

# The Sound Contracting Engineer

## LESS CAN BE MORE: THE 3:1 RULE

• As a sound company becomes larger, more and more time must be devoted to the management of the company, as opposed to the performance of the gig. Pursuing new clients requires time, a commodity that is in short supply if you are constantly working.

The factors determining which sound company will be hired for a tour or concert are usually: price, equipment, personnel, and quality of monitors. Of these, monitors usually determine if the band will want to use you again.

A quick survey of the top 20 sound companies would probably show that over half make their own monitors. Why bother, when so many manufacturers offer products designed for this purpose? A possible answer might be that most manufactured monitors are designed for what the public asks for, as opposed to what might make for an ideal monitor.

That might be considered a pretty bold statement, especially considering one of the companies I own manufactures monitors. However, from a sound company's point of view, there are many reasons that make building their own monitors the ideal solution.

### SMALL MARKET

Even though the esoteric home audio marketplace is small in comparison to the entire consumer base, to a manufacturer of consumer products there is still a fairly large marketing base. However, the esoteric live sound market is small, *very small*. Even if the top 20 sound companies each own 50 monitors, that's still only 1,000 esoteric monitors needed by the entire marketplace.

Even if they are replaced every few years, the market is still only a few hundred every year. Add to this the fact that many companies make their own, and the need for super high quality monitors becomes so limited that it becomes almost worthless for a manufacturer to pursue the market, except for promotional purposes that carry over

to their lower-priced, mass-marketed monitors.

Obviously, manufacturers are going to sell where the market is, and it is at the other end of the spectrum from esoteric monitors. Therefore, because the choices in super high quality monitors is so limited, and because your business may live or die by your monitors, it becomes very important to be sure that whatever you have is used correctly.

Due to space constraints, this article will devote itself mainly to the concept that you are not running multiple monitor mixes on stage, but rather only one or two mixes that everyone must share. After all, that is what 95 percent of the industry works with.

A few common mistakes can make a good monitor system work poorly, while some prior thought can often make a mediocre system perform very well. When I visit clubs, I usually see a bunch of monitors scattered around the stage, one in front of each microphone, with no prior thought to psycho-acoustics, phasing, or the 3:1 Rule. The reason most often given for doing this is, "That's the way it's always done," yet it is often the worst possible thing to do, especially on small stages. Let's look at some of the things you

need to be aware of to get the performance you want out of your system.

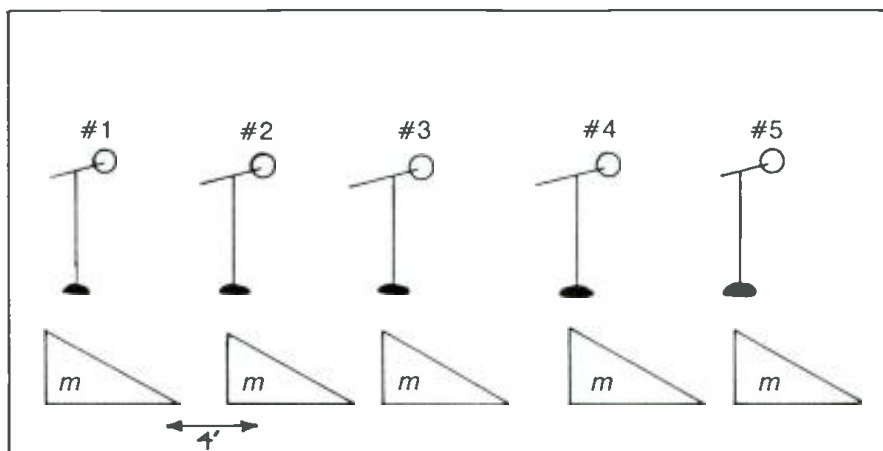
Every soundman should familiarize himself with both acoustics and psycho-acoustics. Acoustics is what happens in a room, psycho-acoustics is what your brain *thinks* is happening in the room. There can be a very large difference between the two.

For instance, you would think that if a monitor is placed to one side, only one ear hears it, so if it is placed directly in front of the mic, both ears would now hear it and therefore it would be more apparent. Although this is logical, in a noisy environment (like onstage) the brain searches for things that stand out as being different. A monitor placed slightly off to one side is going to be heard by one ear more, and therefore will be noticed by the brain more. The ideal position seems to be about 30 degrees off center.

