



# CELL200-Series

## 4G LTE Cellular Module





# Guarantee

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This equipment is guaranteed against defects in materials and workmanship. We will repair or replace products which prove to be defective during the guarantee period as detailed on your invoice, provided they are returned to us prepaid. The guarantee will not apply to:

- Equipment which has been modified or altered in any way without the written permission of Campbell Scientific
- Batteries
- Any product which has been subjected to misuse, neglect, acts of God or damage in transit.

Campbell Scientific will return guaranteed equipment by surface carrier prepaid. Campbell Scientific will not reimburse the claimant for costs incurred in removing and/or reinstalling equipment. This guarantee and the Company's obligation thereunder is in lieu of all other guarantees, expressed or implied, including those of suitability and fitness for a particular purpose. Campbell Scientific is not liable for consequential damage.

Please inform us before returning equipment and obtain a Repair Reference Number whether the repair is under guarantee or not. Please state the faults as clearly as possible, and if the product is out of the guarantee period it should be accompanied by a purchase order. Quotations for repairs can be given on request. It is the policy of Campbell Scientific to protect the health of its employees and provide a safe working environment, in support of this policy a "Declaration of Hazardous Material and Decontamination" form will be issued for completion.

When returning equipment, the Repair Reference Number must be clearly marked on the outside of the package. Complete the "Declaration of Hazardous Material and Decontamination" form and ensure a completed copy is returned with your goods. Please note your Repair may not be processed if you do not include a copy of this form and Campbell Scientific Ltd reserves the right to return goods at the customers' expense.

Note that goods sent air freight are subject to Customs clearance fees which Campbell Scientific will charge to customers. In many cases, these charges are greater than the cost of the repair.



Campbell Scientific Ltd,  
80 Hathern Road,  
Shepshed, Loughborough, LE12 9GX, UK  
Tel: +44 (0) 1509 601141  
Fax: +44 (0) 1509 270924  
Email: [support@campbellsci.co.uk](mailto:support@campbellsci.co.uk)  
[www.campbellsci.co.uk](http://www.campbellsci.co.uk)



# PLEASE READ FIRST

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## About this manual

Please note that this manual was originally produced by Campbell Scientific Inc. primarily for the North American market. Some spellings, weights and measures may reflect this origin.

Some useful conversion factors:

**Area:** 1 in<sup>2</sup> (square inch) = 645 mm<sup>2</sup>

**Length:** 1 in. (inch) = 25.4 mm  
1 ft (foot) = 304.8 mm  
1 yard = 0.914 m  
1 mile = 1.609 km

**Mass:** 1 oz. (ounce) = 28.35 g  
1 lb (pound weight) = 0.454 kg

**Pressure:** 1 psi (lb/in<sup>2</sup>) = 68.95 mb

**Volume:** 1 UK pint = 568.3 ml  
1 UK gallon = 4.546 litres  
1 US gallon = 3.785 litres

In addition, while most of the information in the manual is correct for all countries, certain information is specific to the North American market and so may not be applicable to European users.

Differences include the U.S standard external power supply details where some information (for example the AC transformer input voltage) will not be applicable for British/European use. *Please note, however, that when a power supply adapter is ordered it will be suitable for use in your country.*

Reference to some radio transmitters, digital cell phones and aerials may also not be applicable according to your locality.

Some brackets, shields and enclosure options, including wiring, are not sold as standard items in the European market; in some cases alternatives are offered. Details of the alternatives will be covered in separate manuals.

Part numbers prefixed with a “#” symbol are special order parts for use with non-EU variants or for special installations. Please quote the full part number with the # when ordering.

## Recycling information



At the end of this product's life it should not be put in commercial or domestic refuse but sent for recycling. Any batteries contained within the product or used during the products life should be removed from the product and also be sent to an appropriate recycling facility.

Campbell Scientific Ltd can advise on the recycling of the equipment and in some cases arrange collection and the correct disposal of it, although charges may apply for some items or territories.

For further advice or support, please contact Campbell Scientific Ltd, or your local agent.



Campbell Scientific Ltd, 80 Hathern Road, Shepshed, Loughborough, LE12 9GX,  
UK Tel: +44 (0) 1509 601141 Fax: +44 (0) 1509 270924  
Email: [support@campbellsci.co.uk](mailto:support@campbellsci.co.uk)  
[www.campbellsci.co.uk](http://www.campbellsci.co.uk)



# 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.eu](http://www.campbellsci.eu) or by telephoning +44(0) 1509 828 888 (UK). You are responsible for conformance with governing codes and regulations, including safety regulations, and the integrity and location of structures or land to which towers, tripods, and any attachments are attached. Installation sites should be evaluated and approved by a qualified engineer. If questions or concerns arise regarding installation, use, or maintenance of tripods, towers, attachments, or electrical connections, consult with a licensed and qualified engineer or electrician.

## General

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

## Utility and Electrical

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

## Elevated Work and Weather

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

## Maintenance

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

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





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# 1. Cellular communications

This manual provides information for interfacing CELL200 Series 4G LTE Cellular Modules to Campbell Scientific data loggers.

Use of the CELL200 series requires a cellular line of service. The products compatible with Verizon, AT&T, T-Mobile, Vodafone, and Telstra are shown in the following table.

| Product | Cellular protocol                        | Market                    | Verizon | AT&T | T-Mobile | Vodafone | Telstra | Other <sup>1</sup> |
|---------|--|---------------------------|---------|------|----------|----------|---------|--------------------|
| CELL205 | 4G LTE with automatic 3G fallback        | North America             |         | ✓    | ✓        |          |         | ✓                  |
| CELL210 | 4G LTE CAT-1                             | United States             | ✓       |      |          |          |         |                    |
| CELL215 | 4G LTE with automatic 3G and 2G fallback | EMEA                      |         |      |          | ✓        |         | ✓                  |
| CELL220 | 4G LTE with automatic 3G fallback        | Australia and New Zealand |         |      |          |          | ✓       | ✓                  |
| CELL225 | 4G LTE                                   | Japan                     |         |      |          |          |         | ✓                  |

<sup>1</sup> More than 600 other providers are available worldwide through Campbell Scientific. See [Establish cellular service](#) (p. 2) for more information.

Before using the CELL200 series, please review:

- [Safety](#) (p. iii)
- [Pre-installation](#) (p. 2)
- [QuickStart \(integrated mode\)](#) (p. 8)

## 2. Pre-installation

---

**TIP:**

Check [www.campbellsci.com](http://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>).

### 2.1 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.

#### 2.1.1 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 CELL200 series, call Campbell Scientific to set up service.

#### 2.1.2 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. 84).

**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.

## 2.2 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. 4)

The CELL200 series requires a Micro-SIM (3FF) (6 position / contacts); 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.

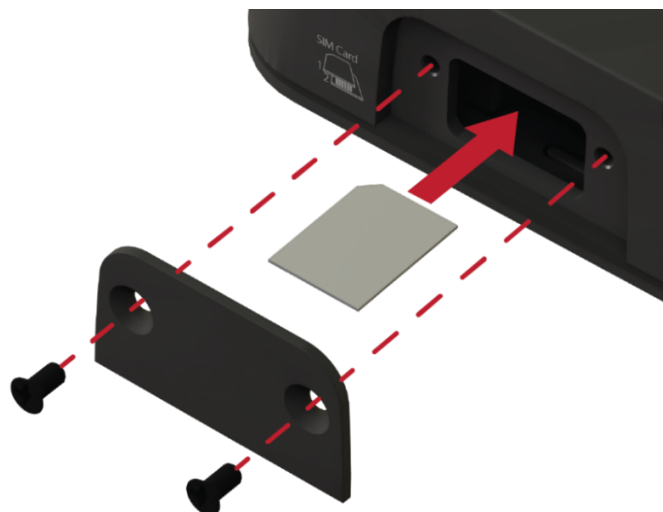


FIGURE 2-1. SIM card installation

## 2.3 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. Complete the steps in the following two sections.

### 2.3.1 Get started

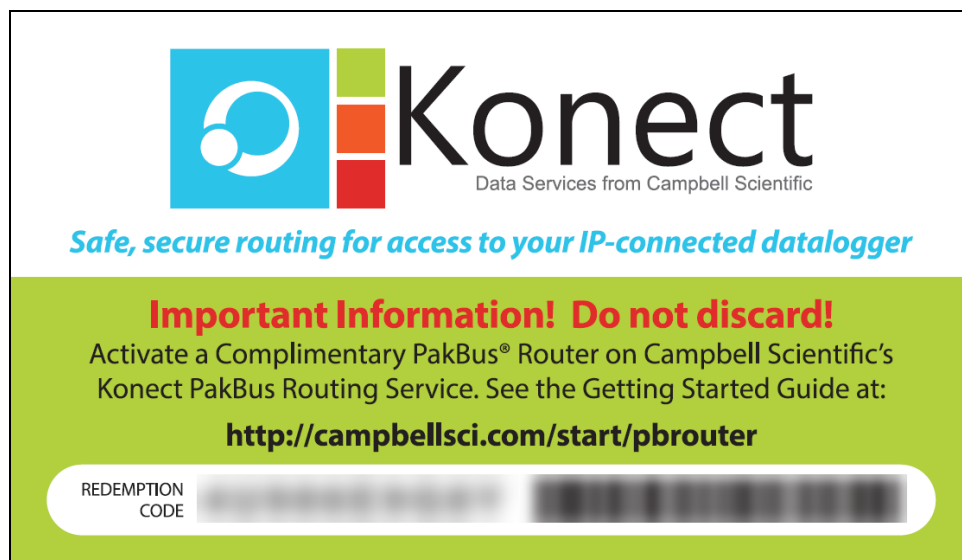
Open a web browser and go to [www.konectgds.com](http://www.konectgds.com).

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.





You will need the Konect PakBus Router redemption code that came on a card with the CELL200 series.



**Konect**  
Data Services from Campbell Scientific

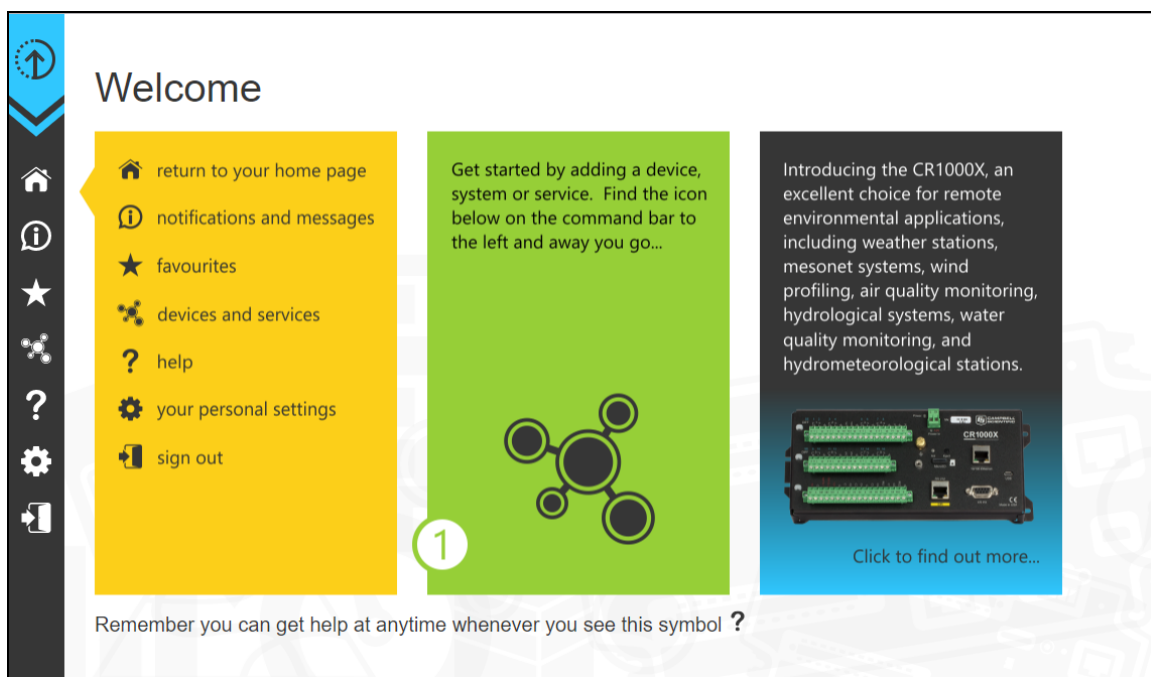
*Safe, secure routing for access to your IP-connected datalogger*

**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>**

REDEMPTION CODE [REDACTED]

## 2.3.2 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.



**Welcome**


- return to your home page
- notifications and messages
- favourites
- devices and services
- help
- your personal settings
- sign out

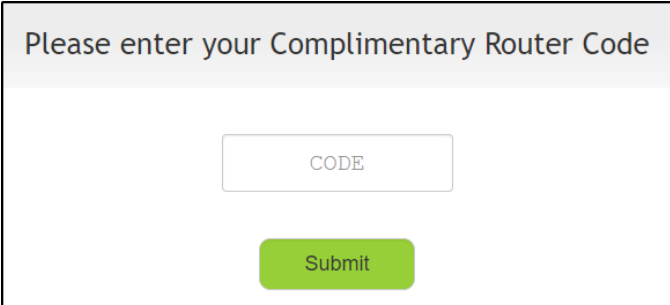
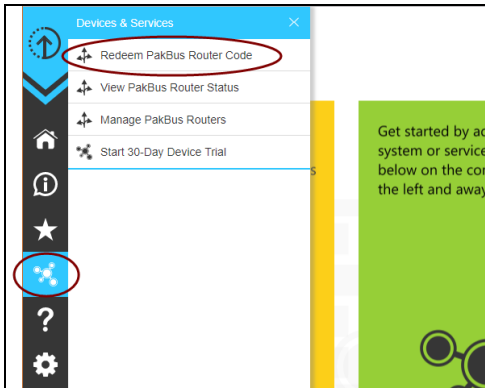
Get started by adding a device, system or service. Find the icon below on the command bar to the left and away you go...

Introducing the CR1000X, an excellent choice for remote environmental applications, including weather stations, mesonet systems, wind profiling, air quality monitoring, hydrological systems, water quality monitoring, and hydrometeorological stations.

Click to find out more...

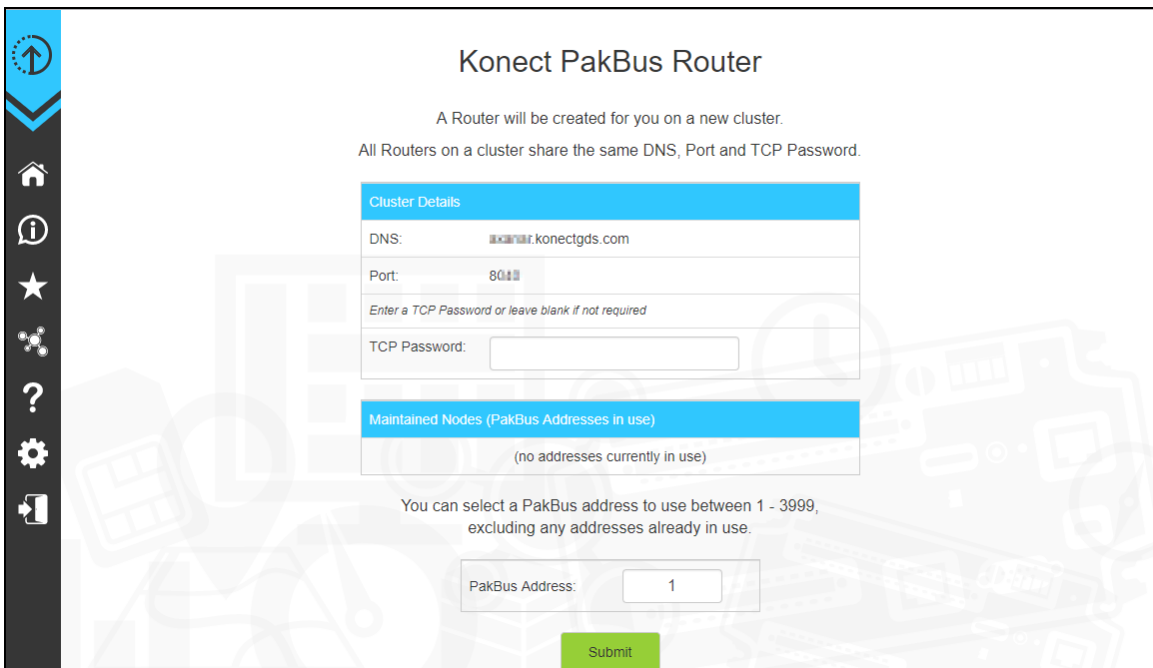
Remember you can get help at anytime whenever you see this symbol ?

- 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**.



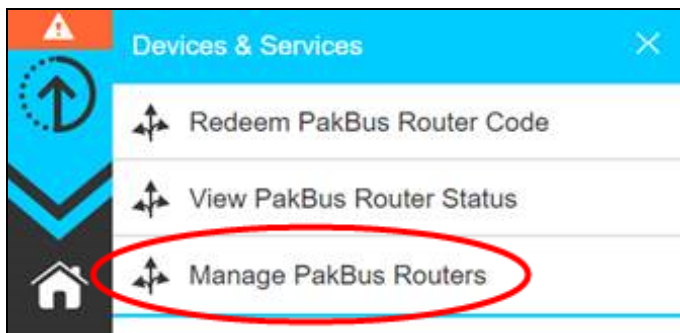
- The next screen shows the assigned **DNS** address and **Port** for the router. An optional **TCP Password** may be entered for additional security, and you must select a unique **PakBus Address** for your data logger.

**TIP:**  
Make note of this information for use in later steps.



- Click **Submit**.

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



**NOTE:**

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

## 3. Overview

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The CELL200-series modules may be configured in one of five ways, depending on the data logger, communications type, and needs of the user.

- **Integrated:** The module mimics the behaviour of our integrated cell modems. No settings are configured directly in the module. All settings are configured in the attached data logger.
- **Non-integrated:** The module mimics the behaviour of our older cellular modems. Settings must be configured in both the module and the data logger.
- **Serial Server:** In this mode, the module receives IP communications over the cellular network and converts those to serial communications to pass on to the data logger. From the perspective of the data logger, this is no different than a serial cable connecting it to a computer.

**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.

- **Serial Client:** Use this mode when the module is behind a cellular provider firewall and it has a private dynamic IP address. In serial client mode the module will connect to the cellular network and initiate a TCP client socket connection.
- **Serial Server/Client:** In serial server/client mode the module connects to the cellular network and opens a listening port. When a client connects to the listening port, the CELL200 series will be in "**Serial Server**" mode, as described earlier. When no client is connected to the listening port, the CELL200 series will be in "**Serial Client**" mode, as described earlier, and all data on the active port will be sent and received through the initiated TCP client socket connection.

