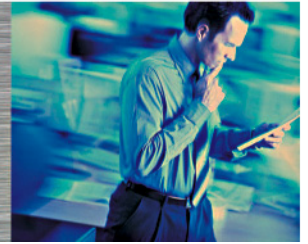


Honeywell Process Solutions



Industrial Wireless Glossary

Wireless technology innovation introduces new terms and concepts to the control engineer. Industrial applications also represent unique application of wireless technology that's important to understand.

Basic Radio Overview

A radio system contains primary components that explain the basics of how it operates. A radio transmitter collects information, characterizes the information in a usable format for the receiving radio to understand and then sends the signal out of its RF antenna in the form of a magnetic pulse or wave.

The transmission medium for electromagnetic wave propagation is referred to as free space.

The signal is then intercepted by a antenna which converts it back to its RF signal properties. The RF signal is then demodulated back to its original form and released.

The completion of this function is identical to the same function if there were some form of connected wire. The advantages include being able to add security, diagnostics information, and avoiding the associated pitfalls with wiring, such as grounding, low power supplies, lightning.

Glossary

Term	Description
10Base-T	The most common Ethernet wiring standard. IEEE 802.3 standard 10Base-T uses twisted pair wiring that's used to connect buildings' telephone wire to the telephone company, runs at 10 Mbps, uses a star network topology, and is limited to a maximum segment length of 100 meters.
802.11	A family of specifications related to wireless networking. See 802.11a, 802.11b, and 802.11g.
802.15.4	The ZigBee Alliance formed this technology for low cost, low power, short hop, mesh networking in a building environment. ZigBee's first release will use DSSS peer-to-peer radio technology.
Absorption	Absorption occurs when suspended water molecules in the terrestrial atmosphere extinguish photons. This could cause a decrease in the power density of the RF signal (attenuation). Most UHF signals are highly resistant to this based on good antenna alignment and survey practices.
Access-point	The interface between the wireless users and the wired backbone in a wireless set-up. It is the hub of a wireless network. Wireless clients connect to the access point, and traffic between two clients travels through the access point.
Amplifier	A device you can connect to your antenna to increase the signal strength and amplify weak incoming signals.
Amplitude modulation (AM)	A method of impressing data onto an alternating-current (AC) carrier waveform. The highest frequency of the modulating data is normally less than 10 percent of the carrier frequency. The instantaneous amplitude (overall signal power) varies depending on the instantaneous amplitude of the modulating data. In AM, the carrier itself does not deviate in amplitude. Instead, the modulating data appears in the form of signal components at frequencies slightly higher and lower than that of the carrier. These components are called <i>sidebands</i> . The lower sideband (LSB) appears at frequencies below the carrier frequency; the upper sideband (USB) appears at frequencies above the carrier frequency. The LSB and USB are essentially "mirror images" of each other. The sideband power accounts for the variations in the overall amplitude of the signal.
Antenna	A device connected to a wireless transceiver that concentrates transmitted and received radio waves to increase signal strength and thus the effective range of a wireless network. To accept an antenna, a device must have an appropriate antenna jack.
Attenuation	The decrease in power of a signal transmitted over a wire, measured in decibels. As attenuation increases, the signal decreases.
Authentication	The process a station uses to announce its identify to another station. It is the handshake that is either accepted or not accepted.
Backbone Network	The main thread of the network that interconnects other networks.

