Getting the Most Out of Personal Monitor and IEM Systems

By David Holland

This article is for anyone currently using or looking into using personal monitor mixers and IEM systems.

History

President/CEO of Future Sonics Incorporated: Marty Garcia introduced the original concept of personal monitors (a.k.a., in-ear headphones, canalphones, professional earphones) and their systems to the pro-audio/sound reinforcement industry in the late 1970's and early 1980's during a tour with musician/producer, Todd Rundgren/Utopia. In addition to his Ear Monitors® brand products, Garcia's experience as an engineer, product developer, audio consultant and innovator brought forward a wide range of his own designed audio systems starting with his first production company, Crystal Sound, in 1979.

The IEM solution offers distinct advantages:

1. No monitor feedback
2. Cleaner stage sightline
3. Better mix and sound quality
4. Talent can control levels to protect their hearing

OSHA (Occupational Safety Health Administration) recommends only 15 minutes exposure to sound pressure levels at 115 dB SPL. It has been documented that a snare drum played hard produces roughly 150 dB SPL at six inches! Imagine what an entire kit played hard produces – now add the band and monitors. What did you say?

The Problem

In live venues, most engineers quickly realize two things:

1. The instruments and stage monitor levels are too loud off the stage
2. These levels make it difficult (or impossible) to obtain a studio quality mix in the audience, especially when trying to mix the audience sound level lower than that coming from the stage. This causes bad recordings and often an imbalanced mix.

Church Sound

Church sound, audio for video, tape ministry, and productions have become increasingly complex with the advent of contemporary praise bands. The stage sound level simply gets out of control for the audience and sound engineer. Many churches have inexperienced volunteer sound engineers which may compound the problem. In a perfect world, we would have the same sound environment in the church as in a recording studio since most of us are recording in real time. IEM's and personal monitoring can help solve the sound pressure problems.

If you want a studio type environment for the engineer, consider removing stage loudspeakers and replacing them with POD like preamps for bass and guitar. As an alternative to POD style preamplifiers, consider relocating guitar amplifiers to a closet or under the stage. A handy way to do this is to use a remote controlled AC power strip outlet for the amp, such as a Furman or Juice Goose. Now the guitar player only needs effects pedals and the remote AC power switch. Some may say they need to hear the speaker… well that may be difficult with IEM's.

Suggest the drummer use electronic drums. If the drummer refuses or screams when you mention electronic drums, consider the IsoPac by ClearSonic. http://www.clearsonic.com

One last note for drummers and bass players desiring more low frequencies, there is a product called Butt Kicker that works really well to produce the low frequencies without adding sound pressure levels. When used with IEM's it is a very pleasing solution. http://www.thebuttkicker.com

Psycho-acoustics and IEM

To be comfortable using in-ear monitors or headphones live, it's a good idea to gain a basic understanding of psycho-acoustics. Psycho-acoustics is our perception of the combination of direct sound sources as well as reflections from room surfaces. When we perform, we experience this important spatial information. I feel it's imperative to retain psycho-acoustics to be comfortable using IEM systems. It should be noted that spatial information is lost when you are using IEM systems because they attenuate ambient sound. A mono dry mix can cause the talent to lose the very reason they are playing – to convey emotion, the message, and to make beautiful music. None of these is achievable if we are uncomfortable with what we hear. To play our best, we must sound our best.

Good News – you <u>can</u> retain valuable information

1. **A baseline stereo mix (as perceived on stage) to retain spatial information is key.** If everyone has a good baseline stereo mix, or **"Perfect Mix"**, then all they need is their "more me", or perhaps two or three if they sing and play. The stereo version of the FOH mix is <u>vital</u> for the music director and talent to hear what the audience is hearing!
2. One or two audience ambient microphones placed at the stage front line will restore the audience sound and missing reflection's you heard before going to IEM's. Locating the microphone(s) away from the stage will cause undesirable delays (about 0.001 sec per foot). Additionally, using a limiter on the ambient mic channel(s) is a good practice to prevent the signals from becoming too loud in the mix. With a stereo mix and some controlled reflections - IEM systems are much more enjoyable.

