

TE3270 Assignment 1
Studio Engineering Research Project

“Effective use of foldback”

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Overview

What is foldback?

Foldback, also known as monitoring, is the term used to describe the mix that the performers will listen to whilst recording in a studio. This is usually a different 'dry' mix and each performer will often have their own personal mix.

What is the importance/purpose of foldback?

Foldback ensures that a performer keeps in turn and in time. Relying on spill from the instruments and the reverberations in the studio could cause singers to become out of time or hinder them hitting notes.

This Report

In this report, I will investigate the technology, workflows and important points to consider when effectively using foldback. I have tagged key points in **bold**.

Technology

Live

Most commonly used are foldback **wedges**, named because of their wedge shape. These are simply speakers on the floor aimed towards the performer. However, these create a lot of extra noise in a studio or on stage. On stage, If multiple performers have multiple wedges between them, they will often compete against each other's wedges, usually leading to a 'more me' war, also known as loudness wars¹, where performers repeatedly ask for 'more me'. This is a byproduct of multiple performers having to share one speaker and mix. Even if each performer has their own wedge, **spill** from other speakers can mask or completely block out crucial parts of the performer's foldback mix. A front of house sound engineer will often have to run his system louder to compete with the on stage volume.



Drummers will often use over-ear **headphones** as the cushioning provides a lot of noise cancelation. This allows them to clearly hear a click track or metronome to keep time.

Another option is **In Ear Monitors**. IEM's provide a lot of sound **isolation** for the performer. They are also more discreet than headphones which is better for live performance. Having the mix direct into your ears is ideal as it means the performer can have an **individual mix**. However, this does mean that anyone who needs to speak to the performer needs to use a microphone, otherwise they will not be heard. IEM's also come with a risk of **hearing damage**², especially if they are used for long durations at high volumes³. This is because despite running at lower volumes, they are much closer to your ear, therefore often run at a higher relative SPL (Sound Pressure Level). They also have a lower dynamic range than other foldback methods. This means that getting the mix right is very important as small deviations can cause a clear, balanced mix to become muddy. IEM's can either be

¹ Harrison, G. (2004) On-stage monitoring. Available at: <http://www.soundonsound.com/sos/mar04/articles/livesound.htm> (Accessed: 24 November 2015).

² Gordon, K. (2008) Keith Gordon. Available at: <http://www.audiologyonline.com/articles/in-ear-monitors-tips-trade-902> (Accessed: 19 November 2015).

³ Shambro, J. (no date) How to mix in-ear monitors A guide to mixing 'ears'. Available at: <http://homerecording.about.com/od/mixinglivesound/a/How-To-Mix-In-Ear-Monitors.htm> (Accessed: 11 November 2015).

wired or wireless. Wireless obviously offers more freedom to move around on stage and to leave the stage without having to unplug. Wireless also comes with its dangers⁴; such as signal dropouts caused by blockage or interference, perhaps with overlapping frequencies.

Studio

Studios will often use **Headphone Amplifiers** and provide studio headphones for performer's foldback. This is favoured over IEM's because portability is not important in a controlled space. The frequency response and clarity of over ear headphones is often better than IEM's. They are also favoured over wedges as you can provide a personal mix for each performer. However, those in the control room will be listening on **Studio Monitors**⁵, this introduces a small, almost un-noticeable delay⁶ of a few milliseconds. You will also hear the room's acoustics and any reverb. Some singers prefer this setup over headphones as it can feel and sound more natural.

It is important to pick the right technology⁷, audio experts swear by the more expensive equipment⁸. There are several important factors when considering what headphone amp and headphones to buy. Before buying, it is important that you know the amp and headphones are compatible. Headphones have different impedances. A higher ohm rating means there is a lower load on the amp often meaning less heat distortion, especially if running for long periods. If you are running multiple headphones⁹, make sure that the amp is capable of providing power to them all. Also, consider the grade of DAC in the amp, some 'audiophiles'

⁴ Rochman, D. and Written (2012) Avoid these Five mistakes in wireless. Available at: <http://blog.shure.com/avoid-these-five-mistakes-in-wireless/> (Accessed: 19 November 2015). Although this reference is referring to wireless microphones, some of the principals are still useful.

