less. As a result, the system will continue to operate normally even under the ground fault condition. **Figure 1** depicts a system that has a resistance grounding scheme. In the case where surge suppression is required for a 3 phase, 4 wire, wye system with a neutral ground resistance (NGR), a 3 phase, 3 wire, delta SPD will want to be specified and used.



In a wye system, the neutral and ground are both located at the center, as shown in **Figure 2**. If the neutral is bonded to the ground, the system will remain unchanged under fault conditions.



In the case where the neutral is not bonded to ground and a fault condition is present, the ground will 'move' towards the phase that has the fault. **Figure 3** shows a fault condition on phase C. The result is phase A to ground and phase B to ground are now at line to line voltage instead of line to neutral voltage. If a 3 phase, 4 wire, wye SPD was installed in an application where the neutral was not bonded to ground and a fault condition occurred on one of the phases, the result would be SPD failure.



In today's electrical systems, with many different grounding systems and various voltages, determining which SPD voltage configuration to specify can be confusing. Following are several helpful guidelines to follow when specifying SPD's:

- Only apply a wye (3 phase, 4 wire) configured SPD if the neutral is physically connected to the SPD and if the neutral is directly and solidly bonded to ground.
- Use a delta (3 phase, 3 wire) configured SPD for any type of impedance (resistive, inductive) grounded system.
- Use a delta (3 phase, 3 wire) configured SPD for a solidly grounded wye system where the neutral wire is not pulled through to the SPD location.
- Use a delta (3 phase, 3 wire) configured SPD if the presence of a neutral wire is not known.

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