

# SCHOOL SOUND

SOUND ADVICE FOR TODAY'S SOUND OPERATOR / SPRING 2011

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## A Gym Sound System Can Sound Good

Reflect for a minute on the sound system in your school's gym. Is the sound system quality good? Can you hear and understand what is announced? Is the volume even, or is it too loud in some seats and unintelligible in other areas? If it is loud enough, is the sound distorted? If you have a good one, count your blessings! Unfortunately, there are not many good gym systems.

A gym sound system must be versatile. Gymnasiums are used for a wide variety of events: sports, the dance line during halftime, convocations or assemblies, graduation ceremonies, concerts, musicals, dramas, etc. A sound system is needed for all these events. Each of these applications has unique requirements that places different demands on a sound system. It is difficult to expect one sound system to meet the exact requirements for each type of event. To provide proper sound reinforcement for each of these applications, several sound systems or configurations may be required. Due to

the space limitation, this article will focus on a sports system set up. Please contact us for more information about the other system configurations.

### Demands of a Sports System:

The sports sound system must provide:

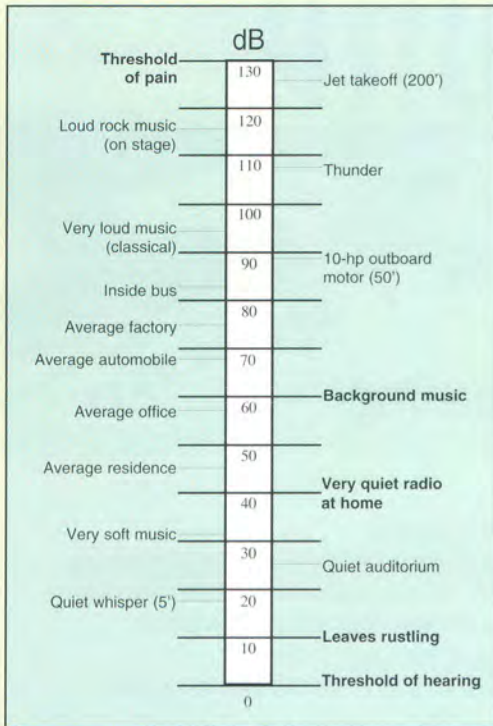
1. Enough volume
2. Sound clarity (intelligibility)
3. Even coverage

These three objectives are extremely interrelated. In other words, they must all be met or the sound will not be satisfactory.

### LOUD ENOUGH

A challenge the system designer must overcome is background noise from the crowd. It is just not appropriate for a crowd to hold in their shouts of enthusiasm during an exciting game. Besides, the team needs to hear the cheers and excitement from the crowd. However,

Continued from page 1



**Figure 1**  
Average sound pressure levels of common sounds.

the crowd noise must be taken into account by the designer, or the system will not fulfill the demands. Figure 1 illustrates the measured sound pressure levels in some common situations. The average noise level at a game may be in the 75 to 85 dB range. Loud cheers can be considerably higher. Although there are a lot of factors which will affect intelligibility, it is commonly accepted that the signal (announcement) should be 25 dB louder than the background noise. Therefore, the sound system must produce 100 to 110 dB in the bleachers—at the listener's ears. Unfortunately, a system capable of levels this loud can be very hard on the budget and the ears. What if the crowd roars with excitement and the background noise raises to 100 dB? It is impractical to expect the sound system to overcome that noise level.

**What can be done to lower the background noise?** Acoustics play an important part in the crowd-noise factor. Crowd noise in a gym with little acoustical treatment will seem

louder than in one which has been acoustically treated. Better acoustics also contribute to better intelligibility. Solving an acoustical problem can be expensive, but it is the best solution in a non-acoustically treated room. Also, the audience will appreciate the sound in a room with good acoustics.

### INTELLIGIBILITY

Above, we stated that an announcement needs to be 25 dB higher than the background noise to be clearly heard. But, when the volume is simply turned up, it often gets distorted because the amplifiers or loud speakers reach their maximum capacity. What help is available?

### Compressor/limiter:

This equipment will help prevent distortion by automatically lowering an excited announcer's voice. When the volume peaks are limited, the average sound level can be increased without fear of distortion.

### Autoleveler:

This is a derivative of the compressor. It compensates for quiet voices and for loud, excited voices. The highest quality models have features which make this product very attractive!

### Automatic Noise

### Sensing Leveler:

These units have a sensor which monitors the crowd noise and adjusts the volume of the sound system to compensate for changes. Now the crowd won't be blasted when the room is quiet and yet can still hear the announcer during the energetic moments.

