

ProSoundWeb EXPERT SERIES



SOLVING WIRELESS SYSTEMS ISSUES

Chapter 2 of 6: Wireless Systems Expert Series

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SOLVING WIRELESS SYSTEMS ISSUES

Identifying problems and detailing solutions to a host of common challenges.

Although the tremendous popularity of wireless microphone, in-ear monitoring and intercom systems continues to increase, there's no denying that these systems present more opportunities for problems than their wired counterparts. Among the challenges are RF (radio frequency) interference, frequency selection, band planning, batteries, shrinking spectrum availability and several other issues.

The millions of wireless systems employed in the U.S. are compelling evidence that the majority of users will live with these added challenges. Besides, many of the problems encountered by wireless users are largely avoidable and happen primarily due to oversights, mistakes and misunderstandings.

The first installment of this series (The Essentials Of Wireless Systems) covered the issues of basic frequency selection, ongoing changes in the RF spectrum available for wireless systems, intermodulation, and multipath, so for more on those topics, be sure to review that article. Here we look at additional common issues to address in order to greatly improve the reliability of wireless systems and help ensure trouble-free operation.

ISSUE: Batteries. Simple but true, and most certainly the number one cause of wireless problems the world over! Fortunately, it's the one that is easiest to fix.

The most common cause of short battery life is poor quality or old age, along with mixing used batteries with new ones, and simply losing track of how long a battery has been in use. Some sound operators also fail to understand that, when turned on, wireless transmitters draw power even if not being used, and that the "mute" switch does not affect the current drain.

SOLUTION: Check transmitter batteries prior to every use. Get a battery tester to help you determine a good battery from a bad one. And when in doubt, change to a new battery!

Name-brand alkaline and primary (one-time use/disposable) lithium batteries such as Duracell and Energizer are the best bet. While private label batteries are often nearly as good, their useful life can vary considerably from purchase to purchase.

Make sure to buy batteries that are date-coded, and don't accept any whose expiration date is less than three years distant. Never use zinc carbon or toy batteries; most can't even properly power up a modern wireless transmitter. In the past decade, rechargeable battery technology has improved dramatically. Now, NiMH and LiPo batteries are every bit as good as alkaline, and in some cases even better.

Still, it's important to recognize the added complexity of using rechargeable batteries – a clear strategy will be needed for keeping them charged, tested, and removed from the pool when the time comes. By doing this, you can save considerable costs – and it's also better for the environment.

ISSUE: Digital interference. Modern digital audio equipment, including processors, equalizers, controllers and other gear, operate at high clock frequen-



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cies that can generate considerable radio frequency (RF) noise. (By the way, this noise is often termed RFI, for “radio frequency interference.”)

As a result, it’s not at all unusual for such equipment to interfere with wireless systems.

Symptoms include low-level spurious tones, buzzing sounds, hissing and a varying noise floor. Digital interference can also cause an unexplained loss of range and other problems.

Although FCC rules require that such equipment be tested to meet spurious emission standards, it’s a fact that not all units are indeed tested. In addition, loose covers and casings, warped metalwork, lax grounding, the wear and tear of travel and other mechanical shortcomings can greatly increase spurious RF emissions.

Even properly approved digital equipment, in good working order, may generate enough interference to affect wireless receivers located nearby. When it occurs, one of the first things to do is to temporarily turn off digital devices to see if they are the source of the problem.

SOLUTION: As a general precaution, wireless receivers and their antennas should be located as far as possible from digital gear. Often just moving the equipment a few rack spaces apart is enough to solve a problem. More severe cases may require separating the wireless power, signal and RF cables from those going to the digital equipment.

Using remote antennas with the wireless systems may also be helpful. And finally, try tightening up the covers on any offending digital gear and adding a ground strap to the cabinet or other local ground point.

ISSUE: Lapel (or lavalier) microphones used with wireless bodypack transmitters can be susceptible to a number of different problems. A common complaint is thin sound quality, which often occurs when the user has previously used only handheld mics intended primarily for vocal applications. These mics generally boost low frequencies to make the voice sound warmer and fuller, but the omnidirectional models normally used with wireless bodypacks don’t have this boost and thus



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can sound noticeably different.

