so your church is considering
IN-EAR MONITORING…

your IEM questions aswered, part two

by Thom Fiegle

In Part 1 of this article, we focused mainly on performers and earphones. In this installment, we will cover a few basics on selecting in-ear systems, then on their implementation, centering on sound engineers and systems for delivering in-ear mixes to performers. To review: the best candidates for in-ear monitoring (IEM) have been identified. Systems have been selected—either wired or wireless, depending on the performer. Earphones have been chosen based on price, sound quality, comfort and other factors.

Our new IEM systems have arrived. What happens next?

Now comes the hard part—keeping everyone happy during the transition. The only statement I would make as a rule is: do not experiment during actual performances! The combined stress of a performance and a new monitoring method can be a sure way to have the performers NOT like the transition. Other than that, there are no hard and fast rules, only guidelines.

Let the musicians take their earphones home to listen to their portable music players. Talk to the praise band as a group. Let them know that the transition is for the benefit of the congregation and to help keep the message of the service clear. Everyone involved should want to work toward that goal.

Adjusting to personal monitoring takes time, so schedule some rehearsals for this purpose—even if only one or two performers are switching. So take your time. Don't force the issue.

How should we handle rehearsals?

During initial rehearsals I advise keeping the wedges in place. Mute them, disconnect them or just turn them off, but don't remove them from the stage right away. The main reason for this is the comfort factor. If using the new IEMs becomes a problem for someone, you can activate that wedge as a fallback just to get through the rehearsal. You don't want to waste the other members' time trying to cater to one person's discomfort.

Resist the temptation to let the performers wear one earphone AND listen to the wedge. This technique does not help the onstage volume situation and can be very dangerous to the performer's hearing. The one-in, one-out approach is the worst of both worlds, subjecting the open ear to the loud sounds on stage, while the ear with the earphone ends up getting turned up as loud as the open ear.

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After a few rehearsals, both the engineer and the performers should have reached a comfort zone with their new IEM systems. At this point, you can remove the monitor wedges from the stage for good. Think of it as a trophy won at the end of a race; you only get it after getting to the finish line.

My budget only allows for a couple IEM systems. Is it worth the trouble?

Absolutely! Keep in mind the primary benefit of in-ear monitoring: decreasing the amount of sound on stage. By reducing stage volume even a little, alleviating even one performer's struggle to hear well, progress is being made. It builds momentum. Technical preparation for a group's transition to personal monitoring can allow for little improvements over time, resulting in everyone's needs being fulfilled because each individual can receive the personal attention needed to make the leap of faith.

Custom-fit earphones offer superior sound, fit, and comfort. Shown here: the ProPhonic 2X-S by Sensaphonics.

How different is the mixing process for in-ears?

Assuming your church is already providing individual mixes to the various band members, the differences are not too drastic. The two most important issues are the lack of external loudspeakers (floor monitors) and the ability to provide a stereo mix.

Without floor wedges in place, only the performer can hear the in-ear mix. This is a distinct benefit, since floor monitors can affect everyone in the room when they are turned up. With IEMs, only the people wearing them know what they are hearing. For this reason, it's critically important that the mix engineer have personal monitor earphones, so he or she can hear what the performers hear.

The direct in-ear mix itself is essentially similar to mixing for wedges, except it is generally done in stereo, whereas wedge mixes are monaural. This is an advantage for the monitor mixer, who can provide a more precise and listenable mix.

Do we need a separate monitor console?

Many contemporary houses of worship have only one mixing console, located in the seating area so that the sound operator can hear the mix they are providing to the congregation, while also providing the monitor mixes to the performers on stage. It's not an optimal situation.

It should be emphasized that a lone, volunteer sound operator should not be responsible for more monitor mixes than he can handle. This is not to imply that certain FOH operators are not capable of mixing monitors from the main console, but it's a difficult and distracting task at best.

The simple fact is, a good sound operator is listening to the mix at all times. One person cannot hear both a speaker system pointed at the audience AND a personal monitor mix through an isolating earphone at the same time. In terms of best practices, my recommendation is to separate the responsibilities for house and monitor mixing. I promise that each mix will benefit from having a dedicated operator to focus on it.

What are the main advantages of separate consoles?

