FURMAN

SMP+ LiFT E.V.S.

THE WORLD'S MOST ADVANCED POWER CONDITIONING TECHNOLOGY

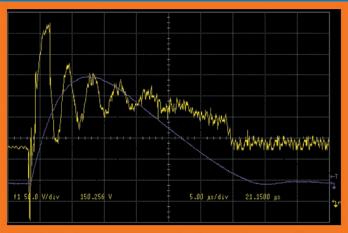
For years, Furman has been a trusted name in both A.C. Power Conditioning and Transient Voltage Surge Suppression (TVSS). Our traditional lines of TVSS circuits have literally saved millions of critical electronic components from destruction. However, the cost for this protection has always been servicing the Furman product after every catastrophic voltage spike or surge. With Furman's new **SMP+** circuit, service calls may virtually become a thing of the past.

Traditional surge suppression circuits "sacrifice" themselves when exposed to extreme transient voltage spikes and surges, requiring the dismantling of your system, and repair of your surge suppressor. Not so with **SMP+**. With Furman's **SMP+**, damaging transient voltages are safely absorbed, clamped and dissipated. No damaged components, no service calls, no down time.

"With Furman's SMP+, damaging transient voltages are safely absorbed, clamped, and dissipated. No damaged components, no service calls, no down time."

Most traditional TVSS circuits utilize metal oxide varistors, silicone avalanche diodes, or active circuits with transistor devices (SCR's). It is important to understand that ANY of these devices can be utilized in either a sacrificial or non-sacrificial TVSS circuit. When any of these technologies are used to absorb the full brunt of a high voltage – high current surge, they can be either damaged or destroyed. These devices are relatively small, and though they can do a credible job of clamping the rated voltage for which they have been designed, they have minimal immunity from large sustained electrical forces. Though some manufacturers will boast that they employ multiple fused MOV's for high joule ratings, and others will boast that they employ no MOV's at all, it is important to separate questionable marketing claims from reality.

TYPICAL SMP CIRCUIT



461 Vpk measured clamping voltage, with over 6 cycles of ringing.

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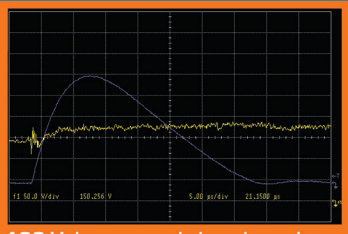


188 Vpk measured clamping voltage, with no measurable ringing.

Both circuits measured with 6,000V / 3,000A pulse.

First, high joule ratings can be achieved simply by paralleling multiple MOV's. Unfortunately, this practice is chiefly for advertising a specification since, typically, a surge will find either the first or the weakest MOV in the circuit and destroy it. Because the circuit is typically fused, additional MOV's offer no advantage to the circuit. Such a design will sacrifice its life whether it uses one MOV, or fifty MOV's in parallel.

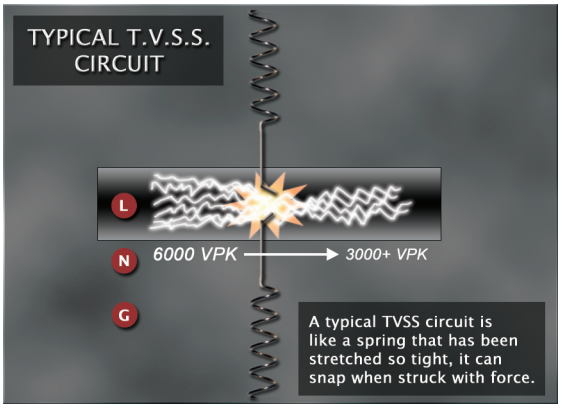
Second, some manufacturers of SMP TVSS circuits will make impassioned cries concerning the fallibility of the meek MOV. If this is true, perhaps they can explain why EVERY electrical utility substation in North America uses large MOV's for its surge suppression? The reality is that a quality non-sacrificial TVSS circuit can utilize MOV's, Avalanche Diodes, or SCR's. The real question should be: How is the circuit constructed, and what is the clamping voltage?

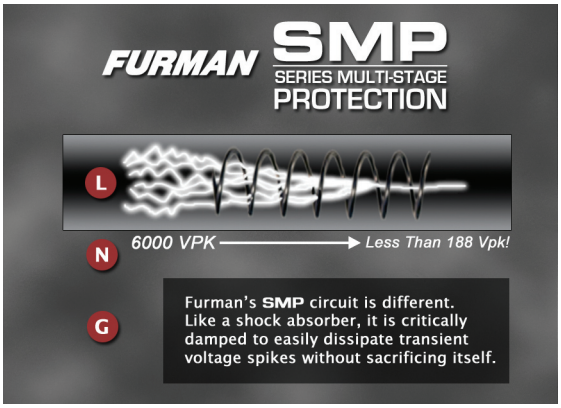
The clamping voltage is extremely important because this is the specification that indicates how much voltage will pass into your sensitive equipment. With Furman's **SMP+** circuit, the clamping voltage is 188 Vpk (this is equivalent to 133 Volts RMS, which is only 11% above an optimal 120VAC line)! Other competing SMP circuits have clamping voltages that we have measured in excess of 400 Vpk! This is unacceptable for a product whose primary purpose is protecting sensitive electronic equipment. If the $10 surge strip available in most hardware stores utilized MOV's with a clamping voltage of 400 volts or greater, it could be considered "non sacrificial" as well. The problem is that most of the equipment

downstream would have very marginal protection from transient voltage surges. At Furman, we've taken a different approach.

