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CAMPBELL SCIENTIFIC, INC.
RMA#____
815 West 1800 North
Logan, Utah 84321-1784

For all returns, the customer must fill out a “Statement of Product Cleanliness and Decontamination” form and comply with the requirements specified in it. The form is available from our website at www.campbellsci.com/repair. A completed form must be either emailed to repair@campbellsci.com or faxed to (435) 227-9106. Campbell Scientific is unable to process any returns until we receive this form. If the form is not received within three days of product receipt or is incomplete, the product will be returned to the customer at the customer’s expense. Campbell Scientific reserves the right to refuse service on products that were exposed to contaminants that may cause health or safety concerns for our employees.
Safety

DANGER — MANY HAZARDS ARE ASSOCIATED WITH INSTALLING, USING, MAINTAINING, AND WORKING ON OR AROUND TRIPODS, TOWERS, AND ANY ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC. FAILURE TO PROPERLY AND COMPLETELY ASSEMBLE, INSTALL, OPERATE, USE, AND MAINTAIN TRIPODS, TOWERS, AND ATTACHMENTS, AND FAILURE TO HEED WARNINGS, INCREASES THE RISK OF DEATH, ACCIDENT, SERIOUS INJURY, PROPERTY DAMAGE, AND PRODUCT FAILURE. TAKE ALL REASONABLE PRECAUTIONS TO AVOID THESE HAZARDS. CHECK WITH YOUR ORGANIZATION'S SAFETY COORDINATOR (OR POLICY) FOR PROCEDURES AND REQUIRED PROTECTIVE EQUIPMENT PRIOR TO PERFORMING ANY WORK.

Use tripods, towers, and attachments to tripods and towers only for purposes for which they are designed. Do not exceed design limits. Be familiar and comply with all instructions provided in product manuals. Manuals are available at www.campbellsci.com or by telephoning (435) 227-9000 (USA). You are responsible for conformance with governing codes and regulations, including safety regulations, and the integrity and location of structures or land to which towers, tripods, and any attachments are attached. Installation sites should be evaluated and approved by a qualified engineer. If questions or concerns arise regarding installation, use, or maintenance of tripods, towers, attachments, or electrical connections, consult with a licensed and qualified engineer or electrician.

General

- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations, such as those of the FAA in the USA.
- Use only qualified personnel for installation, use, and maintenance of tripods and towers, and any attachments to tripods and towers. The use of licensed and qualified contractors is highly recommended.
- Read all applicable instructions carefully and understand procedures thoroughly before beginning work.
- Wear a hardhat and eye protection, and take other appropriate safety precautions while working on or around tripods and towers.
- Do not climb tripods or towers at any time, and prohibit climbing by other persons. Take reasonable precautions to secure tripod and tower sites from trespassers.
- Use only manufacturer recommended parts, materials, and tools.

Utility and Electrical

- You can be killed or sustain serious bodily injury if the tripod, tower, or attachments you are installing, constructing, using, or maintaining, or a tool, stake, or anchor, come in contact with overhead or underground utility lines.
- Maintain a distance of at least one-and-one-half times structure height, 20 feet, or the distance required by applicable law, whichever is greater, between overhead utility lines and the structure (tripod, tower, attachments, or tools).
- Prior to performing site or installation work, inform all utility companies and have all underground utilities marked.
- Comply with all electrical codes. Electrical equipment and related grounding devices should be installed by a licensed and qualified electrician.

Elevated Work and Weather

- Exercise extreme caution when performing elevated work.
- Use appropriate equipment and safety practices.
- During installation and maintenance, keep tower and tripod sites clear of un-trained or non-essential personnel. Take precautions to prevent elevated tools and objects from dropping.
- Do not perform any work in inclement weather, including wind, rain, snow, lightning, etc.

Maintenance

- Periodically (at least yearly) check for wear and damage, including corrosion, stress cracks, frayed cables, loose cable clamps, cable tightness, etc. and take necessary corrective actions.
- Periodically (at least yearly) check electrical ground connections.

WHILE EVERY ATTEMPT IS MADE TO EMBODY THE HIGHEST DEGREE OF SAFETY IN ALL CAMPBELL SCIENTIFIC PRODUCTS, THE CUSTOMER ASSUMES ALL RISK FROM ANY INJURY RESULTING FROM IMPROPER INSTALLATION, USE, OR MAINTENANCE OF TRIPODS, TOWERS, OR ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC.
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Datalogger RF407-Series Spread Spectrum Radio Option

1. Introduction

This manual discusses the RF407-series frequency-hopping spread-spectrum (FHSS) radio option for the CR6-series and CR300-series dataloggers. This manual will refer to these dataloggers collectively as “CRX-RF407.” Throughout the manual CRX-RF407 can be replaced with any datalogger and radio option, unless otherwise noted. The standalone radios (that is, not the dataloggers with the radio option) will be referred to collectively as “RF407.” Throughout the manual RF407 can be replaced with RF412 or RF422, unless otherwise noted.