Data loggers compatible with each mode are shown in the following table.

|  | Integrated PPP | Non-integrated PPP | Serial server <sup>2</sup> | Serial client <sup>3</sup> | Serial server/client <sup>3</sup> |
|--|----------------|--------------------|----------------------------|----------------------------|-----------------------------------|
| CR6 series/CR1000X/CR300 series <sup>1</sup>   | ✓              | ✓                  | ✓                          | ✓                          | ✓                                 |
| CR1000/CR3000/CR800 series   |                | ✓                  | ✓                          | ✓                          | ✓                                 |
| CR200(X) series  |                |                    | ✓                          | ✓                          | ✓                                 |
| Array-based (Edlog) data loggers   |                |                    | ✓                          | ✓                          | ✓                                 |
| <sup>1</sup> Integrated PPP mode requires operating system 03.00 or later for the CR1000X, 09.00 or greater for the CR6 series, and 08.00 or later for the CR300 series.<br><sup>2</sup> Serial server mode requires a public static IP account.<br><sup>3</sup> Requires CELL200 series OS 2.00 or later. |                |                    |                            |                            |                                   |

## 4. QuickStart (integrated mode)


### NOTE:

This QuickStart describes configuring the CELL200 series in integrated mode (mimicking our internal cell modems) with its default settings. It can also be configured in non integrated or serial server mode.

This QuickStart section does not apply to CR3000, CR1000 and CR800-series users. See [Overview](#) (p. 7) for more information on the different modes. See [CELL200 series and data](#)

[logger configuration](#) (p. 30) for more information on configuring the module in the different modes.

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 [FIGURE 4-1](#) (p. 9) for an example of a Campbell Scientific Provisioning Report. Other cellular providers should provide similar information.



**Cellular Data Service  
Provisioning Report**

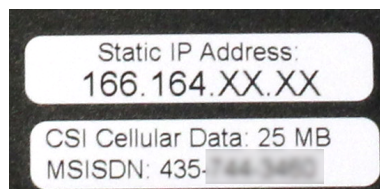
The following device has been provisioned for Campbell Scientific Cellular Data Service.

|                  |                                    |   |   |
|------------------|------------------------------------|---|---|
| Sales Order #    | 12/31/1969                         | Sales Order Due Date  | 12/31/1969  |
| Sales Order Date | 12/31/1969                         | Date Provisioned  | 11/06/2018  |
| Company          | Campbell Scientific Inc. Marketing | Customer ID   | XXXX  |
| Address          | 1000 10th St. SW                   | Contact   |   |
| City             | Spokane                            | Phone   | 435-227-8800  |
| State            | WA                                 | Email   | marketing@campbellsci.com   |
| Country          | United States                      |   |   |
| Postal Code      | 99201-1104                         |   |   |
| Hardware Model # | 1000-17                            | Datalogger (-40 to +70C) -CELL210 w/4G LTE CAT1 VZ -VS Verizon US Static IP |   |
| Serial #         | XXXX-CELL210-VS                    | Static IP   |   |
| Provision Code   | 1000-17                            | CR300-CELL210-VS  | Datalogger (-40 to +70C) -CELL210 w/4G LTE CAT1 VZ -VS Verizon US Static IP                               |
| Data Plan        | 1000-14                            | CELLDATA-VS-A250  | Campbell Scientific Cellular Data Service Subscription -VS Verizon US Static IP - A250 250MB/Mon for 1 Yr |
| Data Limit       | 250 MB                             | Network   | Verizon   |
| ICCID            | 89-4000000477124607                | IP Address  | 166.167.XX.XX   |
| MSISDN           | 435-435-XXXX                       | Konect Pk Bus 70  |   |
| IMEI             | 35810711-200000                    | IP Address  | 166.167.XX.XX   |
| Redemption Code  |                                    |   |   |
| Renewal Due Date | 2019-09-22                         | Service Period  | 11/15/2018 to 12/14/2019  |

*FIGURE 4-1. Static IP provisioning report*

Additionally, Campbell Scientific cellular modules configured with a public static IP address will have two stickers on the module, as shown in [FIGURE 4-2](#) (p. 9). 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.



*FIGURE 4-2. Module with public static IP address*

## 4.1 Modules using Konect PakBus Router (private dynamic IP)

### 4.1.1 Set up hardware

1. Connect the **Cellular** antenna.
2. Connect your data logger to the CELL200-series module RS-232 or CS I/O port. See [Wiring and connections](#) (p. 25).
3. If not connecting through CS I/O, provide power to the CELL200 series.

### 4.1.2 Configure data logger

1. Connect to your data logger by using Device Configuration Utility.
2. On the **Datalogger** tab, change the data logger **PakBus Address** and optional **PakBus/TCP Password** to match the values entered in the Konect PakBus Router setup.
3. On the **Network Services** tab in the **PakBus/TCP Client** field, enter the DNS address and Port number noted during the Konect PakBus Router setup.
4. On the **PPP** tab, set **Config/Port Used** to **CS I/O SDC8** or **RS-232**, depending on how you are connected to the data logger.
5. (Optional) On the **PPP** tab, set **User Name** and **Password** if required by your cellular carrier (usually outside of the United States).
6. Verify the **Modem Dial String** setting is blank.
7. If connecting through RS-232, on the **Comport Settings** tab, set **RS232 BaudRate** to **115200 Fixed**.
8. Shut down Device Configuration Utility and start it again. This will activate the **Cellular** tab needed for the next step.

9. On the **Cellular** tab, enter the **APN** provided by your cellular provider.

The screenshot shows the 'Device Configuration Utility 2.19 Beta' window. The 'Cellular' tab is selected in the top navigation bar. On the left, the 'Device Type' list shows 'CR 1000X Series' selected. The main configuration area includes fields for 'Cell Modem Enable', 'APN' (highlighted with a red box and containing 'MISL4N2STATE'), 'PDP User Name', 'PDP Password', 'Automated Power Schedule', 'Ping Keep Alive', and 'Status'. The 'Status' section shows 'State: Network ready, Datalogger ready.', 'Signal Strength: -85', and 'Signal Quality: -13'. The 'Cellular Network Status' section displays network details like IP, gateway, and DNS. At the bottom, the 'APN' section explains its function and provides a note that the setting is stored in the CELL2xx.

10. (Optional) By default, the CELL200 series will accept incoming communications from any IP address. This can be a security risk. You may specify up to four IP addresses, with wild cards, to limit connections to only those trusted sources. Use an asterisk (\*) as a wild card. For example, a setting of 166.22.\*.\* would allow connections from devices that have IP addresses starting with 166.22. Both IPv4 and IPv6 addresses are supported.

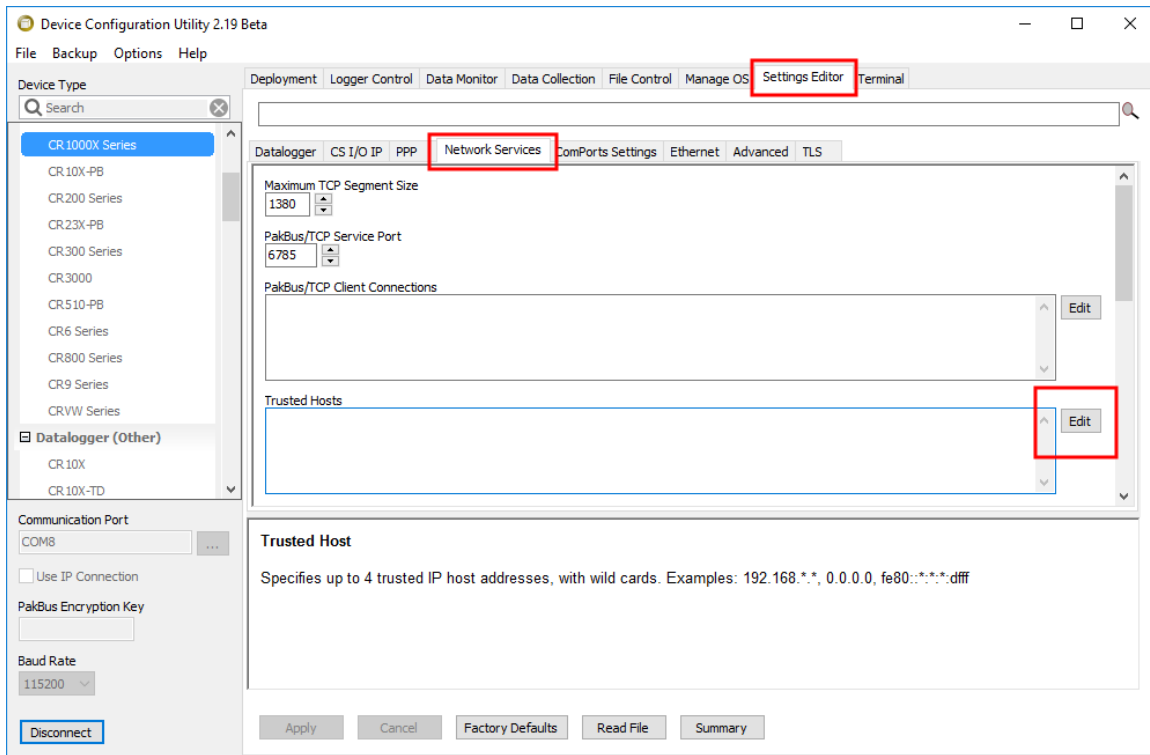
**CAUTION:**

Only set a Trusted IP address if you are familiar with their use. Consult your IT department or Campbell Scientific for assistance.

**NOTE:**

This setting does not affect outbound connections, only incoming connections.

In the Device Configuration Utility go to the **Settings Editor** then **Network Services**. Next to the **Trusted Hosts** field, click **Edit** and **Add** your trusted IP addresses, one at a time.



11. Click **Apply** to save the changes.

### 4.1.3 Set up LoggerNet

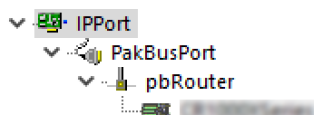
The LoggerNet Network Map is configured from the **LoggerNet Setup** screen.

#### 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:

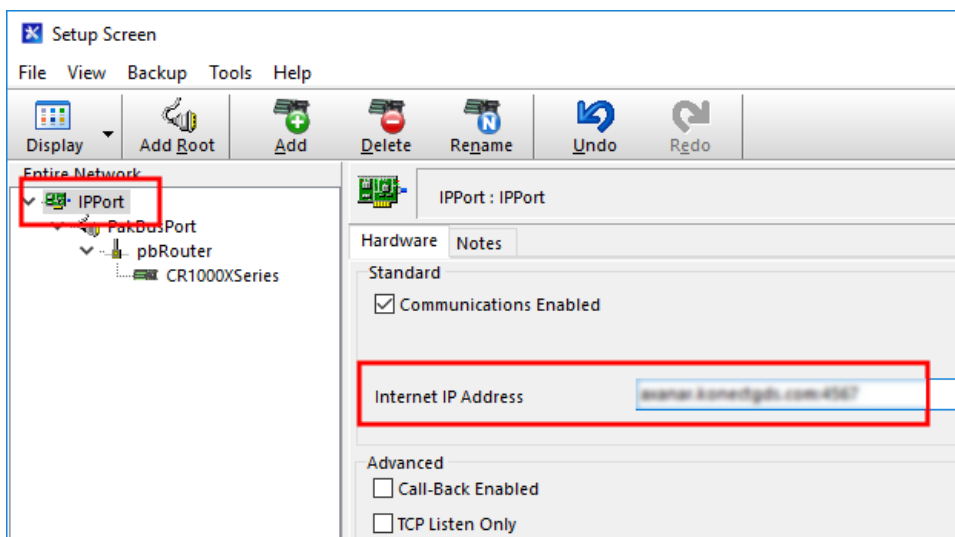
1. Select **Add Root > IPPort**.
2. Select **PakBusPort** and **pbRouter** for PakBus data loggers such as the CR1000X or CR300.



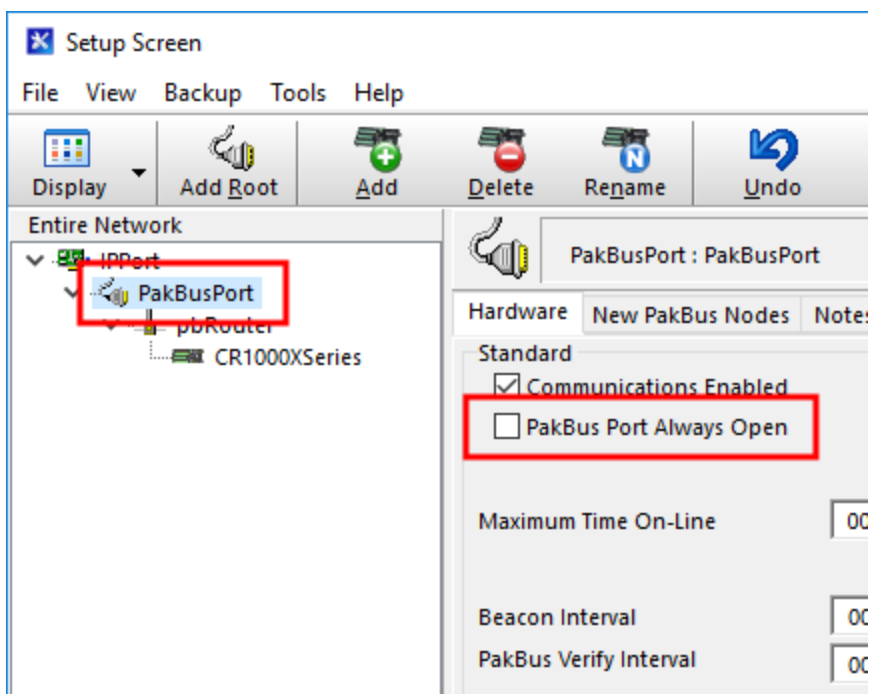
3. Add a data logger to the **pbRouter**.



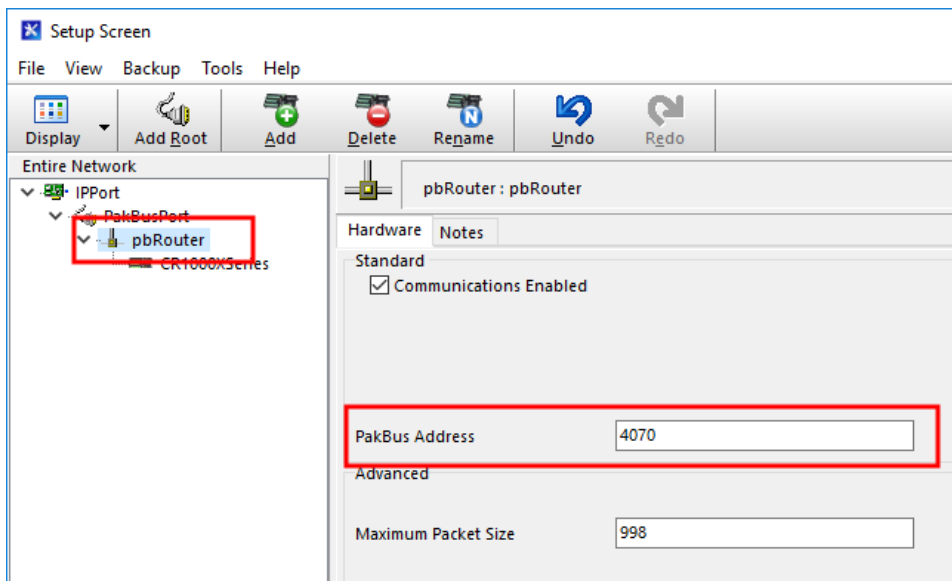
4. Select the **IPPort** in the Network Map. Enter the Konect PakBus Router DNS address and port number as noted in the Konect PakBus Router setup. The DNS address and port number are input in the **Internet IP Address** field separated by a colon. For example, axanar.konectgds.com:pppp where pppp is the port number.



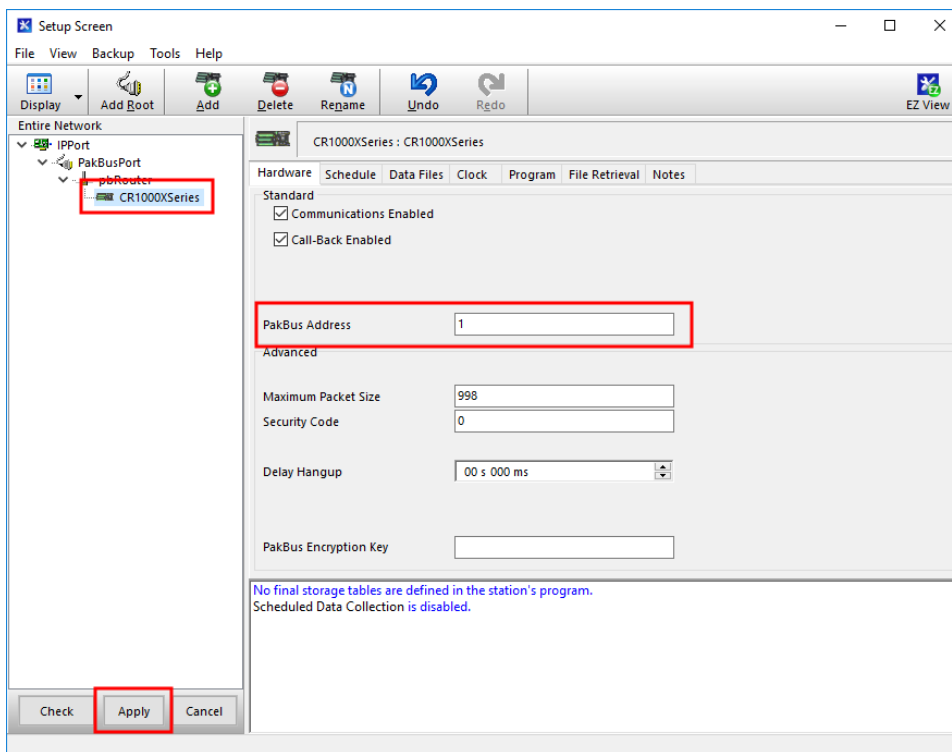
5. For PakBus data loggers, leave the default settings for the **PakBusPort**. **PakBus Port Always Open** should **not** be checked. If used, enter the **TCP Password**.



- For PakBus data loggers, select the pbRouter in the Network Map and set the **PakBus Address** to 4070.



- 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.