There are numerous ways to safely absorb, and dissipate most of the force that constitutes a transient voltage spike. If a carefully constructed parallel circuit of low-loss series inductors, DC rectifiers, and high voltage shunt capacitors is employed, it will absorb enough stress to assure that the clamping device operates with minimal stress. When designed properly for "real world" line conditions and source impedance, the circuit slows down the offending transient surge, much like an electronic "shock absorber." Other SMP circuits that feature poor clamping characteristics will ring and oscillate like an automobile in need of new shocks after encountering a pot hole. Traditional TVSS circuits (without SMP) are akin to a spring that is stretched so taught that it breaks into pieces at the first forceful impact.

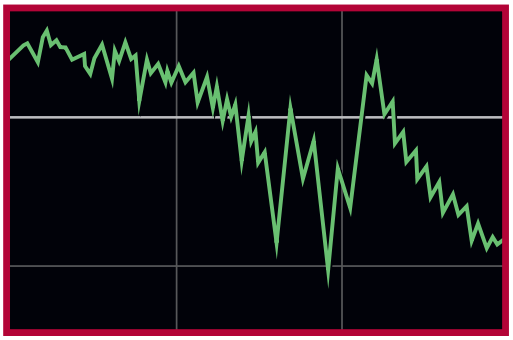
Additionally, all **SMP+** products feature Furman's trusted Extreme Voltage Shutdown (**E.V.S.**) circuit. This protects against sustained over-voltage conditions, such as the all too frequent accidental connections to 208 or 240 VAC, or open series neutral wiring. With this circuit, over-voltage is blocked from reaching the AC outlets, and an LED warning light indicates that the incoming line must be either changed or serviced.



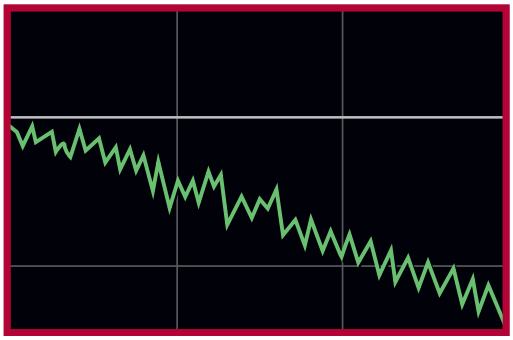


LiFT - Linear Filtering Technology

In the real world, sensitive electronics represent a complex load. Unfortunately, traditional AC filter - conditioners have been designed for unrealistic laboratory conditions. Prior technologies, whether multiple pole filter or conventional series mode, could actually harm audio and video performance more than help due to the resonant peaking of their antiquated, non-linear designs.



TYPICAL A.C. FILTER



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Most traditional RFI / EMI filters are based solely on filtering or notching out specific radio frequencies at a fixed impedance. Far too often, this can create a noise attenuation curve that resembles a roller coaster. Prior filtering schemes assumed impedances were constant, which is far from realistic. Further, these designs did not anticipate high resolution audio and video components or computers at the root of their design. If noise reduction is non-linear and subject to strong ringing patterns that vary with load and dynamics, the AC filtering "cure" can be *WORSE THAN THE DISEASE!*

A filter that is non-linear will sound and look discordant because of the way we hear and see. You cannot lower noise in one octave (thereby unveiling far more information); only to increase the noise an octave away and, further,

dramatically reduce noise 1/2 octave from there. This is akin to a poor job of equalizing a recording, a bad loudspeaker cross-over design, or vivid reds and greens with horrible blacks and yellows in a video presentation. For years, discriminating technicians have complained that many AC conditioners somehow "re-equalized" their carefully calibrated systems. Indeed they did. In the strictest sense, a 400Hz tone at 90dBa will be rendered unchanged regardless of AC noise, or the filtering system that's used. However, a 10kHz signal that is occurring simultaneously at 60dB below the fundamental 400Hz tone will certainly be affected by AC noise that is induced 50dB below the 400Hz tone.

Simply put, the AC noise that is coupled into your components' circuitry may be higher in level than much of the low-level signal it is attempting to record or reproduce. If this occurs, a masking effect will certainly take place. Additionally, many non-linear RF/EMI filters have resonant peaking that can actually add more than 10dB of noise to the incoming AC line!

Zero Ground Contamination Technology

"...the surge suppressor that was purchased to protect your sensitive equipment may actually aid in its demise! Furman's SMP+ takes a different approach, ensuring optimal performance through linear filtering and zero leakage to ground."

Worse still, lost digital data, the need to reboot digital presets, or destroyed digital converters are frequently caused by excessive voltage spikes and AC noise contaminating the equipment ground. This has become a great concern, since the pass-through voltage that follows a TVSS circuit will ultimately have to return to ground. If the dissipation return is limited to the neutral wiring (as with Furman's **SMP+**), it will find its way back to the breaker panel and ultimately to your ground rod. However, if the clamping devices or AC filters have any leakage to ground, they will send some of the offending signal to the ground traces of your critical components. Many of today's high speed processors and sensitive integrated circuits will actually sustain some damage from fissures and punctures between the ground pin and the adjacent signal pins.

What this means is that the surge suppressor that was purchased to protect your sensitive equipment may actually aid in its demise! Furman's **SMP+** takes a different approach, ensuring optimal performance through linear filtering and no leakage to ground.

For more technical questions about Furman's **SMP+** featuring **LiFT** technology, please contact:

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