Monitor consoles are generally located to the side of the performance area, allowing easy communication between engineer and performers. This proximity also allows the monitor operator to be near the acoustic event and thereby make intelligent decisions about how much of which signals need to be mixed into (or out of) the performers' earpieces.

For those using wireless systems, this location offers the assurance of clear line-of-sight between transmitters and receivers, thus providing better reception for both wireless mics and IEM systems.

We can't afford a monitor console right now. Is there an alternative?

If you can't afford a second mixing console, add another volunteer! A monitor engineer working from the main console, wearing isolating earphones, can concentrate on the various mixes on stage, leaving the FOH engineer free to concentrate on mixing for the congregation. It's not the optimal solution, but is often more effective than placing the entire burden on one engineer.

It's really all about the performers. To deliver their best performance, they need to hear their mix clearly and to be comfortable on stage. Some of that confidence comes from knowing they have a dedicated individual listening to their

Advice From The Sound Guy: Mixing Monitors From Front Of House

A sound engineer needs to know each part of the audio signal path, from microphone inputs to loudspeaker (or in-ear monitor) outputs. To effectively mix in-ear monitors from the front of house (FOH) mixing console, it's especially critical to understand how sound flows through the mixing console. In practical terms, the key concept involves the two types of auxiliary (AUX) outputs found on the console – PRE and POST.

The PRE and POST condition of auxiliary outputs on a mixing desk behave in different ways. This is a pivotal concept that must be fully understood before we can go any further. So before we go there, let's start at the beginning of the signal chain and follow it through a system.

INPUT STAGE

A microphone connects to a wire that sooner or later makes a connection to the first stage of a mixer – the Input Stage. A microphone has a small voltage range, so it requires "preamplification" to boost that small voltage up, thus changing the signal from "mic level" to the larger and more useful "line level." Once the microphone is boosted to a level that offers a usable signal-to-noise ratio and enough headroom for a wide dynamic range, its signal travels down the rest of the mixing board's channel strip. Every other stage in that channel strip is dependent on the input stage's level--so when that level is adjusted, every stage of the channel strip is adjusted. The input stage is located at the top of most channel strips and generally gets adjusted once and then left alone.

Generally (and some consoles makers differ), there are two different outputs available right after the input stage. The first of these is called a Direct Output. The second is half of a duplex connection called an Insert Point. What's important to know is that a Direct Output is a line level version of the (mic level) Input Stage, and so is the "sending" side of an Insert Point

Sometimes the Direct Output comes before the Insert Point, sometimes it comes afterward. Sometimes the Insert Point comes before the Equalization Stage, sometimes after. Check the user's manual or block diagram of the mixing console you are using to determine where in your channel strip these connections are.

EQ STAGE

After these two patch points (available on the back panel of the mixer) comes the Equalization Stage. These are tone controls not unlike the Bass and Treble adjustments on a car radio or home hi-fi, but much more powerful. Most sound engineers could write a whole book on equalization (EQ), so I won't go into all the different types and what can be done with them. Just realize that sometimes the EQ affects all of the outputs on

mix and helping them if needed. Having a monitor engineer helps ensure their needs will be met, allowing the musicians to concentrate on their performances.

What makes monitor consoles different?

In general, a monitor console is optimized to provide a large number of individual mixes. Some of these monitor consoles do not even offer faders, using rotary knobs instead, allowing many more auxiliary sends to fit on each channel strip. Because IEM mixes are best done in stereo, separate stereo outputs are needed for each mix.

Monitor consoles designed for use with IEM systems offer lots of stereo auxiliary sends (with one control for level and another for panning) in addition to typical mono aux sends. Most, if not all, of these aux sends are configured as PRE fader or at least offer switching between PRE and POST. (See the sidebar article for more detail.)

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How do I select the right volunteer to mix monitors?

Monitor mixing is really a service business. The engineer provides individual mixes to the performers, each of whom has different needs. The mixers best suited for this role can handle personality conflicts and demanding requests with as much ease as reading a technical manual. Just knowing how all the equipment works does not guarantee a good outcome when a performer asks for something unusual in his or her mix. Good monitor mix operators can generate mixes with a smile and a nod; the word "no" is practically outside of their vocabulary.

