COMMUNICATIONS SETUP GUIDE



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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 nonessential 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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1. Introduction

The CR6-RF451 contains a 900 MHz license-free radio specifically designed to work with Campbell Scientific equipment. It can be used with an RF451 at a base computer to establish communication between *LoggerNet* and the CR6-RF451. A CR6-RF451 can also be part of a new or existing RF450/RF451 network. (Note that the CR6-RF451 cannot be added to an RF401A-series or RF407-series network.)

This document describes how to set up a simple base RF451 to remote CR6-RF451 network. It also describes how to extend that system to include more slave CR6-RF451s and / or a slave/repeater CR6-RF451, and how the CR6-RF451 can be used in combination with other communication methods.

The CR6-RF451 contains the same radio as the standalone RF451. Most of the RF hardware settings are the same for the CR6-RF451 and the RF451. See the *RF451 manual* for more information on RF communication using the CR6-RF451.

Communication Setup 2.

2.1 Basic Procedure: PC with RF451 to CR6-RF451

NOTE

This procedure assumes the RF451 and the CR6-RF451 are in their Factory Default settings.

Help

 \odot ~

Click the Device Configuration Utility icon on the PC.

Device Configuration Utility (DevConfig) opens.



	File Backup Options
	Device Type
	Q Search
	🗄 Camera
	🗄 Cellular Modem
	🗄 Datalogger
	🗄 Datalogger (Other)
	Network Peripheral
g, select Device Type 51.	Peripheral
	Phone Modem
n the right pane.	🗆 Radio
	AL200
	RF400
	RF401
	RF401A Series
	RF407 Series
	RF430
	RE450
	RF451
	RF500M

In DevConfig Radio | RF45

DevConfig dis information in

RF451 Send OS

RF451

The RF451 is a high performance frequency hopping spread spectrum communication. It may be connected to a datalogger, computer, or an purpose of computer-to-datalogger and datalogger-to-datalogger comm



Connect Instructions

Note: Install the USB device driver before connecting this product t 1. Connect the device USB port to your computer using the supplie

 Select the correct Communication Port in the left panel. Not Communication Port to become available for use after physically
 Select the Connect button.



Click Next.

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

On the right pane, click the Install

the USB device driver link.

The Device Driver Installation

Wizard opens.

)	Device Driver Installat	ion Wizard
	Completing th Installation W	ne Device Driver Vizard
	The drivers were succes	ssfully installed on this computer.
	You can now connect y came with instructions, p	our device to this computer. If your device please read them first.
	Driver Name	Status
	Campbell Scientific	, Inc Ready to use
	Contraction (1997)	Back Finish Cancel

Click Finish.

The *Device Driver Installation Wizard* closes.



The RF451 **Status** LED blinks orange.



In the lower left of the *DevConfig* screen, click the **Communication Port** list button.

A list of available communication ports appears.

RF450	
RF451	
RF500M	
TX321/TX320/TX312	
∃ Sampler	~
Communication Port	_
COM13	
	\sim

In the list of available communication ports, click RF451 (COMnn), where nn is the COM port number assigned by your PC, then click OK . The COM port number assigned to the RF451 populates the Communication Port box.	Communications Port (COM1) RF451 (COM13) USB Serial Port (COM3) USB Serial Port (COM4) USB Serial Port (COM5) USB Serial Port (COM6) Ok Cancel
In the lower left of the <i>DevConfig</i> screen, click Connect . Click the extra OK if it appears. <i>DevConfig</i> displays the Deployment tab in the right pane. The RF451 Status LED goes to solid orange.	Communication Port COM13 Use IP Connection Baud Rate 115200 V Connect
In the Deployment tab, set the Active Interface to USB or RS-232 depending on how your computer will be connected to the RF451. Also, set the Radio Operation Mode to Multi-Point Master .	Deployment Settings Editor Send OS Serial No: 936-4701 Versions: RF451: RF451.01.0 Active Interface: USB VSC Address: 7 Baud Rate: V SSC Address: 7 Radio Operation Mode: Multi-Point Master Repeaters Used Network ID: 921 Frequency Key: 9 Use Reg Transmit Power: 1 Low Power Mode: 2 V Receive SubNet ID: 15 Transmit SubNet ID: 15 V Radio ID: 4094 V V V V
Click Apply . The Confirm Settings Apply dialog box appears.	Use IP Connection Baud Rate 115200 Disconnect Apply Cancel



Attach antenna to the RF451.





Provide power to the CR6-RF451:

- connect 12 Vdc at the green -BAT+ terminals,
- or connect 16 to 32 Vdc at the -CHG+ terminals.



