SmartScan™
Advanced Monitoring Solutions

Wireless that Works!

SmartScan Technologies has been providing wireless monitoring systems for over 15 years. During that time we've learned a lot about what to do to make wireless work reliably. The main thing to remember is the fact that we are operating in the same two unlicensed bands (900 MHz or 2.4 GHz) along with millions of other wireless devices like Wi-Fi, wireless pagers, RFID, wireless instruments, etc. This means that the potential for interference is great and ever increasing as the wireless revolution explodes. Maintaining reliable communications in this mess is the challenge we all face when implementing wire-less systems.

Most of our competitors provide wireless units with output power levels of 1 mW. A few provide out-puts of up to 20 mW, but rarely over that. In addition, most of these units operate on a single preset frequency. Consequently, if another station is operating on that frequency, units with low power levels will be drowned out, and their communications will be interrupted. To combat this problem, we provide wireless devices with output power levels which can be adjusted to 40 or 158 mW (900 MHz) and 10 or 100 mW (2.4 GHz with external antenna) to effectively punch through almost any interference. We also offer units with external antennas that will increase the effective radiated power by a factor of three. Another way to combat interference from another wireless device is to simply switch frequencies to a clear channel. This could be done manually whenever a new wireless device is in the area. Of course, this is impractical. A better way is to automatically switch using a technique called Frequency Hopping Spread Spectrum (FHSS). With this proven technology, our wireless sensors constantly change frequencies to find a clear channel within their operating bands. This ability, along with the higher output power levels, costs more and therefore our wireless components are a little more expensive than the less capable units from our competitors. (See the section on Spread Spectrum Technology in the para-graphs below.)

Security

In the past, data security hasn't been an important consideration in a wireless monitoring system. In today's environment, that is not the case. How about the possibility of an unscrupulous person deciding to monitor the temperature levels from the blood bank refrigerators in hopes of detecting an ab-normal condition on which to base a lawsuit? That sounds pretty far fetched, but it is a possibility. Also consider the situation where a disgruntled employee or even a terrorist wants to disrupt hospital operations by falsifying measurement data and creating a huge number of alerts that would have to be responded to.

To prevent the above from happening, all SmartScan's wireless devices use AES-128 Encryption to provide protection from eavesdropping or the falsification of measurement information.

Longer Range

The range of a wireless device operating indoors depends on 1) the construction of the walls between the transmitter and the receiver, 2) the power levels produced by the transmitters, and 3) the types of antennas used. Our CQ series of wireless sensors offers the highest power level of any competitive device, and high gain antennas are also available to increase the range.

Our competitors may say that range isn't important--"just add repeaters." Repeaters are generally not particularly expensive. They do, however, require line power for operation. Installing a new power receptacle in an area where one doesn't already exist will be very expensive.

Optional External Antennas

Optional high gain external antennas are available with all our CQ wireless sensors. This allows greater range than available with the normal internal "chip" antenna.

Power Helps Overcome Signal Path Problems

While freedom of movement is one of the great advantages of wireless sensors, we have occasionally heard, “I don’t want wireless because when I moved my refrigerator just a few feet from where it was, I lost my sensor.” This is invariably due to the physical environment (metal objects which cause signal attenuation and reflections). The CQ sensor’s high power levels and the use of Spread Spectrum technology all but eliminate this objection. (See “multipath fading” in the Spread Spectrum section below.)

Features That Extend Battery Life

High output power requires energy, and the primary consumer of this energy is the radio. To extend battery life, the radio needs to be activated very infrequently. If you simply extend the time between transmissions, you will not be alerted to an abnormal condition in a timely manner. To solve this dilemma, the alarm limits for the sensors being monitored are downloaded and stored in the CQ wireless devices. The on-board microprocessor (separate from the radio) wakes up every second, updates the clock, possibly takes a measurement, and then goes back to sleep. All of this happens very quickly (millisecond or so) so very little power is consumed. After a certain number of measurements are taken, they are averaged and the result compared against the alarm limits. If an alarm condition is detected, the radio will be immediately activated and the measurement sent to the host monitoring station (DA-33). If everything is normal, the average value is stored to be sent at a later time. This time is programmable and is usually set to once every 15 minutes or even once an hour.

Standard Batteries

The CQ wireless sensors utilize standard “AA” alkaline batteries available just about anywhere at low cost. Our competitors use specialized Lithium batteries which are expensive and often must be purchased from the supplier of the sensor. You can also use standard “AA” lithium batteries in our CQ wireless sensor. These can be purchased just about anywhere and even though they cost more than alkaline, they may be more economical because of their extended life.

A Closer Look at Spread Spectrum Technology

A radio channel can be very hostile, corrupted by noise, path loss and interfering transmissions from other radios. Even in an interference-free environment, radio performance faces serious degradation from a phenomenon known as multipath fading. Multipath fading results when two or more reflected rays of the transmitted signal arrive at the receiving antenna with opposing phases, thereby partially or completely canceling the signal. This problem is particularly prevalent in indoor installations. In the frequency domain, a multipath fade can be described as a frequency-selective notch that shifts in location and intensity over time as reflections change due to motion of the radio or objects within its range. At any given time, multipath fades will typically occupy 1% - 2% of the band. From a probability viewpoint, a conventional radio system faces a 1% - 2% chance of signal impairment at any given time due to multipath fading.

Spread spectrum reduces the vulnerability of a radio system to both multipath fading and jammers by distributing the transmitted signal over a larger region of the frequency band than would otherwise be necessary to send the information. This allows the signal to be reconstructed even though part of it may be lost or corrupted in transmission.

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