# Table of contents

1. Introduction ........................................................................................................... 1

2. Precautions .............................................................................................................. 2

3. Initial inspection ...................................................................................................... 2

4. Pre-installation ....................................................................................................... 3
   4.1 Establish cellular service .................................................................................... 3
      4.1.1 Campbell Scientific cellular data service .................................................. 3
      4.1.2 Other service providers ............................................................................. 3
   4.2 Install the SIM card ......................................................................................... 4
   4.3 Konect PakBus Router setup ............................................................................ 5
      4.3.1 Get started ................................................................................................. 5
      4.3.2 Set up Konect PakBus Router ................................................................... 6

5. QuickStart ............................................................................................................... 8
   5.1 Modules using Konect PakBus Router (private dynamic IP) ............................ 10
      5.1.1 Configure RV50(X) ................................................................................... 10
      5.1.2 Enabling PPP mode .................................................................................. 13
      5.1.3 Set up LoggerNet ...................................................................................... 15
      5.1.4 Test the connection .................................................................................. 18
   5.2 Modules using a public static IP ....................................................................... 18
      5.2.1 Configure RV50(X) ................................................................................... 18
      5.2.2 Enabling PPP mode .................................................................................. 21
      5.2.3 Set up LoggerNet ...................................................................................... 22
      5.2.4 Test the connection .................................................................................. 24

6. Specifications .......................................................................................................... 25

7. Installation ............................................................................................................... 26
   7.1 Base station requirements ............................................................................... 27
   7.2 Data logger site equipment ............................................................................. 27
      7.2.1 RV50(X) mounting kit .............................................................................. 29
         7.2.1.1 Mounting the RV50(X) flat on the backplate .................................... 29
         7.2.1.2 Mounting the RV50(X) on edge to the backplate .............................. 30
   7.3 Wiring and connections .................................................................................... 30
1. Introduction

This manual provides information for interfacing the RV50(X) Sierra Wireless AirLink® 4G LTE Cellular Modem to Campbell Scientific dataloggers.

The RV50(X) digital cellular modem is manufactured by Sierra Wireless® and supports network operator switching based on the SIM(s) for use on GSM (Global System for Mobile Communications) and CDMA (Code Division Multiple Access) networks. The modem is accessed through the Internet using TCP/IP communications protocol.

Use of the RV50(X) requires a VerizonLTE or AT&T® HSPA+/LTE business account or an equivalent account from Campbell Scientific or another service provider. For more information, see Establish cellular service (p. 3)

**NOTE:**
The RV50 also supports Verizon® CDMA/1xRTT/EVDO and AT&T® HSPA+/LTE accounts.

For additional information on the RV50(X) module, see the Support section of the Sierra Wireless website.

Before using the RV50(X), please study:

- Safety (p. 56)
- Initial inspection (p. 2)
- Pre-installation (p. 3)
- QuickStart (p. 8)

The RV50(X) module may be configured in one of two ways, depending on the communications type and needs of the user. ACEmanager, a web based configuration tool is hosted by the RV50 (X). It can be accessed using a web browser over the cellular WAN or locally over Ethernet. A number of templates will be provided for download to make most configurations very simple once connected to ACEmanager.

For many applications, the preferred module setup is Point-to-Point Protocol (PPP) mode. In this mode, the module simply passes IP communications directly to the data logger. This enables features such as FTP, HTTP, and emailing. QuickStart (p. 8) describes setting up the module for PPP mode. See the EmailRelay() paper and Blog article with example programs for more information on emailing.

Alternatively, for applications that just need a connection for data collection and data logger maintenance or monitoring, setup as a serial server is sufficient. In this mode, the module
receives IP communications over the cellular network and converts those to serial (RS-232) communications to pass on to the data logger. From the data logger perspective, this is no different than a serial cable connecting it to a computer. For information on configuring the RV50(X) in serial-server mode, see ACEManager and template files (p. 41)

2. Precautions

READ AND UNDERSTAND the Safety (p. 56) section at the front of this manual.

**CAUTION:**
This device uses considerably more power than the data logger, see Specifications (p. 25). It may require a larger power supply, switching power with the data logger, or a combination of these to ensure the battery is not drained. See Controlling power to the RV50(X) (p. 45) for program examples of using switched 12V to control power to the RV50(X).

We strongly recommend changing the default RV50(X) ACEmanager password to prevent unauthorized access and the potential of malware infection. The password can be changed from the ACEmanager Admin tab.

**WARNING:**
Failure to set a strong password in the RV50(X) may result in misuse of the modem by malware or hackers.

3. Initial inspection

The RV50(X) ships with the following items:

- (1) gray power cable (from original manufacturer)
- (4) screws and washers (from original manufacturer)
- (1) 2 ft Ethernet cable
- (1) Quick Deploy Guide for private dynamic IP addresses
- (1) Quick Deploy Guide for public static IP addresses

Upon receipt of the RV50(X), inspect the package and contents for damage. File any damage claims with the shipping company.

Immediately check package contents against the shipping documentation. Contact Campbell Scientific about any discrepancies.
4. Pre-installation

**TIP:**
Check www.campbellsci.com to ensure you are using the latest data logger support software and data logger operating system (OS).

Updating the OS during system setup and testing, or onsite is recommended. Sending an OS to a remote data logger will interrupt the data logger program. If you have questions, contact Campbell Scientific for assistance (https://www.campbellsci.com/support).

4.1 Establish cellular service

For better security, we recommend using Konect PakBus® Router with a private dynamic IP address. This method allows only incoming PakBus communication. No other incoming communication is supported. However, all forms of outbound communication from the data logger are supported, including but not limited to PakBus, email, and FTP.

A public static IP address can also be used. This provides more incoming communication functionality, but is less secure and more vulnerable to unsolicited traffic.

**NOTE:**
A public static IP account must be used when the module is set up in serial server mode. Private dynamic IP accounts do not support the serial server mode.

4.1.1 Campbell Scientific cellular data service

Campbell Scientific can provide subscriptions to cellular service through Verizon, AT&T, T-Mobile, Vodafone, Telstra, and over 600 other providers worldwide. When this cellular service is purchased with the module, the module will come pre-provisioned with the required SIM card and APN. If you have already purchased the RV50(X), call Campbell Scientific to set up service.

4.1.2 Other service providers

While using Campbell Scientific is the simplest way to obtain cellular data service for your module, you can go directly to a provider. For more information on obtaining service directly from Verizon and AT&T, see Verizon Wireless and AT&T (p. 49).
TIP:
Prepaid cellular data plans may experience service slow downs when data limits are reached. If file transfer from a cellular-connected data logger works initially, but later has problems, check for data overage on the cellular plan. This does not apply to Campbell Scientific cellular data services.

4.2 Install the SIM card

NOTE:
If you purchased cellular service from Campbell Scientific with the module, it will come with the SIM (Subscriber Identity Module) card already installed. Proceed to Konect PakBus Router setup (p. 5)

The RV50(X) requires a Mini-SIM (2FF); a smartcard that securely stores the key identifying a mobile subscriber. You should only need to install the SIM once in the life of the module.

To install the SIM card:

1. Remove the SIM card cover.
2. Note the location of the notched corner for correct alignment. The gold contact points of the SIM face down when inserting the SIM card as shown in the following figure. Gently slide the card into the slot until it stops and locks into place. To eject the SIM card, press it in slightly and release.
3. Replace the SIM card cover.
4.3 Konect PakBus Router setup

For better security, we recommend using Konect PakBus® Router with a private dynamic IP address. This method allows only incoming PakBus communication. No other incoming communication is supported. However, all forms of outbound communication from the data logger are supported, including but not limited to PakBus, email, and FTP.

