

# SOUND OF WORSHIP

SOUND ADVICE FOR TODAY'S HOUSE OF WORSHIP / FALL 2010

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## SOUND SYSTEMS, ROOM ACOUSTICS, AND SPEECH

Every church worship service has two elements: SPEECH and MUSIC. Typically, when a church considers the need for upgrading their sound system, they are interested in improving one or both of these elements. It is important to have a basic understanding of the relationship between speech, music and the acoustical characteristics of the worship space.

### Speech

Speech is less understandable in rooms that are highly reverberant.

### Traditional Music

Where speech intelligibility is degraded by highly reverberant rooms, traditional music is enhanced by higher reverberation in worship spaces.

### Contemporary Music

Contemporary music sounds best in spaces that are not reverberant. Put a worship band in an environment with relatively high reverberation and the acoustic results can be frustrating.

### The Sound System to the Rescue

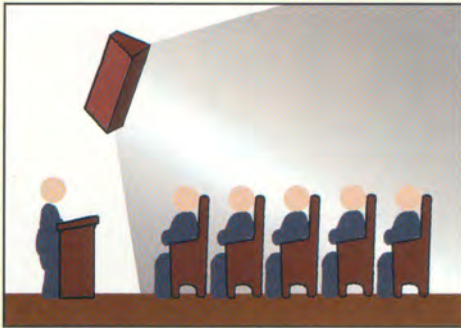
A properly designed sound system that is installed and aligned correctly will greatly IMPROVE problems associated with room acoustics, music and speech. But please notice, I DID NOT say that a sound system will ELIMINATE acoustical problems.

A sound system can help reduce the effects of highly reverberant levels in a room by doing one or more of the following:

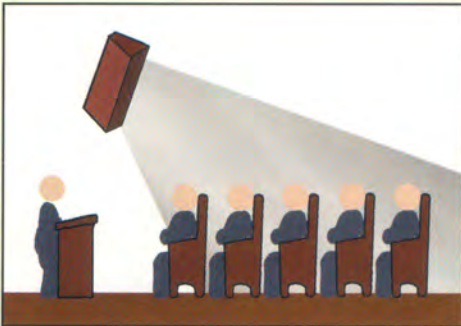
### 1. Increase the Directionality of the Sound Source

When shouting to someone across the room, you can improve the intelligibility of your voice by cupping your hand around your mouth. A sound system can do the same thing. Using highly directional loudspeakers, a sound system designer can focus the sound energy into areas where people are sitting. This helps improve speech and vocal intelligibility.

Continued from page 1



Too much reflected sound energy.



More concentrated sound where it's needed.

## 2. Decrease the Effective Distance Between the Sound Source and the Listener

When standing next to someone in a room, conversation is easy. However, move across the room and intelligibility is hindered. In general, the closer the sound source is to the listener, the higher the intelligibility. In some cases, this is the only effective approach for sound system design. For example, if the sanctuary is highly reverberant and the distance from the loudspeaker to the last pew is 60 feet or greater, one solution for providing good speech intelligibility is to add a delayed loudspeaker (Fig. 2).

## 3. Reduce Unnecessary Sound Energy

Events, such as a small wedding, that use 20% or less of the seating

area can actually degrade the sound system's intelligibility. Because empty unpadded pews are a hard surface, they cause the room to be more reverberant. If possible, turn off any unnecessary loudspeaker components.

As a professional sound system contractor, we have the tools and experience to determine how simple or complex a sound system must be designed in order to provide adequate intelligibility. We can measure the reverberation characteristics of the room and can predict whether a particular loudspeaker system will provide sufficient intelligibility.

There are some cases where a properly designed and installed sound system will provide adequate intelligibility, but specific acoustical problems in the room may prevent the sound system from providing optimum performance. Many of these situations can be corrected with acoustical treatment of the room.

Sometimes the acoustics of the room will prevent the use of any cost-

*Sound systems will not eliminate acoustical problems in a room.*

### The Bottom Line

No matter what specific acoustical problems your church may have, there is only one prudent method for finding the best solution:

- Hire a professional sound system contractor that can accurately measure the acoustical characteristics of the room. If the project involves new construction, there are software tools that can be used to predict the reverberant characteristics of a proposed facility.