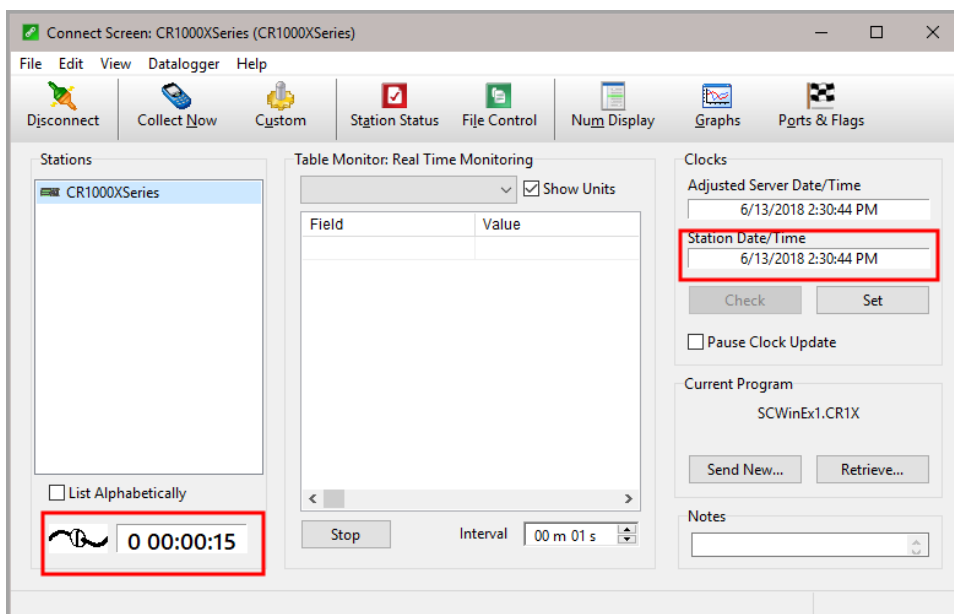
## 4.1.4 Test the connection

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 fifteen minutes. Be patient.

If the call 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.



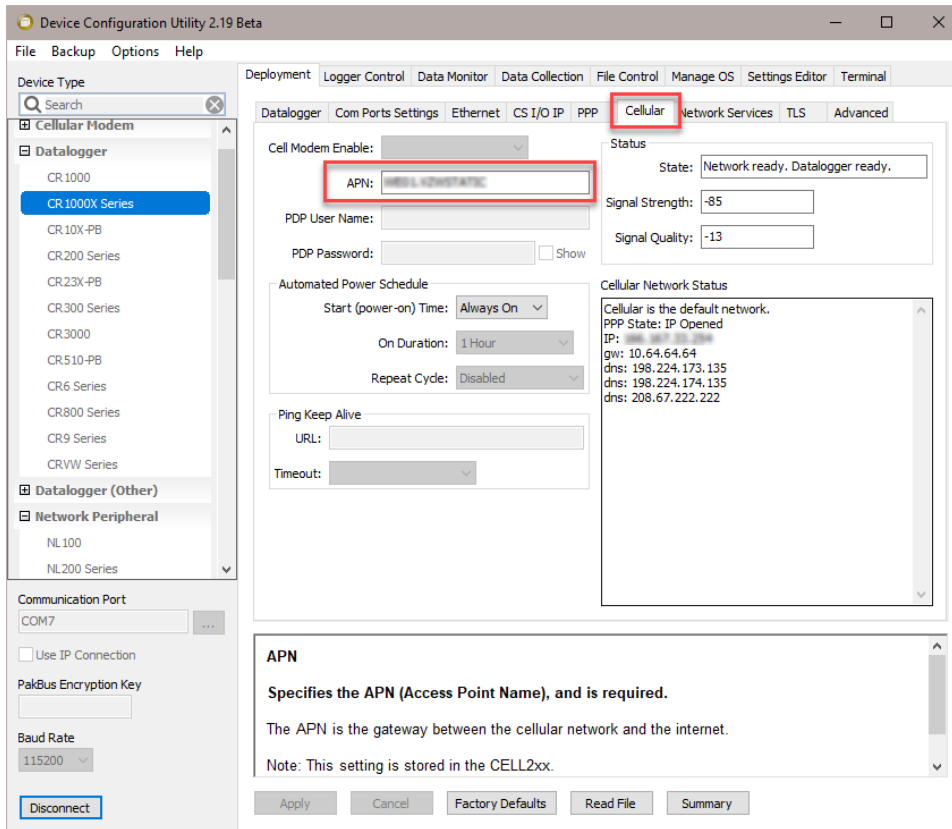
## 4.2 Modules using a public static IP

### 4.2.1 Set up hardware

1. Connect the **Cellular** antenna.
2. Connect your data logger to the CELL200-series module RS-232 or CS I/O port. See [Wiring and connections](#) (p. 25).
3. If not connecting through CS I/O, provide power to the CELL200 series.

## 4.2.2 Configure data logger

1. Connect to your data logger by using Device Configuration Utility.
2. On the **PPP** tab, set **Config/Port Used** to **CS I/O SDC8** or **RS-232**, depending on how you are connected to the data logger.
3. Verify the **Modem Dial String** setting is blank.
4. If connecting through RS-232, on the **Comport Settings** tab, set **RS232 BaudRate** to **115200 Fixed**.
5. On the **Cellular** tab, enter the **APN** provided by your cellular provider.



- (Optional) By default, the CELL200 series will accept incoming communications from any IP address. This can be a security risk. You may specify up to four IP addresses, with wild cards, to limit connections to only those trusted sources. Use an asterisk (\*) as a wild card. For example, a setting of 166.22.\*.\* would allow connections from devices that have IP addresses starting with 166.22. Both IPv4 and IPv6 addresses are supported.

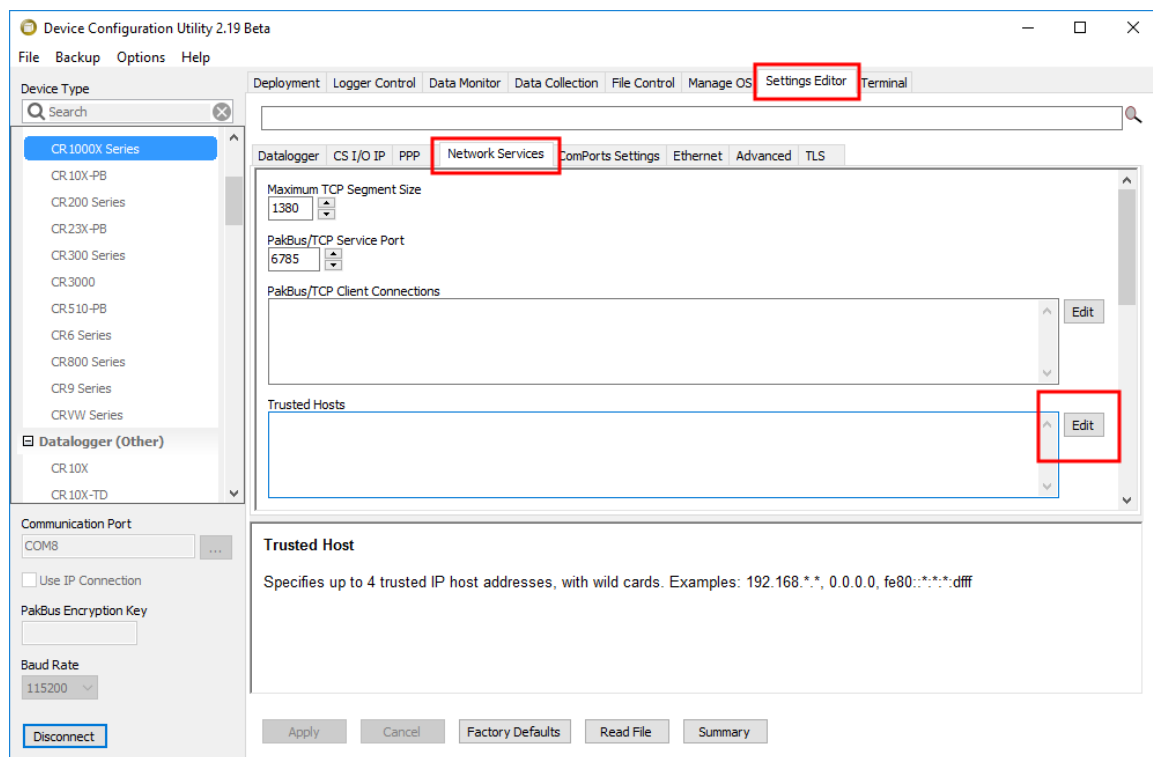
**CAUTION:**

Only set a Trusted IP address if you are familiar with their use. Consult your IT department or Campbell Scientific for assistance.

**NOTE:**

This setting does not affect outbound connections, only incoming connections.

In the Device Configuration Utility go to the **Settings Editor** then **Network Services**. Next to the **Trusted Hosts** field, click **Edit** and **Add** your trusted IP addresses, one at a time.



7. Click **Apply** to save the changes.

### 4.2.3 Set up LoggerNet

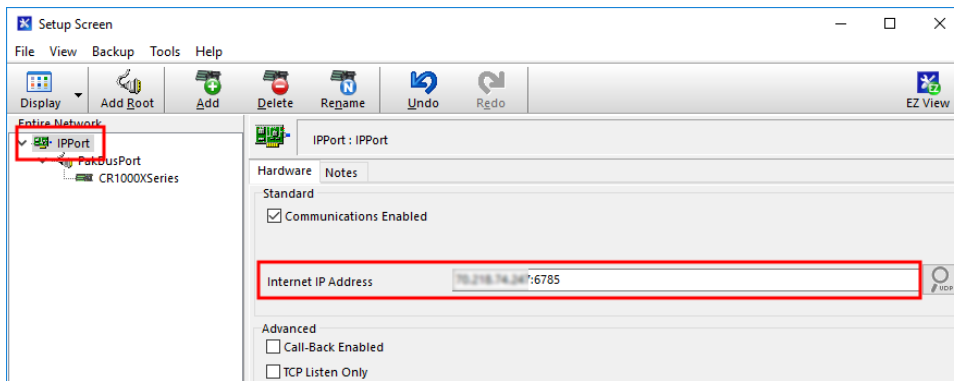
The LoggerNet Network Map is configured from the **LoggerNet Setup** screen.

## NOTE:

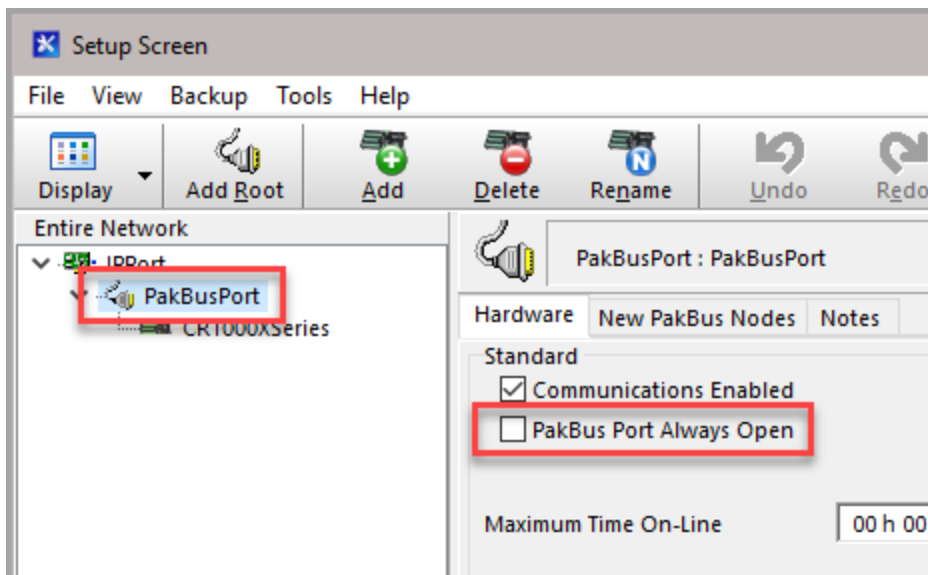
Setup has two options, EZ (simplified) and Standard. Click on the **View** menu at the top of the **Setup** screen, and select **Standard** view.

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

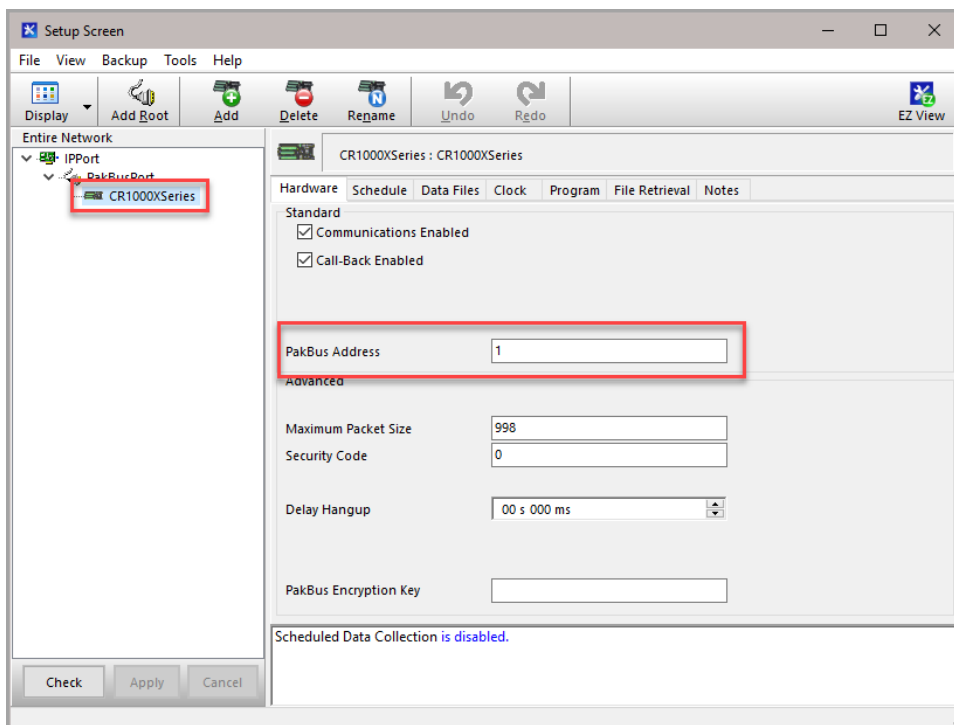
1. Select **Add Root > IPPort**.
2. Select **PakBusPort**
3. Add a data logger to the **PakBusPort**.
4. Select the **IPPort** in the Network Map. Enter the CELL200 series IP address and port number. The IP address and port number are input in the **Internet IP Address** field separated by a colon. Preceding 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.



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**.



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.



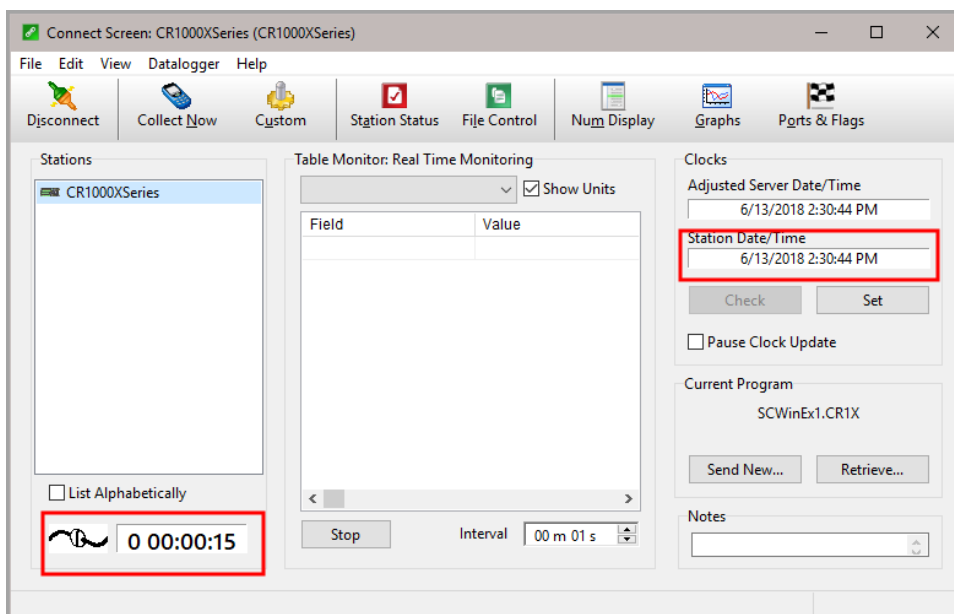
## 4.2.4 Test the connection

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 fifteen minutes. Be patient.

If the call 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.



## 5. Specifications

### Data Logger Compatibility

The CELL200 series is compatible with the CR1000X, CR300 series, CR6 series, CR1000, CR3000, CR800 series, CR200(X) series, CR5000, CR10X, CR10X-PB, CR510, CR510-PB, CR23X, and CR23X-PB. See [Module communications connections](#) (p. 25) for information on communication options with each data logger model.



## Cellular WAN

- Network Technology: 4G with automatic fallback to 3G for CELL205
- CELL205
  - Carrier Approvals: AT&T, T-Mobile USA, Rogers
  - LTE: 1900(B2), AWS(B4), 700(B12)
  - WCDMA: 1900(B2), AWS(B4), 850(B5)
  - FCC ID: XMR201606EC21A
- CELL210
  - Carrier Approvals: Verizon
  - LTE: AWS (B4), 700(B13)
  - FCC ID: XMR201609EC21V
- CELL215
  - Carrier Approvals: Vodafone
  - LTE: 2100(B1), 1800(B3), 850(B5), 2600(B7), 900(B8), 800(B20)
  - WCDMA: 2100(B1), 850(B5), 900(B8)
  - GSM: 1800(B3), 900(B8)
- CELL220
  - Carrier Approvals: Telstra
  - LTE: 2100(B1), 1800(B3), 850(B5), 2600(B7), 700(B28)
  - WCDMA: 2100(B1), 850(B5)
- CELL225
  - Carrier Approvals: NTT Docomo/SoftBank
  - LTE: 2100(B1), 1800(B3), 1880(B8), 800 lower(B18), 00 higher (B19), 850+ (B29)

## Host Interfaces

- CS I/O communications port, DB9 male
- RS-232 serial port, DB9 female
- USB version 2.0 with micro-B connector

## RF Connectors

- 2 SMA antenna connectors (primary and diversity)

## Power

- Operating Voltage: 10 to 30 VDC
- Low Power Mode: 300  $\mu$ A
- Typical Idle: 14 mA @ 12 VDC
- Typical Active: 39 mA @ 12 VDC (CELL205, CELL215, CELL220, CELL225)  
25 mA @ 12 VDC (CELL210)

## Size

- Dimensions: 13.46 X 8.1 X 2.86 cm (5.3 X 3.19 X 1.13 in)
- Weight: 215.5 g (7.6 oz)

## Environmental

- Operating Temperature Range: –40 to 80 °C
- Storage Temperature: –45 to 80 °C
- Humidity: 10 to 90%

## Industry Certifications

- Environmental: RoHS

## SIM (Subscriber Identity Module) card

- Micro-SIM (3FF) (6 position / contacts)

## Data Speeds

- LTE: Max 10 Mbps (download) / Max 5 Mbps (upload)
- WCDMA: Max 384 Kbps (download) / Max 384 Kbps (upload)
- GSM
  - EDGE: Max 296 Kbps (download) / Max 236.8 Kbps (upload)
  - GPRS: Max 107 Kbps (download) / Max 85.6 Kbps (upload)

## Compliance

- View Declaration of Conformity at:  
[www.campbellsci.eu/cell205](http://www.campbellsci.eu/cell205)  
[www.campbellsci.eu/cell210](http://www.campbellsci.eu/cell210)  
[www.campbellsci.eu/cell215](http://www.campbellsci.eu/cell215)  
[www.campbellsci.eu/cell220](http://www.campbellsci.eu/cell220)  
[www.campbellsci.eu/cell225](http://www.campbellsci.eu/cell225)

# 6. Installation

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## 6.1 Base station requirements

A computer running Campbell Scientific LoggerNet software with access to the Internet is needed.