4.3.1 Get started

You will need the Konect PakBus Router redemption code that came on a card with the RV50(X).

![Konect PakBus Router Redemption Card](image)

---

**Important Information! Do not discard!**

Activate a Complimentary PakBus® Router on Campbell Scientific's Konect PakBus Routing Service. See the Getting Started Guide at:

http://campbellsci.com/start/pbrouter

---

Open a web browser and go to www.konectgds.com.
First-time users need to create a **free account**. After you submit your information, you will receive two emails up to five minutes apart. One email will contain a Passport ID and the other your Password. If emails are not received, check your email junk folder.

4.3.2 Set up Konect PakBus Router

1. Sign in to [www.konectgds.com](http://www.konectgds.com) using your Passport ID and Password found in the two received emails. Once logged in, you will be at the Welcome page.
2. Click **Devices and services** on the command bar to the left and select **Redeem PakBus Router Code**. Enter your complimentary Router Code found on the included card with your cellular-enabled device and click **Submit**.

![Image](image_url)

3. The next screen shows the assigned **DNS address** and **Port** for the router. Enter a **TCP Password** and select a unique **PakBus Address** for your data logger.

**TIP:**

**Make note of this information**; it will be required for data logger configuration as well as LoggerNet setup. Please note your **DNS**, **Port**, **TCP Password** and **PakBus address**; you will need them later.

![Image](image_url)

4. Click **Submit**.
5. To edit settings at a later date, click devices and services on the command bar and select Manage PakBus Routers.

![Manage PakBus Routers](image)

**NOTE:**
The DNS address and Port number, assigned when your account was setup, cannot be edited.

5. **QuickStart**

The Provisioning Report received with your Cellular Data Service shows whether the module was configured with a private dynamic or public static IP address. See the following figures for examples of Campbell Scientific Provisioning Reports. Other cellular providers should provide similar information.
Additionally, Campbell Scientific cellular modules configured with a public static IP address will have two stickers on the module. One sticker will show the module phone number and data plan. The second sticker will show the static IP address. Campbell Scientific cellular modules configured with a private dynamic IP address will have one sticker on the module. It will show the module phone number and data plan.
5.1 Modules using Konect PakBus Router (private dynamic IP)

5.1.1 Configure RV50(X)

1. Download the collection of RV50(X) configuration templates from www.campbellsci.com/downloads and run the executable downloaded.

2. Connect the **Cellular** antenna.

3. Connect the **Diversity** antenna, if used. Use of a diversity antenna is recommended, it can improve system performance. It is required in 4G networks, but not 2G or 3G. Note: If a Diversity antenna is not used on a 2G or 3G cellular network, use ACEmanager to disable **WAN/Cellular > Network Credentials > RX Diversity**.

4. Connect the power cable wires to a power supply.

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Function</th>
<th>Connect To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Ground</td>
<td>G</td>
</tr>
<tr>
<td>White</td>
<td>Enable (On/Off)</td>
<td>12V or SW12V or control port</td>
</tr>
<tr>
<td>Red</td>
<td>Power (7 to 36 V)</td>
<td>12V</td>
</tr>
</tbody>
</table>
5. Connect the power cable to the RV50(X) **DC Power** input. When the RV50(X) is properly set up and powered, the status LEDs will turn on. The RV50(X) will begin the activation/provisioning process and attempt to connect to the mobile network. This process typically takes 5 to 10 minutes. A successful connection is indicated by a solid green or solid amber **Network** LED.

**NOTE:**
If Campbell Scientific did not provision the RV50(X) or it does not automatically connect to the network, you may need to to confirm or enter your APN information. Follow steps 6 through 8 to **WAN/Cellular > SIM Slot 1 Configuration > Network Credentials > User Entered APN.**

6. Connect your Windows® computer to the RV50(X) using the supplied Ethernet cable.


8. Look for a sticker on the bottom of your modem with the manufacturer-generated default password. Log in using **User Name** = user and that **Password**. If there is no sticker try 12345 for the password. Make note of the password used so it can be easily referenced when off site. Remote access to the modem interface will require the password.

**TIP:**
We strongly recommend changing the default password to prevent unauthorized access and the potential of malware infection. The password can be changed from the **Admin** tab.
9. Once logged in, check the **Status > Home > Network State** field. It should read Network Ready, indicating the RV50(X) is connected to the cellular network. You can easily test the RV50(X) connection to the Internet by selecting the **Admin > Advanced** tab and using the PING tool to ping an Internet server, such as www.campbellsci.com.

10. Click the Template button in the ACEmanager toolbar. A template application window will appear. Browse to and upload one of the configuration templates downloaded from Campbell Scientific.

<table>
<thead>
<tr>
<th>Template File Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RV50_115200.xml</td>
<td>Default configuration with RS-232 at 115200 baud and Ethernet communication enabled.¹</td>
</tr>
<tr>
<td>RV50_9600.xml</td>
<td>Default configuration with RS-232 at 9600 baud and Ethernet communication enabled.²</td>
</tr>
</tbody>
</table>

¹CR1000X series, CR300 series, CR6 series, CR1000, CR3000, CR800 series, CR5000, and GRANITE 6/9/10  

11. Reboot the RV50(X) after successfully applying the configuration template. You can do this by clicking the Reboot button on the ACEmanager toolbar, by momentarily pressing the Reset button (2 sec), or by temporarily removing power from the RV50(X).
5.1.2 Enabling PPP mode

Launch the Device Configuration Utility. All tabs are within the Deployment category.

On the Datalogger tab, change the data logger PakBus Address and PakBus/TCP Password to match the values entered in the Set up Konect PakBus Router (p. 6) step.

On the Com Ports Settings tab, select the COMPort where the module is connected; this is generally RS-232. Change the Baud Rate to 115200 Fixed.
On the **PPP** tab select the **Config/Port Used** where the modem is connected. This is the same as was selected on the **Com Ports Settings** tab. Set **Modem Dial String** to ATH;AT\APP.

On the **Network Services** tab, in the **PakBus/TCP Clients** box, type the DNS address and Port number noted during the **Set up Konect PakBus Router** (p. 6) step.

**Apply** to save your changes.
5.1.3 Set up LoggerNet

The LoggerNet Network Map is configured from the **LoggerNet Setup** screen.

**NOTE:**
Setup has two options, EZ (simplified) and Standard. Click on the **View** menu at the top of the **Setup** screen, and select **Standard** view.

From the LoggerNet toolbar, click **Main > Setup** and configure the Network Map as described in the following steps:

1. Select **Add Root > IPort**.
2. Select **PakBusPort** and **pbRouter** for PakBus data loggers such as the CR6 or CR1000X.

**NOTE:**
PakBus data loggers include the following models: GRANITE-series, CR6, CR3000, CR1000X, CR800-series, CR300-series, CR1000, and CR200(X)-series.

3. Add a data logger to the **pbRouter**.
4. From the Entire Network, on the left side, select the **IPPort**. Enter the Konect PakBus Router DNS address and port number as noted in the Konect PakBus Router setup (**Set up Konect PakBus Router** (p. 6)). Enter them into the **Internet IP Address** field in the format DNS:Port with a colon separating DNS and Port. For example, axanar.konectgds.com:pppp where pppp is the port number.
5. Leave the default settings for the **PakBusPort**. **PakBus Port Always Open** should not be checked. In the **TCP Password** field enter the TCP Password; this must match the value entered in the Konect PakBus Router setup and LoggerNet setup.
6. For PakBus data loggers, select the pbRouter in the Network Map and set the PakBus Address to 4070.

