



# WIRELESS AUTOMATION CONTROL



## Wireless solution

After numerous requests to supply an economical radio suitable for industrial control, AUTOMATIONDIRECT chose as a partner Atlanta-based Cirronet, which has well over a decade of success in developing innovative wireless data networking and communications products for industrial, OEM and Internet access markets. Employing proprietary Frequency Hopping Spread Spectrum (FHSS) radio transmission technology, Cirronet's products offer reliable, long range performance and

unparalleled immunity against jamming and interference. The new CR series serial and Ethernet radios were developed specifically for the industrial automation marketplace.

## What are FHSS, DSSS, and OFDM radios?

1. FHSS (Frequency Hopping Spread Spectrum): A FHSS radio signal is broadcast on very narrow band in very short bursts. The broadcast signal "hops" around within the channel frequency band. Both transmitter and receiver are synchronized to the same hopping pattern. FHSS provides only 3 Mbps capacity links, but it is a very robust technology, with excellent behavior in harsh environments characterized by large areas of coverage, multiple collocated cells, noises, multipath, Bluetooth presence, etc.

2. DSSS (Direct Sequence Spread Spectrum) A DSSS data signal is combined with a higher-data rate data stream. The resulting signal is spread across at least 10x the bandwidth of the unspread signal. The wider data-stream provides redundancy for bits damaged in transmission. DSSS provides 11 Mbps capacity links, but it is sensitive to RF interference (collocation, multipath, near/far, Bluetooth). The most limiting factor, multipath, may be minimized by using the technology for short distances or in point to point applications.

3. OFDM (Orthogonal Frequency Division Multiplexing) spread spectrum technique distributes the data over a large number of carriers that are spaced apart at precise frequencies. This spacing provides the "orthogonality" in this technique, which prevents the demodulators from seeing frequencies other than their own. The benefits of OFDM are high spectral efficiency, resiliency to RF interference, and lower multipath distortion. OFDM is used by Digital Audio Broadcasting (DAB) standard in the European market and development is ongoing for wireless Local Area Networks - point-to-point and point-to-multipoint configurations.

## Why not use 802.11 wireless Ethernet for all my wireless communication?

1. 802.11b uses high speed, short range, DSSS radios. It is fine for transferring files in a home or office environment but offers a much less robust RF connection than FHSS radios.

2. 802.11b systems are often used for IT LAN, barcode systems, or other non-critical, short-range networks within industrial facilities. Using a non-802.11 technology isolates control network remains from other LANs and reduces the chance of adverse RF interaction. The CR series radios have a unique

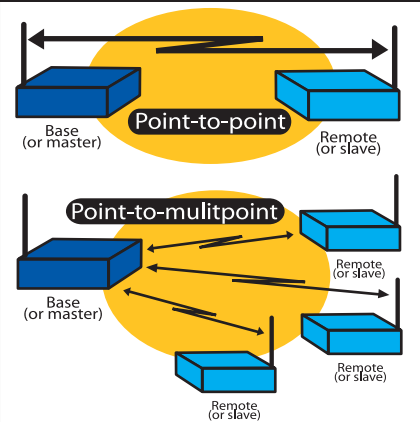
"Frequency Skip" feature that avoids the 802.11 WI-FI Ethernet channels. This means your control radios will not interfere with or suffer interference from co-located PC wireless networks.

3. Hackers expend considerable effort to pierce 802.11 data encryption and other software security schemes. Hackers aren't likely to be familiar with non-802.11 systems, nor are they likely to have radios compatible with a non-802.11 system.

## CR Series Radios feature:

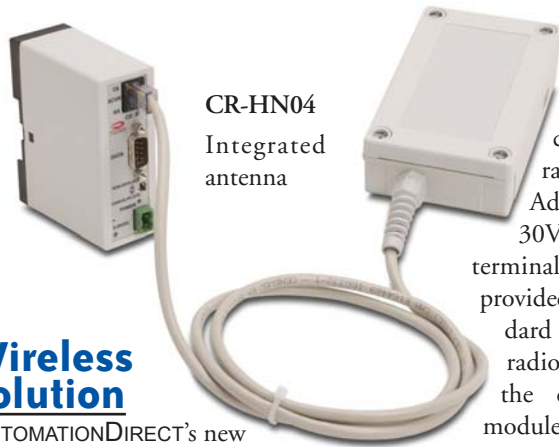
- Transmission at 2.4 GHz, the only truly international unlicensed frequency band
- Frequency Skip feature that prevents interference with/from any co-located 802.11 wireless LANs
- Reliable data throughput using Cirronet's patented FHSS technology; assures reliable performance even in high-multipath and noisy RF environments. CRC error checking and ARQ (automatic repeat-request) schemes for auto-retransmission of bad packets assures errorless data reception.
- Long range with high speed (up to 1.23 Mbps total over-the-air bandwidth in point-to-point and multipoint applications), up to 1.5 miles (farther with high gain antenna)
- License-free operation avoids the hassles and expense of obtaining an FCC license
- Wide operating temperature range from 30 degrees Celcius to +70 Celcius
- Rugged packaging well suited to varied operating conditions; external radios are housed in NEMA 4X/IP 66 enclosures ideal for outdoor and harsh environments.
- Easy-to-understand configuration tools for quick setup
- Fully programmable setup to meet specific site and performance requirements
- UL 2279 listed and CE marked

