

# Powersoft X-Series Amplifiers

By Eddie Ciletti

In a global economy, companies seem to come from out of nowhere. For me, Powersoft was that company. Little did I know that its new X-Series amplifiers are the result of 19 years of Class-D amplifier experience. In that time, there were nine previous models, several still in production, plus custom OEM versions, so there's even a chance your system may have Powersoft modules under the hood.

Launching at this month's Musikmesse/Prolight+Sound show in Frankfurt are the X-4 and the X-8 — the company's first X-Series amplifiers. The X-4 houses 20,000 watts — four 5 kW amplifiers — in a remarkably compact and lightweight 1U package. The X-8 houses twice as many channels in a 2U chassis. Each 5 kW amplifier can effortlessly drive 2-ohm loads, and then some. There are multiple inputs (AES-3, analog and Dante), a routing matrix and extensive onboard DSP (EQ, crossover, dynamics processing) based on the ARM Cortex A-8 processor and TI C6000 DSP platform. Self-diagnostics can predict driver fatigue and deliver email reports.

## » Armonia = Harmony

The front panel is deceptively simple. This was a design decision to prevent accidental or intentional tampering. The X-Series' setup is fully integrated into Armonia Pro Audio Suite, an intuitive interface for parameter adjustment. The system can be monitored and managed via Wi-Fi with a smartphone or a tablet.

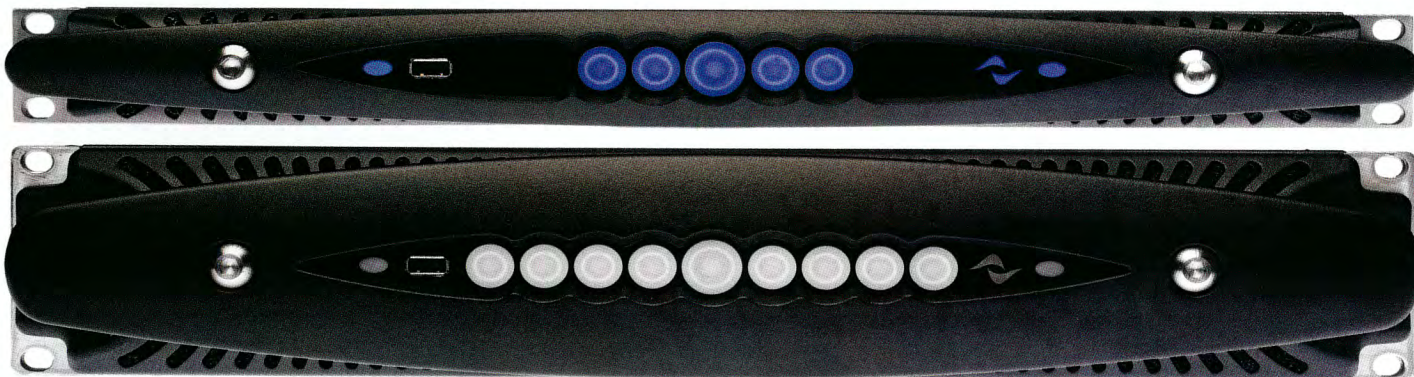
A 20 kW amp in a single rackspace is one thing, but there's a lot more behind this technology, as I discovered.

## » The Demo

At a private demonstration at the company's facility outside Florence, Italy, I was able to hear a single X-8 amp powering a stereo P.A. comprised of HF, MF and LF drivers as well as a pair of subwoofers. The system exhibited clarity without harshness and imaging comparable to a recording studio monitoring system. In addition to their audio sources, I listened to a recent recording project I brought along. I experienced a wall of sound pressure — not just from the subs — incredible impact, low distortion and headroom to spare.

I was surprised when designer, Claudio Lastrucci, hot-plugged two of the X-8 amplifier outputs into a pair of subs — with program running. While Powersoft does not manufacture loudspeakers, the Lastrucci-designed moving-magnet M-Force subwoofer motors are available to loudspeaker manufacturers. The stationary coil's impedance is less than 1-ohm and, while this presents a formidable load to any amplifier, Lastrucci explained that the collective features of his amplifiers are quite comfortable driving them. Catch the video demo of Powersoft's M-Force linear motor subwoofer technology at [fohonline.com/foh-tv](http://fohonline.com/foh-tv) — ed.