7. For PakBus data loggers, select the data logger in the Network Map and set the PakBus Address to match that of the data logger (default address in the data logger is 1). If a PakBus Encryption Key was entered during data logger setup, also enter it here. Click Apply to save the changes.
5.1.4 Test the connection

After the Network Map has been configured, test the cellular connection by using the Connect screen as shown in the following image. Click on the appropriate station and click Connect to initiate a call to the data logger.

**TIP:**
The connection time is subject to many external factors. It is often less than 30 seconds but could be up to 15 minutes. Be patient.

If the connection is successful, the connectors at the bottom of the screen will come together and clock information from the data logger will be displayed in the Station Date/Time field. If the connection fails, a Communications Failure message will be displayed.

![Connect screen](image)

5.2 Modules using a public static IP

5.2.1 Configure RV50(X)

1. Download the collection of RV50(X) configuration templates from [www.campbellsci.com/downloads](http://www.campbellsci.com/downloads) and run the executable downloaded.

2. Connect the Cellular antenna.
3. Connect the **Diversity** antenna, if used. Use of a diversity antenna is recommended, it can improve system performance. It is required in 4G networks, but not 2G or 3G. Note: If a **Diversity** antenna is not used on a 2G or 3G cellular network, use ACEmanager to disable **WAN/Cellular > Network Credentials > RX Diversity**.

4. Connect the power cable wires to a power supply.

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Function</th>
<th>Connect To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Ground</td>
<td>G</td>
</tr>
<tr>
<td>White</td>
<td>Enable (On/Off)</td>
<td>12V or SW12V or control port</td>
</tr>
<tr>
<td>Red</td>
<td>Power (7 to 36 V)</td>
<td>12V</td>
</tr>
</tbody>
</table>

5. Connect the power cable to the RV50(X) **DC Power** input. When the RV50(X) is properly set up and powered, the status LEDs will turn on. The RV50(X) will begin the activation/provisioning process and attempt to connect to the mobile network. This process typically takes 5 to 10 minutes. A successful connection is indicated by a solid green or solid amber **Network** LED.

**NOTE:**
If Campbell Scientific did not provision the RV50(X) or it does not automatically connect to the network, you may need to to confirm or enter your APN information.
Follow steps 6 through 8 to **WAN/Cellular > SIM Slot 1 Configuration > Network Credentials > User Entered APN**.

6. Connect your Windows® computer to the RV50(X) using the supplied Ethernet cable.


8. Look for a sticker on the bottom of your modem with the manufacturer-generated default password. Log in using **User Name** = user and that **Password**. If there is no sticker try 12345 for the password. Make note of the password used so it can be easily referenced when off site. Remote access to the modem interface will require the password.

**TIP:**
We strongly recommend changing the default password to prevent unauthorized access and the potential of malware infection. The password can be changed from the **Admin** tab.
9. Once logged in, check the **Status > Home > Network State** field. It should read Network Ready, indicating the RV50(X) is connected to the cellular network. You can easily test the RV50(X) connection to the Internet by selecting the **Admin > Advanced** tab and using the PING tool to ping an Internet server, such as www.campbellsci.com.

![ACEmanager](image)

10. Click the Template button in the ACEmanager toolbar. A template application window will appear. Browse to and upload one of the configuration templates downloaded from Campbell Scientific.

<table>
<thead>
<tr>
<th>Template File Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RV50_115200.xml</td>
<td>Default configuration with RS-232 at 115200 baud and Ethernet communication enabled.(^1)</td>
</tr>
<tr>
<td>RV50_9600.xml</td>
<td>Default configuration with RS-232 at 9600 baud and Ethernet communication enabled.(^2)</td>
</tr>
</tbody>
</table>

\(^1\)CR1000X series, CR300 series, CR6 series, CR1000, CR3000, CR800 series, CR5000, and GRANITE 6/9/10


11. Reboot the RV50(X) after successfully applying the configuration template. You can do this by clicking the Reboot button on the ACEmanager toolbar, by momentarily pressing the Reset button (2 sec), or by temporarily removing power from the RV50(X).
5.2.2 Enabling PPP mode

Launch the Device Configuration Utility. All tabs are within the **Deployment** category.

On the **DataLogger** tab, make note of the data logger **PakBus Address** (default address is 1).

On the **Com Ports Settings** tab, select the **COMPort** where the module is connected; this is generally RS-232. Change the **Baud Rate** to **115200 Fixed**.
On the PPP tab select the Config/Port Used where the modem is connected. This is the same as was selected on the Com Ports Settings tab. Set Modem Dial String to ATH;AT\APP.".

Apply to save your changes.

5.2.3 Set up LoggerNet

The LoggerNet Network Map is configured from the LoggerNet Setup screen.

NOTE:
Setup has two options, EZ (simplified) and Standard. Click on the View menu at the top of the Setup screen, and select Standard view.

From the LoggerNet toolbar, click Main > Setup and configure the Network Map as described in the following steps:

1. Select Add Root > IPPort.
2. Select PakBusPort
3. Add a data logger to the PakBusPort.
4. Select the **IPPort** in the Network Map. Enter the RV50(X) IP address and port number. The IP address and port number are input in the **Internet IP Address** field separated by a colon. Preceding zeros are not entered in the **Internet IP Address** (for example, 070.218.074.247 is entered as 70.218.74.247). The default port number is 6785.

![Network Map with IPPort selected](image1)

5. For PakBus data loggers, leave the default settings for the **PakBusPort**. **PakBus Port Always Open** should not be checked. If used, enter the **TCP Password**.

![Network Map with PakBusPort](image2)
6. For PakBus data loggers, select the data logger in the Network Map and set the PakBus Address to match that of the data logger (default address in the data logger is 1). If a PakBus Encryption Key was entered during data logger setup, also enter it here. Click Apply to save the changes.

![Network Map Configuration Screen]

5.2.4 Test the connection

After the Network Map has been configured, test the cellular connection by using the Connect screen as shown in the following image. Click on the appropriate station and click Connect to initiate a call to the data logger.

**TIP:**
The connection time is subject to many external factors. It is often less than 30 seconds but could be up to 15 minutes. Be patient.
If the connection is successful, the connectors at the bottom of the screen will come together and clock information from the data logger will be displayed in the Station Date/Time field. If the connection fails, a Communications Failure message will be displayed.

6. Specifications

Sierra Wireless® AirLink® RV50 (MC7355 radio module) and RV50X (MC7455 radio module) cellular modules

Cellular WAN

- Network Technology: 4G with automatic fallback to 3G and 2G (RV50 only)
- See https://s.campbellsci.com/documents/us/miscellaneous/Cellular Modem Frequency Bands.pdf for a complete list of supported frequency bands.

