

Elbow Room

Coordinating frequencies for your wireless units doesn't take black magic, you've just gotta know the territory.

Adding a new wireless mic or intercom system to a show is enough to strike fear into the heart of even the bravest sound engineer and cause him to start combing the yellow pages for the nearest voodoo priest to get a sacrifice burning to the RF gods in hopes of a trouble-free installation. But when it comes down to it, making even the largest RF system work well is actually quite simple, if you know what you're looking for and have the right tools on hand.

Play Nice

When adding new RF equipment to a theatre, there are a few things we need to be careful of to make sure everything will work well together.

"There are three issues that govern frequency selection for wireless users," says Chris Lyons, technical and educational communications manager for Shure. First, we're not alone. "The TV band spectrum used by wireless equipment is shared with other users such as TV stations and public safety radios, both of whom we can't legally interfere with," explains Lyons. Next, the frequencies our equipment operate in must be spaced far enough apart so they won't interfere with each other (exactly how much room depends on the receiver in question and its selec-

tivity performance, or how good at filtering the desired signal from other signals it is). "We need 'radio elbow room,'" jokes Lyons. Third, when we put multiple transmitters in the same area, they interact to produce "ghost" signals—called intermodulation products—that can interfere with reception. These can be easily predicted mathematically, though, so that we can choose frequencies that will work together harmoniously.

"To select frequencies, then, we first choose frequencies that avoid the primary users (e.g., TV stations) and, second, choose frequencies that don't interfere with each other, whether due to close spacing or intermodulation," sums up Lyons.

In some cases, you can just use the "scan" function that's built into every modern manufacturer's wireless receivers. These will basically listen to your antennas in your venue and flip through every frequency that the receiver can tune to and see if there's already signal on any of those frequencies. Once it knows where there's already signal, it can pick out frequencies that fit in between those signals and choose those for itself. And for a small system, this can be all that's needed; the frequencies it picks will get along with the signals in your area and with each other.



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Up Against It

But there's a limitation to these systems, simply based on the minimal processing power the tiny processors inside receivers have to work with. They can do a pretty good job of scanning and assigning frequencies, but they don't have the oomph to do the thousands of calculations needed to actually calculate intermodulation products on the fly. Instead, Lyons explains, they use a pre-programmed list of compatible frequencies that it already knows are intermod issue-free. While those lists are great, they're not exhaustive, so if you're in a very congested area or need more than a handful of wireless units to work together, you'll need the processing power of a full computer along with some specialized software.

In addition to actually formulating the lists of compatible frequencies from scratch to suit your particular radio environment, wireless management software can usually also let you tweak the parameters that they use to calculate what will interfere. So if you're in a relatively clear environment and want to play it safe, you can be more conservative, or if you are trying to squeeze just a couple more usable frequencies out—and know what you're risking—you can make things a little looser.

Thanks to a handful of smart programmers, there are lots of options for software out there that can help us out. If you're using primarily gear from a single manufacturer, most of them provide some sort of free software that will communicate with and program their receivers as well as do these calculations and scans for you. Shure provides Wireless

Workbench, Sennheiser has Wireless Systems Manager (WSM) and Lectrosonics has LecNet2.

All of these programs work great if you're only using equipment from that manufacturer, but if you're mixing and matching with existing or rental gear, or have wireless intercom systems to use, you'll need something a bit more flexible. The exception here is Shure, whose Wireless Workbench allows you to enter the specifications for non-Shure equipment and can even help pick out the frequencies for that gear.

Otherwise, you'll need to step up to dedicated frequency coordination software. The two leading programs are Stage Research's RF Guru and Professional Wireless Systems' Intermodulation Analysis Software (IAS). Even with Shure mics, for larger systems these programs are the way to go, as they let you get a bit more specific with how you configure them.

