

Power Up

Sound & Video Contractor On-Line

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Power protection and regulation devices have become common for computer gear. Yet these are also necessary components for both AV permanent install and touring systems. What is all this power stuff about anyway? When and why are they needed...?

Most systems integrators have been doing installations for years and never bothered with power line conditioners, surge protectors, balanced power, uninterruptible power supplies (UPS), sequential turn-on, voltage stabilizers, and so on. Those integrators smart enough to get into trouble know that most well-designed products already have a varistor spike absorber or similar protection against power line disturbances.

So why are so many consultants and sound contractors specifying and installing power line gear? Perhaps the most compelling reason for that includes the degraded AC power people now live with. It is not just installations in lightning territory fed by outdoor power lines, AV systems being feed nasty power on cruise ships, nor just installations in developing countries. Each month a commercial facility will experience about 60 transient events and 50 surges of varying severity and duration.

DISTURBING

Power disturbances include lightning, low-voltage brownouts during the summer, the garbage from relays in an air-conditioning system (or relays in the cash register), dimmers and lighting effects equipment, the stuff spilling from that old digital effects processor the customer insisted on using, control signals, and even modulated RF signals on the power line. New York has suffered brownouts in the summers for decades, and more recently, California has had its share of low line voltage and rolling blackouts. Aside from out-of-bounds voltage from the power line, AV systems can contaminate themselves. The increasing popularity of switching power supplies in all sorts of equipment from DVD players to power amps contributes harmonics into the power line (not to mention EMI), and certain topologies of switching supplies that really ought not to be used can chew up the power line.

Although quality audio components have used internal surge protection in the past, the trend for higher and higher watts per dollar has so squeezed product designers that a more minimalist approach is now the norm. Besides, wouldn't you rather have your first line of defense be the line conditioner so that it takes the hit and goes down? The alternative is to remove a varistor in the power amplifier and then have to provide a loaner and take the amp for a visit back to the shop!

There are half a dozen functions that power processors can serve, singly or in combination, from simple surge protection, power regulation, balanced power, sequential turn-on, and uninterruptible (backup) power to catastrophic shutdown — such as when a 110V power condition system is inadvertently plugged in to 220V power.

In the future, expect to see smarter power processing such as remote switching, system control and load monitoring down the power line, and, with more efficient and agile amplifiers as well as homeland security paranoia, uninterruptible power supplies for power amp emergency operation when the power fails altogether. Because there are just too many outfits that make too many variations of these devices to cover them all, I have picked out some of the more popular units to talk about....

POWER CONDITIONERS

Power line conditioners have become popular because of computer and digital equipment (digital effects processors) sensitivity to even very short-term power spikes. Power conditioners are less expensive than regulators, and for most applications, they provide adequate protection. These line conditioners protect electronic equipment by combining a high-voltage surge and transient suppressor with an RFI/EMI interference filter. The filter works to prevent noise from fluorescent lights, electric motors, radio transmitters, and similar sources of electronic pollution from leaking from the AC line into both analog and digital circuits. Typically, a varistor clamping suppression circuit responds in nanoseconds, clamping spikes and surges to safe levels. A large power spike can do a lot of damage, and though the basic power products do not attempt to stabilize voltage, they do deal with surges. It is not uncommon for a basic surge protector/line conditioner to be described as a voltage stabilizer, but that is a far more ambitious animal that I will get to shortly. Generally, these surge protector/RF line filters are integrated into a power distribution panel package.

VOLTAGE REGULATORS

Voltage regulators are used for protection from problems that are caused by power line sags, brownouts, overvoltages, or unstable power sources, such as when the system is to be powered off a generator — just about everything short of complete loss of power. Regulation can be by ferroresonant transformers, variable tap transformer systems, or switching power supplies. Ferroresonant transformers and variable tap transformers have been the established solution. Low-power gear-switching supplies for power regulation are all over the place, and they can be found in just about every laptop computer and other universal power supplies in consumer products.

SEQUENTIAL TURN-ON CONTROLLERS

These gizmos will turn on equipment with a time delay, with some of the power outlets being activated before others. About 20 years ago, several high-performance audio integrated circuits (IC) began to appear that had decent sound quality and specs, but when they were powered up as the DC supply rails ramped up to a few volts, the IC would send garbage through their outputs for the first second or two after they woke up. Powering down usually was the same story.

Today this problem still exists with many of the analog ICs that audio engineers would otherwise prefer to use. Because many audio components are built on tight design budgets, there often is not enough money to buy both these high-performance ICs (with the nasty response to their wake-up call) and also add a relay, an optocoupler, or another turn-on mute for the output. So often it is a race to see if the installation's amplifiers will turn on before the audio mixers and signal-processing electronics are done belching. If the turn-on junk makes it through the amplifiers, then the sound system's speakers are in for a rough time. Unmuted turn-on transients are the cause of excessive wear and tear and perhaps even premature failure, especially in the case of compression drivers that are biamped and directly coupled to the power amps (a crossover capacitor selected for an octave below the intended crossover point isn't a bad idea, by the way).

Aside from turn-on/turn-off transients, sequential turn-on/off reduces the potential for tripped circuit

breakers, blown fuses, or voltage spikes caused by simultaneous power application. There are not many excuses for leaving this out of any job...