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The in-ear monitoring guide

Do you want to upgrade your live and rehearsal experience? The information and tips in this guide will help you, and it's incredibly easy – for any budget or setup.



Why in-ear monitoring?

Regardless of your level of fame, budget, or the size of your band, whether you're fighting for success or playing for passion, hearing yourself well is a prerequisite to improving your performance. And whether you are a pro or an amateur, you won't want to ruin your hearing during loud rehearsals, or on stages that can feel like acoustic battlegrounds.

There are many things musicians might disagree on, but rarely this

There is maybe one topic that almost everyone in the music industry agrees on: in-ear monitoring. Wedges are an acoustic compromise. They not only interfere with mics and PA systems, they also take up space and you have to stay within their sweet spot to be able to hear yourself.

In-ear monitoring can end the noise battle on stage, where amplified and non-amplified instruments wage a war nobody can win. Everything is lost on this acoustical battlefield: detail, precision, orientation. And, more often than not, so is the musician's hearing.

When you play on smaller or mid-sized stages, the wedges not only take up a lot of room – they add to the PA sound, especially in the mids and lows, which results in a confused sound, both on and off stage. Plus, they take up a lot of space in your van and need extra setup time.

With IEMs, you can take your perfect sound anywhere – in a lightweight package.

In-ear monitoring makes life better

On site, you simply plug in your IEM rack, and you're ready. You set up faster, you play better, and you deliver a better experience for your audience. You can work with lower volumes but get much more precision and orientation.

Your audience will notice the improvement in sound. The engineer will like you, because you're saving them a lot of time during soundcheck as your monitor mix is already perfect. You allow them to focus on their job, which is to provide a solid sound for the audience.

Take your talents seriously

In the end, it's not only about efficiency and quality on the road. It's also about taking your talents seriously. You need to hear yourself to deliver your best, and you need to hear the others to work as a band, as a team. This includes not ruining your hearing with too much volume and too much acoustic interference. Even if the band is your hobby and you don't want to perform live on stage, in-ear monitoring will give you a new experience.

Change "loud" to "precise"

In-ear monitoring lets you play better, simply because you have a better representation of everything that's important to you: your band, your sources, and your sound – all in a perfect resolution.



Watch our IEM tutorials on YouTube

For the launch of XS Wireless IEM, we have produced a series of five video tutorials with monitor engineer Chris Lanterns. In these tutorials, Chris explains how in-ear monitoring works and how musicians will benefit during rehearsals and for their live performances.



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Four tips for a good start

You might think an in-ear monitoring system will be expensive, but now, in-ear solutions that you can really rely on, like XS Wireless IEM, have become much more affordable. Here are four tips to get you off to a good start:

1 Prepare good signals

For an IEM system to work, you need some serious signal management, as the monitoring “magic” relies on clean sources. You can’t craft a perfect monitoring mix without all the sources. So, you need to mike your setup – from drums to amps to vocals.

This not only goes for live sessions, but for rehearsals, too.

2 You need to mix it

The mixing console is the heart of your setup, so it’s important to get one that will work for you now and in the future as your system grows and the number of inputs you need increases. You can save yourself duplicate purchases by planning ahead: How many channel inputs and aux outputs will you need? Even if you play electronic music with a laptop and an audio interface, this will still be helpful if you want to add a keyboard or a vocal mic at a later point in time.

Luckily, digital mixers have changed the audio landscape, delivering a lot of headroom at very friendly prices. Wi-Fi enabled digital consoles allow for easy control, because most of them let you log in from a cell phone or tablet.

For helpful tips, please consider the checklist under “Scalable solutions”.





3 How many IEM systems will you run?

You can easily start with one transmitter and broadcast the same mix to several receivers. However, with every transmitter you add, you can fine-tune and shape the monitor sound in more detail. More often than not, you will end up with a system for every musician on stage. You can grow your monitoring step by step.

4 Add splitters

We've covered the mics, the mixer, and the wireless systems – now, you're just one device away from a setup that makes your monitoring a no-brainer for any live or rehearsal session: splitters.