### UNUSED MICS

If you ever work with David Bromberg, he will be very specific about this point, but he will be adamant about the subject of phasing caused by unused microphones left on. If there is a mic being used a couple of feet from an on, but unused mic, the unused mic will help create an environment that is the

Figure 1. Front view of a 20-foot wide stage. The distance from mic 1 to monitor 1 is five feet. However, the distance from mic 1 to monitor 2 is less than eight feet. In addition, mics 2, 3, and 4 all have a total of three monitors within eight feet of each mic.



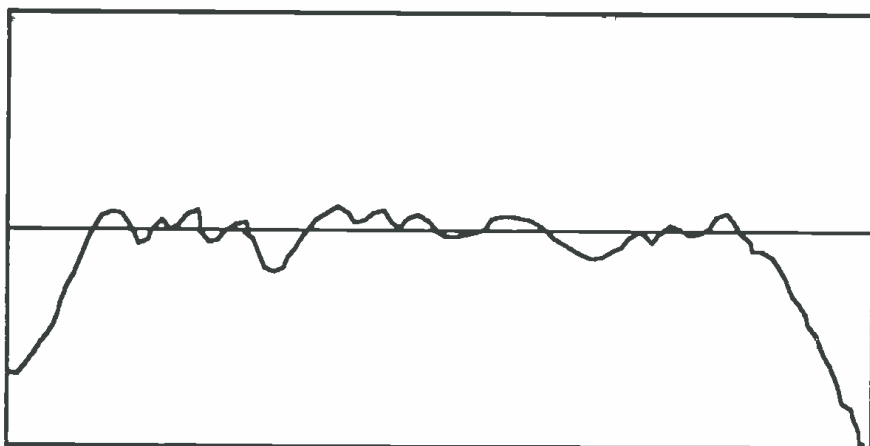


Figure 1A. Frequency response of mic 1 with only one monitor on.

equivalent of setting a digital delay on two milliseconds and sending that back through the monitors.

This results in a monitor system that sounds "washed out" and feeds back much quicker. The sound is lacking in mid-bass and has no clearly defined midrange. The only way to avoid this is by

turning off all unused mics in the monitors. (Of course, this also applies to the "house" mix. The more you turn off mics, the cleaner your mix will be. Even turning down the unused mics several dB makes a big difference. So, if a background vocalist isn't used in a song, turn off that mic.)

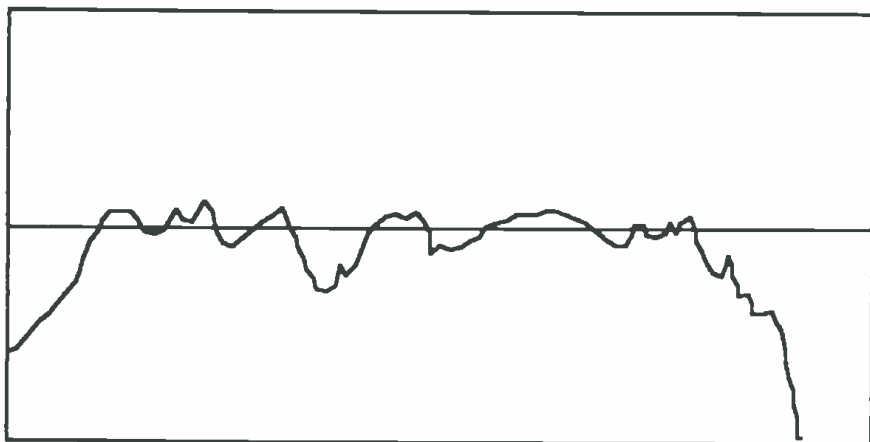
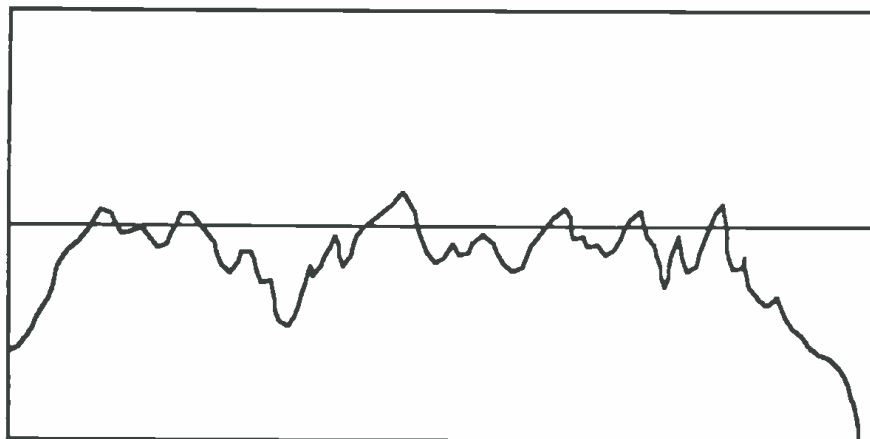


Figure 1B. Frequency response of mic 1 with all monitors on.