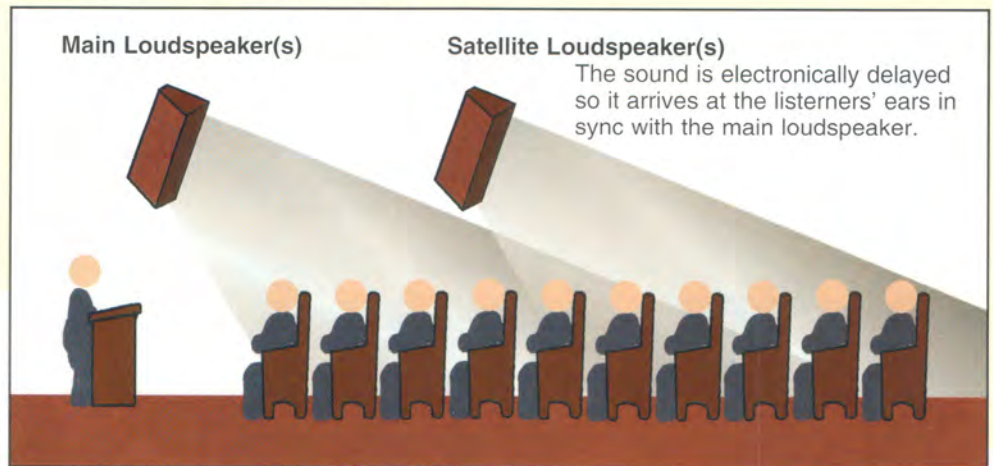


Figure 2 – Use a satellite loudspeaker to move loudspeaker closer to listener in a highly reverberant room.

effective sound system solution. At this point, the customer has several options. In some cases, acoustical treatment can be included in the sound system design package. There are times, however, when an acoustical consultant should become a part of the project.

- Make certain that you provide us ALL the pertinent information regarding styles of worship music.

Give us a call to let us help you with your sound system decisions.

## TECH TALK

# Gain Structure

Gain structure is basically a fancy way to describe the volume settings for each piece of sound equipment in a system. Properly setting the gain structure minimizes the amount of noise (hiss) in the sound system. This article gives you two sets of steps to correctly set the gain structure. Follow the first set of steps if you have a basic six- or eight-input mixer. Otherwise, follow the “Mixing Console” set of steps.

### Basic six- or eight-input mixer/amplifier

1. Turn all the individual channel volume controls down (counterclockwise).
2. Adjust the master volume control to about the 12 o'clock position.
3. Choose one of the primary channels (pulpit). Have a volunteer speak into the microphone while slowly turning up the volume control for that channel. Adjust the control until you achieve the desired volume from the sound system.

If the channel volume control knob is very low or very high, adjust the master control to compensate.



If you cannot achieve enough volume before feedback (a hollow ringing sound) appears, you will need to turn the volume control down and have the talker speak louder or move closer to the microphone.

4. After you have adjusted the first channel, move on to the other channels and perform the same procedure. However, do not adjust the master control.

5. After you have finished setting all the channels, you can use the master volume control to fine tune the overall volume.

### Mixing Console

This type of mixer has some additional controls which need to be adjusted.

1. Move all the individual channel faders down to their off position. That is usually indicated by the  $\infty$  sign.
2. Turn the channel “gain” (or trim) control down or counterclockwise. This is usually at the top of each channel strip.
3. Bring the master output fader up to the “0” position or the heavy hash mark. One manufacturer marks this position with a “U.”
4. Now have the instrument play or the talker speak into his microphone. Move the channel fader for that input up to the “0” position.
5. Slowly adjust the “gain” control until the volume from the sound system is correct.

6. If the “gain” control is fully counterclockwise and the volume is still too loud, check to see if your mixer has a “pad” button. Pushing this button down will decrease the input level (often by 20 dB). Now you will

be able to control the level with the “gain” control.

### General Tips

1. As the number of “on” microphones increases so does the potential for feedback. Keep microphones off when they are not being used. A sound system operator can turn the channels on and off or you could use microphones with switches. Another better option is to use an automatic mixer for your speech microphones. This type of mixer will turn the microphones on and off as needed.

2. As more channels are added, the overall volume will likely increase. This can be compensated by lowering the master fader a bit or lowering each channel fader.

3. When mixing multiple instruments and vocals, listen for what is too loud and bring it down rather than increase the level of everything else. That will help keep the overall volume under control.

4. On systems with a mixer and separate power amplifier(s), you may also need to adjust the input level control on the amplifier(s). If you do not have good meter movement on your mixer or there is a lot of noise (hiss) from your loudspeakers, then turn down the input level control on the amplifier(s). You will need to repeat step 5 in the “Mixing Console” section again. Warning: Please do not attempt this unless you have a thorough understanding of your total system. Please call if you need help.

You should be on your way to a good start. Remember to give yourself time to practice with the mixer.

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**SOUND ADVICE  
FOR TODAY'S  
HOUSE OF WORSHIP**

**FALL 2010**

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