⁵ Foldback mix: Vocal pitch -vs- headphones. - avid pro audio community (2013) Available at: <http://duc.avid.com/showthread.php?t=137997> (Accessed: 19 November 2015).

⁶ Monitoring & vocals (2015) Available at: http://www.soundonsound.com/sos/1995_articles/jan95/vocalstips.html (Accessed: 23 November 2015).

⁷ Jecklin float electrostatic headphones (2014) Available at: <http://www.stereophile.com/content/jecklin-float-electrostatic-headphones/#eXmLOmRjL4HBy7D2.97> (Accessed: 11 November 2015).

⁸ Arment, M. (2014) Two ridiculous headphones and a pile of Schiit – Marco.org. Available at: <http://www.marco.org/2014/07/12/ridiculous-headphones-pile-of-schiit> (Accessed: 11 November 2015).

⁹ Barfunkel (no date) Cheap headphone amps worth getting?. Available at: <https://www.gearsllutz.com/board/electronic-music-instruments-electronic-music-production/998342-cheap-headphone-amps-worth-getting.html> (Accessed: 11 November 2015).

claim they can tell the difference between cheaper DAC's and 192KHz 24-bit DAC's¹⁰, although this is debated¹¹.

One problem with digital systems in studios is **latency**¹². By the time the signal has been converted to digital, processed and converted back to analogue, there is a noticeable delay in the performers foldback which can be off-putting. Some manufactures offer zero-latency monitoring¹³ with their hardware. They can do this by using Digital Signal Processing within the DAC, bypassing the computer and reducing the round trip latency. Some advanced hardware can mirror the settings of the DAW within the hardware for one or two channels of foldback.

¹⁰ DeleteTheWeak, 6, G., 6, calinet, 288, K. and 99, georgeaf (2014) Main difference between cheap and expensive DACs. Available at: https://www.reddit.com/r/headphones/comments/2mts0d/main_difference_between_cheap_and_expensive/ (Accessed: 11 November 2015).

¹¹ Monty (2012) 24/192 music Downloads are very silly indeed. Available at: <https://xiph.org/~xiphmont/demo/neil-young.html> (Accessed: 17 November 2015).

¹² Learn - the truth about digital audio Latency (no date) Available at: <https://www.presonus.com/community/Learn/The-Truth-About-Digital-Audio-Latency> (Accessed: 19 November 2015).

¹³ Albano, J. (no date) Understanding Latency in your DAW. Available at: <https://ask.audio/articles/how-to-achieve-true-zero-latency-monitoring-in-your-daw> (Accessed: 24 November 2015).

Analogue vs Digital

Analogue Desks

On a small analogue desk used for live gigs, a desk will usually have two or three **auxiliary outputs** that can be used for foldback mixes.

Larger analogue desks will also have auxiliary mixes, however, they might also have a **Matrix** which is essentially a mix of mixes¹⁴. You will set up a range of mixes, ie, vocals, dominant instrument, drum (kick and snare) and then use the matrix to provide a mix of these mixes to different parts of the stage. This means that if the balance between the vocals needs to change, you change the vocal mix, affecting all zones. However if the singers request more of themselves, you change this on the matrix which will only affect them. The matrix will often include feeds from the left and right masters. This is very useful for loudspeaker management on large stages as you can create 'audio zones' with foldback wedges.

Digital Desks

Digital desks also have many mixes and often also include a matrix. One benefit of a digital desk with motorised faders is that you can use a function called, 'Sends on Faders'. Sends is referring to mixes and the function allows you to mix a particular auxiliary send or matrix channel as you would with the FOH mix, on the faders.