## 6.2 Data logger site equipment

- CELL200-series 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. 25)
- Environmental Enclosure — ENC10/12, ENC12/14, or ENC16/18

### If connecting to CS I/O port:

SC12 cable (preferred for CR1000X series, CR300 series, CR6 series, CR1000, CR3000, CR800 series, CR5000, and GRANITE 6/9/10 data loggers ) — connects the module to current data logger with a **CS I/O** port. See [CS I/O connection](#) (p. 27)

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: Modem Enable
- CS I/O ME Baud Rate: 9600
- RS-232 Mode: Modem (default)
- Baud Rate:
  - 115.2K for CR1000X series, CR300 series, CR6 series, CR1000, CR3000, CR800 series, CR5000, and GRANITE 6/9/10 data loggers

- 9600 for CR10X, CR10X-PB, CR510, CR510-PB, CR23X, CR23X-PB, and CR200 (X) series 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 CR1000X series, 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.

- Antenna — the following antennas are available from Campbell Scientific. Contact Campbell Scientific for help in determining the best antenna for your application.
  - 2 dBd 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 dBd 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. It has a high-efficiency response on nearly all 4G, 3G, and 2G frequency bands and is, therefore, primarily used with cellular gateways and routers. This antenna attaches directly to the CELL200 series and is intended for use inside the enclosure. Please note that the backplate of the enclosure is a grounded plane. If it is interposed between the antenna and the cell tower, it may attenuate the strength of the transmission signal. Simply turning the enclosure 90 to 180 degrees on its mounting mast may solve weak transmission issues.



**TIP:**

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

## 6.3 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.

### 6.3.1 Module communications connections

The following table shows communications options for each Campbell Scientific data logger model.

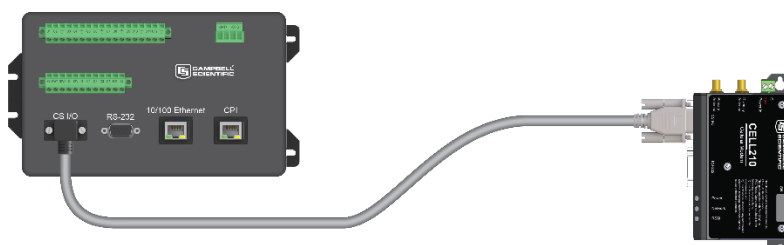
**Table 6-1: CELL200 series data logger compatibility chart**

| Data logger model | Connecting to CELL200 series via CS I/O port | Connecting to CELL200 series via RS- 232 port  |
|-------------------|--|--|
| CR300             | N/A  | RS-232 null modem cable, or C-port to RS-232 cable (PPP or serial server)                                    |
| CR310             | N/A  | RS-232 null modem cable, or C-port to RS-232 cable (PPP or serial server)                                    |
| CR6               | SC12 CS I/O cable (PPP and serial server)    | CPI/RS-232 cable, or C- or U-port to RS-232 cable, or SC105 CS I/O to RS-232 adapter                         |
| CR1000X           | SC12 CS I/O cable (PPP and serial server)    | CPI/RS-232 cable, or C-port to RS-232 cable, or SC105 CS I/O to RS-232 adapter                               |
| CR200(X)          | N/A  | RS-232 null modem cable (serial server only)   |
| CR800             | SC12 CS I/O cable (PPP and serial server)    | RS-232 null modem cable (PPP or serial server), or C-port to RS-232 cable, or SC105 CS I/O to RS-232 adapter |
| CR1000            | SC12 CS I/O cable (PPP and serial server)    | RS-232 null modem cable (PPP or serial server), or C-port to RS-232 cable, or SC105 CS I/O to RS-232 adapter |
| CR3000            | SC12 CS I/O cable (PPP and serial server)    | RS-232 null modem cable (PPP or serial server), or C-port to RS-232 cable, or SC105 CS I/O to RS-232 adapter |
| CR5000            | N/A  | RS-232 null modem cable (serial server only)   |
| CR510 and CR10X   | N/A  | SC105 CS I/O to RS-232 adapter   |

| Table 6-1: CELL200 series data logger compatibility chart |   |   |
|---|---|---|
| Data logger model   | Connecting to CELL200 series via CS I/O port                      | Connecting to CELL200 series via RS- 232 port   |
| CR510-PB and CR10X-PB                                     | SC12 CS I/O cable<br>(serial server only)<br>(SDC7 and SDC8 only) | SC105 CS I/O to RS-232 adapter  |
| CR23X   | N/A   | RS-232 null modem cable<br>(serial server only), or<br>SC105 CS I/O to RS-232 adapter |
| CR23X-PB  | SC12 CS I/O cable<br>(serial server only)<br>(SDC7 and SDC8 only) | RS-232 null modem cable<br>(serial server only), or<br>SC105 CS I/O to RS-232 adapter |

FIGURE 6-1 (p. 27), FIGURE 6-2 (p. 28), and FIGURE 6-3 (p. 28) illustrate the most common communication connections between a data logger and a CELL200 series.

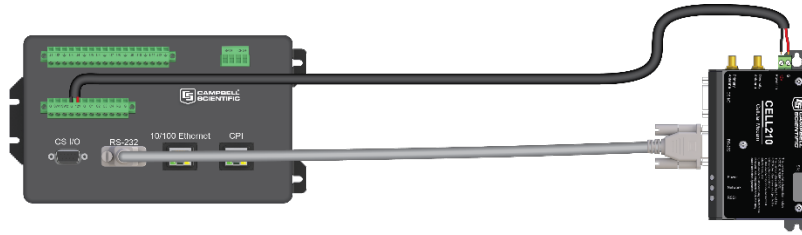
CS I/O connection using an SC12 cable



The SC12 is used to connect the module to a data logger CS I/O port.

FIGURE 6-1. CS I/O connection

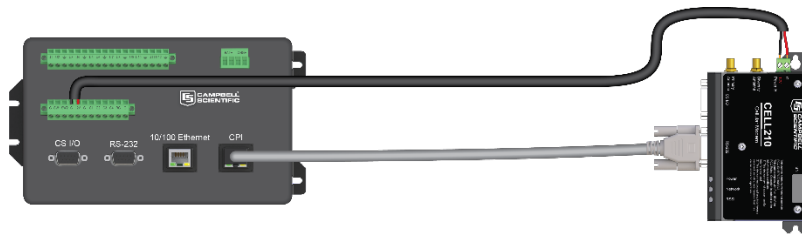
### RS-232 connection using a null modem cable



Null Modem Cable is used to connect the module to the CR3000, CR800, CR2XX, CR300 series, or CR1000 **RS-232** port. Power is provided from the **12V** or **SW12V** port of the data logger.

*FIGURE 6-2. RS-232 connection*

### CR1000X or CR6 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 CR1000X. Power is provided from the **12V** or **SW12V** port of the data logger.

*FIGURE 6-3. CR6/CR1000X RS-232 connection*

## 6.3.2 Module power connections

When connecting through the **CS I/O port**, power for the module is provided by the data logger. When connecting through the **RS-232** port, power must be supplied through the **Power In** connector.

[Controlling power to the CELL200 series](#) (p. 58) provides an example CRBasic program using the **IPNetPower()** instruction to control power to the CELL200 series. This functionality is available in the CR300 series (all operating systems), the CR6 series with operating system 09.00 or greater, and the CR1000X with operating system 03.00 or greater. To control power in these data loggers with older operating systems or any CR1000, CR800 series, or CR3000, you will need to use a **SW12V** port on the data logger and communicate over RS-232.

Alternatively, CR1000X series, CR300 series, CR6 series, CR1000, CR3000, CR800 series, CR5000, and GRANITE 6/9/10 can use terminal commands to control power. Search for "**deep sleep**" and "**wakeup**" in [Using cell modem terminal functionality](#) (p. 65). CR1000, CR800 series, and



CR3000 CRBasic programs require **PPPClose** before the **"deep sleep"** command and **PPPOpen** before the **"wakeUp"** command.

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

### 6.3.3 Antenna connections

Connect the antenna to the **Primary Antenna** SMA connector.



FIGURE 6-4. Antenna connections

Use of the **Diversity** antenna can improve performance, but is not required.

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.

## 6.4 CELL200 series and data logger configuration

### NOTE:

Instructions in this section assume that the steps in [Pre-installation](#) (p. 2) have been completed. Cellular service must be setup before web access using [www.cell.linktodevice.eu/](http://www.cell.linktodevice.eu/) is available.

Select the installation option that best suits your application. The [Overview](#) (p. 7) section describes the differences.

|  |    |
|--|----|
| 6.4.1 Integrated mode option .....           | 30 |
| 6.4.2 Non-integrated mode option .....       | 30 |
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| 6.4.4 Serial client mode option .....        | 43 |
| 6.4.5 Serial server/client mode option ..... | 49 |

### 6.4.1 Integrated mode option

[QuickStart \(integrated mode\)](#) (p. 8) describes setting up the CELL200 series in integrated mode with its default settings.

If the module is not in its default settings, the settings in the CELL200 series must match those in the data logger for integrated mode to work. This includes the **SDC Address** for CS I/O communication or the **RS-232 Baud Rate** for RS 232 communication. Once these settings match, all other configuration changes can be done in the data logger as described in [QuickStart \(integrated mode\)](#) (p. 8).

See [Non-integrated mode option](#) (p. 30) for information on changing these settings in the CELL200 series and data logger.

### 6.4.2 Non-integrated mode option

In non-integrated mode, the module mimics the behaviour of our older cellular modems. This mode should be used when doing a direct replacement of a Raven or an RV50 modem.

#### 6.4.2.1 Configure CELL200 series

1. Connect a USB cable between your module and computer.
2. Connect the **Cellular** antenna.

3. Connect the **Diversity** antenna, if used. (Not required. See [Antenna connections](#) (p. 29).)
4. Open a web browser and go to: [www.cell.linktodevice.eu/](http://www.cell.linktodevice.eu/).

**TIP:**

If your computer does not respond to the DNS server correctly, browse to 192.168.86.1.

5. On the **Settings** tab, enter the **APN** provided by your cellular provider.
6. If you will be connecting through CS I/O, select the desired **SDC Address**.
7. If you will be connecting through RS-232, select the desired **RS232 Baud Rate**.
8. (Optional) By default, the CELL200 series will accept incoming communications from any IP address. This can be a security risk. You may specify up to four IP addresses, with wild cards, to limit connections to only those trusted sources. Use an asterisk (\*) as a wild card. For example, a setting of 166.22.\*.\* would allow connections from devices that have IP addresses starting with 166.22. Both IPv4 and IPv6 addresses are supported.

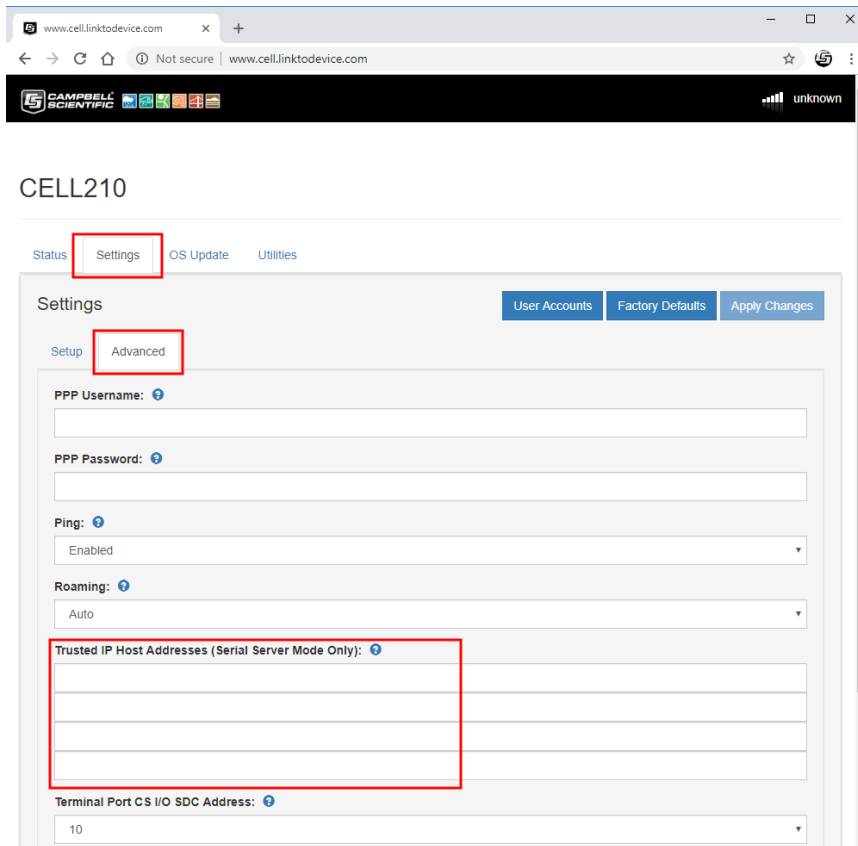
**CAUTION:**

Only set a Trusted IP address if you are familiar with their use. Consult your IT department or Campbell Scientific for assistance.

**NOTE:**

This setting does not affect outbound connections, only incoming connections.

Select **Settings** then **Advanced** tab. Enter your trusted IP addresses, one per line, in the **Trusted IP Host Addresses** box.



9. (Optional, for modules with static IP addresses.) To get remote access to the module you must first set up a **User Account**. For security purposes there is no default account. Select **Settings > User Accounts > Logon > Create a new Account**. Provide **Name**, **Password**, and select the **Permission Level**. Close then **Apply Changes**.

Once the module has an account it can be accessed remotely using its static IP address. Type the IP address into a web browser to be prompted for the user name and password.

### 6.4.2.2 Configure data logger

1. Connect to your data logger using Device Configuration Utility.
2. If using the Konect PakBus Router:
  - a. On the **Datalogger** tab, change the data logger **PakBus Address** and optional **PakBus/TCP Password** to match the values entered in the Konect PakBus Router setup.
  - b. On the **Network Services** tab in the **PakBus/TCP Client** field, enter the DNS address and Port number noted during the Konect PakBus Router setup.

3. On the **PPP** tab, set **Config/Port Used** to the CS I/O SDC address selected in the module or RS-232 depending on how you will be connected to the data logger.
4. Verify the **Modem Dial String** setting is blank.
5. (Optional) If using CS I/O communication, the throughput can be enhanced by changing the SDC Baud Rate from 115200 to 460800. On the **Advanced** tab, set the **SDC Baud Rate** to 460800. Note that if there are other devices on the **CS I/O** port, they all must be able to support this higher baud rate.

### 6.4.2.3 Set up hardware

1. Connect the **Cellular** antenna.
2. Connect your data logger to the CELL200-series module RS-232 or CS I/O port. See [Wiring and connections](#) (p. 25).
3. If not connecting through CS I/O, provide power to the CELL200 series.

### 6.4.2.4 Set up LoggerNet

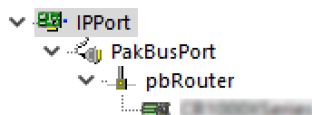
The LoggerNet Network Map is configured from the **LoggerNet Setup** screen.

**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.

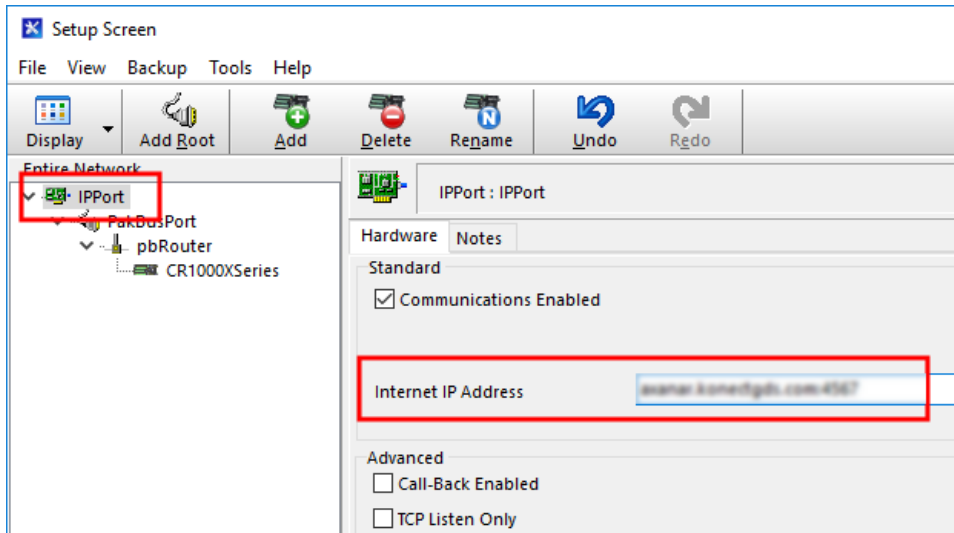
From the LoggerNet toolbar, click **Main > Setup** and configure the Network Map as described in the following steps:

1. Select **Add Root > IPPort**.
2. Select **PakBusPort** and **pbRouter** for PakBus data loggers such as the CR1000X or CR300.