## Configurations





# CR-HN SERIES SERIAL RADIO MODEMS



CR-HN04  
Integrated  
antenna

When using a specialty antenna, a short, pre-manufactured, RF cable connects the antenna to the radio module. The Serial Adapter Box accepts 10-30VDC via a removable screw terminal plug. An adapter is provided for connection to a standard 120VAC receptacle. The radio module is powered over the cable linking the radio module to the serial adapter.

## Wireless solution

AUTOMATIONDIRECT's new

CR-HN series serial radios are versatile, low cost, 2.4 GHz frequency-hopping spread spectrum wireless data modems. AUTOMATIONDIRECT and Cirronet™ have worked together to repackage Cirronet's popular HopNet 210 radio modem to be the most practical wireless solution for the industrial controls market. The CR-HN radios are ideal for SCADA applications as remote modems in multipoint configurations and are an extremely cost-effective solution for point-to-point installations.

A DIN-rail mounted Serial Adapter Box, one of the major components of the CR-HN series, resides in the control panel while the NEMA 4X radio module is mounted externally to the control panel to achieve the best line-of-sight link to the other radio antennas in the system. For most purposes, the CR-HN radio module incorporates an integral 6dB antenna, creating a "single piece" modem. The integral 6dB patch antenna provides a line-of-sight range of several miles. For extended distances or in obstructed environments, higher gain and/or directional antennas are available. A standard serial cable connects the communicating device to the CR-HN serial adapter. Similar "serial-quality" cabling is used for the link between the serial adapter and radio module. In most cases, no expensive, troublesome RF quality cabling is required. The CR-HN radio module simply installs on the side of a building or attaches to a mast where the antenna would normally be mounted.

The CR-HN series has exceptional multipath fade rejection as well as immunity to jamming. Up to 16 networks can be grouped together with 63 remotes (slaves) per network. The HN series radios have a unique "Frequency Skip" feature to avoid the standard 802.11 wireless WI-FI Ethernet channels. This means your control radios will not interfere with or suffer interference from PC wireless networks that may be grouped together. Selectable transmit power levels of 10mW and 100mW allow the CR-HN series to be used worldwide even with the gain of the patch antenna. The CR-HN series radios communicate over the air at 460.8 Kbps and support both point-to-point and point-to-multipoint networks.

They are field proven performers that deliver robust, reliable performance in hostile industrial environments. The CR-HN series is UL, FCC and CE marked.

### Features:

- 2.4 GHz Frequency Hopping Spread Spectrum Technology
- Unique "Frequency Skip" setting to avoid 802.11 Wireless Ethernet LANs
- 460 Kbps over the air and 115 Kbps I/O data rates
- 64 hopping patterns
- FCC Certified and CE marked
- Integral 6dB patch antenna
- RS-232 asynchronous serial interface
- Transparent and MODBUS support modes

### Benefits:

- Exceptional immunity to multipath fading and jamming
- Grouping of multiple networks
- No interference with/from 802.11 Wireless Ethernet networks
- License-free applications
- Cost-effective, simple installation
- Connects to PC Serial ports
- Point to point and point to multipoint

### CR-HN Series Serial Radio Modems

Part Number	Description	Price
CR-HN50	Hop-Net radio with 50ft cable and integral antenna	check
CR-HN50X	Hop-Net radio with 50ft cable and external antenna connector	check!
CR-HN04	Hop-Net radio with 4ft cable and integral antenna	check
CR-HN04X	Hop-Net radio with 4ft cable and external antenna connector	check
CR-HNSA	Replacement Serial Adapter for all CR radios	check
CR-OMN2402	Replacement Dipole Antenna, 2.4GHz, 2dB, right angle	check
CR-OMN2409	9dB, 2.4 GHz, Omni Antenna	check
CR-CRN2409	9dB, 2.4 GHz, Corner Reflector Antenna	check
CR-PAR2418	18dB, 2.4 GHz, Parabolic Dish Antenna	check
CR-CBL24N	24" RF Cable, Reverse TNC to N connects an external antenna to a CR radio	check
CR-CBL60N	60" RF Cable, Reverse TNC to N connects an external antenna to a CR radio	check
CR-REPETR	Dual radio repeater with rechargeable lead-acid battery. Requires two CR series antennas and two series CR-CBLxxN RF cables. Non-stock item, 3 week delivery.	check

