

# Frequency Hopping Spread Spectrum Technology

In conventional wireless communications systems, a transmitter and receiver are tuned to the same frequency. The total bandwidth required is related to the type of modulation used on the transmitter.

A common form of modulation used for digital data was the audio tone modems which provided 2 audio tones where one tone represented a digital 0 and the other represented a digital 1.

The weakness of the system was the ability to interfere with the communications by having another transmitter on the same or nearly the same frequency. Such interference totally destroyed the usefulness of the communication system.

With modern technology in solid state radio frequency circuits, and microprocessors, a method was developed that made direct interference between wireless systems difficult.

The method involved setting aside a wide bandwidth of frequency spectrum and allowing the transmitter to hop around inside the allocated space. The receiver was designed so it could match the hopping sequence and thereby the communications between the two was reliable but nearly impossible to interfere with. If an interfering transmitter could not match the hop sequence, it could not destroy the communication link between the hopping transmitter and receiver.

This form of communications was designated Spread Spectrum, Frequency Hopping technology. The Spread Spectrum implies the bandwidth used is broad, and the Frequency Hopping indicates the transmitter and receiver change frequency rapidly in a defined pattern which is known to the transmitter and receiver.

The Wilkerson Instrument Company wireless products have 3 available frequency bands, 2 in the 915MHz ISM band and 1 in the 2.4GHz band. Each of these hops on 25 different frequencies and each has 7 available Hop Sequences.

This allows 7 systems on the same band to operate in close proximity without interfering with each other. Utilizing all 3 bands allows 21 systems to operate in close proximity.

The Wilkerson Instrument Company Modbus® RTU Protocol wireless system can poll from 1 to 247 remote transmitters on 1 Hop Sequence. With 7 Hop Sequences per frequency band, each frequency band can have 7 X 247 (1729) remote transmitters.

## ISM

The ISM radio bands, as relates to the wireless products manufactured and sold by Wilkerson Instrument Company, are license free radio bands designated for Industrial, Scientific, and Medical use. The 2 bands of interest are 915MHz (902 - 928MHz) and 2.400 - 2.500GHz.

These bands are defined by international treaty for license free use in Region 2 of the treaty. Region 2 comprises the Americas, except Greenland, and some of the Eastern Pacific Islands. Australia and Israel specifically allow use of the 915MHz band.

Uses of these bands, in the United States, are governed by Part 18 of the Federal Communications Commission (FCC) rules, while Part 15, subpart B, of the FCC rules governs the requirements for unlicensed communication devices.

Designers of the wireless circuits must follow the FCC requirements in their design. Products sold and used in Region 2 must be marked as certified for this use.