Tech Talk
With Bob Dolph

Wireless Technology Offers Wide Spectrum of Opportunities

As a security dealer, I always enjoyed the versatility and creativity of wireless alarm system applications — the excitement to be able to go where wired systems cannot, the opportunity to provide temporary portable security in an instant, to name just a few reasons. Additionally, new, low-powered technologies and emerging standards will make way for even more excitement in the near future.

This month, we will take a look at the technology, explore the opportunities and discuss some tips on modern wireless security systems.

Assessing Frequency Allocations

When I first started installing wireless security systems some 30 years ago, the challenges were huge. The lower frequencies made the positioning of sensor modules a black art. Today, the radio spectrum is more crowded and frequencies have gone up to allow more bandwidth for high data rate devices, such as cell phones, wireless video and laptop computers.

Radio frequencies for wireless security have gone to mainly three unlicensed public FCC spectrums: 290-345 MHz; 902-928 MHz; and 2.4-2.4835 MHz. These ranges fall under public access FCC Part 15. For further reference, see Parts 15.249, 15.247 and 15.231. Also, keep an eye out for upcoming ZigBee standards.

Many other devices, such as portable phones, walkie-talkies and garage-door openers, occupy this radio spectrum. High data rate devices such as digital cordless phones and Wi-Fi, laptop communications occupy the 2.4 GHz area. Low data rate security devices typically occupy the 300 MHz and 900 MHz spectrum.

One of the questions many dealers ask today is, "How reliable can wireless security systems be while sharing public radio spectrums with so many other consumer devices?"

I recently posed the question to Don Hume, CTO and co-founder of Louisville, Colo.-based Inovonics Wireless Corp., to which he replied, "Radio interference has always been an issue. However, intelligent technologies such as frequency hopping— which Inovonics (www.inovonics.com) pioneered in the security industry many years ago — along with spatial diversity, are designed to increase alarm transmission reliability."

Spatial Diversity Uses 2 Antennas

Alarm sensor transmissions arrive at a control receiver from various directions, depending on the reflective nature of components in the general area *(see diagram below)*. This is often referred to as *multi path transmission.* Because the radio signals travel at the same speed but at different distances, the same signal will arrive at a receiver's antenna at slightly different times.

The signals are slightly out of phase when they reach the antenna and can either slightly enhance the signal or, more likely, reduce it considerably. This effect is known as the *Rayleigh Fading phenomenon,* or simply multi-path fading.

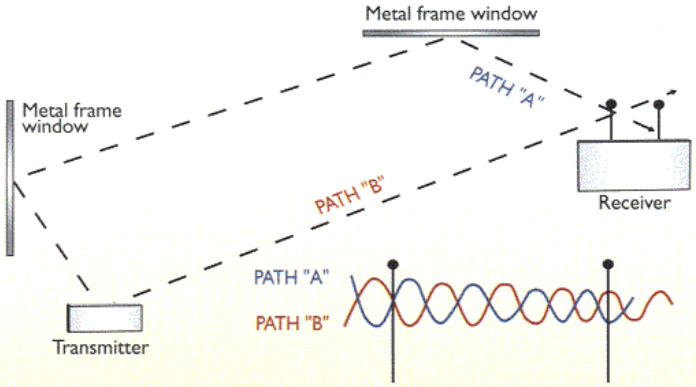
Many of today's alarm receivers have two antennas rather than the single one of the past. Why? By implementing a dual antenna configuration, the receiver can switch between antennas to capture the best signal at that particular moment *(see diagram)*. Multiple antennas receiving the same signal is often referred to as *spatial diversity.*

Bob Dolph has served in various technical management and advisory positions in the security industry for 25 years. Bob currently is a training and products consultant for the security industry. He lives in Orlando, Fla.

BOB'S TIPS

- Make sure the conduct a site survey.
- Program battery supervision on pendent transmitters.
- RF components need to be tested often.
- Portable wirless alrarms provide new sales opportunities.
- Spatial diversity improves system preformance.