Figure 1C. Frequency response of the system with all mics and monitors on.



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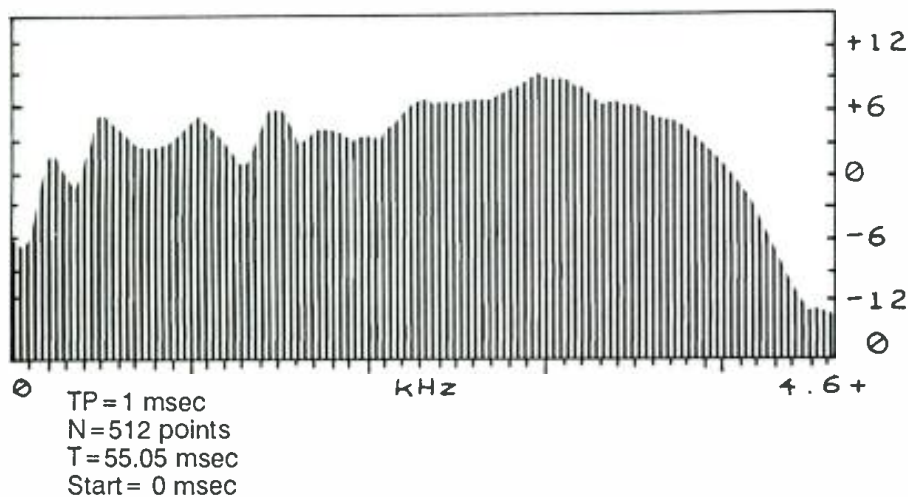
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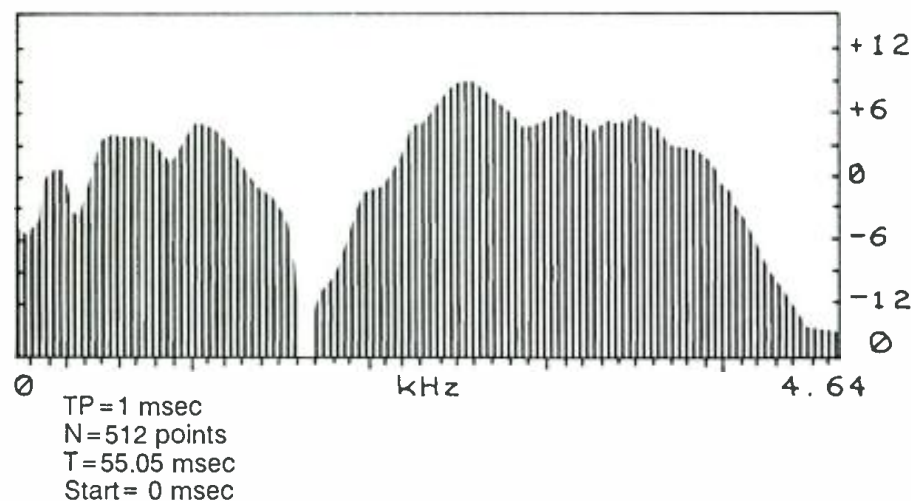
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The concept of two sound sources washing out the mix also applies to speakers. In fact, many people refer to the "3:1 Rule." The concept is that if the monitor is located next to the microphone on the stage (about 5 feet away), the next closest monitor should be located a minimum of 15 feet away from the mic.

A good example of this is a club with a 20 foot wide stage, and a band with five vocalists across the front. The concept of putting a monitor in front of each microphone would result in a situation where each individual monitor is located 5 feet from the microphone, while the next closest monitor is only 7.5 feet away (Figure 1). Obviously, this is going to wash out the sound. However, this doesn't happen just once, but is multiplied five times across the stage. In fact, the three center mics each have two monitors within 7.5 feet washing out the sound (Figure 1A, 1B and 1C).



IN ALIGNMENT



NON ALIGNMENT

Figure 2. These two graphs demonstrate the advantages of driver alignment. They show the crossover region where the high and low frequency drivers interact. The graph above is the response curve for the Sub-Atomic Pile speaker. Below, the graph is of the same system with the high frequency system slid back into the box five inches. A small change in driver placement can make a profound difference.



