

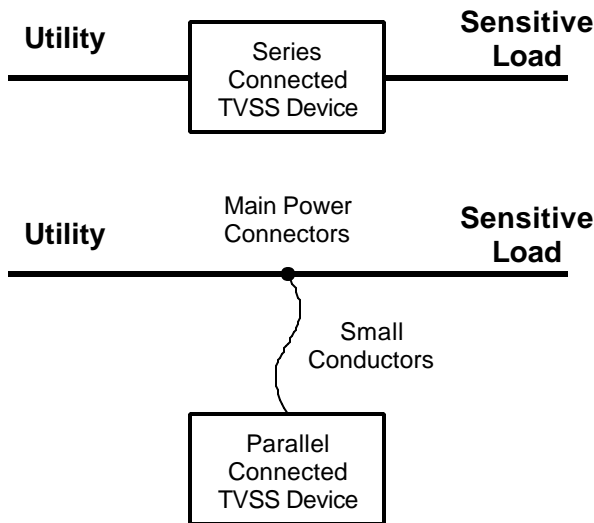
Effective Use of TVSS Devices

Transient Voltage Surge Suppression (TVSS) is an important part of any power conditioning strategy. Most equipment users are aware of the damage that can be caused by transient impulses to unprotected equipment.

Simply purchasing a TVSS device does not ensure protection, however. Proper installation or application of a TVSS device is critical to ensure proper equipment protection.

Series and Parallel Connected Devices

There are two methods of connecting a TVSS device to a facility system. **Series** connected devices are designed to permit the equipment power conductors to be brought through the device. **Parallel** connected devices are designed to be connected to the main equipment feed using short conductors, smaller in size than the power conductors.



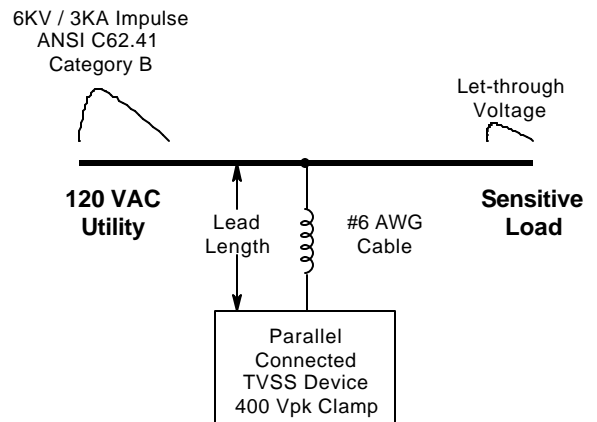
Application Note - AN-13

Parallel Connected TVSS Devices

Manufacturers produce parallel connected TVSS devices because this type of suppressor can be used for a wide variety of applications. A single model of a parallel connected device can be applied to many different types of loads and conductor sizes. Further, a parallel connected device can be quite effective when it is properly installed.

The key to proper installation of a parallel connected TVSS device is **Lead Length**. Every conductor and connection has an inherent resistance and inductance. These characteristics reduce the TVSS device effectiveness, resulting in higher let-through voltage than the performance of the clamping device used within the TVSS.

Any lead length will reduce TVSS effectiveness. Lead lengths under 12" are essential to permit TVSS devices to clamp properly at impulse frequencies and amplitudes. Longer lead lengths significantly reduce the TVSS effectiveness.



Lead Length	Typical Let-through Voltage (120 VAC)
6"	450 Vpk
18"	500 Vpk
36"	600 Vpk
72"	800 Vpk

Series Connected Devices

Series connected TVSS devices will perform as expected, regardless of where they are installed. It is important to ensure that the Series connected device has terminals capable of accepting the main power conductors, and that the device is properly rated for the full load current. Series connected devices are more expensive than parallel connected devices of equivalent performance and quality.

The common plug-in surge suppressor strip is a Series connected device.



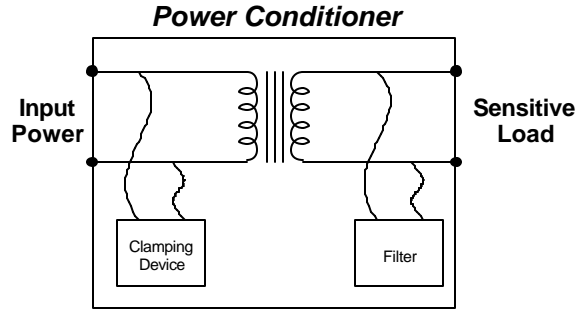
Transient Suppression in Power Conditioners

Hard-wired surge suppressors can be either series connected or parallel. Parallel connected suppressors need to be connected with very short lead lengths, in order to be effective.

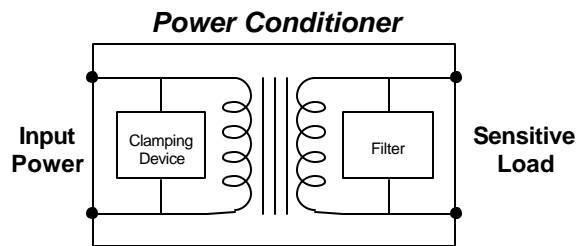
In the case of power conditioners that include surge suppression, the lead length of the clamping devices is determined by the manufacturer. Competent manufacturers design internal surge suppression with lead length in mind. With proper component layout and device selection, lead lengths can be reduced to a few inches.

Some manufacturers simply add a clamping device to a transformer, and consider the device to have effective surge suppression. However, if the clamping device is connected using excessive lead length, the power conditioner may not provide effective protection.

It is important to test and verify the performance of a power conditioner filter and clamping surge suppressor *as installed*. Only this type of real world testing can be relied upon. Unfortunately, many manufacturers publish performance specifications based on calculation or theoretical performance of the installed components.



Excessive lead length results in reduced performance, and higher levels of output noise and impulses.



Minimizing lead length results in optimal impulse and noise suppression.

Recommendations

Users of TVSS and Power Conditioners must consider the effects of installation and lead length on the performance of their protective devices.

Parallel connected TVSS devices are connected by the end-user, and improper installation can degrade TVSS performance. Short lead length is critical.

Lead lengths in series connected and power conditioner based TVSS systems are controlled by the manufacturer. End users should physically inspect the device layout to ensure that lead lengths are small. Insist on actual device test reports, not theoretical or calculated performance specifications, to ensure that TVSS protection is effective in these devices.

TEAL Electronics designs and manufactures power conditioners with minimal lead length, assuring maximum protection from high performance, low impedance filters.