



## 5 things you need to know about Power Conditioning

### #1

#### *Who are Furman?*

Furman have been producing high-quality products since 1974. In fact some of Furman's employees have direct experience with the old products as they used to sell them in the early 90's.

The company was founded originally to manufacture professional audio products and then moved on to video signal processing. However, most people now associate Furman primarily with their range of trusted AC power conditioning and distribution products. Furman is now producing products for energy management too, using their proprietary BlueBOLT® cloud-based platform.

Since the company's focus is now on power, Furman's products now span a wide range of markets; applications for these products are no longer limited to music. The Furman CE line, established in 2001, incorporates a complete line of AC power management products specifically engineered for today's custom home theatre and audiophile systems. Additional applications for the products include sound reinforcement, home and professional recording, post-production, broadcast systems, commercial audio/video installation and commercial/residential energy monitoring and management.

The focus on engineering innovative, cutting edge AC power technologies has led to revolutionary developments in this field which places Furman in a unique position. There are very few companies producing products specifically in this arena.

Furman's buzz words "Multi-Stage Protection", "Linear Filtering Technology", "Extreme Voltage Shutdown", "True RMS Voltage Regulation", and "Power Factor Technology" all contain innovative designs specifically engineered to address incoming mains issues that interface with sensitive equipment.

If your "dirty" mains needs any sort of clean-up there is a Furman product that fits the bill.

### #2

#### *Why do I need Power Conditioning?*

The science that brought us alternating current (AC Power) was brilliant in its day and continues to be one of the most efficient means of distributing electricity over hundreds of miles all over the country. Whilst improvements in the way this is done have been made over the years, the basic principles remain. Electricity is generated and fed to consumers using a bewildering array of transformers and cabling. It's important to realise that the system of delivery whilst vast and very

powerful, is in essence very basic. Whilst mains frequency is generally maintained very well, voltage delivery can vary - in some places by a large amount at various times of the day. It's true that the distribution companies do what they can to keep voltage outputs within reasonable tolerances but erratic demand and inconsistent cable lengths can thwart this at every turn.

Cables are often out in the open and have to face whatever the elements can throw at them daily. Due to there being a great many connections and the fact that the supplies are routed through many of pieces equipment before the mains power gets to the consumer, it is almost impossible to guarantee a clean, noise free, stable supply.

Lightning storms and power line repairs are an obvious source of line problems there are many more - the most damaging are transient "spikes" on the power line. Every time a supply is switched from one transformer bank to another, or a circuit is turned on or off for maintenance, a noise spike is generated which propagates out over the entire network. These can ultimately "show themselves" on our equipment as an audible noise or a sharp white flash on a video monitor. Take note that these spikes can also destroy your equipment power supply too!

Our audio and video equipment that we use on a daily basis is, generally, very sensitive. The equipment has to take tiny signals and amplify them to produce the type of output that is desired for the installation. If any nasty noise or hum is present in the original (tiny) signal then this anomaly shows itself immediately on the finished output. Noise spikes can also cause digital equipment to stop, behave erratically or completely hang up. A clean mains supply is not a luxury, it is absolutely required.

This is where Furman steps in....

There are many ways to reduce noise on the mains and the Furman products do this admirably. Depending on the type of noise suppression you require, Furman has a product to suit.

### **#3**

*What's the difference between Power Conditioning, Voltage Regulation and Power Sequencing?*

If you look at the Furman range, you will see that it falls into three main categories:

***Power conditioning***  
***Voltage Regulation***  
***Power Sequencing***

#### ***Power conditioning:***

Want to get rid of noise on your mains? Power conditioning is what you need. Does your audio equipment emit odd noises sporadically? Does your video output show noise "flecks" on the screen or are you seeing vertically rising hum bars on the monitor? Does your digital processing behave erratically or stop without warning?

Of course, some of these symptoms can be caused by bad cabling, badly wired plugs and sockets or simply worn-out connectors. If you've eliminated these causes, the problem could well be a mains issue. The level of conditioning you

actually require depends on the problem but Furman have many products with different technologies to combat different issues. As always, generally the most expensive unit will have all of them and provide the best protection and conditioning.

### ***Voltage Regulation:***

Some devices are very fussy when it comes to their input mains voltage. If input mains drops significantly then some power supplies cannot regulate their outgoing supplies properly which results in hum appearing on their outputs - resulting in hum on audio or hum bars appearing on video. It may be simply that your particular device operates on 240V but there is only a 220V - or even a 120V supply available. This can apply on some ships and in other countries. If you need your gear to work then you need a voltage regulator. This is something that will "deliver" your required supply voltage independent of the actual mains supply. These voltage regulators will also deliver a stable output even if the mains only varies by a small percentage. The regulators also detect higher than normal mains and regulate that down so that you can still use your devices as normal.

### ***Power Sequencing:***

This is neither regulation or conditioning but a method of ensuring that your devices get powered up in the right order. For instance, the correct order of powering an audio system could be:

- 1) Mixer ON
- 2) Processing ON
- 3) Amplifier ON

A power sequencer will enable you to do this easily merely by connecting the relevant equipment to the relevant sequencer output.

It also stands to reason that you would need to turn OFF the equipment in the reverse order like this:

- 1) Amplifier OFF
- 2) Processing OFF
- 3) Mixer OFF

Powering the equipment on or off in the correct sequence can prevent turn on or turn off surges from reaching your speaker system and prevent speaker damage.