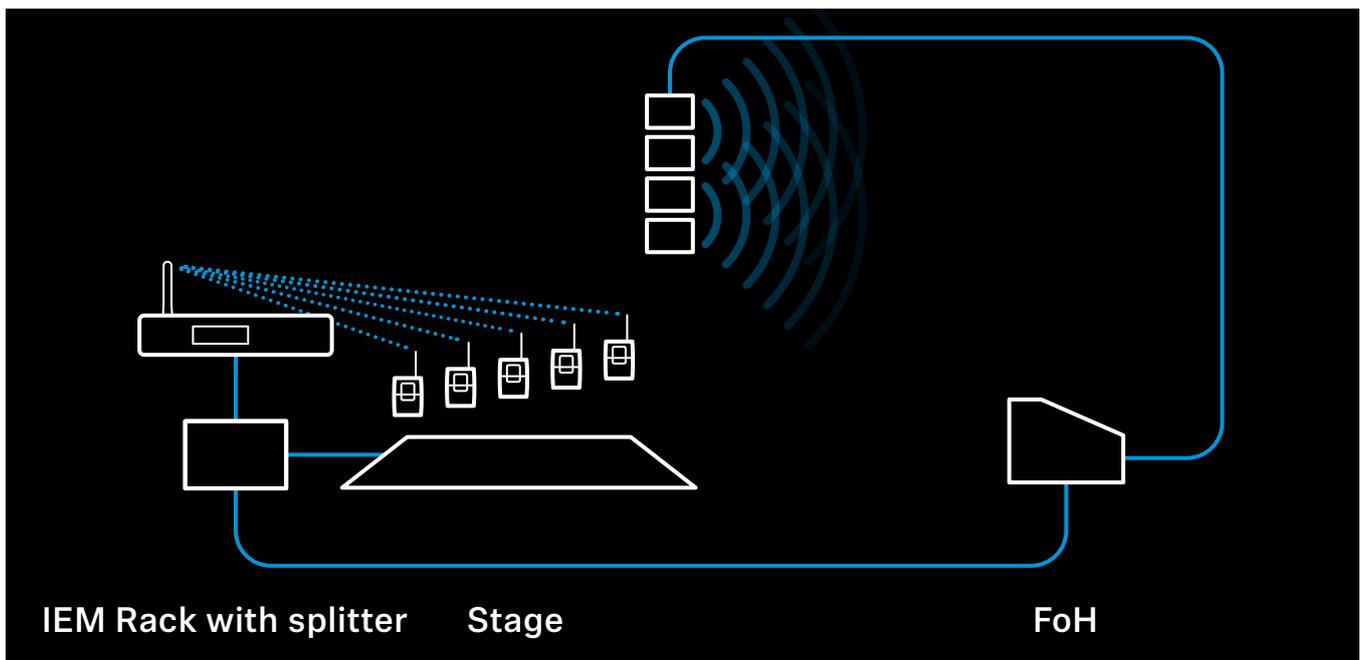
Splitters double one XLR input (your vocals, guitar, or drums for example) to two XLR outputs. This allows you to mix your IEM completely independently – and the other signal goes to the PA system or front-of-house engineer for the audience mix.

“Can I start as the only one using in-ear monitoring in my band?”

Technically, yes. But you'll miss the real potential. You'll just have yourself as a source. Your in-ears will attenuate the sound from the band, who are still playing with wedges. Using just one in-ear is not recommended: It will be too loud in that ear, and obscure your hearing overall. Plus, you need to install your one transmitter on stage and get a signal from the monitor console. This is a lot of compromise, and in most situations will fail to deliver the real potential of true in-ear monitoring.