Personal Monitor Mixing

With conventional monitors, or wired/wireless IEM's, there is always a need for a "more me". ("Hey Joe, can I get a little *more me* in the monitors"). This age-old problem is the leading cause of sign language between talent and engineers.

Personal monitor mixing eliminates sign language and lets you Control Your Mix®**.** Just what signals are required? It's my opinion that it requires two primary signals:
1. A quality "stereo mix" from the front of house console
2. A "more me" or two, just like what we get in a recording studio

We all know trying to mix monitors from the FOH is virtually impossible because you can't mix something you can't hear! Hear Back® solves this problem. You can even rehearse without the PA speakers turned on!

How to Connect Personal Monitoring or "This is the Tricky Part"

First, let us assume a church requires ten "more me" signals. In addition, we need a quality stereo mix – or the "perfect mix". Now, that sounds easy - right? Well in the real world, it can be very difficult or impossible with the mixers many of us are using.

The rule is if it uses a microphone - it needs equalization!

While electronic instruments such as synthesizers, electronic drums, and modeling guitar preamp's produce good tone without EQ, they can use pre-EQ outputs on your console. However, all inputs (voice or instrument) using a microphone need a post-EQ, and pre-fader send. The post-EQ signal makes the voice or instrument sound better, and the pre-fader prevents the sound engineer from changing your "more me" levels.

So where do we connect our personal monitor mixer's ten "more me" inputs? The typical console output choices are:

1. inserts
2. direct outputs
3. Aux sends
4. ADAT output for digital mixers

Most manufacturers provide direct outs and inserts that can be used for the "more me" outputs, but unfortunately they are often pre-EQ, which means vocalists and acoustic instruments sound bad. If your console doesn't have post-EQ direct outs or inserts, then it will require ten, post-EQ, and pre-fader AUX outputs, not a common feature on most consoles! Additionally, you will likely need another one or two post-fader sends for effects.

Connection Solution

Because of repeated conversations with end user's about the lack of post-EQ/pre-fader sends, Hear Technologies developed a 16 x 12 x 2 x 2 monitor mixer called Mix Back. The Mix Back has sixteen inputs, a stereo AUX input (for the "perfect mix" from FOH), two stereo outputs (the "perfect mix" when used stand-alone) and twelve mono analog outputs. The master outputs are available simultaneously as analog, ADAT optical and Hear Bus. The Hear Bus outputs permit connecting two stereo "perfect mixes" and twelve "more me" signals using two CAT5e cables to two Hear Back systems. Additional units may be strapped together for larger systems.

Each channel of the Mix Back features a built-in passive mic split so you are independent of the main FOH console. You now have your own tone control as well as effects send and level controls. Now you simply assign the "more me" signals to the Hear Back Hub(s) and give each talent their required "more me" signals. Mix Back and Hear Back are a simple, flexible, affordable, and great sounding solution to any monitor application.

Figure 1 is a basic connection diagram. Notice the FOH "perfect mix" connects to the Mix Back stereo AUX input, which may be routed to Stereo 1 and 2 masters. Send the perfect mix to as many Hear Back Hubs as desired and have unlimited "more me" controls. It is much easier for the talent to control only their "more me" knobs and the "perfect mix" rather than trying to mix everyone.