While some techs might discuss how or why a request is absurd or impossible, the best monitor engineer is the one who says, "Let's try it and see." This technician will make a few adjustments and ask, "how's that?" Nine times out of ten, the performer will be so pleased that someone even tried their idea that they will be satisfied. If the idea falls flat, at least the attempt was made and a lesson was learned. I try to encourage new mixing students to try everything; they'll remember what works—and what doesn't!

> Without a monitor engineer, performers must be willing and able to take matters into their own hands and satisfy their own requirements.

What about having the performers do their own mixes?

This involves the use of distributed audio networks, like those by Aviom and Hear Technologies. These digital systems distribute multi-channel audio from a central hub to individual miniature mixers around a performance area via CAT5 cables. Performers then plug their earphones directly into their mini-mixers. These devices are wired (i.e., not wireless) by nature, and offer many of the advantages of individual IEM systems.

These systems usually connect to an existing console's Direct Outputs or the sending side of its Insert Points. The hub accepts up to 16 channels and converts them to a data stream that travels down a single CAT5 (like Ethernet) cable. This cable is then attached to a number of mini-mixers, which are all daisy-chained together. This allows the performers to mix their own monitors. This

a mixer, sometimes it affects only some of them, and other times it only affects the FOH mix. It depends on your console, and how it's set up.

Some manufacturers place little jumpers inside of the mixer to allow advanced users to modify the way an EQ circuit behaves based on individual needs. If you are considering purchasing a new mixing console to help facilitate personal monitor mixes, do some research to find out which brands and model numbers offer the degree of flexibility your services require.

AUX STAGE

OK, so the signal is preamplified, possibly inserted upon and probably equalized in some way. Then the signal arrives at a mixing matrix know as the Aux Stage (short for "auxiliary"). These are rotary knobs that act as level controls for any purpose that is NOT the fader mix. (The fader mix, also called the House, FOH or Main mix, is controlled by the ubiquitous sliders, called faders, found at the bottom of each channel strip.) Aux Sends, on the other hand, come in the form of knobs. They work just like faders, turning a signal up or down by a certain amount. They just take up a lot less space on the channel strip.

I had to tell you all that so that I can tell you the next part. This is important: sometimes, these Aux Sends are independent of the fader position (known as PRE fader) and sometimes their actual level is dependent on the position of the fader below it (known as POST fader). Sometimes, a group of Aux Sends can toggle between PRE and POST.

When generating monitor mixes from the FOH console, in 99 percent of all cases, the Aux Sends should be PRE fader. This is so that any changes made with the main faders in adjusting the main house mix, will not affect the level of the monitor mixes on stage. (And vice versa, for that matter.) Rarely, if ever, are the adjustments made for the FOH mix the same kind of adjustments that a performer would want.

However, and there are always exceptions. Some individual channels can indeed benefit from a POST fader level being sent to the monitors. A good example is the worship leader's pulpit or altar microphone. But as a general rule of thumb, monitor mixes done from the FOH console should be done with the Aux Sends set up for PRE fader operation.

In my experience, this simple tutorial has proven to be very helpful to volunteer sound operators faced with the prospect of mixing in-ear monitors from the main house console. If I could offer only one more piece of advice for this situation, it would be to invest in good earphones, so that you can hear the in-ear mix exactly as the performers on stage do.

—by Thom Fiegle, The Sound Guy

A typical analog monitoring console, the GL2800M from Allen & Heath can provide up to eight independent stereo monitor mixes.

technology has been received with open arms by houses of worship wanting many individual mixes without a dedicated monitor console and engineer.

Isn't this the simplest solution?

Well, yes and no. Before jumping right into this method of audio distribution, some serious soul-searching must take place to determine if everyone up on the deck really can and should control their own mix. Without a monitor engineer, performers must be willing and able to take matters into their own hands and satisfy their own requirements. For some this is liberating; for others, it can be frustrating and distracting.

Some performers have their hands full with drumsticks, guitars, etc., and don't really have the time, energy or know-how to get the most out of these devices. However, in the hands of a willing and able worship team, these types of devices can really help get monitor mixing under control. Since these devices are digital by nature, the ability to save and recall mixes at the touch of a button comes standard. So if the same performer plays in the same ensemble every week, that mix can be stored as a preset on his mini-mixer that generates, at least, a starting point for each service. (A digital mixing console has the same benefit.)