Your IEM rack

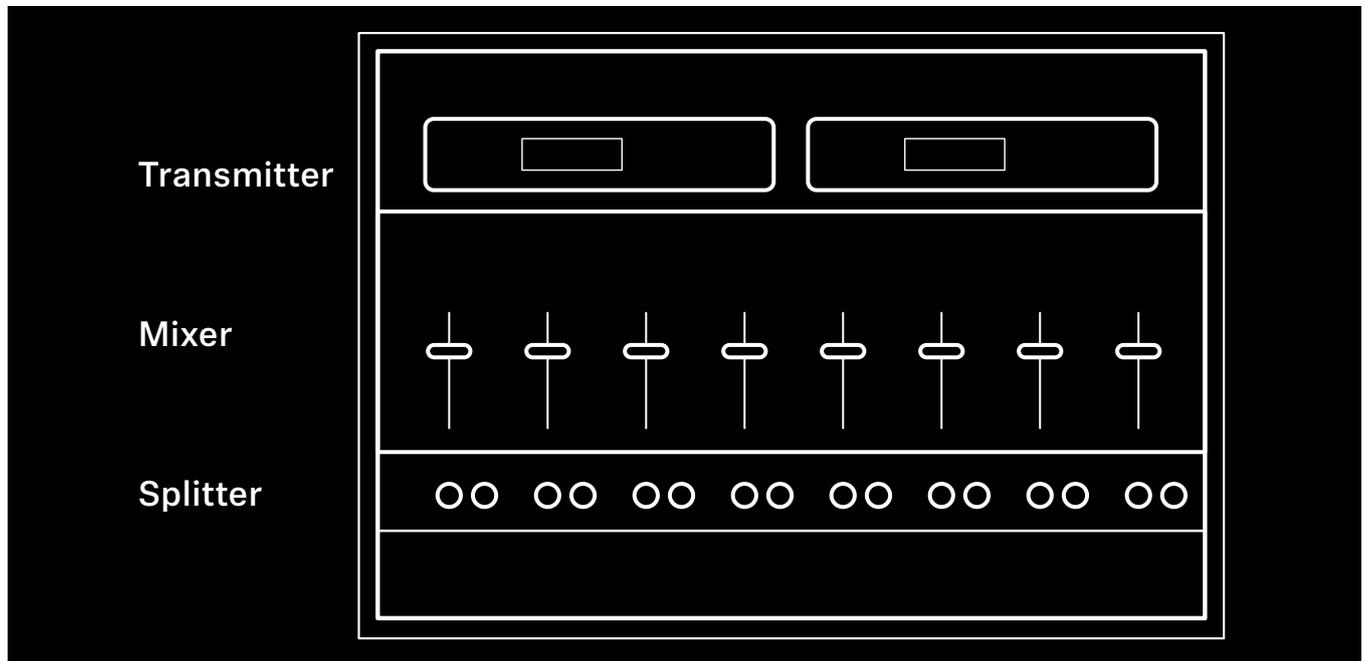
You can group all the equipment in a compact 19" rack and case: Bands big and small rely on this infrastructure. Once set up, you can install it in minutes – for rehearsals or on any live stage. Of course, you will need some time to select the gear and fine-tune everything, but once you're set up, you will have your perfect mix ready in no time at all. All you need is a rack-mountable mixer, possibly digital, and some splitters that match your needs. Your trusted sound or club technician probably has tons of hints and helpful experience.



Once set up, you'll profit again and again from your IEM system, in time saved and audio quality.

Advantages

- + You can take your perfect IEM mix anywhere
- + Fast set-up
- + Works for rehearsals and live gigs
- + Open for multiple configurations/setup
- + Will work on any stage
- + Very budget-friendly
- + Easy to upgrade if needed



Mixer

This can be a digital or analogue solution. Digital mixers are more versatile. Many feature a monitoring mode that allows you to fine-tune your mix from a mobile phone or tablet. Choose the number of inputs and outputs wisely. Aux sends must be pre-fader if you want to use the main output as well. Post-fader solutions will change the aux mixes once you change a channel fader.

IEM Transmitters

You can always start with one IEM transmitter and broadcast to several receivers. Leave some room for a second, third, or fourth unit. A second system instantly allows for so many more mixing options. The band will love it. Once you start using multiple transmitters, you might want to plan for a front-mountable antenna solution. This can help your receivers to get the best possible signal.

Splitter

All your mics and DI boxes go here and their signals get duplicated: One signal goes to your monitoring console, the other to the PA system or front-of-house engineer. There are lots of splitters available, but you can also custom-build them easily (and save a good chunk of your budget).