Click the *LoggerNet* icon on the PC.

LoggerNet opens.





Previous Next 🕨

Finish

Cancel

Wizard <u>H</u>elp



Select CR6Series. Click Next.



In the list of available communication ports, click **RF451** (**COMnn**), where **nn** is the COM port number assigned by your PC, then click **Next**.

(Note that you choose **RF451** (**COMnn**) to select the USB port to which the RF451 is attached. *LoggerNet* sees the CR6-RF451 as directly connected to this port. The RF451 to CR6-RF451 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**.

	EZSetup Wizard - CR6Ser	ries (CR6Series)
Progress	Datalogger Settings	
Introduction	Baud Rate	Select the baud rate that will be used in communicating with the datalogger. Note: The
Communication Setup	113200	max baud rate for SC32A interfaces is 19,200 bps. The max for SC929 is 38,400 bps.
Datalogger Settings		
Setup Summary	PakBus Address 1	A unique PakBus address is used to identify the datalogger in the PakBus network. Enter the PakBus address that was set on the datalogger.
Communication Test		Valid range is 1-4094. Suggested range is 1-3999.
Datalogger Clock	Extra Response Time	If the datalogger requires extra time to respond, enter the extra response time.
Send Program	UU seconas 💌	
Data Files	Max Time On-Line	Because some links are costly, it may be desired to
Scheduled Collection	00 h 00 m 00 s 🗢	have the connection closed automatically. Enter the maximum time for a connection to stay online.
Wizard Complete		u means stay online until the USEr disconnects.
	Previous Next	Finish Cancel Settings Help



Leave these settings at their default values. Click **Next**.

This screen shows a summary of the settings that you entered. Click **Next**.

EZSetup Wizard - CR6Series (CR6Series)		
Progress Communication Setup Wizard - CR6Series (CR6Series) Progress Communication Setup Summary The following is a summary of the datalogger setup. Datalogger Information Datalogger Settings Datalogger Information Datalogger Type: CR6Series Datalogger Type: CR6Serie		
Datalogger Clock Send Program Data Files Scheduled Collection Wizard Complete	Datalogger Settings Baud Rate: 115200 PakBus Address: 1 Security Code: 0 Extra Response Time: 0s Max Time Online: 0h 0m 0s	
	Previous Next Finish Cancel Summary Help	





Click Next.

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

The datalogger clock is then set to the PC clock, the *EZSetup Wizard* closes, and the CR6 is added to the *Setup* screen.



EZSetup Wizard - CR6Series (CR6Series)

 Data hies
 Set Datalogger Clock

 Scheduled Collection
 Note: Because there are delays in the communication link, when the clock is set there may be some difference between the datalogger and adjusted server clock.

 Connection Time: 0:01:25

 • Previous

 Next

 • Finish

Cancel
Clock Help





Use *LoggerNet Connect* to connect to the datalogger, send programs, and view and collect data.

2.2 PC with RF451 to Multiple CR6-RF451s

The Basic Procedure can be extended to include multiple slave CR6-RF451s in the system.



With multiple CR6-RF451s, *DevConfig* must be used to give each CR6-RF451 a unique **PakBus Address**. This changes the hardware setting in the CR6-RF451.

٥	Device Configuration Utility 2.12 – 🗖 🗙
File Backup Options Help	
Device Type Q Search	Deployment Logger Control Data Monitor File Control Send OS VW Diagnostics Settings Editor Terminal Datalooger Com Ports Settings Ethernet CS 1/0 IP PPP RF451 Network Services TIS Advanced
C86 ^ CR800 Series CRW Series CRW Series ^ Datalogger (Other) CR 10X CR 10X-TD CR 20X CR 20X-TD CR 5000 CR 510-TD CR 5000	Serial Number: 1590 OS Version: Ref. Std. 0.3.07 Sation Name: KevinCR6 Paldus Address: 7 Paldus Encryption Key: Paldus Encryption Key: Paldus TCP Password: Confirm Paldus/TCP Password:
NL100 NL200 Series NL240 NL300	
Communication Port COM11 Use IP Connection Pakeus Encryption Key Baud Rate 115200 Disconnect	Apply Cancel Factory Defaults Read File Summary

These unique PakBus® addresses must be entered on the **Datalogger Settings** tab of the *EZSetup Wizard*. This change is to make the software settings (*LoggerNet*) match the change we made in the hardware settings using *DevConfig*.

