Understanding Digital Radio Systems By Laura Quarantiello

If you were to step into a scanner listeners nightmare you wouldn't see any two-headed beasts under the bed, any faceless figures chasing us with knives down dark alleys, what you would see instead is a silent scanner, one tuned to a radio system that isn't transmitting any voice signals. Welcome to my nightmare and maybe yours too: radio communications that truly can't be monitored. We have heard the rumors for years, the relentless industry chatter telling us that soon there would be digital radio systems that would force our scanners into silence, taking from us many of the top targets of radio listening: law enforcement communications, fire, emergency medical, local government, and more.

On the eve of the 21st Century we are finally beginning to see this nightmare come true. In many areas of the country digital trunked radio systems are coming online and our radios are emitting nothing but useless noise. Take, for instance, the Iowa Department of Transportation, which has installed an ASTRO integrated voice and data digital radio system, or the State of Florida who has 15 agencies on its 800 MHz ASTRO digital trunked system, and the State of New Hampshire which is integrating its digital system to serve many agencies including the State Police. And these are just three of many.

Let's face it, digital is revolutionizing public safety communications and until the scanner industry comes up with a digital-capable scanner, we had better get used to the sounds of silence. In the meantime, our best bet when faced with a new technology is to learn all we can about it. If you're wondering what this digital revolution is all about, here's a primer.

BITS AND BYTES

You've probably heard the names on the street already: SMARTNET (tm), SMARTZONE (tm), SECURENET (tm) and ASTRO (tm). These are digital signaling schemes far different from the conventional radio systems we are so familiar with. Conventional radio systems - even trunked radio systems - work on an easy premise: you pick up a microphone, press the transmit switch and speak. Your voice is sent via a radio wave to a receiver, where your voice is heard from the speaker. That's called voice modulation and it's a pretty simple idea. But, with digital systems, voice information is handled differently. Digital systems use a voice encoder-decoder technique called vocoding to sample the voice sound, convert the samples into digital bits, send them out via that same radio wave, and then reconstruct them at the receiver.

It's those digital bits that give us scanner listeners the problem. Unless you have a digital radio which converts the digital bits back into voice, your scanner is only capable of receiving the digital bits, not the reconstructed voice. What you'll hear is a very irritating "blat" or "buzz" from the speaker. To further stir the pot, many digital systems are capable of sending both digital voice and data on the same channels. This means users no longer need a separate radio system just for data transmission. Digital systems can also perform embedded signaling, meaning a "paging" signal can be sent to any one or more radios in the group, as well as many types of system control, safety and security information. And to top everything off, digital signals use 12.5 kHz spectrum spacing, not the usual 25 kHz.

Are you impressed yet? You should be. Digital systems enable error detection and correction techniques to allow more reliable voice and data recovery, and they even minimize or outright eliminate the voice fading and static often heard on analog radios. Digital voice also sounds better and doesn't experience losses in fringe coverage areas. Encryption can be used on digital systems without any degradation to audio quality or system range. And these systems use expandable software that allows them to take advantage of new features and capabilities. It all spells out a fancy system for the user, but a major problem for scanner listeners.

WHY DIGITAL?

It's obvious why so many municipalities are making the move to digital trunked radio systems and it isn't just because digital makes sensitive communications unmonitorable. It's also because digital uses narrowband technology, allowing more efficient use of the radio spectrum. Remember, digital uses 12.5 kHz bandwidth, not the usual 25 kHz. Digital systems also allow for system growth; today your city may only need police and fire on their system, but in a few years they may also want to add city services, school districts, and other agencies. They may also want to provide AVL (Automatic Vehicle Locating) to map the locations of police units, or CAD (Computer Aided Dispatching). With a

Understanding Digital Radio Systems (cont.)

digital system, adding features and users is easy. Lastly, APCO Project 25 is a big factor in system choice today. Project 25 lays down the ground rules for public safety digital systems and most areas that are or want to upgrade to digital must be Project 25 compliant.

SO WHAT ABOUT US?

That brings us to every scanner listener's nightmare: the unmonitorable system. It's true that digital systems cannot be heard by conventional scanners on the market today. Both Uniden and Radio Shack sell Trunk Tracking scanners which follow Motorola analog trunked systems (except for the just released BC245XLT which also tracks GE/Ericcson systems), but digital trunk tracking is still just a hope on the horizon.

At this point, the only way to listen to these systems is to a buy

an actual digital radio like the Motorola ASTRO MTS-3000 and have it programmed to monitor the system talkgroups. Unfortunately, these radios run in the neighborhood of \$4,000. If you can dig up the money, you'll still be out of luck unless you're a police officer, firefighter or city employee who has a legitimate need and permission to have their radio programmed by the radio shop. Believe me, unless you have a friend on the inside, your chances of having the radio shop program your radio is nil.

So what do you do if a system in your area has gone to digital 800 MHz trunking? First, keep an ear on the old VHF or UHF frequencies, as simulcasting of communications is common until the system is fully operational and all units are online. Second, do a little detective work to find out exactly which agencies have transferred to the new system and if they are using digital. In my area, for instance, only law enforcement agencies are using digital, almost everyone else is using analog trunked mode. I may not be able to monitor police, but I can hear Fire/EMS and even the Medical Examiner's office, which helps me to keep track of things. Thirdly, realize that there are still other monitoring targets out there beyond digital systems. Your old VHF/UHF scanner is not obsolete.

Which brings us right back to the beginning, a little wiser maybe, but still out in the radio deep freeze. What about us, indeed? Hey, scanner manufacturers, are you listening?