You'll also need two XLR snakes: One for your IEM mixer, the other one for the stage box at live events. You can also send a digital stream of all your signals to the local front of house. Always keep in mind that you may need to integrate different devices, tech and infrastructure.

Tool Box

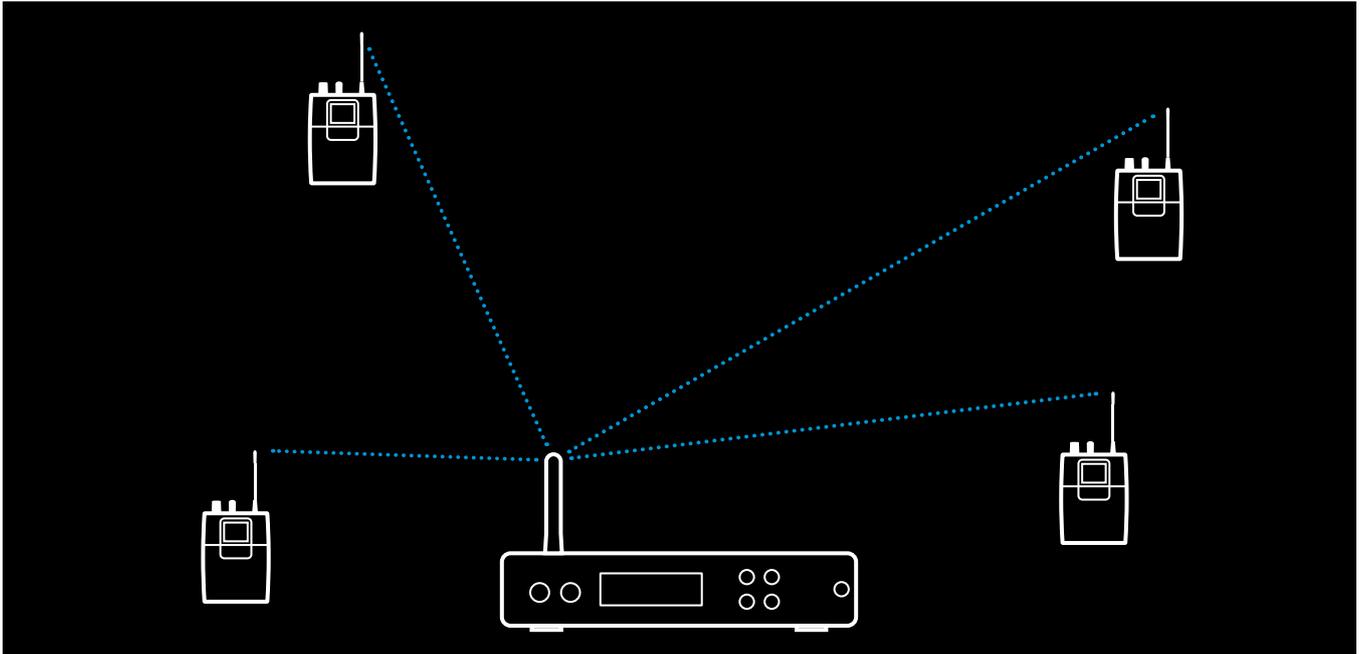
You might want to leave some space in your rack for a tool box (approx. 2U depending on your needs). Batteries can go here, as well as adapters, cables, and tools.

Rack

It can be plastic or wooden, depending on your budget. Choose a 19" variant that is big enough to accommodate future needs.

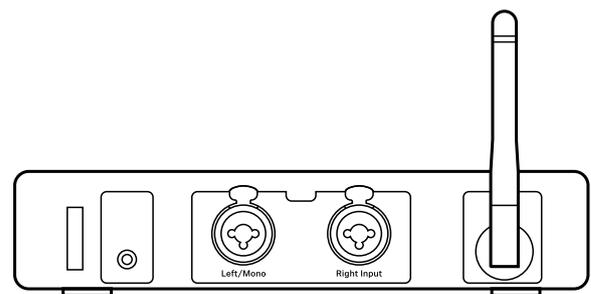
A quick IEM system walkthrough

Let's use the XS Wireless IEM system as an example.