Both of these come pre-configured with dozens of common equipment models to choose from and allow you to enter your own if you've got gear that isn't included. Each has its plusses and minuses. IAS is the big gorilla in the room—used to coordinate heavy RF events like the Super Bowl and the big TV awards shows—and while scary-looking at first, it is very powerful and pretty easy to use.

On the other hand, RF Guru is the clear winner on price for those on a tight budget and has grown a lot through its first releases. It offers the unique ability to let you plop all your available gear in a list, tell it how many frequencies you would like to try for in that band (great when you're dealing with an existing stock) and then calculate the maximum number of compatible frequencies all in one fell swoop, which would take a few additional steps in IAS. That said, the large rental shops tend to stick to IAS's longer track record and more concise interface, while keeping an eye on RF Guru as it continues to mature.


Wireless Walk-through

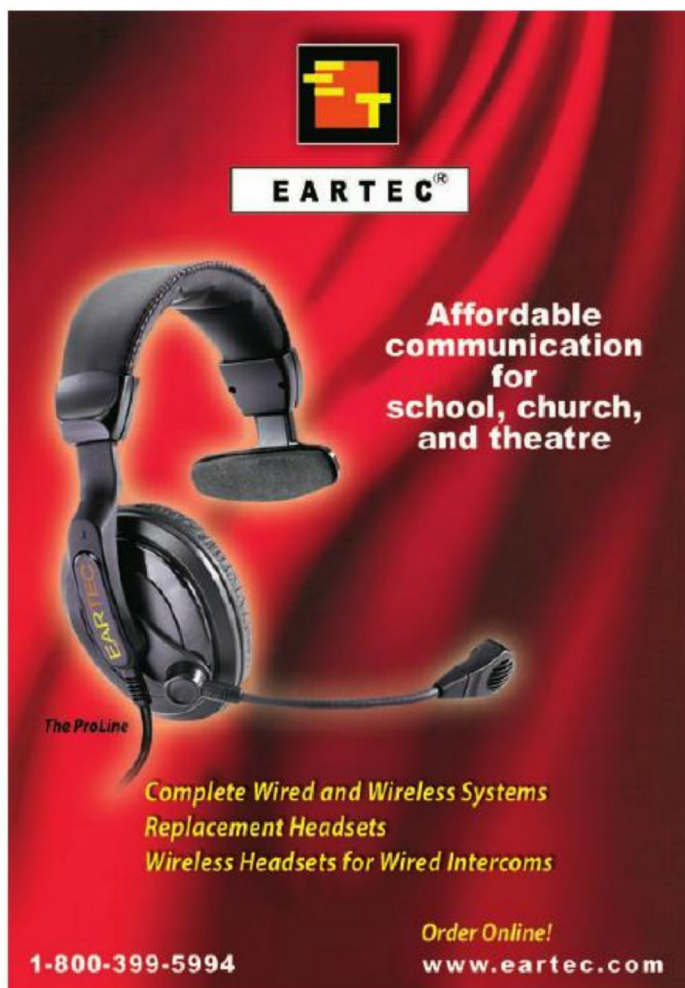
While the two programs are similar, I'll use IAS in this walk-through. There wasn't space to include screenshots of each step, but if you head over to www.stage-direct.com/elbowroom you'll see shots of each step.

Start by telling the program where you'll be using the system by entering a zip code, which pulls up a list of known TV stations in that area. Then, if needed, you can manually enter other frequencies you know to steer clear of, such as any that are in use in another theatre in the same complex as yours.

Once you've done that, you pick a model and frequency band for the gear you want to use and, after a quick calculation, IAS will tell you how many frequencies are available in that band. As long as there are enough to give you the number you need to use, plus a couple spares for good measure, you're set. Check off the ones you want to use and you're ready to rinse and repeat.

Continue to add gear, starting with the least flexible equipment (usually wireless intercom systems, which in older systems may not be flexible at all) and work down to the most flexible wireless mics. Once you've got a list with enough frequencies for your whole system, plus spares, you're good to go.

Print out the list, program your gear and away you go! 



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