How Spatial Diversity Improves Performance

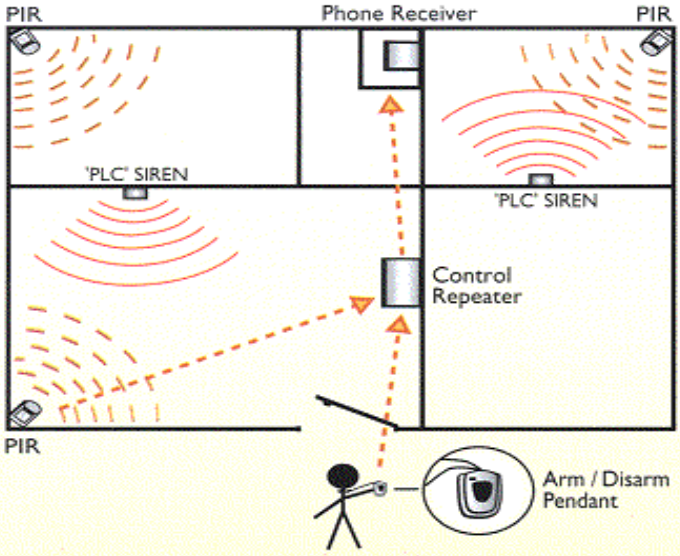


Spatial diversity improves system performance by using a dual-antenna configuration and an intelligent receiving algorithm that allows the receiver to switch between antennas to capture the best signal at that particular moment.

Tech Talk

With Bob Dolph

Example of a 2-Stage Wireless System



The two-stage wireless security system can be a plus when selling to customers, as many of them will like the extra evasive security concept.

The ideal distance between these antennas is 1/4 of a wavelength.

While spatial diversity design makes alarm sensor placement less critical for installers than single antenna systems, additional precautions should be taken when installing or designing and specifying an RF security system. The blocking of a signal, known as *shadow fading,* comes from surrounding metal. Use RF repeaters in these situations.

Conducting a site survey is highly recommended when specifying a wireless security system. A testing device, sometimes called an *RF sniffer,* can be used to check signal strength and local RFI.

Frequency Diversity Is Multichannel

In addition to achieving a high degree of interference avoidance, frequency hopping spread spectrum provides inherent frequency diversity, which dramatically reduces the effects of multi-path fading.

FCC Part 15 allows spread spectrum technology in the 900 MHz, 2.4 GHz and 5.7 GHz regions of the spectrum.

Frequency diversity is achieved through the transmission of redundant signals sent out over many channels. If one channel's signal cannot get through, another one will.

Combined with spatial diversity, these technologies create a powerful and reliable method to handle today's busy RF spectrum.

2-Stage Systems Please Customers

When I was an alarm dealer, I used a popular wireless alarm configuration I like to call a two-stage wireless system. The concept of this configuration is rather simple but allows for very short installation time and, as you will see, has some competitive advantages.

The system consists of a portable wireless system control, with backup power and some sort of audible device.

The second stage is when the main control acts like a repeater, sending central station commands to an independent small covert receiver that is connected to a phone system. This configuration *(see diagram above)* allows for easy installation since the phone connection is independent of the main alarm control and can be installed in a convenient and covert phone line location.

Additionally, a tamper sensor was installed in the control. Any effort to tamper with or attack the main control would immediately send a repeater signal to the phone communicator receiver, which might even be in an adjacent dwelling. This two-stage wireless security link was always an extra plus when selling to the customer, as many of them liked this evasive security concept. Recently, GE Interlogix (www.ge-interlogix.com) introduced the Allegro system, which is packaged with a similar two-stage wireless concept.

Temporary Systems Can Lift Sales

Another application for this type of configuration is the use of a portable temporary alarm system, which used to serve as another sales-closer for me. When a customer asked, "When can the system be installed?" I would reply, "I can have a fully functional monitored temporary system installed for you in about a half-hour; is that OK?" You might want to consider having each salesperson keep one in their cars, *once they have been trained.*

PIR and acoustical glass-break sensors were typically used to keep the temporary application simple but effective.

One of the minor installation challenges was temporarily mounting sensors to a finished wall without leaving any damage when they were removed. At the time, I simply used some sewing pins for temporarily mounting these sensors in wallboard. Today, a new temporary mounting technology is available.

3M (www.3m.com) makes a special release foam tape called the Command™ release tape system with the interlocking velcro-type option. This stuff is really amazing. When you are ready to remove the tape, simply pull on the special tab and the tape releases from the wall with no tearing or residue.