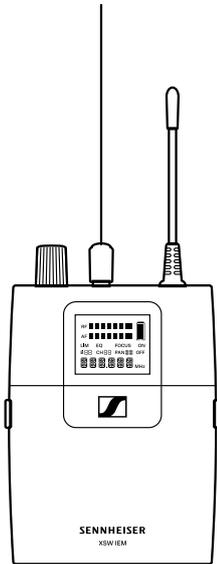
The transmitter

You'll send your mix to the transmitter which can broadcast to an endless number of receivers. You can build a basic IEM system with just one transmitter, but the more transmitters you use, the more individual mixes you can craft. Typical installations see two to four transmitters in use.



Mono or stereo mode

- If you have just one signal/XLR, you'll pick Mono Mode. It will send one input to both channels, left and right.
- Enable Stereo Mode when you have two inputs. You can connect most sources directly (if they don't need pre-amplifiers). More often than not, you will connect a pre-mixed input from your mixing console. This can include keys in stereo, for example.



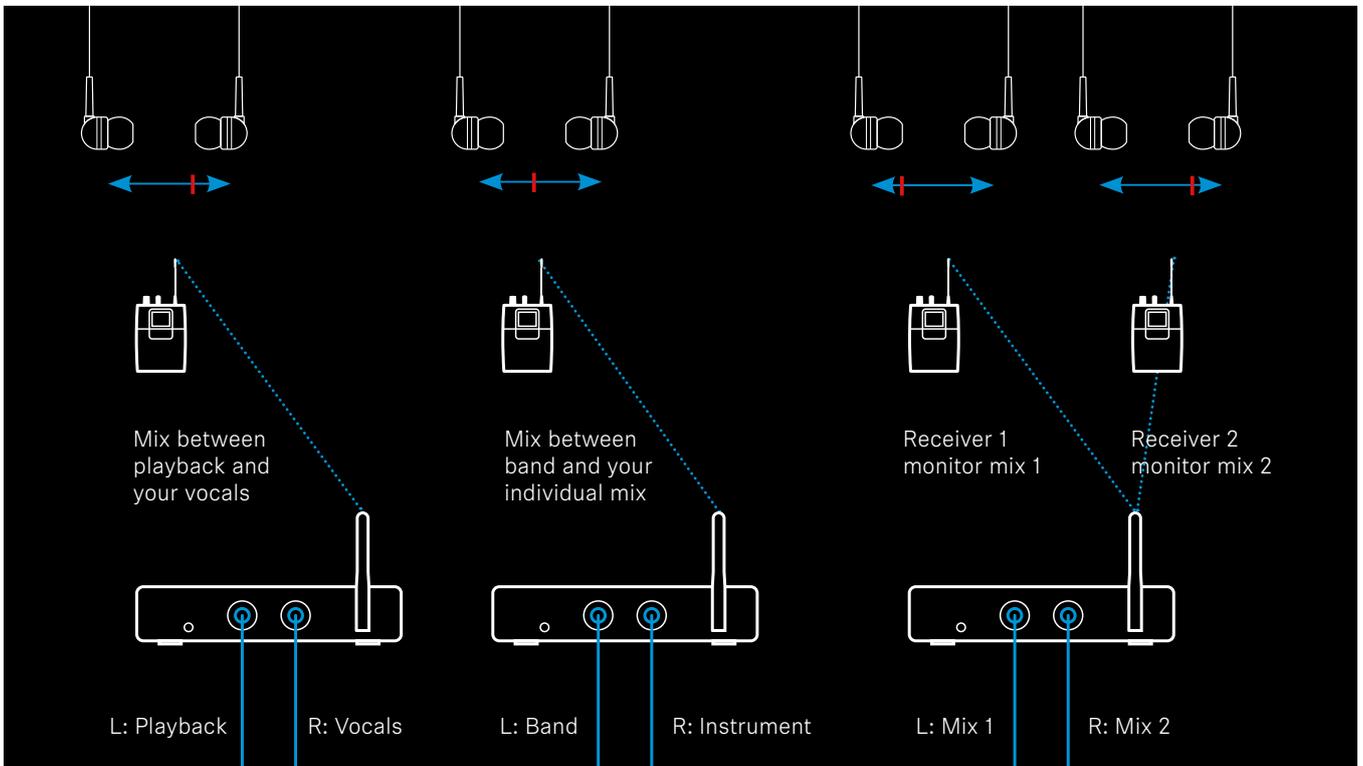
The receiver

This is your personal control central. In addition to the volume control and connector for your in-ears, it features a menu that allows you to fine-tune your mix to your liking, giving you access to the Focus Mode.