Figure 3. Two equalizer settings of aligned monitors. Because of the smoothness of an aligned system, the top eq is set to remove the peaks common to the Shure SM-57 while the bottom eq is set for a SM-58. Notice that the presence peak had to be removed from the SM-58.

In this situation, two strong sidefill monitors would provide more mics with more volume than five stage monitors. The center mic might benefit from a spot monitor (preferably on its own mix with only that mic in the mix), but the greatest level to everyone is from less, not more, monitors.

## PSYCHO-ACOUSTICS

Taking this logic further, you begin to see how two high quality monitors can be more advantageous than five inexpensive ones. If you remember last month's article on artist accommodation, some musicians don't feel comfortable without seeing a monitor in front of them, and feel naked with only a sidefill system. They may complain that the system is not as good as individual monitors. This is part of psycho-acoustics, the musician needing to feel comfortable. Sometimes psycho-acoustics can drive you psycho. (Please realize that I am not disapproving of spot monitors, just don't put a bunch of mics and monitors close together on one mix.)

One of the advantages high-quality monitors often have is that the components (woofers and tweeters) have been aligned. Basically, this means that the sound from the woofer reaches your ear at the same time as the sound from the tweeter. There are several ways to accomplish this (and this one subject could fill an article), but the importance is how it affects the sound at the crossover point, especially since the crossover point is usually in the middle of the vocal region.

An aligned system will add the woofer and tweeter together evenly, creating a smooth transition from the lows to the highs. However, if the high end horn is as little as 0.5 millisecond behind the woofer (6 inches), this will create a dip in the frequency response in the crossover region of 15 dB or more! This causes the midrange to essentially disappear for a 0.5 octave or so. Considering there are approximately 6 octaves from the lowest bass singer to the highest soprano, a 0.5 octave disappearance is the equivalent of throwing out 10 percent of the vocal range.

## WHEN NOT TO EQ

Some people might assume that this can be equalized back in. **DON'T EVEN TRY IT, YOU WILL BE PLAGUED BY FEEDBACK!** In the live sound field, too many people try to



fix acoustic problems by inserting another electronic device into the chain. Learn how to fix acoustic problems acoustically, instead of trying to "patch it" and you will have a much easier and better sounding system.

Notice that I have spent a long time describing how to use monitors, without ever mentioning equalizers. This is because most equalizers end up being overused fixing many of the previous problems, or the system becomes "over-equalized" and the equalizer creates as many problems as it solves. Many soundmen comment about how great a Modular P.A. sounds with the equalizer left "flat." In fact, 95 percent of our shows never use the equalizer at all. This is *not* to say that I don't believe in equalizers, but that most equalizers are misused or overused.

An equalizer is supposed to help you correct for deficiencies in the system. Properly used, an equalizer can improve the gain before feedback by as much as 6 dB.

The usual way to use an equalizer is to make the system feedback, then reduce the frequencies that are too loud, then turn the system up again and repeat the process. This works to a certain extent, but can get you into serious trouble. Although the equalizer is being used to remove unwanted frequencies, once you've pulled down the majority of faders, all you are doing with the equalizer is turning the system down.

A good general rule is: once you've used one-third of the faders on the equalizer, STOP! If an equalizer has ten bands (octaves), use three or four of them; if it has twenty-seven bands (1/3 octaves), don't use more than nine of the faders. Although rules are made to be broken, rarely break this one. If you need to use more than 1/3 of the faders on your equalizer, then you probably have other problems that need to be fixed.

Many soundmen choose their mics according to the sound they want to achieve in their "house" mix. This might make sense from that point of view, but from a monitor point of view it is severely flawed. A built-in peak in a microphone must be removed to get greater output from the monitor system. Choose your microphones carefully, or you'll use all of your equalization getting rid of the "sound" of the microphone.

A good example of this is the Shure SM-58. The SM-58 has a built-in presence peak that the SM-57 doesn't

have. Assuming your monitor system is flat, in order to get the loudest possible monitors you would need to remove the 58s presence peak with your equalizer. This isn't to say don't use 58s, but rather give some prior thought to how you utilize your mic selection (Figure 3).

As you begin to experiment more and more with these concepts, you will begin to understand why many top soundmen truly believe that less can be more. More importantly, you will

begin to experiment and think for yourself.

Sound reinforcement is a very young industry, with a great deal still undiscovered. Remember, we're talking about sound, something that isn't seen. It's not like the lights where either it's on or off, green or blue. Whenever you are told something can't be done, think about the problem and decide for yourself. After all, the superstar soundmen of tomorrow are the kids in garages experimenting today. 