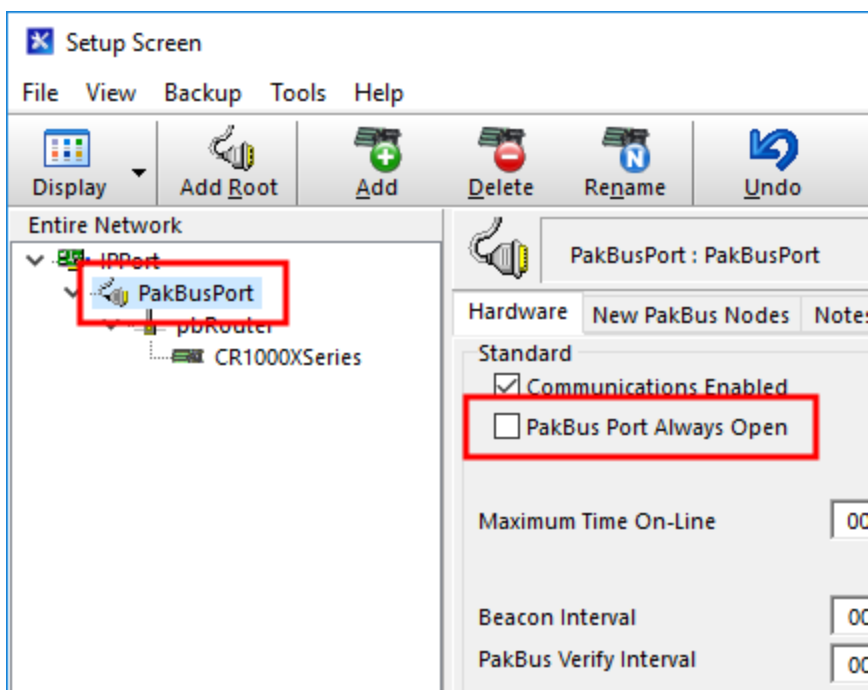


3. Add a data logger to the **pbRouter**.

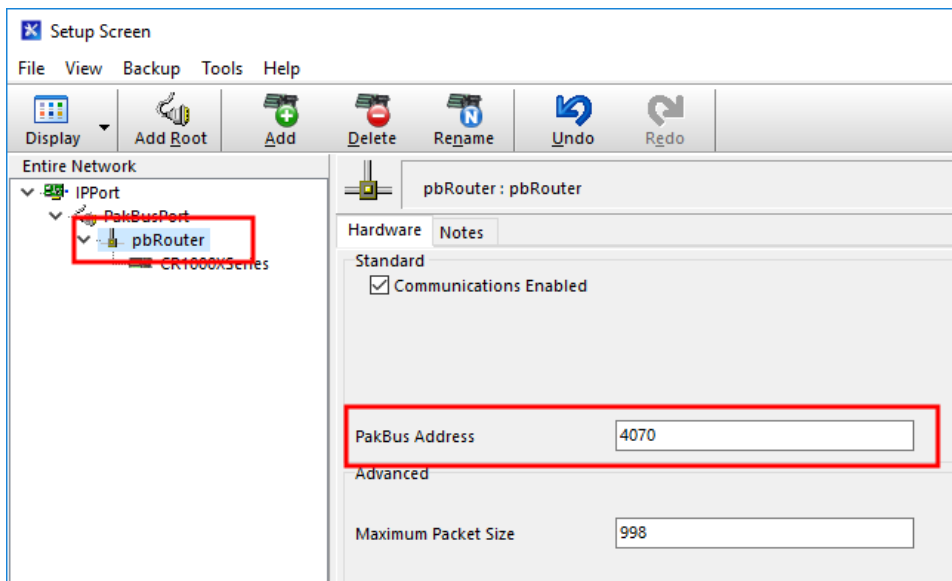
4. Select the **IPPort** in the Network Map. Enter the CELL200 series IP address (public static IP) or the Konect PakBus Router DNS address (private dynamic IP), along with the port number. The address and port number are input in the **Internet IP Address** field separated by a colon. Preceding zeros are not entered (for example, 070.218.074.247 is entered as 70.218.74.247). When not using Konect, the default port number is 6785.



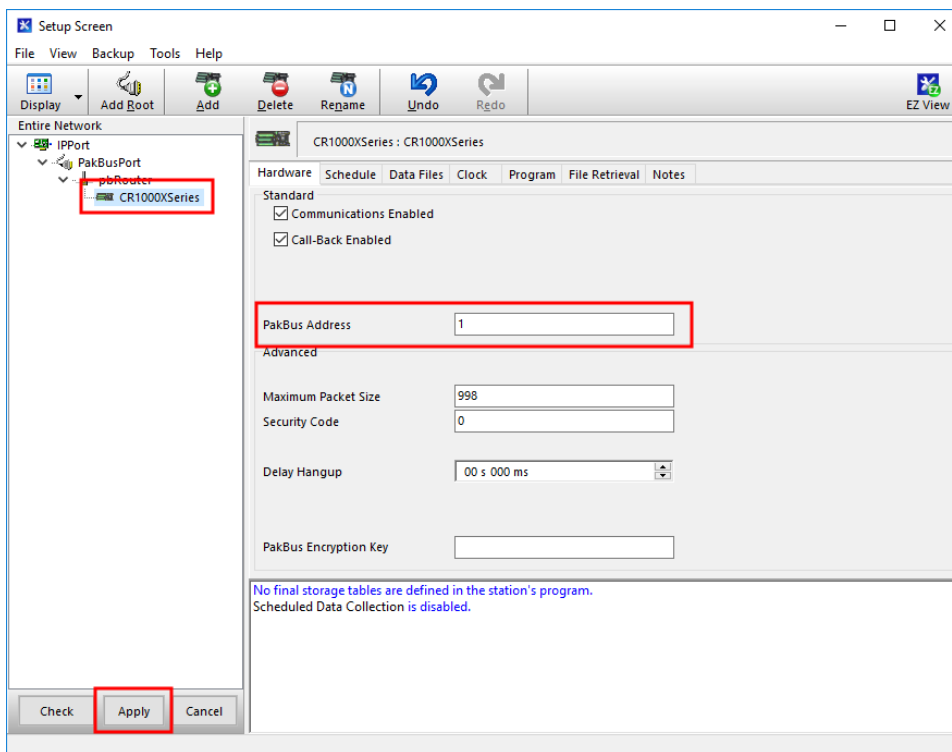
5. For PakBus data loggers, leave the default settings for the **PakBusPort**. **PakBus Port Always Open** should **not** be checked. If used, enter the **TCP Password**.



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.



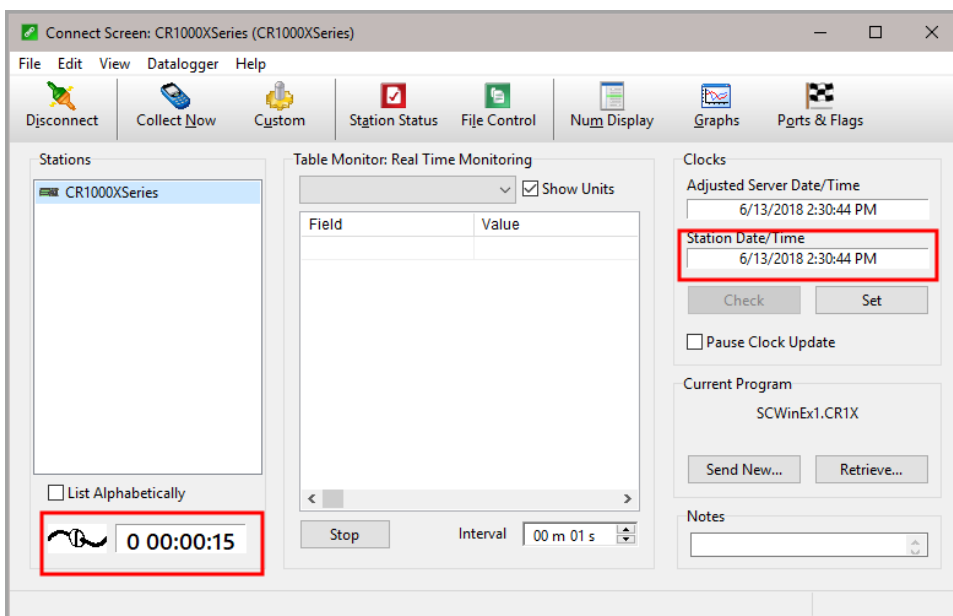
### 6.4.2.5 Test the connection

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 fifteen minutes. Be patient.

If the call 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.



### 6.4.3 Serial server mode option

In serial server mode, the module receives IP communications over the cellular network and converts those to serial communications to pass on to the data logger. From the perspective of the data logger, this is no different than a serial cable connecting it to a computer.

This is the mode used with CR200-Series and Edlog (CR23X, CR10X, and CR510) data loggers, and cellular-to-RF networks. Only one IP connection at a time is supported.

#### 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.



**NOTE:**

Instructions in this section assume that you have established cellular service and the SIM card has been installed as described in [QuickStart \(integrated mode\)](#) (p. 8).

### 6.4.3.1 Configure CELL200 series

To set up the CELL200 series in serial server mode:

1. Connect a USB cable between your module and computer.
2. Connect the **Cellular** antenna.
3. Connect the **Diversity** antenna, if used. (Not required. See [Antenna connections](#) (p. 29).)
4. Open a web browser and go to: [www.cell.linktodevice.eu/](http://www.cell.linktodevice.eu/).

**TIP:**

If your computer does not respond to the DNS server correctly, browse to 192.168.86.1.

5. On the **Settings** tab, enter the **APN** provided by your cellular provider.
6. Set **Mode** to **Serial Server**.
7. Set **Serial Server Listen Port Number**. (Default is 3001. This is entered along with the IP address as part of the LoggerNet configuration.)

8. (Optional) In this mode, an **Automated Power Schedule** can be setup to save on battery life or on cellular charges. Go to the **Settings** then **Serial Mode Setup** tab. Enter a **Start (power-on) Time**, **On Duration**, and **Repeat Cycle**.

The screenshot shows a web browser window with the address bar displaying 'CELL205' and 'www.cell.linktodevice.com'. The page title is 'CELL205'. Below the title, there are tabs for 'Status', 'Settings', 'OS Update', and 'Utilities'. The 'Settings' tab is selected and highlighted with a red box. Under the 'Settings' tab, there are three sub-tabs: 'General', 'Serial Mode Setup', and 'Advanced'. The 'Serial Mode Setup' tab is selected and highlighted with a red box. In the 'Serial Mode Setup' section, the 'Server (Listening) Port Number' is set to '3001'. Below this, the 'Automated Power Schedule' section is highlighted with a red box. It contains three fields: 'Start (power-on) Time' set to '22:00', 'On duration' set to '10 Minutes', and 'Repeat cycle' set to 'Every Hour'. Below the 'Automated Power Schedule' section, there is a 'Trusted IP Host' section with a label 'Addresses:' and two empty input fields.

For example: With the following settings of **Start (power-on) Time** of 22:00, **On Duration** of 10 minutes, and **Repeat Cycle** of Every Hour the cellular module will turn on for ten minutes only twice each day. It will turn on at 10:00 pm and 11:00 pm. It will not turn on at midnight since it is powered off at the start of the next day.

9. (Optional) By default, the CELL200 series will accept incoming communications from any IP address. This can be a security risk. You may specify up to four IP addresses, with wild cards, to limit connections to only those trusted sources. Use an asterisk (\*) as a wild card. For example, a setting of 166.22.\*.\* would allow connections from devices that have IP addresses starting with 166.22. Both IPv4 and IPv6 addresses are supported.

**CAUTION:**

Only set a Trusted IP address if you are familiar with their use. Consult your IT department or Campbell Scientific for assistance.

**NOTE:**

This setting does not affect outbound connections, only incoming connections.

Go to the **Settings** then **Advanced** tab. Enter your trusted IP addresses, one per line, in the **Trusted IP Host Addresses** box.

The screenshot shows a web browser window at [www.cell.linktodevice.com](http://www.cell.linktodevice.com). The page title is "CELL210". Below the title, there are tabs: "Status", "Settings" (highlighted with a red box), "OS Update", and "Utilities". Under the "Settings" tab, there are sub-tabs: "Setup" and "Advanced" (highlighted with a red box). The "Advanced" tab contains several settings: "PPP Username:" (text input), "PPP Password:" (password input), "Ping:" (dropdown menu set to "Enabled"), "Roaming:" (dropdown menu set to "Auto"), "Trusted IP Host Addresses (Serial Server Mode Only):" (a text area with four lines, highlighted with a red box), and "Terminal Port CS I/O SDC Address:" (dropdown menu set to "10"). At the top right of the settings area, there are buttons for "User Accounts", "Factory Defaults", and "Apply Changes".

10. (Optional, for modules with static IP addresses.) To get remote access to the module you must first set up a **User Account**. For security purposes there is no default account. Select **Settings > User Accounts > Login > Create a new Account**. Provide **Name**, **Password**, and select the **Permission Level**. Close then **Apply Changes**.

Once the module has an account it can be accessed remotely using its static IP address. Type the IP address into a web browser to be prompted for the user name and password.

### 6.4.3.2 Configure data logger

1. Connect to your data logger by using Device Configuration Utility.
2. On the **PPP** tab, set **Config/Port Used** to **Inactive**.
3. When using RS-232 serial server mode, it is recommended that you use a fixed baud rate on the data logger RS-232 port. On the **Com Ports Settings** tab, select the RS-232 port and set the **Baud Rate** to the fixed option to match the RS 232 baud rate set in the CELL200-series module.
4. If using CS I/O communication, the throughput can be enhanced by changing the SDC Baud Rate from 115200 to 460800. On the **Advanced** tab, set the **SDC Baud Rate** to 460800. Note that if there are other devices on the **CS I/O** port, they all must be able to support this higher baud rate.

### 6.4.3.3 Set up hardware

1. Connect the **Cellular** antenna.
2. Connect your data logger to the CELL200-series module RS-232 or CS I/O port. See [Wiring and connections](#) (p. 25).
3. If not connecting through CS I/O, provide power to the CELL200 series.

### 6.4.3.4 Set up LoggerNet

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

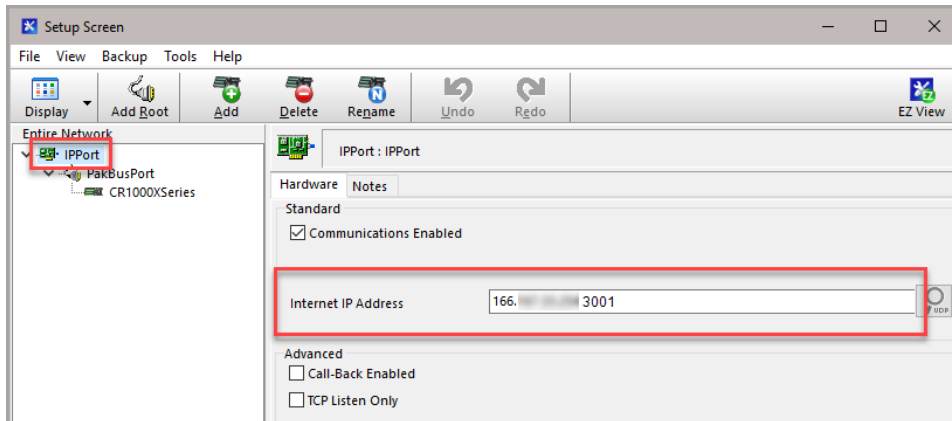
#### NOTE:

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

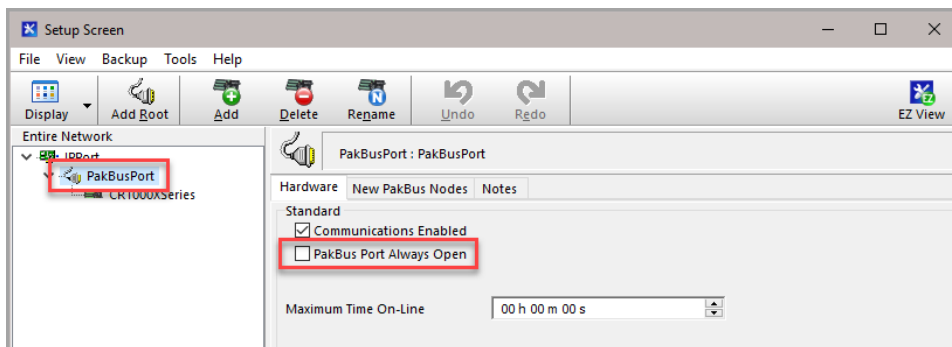
From the LoggerNet toolbar, click **Main > Setup** and configure the Network Map as described in the following steps:

1. Select **Add Root > IPPort**.
2. Add a data logger to the **IPPort**.

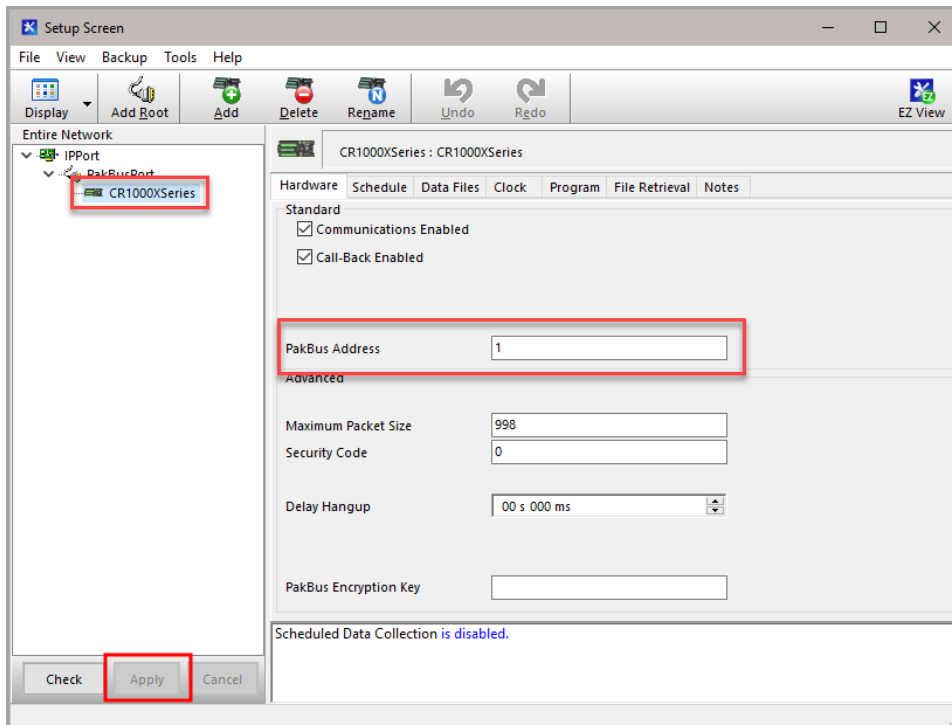
3. Select the **IPPort** in the Network Map. Enter the CELL200 series IP address (public static IP) or the Konect PakBus Router DNS address (private dynamic IP), along with the port number. The address and port number are input in the **Internet IP Address** field separated by a colon. Preceding zeros are not entered (for example, 070.218.074.247 is entered as 70.218.74.247). For serial server mode, the default port number is 3001.



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



5. 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). Click **Apply** to save the changes.



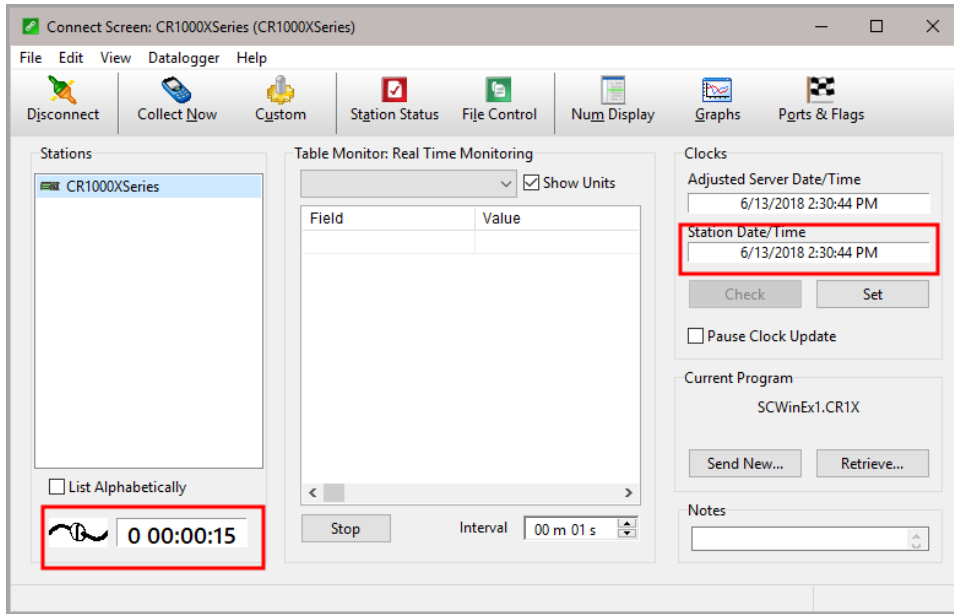
#### 6.4.3.5 Test the connection

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:

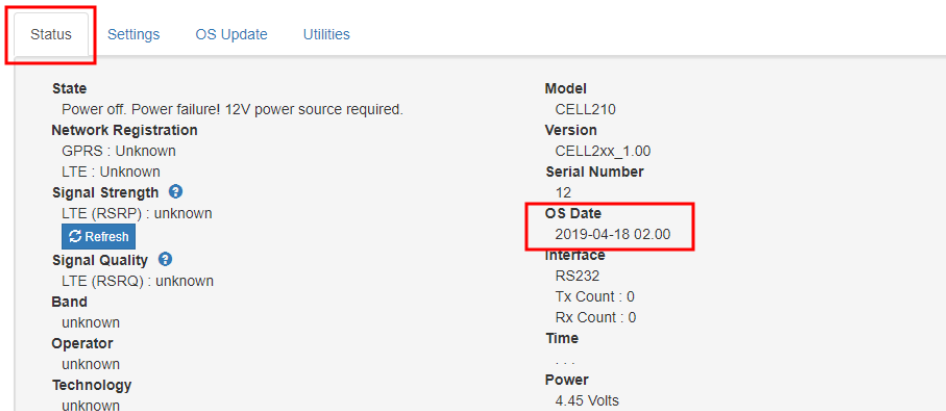
The connection time is subject to many external factors. It is often less than 30 seconds but could be up to fifteen minutes. Be patient.