Focus Mode

There are two basic operation modes for IEM receivers:

- With Focus Mode off, one signal source is on your left ear plug, the other on your right ear plug, and you can set the volume according to your needs.
- With Focus Mode on, both signal sources are mixed in the receiver. You can now decide which source you would like to be in the foreground (louder) or in the background (quieter).



Examples for “Focus Mode On” options

Choosing your in-ear headphones

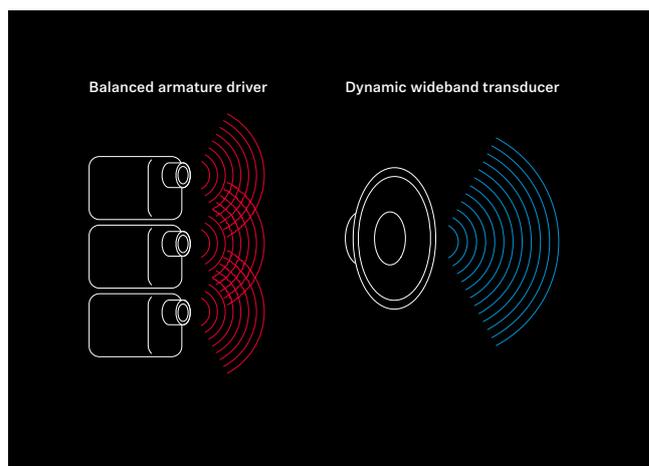
Theoretically, you can plug any headphone with a 3.5 mm jack into your receiver, but special monitoring earphones are a better solution: They have a wider, more neutral sound spectrum to reproduce every detail. Good in-ear monitors insulate you from other sources and fit perfectly. They won't fall out of your ears, no matter how crazy your stage performance gets. This is not possible with classic hi-fi in-ears.

Dynamic or balanced armature system?

Common in-ear solutions rely on a balanced armature system, a configuration that stems from the early days of hearing aids. To allow for the smallest possible devices, engineers used multiple drivers, each catering to a certain frequency range. Some systems use two, three, or up to eight drivers.

This design comes at a price, however: Wherever these ranges overlap, interference can occur, causing acoustical stress. Also, balanced armatures tend to have a weaker bass response.

Sennheiser uses dynamic drivers that deliver the entire sound spectrum organically, without artifacts. The IE PRO series features 10mm and 7mm drivers – small but powerful down to the lowest frequencies.





The IE 4

Sennheiser's standard in-ear headphones that you get for free with all Sennheiser IEM sets.



The IE 100 PRO: The best deal

The budget-friendly workhorse of the IE PRO series. Clean and crisp detail thanks to TrueResponse® technology. Features excellent shielding and an optimized earpiece, and comes with a set of different silicone and foam tips.



The IE 400 PRO: More punch

The upper class of in-ear monitoring. Delivers more punch, more transparency, and more control. If you're looking for distortion-free, natural sound with a transparent mid-range reproduction and clear high frequencies, the IE 400 PRO is the right choice.



The IE 500 PRO: More precision

The flagship of the IE PRO series combines power and clarity, delivering a wide and deep soundstage. The twisted pair cable offers optimized resistance to structure-borne noise.



The FA 500 Custom: Outstanding sound with custom fit

The FA 500 Custom in-ear monitors combine Sennheiser's top-of-the-range transducer with Fischer Amps' custom-made moulds. Comfort and perfect fit meet reliable purity of sound.

