

WINTER 2009/2010

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## Safety and Your Sound System

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### For More Information

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Figure 1  
AC power cord with three terminals

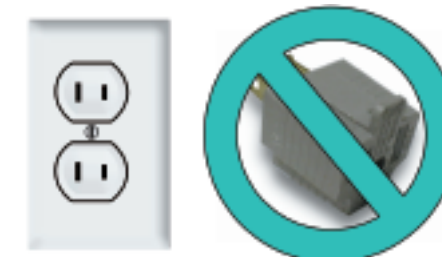


Figure 2  
Do not use a 3-prong to 2-prong adapter.

### AC Grounding

Most modern sound equipment has an AC power cord with three terminals on the AC plug. Two of the terminals are for actual AC power. The third round one is

the safety ground terminal (Figure 1). It connects the chassis of the sound equipment to the building's electrical ground. The primary reason we ground a sound system is for safety. A properly grounded sound system will prevent someone from receiving a lethal shock. A secondary reason is to reduce external noise pickup.

So what can happen if the AC outlet in your church only has a 2-wire AC outlet with no ground terminal? The installer of the equipment probably put a 3-prong to 2-prong adapter (often called a Cheater) on the AC plug and plugged it into the AC

Continued from page 1

outlet (Figure 2, on page 1). It may have worked fine for years without a problem. But something may go wrong inside the equipment, or perhaps the AC cord frayed a bit. Somehow, the hot side of the power line comes into contact with the chassis of the equipment. If the equipment had been grounded, the electrical circuit breaker or fuse would have blown. However, now there is no ground connection, and nobody knows the potential lethal danger that is lurking. The first person to grab a microphone and touch a grounded piece of metal will immediately discover the fault. If they are lucky, they will only receive a mild shock. If they are standing in a baptismal tank they may die.

The simple solution is to make sure all your equipment is properly grounded. That may mean spending

Figure 3  
Use gaffer's tape for cables in traffic areas.



some money to hire an electrician to check for you. It may mean having to add some new wiring. But that is a small expense compared to life.

Sometimes, a sound technician may feel it necessary to intentionally lift (remove) the ground connection. This is sometimes done to reduce hum and noise in the sound system. The hum is usually the result of equipment and/or connectors being grounded in several places and a ground loop is formed. This article is too brief to deal with ground loops in detail. However, NEVER defeat the AC safety ground on the console or any equipment connected directly to the microphones. They need to take first priority in grounding safety. There are methods to provide both safe and ground-loop-free operation. Please call us if you have ground-loop hum and noise problems. We will be glad to help you achieve a hum-free sound system.

### Cables

Sound systems and cables go hand in hand. However, cables can present some safety concerns. Many people have tripped over a cable and hurt themselves, the equipment or both. What can be done to improve your safety?

First, use high quality cables. Quality cables will lay flat which means they are harder to trip over. Better yet, tape down the cables that are in traffic areas (see Figure 3). Please don't use ordinary duct tape. Instead, use high quality gaffer's tape that won't leave a residue on the floor, walls, or cables.

Second, take care of your cables. Remove the twists and kinks when you wrap the cables after each use. Your cables will last longer and be safer to use if you take the time to properly store them.



Figure 4  
Overhead loudspeaker mounting is a safety hot spot.

### Wireless Microphones

Wireless microphones can also improve the safety of your sound system. They eliminate the tripping potential of cables and are safe electrically (there is no AC connection). This is the safest microphone to use around a baptismal font or tank.

### Loudspeaker Mounting

Another safety hot spot is the loudspeaker mounting techniques. If the loudspeakers could potentially fall on someone, they better be secure. The mounting hardware should have a heavier workload limit than necessary. The installer's safety motto is: The installer should be so sure of his installation that he could sleep under it!

Everyone working with the sound system must be concerned and aware of the potential risks. They must work diligently to avoid and eliminate any hazardous situations. Please call us if you have any questions about safety. We will be glad to check out your system and discuss any safety concerns.

## SIGNAL LEVELS TECH TALK WHAT'S HOT AND WHAT'S NOT

A 3 Volt light bulb plugged into a 120 Volt circuit may shatter because the bulb is designed for a much lower voltage. In the reverse, a bulb designed for a 120 Volt circuit that is connected to low voltage batteries will be very dim at best.

In a similar way, audio systems are comprised of devices designed to operate within a certain range of voltage and current (as depicted in Figures 5 and 6). To connect sound system equipment together properly, it is important to have a basic understanding of these signal levels.

**Side Note:** It is easier to talk about voltage amplitudes as a ratio, called dBV, with the reference being 1.0V. For example, if you double a voltage, the ratio would increase by 6 dB. So, a 2V signal would be 6 dBV or a 0.5V signal would be -6 dBV.

### Microphone Level

This is the smallest audio signal. This category of signal typically falls within the range of -60 dBV to -30 dBV. This represents a voltage range of .001 Volts and .032 Volts. Microphones, direct boxes and some acoustic guitar pickups will produce this very low signal.

### Line Level

Line level signals vary from -20 dBV to 24 dBV. Within this range of signals are two subcategories.

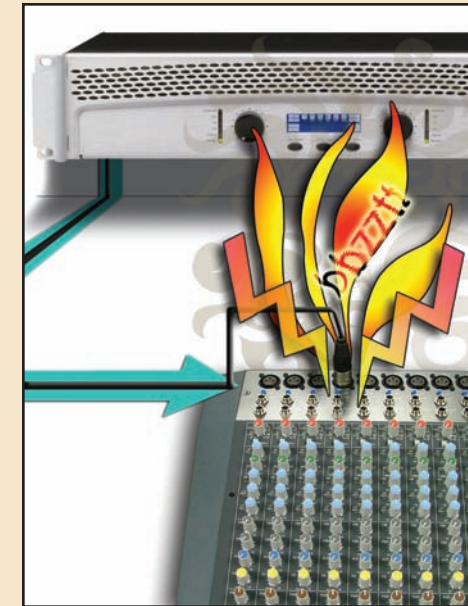


Figure 5  
Too much power may cause damage.



Figure 6  
If the signal is too low, the equipment doesn't work to it's full potential.

**Semi-Professional Level:** The output signals of "consumer" grade CD players, FM tuners, MP3 players, etc. are usually measured to be approximately -20 dBV to -10 dBV. This represents a voltage range of .1 Volts to .32 Volts.

**Professional Level:** The output of most mixers and signal processors such as compressors, equalizers, and crossovers are usually in the range of 4 dBV to a maximum of 24 dBV. This represents a voltage range output of 1.6 Volts to 15.8 Volts (at their peak).

### Loudspeaker Level

This is the signal that power amplifiers produce. The amplifier output feeds the loudspeakers of the sound system. The peak power output of most amplifiers can range from 50 Watts to 1000 Watts. Watts?! What about Volts?! Well, if you connect to an 8 ohm loudspeaker, the voltage range is approximately 20 Volts (26 dBV) to 90 Volts (39 dBV) and more.

### A Final Note

Matching signal levels is an essential part of both installing and operating a sound system. If you have any questions or sound system problems, please give us a call.