The radio options cannot be mixed. A CRX-RF407 can only be used with other CRX-RF407s and RF407s. A CRX-RF412 can only be used with other CRX-RF412s and RF412s. A CRX-RF422 can only be used with other CRX-RF422s and RF422s.

These dataloggers are designed for license-free use in several countries:

- The RF407 option has a 902 to 928 MHz operating-frequency range appropriate for use in the United States and Canada (FCC / IC compliant).
- The RF412 option has a 915 to 928 MHz operating-frequency range appropriate for use in Australia and New Zealand (ACMA compliant).
- The RF422 option has an 863 to 873 MHz operating-frequency range appropriate for use in most of Europe and some of Asia (ETSI compliant).

A CRX-RF407 can be used with an RF407 at a base computer to establish communication between LoggerNet and the CRX-RF407. A CRX-RF407 can also be part of a new or existing RF407 network.

This document describes how to set up a simple base RF407 to remote CRX-RF407 network. It also describes how to extend that system to include more CRX-RF407s and how the CRX-RF407 can be used in combination with other communication methods.

A CRX-RF407 contains the same radio as a standalone RF407. Most of the radio settings are the same for the CRX-RF407 and the RF407. See the RF407-Series Spread Spectrum Radios manual for more information on specifications and radio communication using the CRX-RF407.
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

2. Communication Setup

2.1 Basic Procedure: PC with RF407 to CRX-RF407

NOTE This procedure assumes the RF407 and the CRX-RF407 are in their Factory Default settings.

Click the Device Configuration Utility icon on the PC.

Device Configuration Utility (DevConfig) opens.

In DevConfig, select Device Type | Radio | RF407 Series.

DevConfig displays RF407 series information in the right pane.
On the right pane, click the **Install the USB device driver** link.

The *Device Driver Installation Wizard* opens.

Click **Next**.

The device drivers are installed and the *Wizard* advances to the next screen.
Click Finish.

The Device Driver Installation Wizard closes.

Connect the USB port on your RF407 to a USB port on your computer.

The TX/PWR and RX LEDs flash once, after which the TX/PWR LED begins blinking at the Power Mode interval (0.5 sec, by default).
In the lower left of the DevConfig screen, click the Communication Port list button.

A list of available communication ports appears.

In the list of available communication ports, click RF407-Series (COMnn), where nn is the COM port number assigned by your PC. Click OK.

The COM port number assigned to the RF407 populates the Communication Port box.
In the lower left of the DevConfig screen, click Connect. If the Avoid Conflicts with the Local Server window appears, click OK.

DevConfig displays the Deployment tab in the right pane.

In the Deployment tab, set the Active Interface to USB or RS-232 depending on how your computer will be connected to the RF407.
Click **Apply**.

The **Confirm Settings Apply** dialog box appears.

Click **Yes**.

The TX/PWR and RX LEDs flash once, after which the TX/PWR LED returns to blinking at the **Power Mode** interval (0.5 sec, by default).

The **settings changes have been saved** dialog box appears.

Click **OK**.

**DevConfig** disconnects from the RF407 and returns to the main RF407 screen.
Attach an antenna to the RF407.

Provide power to the RF407. (The RF407 can be powered through the USB port or through the DC Power jack.)

Attach an antenna to the CRX-RF407.

Provide power to the CRX-RF407:
• connect 12 Vdc at the green –BAT+ terminals,
• or connect 16 to 32 Vdc at the –CHG+ terminals.

Open LoggerNet.
From the LoggerNet toolbar, select Setup from the Main category.

If the Setup screen does not say EZ (Simplified) View at the top, click EZ View in the top-right corner, to switch to the EZ View.

Click Add.

The EZSetup Wizard opens.

Click Next.
Select CR6Series or CR300Series depending on your datalogger. Click Next.

Select Direct Connect. Click Next.

In the list of available communication ports, click RF407-Series (COMnn), where nn is the COM port number assigned by your PC. Click Next.

(Note that you choose RF407-Series (COMnn) to select the USB port to which the RF407 is attached. LoggerNet sees the CRX-RF407 as directly connected to this port. The RF407-to-datalogger link does not need to be indicated in LoggerNet.)
Enter the PakBus Address of your datalogger. The default address is 1. Keep all other defaults. Click Next.

Leave the datalogger security settings at their default values. Click Next.

The Communication Setup Summary screen shows a summary of the settings that you entered. Click Next.
Make sure that **Yes** is selected. Click **Next**.

*LoggerNet* attempts to communicate with the CRX-RF407 and, if successful, the *EZSetup Wizard* advances to the **Communication Test Succeeded** screen. (If communication is unsuccessful, click **Previous** and verify all of the settings are correct.)

Click **Next**.

Click **Set Datalogger Clock**, and then click **Finish**.

The datalogger clock is set to the PC clock, the *EZSetup Wizard* closes.
The CRX-RF407 is added to the Setup screen. (Note that it will be named CR6Series or CR300Series. The radio option will not be indicated.)