If the call 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.



## 6.4.4 Serial client mode option

This mode requires CELL200 series operating system 2.00 or newer. Find the CELL200 series OS version in the **OS Date** field of the **Status** Tab. For more information, see [Updating the operating system and firmware](#) (p. 80).



In serial client mode the module will connect to the cellular network and initiate a TCP client socket connection. When data is sent to the active port (RS-232 or CS I/O) it will be sent out on the TCP client connection. When data is received on the TCP client socket connection it is passed to the active port (RS-232 or CS I/O).

Use this mode when the module is behind a cellular provider firewall and it has a private dynamic IP address. This mode requires the receiving TCP/IP connection be on a public static IP address, on the same private cellular network, DNS name or there be a hole in the firewall.

**NOTE:**

Instructions in this section assume that you have established cellular service and the SIM card has been installed as described in [QuickStart \(integrated mode\)](#) (p. 8).

### 6.4.4.1 Configure CELL200 series

To set up the CELL200 series in serial server mode:

1. Connect a USB cable between your module and computer.
2. Connect the **Cellular** antenna.
3. Connect the **Diversity** antenna, if used. (Not required. See [Antenna connections](#) (p. 29).)
4. Open a web browser and go to: [www.cell.linktodevice.eu/](http://www.cell.linktodevice.eu/).

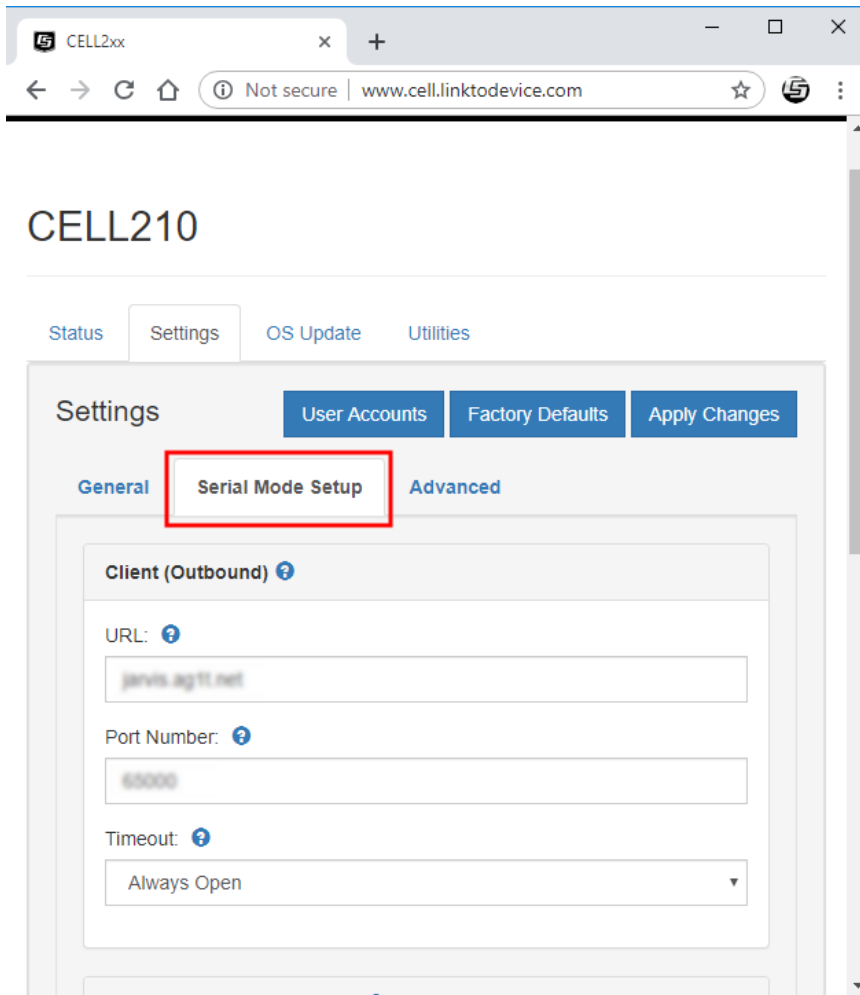
**TIP:**

If your computer does not respond to the DNS server correctly, browse to 192.168.86.1.

5. On the **Settings** tab, enter the **APN** provided by your cellular provider.
6. On the **General** tab, set **Mode** to **Serial Client**.



7. Select the **Serial Mode Setup** tab.



8. Enter the **URL** and **Port Number** of the server/device that the module will connect to.
9. (Optional) Select **Always Open** for the **Timeout**.

10. (Optional) In this mode, an **Automated Power Schedule** can be setup to save on battery life or on cellular charges. Go to the **Settings** then **Serial Mode Setup** tab. Enter a **Start (power-on) Time**, **On Duration**, and **Repeat Cycle**.

The screenshot shows the CELL205 web interface in a browser. The 'Settings' tab is selected and highlighted with a red box. Within the 'Settings' section, the 'Serial Mode Setup' sub-tab is also highlighted with a red box. The 'Automated Power Schedule' section is outlined with a red rectangle. It contains three dropdown menus: 'Start (power-on) Time' set to 22:00, 'On duration' set to 10 Minutes, and 'Repeat cycle' set to Every Hour. The 'Server (Listening) Port Number' is set to 3001. Below this, the 'Trusted IP Host' section is visible with an 'Addresses' field.

For example: With the following settings of **Start (power-on) Time** of 22:00, **On Duration** of 10 minutes, and **Repeat Cycle** of Every Hour the cellular module will turn on for ten minutes only twice each day. It will turn on at 10:00 pm and 11:00 pm. It will not turn on at midnight since it is powered off at the start of the next day.

#### 6.4.4.2 Configure data logger (optional)

**SendVariables()** is used to initiate a data logger call-back attempt to a computer running LoggerNet. It has the following syntax:

**SendVariables** (ResultCode, ComPort, NeighborAddr, PakBusAddr, Security, TimeOut, "TableName", "FieldName", Variable, Swath )

The **ComPort** needs to be set to **ComRS232** or **ComSDC8** depending on how you have the module connected to the data logger. Set the **TableName** to "Public" and the **FieldName**

to **"Callback"**. The remaining parameters in the instruction are ignored. The resulting instruction will look similar to:

```
SendVariables (SendResult, COMRS232, 0, 4094, 0000, 0, "Public", "Callback",  
Scratch, 1)
```

After LoggerNet receives the variable **"Callback"** it will begin collecting data from the data logger and store it to a file based on the data collection settings in the Setup window. See the CRBasic help for more information.

### 6.4.4.3 Set up hardware

1. Connect the **Cellular** antenna.
2. Connect your data logger to the CELL200-series module RS-232 or CS I/O port. See [Wiring and connections](#) (p. 25).
3. If not connecting through CS I/O, provide power to the CELL200 series.

### 6.4.4.4 Set up LoggerNet

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

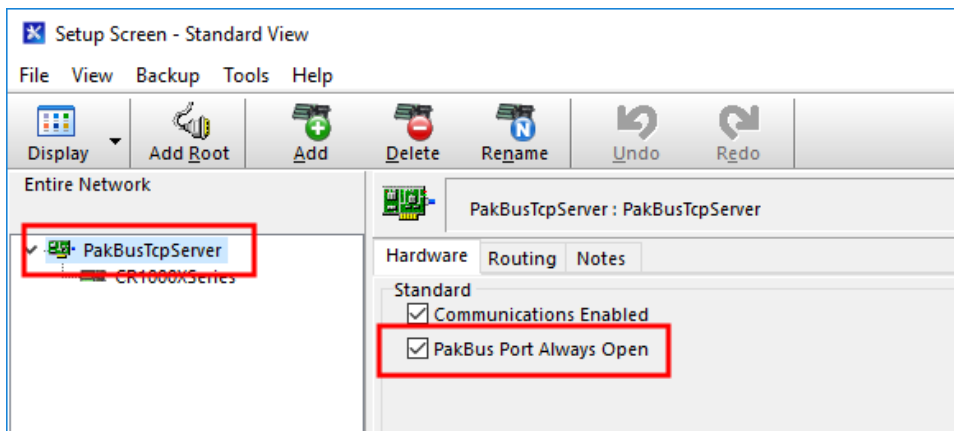
**NOTE:**

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

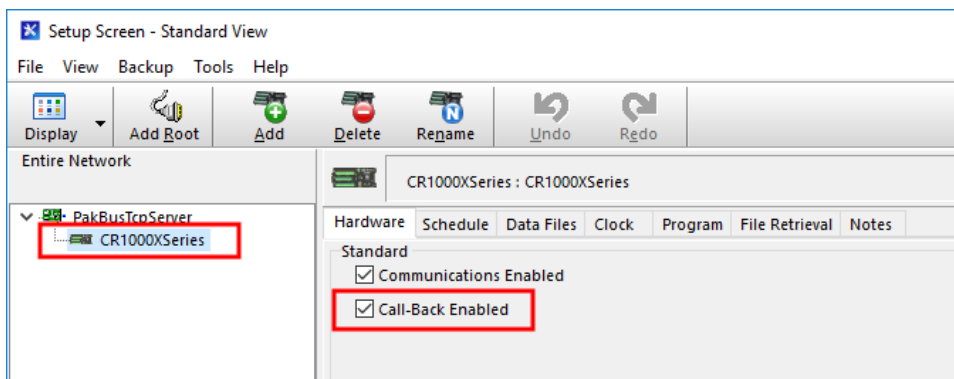
From the LoggerNet toolbar, click **Main > Setup** and configure the Network Map as described in the following steps:

1. Select **Add Root > PakBusTcpServer**.
2. Add a data logger to the **PakBusTcpServer**.

3. Select the **PakBusTcpServer** in the Network Map. Select **PakBus Port Always Open**; the box should have a check.



4. Select the data logger in the Network Map. Select **Call-Back Enabled**; the box should have a check.



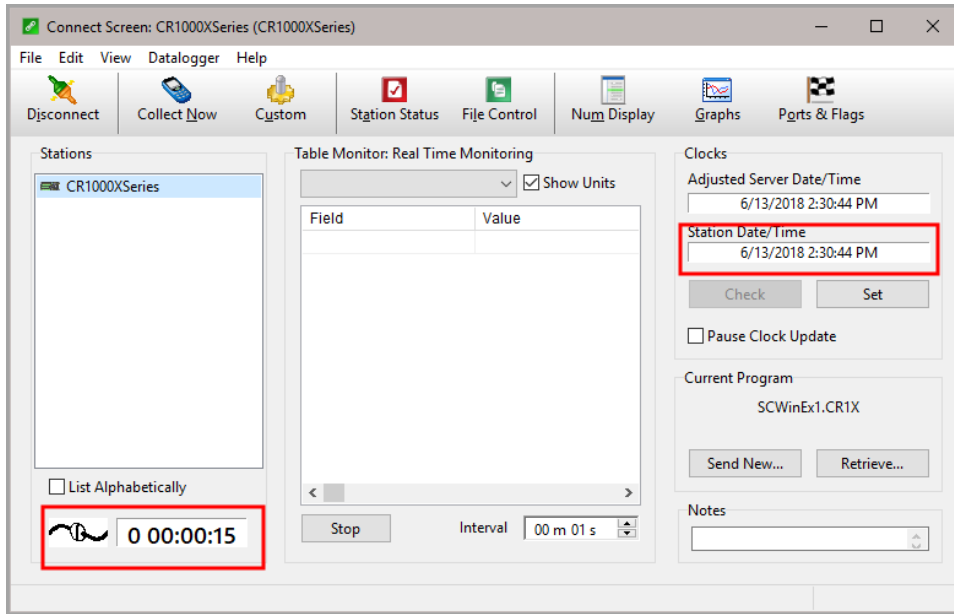
#### 6.4.4.5 Test the connection

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:

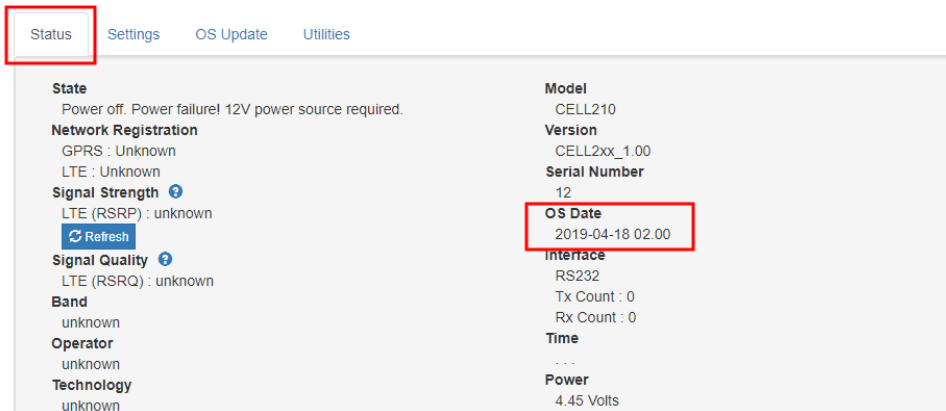
The connection time is subject to many external factors. It is often less than 30 seconds but could be up to fifteen minutes. Be patient.

If the call 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.



## 6.4.5 Serial server/client mode option

This mode requires CELL200 series operating system 2.00 or newer. Find the CELL200 series OS version in the **OS Date** field of the **Status** Tab. For more information, see [Updating the operating system and firmware](#) (p. 80).



In serial server/client mode the module connects to the cellular network and opens a listening port. When a client connects to the listening port, the CELL200 series will be in "**serial server**" mode. In serial server mode, all data on the active port (RS-232 or CS I/O) will be routed through the listening port. When no client is connected to the listening port, the CELL200 series will be in "**serial client**" mode and all data on the active port will be sent and received through the initiated TCP client socket connection.

The incoming connection, or serial server mode, takes precedence. An outbound, or client, connection will be interrupted if a connection is made on the incoming, or server, listening port.

**NOTE:**

Instructions in this section assume that you have established cellular service and the SIM card has been installed as described in [QuickStart \(integrated mode\)](#) (p. 8).

### 6.4.5.1 Configure CELL200 series

To set up the CELL200 series in serial server mode:

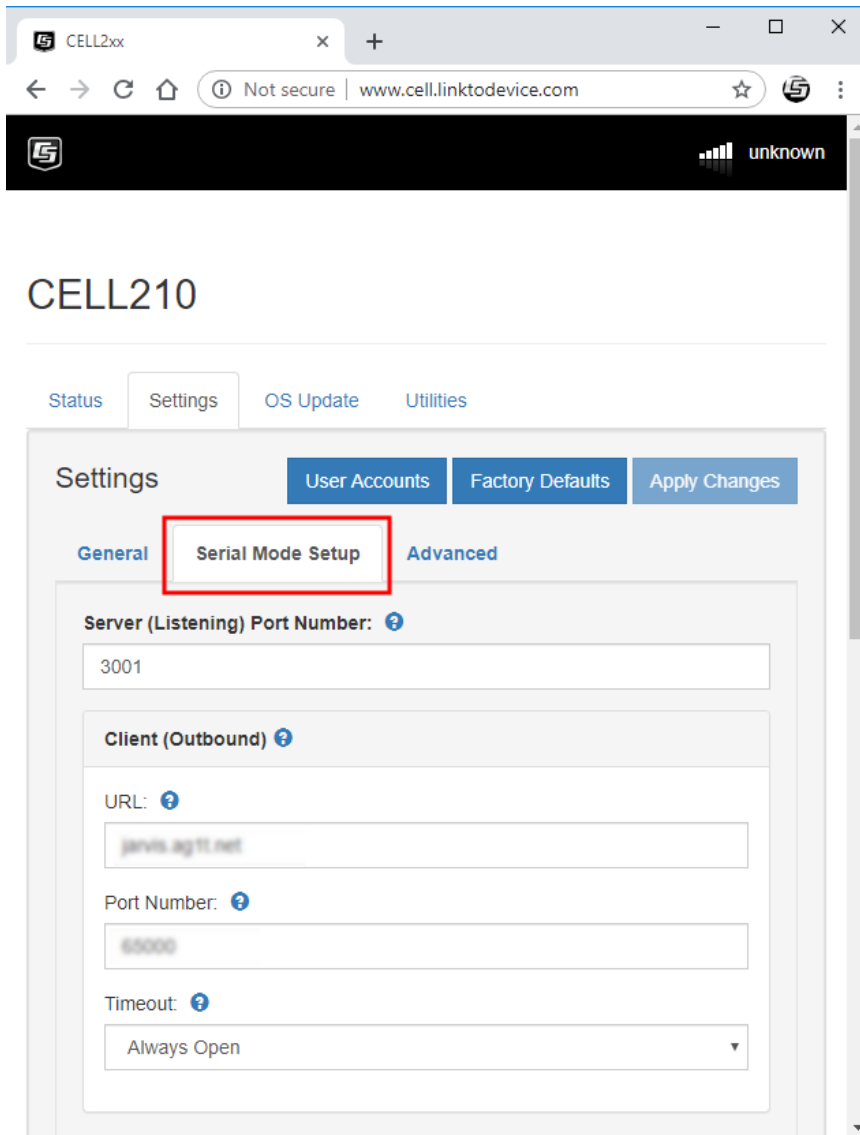
1. Connect a USB cable between your module and computer.
2. Connect the **Cellular** antenna.
3. Connect the **Diversity** antenna, if used. (Not required. See [Antenna connections](#) (p. 29).)
4. Open a web browser and go to: [www.cell.linktodevice.eu/](http://www.cell.linktodevice.eu/).