It's all in the planning

Planning a solid IEM system means counting all your inputs, deciding on (future) outputs, and matching them to the mixer you want to use. The scheme below will help you select the hardware you need.

1 Planning the inputs

List all the sources you need for your sessions. This includes all mics - vocals and instruments - and all the DI or laptops. If you plan to have a click track channel, count it in. Maybe you are also planning for an audience mic or a mic for internal communications. All these inputs will go to your mixing desk.

2 Selecting the number of outputs

How many outputs will you need? Every transmitter translates to two outputs. The more transmitters you use, the more individual mixes you can create for the band members. And you may still want to consider outputs for wedges.

3 Choosing the mixer and splitter

Once you have established the number of inputs and outputs you will need, you are able to choose the right mixer and the right number of splitters. Remember: the splitter duplicates your signals so that they can be used for monitoring and PA/front of house.

4 Transporting the tech

For transport, an IEM rack is an ideal solution. Tip: Always add an extra height unit and plan in a toolbox at the bottom for batteries, tools, etc. Also plan in extra room for more transmitters if you are starting out with one or two. Their number will increase, as band members will prefer individual mixes once they experience the advantages of IEMs.





Getting all the signals

For in-ear monitoring to work, you need to mike all the sources (except, of course, DI boxes). It's best not to rely on what you can get at venues; it will mean ever-changing mic setups, and this will force you to re-arrange your mixing settings every time. Also, your sound will change from mic to mic.

It's better to have your own setup. You can use it whenever and wherever you like: During rehearsals, when recording, or if you are on tour. Your own equipment is the very foundation of your mix and will avoid any unwanted surprises.

Do you feel isolated from the audience?

A typical concern when it comes to in-ear monitoring is isolation. Once you can hear yourself and the band perfectly, you are also isolated from everything else. If you want more connection, add a stage and audience mic, possibly with a cardioid or super-cardioid pick-up pattern. Bear in mind that high levels of audience sound can mess with your in-ear mix, so choose the level of the ambient mic in your mix with care.

Do you feel isolated from your band?

When you all wear in-ears, you can't talk to each other easily. You may want to add some communication mics with an on/off switch for those who do not use a vocal mic.

Start with a basic set-up and expand it over time

In-ear monitoring solutions can be created step by step. You can add more transmitters at a later date to expand the number of your IEM mixes. Take care to select your core system wisely to avoid duplicate purchases. Choose a solid mixer with sufficient inputs and outputs. Decide on a rack that has all the space you need.

Low-cost starter solutions

Two musicians can easily start with one IEM set and an additional receiver. Every receiver can balance the mix individually. If there aren't too many extra sources, you can even work without a mixer. Nonetheless, once you go live, you'll need a splitter – otherwise, you will just get a front-of-house mix.

If you're a band, you can start with one transmitter and receivers for every band member. You will need to pre-mix the two inputs, and everyone needs to be a bit tolerant with the base mix. But it will still be so much better.

The better entry-level solution

Add a second transmitter for a second musician. This allows for two stereo mixes and more fine-tuning with audibly better results. For live shows, you will need a splitter, otherwise you just get the front-of-house mix.

The more-comfortable semi-pro solution

You add a mixing console, most probably a digital one, and have a dedicated mic set-up. Maybe you start out with one transmitter and several receivers, and more transmitters can follow later. You might want to use a rack and add a splitter, too, to get your own dedicated in-ear mixes when performing live.

The pro solution

You have a full microphone set-up that connects to your IEM rack. Several IEM transmitters deliver a pristine stereo mix to each band member, with each mix exactly matching the needs of the respective band member. Precise monitor sound ensures that you can play and sing your best, and you also benefit from the system during rehearsals, protecting your hearing all along.

Crafting your IEM

Take the time you need and reserve one or two rehearsals for your IEM mix. Drums may take extra time to mix their kit, then the others blend in: Instruments first, vocals second. The more transmitters you use, the more individual mixes are possible. Two transmitters will already make a huge difference to some parts of the band.

- **Add some reverb.** Vocals sound strange and artificial without some reverb. In real life, there is no sound without at least some natural reverb and it can also help to 'glue' all the sources together.