Term	Description
Band	Another term for spectrum used to indicate a particular set of frequencies. Wireless networking protocols work in either the 900MHz, 2.4 GHz or the 5 GHz bands.
Bandpass filter	A bandpass filter is an electronic device or circuit that allows signals between two specific frequencies to pass, but that discriminates against signals at other frequencies.
Baud	Unit of signal frequency in signals per second. Not to be confused with "Baud Rate" as referred to network exchange, since signals can represent more than one bit. Baud equals bits per second only when the signal represents a single bit like in ASCII or a Serial string of data. A measure of transmission speed; the reciprocal of the time duration of the shortest signal element in a transmission.
Broadband	A data transmission technique allowing multiple high-speed signals to share the bandwidth of a single network through frequency division multiplexing .
Carrier signal	A tone or radio signal modulated by data, usually for long-distance transmission.
Channel	A specific portion of the radio spectrum; for example, the channels allotted to one of the wireless networking protocols
Coaxial Cable	A coaxial cable is an electrical cable with a conductor (or wire) at its center surrounded by insulating materials and an outer metal shield conductor with an axis of curvature coinciding with the inner conductor.
Collision	The interference that results when two devices on a network start transmitting at the same time wireline or wireless.
Continuous Wave	This is an RF signal that maintains full power, i.e. it is not switched off periodically.
Decibels	The unit used for measuring antenna gain. Decibels are abbreviated as dB, and you may also see dBm (decibels relative to a reference level of 1 milliwatt) and dBi (decibels relative to an isotropic radiator, or a single point antenna).
Dipole antenna	An antenna type that offers omni-directional coverage, but not much gain. Access points usually have one or two dipole antennas to increase their gain slightly. A dipole antenna is a straight electrical conductor measuring 1/2 wavelength from end to end and connected at the center to a radio-frequency (RF) feed line. Probably the simplest and most common form of antennas.
DSSS Direct sequence spread spectrum	Direct-Sequence Spread Spectrum is a system for generating spread-spectrum transmissions. It generates a redundant pattern for each bit to be transmitted, called a chipping code. Using this, the signal is split over several frequencies, and the different parts are sent concurrently. This method is faster than FHSS, but is more sensitive to environmental factors. Wi-Fi transmissions use DSSS.
EMI or EMF	These are Electro Magnetic Interference or Electro Mechanical Fields. This is the noise that may cause a harmonic in the field creating some form of radio communication interference. Typically can be corrected by proper antenna alignment or shielding of the noise source.
Ethernet	The most common networking standard in the world, formally known as IEEE 802.3.
FHSS	Frequency-Hopping Spread Spectrum changes, or hops, frequencies in a pattern known to both sender and receiver. In contrast to DSSS FHSS is little influenced by radio stations, reflections, or other environmental factors, but it is much narrower in bandwidth than DSSS.
Faraday Shield	The Faraday Cage or Shield is an apparatus design to prevent the passage of electromagnetic fields or waves. In the radio world this could be a steel wall or a poured concrete wall that has a meshed cross wire for structural
Firewall	A network program that blocks malevolent traffic that might endanger the computers on your network.
Fixed wireless	The operation of wireless devices in a specific location, such as an office. This term is usually used for devices that need to be plugged in to operate, such as a desktop computer. If it runs off a battery, it's not fixed wireless.
Fresnel Zone	The Fresnel (pronounced fre-nel) zone is the area around the visual line-of-sight that radio waves spread out into after they leave the antenna. While it is easy for the signal to pass through a wall without much attenuation it makes it more difficult when the RF signal passes through something that possess allot of moisture. Trees tend to retain allot of moisture and can absorb a fair amount of power attenuating the signal.
Frequency Hopping Spread	A technology invented by Hedy Lamarr and heavily used by the military. Uses a signal random hopping pattern over a specific range or channel, to deliver each packet of information that is communicated digitally. If employed