**TIP:**

If your computer does not respond to the DNS server correctly, browse to 192.168.86.1.

5. On the **Settings** tab, enter the **APN** provided by your cellular provider.
6. On the **General** tab, set **Mode** to **Serial Server/Client**.

7. Select the **Serial Mode Setup** tab.



8. Set **Server (Listening) Port Number**. (Default is 3001. This is entered along with the IP address as part of the LoggerNet configuration.)
9. Enter the **URL** and **Port Number** that the module will connect with.
10. (Optional) Select **Always Open** for the **Timeout**.

11. (Optional) In this mode, an **Automated Power Schedule** can be setup to save on battery life or on cellular charges. Go to the **Settings** then **Serial Mode Setup** tab. Enter a **Start (power-on) Time**, **On Duration**, and **Repeat Cycle**.

The screenshot shows a web browser window with the address bar displaying 'www.cell.linktodevice.com'. The page title is 'CELL205'. Below the title, there are tabs for 'Status', 'Settings', 'OS Update', and 'Utilities'. The 'Settings' tab is selected and highlighted with a red box. Under the 'Settings' tab, there are sub-tabs: 'General', 'Serial Mode Setup', and 'Advanced'. The 'Serial Mode Setup' tab is selected and highlighted with a red box. In the 'Serial Mode Setup' section, the 'Server (Listening) Port Number' is set to '3001'. Below this, the 'Automated Power Schedule' section is highlighted with a red box. It contains three fields: 'Start (power-on) Time' set to '22:00', 'On duration' set to '10 Minutes', and 'Repeat cycle' set to 'Every Hour'. Below the 'Automated Power Schedule' section, there is a 'Trusted IP Host' section with a label 'Addresses:' and two empty input fields.

For example: With the following settings of **Start (power-on) Time** of 22:00, **On Duration** of 10 minutes, and **Repeat Cycle** of Every Hour the cellular module will turn on for ten minutes only twice each day. It will turn on at 10:00 pm and 11:00 pm. It will not turn on at midnight since it is powered off at the start of the next day.



- (Optional) By default, the CELL200 series will accept incoming communications from any IP address. This can be a security risk. You may specify up to four IP addresses, with wild cards, to limit connections to only those trusted sources. Use an asterisk (\*) as a wild card. For example, a setting of 166.22.\*.\* would allow connections from devices that have IP addresses starting with 166.22. Both IPv4 and IPv6 addresses are supported.

**CAUTION:**

Only set a Trusted IP address if you are familiar with their use. Consult your IT department or Campbell Scientific for assistance.

**NOTE:**

This setting does not affect outbound connections, only incoming connections.

Go to the **Settings** then **Advanced** tab. Enter your trusted IP addresses, one per line, in the **Trusted IP Host Addresses** box.

The screenshot shows a web browser window with the URL [www.cell.linktodevice.com](http://www.cell.linktodevice.com). The page title is "CELL210". The navigation bar includes "Status", "Settings" (highlighted with a red box), "OS Update", and "Utilities". The "Settings" section has tabs for "Setup" and "Advanced" (highlighted with a red box). The "Advanced" tab contains several configuration fields: "PPP Username:", "PPP Password:", "Ping:" (set to "Enabled"), "Roaming:" (set to "Auto"), "Trusted IP Host Addresses (Serial Server Mode Only):" (a text area with four empty lines, highlighted with a red box), and "Terminal Port CS I/O SDC Address:" (set to "10"). Buttons for "User Accounts", "Factory Defaults", and "Apply Changes" are located at the top right of the settings area.

### 6.4.5.2 Configure data logger

1. Connect to your data logger by using Device Configuration Utility.
2. On the **PPP** tab, set **Config/Port Used** to **Inactive**.

3. When using RS-232 serial server mode, it is recommended that you use a fixed baud rate on the data logger RS-232 port. On the **Com Ports Settings** tab, select the RS-232 port and set the **Baud Rate** to the fixed option to match the RS 232 baud rate set in the CELL200-series module.
4. If using CS I/O communication, the throughput can be enhanced by changing the SDC Baud Rate from 115200 to 460800. On the **Advanced** tab, set the **SDC Baud Rate** to 460800. Note that if there are other devices on the **CS I/O** port, they all must be able to support this higher baud rate.

### 6.4.5.3 Set up hardware

1. Connect the **Cellular** antenna.
2. Connect your data logger to the CELL200-series module RS-232 or CS I/O port. See [Wiring and connections](#) (p. 25).
3. If not connecting through CS I/O, provide power to the CELL200 series.

### 6.4.5.4 Set up LoggerNet

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

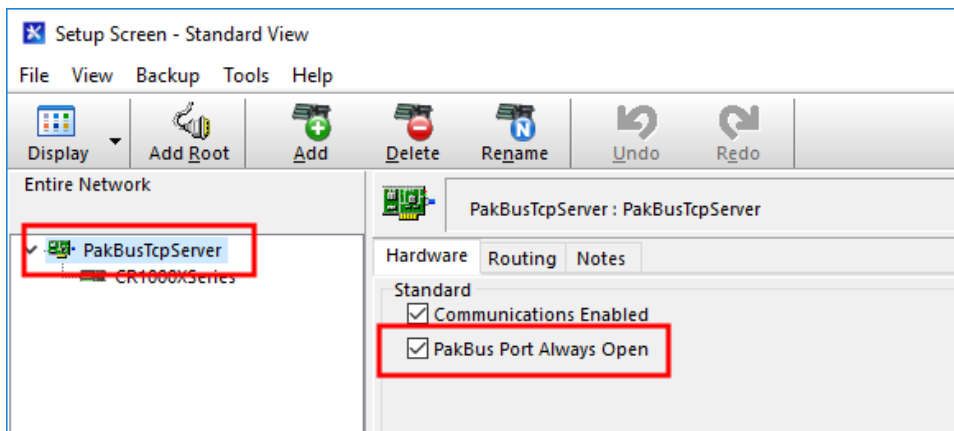
**NOTE:**

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

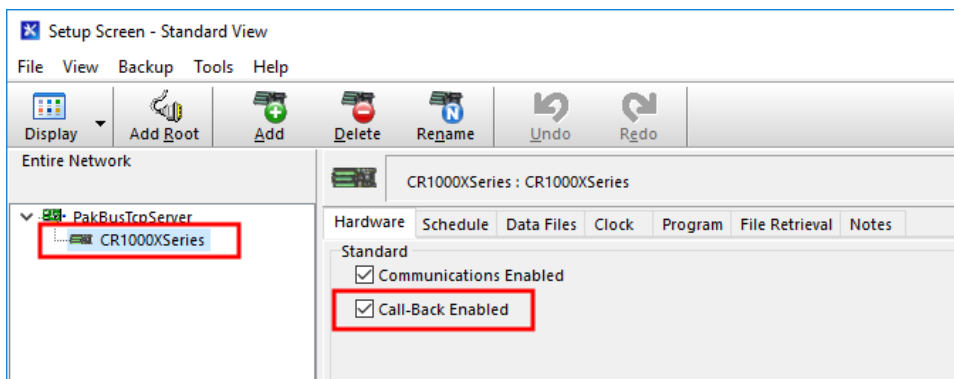
From the LoggerNet toolbar, click **Main > Setup** and configure the Network Map as described in the following steps:

1. Select **Add Root > PakBusTcpServer**.
2. Add a data logger to the **PakBusTcpServer**.

3. Select the **PakBusTcpServer** in the Network Map. Select **PakBus Port Always Open**; the box should have a check.



4. Select the data logger in the Network Map. Select **Call-Back Enabled**; the box should have a check.



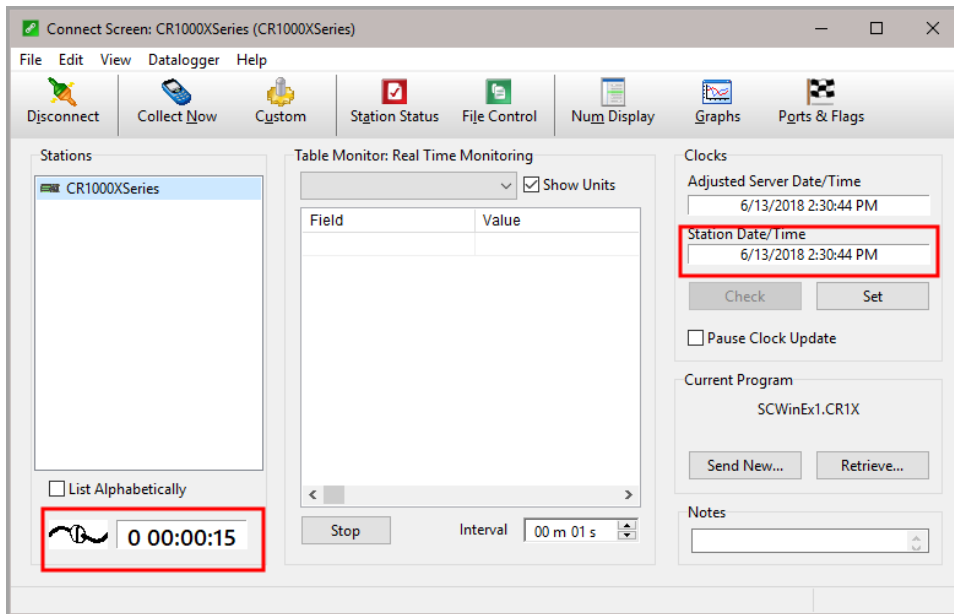
#### 6.4.5.5 Test the connection

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 fifteen minutes. Be patient.

If the call 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.



## 7. Operation and maintenance

### 7.1 Ports

The **CS I/O** port is the main port used with Campbell Scientific data loggers. Its function is described throughout this manual.

The **RS-232** port can also be used with Campbell Scientific data loggers through a null modem cable (or CPI/RS-232 RJ45 to DB9 cable for the CR1000X and CR6 series).

The **USB** port is used to check the module status, configure the module, send a new operating system, or watch low-level communications. This is done by opening a web browser and using the following URL: [www.cell.linktodevice.eu/](http://www.cell.linktodevice.eu/).

#### TIP:

If your computer does not have access to a DNS server, browse to 192.168.86.1.

## 7.2 LED indicator lights

When your CELL200-series module is connected to power and an antenna, there is a specific pattern to the lights to indicate its operation mode as described in [LED Indicator Lights](#) (p. 57).

| Table 7-1: LED Indicator Lights |  |  |  |
|---------------------------------|--|--|--|
|                                 | Green  | Blue   | Red  |
| Network                         | Flashes every 8 seconds when authenticated with cellular network | Flashes with traffic to/from internal cell modem         | Flashes every 8 seconds when issue with network/settings           |
| Signal                          | Flashes every 8 seconds to indicate good signal strength         | Flashes every 8 seconds to indicate fair signal strength | Flashes every 8 seconds to indicate marginal or no signal strength |
| Power/Traffic                   | Flashes every 8 seconds to indicate all is good in network       | Flashes with traffic on RS-232 or CS I/O                 | Used to let user know it is in low power state (only LED flashing) |



# Appendix A. Controlling power to the CELL200 series

---

This example shows how to control power to the CELL200 series by using the CRBasic `IPNetPower()` instruction. The program uses the `TimeIsBetween()` instruction to power the CELL200 series for 15 minutes every 60 minutes between 9:00 a.m. and 5:00 p.m.

## NOTE:

The `IPNetPower()` functionality shown in this example is available in the CR300 series with operating system 08.00 or greater, the CR6 series with operating system 09.00 or greater, and the CR1000X with operating system 03.00 or greater. To control power in these data loggers with older operating systems or any CR1000, CR800 series, or CR3000, you will need to use a **SW12V** port on the data logger and communicate over RS-232. When using a **SW12V** port, we recommend using a `PPPClose()` instruction to shut down the network prior to powering down the CELL200 series.

## 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.

### CRBasic Example 1: Turn CELL200 series ON and OFF under data logger control

```
'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
```

## CRBasic Example 1: Turn CELL200 series ON and OFF under data logger control

```
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 CELL200 series
  'on for 15 minutes at the start of every hour
  If TimeIsBetween(9,17,24,Hr) AND TimeIsBetween(0,15,60,Min) Then
    ModuleState=True
  Else
    ModuleState=False
  EndIf
  'Always turn OFF CELL200 series if battery drops below 11.5 volts
  If BattV<11.5 Then ModuleState=False
  'Set CELL200 series power to the state of 'ModuleState' variable
  IPNETPower(5,ModuleState)
  'Call Data Tables and Store Data
  CallTable Daily
NextScan
EndProg
```



# Appendix B. Configuring settings and retrieving status information with the CRBasic program

---

## B.1 Using the SetSetting() instruction

**NOTE:**

This functionality is available in the CR1000X, CR300-series, and CR6 dataloggers only.

This example shows how to set up the cellular module using the `SetSetting()` instruction. It also illustrates how to retrieve status information from the module in the CRBasic program. This program can be downloaded from

<https://s.campbellsci.eu/documents/eu/miscellaneous/CELL2XX-SetSettings.dld>.

### CRBasic Example 2: Settings configuration and status retrieval

*'CR300 Series*

```
Public battery_voltage
Public panel_temperature_c

'cell modem diagnostic information
Public cell_todays_usage      : Units cell_todays_usage = KB
Public cell_yesterdays_usage : Units cell_yesterdays_usage = KB
Public cell_this_months_usage : Units cell_this_months_usage = KB
Public cell_last_months_usage : Units cell_last_months_usage = KB
Public cell_rssi As Long      : Units cell_rssi = DB
Public cell_info As String * 400
Public cell_ip_address As String * 40
Public cell_rsrp As Long
Public cell_rsrq
Public cell_ecio
Public cell_status As String * 300
Public cell_state As String * 100
```

## CRBasic Example 2: Settings configuration and status retrieval

```
DataTable(CELL_DIAGNOSTICS, True, -1)
  Sample(1, cell_todays_usage, FP2) 'or
  Sample(1, Settings.CellUsageToday, FP2)
  Sample(1, cell_yesterdays_usage, FP2) 'or
  Sample(1, Settings.CellUsageYesterday, FP2)
  Sample(1, cell_this_months_usage, FP2) 'or
  Sample(1, Settings.CellUsageMonth, FP2)
  Sample(1, cell_last_months_usage, FP2) 'or
  Sample(1, Settings.CellUsageLastMonth, FP2)
  Sample(1, cell_rssi, IEEE4) 'or
  Sample(1, Settings.CellRSSI, IEEE4)
  Sample(1, cell_info, String) 'or
  Sample(1, Settings.CellInfo, String)
  Sample(1, cell_ip_address, String)
  Sample(1, cell_rsrp, IEEE4) 'or
  Sample(1, Settings.CellRSRP, IEEE4)
  Sample(1, cell_rsrq, FP2) 'or
  Sample(1, Settings.CellRSRQ, FP2)
  Sample(1, cell_ecio, FP2) 'or
  Sample(1, Settings.CellECIO, FP2)
  Sample(1, cell_status, String) 'or
  Sample(1, Settings.CellStatus, String)
  Sample(1, cell_state, String) 'or
  Sample(1, Settings.CellState, String)
EndTable

DataTable(TEST_DATA, True, -1)
  DataInterval(0, 5, Min, 10)
  Minimum(1, battery_voltage, FP2, True, False)
  Sample(1, panel_temperature_c, FP2)
EndTable

'Main Program
BeginProg
  'set up attached cell2xx module via CRBasic programming.
  SetSetting("CellEnabled", True)
  'Cell modem is enabled, True = enabled, False = disabled
  SetSetting("CellAPN", "*****.*****")
  'Replace *s with APN assigned by cellular provider
  SetSetting("CellPwrStartTime", 1440)
  'Automated start-up schedule. Setting is in minutes (into day).
  '1440 = Always on. 15 = 00:15 hours, 180 = 03:00 hours, 1380 = 23:00 hours
  SetSetting("CellPwrDuration", 0)
  'How long the modem is to stay online after it hits it Start Time.
  'Setting is ignored if CellPwrStartTime is set to 1440
  SetSetting("CellPwrRepeat", 0)
```

## CRBasic Example 2: Settings configuration and status retrieval

```
'Specifies the interval (in minutes) after the
'first time of the day that the data logger
'powers on its cellular interface, that the
'data logger will power its cellular interface at
'subsequent times throughout the day. 0 = disabled.
SetSetting("CellBillingDay", 15)
'Tells the modem what day of the month to roll
'over its stats counters. Used to align it with
'my cellular provider's billing dates.
SetSetting("CellDiversity", 1)
'Turns on the use of the cell modules diversity
'antenna in the cellular module. 0 = OFF. 1 = ON.

cell_ip_address = PPPOpen() 'Just make sure we are ready to go!

Scan (1,Sec,0,0)
  PanelTemp (panel_temperature_c,60)
  Battery (battery_voltage)
  CallTable TEST_DATA
NextScan

SlowSequence
  Scan (10, Min, 0, 0)
  cell_rssi = Settings.CellRSSI
  'read RSSI (signal strength) from tower connected to
  cell_todays_usage = Settings.CellUsageToday 'usage reported in KB
  cell_yesterdays_usage = Settings.CellUsageYesterday 'usage reported in KB
  cell_this_months_usage = Settings.CellUsageMonth 'usage reported in KB
  cell_last_months_usage = Settings.CellUsageLastMonth 'usage reported in KB
  cell_info = Settings.CellInfo
  'Cell Info. Same information that shows in the
  'DevConfig Cellular Network Status field
  cell_status = Settings.CellStatus
  'Status of the cellular modem.
  cell_state = Settings.CellState
  'State that the modem is in. "Network ready." lets me
  'know my modem is good to go.
  'CellState can be the following (but not limited to):
  "Power off.",
  "Powering up.",
  "Powered up.",
  "SIM authorized.",
  "Setting baud rate.",
  "Waiting for baud rate.",
  "Baud rate set.",
  "Baud rate failure.",
  "Power off. Waiting for retry.",
```

## CRBasic Example 2: Settings configuration and status retrieval

```
"Powered up. SIM auth failure.",
"Querying modem.",
"Waiting for network registration.",
"Configuring modem.",
"Dialing.",
"Dialing (retry).",
"Dialed.",
"PPP negotiation.",
"Network ready.",
"PPP closing.",
"PPP paused.",
"PPP dropped.",
"Terminal AT command mode.",
"Firmware update mode.",
"Shutting down."
cell_rsrp = Settings.CellRSRP
'Reference signal received power for LTE in dbm.
'Very similar to RSSI
cell_ecio = Settings.CellECIO 'Reference signal received quality for 3G.
cell_rsrq = Settings.CellRSRQ 'Reference signal received quality for 4G.

cell_ip_address = IPInfo (1, 0)
'Get the TCP/IP address of the PPP/cellular modem interface.

CallTable CELL_DIAGNOSTICS
NextScan
EndSequence
EndProg
```

# Appendix C. Cellular module terminal functionality

---

This appendix discusses the terminal functionality of the CELL200-series modules. This functionality requires a data logger with a CS I/O port.