- **Avoid high compression.** It will narrow the dynamic range you hear in your monitors, and you will lose the feeling of what is forceful and loud and what is soft and quiet.

- **Level your transmitter gain as high as possible but make sure it does not clip.** The more gain you transmit, the clearer and more stable your RF transmission. In this instance, more is more.

- **Once you have a solid basic mix think about changes on your instrument first.** Changing the global mix should always be the second step, if at all.

- **Try to craft global mixes for the band members that work with every song.** If you try to build a per-song mix, it often comes at the expense of your interplay. For example, if you choose different levels for every song, you will not be able to judge your own playing in relationship to the band. Am I playing loud enough? Does my sound match the band's overall sound?
- **Rule of thumb:** Simply going for "Make it louder" is a quick solution, but rarely the best one.



Frequency management

When operating a wireless IEM system like XS Wireless IEM, you are transmitting in the professional UHF range. This system comes with preconfigured banks and aligned frequencies, so you don't need to worry about interference problems. But it's still worth taking time to develop good habits.

- Make this your personal routine: Before you turn on the transmitter, always check the frequencies with your receiver first. This is especially important when you are at a new venue. Are your channels free? Test them during the sound-check and, if this is a long time before you're going to perform, check again before your gig. Things change, and you don't want risk using occupied channels.

- You can check channels by hopping through the presets on your receiver. The transmitter(s) remain(s) turned off. Always unplug your in-ear headphones before scanning, you never know what channel you might hit. If RF or AF show even at a low level, consider the channel occupied. Find a frequency bank with as many free channels as you have transmitters.

- Always use channels from the same frequency bank for your band.

Additional wireless tips

+ Are you working with wireless microphone systems? Make sure that you leave at least one metre (three feet) distance between the antenna of the wireless mic receiver and the antenna of the IEM transmitter to avoid any interference.

+ If you are working with two IEM transmitters, please make sure their antennas do not touch. Once you work with three or more IEM transmitters, you will need to use an antenna combiner and a separate antenna.

+ Antennas should not have contact with metal surfaces.

+ Consider installing a front-mount antenna or remote antenna for better RF performance and a direct line of sight to your team on stage.

+ UHF waves can pass through drywalls or wooden structures quite easily. Metal structures or surfaces, however, will reduce the RF performance dramatically. It's always better to check your environment with a UHF mindset.

+ The receiver antenna should not touch your skin. You are 80% water – and water severely blocks radio transmissions.





Additional tips and tricks using in-ears

- + **When you go for rechargeable batteries, choose ones with more than 2,000mAh capacity.**

You want a lot of reserve to easily cover soundchecks, pauses and performance – or a solid rehearsal session.

- + **The volume of your in-ear headphones depends on their impedance, for example 16 or 32 ohms.**

Different products can have different volumes even if you all have the receiver set to 5 or 7. Today's receivers can cover a wide range of impedance without a problem.

- + **Turn down the volume before you plug in the headphones.** This protects you from accidental, and potentially harmful, peaks.

- + **Always have the limiter activated on the receiver.** It's your acoustic safeguard.

- + **Always use two earplugs, not just one.**

You will get better sound and will protect your hearing. Using one in-ear works against the PA and ambient environment, which forces you to crank the volume up to unhealthy levels. Your hearing is vital for your craft, treat it well.

+ **Check and clean the ear buds regularly.** In more cases than you might think, a sudden dull or strange sound comes from dirty ear buds. Most in-ears come with a cleaning tool. Also, cleaning tips for in-ear monitors are great, as are disinfectant wipes.

+ **Always have spare parts to hand:** a back-up set of in-ears, rechargeable batteries (remember, with more than 2,000mAh), a charger, and tools.

+ **Whenever possible, use stereo instead of mono sound.** Some of today's solutions also support 3D audio. It's not a gimmick, but will help you to position yourself correctly – and naturally – in the mix.

Treat your hearing with respect. Your ability to perform well will fade over time if you risk your hearing. Treat it well, and use your in-ear monitors responsibly, as they are able to deliver high SPLs. Loud is just loud and not clearer or better and is a sign of a bad monitor mix.





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