Term	Description
Spectrum	properly has an inherent security within its own design. Frequency hopping spread spectrum is commonly abbreviated to FHSS or FH. Bluetooth uses frequency hopping spread spectrum.
Gain	The amount by which an antenna concentrates signal strength in a wireless network.
Harmonics	Signals that output at harmonic frequencies can cause interference to other communications. Example: a broadcast signal at 418.5 MHz (in the standard UHF band) would have a second harmonic at 937 MHz, a third harmonic at 1.2555 GHz, a fourth harmonic at 1.874 GHz, and so on. The harmonic is always a multiplier of the original signal. Some or all of these harmonic signals could, if strong, disrupt activities in other wireless services.
Header	Address information on packets that says where its destination is.
High-gain antenna	An antenna that significantly increases signal strength, necessary for long-range wireless networks.
Hub	The central device in a star network, whether wired or wireless. Wireless access points act as hubs in wireless networks.
IEEE	Institute of Electrical and Electronics Engineers. The acronym is pronounced I-triple-ee, and the organization develops standards for the computer and electronics industry, such as Wi-Fi.
ISM bands	Industrial, Science and Medical bands. These bands were released to the public by the FCC for development in the above mentioned area's. They are more commonly know by the frequencies that they cover. 900MHz, 2.4GHz and 5.8 GHz
Kbps	Kilobits per second, or thousands of bits per second, a measure of bandwidth.
Latency	The delay between requesting, and actually receiving or accessing data.
Line of sight	A clear line from one antenna to another in a long-range wireless network. A line of sight is necessary for a long-range network to connect. RF line of sight differs then a visual line of sight.
Long haul	The transmission of data over long distances, potentially many miles. Traditionally, wired networks have been necessary for long haul, but with 802.16, also known as WiMax, long haul via wireless will become more feasible.
Mbps	Megabits per second, or millions of bits per second, a measure of bandwidth.
Megahertz	A measure of electromagnetic wave frequency equal to one million (1,000,000) hertz, often abbreviated as MHz and used to specify the radio frequency used by wireless devices.
Mesh networking	To mesh is to offer multiple paths for data to get from its originating source to its destination point based on its control definition in its packet of data. Most mesh networks are networks that use one of two connection arrangements. Full mesh topology or partial mesh topology. In the full mesh topology, each node is connected directly to each of the others. In the partial mesh topology, nodes are connected to only some, not all, of the other nodes.
Modem	Short for modulator/demodulator. A modem modulates outgoing digital data into analog signals so they can be sent over copper phone lines, and demodulates incoming analog signals into digital.
Multipath	The simultaneous reception of two copies of the same signal that arrive via separate paths with different delays. This creates a common error on continuous wave signals that use modulation to send the signal. The nature of FHSS makes it resistant to this echoed signal. In the TV world it could create "ghost" images on the screen.
Multiplex	To combine multiple signals for transmission over a single channel. For example, a Wi-Fi connection uses Orthogonal Frequency Division Multiplexing, which spreads the signal power over a large band. It breaks the signal into parts, enabling a fast transmission that is sent as several slower transmissions simultaneously, using different frequencies.
Node	Any intelligent device connected to the network. This includes terminal servers, host computers, and any other devices (such as remote terminals, Ethernet, printers) that are directly connected to the network. A node can be thought of as any device that has a hardware address.
OFDM	Abbreviation for Orthogonal Frequency Division Multiplexing. This frequency was designed to minimize interference between other signals. It is a narrowband signal split into several channels and uses digital modulation. It is often used for digital television. It is suited for extremely high frequencies where broad bands

Term	Description
	can offer wide simultaneous jumps.
OMNI Directional Antenna	See Dipole antenna above.
Packet	A series of bits containing data and control information including source and destination node addresses, formatted for transmission from one node to another.
Packet switching	<p>A method of switching data in a network where individual packets of a set size and format are accepted by the network and delivered to their destinations by using any available route necessary. The sequence of the packets is maintained and the destination established by the exchange of control information contained in the packets, between the sending terminal and the mesh network before the transmission starts. The network is open to all nodes, all the time, with packets from the various nodes being interleaved throughout the network.</p> <p>The packets can be transmitted in any order, as the control information sent at the beginning of the transmission ensures they are interpreted in the correct order at the receiving end. Because each packet carries its own control instructions, it can use any route to reach its destination.</p>
Panel antenna	An antenna type that radiates in only a specific direction. Panel antennas are commonly used for point-to-point situations. You may also see them called "patch antennas."
Parabolic antenna	An antenna type that radiates a very narrow beam in a specific direction. Parabolic antennas offer the highest gain for long-range point-to-point situations.
Path Loss	The loss of a signal as it is traveling through space - usually due to broken line of site or antenna mismatch.
Point-to-multipoint	A wireless network in which one point (the access point) serves multiple other points around it. Indoor wireless networks are all point-to-multipoint, and long-range wireless networks that serve multiple clients usually employ either a single omni-directional antenna or multiple sector antennas.
Point-to-point	A long-range wireless network between two points. Point-to-point wireless networks use directional antennas and require an antenna at either point.
Propagation Mapping	This is a method (by using 2 separate devices) to determine how a RF signal(s) may propagate through a plant to determine the levels of strength at various areas within the plant. It can also be used to not possible interferences within your frequency spectrum.
RSSI	Abbreviation for Received Signal Strength Indicator, answers the question "How many bars do you have?"
Redundancy	Radio offers a lot of redundancy options as multiple technologies can coexist in the same area without interfering. You can use different types of technologies in the same frequency band or the same technology in different bands.
Reflection	There are many factors that come into play here. In many cases reflection could be a good thing as the signal could gain more in strength due to a complete line of site obstruction. It could also impede the receivers performance of seeing the signal if the amount of reflection has delayed the response.
Remote access point	One of a number of secondary access points in a wireless network that uses WDS to extend its range. Remote access points, sometimes also called "relay access points," connect to a master access point.
Repeater	<p>There are many different types of repeaters in the radio world that:</p> <ul style="list-style-type: none"> • Take the data in one radio format, demodulate it and then modulate it and send it out in another format and potentially another frequency. • Seamlessly repeat the data with a new header as to not create a collision. • Collect the data and then use a delay tactic as to not conflict with the data received.
RFI	Abbreviation for Radio Frequency Interference. This is where one may have some form of radio interference on the channel and frequency that they are working on. This could be do to a number of factors including other radio harmonics, large sidebands and EMFs.
RFID	Abbreviation for Radio Frequency Identification, a technology used to uniquely identify objects. A transceiver (say, at a highway toll booth) sends out a signal that activates a transponder (a tag installed in a car, for example), which sends data back to the transceiver (let me through, I've already paid).
RF Power Level	RF power can be measured in two ways. It is either receiver signal input or transmitter output. The power is