More good news about Mix Back

When using IEM's, we experience several dB of attenuation of external sound. This makes it difficult for the music director to communicate with the talent. Mix Back features a built-in talkback mic preamp, controlled using a sixteen button remote. The remote permits the music director to speak to any or all of the twelve "more me" outputs and to each of the stereo buses (example: all vocalists or all musicians). Additionally, Mix Back has a balanced talkback output that can serve as a means to communicate to the FOH engineer. Visit www.HearTechnologies.com for more details.
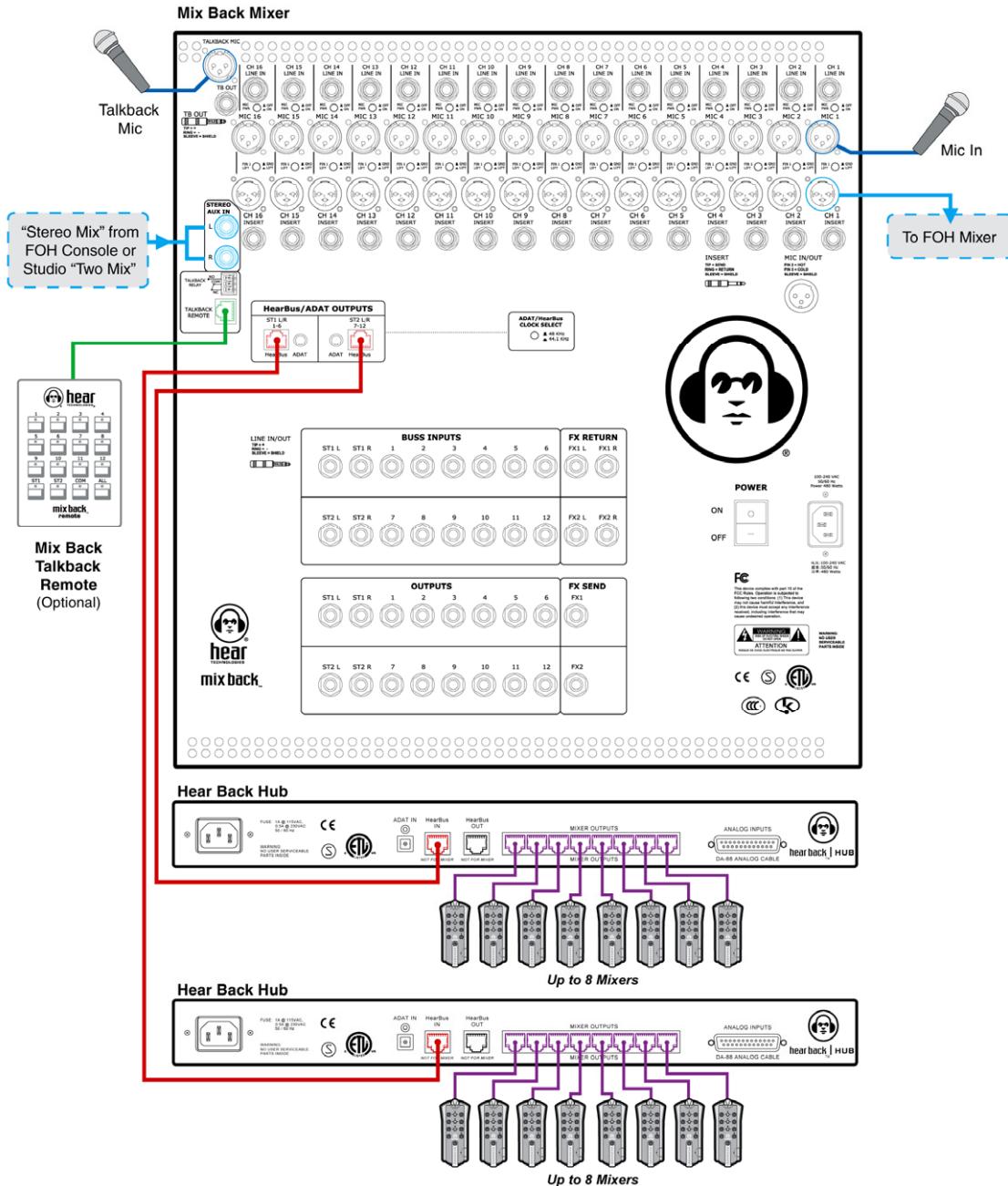

Figure 1
Mix Back with twelve "more me" inputs, perfect mix and talkback