# SERIAL RADIO MODEM SPECIFICATIONS



**CR-HN04X**  
Reverse TNC male connector  
requires CR series antenna



**CR-HN04**  
Integrated  
antenna

<b>CR-HN Series Specification</b>	
<b>Electrical Specifications</b>	
Frequency Band	2.4 GHz
Licensing	Unlicensed under FCC Part 15, ETSI 300.328
Number of Channels	75 or 25
Hopping Patterns	User configurable, 64 patterns (networks) available
I/O Data Rate	Up to 115.2 Kbps Asynchronous
RF Channel Rate	460 Kbps
Line of Sight Range	> 5 Miles
RF Bandwidth	750 KHz
Modulation Type	GFSK
Output Impedance	50 Ω
Network Protocol	Dynamically Assigned TDMA with ARQ
Transmit Power	EIRP: +16dBm/+24dBm
Receive Sensitivity	-99dBm
Power Requirements	10 - 30VDC, 160mA typical, 750mA surge
Serial Data Interface	Asynchronous RS-232
<b>Mechanical Specifications</b>	
Antenna	CR-HN50 & CR-HN04: Integrated 6dB Patch CR-HN50X & CR-HN04X: Reverse TNC Male Connector, requires CR series antenna
Case Materials	Polycarbonate, NEMA 4X
Dimensions: in(mm)	5.13 (130) x 3.13 (79) x 1.38 (35) (excl. flange)
Weight excl. cable	235g
Data Connector	9-Pin D
Power Connector	2 Pin, plug-in, screw terminal
Cables	CR-HN04 comes with 4 feet of cable CR-HN50 comes with 50 feet of cable
LED Indicators	Power, Tx, Rx, Carrier Detect
<b>Environmental Specifications</b>	
Temperature Range	-30°C to 70°C (radio enclosure)
Humidity	95% at 40°C, Non-condensing
<b>Approvals</b>	
UL 508	
CE	





# CR-SE SERIES ETHERNET RADIO MODEMS

## Wireless solution

AUTOMATIONDIRECT's new CR-SE series Ethernet radios are based on the same patented Cirronet radio technology as the CR-HN serial radios. These are low cost, 2.4 GHz frequency-hopping spread spectrum wireless data modems. They provide long range, high-speed wireless connectivity among Ethernet devices in industrial settings. The CR-SE radios have exceptional multipath fade rejection as well as immunity to jamming. AUTOMATIONDIRECT and Cirronet combined forces and repackaged Cirronet's popular SEM 24 radio modem to be the most practical wireless Ethernet solution for the industrial controls market. Typical CR-SE applications include wireless industrial automation and data collection, network bridging, PLC networking and SCADA. CR-SE radios can function as a high speed bridge to a distant Ethernet network node or a CR-SE radio base station can be connected to multiple remote CR-SE radios to build a wireless Ethernet network. The higher gain antennas increase the range up to 5 plus miles. All CR-SE models enable long range connectivity far beyond cabled Ethernet maximums.

Up to 16 separate CR-SE radio networks can be placed together with 63 remote units (slaves) per network. The HN series radios have a unique "Frequency Skip" feature to avoid the standard 802.11 wireless WI-FI Ethernet channels. This means your control radios will not interfere with or suffer interference from PC wireless networks that may be grouped together. Selectable transmit power levels of 10mW and 100mW allow the CR-SE series to be used worldwide. The CR-SE series radios support both point-to-point and point-to-multipoint networks. They are field proven performers that deliver robust, reliable performance in hostile industrial environments. The CR-SE series is UL, FCC and CE marked.

## Choose from four models

### Local Radio

The radio modem and a Network Interface unit are combined into one DIN-rail mountable module. A 2dB whip antenna, which is provided, can be attached directly to the unit or mounted externally to the enclosure via an optional CR-CBLxxN RF cable.

### Remote Radio

For extended distances or in obstructed environments, higher gain and /or directional antennas are available. A Network Interface Unit (NIU) is housed in a enclosure and is connected via its terminal strip to the remote radio module located up to 300 feet away. The remote radio module, housed in a weatherproof NEMA 4X/IP 66 enclosure, mounts directly to the antenna mast or side of a building. A short, pre-manufactured, RF cable connects the antenna to the radio module. No need to hassle with expensive and troubling RF custom cables. Choose the proper CR-CBLx cable, in respect to the distance between the NIU and the radio module, and the proper antenna, both are ordered separately.