Another cause of audio anomalies from lapel mics is interference. RF energy can “couple” into the mic cable and affect the preamplifier circuitry in the mic capsule. A high percentage of all lapel mics exhibit this problem under at least some circumstances. If the voice quality, level, and audio noise varies when the mic and cable are moved around in close proximity to the wireless transmitter antenna and body, it is almost certain that RF interference is present.

SOLUTION: Most lavalier microphones manufactured today, even mid-tier offerings, are immune from these past problems. Choosing a model from a reputable manufacturer will almost certainly provide trouble-free performance in this regard.

ISSUE: Lapel mic feedback. Users new to wireless often complain that a system is defective because feedback occurs where none was present before. Part of the problem is that, again, the lapel mics typically used with wireless are not directional and thus provide little feedback protection. However, the larger problem is usually that the mobility of wireless allows users to walk into zones more likely to cause feedback.

SOLUTION: Moving the mic closer to the mouth and lowering gain can be helpful. Also try lapel mics with a unidirectional pattern; the downside is that they can suffer from sudden drops in level when wearers turn their heads.

Another possible solution is headset/headworn mics, which reside much closer to the source (mouth), but some users think they’re unsightly. Key aspects to effective solutions are acoustic, by training users to avoid feedback zones, talk in a louder than normal voice, and by designing the loudspeaker configuration to put feedback zones out of reach.

ISSUE: Lapel mic mechanical problems are common because their cables are small, often delicate, and typically get considerable abuse.

Even if not damaged outright (i.e., the cable pulled out of the mic connector),



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lapel mic cables eventually wear out. Most often this wear occurs first at the connector end, but keep in mind that it can also happen at the capsule end. Usually the cable shield fails first due to constant bending near the connector's strain relief.

When this happens, clicks, pops, other noise and "lost audio" are experienced. Even before there's a complete break in the shield, pops and clicks due to RF disturbances can happen.

SOLUTION: It's always prudent to check the cables for noise when testing the transmitter prior to handing out to the user. Breaks at the connector end can usually be repaired but a break at the capsule end may not be fixable.

Mechanical noise due to lapel mic capsules rubbing on clothing is relatively common and can usually be eliminated by using the right type of mic clip, one that holds the capsule away from the fabric. It may also be necessary to carefully secure the cable near the mic capsule with tape on the underside of the user's garment

Static electricity sometimes creates audio noise, especially with certain types of fabric. Clothing anti-static spray usually solves this problem.

ISSUE: System quality. It may seem strange to list "system quality" as a wireless problem, but a great many wireless difficulties start with inferior equipment. Inexpensive systems can often work well in rural areas and/or in relatively undemanding applications, but in larger cities and their surrounding suburbs can be plagued by frequency congestion and myriad interference sources, so something better may be required.

The same is usually true when more than a few systems must be operated at the same site. And this situation is worsening: Available spectrum is shrinking, and clients tend to request more and more wireless channels.

Unfortunately, there is no new magic technology that can cut the cost of a quality wireless system significantly. Right now, if cost goes down, generally so do quality and performance. It's easier and cheaper for manufacturers to promote their mic capsules and "features" rather than build in better performance.

SOLUTION: If a wireless system doesn't have the selectivity (the ability to reject strong adjacent channel RF energy) to cut through all of the "junk" in the air, it doesn't matter which mic element it has, how neat the feature set, or how much money was "saved." You're simply left with something that doesn't work as you need it to.

The recommendation is to pay a little more and go for performance over

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features. High-quality wireless systems today offer very good performance at prices starting below \$1,000 per channel.

FINAL THOUGHTS: All in all, wireless microphone and in-ear monitoring systems can significantly enhance the experience for audiences and performers alike. Freedom of movement for actors, musicians, ministers, orators and politicians is a major benefit.

The best bet is to stay informed and educated. Watch for announcements about RF issues related to the FCC and potential other users of the spectrum. Keep up with the technology as manufacturers introduce new systems.

And most of all, stay up on troubleshooting skills so you can identify where the problems originate. Sometimes the wireless will be at fault, and sometimes not. It's best to know the difference.

Next time we'll address implementing and optimizing wireless system antennas.

About Radio Active Designs:

Radio Active Designs, formed by a group of top wireless audio specialists, designs and manufactures spectrally efficient (wireless intercom systems) to ensure that all live events, performing arts, and broadcast media may continue to flourish with minimal negative impact from the fallout of the FCC (600 MHz) auction and TV channel repack.

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