Use LoggerNet Connect to connect to the datalogger, send programs, and view and collect data.
2.2 PC with RF407 to Multiple CRX-RF407s

The Basic Procedure can be extended to include multiple CRX-RF407s in the system.

With multiple CRX-RF407s, DevConfig must be used to give each CRX-RF407 a unique PakBus Address. This changes the hardware setting in the CRX-RF407.

NOTE
Most Campbell Scientific devices come from the factory with a default PakBus address of 1. For this reason, it is best not to assign PakBus address 1 to any device in the network. Then, if a new device with default settings is added to the system, it will not create a conflict.
These unique PakBus® addresses must be entered on the **Datalogger Settings** tab of the **LoggerNet EZSetup Wizard**. This change is to make the software settings (**LoggerNet**) match the change we made in the hardware settings using **DevConfig**.

![EZSetup Wizard](image)

Once you have used the **EZSetup Wizard** to add all of the dataloggers in your network, they will all appear on the **Setup** screen.

![Setup Screen](image)
2.3 CRX-RF407 as a Router

The previous procedure can be extended to use one CRX-RF407 as a router in the network to go around an obstacle such as a hill or to reach longer distances.

This requires only a few changes to the previous procedure.

First, use DevConfig to connect to the CRX-RF407 that will be used as a router. On the Com Ports Settings tab, set Select the ComPort to RF. Set the Beacon Interval to 60 seconds (or the amount of time you are willing to wait for the leaf dataloggers in the network to be discovered) and the Verify Interval to something slightly greater than the expected communication interval between the router and the leaf dataloggers in the network. For example, the following screenshot shows the Verify Interval set to 90 seconds.
Next, use the Advanced tab in DevConfig to set Is Router to True in the CRX-RF407 that will act as a router.

As in the previous example, DevConfig should be used to give each CRX-RF407 in the network a unique PakBus Address.
To set up the network in LoggerNet, select Setup from the Main category. If the Setup screen says EZ (Simplified) View at the top, click Std View in the top-right corner to switch to the Standard View. Select Add Root | ComPort | PakBusPort (PakBus Loggers) | CR6Series or CR300Series (the type of datalogger that will be used as a router). Close the Add selection window. Select the ComPort in the network map. Use the ComPort Connection drop-down list to select the COM port assigned to the RF407-Series.

Select the PakBusPort in the network map. Select the PakBus Port Always Open checkbox. If it is possible that LoggerNet could communicate with any other dataloggers in the network without going through the router CRX-RF407 and you wish to prevent this, set the Beacon Interval to 00 h 00 m 00s.
Select the router datalogger in the network map. Set the **PakBus Address** to the address that was assigned in *DevConfig*.

For each of the leaf CRX-RF407s in the network, right-click on the router CRX-RF407 and select the appropriate datalogger type. Select the newly added datalogger in the network map and set the **PakBus Address** to that assigned using *DevConfig*.
After all of the leaf dataloggers have been added to the network map, click **Apply**.

All of the dataloggers will be added to the **Connect** screen, where you can connect to each datalogger, send programs, and view and collect data.
2.4 Communication Combinations

The CRX-RF407 can be used in a system with multiple communication methods. For example, in the figure below, the router CRX-RF407 communicates with LoggerNet through an RV50 cellular modem connected to the CRX-RF407 using a CPI/RS-232 Data Cable. (An Ethernet connection could also be used between the RV50 and the CRX-RF407. See the RV50 manual for more information.) The router CRX-RF407 communicates with the leaf CRX-RF407s through RF.

The RF portion of this network requires no changes to the hardware settings described in the previous procedure (Section 2.3, CRX-RF407 as a Router (p. 16)). See the manual for the communication product being used in combination with the CRX-RF407 (in this example, the RV50) for information on setting up LoggerNet to communicate with the router CRX-RF407.

2.5 Network Planner

For more complicated networks, LoggerNet Network Planner is recommended for the network setup. Select devices from the Device Palette and place them on the drawing canvas. Use the link tool to draw lines indicating the communication links between devices. Use the activity tool to indicate activities that will take place between devices.
Network Planner calculates the optimum settings for each device in the network and allows you to send these settings to the device. If any change is made to a device in the network, that change is propagated to every affected device setting. Network Planner can then use the information entered to configure LoggerNet Setup.

Refer to the Network Planner help for more information.

3. Troubleshooting

If there are intermittent communication problems with the above setups, there may be another network in the area causing interference. To help remove the interference, use DevConfig to change the Network ID and RF Hop Sequence in all RF407s and CRX-RF407s to a different value. Each of these settings must have the same value in all RF407s and CRX-RF407s. For example, the Network ID in all devices could be set to 1726, and the RF Hop Sequence in all devices could be set to 1. This is just an example. The Network ID can be any number between 0 and 32767. The RF Hop Sequence can be any number between 0 and 7 in an RF407 or RF412 network; it can be any number between 0 and 9 in an RF422 network.
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