### Features:

- 2.4 GHz Frequency Hopping Spread Spectrum Technology
- Unique "Frequency Skip" setting to avoid 802.11 Wireless Ethernet LANs
- 64 hopping patterns (for co-locating separate networks with up to 64 radios/network)
- FCC Certified, UL listed and CE marked
- 2dB right angle whip antenna
- Web browser interface

### Benefits:

- Exceptional immunity to multipath fading and jamming
- Grouping of multiple networks without interference
- No interference with/from 802.11 Wireless Ethernet networks
- License-free applications worldwide
- Cost-effective, simple installation
- Connects to any 802.3 Ethernet LANs
- Point-to-point and point-to-multipoint

CR-SE Series Ethernet Radio Modems		
Part Number	Description	Price
<b>CR-SEB</b>	10/100 Base-T Ethernet radio bridge, 460Kbps with 2dB, Rt Angle, Omni antenna	check
<b>CR-SEBX</b>	10/100 Base-T Ethernet radio bridge, 460Kbps with external antenna connector	check
<b>CR-SEH</b>	High-speed, 10/100 Base-T Ethernet radio bridge, 1.23Mbps with 2dB, Rt. angle, Omni antenna	check
<b>CR-SEHX</b>	High-speed, 10/100 Base-T Ethernet radio bridge, 1.23Mbps with external antenna connector	check
<b>CR-SEAP</b>	Serial to Ethernet Access Point, enables serial devices on CR-HN radios to appear as nodes on an Ethernet network, 10/100 Base-T, 460Kbps with integral antenna	check
<b>CR-OMN2409</b>	9dB, 2.4 GHz, Omni Antenna	check
<b>CR-CRN2409</b>	9dB, 2.4 GHz, Corner Reflector Antenna	check
<b>CR-PAR2418</b>	18dB, 2.4 GHz, Parabolic Dish Antenna	check
<b>CR-CBL24N</b>	24" RF Cable, TNC to N connects an external antenna to a CR radio	check
<b>CR-CBL60N</b>	60" RF Cable, TNC to N connects an external antenna to a CR radio	check
<b>CR-REPETR</b>	Dual radio repeater with rechargeable lead-acid battery. Requires two CR series antennas and two series CR-CBLxxN RF cables. Non-stock item, 3 week delivery.	check
<b>CR-CBLE1</b>	External Antenna Cable Kit includes weatherproof radio connector on 100ft pigtail cable	check
<b>CR-CBLE2</b>	External Antenna Cable Kit includes weatherproof radio connector on 200ft pigtail cable	check
<b>CR-CBLE3</b>	External Antenna Cable Kit includes weatherproof radio connector on 300ft pigtail cable	check
<b>CR-PSCN</b>	Replacement Power Plug for all CR radios	check
<b>CR-PSAC</b>	Replacement AC Adapter for CR radios with plug	check

# ETHERNET RADIO MODEM SPECIFICATIONS



CR-SE Series Specification	
<b>Electrical Specifications</b>	
Frequency Band	2.4 GHz
Licensing	Unlicensed under FCC Part 15, ETSI 300.328
Number of Channels	SEB - 75, SEH - 43 (USA); SEB - 75, SEH - 27 (Canada, France, Spain & Japan)
Hopping Patterns	User configurable, 64 patterns (networks) available
Data Throughput	SEB - 400 Kbps; SEH - 1.0 Mbps
RF Channel Rate	460Kbps/1.23Mbps
Line of Sight Range	> 1 Miles
RF Bandwidth	SEB - 750 KHz; SEH - 1.5 MHz
Modulation Type	GFSK
Output Impedance	50 $\Omega$
Network Protocol	Dynamically Assigned TDMA with ARQ
Transmit Power	EIRP: +16dBm/+24dBm
Receive Sensitivity	SEB = -93dBm; SEH = -90dBm
Power Requirements	9-30VDC (12-30VDC SEHX & SEBX), 160mA typical, 750mA surge
Ethernet Protocol	802.3, 10/100 Base-T (for SEB and SEH/10/100)
<b>Mechanical Specifications</b>	
Antenna	CR-SEB & CR-SEH: 6", 2dB, Rt. angle, Dipole, Omni antenna CR-SEBX & CR-SEHX: ReverseTNC Male connector, requires CR series antenna
Case Materials	Polycarbonate, NEMA 4X
Dimensions (in)	5.5 x 4.5 x 1.78 (excl. flange)
Weight excl. cable	235g
Data Connector	RJ45
Configuration Connector	RJ11
Synchronization Connector	RJ11
Antenna (SEB & SEH only)	TNC Male
Transceiver (SEBX & SEHX only)	15 pin
Power Connector	2 Pin, plug-in, screw terminal
LED Indicators	Power, Tx, Rx, RF Link, Link
<b>Environmental Specifications</b>	
Temperature Range	-30°C to 70°C Network Interface Unit -40°C to 70° Radio enclosure (SEBX & SEHX only)
Humidity	95% at 40°C, Non-condensing
<b>Approvals</b>	
UL 508	
CE	