It should also be noted that Powersoft amplifiers are used to drive the Hadron Collider's magnetic acceleration coils. Powersoft amps were also employed at the Grammy Awards and the latest New Year's Eve celebration in Times Square.



Powersoft's X-4 (top) and X-8. The illuminated buttons change color to indicate status. The USB port is used both to load and save presets as well as to play audio files.

## » Power Versatility

Powersoft's robust switchmode power supply is designed to tolerate over-voltage and it runs on any available line voltage from 85 to 400 volts — single to three phase — in Y and Delta configurations, with or without neutral. The supply soft-starts to slowly charge a capacitor reservoir that stores 900+ joules.

## » Efficiency Plus

From a power standpoint, Class-D amplifiers and switchmode power supplies are inherently lean consumers compared to their linear predecessors. Powersoft's real-time Power Factor Correction (PFC) further improves efficiency. Fig. 1 provides an overview.

The process starts at the top of the graphic as the AC power is converted (rectified) from AC to DC. Each time the rectified sine waves charge the filter capacitors (a.k.a the "reservoir"), harmonic current spikes are reflected back into the power line. While typical of all electronic devices — amplifiers, computers, lighting systems, motors, etc. — ignoring reflected harmonics is undesirable, inefficient and contributes to the radiated noise we are constantly fighting at performance facilities.

While beyond the scope of this article, it is important to understand the phase relationship

between the power line voltage and power line current. For a purely resistive load — such as an incandescent lamp — the current would be in-phase with the voltage. The actual loudspeaker "load" is very reactive — the current reflected through the amplifier back to the power supply is no longer in-phase with the voltage. Powersoft's PFC works in real-time by correcting the additional noise currents generated as the amplifier delivers current to the load.

## » Damping Factor

On the subject of reactive loads, each push from the amplifier results in an equal and opposite reaction from the drivers, known as back EMF. (Imagine inflating several party balloons, all-at-once, by mouth!) Typically, an amplifier's low output impedance and negative feedback increase the amplifier's dominance over the driver, a.k.a. damping factor, which is defined as speaker impedance/amplifier impedance. Here again, another Powersoft innovation

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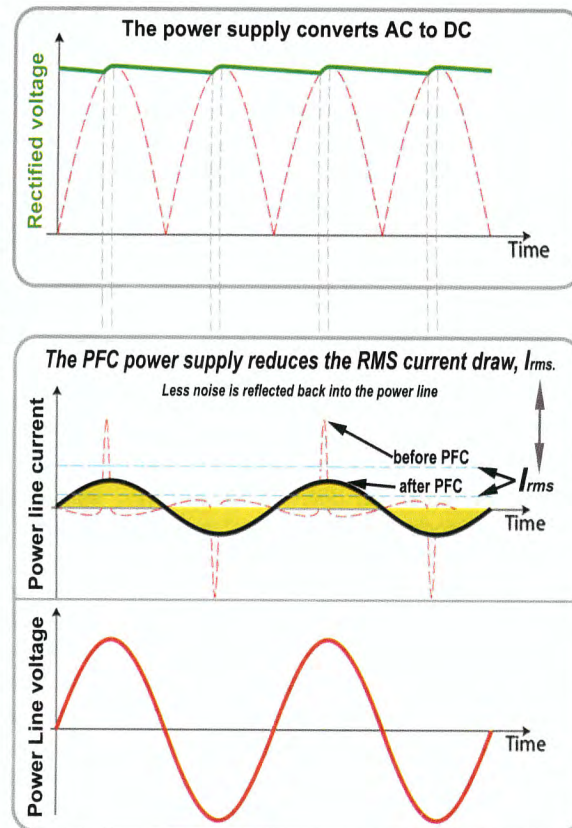


Fig. 1: The red spikes are rectification harmonics that — untreated — would typically be reflected back to the power line. Power Factor Correction (PFC) reduces harmonics and improves efficiency.