EZSetup Wizard - CR6Series_3 (CR6Series)			
Progress	Datalogger Settings		
Introduction	Baud Rate	Select the baud rate that will be used in	
Communication Setup	115200 🗸	communicating with the datalogger. Note: The max baud rate for SC32A interfaces is 19,200 bps. The max for SC929 is 38,400 bps.	
Datalogger Settings			
Setup Summary	PakBus Address 7	A unique PakBus address is used to identify the datalogger in the PakBus network. Enter the PakBus address that was set on the datalogger.	
Communication Test		Valid range is 1-4094. Suggested range is 1-3999.	
Datalogger Clock	Extra Response Time If the datalogger requires extra time to response time.		
Send Program	00 seconds 📼		
Data Files			
Scheduled Collection	00 h 00 m 00 s	have the connection closed automatically. Enter the maximum time for a connection to stay online.	
Wizard Complete		0 means stay online until the user disconnects.	
	Previous Next	Finish Cancel Settings Help	

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 - EZ (Simplified) View	- 🗆 🗙
File View Network	(Help	
Add Delete	Edit Rename	Std View
CR6Series_PBA_9	Datalogger Information Datalogger Type: CR6Series_PBA_7 Direct Connect Connection COM Port: RH31 (COM13) Datalogger Settings Baud Rat: 115200 PakBus Address: 7 Security Code: 0 Extra Response Time: 0s Max Time Online: 0h Om 0s Collection Schedule Scheduled Collection is OFF	ected. localhost

2.3 CR6-RF451 as a Repeater

The previous procedure can be extended to use one CR6-RF451 as a repeater in the network to go around an obstacle such as a hill.



This requires only two changes to the previous procedure.

First, use *DevConfig* to enable the **Repeaters Used** checkbox in the RF451 and each CR6-RF451. (To see these settings when connected to a CR6-RF451, you must select the **RF451** tab at the top of the screen.)

٥	Device Configuration Utility 2.12 -	×
File Backup Options Help		
Device Type	Deployment	
Q Search 🛞	Datalogger Com Ports Settings Ethernet CS I/O IP PPP RF451 Network Services TLS Advanced	
CR60 CR800 Series CR800 Series CRWV Series ID batalogger (Other) ID Hetwork Peripheral ID Phone Modem ID Radio AL200 RF400 RF401 RF450	Datalogger Com Ports Settings Ethernet CS I/O IP PPP RC+91 Network Services TLS Advanced Image: Com Ports Settings Serial No 6789ABCDE Versions Daughter: / Freewave: 0123456789 Radio Operation Mode Point to Multi-Point Slave V Repeaters Used Network ID: 1042 Frequency Key: 5 Use Repeater Frequency Key Transmit Power: 1 Low Power Mode: 2 Recleve SubNet ID: 15 Transmit SubNet ID: 15	
RF451 RF500M		
Communication Port COM11 Use IP Connection PakBus Encryption Key Baud Rate 115200 Disconnect	RF451 Repeaters Used Setting In a MultiPoint network it is critical to transmission timing to configure this parameter correctly. This box should be checked if there are any Repeaters in the network. It should be left unchecked if there are no Repeaters present. This parameter should be set to the same value in all transceivers in a MultiPoint network. Note: This box should be checked when running Diagnostics from the Master. Apply Cancel Factory Defaults Read File	~

Second, set the **Radio Operation Mode** to **Point to Multi-Point Slave/Repeater** in the CR6-RF451 that will act as a repeater.

٥	Device Configuration Utility 2.12 – 🗖 🗙	
File Backup Options Help		
Device Type	Deployment	
Q Search 🚫	Datalogger ComPorts Settings Ethernet CS I/O IP PPP RF451 Network Services TIS Advanced	
CR6 ^		
CR800 Series		
CRVW Series	Serial No 6789ABCDE Versions Daughter: / Freewave: 0123456789	
■ Datalogger (Other)	Radio Operation Mode Point to Multi-Point Slave/Repeater V 💟 Repeaters Used	
Network Peripheral	Network ID: 1042 Frequency Key: 5 A Use Repeater Frequency Key	
Phone Modem	Transmit Power: 1 Low Power Mode: 2	
🗆 Radio	Recieve SubNet ID: 15 💌 Transmit SubNet ID: 15 💌	
AL200		
RF400		
RF401		
RF401A Series		
RF407 Series		
RF430		
RF450		
RF451		
RF500M		
· · · · · · · · · · · · · · · · · · ·		
Communication Port COM11	RF451 Operation Mode Setting	
Use IP Connection	The Operation Mode option designates the method FreeWave transceivers use to communicate with each	
PakBus Encryption Key	other. FreeWave transceivers operate in a Master to Slave configuration. Before the transceivers can operate	
	togetrer, trey must be set up to property communicate.	
Baud Rate	In a Point-to-Point configuration, Master or Slave Mode may be used on either end of the communication link	
115200 ∨	are controlled by the settings in the Master. Also, radio network diagnostics can only be accessed at the	
	Master radio Therefore, we augreent you deploy the Master on the communications and where it will be	
Disconnect	Apply Cancel Factory Defaults Read File Summary	

