

Taming The Wild Stage Monitor

Intuitively, a stage monitor setup seems like a really bad idea. The speakers are pretty close to the microphones, often pointing directly at the microphones – a perfect setup for feedback. Further, they have a tendency to muddy up the house sound since, because of the directional characteristics of loudspeakers, the audience hears a lot of bass coming from the monitor speakers but no treble, since the speakers are aimed at the performers. Still, stage monitors have become an essential part of just about every sound reinforcement gig. Here are some tips to keep them under control.

What Goes Into The Monitor Mix?

Since the monitors almost always get a different mix (or several mixes) from the front of house, you have some options as to what and how much to put into those speakers. An inexperienced band will say “We want to hear everything.” That’s a sure sign you’ll be in trouble. It’s important to figure out what’s NOT needed in the monitor and start building the mix from there.

Singers always want to hear themselves in the monitors, but it’s often not necessary to put electric guitars or bass in the monitors since those are usually loud enough on stage to hear directly. Unless the drummer wants to hear himself really loud (then you know you’re in trouble) there’s rarely a need for more drums in the monitor mix than is necessary to keep everyone in time.

Since feedback is usually the greatest bugaboo with a monitor system, the fewer live mics you have with loudspeakers pointing at them, the easier it will be to keep feedback in check.

Speaker Placement

When you set up the stage, take a good look around. Where are the monitor wedges pointing? We almost always use directional mics in sound reinforcement, and a cardioid mic has considerably lower sensitivity from the rear than the front. By carefully placing the monitor speakers so that they’re aimed right at the rear-facing null in the mic’s pickup pattern, you can increase the gain before feedback by several dB.

Also, as obvious as it seems, make sure the speakers are aimed at the players. A monitor blasting full volume at someone’s pants legs won’t help any of the players and will only make your job mixing the

house more difficult. Sometimes moving a wedge a few inches, tilting it at a different angle, or turning it a few degrees can make a big difference in how well it can be heard by the players (and can’t be heard by the mics).

Pay particular attention to monitors for seated performers. Wedge cabinets are usually constructed so that they fire upward at about the correct angle for a standing performer. Prop up the rear edge of the speaker cabinet with a 2x4 if necessary to aim it at the player’s head, not over it.

Ringin’ Out The System

Feedback occurs at very specific frequencies — the frequencies at which the total system gain from mic to speaker and around again exceeds unity. Using an equalizer (usually a graphic, though a parametric is more effective but a little harder to operate), we can reduce the gain at those troublesome frequencies so that it’s below unity.

Start with the equalizer set flat, the master level control for the monitor system turned all the way down, and the Aux Send mix levels set about where you expect them to be. This is only a guess at this point but you have to start somewhere. Now slowly raise the level of the master send and pretty soon you’ll start to hear the system howl at some frequency.

Back it off a little so the feedback just stops, and then start pushing the sliders on the graphic equalizer up one (and only one) at a time until you find the one that makes the system start to howl. That’s your first feedback frequency. With experience, you’ll start to recognize those frequencies and automatically reach for the right slider.

Once you’ve located the hot frequency, pull that equalizer slider down several dB and raise the master send level again. You should now find that you can bring the monitor gain up a little farther than before until feedback starts again. Hopefully the feedback this time will be at a different frequency – if not, you didn’t take the first frequency down far enough. Move its slider down a few more dB and continue. A couple of times through this exercise and you should be able to get enough level in the monitors before feedback occurs to satisfy your players.

There are a couple of problems with this process that you should understand, however. The feedback

is caused by a very high Q resonance somewhere. That means that the feedback frequencies will fall within very specific and narrow ranges. The resolution of your equalizer may be such that the feedback frequency falls in between two bands, and taming that frequency requires too deep of a cut at one (or even both) of the surrounding frequencies.

That can take a pretty big chunk out of the spectrum. You can reduce the feedback, but when the singer does his sound check, he'll tell you that his voice doesn't sound right. The reason is that he's missing those frequencies from his voice that you just took out with the equalizer.

A 1/3-octave band equalizer is better than a one octave band EQ for controlling monitor feedback, and a parametric equalizer is even better. With a parametric, you can start ringing out the system by following these steps in order:

1. Use a fairly wide bandwidth (1/2 octave or so).
2. Boost.
3. Sweep the filter to get in the ballpark of the feedback frequency.
4. Narrow down the bandwidth and sweep over a smaller and smaller range until you nail the frequency accurately.
5. Cut as much as you need within that narrow frequency range so as to remove as little of the spectrum as possible.

Another problem is that as the stage fills up with players, the house fills up with audience, the mics move when a guest comes out, and the air temperature and humidity change, the natural feedback frequencies will change. This requires that you make some adjustments during the show. For this reason, mixing monitors for a large show or venue is almost always done by someone other than the house mixer, and with a separate console. It requires a lot of concentration.

