Spread Spectrum Radio Modems

Models RF400, RF410, RF415

Spread spectrum radios spread the normally narrowband information signal over a relatively wide band of frequencies. This allows the communications to be more immune to noise and interference from RF sources such as pagers, cellular phones and multipath.[1] The RF400-series modems reduce susceptibility to RF interference from other spread spectrum devices by providing user-selectable frequency hopping patterns.

The RF400-series spread spectrum radio modems support point-to-point and point-to-multipoint datalogger communications. They can serve as a field modem/radio while connected to the datalogger or as a base station modem/radio when connected to a computer. The RF400-series modems can also be used for general purpose wireless data communications.

Features

- Individual FCC license not required[2]
- Transmission distance of one to 10 miles using inexpensive omni-directional antennas (shown), several times that using higher gain directional antennas (please note that line-of-sight obstructions and RF interference will affect transmission distance)
- Low power consumption
- 9-pin CS I/O port that connects directly to the datalogger (no additional interface required)
- 9-pin RS-232 port that connects directly to a computer serial port or other RS-232 device
- 25-channel frequency-hopping radio
- Built-in simplified and advanced setup menus for configuring port modes, network/radio addresses, hop table, and power saving modes
- Setup that allows different addresses for multiple dataloggers in a point-to-multipoint network (call about repeater capability)
- Settings stored in non-volatile memory

1. *The operating frequency band of these radio modems may be shared with other non-licensed services such as cordless telephones and with licensed services including emergency, broadcast, and air-traffic control.*
2. *RF400-series modems, like all FCC Part 15 devices, are not allowed to cause harmful interference to licensed radio communications and must accept any interference that they receive. Most Campbell Scientific users operate in open or remote locations where interference is unlikely. If there is a problem, interference can be reduced using methods such as moving the device, reorienting or using a different type of antenna, or adding RF shielding. We recommend the use of licensed UHF or VHF narrowband frequencies for critical communication links.*

CAMPBELL SCIENTIFIC, INC.
815 W. 1800 N. • Logan, Utah 84321-1784 • (435) 753-2342 • FAX (435) 750-9540 • www.campbellsci.com

Ordering Information

RF400 **900 MHz Spread Spectrum Radio/Modem (US/Canada)**

RF410 **922 MHz Spread Spectrum Radio/Modem (Australia/Israel)**

RF415 **2.4 GHz Spread Spectrum Radio/Modem (Worldwide)**

Omnidirectional antennas are normally used at the base station and nearby stations. Yagi antennas are needed at distant stations or other special cases. Call one of our Applications Engineers for help in choosing an antenna. Only the following FCC approved antennas can be used.

RF400 and RF410 antennas

Direct connect antennas (antenna cable not required)

14310	900 MHz, Omnidirectional, ¼ Wave, Whip, 0 dBd RPSMA
14204	900 MHz, Omnidirectional, ½ Wave, Whip, 0 dBd RPSMA, jointed, adjustable from 0° to 90°

Antennas that require a cable

14221	900 MHz, Omnidirectional, 3 dBd, with mounts
14205	900 MHz, Yagi, 6 dBd, with mounts
14201	900 MHz, Yagi, 9 dBd, with mounts

Yagi antennas (14201 shown) are intended for longer transmission distances.

RF415 antennas

Direct connect antennas (antenna cable not required)

16005	2.4 GHz, Omnidirectional, ½ wave, whip, 0 dBd RPSMA

Antenna that requires a cable

16755	2.4 GHz, Yagi, 13 dBd with mounts

Cables for our 14221, 14205, 14201, or 16755 antennas

Recommended for cable lengths <10 ft

COAX RPSMA-L	Low-loss RG58 antenna cable with reverse polarity, SMA connector and type N male connector. Specify length, in feet, after L.

Recommended for cable lengths >10 ft and/or use with lightning protection

COAX NTN-L	Low-loss RG8 antenna cable with type N male to type N male connectors (requires 14462). Specify length, in feet, after L.
14462	Antenna surge protector kit. Includes one COAX RPSMA-L1.5. Requires COAX NTN-L cable.

Additional accessories

14220	Base cable/power kit (includes ac adapter and 9-pin-to-9-pin RS-232 cable)
14162	Mounting bracket kit
14291	Optional power cable

Specifications

Operating Frequency:	910 to 918 MHz RF400, 920 to 928 MHz RF410, 2.450 to 2.460 GHz RF415
Type:	Frequency Hopping Spread Spectrum (FHSS) Transceiver
I/O Data Rate:	9600 bps
Channel Capacity:	65,000 Network Identifiers share 25 hop channels
Frequency Hopping Patterns:	Six different selectable patterns
Frequency Control:	Direct FM
Receiver Sensitivity:	-110 dBm (-104 dBm RF415) at 10^{-4} bit error rate (Campbell Scientific protocols will issue retries wherever a bit error occurs)
Interference Rejection:	70 dB at pager and cellular phone frequencies
Transmitter Power Output:	100 mW nominal (RF400, RF410) 60 mW nominal (RF415)
Antenna Connector:	Reverse polarity SMA
FCC ID:	OUR9XTREAM (RF400, RF410) OUR-24XSTREAM (RF415)
Operating Temperature Range:	-25° to +50°C (call about extended temperature ranges)
Dimensions:	4.75 x 2.75 x 1.3 inches (12.1 cm x 7.0 cm x 3.3 cm)
Power:	9 to 16 Vdc
Average Current Drain:	<1 mA stand-by (assuming power-saving options used), 24 mA while receiving, <75 mA while transmitting (RF400, RF410) 36 mA while receiving, 75 mA while transmitting (RF415)
LEDs:	Power on, TX, RX, diagnostics
CS I/O Connector:	9-pin "D" Male for all needed communications lines. Newer loggers provide power to the radio on this connector. Older loggers may require optional power cable #14291*
RS-232 Connector:	9-pin "D" Female for TX, RX, CTS, ground RS-232 levels
Power Connector:	Barrel connector, center positive 12 V for use in base station configuration or with older dataloggers (newer loggers provide power to the radio on the CS I/O connector)
Compatible Devices:	21X(L), CR10(X)*, CR23X, CR510, CR7, CR5000, CR500, RAD Modem, and COM200/COM210 (w/PS512M and no logger only).

**Older wiring panels (CR10 silver or CR10 black with gray terminal strips) will require optional power cable #14291.*

Inteltronics Instrumentation

Uitsig, De Kroon, Brits
P.O. Box 181, Brits, 0250, S.A
TEL: +27 (0)12 250 2403
FAX: +27 (0)12 250 2809
E-mail: itronics@icon.co.za
Web Site: www.inteltronics.co.za

CAMPBELL SCIENTIFIC, INC.

815 W. 1800 N. • Logan, Utah 84321-1784 • (435) 753-2342 • FAX (435) 750-9540
Offices also located in: Australia • Brazil • Canada • England • France • South Africa • Spain

Printed February 2003