Host Interfaces

- 10/100/1000 Ethernet RJ45
- RS-232 serial port, DB9 female
- USB version 2.0 with micro-B connector

RF Connectors

- 3 SMA antenna connectors (primary, diversity & GPS)
- Active antenna support
Power

- Operating Voltage: 7 to 36 Vdc
- Typical Enable/Ignition Sense Line Low: 1 mA @ 12V
- Typical Idle: 65 to 95 mA @ 12V, depending on configuration
- Typical Active: 250 to 300 mA @ 12V, depending on configuration

Size

- Dimensions: 119 x 34 x 94 mm (4.69 x 1.34 x 3.7 in)
- Weight: 320 g (11.3 oz)

Environmental

- Operating Temperature Range: –30 to 70 °C (–22 to 158 °F)
- Storage Temperature: –40 to 85 °C (–40 to 185 °F)
- Humidity: 90% @ 60 °C
- Military Specification: MIL-STD-810G conformance to shock, vibration, thermal shock, and humidity
- IP64 rated ingress protection

Industry Certifications

- Safety: IECEE Certification Bodies Scheme (CB Scheme), UL60950
- Vehicle Usage: E-Mark (UN ECE Regulation 10.04), ISO7637-2, SAE J1455 (Shock & Vibration)
- Hazardous Environments: Class 1 Div 2
- Environmental: RoHS, REACH, WEEE

7. Installation

7.1 Base station requirements ................................................................. 27
7.2 Data logger site equipment ................................................................. 27
  7.2.1 RV50(X) mounting kit ................................................................. 29
7.3 Wiring and connections .................................................................. 30
  7.3.1 Module communications connections ............................................. 31
  7.3.2 Module power connections ............................................................ 32
  7.3.3 Antenna connections ................................................................. 32
7.4 Hardware and software setup

7.1 Base station requirements
A computer running Campbell Scientific LoggerNet software with access to the Internet is needed.

7.2 Data logger site equipment

- RV50(X) module with power cable (included with module)
- Data logger — CR1000X series, CR300 series, CR6 series, CR1000, CR3000, CR800 series, CR5000, and GRANITE 6/9/10
- Module Interface, see Module communications connections (p. 31)
- Environmental Enclosure — ENC10/12, ENC12/14, ENC14/16 or ENC16/18

If connecting to CS I/O port:
SC105 Interface — connects the module to any data logger with a CS I/O port. It must be configured using Device Configuration Utility. Settings should be:

- CS I/O Mode: SDC Address 8
- CS I/O ME Baud Rate: 115.2k
- RS-232 Mode: Modem (default)
- Baud Rate:
  - 115.2k fixed for CR1000X series, CR6 series, CR1000, CR3000, CR800 series, CR5000, and GRANITE 6/9/10 data loggers
- 8 data bits, 1 stop bit, no parity

If connecting to RS-232 port:
Null Modem Cable (9 pin, male-to-male) — connects the module to the CR300 series, CR1000, CR3000, CR800 series, and CR200(X) series RS-232 port.

CPI/RS-232 RJ45 to DB9 Cable — connects the module to the CR6 series or CR1000X series CPI/RS-232 port.

If connecting to Ethernet port:
Ethernet cable - connects the module to CR6 or NLxxx.

- Antenna — the following antennas are available from Campbell Scientific. Contact Campbell Scientific for help in determining the best antennas for your application.
- 2 dBi 4G/3G Omnidirectional Antenna: An omnidirectional antenna with mounting bracket that is ideally suited for use with 4G and 3G cellular gateways. The mounting bracket attaches to a mast or crossarm, and it serves as the antenna ground plane. The antenna has an N type (female) threaded permanent stud for easy mounting to the included bracket or through an enclosure wall. A coaxial cable, sold separately, is required to connect this antenna to the inline surge suppression or module antenna jack. The antenna includes a mount/U-bolt assembly for attaching the antenna to a mast, post, or crossarm up to 3.8 cm (1.5 in) in diameter.

- 8 dBi Yagi Wideband Antenna: A higher gain antenna that should be “aimed” at the service provider antenna. It covers both the 800-MHz band and the 1.9-GHz band. The antenna comes with bracket/U-bolt assembly for attaching the antenna to a mast or post. A coaxial cable, sold separately, is required to connect this antenna to the inline surge suppression or module antenna jack. This antenna is recommended for areas that require a higher gain antenna.
- 4G/3G Cellular Whip Antenna with SMA Connector: A wideband termination antenna with SMA connector and articulating base. This antenna is intended for short-term testing use only. It is not intended for long-term use. Campbell Scientific recommends that customers use external antennas for the best reception and transmission of cellular signals.

**NOTE:**
When antennas are located away from the RV50(X), keep the cables as short as possible to prevent the loss of antenna gain. Route the cables to protect them from damage and so they will not be snagged or pulled on. Avoid binding or sharp corners in the cable routing. Bundle and tie off excess cable. Make sure the cables are secured so their weight will not loosen the connector from the RV50(X) over time.

**TIP:**
Cellular phone apps, such as OpenSignal (https://opensignal.com/), show the direction to point an antenna to get the best signal strength.

### 7.2.1 RV50(X) mounting kit

#### 7.2.1.1 Mounting the RV50(X) flat on the backplate

Use the two included flat-head Phillips screws to mount the bracket to the backplate first. Then use two of the included pan-head Phillips screws to mount the RV50(X) to the bracket.
7.2.1.2 Mounting the RV50(X) on edge to the backplate

Use two of the included pan-head Phillips screws to mount the RV50(X) to the bracket. Then use two of the included pan-head Phillips screws to mount the bracket to the backplate.

7.3 Wiring and connections

This section explains how to connect the module for different communications methods. It also describes how to power the module and connect an antenna.
7.3.1 Module communications connections

RS-232 connection using a null module cable

Null module Cable, is used to connect the module to the CR3000, CR800 series, CR2XX, CR300 series, CR1000, CR1000X series or CR5000 **RS-232** port.

RS-232 connection using a CPI/RS-232 cable

RS-232/CPI RJ45 to DB9 Male DTE, is used to connect the module to the CR6 or GRANITE 6/9/10.

Ethernet connection

An Ethernet cable is used to connect the module to the **Ethernet** port of the data logger, NL1XX, or NL2XX.

CS I/O connection using an SC105

The SC105 interface is used to connect the module to a data logger **CS I/O** port. The SC105 can be connected directly to the module **RS-232** port. Alternatively, it can be connected to the
module using the serial cable supplied with the SC105. The SC105 is attached to the data logger CS I/O port using the SC12 cable supplied with the SC105.

### 7.3.2 Module power connections

Connect the power cable to a power supply.

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Function</th>
<th>Connect To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Ground</td>
<td>G</td>
</tr>
<tr>
<td>White</td>
<td>Enable (On/Off)</td>
<td>12V or SW12V or control port</td>
</tr>
<tr>
<td>Red</td>
<td>Power (7 to 36 V)</td>
<td>12V</td>
</tr>
</tbody>
</table>

Connect the power cable to the RV50(X) **DC Power** input. When the RV50(X) is properly set up and powered, the status LEDs will turn on. The RV50(X) will begin the activation/provisioning process and attempt to connect to the mobile network. This process typically takes 5 to 10 minutes. A successful connection is indicated by a solid green or solid amber **Network** LED.

**Controlling power to the RV50(X)** (p. 45) provides an example CRBasic program using the **SW12 ()** instruction.

The **USB** port provides power for module configuration, but is not sufficient for normal operation.

### 7.3.3 Antenna connections

1. Connect the cellular antenna to the **Cellular** antenna connector. Mount the cellular antenna so there is at least 20 cm between the antenna and the user or any bystander.

2. Connect a second antenna to the **Diversity** antenna connector.

Antenna diversity, also called space diversity, is a scheme that uses two or more antennas to improve the quality and reliability of a wireless link. Often, especially in urban and indoor...
environments, there is no clear line of sight between transmitter and receiver. Instead, the signal is reflected along multiple paths before finally being received. Each bounce can introduce phase shifts, time delays, attenuations, and distortions that can destructively interfere with one another at the aperture of the receiving antenna. Diversity-antenna-capable devices support multiple antennas (usually two) in order to combat this phenomenon and minimize its effects.