Be A Good Diplomat

To minimize problems, try to minimize what goes to the monitor speakers. It's almost impossible to get the band to turn down, but the quieter they play, the better they'll hear the monitors, and the fewer problems you'll have mixing the house. But frustrating as it is, don't fight with the band. You really have to give them what they want to hear or they won't put on a good show. A good portion of the job of mixing monitors is personality. Let them know that you want to

know what problems they're having, and don't expect them to solve your problems for you.

Often you can make suggestions for the band's setup that will make them sound a lot better and hear better. Is the bass so boomy on stage that it's indistinct and has to be much too loud to be heard clearly? Help the bass player adjust his tone controls. Get clarity at the source and he'll thank you. Turning or tilting an amplifier cabinet or raising it up off the floor often gets the direct sound up to where it can be heard without being so loud, or without having to be put into the monitor mix.

Good Mic Technique

The better mic technique the singers have, the more level you can give them before feedback occurs. Vocal mics have a tendency to pick up everything if the singer isn't really close. When this happens, turning the singer's mic up in the monitor mix not only brings up his voice, but everything else on stage, and that doesn't help him to hear himself any better; he's just louder.

EQ for Other Reasons than Feedback

Try to minimize the frequency range that you're sending to a monitor. Think about what it's doing and get rid of the frequencies that you can't use. A 12" wedge isn't going to reproduce much below about 60 Hz, so use your graphic equalizer or low-cut filter to take off some bottom end. It'll make more headroom in the amplifier for the range where you really need it. You can almost always cut some of the monitor signal in the 250-350 Hz area on the drums because there'll be plenty of that floating around the stage acoustically. You may find some other frequencies that you can cut without affecting the sound. The more low frequencies you can cut out of the monitors without the band sounding thin, the less trouble you'll have in the house.

Pflop the Phase

One old road dog monitor engineer trick is to reverse the phase, or more accurately, the polarity, of selected monitor speakers. There are a couple of reasons why this sometimes helps.

First, in addition to having unity gain around the feedback loop, the microphone and speaker signals have to be in phase in order for feedback to occur. If they're out of phase, you need more than unity gain before feedback will occur. Phase of an acoustic source isn't a simple parameter - it's different for

every frequency and it changes every time a mic is moved relative to a speaker. But by reversing the polarity of the speaker or the mic (which creates a 180 degree phase shift at all frequencies), you may be able to put the most offending frequency farther out of phase in the feedback loop, giving you more available gain before feedback.

There's also a physiological reason why inverting polarity of a monitor may improve its audibility. When you sing, you hear your voice both from outside your head and from the inside as well, through the passages that connect your throat to your ears. If the speaker is pushing air against the outside of your eardrum at the same time that your voice is pushing against it from the inside, the two are going to partially cancel. If one is pushing while the other is pulling, your eardrum will move further and you'll hear the sound louder. Some people won't notice a change at all, but others will find it dramatic. You can't change the length of the singer's throat, but you can change the polarity of the voltage going to the monitor speaker.

Mackie compact mixers don't have polarity switches for the mics or outputs, but you can reverse the speaker polarity by reversing the two leads from the amplifier to the speaker. It might help. Chances are this trick will only work for one singer or one mic, but it never hurts to try. You might save the day.

You can make or buy a couple of microphone polarity reversing adapters to carry in your tool kit. A short piece of mic cable that's been "miswired" so that pins 2 and 3 are swapped on one end makes a handy mic polarity inverter. Just patch it in line with the mic cable and you've inverted the polarity of that microphone.

Exceptions, Of Course

There are times when a well-balanced monitor mix—essentially the same as the house mix—is really what you need on stage. You'll find that all-acoustic groups such as bluegrass or non-electric Celtic bands want to hear a mix like this. Their instruments are all pretty near the same volume and they balance pretty well acoustically, so they just need a monitor mix that's loud enough to overcome distractions from audience noise or slapback echo from the house speakers bouncing off a back wall. (Consider turning the mains DOWN!!)

You may find that an effective way to create a monitor mix for a group such as this from the FOH console is to use post-fader/EQ sends rather than

pre-sends. Starting out with the sends on all the channels turned up to the same level will give you the same mix in the monitors as you're hearing in the house. From there, you can make adjustments based on the players' requests. As things change and you make adjustments in the FOH mix, those changes will be reflected in the monitor mix. But you have to be sensitive to what the players are actually doing, otherwise you'll be fighting them, and that's not good.

In-Ear monitors are becoming more popular, and this is a very good thing. Many bands today are playing without monitor speakers at all, which greatly reduces the volume coming off the stage (since amps don't have to turn up to compete with the wedges). Often, though, since everyone wears his or her own private "monitor speaker" there will be requests for a separate mix for each performer. You may not have enough sends on your console to create all of those mixes.

One approach to this is to use the auxiliary sends on the main console as submasters, and use a second console to mix those submasters to individual ear-phone mixes. For example, you could use one auxiliary send for the drums, and give everyone who wants the drums in their monitors the same drum mix. It's a bit of a sanity saver if it works for your artists.

Notes