Another benefit of digital over analogue is that most modern digital desks come with network functionality and companion applications. For example, Yamaha desks such as the LS9, M7CL, QL and CL series all have companion 'StageMix'¹⁵ iPad apps. If both the desk and tablet are on the same network, this allows you to take control of the desk's functionality wirelessly and remotely. The app is acting as a **control surface** for the digital desk, something which cannot be done with analogue desks. Obviously, this is useful for FOH as you can move around the room and mix, even joining in with the crowd; however this is also extremely useful for mixing foldback wedges. With this technology, you can walk around on the stage, listen to the mixes, change the matrix and even talk to the performers to understand what changes they would like.

¹⁴ Eargle, J. and Foreman, C. (2002) Audio engineering for sound reinforcement pp.84. Available at: <https://books.google.co.uk/books?id=YWzZe6z4xdAC&pg=PA84&hl=en#v=onepage&q&f=false> (Accessed: 17 November 2015).

¹⁵ Applications | peripherals | products | Yamaha (no date) Available at: <http://www.yamahaproaudio.com/global/en/products/peripherals/applications/> (Accessed: 19 November 2015).

Digital Audio Workstations

In Non Linear Audio Editors, foldback is at it's most flexible. You can take a direct out from a channel, you can make an auxiliary mix from channels, or you can make busses and make mixes from those busses. The flexibility of having a computer as the interface is preferable over other solutions. It also means that you can have as many busses, mixes and outputs as the software can handle. You are not limited by having a fixed number of outputs channels. However, you are still limited by the number of outputs on your DAC and the number of channels on your headphone amp.

Creating a good mix

What is in a foldback mix?

When constructing a foldback mix from scratch, it is important to include two essential things. Something to keep **Tempo** and Something to keep **Tune**. In a smaller band, the kick drum may be used to keep time. However, if a song is offbeat or the drum kit is not mic'd, this may not be a suitable solution. Larger bands or studio performers will often use a click track, you can think of this as a digital metronome. This is usually controlled by the drummer using something like a Tama Rythmwatch¹⁶, by the keyboard player from a program such as Mainstage or as is part of a backing track.

The keep tune, a performer will often have a **dominant instrument** to listen to. This will be an instrument that will stay on the tune, for example a keyboard or Acoustic Guitar, rather than something like Electric Guitar.

The performers will also have some form of talkback from the control room or sound engineer. This is vital for communication back to the stage which saves time and can be crucial in live situations.

Providing a safe mix

It is important for a sound engineer to provide a safe mix. If you damage a performers hearing, their career is ruined. Most modern IEM packs have limiters built in to try and prevent this. However for wedges etc, it is important to watch volumes, you could use a SPL meter for this.

Compression may sometimes be used on a performers mix. This has the effect of making the mix seem fuller and in a way, older than without. It can also help combat issues with instruments with a large dynamic range. Say, for example, a keyboard; when play loudly, you will want it at a certain level in the mix. If then it is played softly, it could appear to drop out of the mix.

¹⁶ O, H. G. C. (no date) Rhythm watch RW105 | TAMA drums. Available at: <http://www.tamadrum.co.jp/usa/products/accessories/RW105.html#.VIS5BUsbikQ> (Accessed: 24 November 2015).

Discussion & Summary

Unfortunately, I have not been able to fit everything into this report, there are other areas I would have like to look at further. Other topics I would have liked to include in this report are:

- Different foldback techniques for different sized studios
- The importance of considering foldback when designing a studio
- The importance of battery choice:

"One of the largest problems for IEM's is batteries. Although many people use rechargeable batteries with no problem some report problems such as them producing a lower voltage¹⁷, or even losing power more quickly¹⁸. Some performers will not take the risk and will use single-use batteries for every gig and replace them each time. Despite science making huge advances in rechargeable batteries, many still do not trust them."

I also planned to interview some musicians about what was important for them when considering foldback. I also wanted to interview some studio designers, however I could not get in touch.

¹⁷ IEM pack rechargeable batteries (2015) Available at: <http://forums.prosoundweb.com/index.php?topic=152936.0> (Accessed: 19 November 2015).

¹⁸ Batteries and wireless microphones | Shure technical FAQ (no date) Available at: http://shure.custhelp.com/app/answers/detail/a_id/250/~batteries-and-wireless-microphones (Accessed: 19 November 2015).

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