Diversity antennas are not required for 2G/3G connections; however, they are highly recommended in order to get the most reliable connection, especially in areas of low coverage. Identical or very similar antennas should also be used for the best results.

For 4G networks, the second antenna operates as a MIMO (multiple input, multiple output) antenna, providing a second receive path. This connection is required for operation on 4G/LTE networks.

<table>
<thead>
<tr>
<th>Service</th>
<th>Frequency (MHz)</th>
<th>Wavelength (λ) (mm)</th>
<th>Best antenna separation (mm) (1/2 λ)</th>
<th>Good antenna separation (mm) (1/4 λ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTE</td>
<td>700</td>
<td>428</td>
<td>214</td>
<td>107</td>
</tr>
<tr>
<td>LTE</td>
<td>800</td>
<td>375</td>
<td>187</td>
<td>94</td>
</tr>
<tr>
<td>LTE</td>
<td>900</td>
<td>333</td>
<td>167</td>
<td>83</td>
</tr>
<tr>
<td>LTE</td>
<td>1800</td>
<td>167</td>
<td>83</td>
<td>42</td>
</tr>
<tr>
<td>LTE</td>
<td>2100</td>
<td>143</td>
<td>71</td>
<td>36</td>
</tr>
<tr>
<td>LTE</td>
<td>2600</td>
<td>115</td>
<td>58</td>
<td>29</td>
</tr>
<tr>
<td>WCDMA</td>
<td>850</td>
<td>353</td>
<td>176</td>
<td>88</td>
</tr>
<tr>
<td>WCDMA</td>
<td>900</td>
<td>333</td>
<td>167</td>
<td>83</td>
</tr>
<tr>
<td>WCDMA</td>
<td>1900</td>
<td>158</td>
<td>79</td>
<td>39</td>
</tr>
<tr>
<td>WCDMA</td>
<td>2100</td>
<td>143</td>
<td>71</td>
<td>36</td>
</tr>
<tr>
<td>CDMA/EV-DO</td>
<td>800</td>
<td>375</td>
<td>187</td>
<td>94</td>
</tr>
<tr>
<td>CDMA/EV-DO</td>
<td>1900</td>
<td>158</td>
<td>79</td>
<td>39</td>
</tr>
<tr>
<td>GSM/GPRS/EDGE</td>
<td>850</td>
<td>353</td>
<td>176</td>
<td>88</td>
</tr>
<tr>
<td>GSM/GPRS/EDGE</td>
<td>900</td>
<td>333</td>
<td>167</td>
<td>83</td>
</tr>
<tr>
<td>GSM/GPRS/EDGE</td>
<td>1800</td>
<td>167</td>
<td>83</td>
<td>42</td>
</tr>
<tr>
<td>GSM/GPRS/EDGE</td>
<td>1900</td>
<td>158</td>
<td>79</td>
<td>39</td>
</tr>
</tbody>
</table>
In more complex installations, such as those requiring long cable lengths or multiple connections, you must follow the maximum dBi gain guidelines specified by the radio communications regulations of the Federal Communications Commission (FCC), Industry Canada, ACMA in Australia, or your country’s regulatory body.

7.4 Hardware and software setup

You will need to know how your RV50(X) was configured, either with a private dynamic or public static IP address. The Provisioning Report received from Campbell Scientific or another cellular provider should provide this information.

See QuickStart (p. 8) for more information.

8. Operation and maintenance

8.1 Ports

The **RS-232** port is the main port used with Campbell Scientific dataloggers. Its function is described throughout this manual.

The **USB** port is not used in Campbell Scientific applications.

The **Ethernet** port may be used in place of PPP Mode to get to the IP stack of the data logger. However, this method comes with higher current drain for both the module and the data logger. See Using the RV50(X) Ethernet port (p. 47) for more information.

8.2 LED indicator lights

When your RV50(X) is connected to power and an antenna, there is a specific pattern to the lights to indicate its operation mode as described in the following table:
<table>
<thead>
<tr>
<th>LED</th>
<th>Color / Pattern</th>
<th>Description</th>
<th>LED Power Saving Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Off</td>
<td>No power or input voltage ≥ 36 VDC or ≤ 7 VDC</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Solid Green</td>
<td>Power is present.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Green with Amber Flash</td>
<td>Power is present and the modem has a GPS fix.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solid Red</td>
<td>Standby mode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flashing Green</td>
<td>When you press the reset button, flashing green indicates when to release the reset button to reboot the modem.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flashing Red</td>
<td>When you press the reset button, flashing red indicates when to release the reset button to reset the modem to the factory default settings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flashing Amber</td>
<td>When you press the reset button for more than 20 seconds, flashing amber indicates when to release the reset button to enter Recovery mode.</td>
<td></td>
</tr>
<tr>
<td>Signal</td>
<td>Solid Green</td>
<td>Good signal (equivalent to 4–5 bars)</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Solid Amber</td>
<td>Fair signal (equivalent to 2–3 bars)</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Flashing Amber</td>
<td>Poor signal (equivalent to 1 bar)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If possible, Sierra Wireless® recommends moving the modem to a location with a better signal.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flashing Red</td>
<td>Inadequate (equivalent to 0 bars)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sierra Wireless recommends moving the modem to a location with a better signal.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** The quality of the signal strength is measured using the appropriate parameters for the radio technology in use.
### Table 8-1: LED indicator lights

<table>
<thead>
<tr>
<th>LED</th>
<th>Color / Pattern</th>
<th>Description</th>
<th>LED Power Saving Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Network</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solid Green</td>
<td>Connected to an LTE network</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Solid Amber</td>
<td>Connected to a 3G network or 2G network (RV50 only)</td>
<td>Off</td>
</tr>
<tr>
<td></td>
<td>Flashing Green</td>
<td>Connecting to the network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flashing Red</td>
<td>No network available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flashing Red / Amber</td>
<td>Network Operator Switching is enabled, but the modem is unable to locate the required firmware. For more information, refer to the ALEOS Software Configuration User Guide (Admin chapter) from the Sierra Wireless website.</td>
<td></td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flashing Green</td>
<td>Traffic is being transmitted or received over the WAN interface.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flashing Red</td>
<td>Traffic is being transmitted or received over the serial port. This behavior only appears if the RV50(X) is configured to display it. For more information, refer to the ALEOS Software Configuration Guide (Serial chapter) from the Sierra Wireless website.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flashing Amber</td>
<td>Traffic is being transmitted or received over both the WAN interface and the serial port. This behavior only appears if the RV50(X) is configured to display it. Refer to the ALEOS Software Configuration Guide (Serial chapter) from the Sierra Wireless website.</td>
<td></td>
</tr>
</tbody>
</table>
### Table 8-1: LED indicator lights

<table>
<thead>
<tr>
<th>LED</th>
<th>Color / Pattern</th>
<th>Description</th>
<th>LED Power Saving Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>Green LED chase</td>
<td>Radio module reconfiguration/firmware update or Network Operator Switching is in progress.</td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>Amber LED chase</td>
<td>Firmware update is in progress.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solid Amber</td>
<td>Firmware update complete (all LEDs are amber except the Power LED)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Red LED chase</td>
<td>The modem is in Recovery mode.</td>
<td></td>
</tr>
</tbody>
</table>

### 8.3 Signal strength and quality

Both signal strength and quality contribute to successful cellular data communications. The factors that influence signal strength and quality include but are not limited to:

- proximity to the cellular tower
- tower load
- competing signals
- physical barriers (mountains, buildings, vegetation)
- weather

Because signal strength and quality can vary due to many factors, they may not give a true indication of communications performance or range. However, they can be useful for activities such as:

- determining the optimal direction to aim a Yagi antenna
- determining the effects of antenna height and location
- trying alternate Yagi antenna (reflective) paths
- seeing the effect of vegetation and weather over time

### 8.3.1 Signal strength

Signal strength is how strong the received signal is. The closer your RV50(X) is to the cellular tower, the more signal the antenna will pick up. Signal strengths are lower the farther away from the tower the RV50(X) is.
For 3G networks, signal strength is reported as RSSI (Received Signal Strength Indicator). For 4G, it is RSRP (Reference Signal Received Power).