## **#4**

*Furman Patented Power Conditioning Technologies. What are they?*



**Series Multi-stage Protection Plus**

The Furman SMP circuit is designed to handle multiple 6000 Volt or 3000 Amp (yeah - you heard right – it's *that* high!) pulses without sustaining any damage. This is far beyond the demands placed on typical surge suppressors but it is deemed necessary to ensure that maximum protection possible.

Furman's SMP relies on a network of components to slow down the impact of a potentially catastrophic surge by capturing it, dissipating it in the form of heat, and absorbing the remaining excess energy. When tested with multiple 6,000V/3,000A surges, the SMP circuit's maximum "let-through voltage" is only 376V Pk / 266V RMS on a 230V line.

Due to the design of the circuit, it will not degrade over time (unlike most standard surge suppressors) and show minimal increase in line impedance (unlike many "advanced" surge suppressors).

The SMP circuit is not simply designed to protect from a catastrophic surge, such as a lightning strike – it is engineered to provide maximum life to connected equipment. This means it not only protects from devastating spikes and surges, but also offers protection from the dozens to hundreds of small spikes and surges your equipment is exposed to on a daily basis. These common voltage fluctuations, although small, can have a serious adverse effect over the long-term. Even when protected by a standard surge protector, digital circuits can see long-term damage due to exposure of voltage on the ground line, causing intermittent behaviour, equipment lock-ups, and data loss. By absorbing these everyday surges without deterioration of the circuit or contamination of the ground line, Furman's SMP maximizes the longevity of connected equipment and minimizes the risk of downtime or failure in mission-critical applications.



### **Linear Filtering Technology**

Whilst it is delivering your power, your AC mains outlet also delivers a significant amount of line noise.

This is due to many reasons: the widening popularity of switching power supplies and the harmonics they backfeed into our AC power mains, the deterioration of our power grid from age and use, and the noise pollution generated from the massive amounts of electronic devices on our grid at any given time, among others. When this AC noise couples into critical circuits, it will distort and mask low-level signal information. This information is vital to today's high-performance, high-definition video and audio.

Furman's LiFT employs a finely tuned low-pass filter to reduce the differential AC noise coming from the mains. What is significant about Furman's filtering is that it reduces the AC noise in a linear fashion across a very wide bandwidth. Prior filtering schemes (such as those found in most AC conditioners and, in fact, Furman's own conditioners prior to developing LiFT) reduce noise unevenly, creating a noise attenuation curve that resembles a roller coaster. This is akin to a poor job of equalizing a recording.

With Furman's LiFT, differential AC noise is reduced linearly, across a very wide bandwidth, even extending into the video frequencies. This results in a lower noise floor for your audio system, improved picture on your video display, and protection from possible data corruption and losses caused by low level differential AC noise fed into digital systems.



### **Extreme Voltage shutdown**

Transient spikes and ground contamination are not the only problems faced by today's sensitive electronics. There are also sustained over-voltage conditions, sometimes called "extreme" voltages. Many surge suppression devices will not be able to protect equipment from sustained over voltage. These conditions can occur for multiple reasons: wiring faults, storms and traffic accidents, and accidental connections can result in delivery of over 400V to your connected equipment. (What happens if you accidentally plug your mains board into a 3-phase outlet???)

Many surge suppression devices are not equipped to handle these kind of conditions. Without proper protection, the end result is destroyed equipment, or at best, a destroyed surge suppression system. Furman's EVS constantly monitors incoming voltage, and once any overvoltage condition over 275 volts AC is detected, a relay opens which immediately shuts down the unit and all connected equipment. An indicator light informs the user there is a problem, and once the condition has been corrected, the unit may be reset and will operate normally.

### **#5**

*What Power Conditioners are available and what is the difference between them?*

Furman have several ranges of conditioners available. Here's a quick run-down on what each series is capable of.

### **Merit Series:**

This is the perfect low-cost AC Power Solution for any rack mount system. Not only does it provide a basic level of power conditioning but these processors have a 10A rating and have 11 IEC outlets on the rear.

### **M-10X-E:**

This is the entry-level unit that has spike and surge protection as well as a front panel LED indicator that lets you know your equipment is being protected.



### **M-10LX-E:**

Features identical to the M-10X-E but also includes two retractable incandescent lamps with dimmer to light up the equipment in the rack.



### **Classic Series:**

This series adds many additional levels of power conditioning such as **SMP**, **LIFT** and **EVS** to offer a more complete conditioning system that can handle many different kinds of mains issues.

### **PL-8 C E:**

This is the basic model in the Classic range and features standard conditioning plus advanced conditioning as described above. The unit has a 10 Amp rating and has 11 IEC outlets on the rear. It also includes two retractable incandescent lamps with dimmer.



### **PL-Plus C E:**

Specification as per the PL-8 C E but also includes an LED Voltmeter on the front panel.



### **PL-Pro DMC E:**

Specification as per the PL-Plus C E but also includes a Digital LED Voltmeter/Ammeter on the front panel. You also get an additional IEC outlet on the front panel – very handy soldering irons or lamps when you are working on the rack itself. This unit also has a detachable 16A input IEC inlet with a metal locking bracket included to retain the power cable.