2.4 Communication Combinations

The CR6-RF451 can be used in a system with multiple communication methods. For example, in the figure below, the master CR6-RF451 communicates with *LoggerNet* through an RV50 cellular modem connected to the CR6-RF451 using a CPI/RS-232 Data Cable. (An Ethernet connection could also be used between the RV50 and the CR6-RF451. See the RV50 manual for more information.) The master CR6-RF451 communicates with the slave CR6-RF451s through RF.



This network only requires a few changes to the hardware settings described in the Basic Procedure (Section 2.1, *Basic Procedure: PC with RF451 to CR6-RF451 (p. 2)*). The master RF451 has been replaced by a CR6-RF451, but *DevConfig* should still be used to set its **Radio Operation Mode** to **Multi-Point Master** as described in the procedure. In addition, the master CR6-RF451 must be made into a router. This is done from the **Advanced** tab in *DevConfig*. Set the **Is Router** setting to **True**.

0	Device Configuration Utility 2.12 -	×
File Backup Options Help		
Device Type	Deployment Logger Control Data Monitor File Control Send OS VW Diagnostics Settings Editor Terminal	
Q Search 🛞	Datalogger Com Ports Settings Ethernet CS I/O IP PPP RF451 Network Services TLS Advanced	
🛛 Camera 🔥 ^		
CC5MPX	Is Router: True V DSR: Drive Size: U	
CC640	Communication Allocation: 50 🍝 SDC Baud Rate: 115200 Fixed 🗸	
🖻 Cellular Modem	Max Packet Size: 1000	
LS300	Eles Manager	
Raven XT	PakBus Address Files Manager File Name Count	
Datalogger	1 0	
CR 1000		*
CR 10X-PB		٣
CR2 Series	1 🗘	*
CR200 Series	1 .	*
CR23X-PB		
CR300 Series		
CR3000		
CR510-PB		
CR6		
CR800 Series		
Communication Port		
COM11		
Use IP Connection		
PakBus Encryption Key		
Baud Rate		
115200 ∨		
Disconnect	Apply Cancel Factory Defaults Read File Summary	

See the manual for the communication product being used in combination with the CR6-RF451 (in this example, the RV50) for information on setting up *LoggerNet* to communicate with the master CR6-RF451.

2.5 Network Planner



For more complicated networks, the *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 FreeWave® network in the area causing interference. To remove the interference, use *DevConfig* to change the **Network ID** and **Frequency Key** in all RF451s and CR6-RF451s to a different value. Each of these settings must have the same value in all RF451s and CR6-RF451s. For example, the **Network ID** in all devices could be set to **1726**, and the **Frequency Key** in all devices could be set to **1**. This is just an example. The **Network ID** can be any number between 0 and 4095, excluding 255. The **Frequency Key** can be any number between 0 and 14.

0	Device Configuration Utility 2.12 – 🗖 🔼	
File Backup Options Help		
Device Type	Deployment Logger Control Data Monitor File Control Send OS VW Diagnostics Settings Editor Terminal	
Q Search 🛞	Datalogger Com Ports Settings Ethernet CS I/O IP PPP RF451 Network Services TLS Advanced	
🗄 Camera 🔥		
CC5MPX		
CC640	Serial No Versions Daughter: RF451.00.20 / Freewave:	
🗉 Cellular Modem	Radio Operation Mode Point to Multi-Point Slave V Repeaters Used	
LS300	Network ID: 1726 Frequency Key: 1 Use Repeater Frequency Key	
Raven XT		
🗉 Datalogger	Iransmit Power: 1 Low Power Mode: 2	
CR1000	Recieve SubNet ID: 15 🔹 Transmit SubNet ID: 15 🔹	
CR10X-PB		
CR2 Series		
CR200 Series		
CR23X-PB		
CR300 Series		
CR3000		
CR510-PB		
CR6		
CR800 Series		
Communication Dont		
COM11		
Use IP Connection		
PakBus Encryption Key		
Baud Rate		
115200 V		
Disconnect	Apply Cancel Factory Defaults Read File Summary	
		_

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