Signal strength units are –dBm; –70 is a stronger signal than –100.

- -78: good
- -78 to -93: fair
- - 94 to -102: poor
- less than -103: inadequate

**8.3.2 Signal quality**

Signal quality shows how much interference there is between the cellular tower and RV50(X), or how noisy a band is. Cellular signal noise comes from reflections, ghosting and other interference. Better signal quality is an indicator of more successful communications during precipitation events such as rain and snow.

For 3G networks, signal quality is ECIO (Energy to Interference Ratio). For 4G, this is RSRQ (Reference Signal Received Quality).

Signal quality units are –dBm; 0 is a better signal than –10.

Find your module signal strength and quality through ACEmanager. Click Status > Cellular and look for **Signal Strength (RSSI)** and **Signal Quality (RSRQ)**.
8.4 Rebooting the RV50(X)

There are two methods to reboot the RV50(X):

- On the RV50(X), press the **Reset** button for 1–5 seconds. (Release the button when the **Power** LED flashes green.)
- In ACEmanager, click the **Reboot** button on the toolbar.

8.5 Reset the RV50(X) to factory default settings

There are two methods to reset the RV50(X) to the factory default settings:

- On the RV50(X), press the **Reset** button for more than 5 seconds. (Release the button when the **Power** LED flashes red.) Once the LEDs resume their normal operating behavior, the reset is complete.
- In ACEmanager, go to **Admin > Advanced** and click the **Reset to Factory Default** button.

8.6 Recovery mode

If the RV50(X) fails to boot properly, it automatically enters recovery mode. If the RV50(X) is unresponsive to ACEmanager input and AT commands, it can manually be put into recovery mode. Recovery mode enables you to update the RV50(X) firmware and return it to working order.

To enter Recovery mode manually:

- Press the **Reset** button for more than 20 seconds. (Release the button when the Power LED flashes amber.)

To recover the router:

- Update the firmware using the Recovery mode interface. Once the new version is successfully uploaded and installed, the RV50(X) will reboot and exit Recovery mode. When the process is complete, the ACEmanager login screen will appear.

**NOTE:**
Reload the RV50(X) firmware and templates after the Recovery.
To exit Recovery mode, if it has been inadvertently entered, do one of the following:

- Press the RV50(X) Reset button.
- Click Reboot on the ACEmanager Recovery screen.
- Wait 10 minutes. If no action is taken within 10 minutes of the module entering Recovery mode (for example, if the Recovery screen has not been loaded by the web browser), it automatically reboots and exits Recovery mode.

### 9. Attributions

AirLink and Sierra Wireless are registered trademarks of Sierra Wireless.

AT&T is a trademark of AT&T Intellectual Property.

Bell is a registered trademark of Bell Canada.

PakBus is a registered trademark of Campbell Scientific, Inc.

Rogers is a trademark of Rogers Communications.

Sprint is a registered trademark of Sprint.

T-Mobile is a registered trademark of Deutsche Telekom AG.

Telus is a registered trademark of Telus Corporation.

Verizon is a registered trademark of Verizon.

All other trademarks or registered trademarks are the property of their respective owners.
Appendix A. ACEManager and template files

ACEManager along with template files can be used to set up the RV50(X) in PPP or serial server mode. To enable PPP mode, see Enabling PPP mode (p. 13).

ACEManager is accessed via a web browser. For initial setup or troubleshooting with a direct (cabled) connection, connect a standard Ethernet (RJ45) cable between the Ethernet port on the computer and that on the module. Type http://192.168.13.31:9191 into a web browser.

Once the module is provisioned on the network, it may be accessed over the air by typing http:// followed by the IP address of the module, followed by the port :9191.

The first screen is a login (shown below). Look for a sticker on the bottom of your modem with the manufacturer-generated default password. Log in using User Name = user and that Password. If there is no sticker try 12345 for the password. Make note of the password used so it can be easily referenced when off site. Remote access to the modem interface will require the password.

TIP:
We strongly recommend changing the default password to prevent unauthorized access and the potential of malware infection. The password can be changed from the Admin tab.
After entering the password and pressing enter (or clicking Log In), the following status screen is displayed:

![Status Screen]

RV50 template files from the Campbell Scientific website (www.campbellsco.com/downloads) are used to configure the RV50(X) module using ACEmanager.

<table>
<thead>
<tr>
<th>Template File Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RV50_115200.xml</td>
<td>Default configuration with RS-232 at 115200 baud and Ethernet communication enabled.&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>RV50_96000.xml</td>
<td>Default configuration with RS-232 at 9600 baud and Ethernet communication enabled.&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>1</sup>CR1000X series, CR300 series, CR6 series, CR1000, CR3000, CR800 series, CR5000, and GRANITE 6/9/10

Click the **Template** menu in the top right of the screen. When prompted for a template file name, select **RV50_115200.xml** or **RV50_9600.xml**. The following screen shows the settings under the **Serial** tab after the 115200 baud template file has been loaded.

![Template menu screenshot](image)

Click on **WAN/Cellular** for the following screen:

![WAN/Cellular screenshot](image)

Enter the APN as shown in the screen above. The example is for an **APN = I2GOLD**.

After the template file has been loaded, and the APN entered, click **Apply** to save the changes in the module.
Click **Reboot** to restart the module. Alternately, reset the module by pressing **Reset** on the front of the module or by removing power from the module.

Click **Logout** to terminate communications with the module.

**WARNING:**
Unless you Apply the commands, the changes made will not be saved in the module. For most commands, you must reboot the module for the newly written values to take effect.

The module is now set up for PPP or serial server mode.
Appendix B. Controlling power to the RV50(X)

The RV50 uses considerably more power than the data logger. Therefore, it may be necessary to use the data logger to control power to the RV50. The following program examples show how to control power to the RV50 using the switched 12V (SW12V) terminal on the data logger.

This example shows how to control power to the RV50 by using the CRBasic TimeIsBetween() instruction to turn on SW12 for 15 minutes every 60 minutes between 9:00 a.m. and 5:00 p.m.

NOTE:
TimeIsBetween() requires operating system version 28.00 or greater in the CR1000, CR3000, or CR800. It is supported in all CR1000X, CR6, and CR300 operating systems.