### Equalization:

By properly adjusting the quality of the sound, better clarity can often be

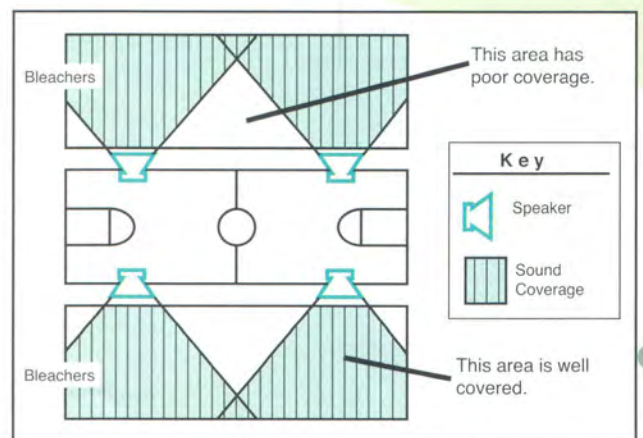
achieved. This is done through an equalizer. An equalizer is a set of filters which give the sound system tech the ability to adjust the tone of the sound system. The result is better, more natural sound which is easier to understand.

### SOUND SYSTEM COVERAGE

The goal of a sound system designer is to provide the same volume and quality to every listener in the room. However, in reality, this is not an easy task. But with today's computer modeling programs and equipment, we can get very close to this goal. Poor coverage occurs when some people hear the announcement clearly, others get blasted and yet others cannot hear at all. Every loudspeaker covers a specific area (Figure 2). If a listener is in the coverage area, s/he may hear clearly. If the loudspeakers are not chosen, positioned and aimed accurately, there may be areas that are not covered. In those areas, people will not hear well.

**Is your crowd happy?** Very few things are more frustrating to an audience than not being able to clearly hear. We have the experience, tools, and equipment to help you make your crowd happy. Call us today.

■ Ron Huisinga



**Figure 2 — Speaker Coverage Patterns**

## TECH TALK PODIUM MICROPHONES

Have you ever listened to a speech interrupted by feedback? Or worse yet, have you been the talker and encountered feedback? This article will explore some of the problems associated with the podium microphone and provide some hints to make yours work more effectively.

### One at a Time, please!

Only one microphone should be placed on the podium. Two microphones can produce very poor sound.

Pretend you are the talker in Figure 3a. Assume both microphones in the example are turned on. The top solid line in Figure 3b shows the combined frequency response of the two microphones assuming the talker remains exactly centered between the microphones. However, if the talker moves slightly off-center, the sound will travel a different distance to reach each microphone, arriving at slightly different times. When the two signals combine, there will be level additions at certain frequencies and cancellations at other frequencies. The result is unnatural sound. And worse yet, as the talker moves around, the sound quality will change too. The gold line in Figure 3b shows the resultant frequency response curve.

The change in frequency response is caused by phase cancellation. Phase cancellation can also occur when both a podium microphone and a lavalier (neck) microphone are on at the same time.

Recreate this situation for yourself: Turn on a lectern microphone and a lavalier microphone. Speak into both at the same time. You will quickly notice the combined result is very audible. The sound that is produced is very unnatural and the quality will change constantly as the talker moves. The tone

controls on your mixer cannot correct this problem. The only solution is to turn off one of the microphones.

You can also encounter a phase cancellation problem when one microphone is on a gooseneck above the podium. The sound from the talker travels from their mouth and strikes the microphone. However, some of the sound will continue to travel down, bounce off the podium and then travel back to the microphone. The path lengths are different, so there is time (phase) difference. The resultant combination again produces a sound that is unnatural.

### Podium Microphone Operational Hints

Fortunately, there are several things you can do to improve this situation.

- Use a directional (cardioid) microphone.
- Put carpet or some other absorbent material on the lectern to help absorb the sound reflection.
- Position the microphone at least 8 inches above the lectern surface.
- Don't get too close to the microphone. If you are speaking one inch from the microphone, and then move back another three inches, the change in distance will produce a large change in

volume. That is not caused by the microphone. It is a law of physics called the inverse square law. A doubling of the distance will decrease the sound level by 6 dB. All microphones behave exactly the same. Moving from one inch to four inches from the microphone will cause the sound level to drop by 12 dB. Your ears will perceive a level drop of more than half.

However, if you are a foot from the microphone, the same three-inch change in distance will produce very little change in volume. You would have to move back three more feet to drop the level by 12 dB!

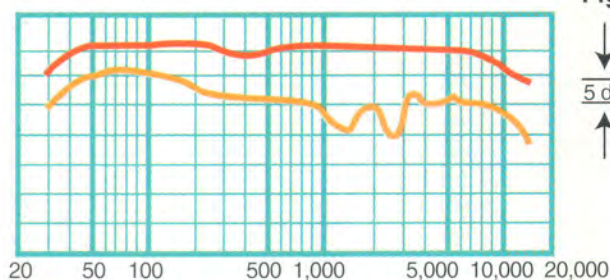
- Turn off all the microphones that are not in use.

### What Microphone Is Right for Me?

Good question! Many microphones are available today for podium applications. Many schools can use the miniature microphones. They are mounted on a thin gooseneck that is easy to move. This makes it easy to adjust for the different heights of various talkers. These microphones also have a very small profile so they look good. And best of all, they sound excellent! So don't be content with that old, big, ugly microphone any longer. Look into a new podium microphone today. Please call us for a recommendation for your application. We would be glad to help answer any of your questions.

■ Ron Huisinga

Figure 3a



■ Talker on Center Line  
■ Talker 5" Off Center Line

Combined frequency response for two microphones. The microphones are 2 feet apart and 1.5 feet from the talker.

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