Term	Description
	typically expressed in watts. The FCC has limited the power that can be used in the ISM bands to a maximum of 1 Watt. To exceed that you would need special licensing. Power can also be measured in dBm's in a logarithmic relationship to Watts. Example; 1 Watt = 30dBm and 100mWatt = 20dBm and 10mWatt = 10dBm.
Sidebands	Sidebands are the leading and lagging points that generate off of a continuous wave RF signal. Typically referred to as (USB) upper side bands and (LSB) lower side bands. They usually mirror each other.
Signal loss	The amount of signal strength that is lost in antenna cable, connectors, and free space. Signal loss is measured in decibels.
Signal Propagation	The signal propagation is the actual spatial relationship on how the RF signal patterns itself when being transmitted throughout a given area. A propagation map can be easily drawn based on output power, antenna type and frequency if in a completely open unobstructed area. In a plant all bets are off because there will be different factors in play as to how the signal emits throughout the area.
Signal strength	The strength of the radio waves in a wireless network.
SP100	Instrumentation Systems and Automation (ISA) Society standard committee for the development of an industrial wireless standard, ISA100.
Spread spectrum	A form of wireless communication in which a signal's frequency is deliberately varied. This increases bandwidth and lessens the chances of interruption or interception of the transmitted signal.
Star network	A network topology in which all traffic goes through a central hub. Many of today's wireless networks use star networks.
Topology	The specific layout of a network a wireless network noting all of its physical layers. Noting different types of layouts like Star, point-to-point and full & partial meshing to mention a few.
Transmit power	The amount of power used by a radio transceiver to send the signal out. Transmit power is generally measured in milliwatts, which you can convert to dBm.
Twisted pair	A wiring type in which each pair of wires twists in a certain way to reduce electromagnetic interference for the purpose of networking. Compare twisted pair to silver-satin telephone wire, in which the pairs don't twist and cannot be used for networking.
UHF	Abbreviation for Ultra High Frequencies. 300MHz to 3GHz (The 900MHz and 2.4GHz ISM bands fall into this spectrum).
WAN	Abbreviation for Wide Area Network, A collection of local area networks connected by a variety of physical means. The Internet is the largest and most well-known wide area network. Wide area network is generally abbreviated to WAN.
WEP	Abbreviation for Wired Equivalent Privacy. It is a common method for achieving the same level of Security on LAN's. The WEP is either a 64, 128 or 256 bite encryption that creates the handshaking between the server and the node device.
Wi-Fi	This simply refers to Wireless Fidelity. It refers to any broadband wireless device for 802.11 network communication.
WLAN	Wireless Local Area network.
WINA	Wireless Industrial Network Alliance is a coalition of industrial end user companies, technology suppliers, industrial organizations, software developers, system integrators, and others interested in the advancement of wireless solutions for industry.
XYR 5000	A radio based system using FHSS to communicate with to numerous field devices in a star topology fashion. Honeywell was the first major process instrument manufacturer to release a wireless product.
Yagi antenna	A directional antenna type that radiates all of its power in a specific direction, very similar to a TV antenna for VHF signals.
ZigBee	An Alliance Committee formed to design low power, low cost RF technology to minimize wiring cost in building construction of utility controls.

More Information

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