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uses the back EMF from the loudspeakers to recharge the reservoir just as electric vehicles — like Tesla and Prius — recharge their batteries during the braking process. Combined, these features provide an ultra-efficient, high-powered amplifier design for the X-Series.

The X-Series also features an adjustable damping factor that can compensate for cable length — essentially taking the cable out of the equation. The amplifier's damping diagnostics are sensitive enough to measure and store the loudspeaker's impedance, and is sensitive enough to compensate for sound waves reflected back at the speaker. So, for example, the X-Series can tell the difference between a flown cabinet and one on the floor.

### » Built to Last

Reliability comes from a number of design factors: technical, mechanical and thermal. For example, the amps feature rear support brackets on either side of the power input and the Dante inputs. Forced-air cooling is from front to back, with a filter behind the front panel. The amplifiers are designed to be stacked, one on top of the other. This circuitry not only delivers the goods, but can endure abuse and protect itself from failure. Of course the sound contractor/system designer plays a key role in this too.

The X-Series introduces a new, adaptive operating system that actively monitors multiple test points through the unit. The power delivered by each output channel is measured, processed and compared with the power drawn from the mains. The system collects enough data to know both the amount of stored energy in the reservoir as well as what is available from the mains. The system is immune from over-voltage, over-current, over-temperature and short circuits as well as clipping prevention. Subsonic and VHF filtering are employed at the input.

Modern touring and fixed P.A. systems



It takes a beast of an amp to drive a 2-ohm reactive load, let alone this new M-Force subwoofer motor (shown here with designer Claudio Lastrucci), yet the X-4 / X-8 amplifiers can drive it with ease.

are delivering a staggering amount of power thanks to Class-D technology. The traveling tour company puts physical demands on its equipment, the environments can be hostile and the equipment itself must be versatile and robust.

In the pursuit of improved performance, Powersoft has offered a hidden room of solutions. The combination of dynamic PFC and recycled back EMF are solutions that further improve efficiency. Adjustable Damping Factor opened the door to driver analysis. These features together allow the X-Series to drive nearly impossible reactive loads like the company's M-Force subwoofer motor. While Powersoft has not yet achieved the impossible — self-propulsion — the company does seem to be in an infinite loop of creative and technical innovation.

### » Designer and Company Philosophy

Both evolutionary and revolutionary, the X-Series is borne of curiosity and driven by the determination and tenacity of designer Claudio Lastrucci, who — like many of us — is a self-described audio fanatic. Lastrucci's dream was to meld high power with listen-ability.

Each step of the way, as goals were met, the product and its applications came into focus, almost as if, as one problem was resolved or a specification improved, other applications and features became possible. One example of this is another product called DEVA (pronounced *day-vuh*). It is a fully self-contained solar-power wireless monitor designed for outdoor use. It's proof that Powersoft's efficiency gains in one product opened the door to applications that weren't previously considered.

I knew little of Powersoft prior to the demo. I wondered what could possibly be new in amplification. I went in a skeptic and came out a believer. Powersoft inspired me, and I believe they will continue to innovate, to meet and exceed demand and expectations. For more info, visit Powersoft at [powersoft-audio.com](http://powersoft-audio.com). **FH**

Eddie Ciletti is a noted pro audio journalist, educator, engineer and operator of Manhattan Sound Technicians. Visit him at <http://www.tangible-technology.com>.



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## Rule #1: Don't piss off the sound guy!

The advertisement features a large, stylized microphone on the left. In the background, a computer monitor displays the proaudiospace website. The website header includes the title 'proaudiospace' and the slogan 'RULE #1: DON'T PISS OFF THE SOUND GUY!'. Below the header, there are navigation links for MEMBERS, GROUPS, BLOG, FORUMS, MEDIA, CHAT, and FORUMS ONLINE. The main content area shows a 'LATEST ACTIVITY' section with several posts, each featuring a profile picture and a snippet of text. At the bottom of the advertisement, there is a silhouette of a crowd of people with their arms raised, and the URL 'proaudiospace.com/join' is prominently displayed in large, blue, bold letters.