<table>
<thead>
<tr>
<th>CRBasic Example 1: Turn RV50(X) ON and OFF under data logger control</th>
</tr>
</thead>
</table>

'CR300 Series

'Declare Variables and Units
Public BattV
Public PTemp_C
Public ModuleState As Boolean

Units BattV=Volts
Units PTemp_C=Deg C

'Define Data Tables
DataTable(Daily,True,-1)
    DataInterval(0,1440,Min,10)
    Minimum(1,BattV,FP2,False,False)
EndTable

'Main Program
BeginProg
    'Main Scan
    Scan(5,Sec,1,0)
    'Default Data Logger Battery Voltage measurement 'BattV'
    Battery(BattV)
    'Default Wiring Panel Temperature measurement 'PTemp_C'
    PanelTemp(PTemp_C,60)
    'Between the hours of 9:00 and 17:00, turn the RV50(X)
    'on for 15 minutes at the start of every hour
CRBasic Example 1: Turn RV50(X) ON and OFF under data logger control

If TimeIsBetween(9,17,24,Hr) AND TimeIsBetween(0,15,60,Min) Then
  ModuleState=True
  PPPOpen
  SW12(1)
Else
  ModuleState=False
  PPPClose
  SW12(0)
EndIf

'Always turn OFF RV50(X) if battery drops below 11.5 volts
If BattV<11.5 Then
  'Set RV50(X) power to the state of 'ModuleState' variable
  SW12(0)
EndIf

'Call Data Tables and Store Data
CallTable Daily
NextScan
EndProg
Appendix C. Using the RV50(X) Ethernet port

The RV50(X) Ethernet port can be used to communicate with IP-enabled devices such as data loggers and IP cameras. However, the use of Ethernet communication increases the total system current demand (the module and the device you are connecting to) by several milliamps as compared to the use of serial communications.

The following example can be used to communicate with a CR1000 / NL121 via the RV50(X) Ethernet port. Port forwarding in the RV50(X) must be enabled and specific ports need to be forwarded to the CR1000 (in this case ports 80 and 6785). Additional ports can be configured as needed. The host IP address 192.168.13.50 specified in the figure below is the IP address of the CR1000.

![Port Forwarding Example](image-url)
For this example, a static **Ethernet IP Address**, **Default Gateway**, **Ethernet Subnet Mask**, and **Ethernet Name Servers** are configured in the CR1000 as shown in the figure below. The example CR1000 Ethernet IP address of 192.168.13.50 is the same address used in the RV50(X) port forwarding configured previously.

Once the RV50(X) and the CR1000 have been configured and the RV50(X) has been rebooted, you can communicate with the CR1000 via LoggerNet using the public IP address of the RV50(X) and port 6785. You can also open a web browser and enter the public IP address of the RV50(X) to see the default web page of the CR1000.
Appendix D. Verizon Wireless and AT&T

NOTE:
Campbell Scientific can provide Verizon Wireless or AT&T service. This is the simplest way to set up your module on the Verizon Wireless or AT&T network. See Campbell Scientific cellular data service (p. 3).

D.1 Verizon Wireless

What you need:

- Verizon Wireless 4G LTE CAT-1 coverage at the data logger site. For a coverage map, refer to: www.verizonwireless.com/landingpages/better-matters/#maps
- Verizon Wireless 4G LTE private dynamic IP account in conjunction with Campbell Scientific Konect PakBus Router Service. (A Verizon Wireless 4G LTE static unrestricted IP account can also be used. However, Verizon generally requires new users to have 50 lines of service to obtain the static unrestricted IP account. Also, there is generally a $500 one-time-per-customer charge to activate static IP on the account.)

To set up an account, you will need the IMEI number of the module. The IMEI number is listed on a label on the module. To set up an account with Verizon Wireless, call:

800-526-3178 for Business Sales
800-256-4646 for Personal Sales

Verizon Wireless will provide a SIM (Subscriber Identity Module) card for each module. The Mini-SIM (2FF) card must be installed inside of the module as described in Install the SIM card (p. 4). In addition to the SIM card, you should receive:

- 10-digit MSISDN number (telephone number associated with the SIM, used for billing)
- An APN (Access Point Name) for 4G LTE CAT-1 service. A common APN used for this application is: VZWINTERNET. The user must program the APN into the module.
- For static IP accounts only, an IP Address will be included.
D.2 AT&T

What you need:

- AT&T 4G LTE CAT-1 coverage at the data logger site. For a coverage map refer to: www.att.com/maps/wireless-coverage.html.
- AT&T 4G LTE private dynamic IP account in conjunction with Campbell Scientific’s Konect Router Service. (An AT&T 4G LTE static unrestricted IP account can also be used. However, AT&T charges $3/month/device for the static IP account.)

To set up an AT&T account, contact your AT&T Business Account Representative or Blu-Telecommunications.

Blu-Telecommunications is part of the Alliance Channel with AT&T and can assist any customer nationwide. Blu-Telecommunications will contact AT&T and work with an AT&T account manager to set up an account.

Contact information for Blu-Telecommunication:

Website: www.blu-tel.com
Phone number: (877) 422-2616, or Email box: i2gold@blu-tel.com
What to ask for: M2M Setup
Who to ask for: Carlos Morales or Andy Tran

An APN (Access Point Name) must be added onto the account to make the module accessible through the Internet. For networks with fewer than 30 modules, the standard ‘I2Gold APN’ can be used; networks with more than 30 modules will require a ‘Custom APN’. A Custom APN has a setup fee starting at $500 and takes a minimum of 7 to 14 business days to complete. The user must program the APN into the module.

AT&T will provide a Subscriber Identity Module (SIM) card for each module. The Mini-SIM (2FF) card must be installed inside of the module as described in Install the SIM card (p. 4). In addition to the SIM card, you should receive:

- 10-digit MSISDN number (telephone number associated with the SIM, used for billing)
- An APN (Access Point Name) for 4G LTE CAT-1 service. A common APN used for this application is: BROADBAND. The user must program the APN into the module.
- For static IP accounts only, an IP Address will be included.
Appendix E. Regulatory information

This information provided by Sierra Wireless®.

E.1 Important information for North American users

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 own expense.

Changes or modifications to this device not expressly approved by Sierra Wireless could void the user’s authority to operate this equipment.

E.2 RF exposure

In accordance with FCC/IC requirements of human exposure to radio frequency fields, the radiating element shall be installed such that a minimum separation distance of 20 cm should be maintained from the antenna and the user’s body.

This product is only to be installed by qualified personnel.

To comply with FCC/IC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain must not exceed the specifications listed below for the device used.
<table>
<thead>
<tr>
<th>Device</th>
<th>Frequency Band</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>AirLink RV50 (N7NMC7355 2417C-MC7355)</td>
<td>Cellular Band</td>
<td>4.0 dBi</td>
</tr>
<tr>
<td></td>
<td>PCS Band</td>
<td>3.0 dBi</td>
</tr>
<tr>
<td></td>
<td>Band 2</td>
<td>3.0 dBi</td>
</tr>
<tr>
<td></td>
<td>Band 4</td>
<td>4.0 dBi</td>
</tr>
<tr>
<td></td>
<td>Band 13</td>
<td>4.0 dBi</td>
</tr>
<tr>
<td></td>
<td>Band 17</td>
<td>4.0 dBi</td>
</tr>
<tr>
<td></td>
<td>Band 25</td>
<td>3.0 dBi</td>
</tr>
<tr>
<td>AirLink RV50(X) (N7NMC7455 2417C-MC7455)</td>
<td>Bands 2, 4, 5, 12, 13, 25, 26</td>
<td>6.0 dBi</td>
</tr>
<tr>
<td></td>
<td>Band 7, 41</td>
<td>9.0 dBi</td>
</tr>
</tbody>
</table>

### E.3 EU

Sierra Wireless hereby declares the AirLink RV50(X) devices is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

The RV50(X) displays the CE mark.

Changes or modifications to this device not expressly approved by Sierra Wireless could void the user’s authority to operate this equipment.

This product is only to be installed by qualified personnel.