It seems like we need a little of everything. How do we do that?

Just like it's absolutely OK to have a hybrid stage consisting of IEMs and loudspeakers, its fine to add distributed audio as appropriate. This allows a sound engineer to handle the key monitor mixes from the console, while the remaining performers handle their own mixes onstage. Often, a "troublesome" performer who is very demanding is best handled by letting him/her make their own mix. If nothing else, they will quickly learn that getting a good mix is not as easy as shouting a few demands to the beleaguered sound engineer. After all, the Lord helps those who help themselves!

Should the in-ear mix be done in stereo or mono?

In a word: stereo. God gave us two ears for a reason. We use these left and right pickups (our ears) to more accurately perceive and understand our environment. The brain uses localization cues originating from left and right as much as it interprets how loud a sound is; what note was played when, and where it came from. Similarly, stereo in-ear monitoring surpasses mono. So whenever possible, mix IEMs in stereo.

Can you give an example of how stereo improves the in-ear mix?

The biggest benefit is left/right panning. If two guitarists are monitoring in mono, each might have a hard time distinguishing which is his or her own. Sending one guitar a little bit left and the other guitar a little bit right makes them easy to differentiate.

> If a section of players shares a mix, they can hear their *ACOUSTIC BLEND* as opposed to having the mixing board blend for them. This can result in better *PERFORMING*, in addition to better MONITORING.

The result is that both guitars can actually be quieter in the mix overall, but each player can easily pick out—by location, not volume—their own sound. This technique can be employed with any two (or more) instruments that are similar in frequency response: two voices, a guitar and a saxophone, organ and choir, etc.

A little panning goes a long way. In general, avoid full left/right panning unless the stereo sound needs to be wide, like drum overheads or a piano.

Does stereo monitoring require more channels?

Yes. Each stereo monitor mix requires two outputs from the mixing console. So it's important to know how many Aux output channels are available from your console. If your band requires a lot of monitor mixes, some of them may need to be mono if your console lacks a sufficient number of outputs. It's also possible to add extra channels through auxiliary send expanders, which are much less expensive than a full console.

How many mixes does my worship band need?

The musicians will tell you that they each need a separate mix, and everyone has individual preferences for what they prefer to hear. Certainly, the worship leader, praise band leader, and soloists will need their own mixes. However, sometimes the rhythm section (drums, bass) can share a mix. In large assemblies, certain sections, such as horns or backing vocalists, can be grouped together for mixing purposes.

Author Thom "The Sound Guy" Fiegle recommends having a dedicated monitor engineer, especially with in-ear monitors. Note his use of IEM earphones while mixing.

How does having fewer in-ear mixes help?

With fewer mixes required, the sound engineer can more easily keep track of them all and make them sound good. It can also save money. A three-piece horn section can be outfitted with one transmitter and three identical receivers, instead of three complete IEM systems. Not only does this save money, but it also saves on the number of wireless channels to be managed. If a section of players shares a mix, they can hear their *acoustic blend* as opposed to having the mixing board blend for them. This can result in better *performing*, in addition to better monitoring.

How much does it all cost?

Outfitting an entire stage with in-ear monitors can be expensive. The good news is that it can be done incrementally, even one performer at a time. So unlike the purchase of a full sound system (or even a mixing desk), it's easy to control costs by implementing IEMs one or two at a time. It's also a lot less stressful.

OK, I'm sold. But who should get the first system?

The glib and easy answer is: whoever needs it the most. To ensure success, it should be whoever wants it the most. In many churches, it's the worship leader. In terms of realizing the greatest benefit, the best candidate for in-ear monitors is the person with the loudest monitors on stage, usually the drummer. This has the added advantage of making your first system a hardwired system, eliminating any potential wireless issues.❖

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At Sensaphonics, Thom's mission is to help customers make a smooth transition to IEM systems, while also helping design new products. Previously, Thom worked for Shure, most notably as product specialist for personal monitors and technology liaison for advanced development engineering.

With his extensive experience and expertise in product development and live sound, Thom Fiegle offers a unique perspective on the proper use of personal monitors. Contact him at soundguy@sensaphonics.com.