### E.4 Declaration of conformity

The Declaration of Conformity made under Directive 1999/5/EC is available for viewing at:

**RV50X:** [https://source.sierrawireless.com/resources/airlink/certification_and_type_approval/rv50x_ce_declaration_of_conformity/](https://source.sierrawireless.com/resources/airlink/certification_and_type_approval/rv50x_ce_declaration_of_conformity/)

**RV50:** [http://source.sierrawireless.com/resources/airlink/-certification_and_type_approval/rv50_ce_declaration_of_conformity/](http://source.sierrawireless.com/resources/airlink/-certification_and_type_approval/rv50_ce_declaration_of_conformity/)
E.5 RoHS compliance

DECLARATION OF EU RoHS COMPLIANT PRODUCT

Sierra Wireless S.A. for itself and its subsidiaries (collectively, “Sierra Wireless”) certifies that to the best of its knowledge the products identified below to be “RoHS Compliant”:

<table>
<thead>
<tr>
<th>Item</th>
<th>Product Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RV50</td>
</tr>
<tr>
<td>2</td>
<td>RV50x</td>
</tr>
<tr>
<td>3</td>
<td>ACCESSORY,RV50,DIN MOUNT BRACKET</td>
</tr>
</tbody>
</table>

RoHS compliant defines that the product conforms to the requirements of the European Union’s on the restriction of the use of certain hazardous substances in electrical and electronics equipments directive, 2011/65/EU (“RoHS directive”), including directive 2015/863 amending annex II. The RoHS directive is with respect to any homogenous components used in the product as shipped by Sierra Wireless, in its entirety.

**ROHS - Exemptions according to annex III**

- ☐ No exemption
- ☐ Exemption 6(b): Lead as an alloying element in aluminum containing up to 0.4 % lead by weight
- ☐ Exemption 6(c): Copper alloy containing up to 4 % lead by weight
- ☐ Exemption 7(a): Lead in high melting temperature type solder (ie lead-based alloys containing 85% by weight or more lead)
- ☐ Exemption 7(c)-I: Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, eg piezoelectronic devices, or in a glass or ceramic matrix compound
- ☐ Exemption 7(c)-II: Lead in dielectric ceramic in capacitors for a rated voltage of 125 V AC or 250 V DC or higher
- ☐ Exemption 15: Lead in solders to complete a viable electrical connection between semiconductor die and carrier with integrated circuit flip chip packages.
- ☐ Other exemption than above.

Sierra Wireless has reached its conclusion that the products listed above are RoHS compliant based on its knowledge and belief via internal design controls, analytical test data and information provided by its component suppliers. However, Sierra Wireless makes no representation or warranty as to the accuracy of such third party information.

Sierra Wireless, S.A.

Name: Rafet Lakhdar
Title: Director Global Customer Quality
Date: January 10th, 2016
Limited warranty

Products manufactured by Campbell Scientific are warranted by Campbell Scientific to be free from defects in materials and workmanship under normal use and service for twelve months from the date of shipment unless otherwise specified on the corresponding product webpage. See Product Details on the Ordering Information pages at www.campbellsci.com. Other manufacturer’s products, that are resold by Campbell Scientific, are warranted only to the limits extended by the original manufacturer.

Refer to www.campbellsci.com/terms#warranty for more information.

CAMPBELL SCIENTIFIC EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Campbell Scientific hereby disclaims, to the fullest extent allowed by applicable law, any and all warranties and conditions with respect to the Products, whether express, implied or statutory, other than those expressly provided herein.
Assistance

Products may not be returned without prior authorization.

Products shipped to Campbell Scientific require a Returned Materials Authorization (RMA) or Repair Reference number and must be clean and uncontaminated by harmful substances, such as hazardous materials, chemicals, insects, and pests. Please complete the required forms prior to shipping equipment.

Campbell Scientific regional offices handle repairs for customers within their territories. Please see the back page for the Global Sales and Support Network or visit www.campbellsci.com/contact to determine which Campbell Scientific office serves your country.

To obtain a Returned Materials Authorization or Repair Reference number, contact your CAMPBELL SCIENTIFIC regional office. Please write the issued number clearly on the outside of the shipping container and ship as directed.

For all returns, the customer must provide a “Statement of Product Cleanliness and Decontamination” or “Declaration of Hazardous Material and Decontamination” form and comply with the requirements specified in it. The form is available from your CAMPBELL SCIENTIFIC regional office. Campbell Scientific is unable to process any returns until we receive this statement. If the statement 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. 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
- Protect from over-voltage.
- Protect electrical equipment from water.
- Protect from electrostatic discharge (ESD).
- Protect from lightning.
- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations.
- 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, 6 meters (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.
- Only use power sources approved for use in the country of installation to power Campbell Scientific devices.

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.

Internal Battery
- Be aware of fire, explosion, and severe-burn hazards.
- Misuse or improper installation of the internal lithium battery can cause severe injury.
- Do not recharge, disassemble, heat above 100 °C (212 °F), solder directly to the cell, incinerate, or expose contents to water. Dispose of spent batteries properly.

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.
Campbell Scientific regional offices

**Australia**
- **Location**: Garbutt, QLD Australia
- **Phone**: 61.7.4401.7700
- **Email**: info@campbellsci.com.au
- **Website**: www.campbellsci.com.au

**Brazil**
- **Location**: São Paulo, SP Brazil
- **Phone**: 11.3732.3399
- **Email**: vendas@campbellsci.com.br
- **Website**: www.campbellsci.com.br

**Canada**
- **Location**: Edmonton, AB Canada
- **Phone**: 780.454.2505
- **Email**: dataloggers@campbellsci.ca
- **Website**: www.campbellsci.ca

**China**
- **Location**: Beijing, P. R. China
- **Phone**: 86.10.6561.0080
- **Email**: info@campbellsci.com.cn
- **Website**: www.campbellsci.com.cn

**Costa Rica**
- **Location**: San Pedro, Costa Rica
- **Phone**: 506.2280.1564
- **Email**: info@campbellsci.cc
- **Website**: www.campbellsci.cc

**France**
- **Location**: Vincennes, France
- **Phone**: 0033.0.1.56.45.15.20
- **Email**: info@campbellsci.fr
- **Website**: www.campbellsci.fr

**Germany**
- **Location**: Bremen, Germany
- **Phone**: 49.0.421.460974.0
- **Email**: info@campbellsci.de
- **Website**: www.campbellsci.de

**India**
- **Location**: New Delhi, DL India
- **Phone**: 91.11.46500481.482
- **Email**: info@campbellsci.in
- **Website**: www.campbellsci.in

**South Africa**
- **Location**: Stellenbosch, South Africa
- **Phone**: 27.21.8809960
- **Email**: sales@campbellsci.co.za
- **Website**: www.campbellsci.co.za

**Spain**
- **Location**: Barcelona, Spain
- **Phone**: 34.93.2323938
- **Email**: info@campbellsci.es
- **Website**: www.campbellsci.es

**Thailand**
- **Location**: Bangkok, Thailand
- **Phone**: 66.2.719.3399
- **Email**: info@campbellsci.asia
- **Website**: www.campbellsci.asia

**UK**
- **Location**: Shepshed, Loughborough, UK
- **Phone**: 44.0.1509.601141
- **Email**: sales@campbellsci.co.uk
- **Website**: www.campbellsci.co.uk

**USA**
- **Location**: Logan, UT USA
- **Phone**: 435.227.9120
- **Email**: info@campbellsci.com
- **Website**: www.campbellsci.com