To use the terminal functionality of the module, you must enable the terminal port. To do this:

1. Connect a USB cable between your module and computer.
2. Connect the **Cellular** antenna.
3. Connect the **Diversity** antenna, if used. (Not required. See [Antenna connections](#) (p. 29).)
4. Open a web browser and go to: [www.cell.linktodevice.eu/](http://www.cell.linktodevice.eu/).

**TIP:**

If your computer does not respond to the DNS server correctly, browse to 192.168.86.1.

5. On the **Settings > Advanced** tab, set the **Terminal Port CS I/O SDC Address**. (It must be set to a different address than the one used for the **CS I/O Port SDC Address**.)
6. Click **Apply Changes**.

[Settings configuration and status retrieval](#) (p. 60) illustrates how to use this functionality in a CRBasic program.

The functionality can also be accessed directly using the terminal emulator of the data logger in serial talk through mode. The data logger terminal emulator can be accessed by connecting to the data logger in Device Configuration Utility and selecting the **Terminal** tab. (It can also be accessed from the **Connect** screen by selecting **Datalogger | Terminal Emulator** and then clicking **Open Terminal**.) With the terminal window open, press return a few times until you receive the data logger prompt (for example, CR1000X>). Type P. Then type the number corresponding to the **Terminal Port CS I/O SDC Address** set in the CELL200-series module. You should receive a **CELL2xx>** prompt. The commands in this appendix can be used from this prompt to interact with the CELL200-series module.

## help

Displays all the commands that are available in the cellular module terminal.

# C.1 Using cell modem terminal functionality

## NOTE:

This functionality is available in all CRBasic data loggers with a CS I/O port.

CELL200 series settings configuration and status retrieval using terminal functionality (p. 65) shows how to set up an attached CELL200-series module using the terminal functionality in the module. It also illustrates how to use the same functionality to retrieve status information from the CELL200 series and put the module into low power mode. This program can be downloaded from <https://s.campbellsci.eu/documents/eu/miscellaneous/CELL2XX-Settings.dld>.

To use the terminal functionality of the module, you must enable the terminal port. To do this:

1. Connect a USB cable between your module and computer.
2. Connect the **Cellular** antenna.
3. Connect the **Diversity** antenna, if used. (Not required. See [Antenna connections](#) (p. 29).)
4. Open a web browser and go to: [www.cell.linktodevice.eu/](http://www.cell.linktodevice.eu/).

## TIP:

If your computer does not respond to the DNS server correctly, browse to 192.168.86.1.

5. On the **Settings | Advanced** tab, set the **Terminal Port CS I/O SDC Address**. (It must be set to a different address than the one used for the **CS I/O Port SDC Address**.)
6. Click **Apply Changes**.

## CRBasic Example 3: CELL200 series settings configuration and status retrieval using terminal functionality

```
Public modem_apn As String * 50 'Current Access Point Name
Public modem_battery_voltage 'Modem's current battery voltage
Units modem_battery_voltage = V
Public modem_current_day_usage As Long 'Today data usage statistics
Units modem_current_day_usage = kB
Public modem_current_month_usage As Long 'Current month's data usage
Units modem_current_month_usage = kB
Public modem_diversity As String 'Current setting for the Diversity Antenna
Public modem_ecio 'Current ECIO value (3G signal quality)
Public modem_ipprotocol As String 'Current setting for IP Protocol (IPv4,
                                   'IPv6, or IPv4/IPv6)
Public modem_mode As String 'Current modem mode (PPP or Serial Server)
Public modem_previous_day_usage As Long 'Previous day's data usage
Units modem_previous_day_usage = kB
```

### CRBasic Example 3: CELL200 series settings configuration and status retrieval using terminal functionality

```
Public modem_previous_month_usage As Long 'Previous month's data usage
Units modem_previous_month_usage = kB
Public modem_rsrp 'Current modem RSRP value (LTE signal Strength)
Public modem_rsrq 'Current modem RSRQ value (LTE signal Quality)
Public modem_rssi 'Current modem RSSI value (3G signal strength)
Public modem_sdc_address 'Modem's current SDC address (CS I/O Port SDC
                        'Address setting)
Public modem_state As String * 60 'Current state of the modem (status)
Public modem_is_off As Boolean
Public modem_reset_needed As Boolean

'variables used to parse the strings returned by the modem.
Const CRLF = CHR(13) & CHR(10)
Public returned_value As String * 70
'Temp string to hold the values returned by the modem

'Other variables
Public battery_voltage
Public panel_temperature_c

DataTable(CELL_DIAGNOSTICS, TRUE, -1)
  Sample(1, modem_apn, String)
  Sample(1, modem_battery_voltage, FP2)
  Sample(1, modem_current_day_usage, IEEE4)
  Sample(1, modem_current_month_usage, IEEE4)
  Sample(1, modem_diversity, String)
  Sample(1, modem_ecio, FP2)
  Sample(1, modem_ipprotocol, String)
  Sample(1, modem_mode, String)
  Sample(1, modem_previous_day_usage, IEEE4)
  Sample(1, modem_previous_month_usage, IEEE4)
  Sample(1, modem_rsrp, FP2)
  Sample(1, modem_rsrq, FP2)
  Sample(1, modem_rssi, FP2)
  Sample(1, modem_sdc_address, FP2)
  Sample(1, modem_state, String)
  Sample(1, modem_is_off, Boolean)
  Sample(1, modem_reset_needed, Boolean)
EndTable

BeginProg
  'Setup Campbell Scientific external modem
  #If ((LoggerType = CR6 AND OSVERSION >= 9) OR (LoggerType = CR1000X AND _
      OSVERSION >= 3) OR LoggerType = CR300 AND OSVERSION >= 8)) Then
    SetSetting("CellAPN", "*****.*****")
    'Replace *s with APN assigned by cellular provider
```

### CRBasic Example 3: CELL200 series settings configuration and status retrieval using terminal functionality

```
SetSetting("CellDiversity", 0)
SetSetting("CELLBillingDay", 10)

SetSetting("PPPInterface", COMSDC8) 'Set PPP Interface to COMSDC8
'Open a serial connection to the modem using the SDC address listed in the
modem's
'Terminal Port CS I/O SDC Address: setting.
SerialOpen(ComSDC11, 460800, 0, 0, 500)
#Else
modem_reset_needed = FALSE
'Open a serial connection to the modem using the SDC address listed in the
modem's
'Terminal Port CS I/O SDC Address: setting.
SerialOpen(ComSDC11, 460800, 0, 0, 500)
SerialOut(ComSDC11, CRLF, "CELL2xx>", 1, 200)
SerialOut(ComSDC11, "set apn ****.****" & CRLF, CRLF, 1, 200)
'Replace *s with APN assigned by cellular provider
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
If (returned_value = "APN saved. Cellular module reset required!" & _
    CHR(13)) Then
    modem_reset_needed = TRUE
EndIf

SerialOut(ComSDC11, "set div 0" & CRLF, CRLF, 1, 200)
'Tell the modem not to use the diversity antenna on the cellular
modem (default). 0 = off 1 = on
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
If (returned_value = "Diversity saved. Cellular module reset required!" & _
    CHR(13)) Then
    modem_reset_needed = TRUE
EndIf

SerialOut(ComSDC11, "set baud 115200" & CRLF, CRLF, 1, 200)
'Set the baud rate on the RS-232 port of the cellular modem
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
If (returned_value = "Baud rate saved. Cellular module reset required!" & _
    CHR(13)) Then
    modem_reset_needed = TRUE
EndIf

SerialOut(ComSDC11, "set mode PPP" & CRLF, CRLF, 1, 200)
'Set the mode the modem operates in PPP or SERIAL
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
If (returned_value = "Mode set to PPP mode. Reboot required!" & _
    CHR(13)) Then
    modem_reset_needed = TRUE
```



## CRBasic Example 3: CELL200 series settings configuration and status retrieval using terminal functionality

```
EndIf

SerialOut(ComSDC11, "set sdc 7" & CRLF, CRLF, 1, 200)
'Set the SDC address of the modem (7, 8, 10, 11)
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
If (returned_value = "SDC address saved. Cellular module reset required!" _
    & CHR(13)) Then
    modem_reset_needed = TRUE
EndIf

SerialOut(ComSDC11, "set listen port 3001" & CRLF, CRLF, 1, 200)
'Set the listen port
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
If (returned_value = "Listen port set. Reboot required!" & _
    CHR(13)) Then
    modem_reset_needed = TRUE
EndIf

SerialOut(ComSDC11, "set billing 10" & CRLF, CRLF, 1, 200)
'Set day of the month for billing statistics
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)

SerialOut(ComSDC11, "set roaming auto" & CRLF, CRLF, 1, 200)
'Set the roaming mode of the data logger (Auto or disabled).
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
If (returned_value = "Roaming set to Auto. Cellular module reset required!"
    _
    & CHR(13)) Then
    modem_reset_needed = TRUE
EndIf

SerialOut(ComSDC11, "set ipprotocol IPv4" & CRLF, CRLF, 1, 200)
'Set the IP protocol used on the cellular network (IPv4, IPv6, or
'IPv4/IPv6).
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
If (returned_value = "Protocol set to IPv4. Cellular module reset _
    required!" & CHR(13)) Then
    modem_reset_needed = TRUE
EndIf

'other set commands include:
' set ppp user (PPP username in modem)
' set ppp pass (PPP password in modem)
' set comms watch (allows user to sniff/watch a port, usually not used
' programatically)
```

### CRBasic Example 3: CELL200 series settings configuration and status retrieval using terminal functionality

```
If (modem_reset_needed = TRUE) Then
  Do While (modem_reset_needed = TRUE)
    SerialOut(ComSDC11, "reboot" & CRLF, CRLF, 1, 200)
    SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
    If (returned_value = "Reboot started . . ." & CHR(13)) Then
      modem_reset_needed = FALSE
      returned_value = ""
    EndIf
  Loop
EndIf
#EndIf

Scan (1, SEC, 3, 0)
  PanelTemp(panel_temperature_c, _60Hz)
  Battery(battery_voltage)
NextScan

SlowSequence
Scan(2, MIN, 0, 0)
  'reset our variables so we know we are getting good data every time
  modem_apn = ""
  modem_battery_voltage = 0
  modem_current_day_usage = 0
  modem_current_month_usage = 0
  modem_diversity = ""
  modem_ecio = 0
  modem_ipprotocol = ""
  modem_mode = ""
  modem_previous_day_usage = 0
  modem_previous_month_usage = 0
  modem_sdc_address = 0
  modem_state = ""
  returned_value = ""

  SerialFlush(ComSDC11)
  'clean out any garbage characters that might have come in.
  SerialOut(ComSDC11, CRLF, "CELL2xx>", 1, 200)
  'Send a CRLF and wait CELL2xx prompt before continuing on.
  SerialOut(ComSDC11, "show apn" & CRLF, CRLF, 1, 200)
  'Query for the modems current APN setting.
  SerialIn(modem_apn, ComSDC11, 100, CHR(13), 1000)

  SerialFlush(ComSDC11)
  SerialOut(ComSDC11, "show rssi" & CRLF, CRLF, 1, 200)
  'Query for the modem's 3G signal strength information (RSSI)
  SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
```

## CRBasic Example 3: CELL200 series settings configuration and status retrieval using terminal functionality

```
modem_rssi = returned_value 'convert string to numeric value'

SerialFlush(ComSDC11)
SerialOut(COMSDC11, "show rsrp" & CRLF, CRLF, 1, 200)
'Query for the modem's LTE network signal strength (RSRP)'
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
modem_rsrp = returned_value

SerialFlush(ComSDC11)
SerialOut(COMSDC11, "show ecio" & CRLF, CRLF, 1, 200)
'Query for the modem's 3G network signal quality (ECIO)'
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
modem_ecio = returned_value

SerialFlush(ComSDC11)
SerialOut(COMSDC11, "show rsrq" & CRLF, CRLF, 1, 200)
'Query for the modem's LTE network signal quality (RSRQ)'
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
modem_rsrq = returned_value

SerialFlush(ComSDC11)
SerialOut(ComSDC11, "show diversity" & CRLF, CRLF, 1, 200)
'Query for the modem's current diversity antenna setting'
SerialIn(modem_diversity, ComSDC11, 100, CHR(13), 1000)

SerialFlush(ComSDC11)
SerialOut(ComSDC11, "show ipprotocol" & CRLF, CRLF, 1, 200)
'Query for the modem's current IP protocol configuration'
SerialIn(modem_ipprotocol, ComSDC11, 100, CHR(13), 1000)

SerialFlush(ComSDC11)
SerialOut(ComSDC11, "show sdc" & CRLF, CRLF, 1, 200)
'Query for the modem's current SDC address'
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
modem_sdc_address = returned_value

SerialFlush(ComSDC11)
SerialOut(ComSDC11, "show mode" & CRLF, CRLF, 1, 200)
'Query for the modem's current operating mode (PPP or Serial Server)'
SerialIn(modem_mode, ComSDC11, 100, CHR(13), 1000)

SerialFlush(ComSDC11)
SerialOut(ComSDC11, "show state" & CRLF, CRLF, 1, 200)
'Query for the modem's current state'
SerialIn(modem_state, ComSDC11, 100, CHR(13), 1000)
```

## CRBasic Example 3: CELL200 series settings configuration and status retrieval using terminal functionality

```
SerialFlush(ComSDC11)
SerialOut(ComSDC11, "show usage today" & CRLF, CRLF, 1, 200)
'Query for today's cellular data usage
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
modem_current_day_usage = returned_value

SerialFlush(ComSDC11)
SerialOut(ComSDC11, "show usage yesterday" & CRLF, CRLF, 1, 200)
'Query for yesterday's cellular data usage
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
modem_previous_day_usage = returned_value

SerialFlush(ComSDC11)
SerialOut(ComSDC11, "show usage month" & CRLF, CRLF, 1, 200)
'Query for this month's cellular data usage
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
modem_current_month_usage = returned_value

SerialFlush(ComSDC11)
SerialOut(ComSDC11, "show usage lastmonth" & CRLF, CRLF, 1, 200)
'Query for last month's cellular data usage
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
modem_previous_month_usage = returned_value

SerialFlush(ComSDC11)
SerialOut(ComSDC11, "show bat" & CRLF, CRLF, 1, 200)
'Query for last month's cellular data usage
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
modem_battery_voltage = returned_value

CallTable CELL_DIAGNOSTICS
NextScan
EndSequence

SlowSequence
Do
  Delay(1, 5, Sec)

If(TimeIsBetween(10, 58, 60, Min) AND modem_is_off <> TRUE) Then
  'make sure the modem is off at 10 minutes into
  'the hour until 58 minutes into the hour
  'PPPClose'Uncomment line for CR1000, CR800 series, and CR3000.
Do Until (modem_is_off = TRUE)
  SerialFlush(ComSDC11)
  'clean out any garbage characters that might have come in.
  SerialOut(ComSDC11, CRLF, "CELL2xx>", 1, 200)
```

## CRBasic Example 3: CELL200 series settings configuration and status retrieval using terminal functionality

```
'Send a CRLF and wait CELL2xx prompt before continuing on.
SerialOut(ComSDC11, "deep sleep" & CRLF, CRLF, 1, 200)
'put the modem into low power mode
SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
If(returned_value = "Sleep enabled." & CHR(13)) Then
    modem_is_off = TRUE
    returned_value = ""
EndIf
Loop
EndIf

If((TimeIsBetween(0, 10, 60, Min) OR TimeIsBetween(58, 60, 60, Min)) _
AND modem_is_off <> FALSE) Then
    'turn the modem on at the top of the hour in a 10 minute windows
    'PPPOpen'Uncomment line for CR1000, CR800 series, and CR3000.
    Do Until (modem_is_off = FALSE)
        SerialFlush(ComSDC11)
        'clean out any garbage characters that might have come in.
        SerialOut(ComSDC11, CRLF, "CELL2xx>", 1, 200)
        'Send a CRLF and wait CELL2xx prompt before continuing on.
        SerialOut(ComSDC11, "wakeup" & CRLF, CRLF, 1, 200)
        'bring the modem fully back online
        SerialIn(returned_value, ComSDC11, 100, CHR(13), 1000)
        If(returned_value = "Sleep disabled." & CHR(13)) Then
            modem_is_off = FALSE
            returned_value = ""
        EndIf
    Loop
EndIf
Loop
EndSequence
EndProg
```

## C.2 Status commands

Status commands show current values of the information being requested. Some correspond to settings and others are tied to diagnostic information. All values returned are strings. Not all modems return all values. Values returned are also dependent on the network the device is connected to.

### show apn

Displays the **APN** (Access Point Name) currently used by the cellular module. Corresponds with the APN setting in the web interface of the cellular module.

### **show baud**

Displays the current baud rate of the cellular module RS-232 port. Corresponds with the **RS232 Baud Rate** setting in the web interface of the cellular module.

### **show mode**

Displays the current operating mode of the cellular module. Results are **PPP** or **Serial Server**. Corresponds with the **Mode** setting in the web interface of the cellular module.

### **show diversity**

Displays the current setting of cellular module antenna configuration. Results are **Disabled** or **Enabled**. Corresponds with the **Diversity Antenna** field in the web interface of the cellular module.

### **show ipprotocol**

Displays the current value of the cellular module IP protocol configuration. Results are **IPv4**, **IPv6**, or **IPv4/IPv6**. Corresponds with the **IP Protocol** field in the web interface of the cellular module.

### **show sdc**

Displays the current setting for the modem SDC address. Values are **7**, **8**, **10**, or **11**. This value corresponds with the **CS I/O Port SDC Address** setting in the web interface of the cellular module.

### **show listen port**

Displays the current setting for the cellular module TCP/IP listening port (used in Serial Server mode). Values can range from 1 to 65535. Corresponds with the **Serial Server Listen Port Number** setting in the web interface of the cellular module.

### **show billing**

Displays the current value for the billing cycle day. Values can range from 1 to 31. Corresponds to the **Billing Cycle Day** field in the web interface of the cellular module.

### **show roaming**

Displays the current setting for the modem roaming capabilities. Return values are **Auto** and **Disabled**. Corresponds to the **Roaming** setting in the web interface of the cellular module.

### **show sdc term**

Returns the current value for the SDC terminal interface in the modem. Returned values are **7**, **8**, **10**, and **11**. Corresponds to the **Terminal Port CS I/O SDC Address** setting in the web interface of the cellular module.

### **show model**

Returns the model information of the modem. Returned values are **CELL205**, **CELL210**, **CELL215**, or **CELL220**.

**show rev**

Returns the revision of the CELL200 series OS.

**show arev**

Returns the alternate or subversion revision of the CELL200 series OS.

**show osdate**

Returns the build date and alternate version of the CELL200 series OS.

**show serial**

Returns the serial number of the modem.

**show mod manu**

Returns the manufacturer of the modem radio chipset.

**show mod model**

Returns the model number of the modem radio chipset.

**show mod rev**

Returns the model revision of the modem radio chipset.

**show mod arev**

Returns the alternate or sub revision of the modem radio chipset.

**show imei**

Returns the modem IMEI (International Mobile Equipment Identity) number.

**show imsi**

Returns the modem IMSI (International Mobile Subscriber Identity) number.

**show iccid**

Returns the modem ICCID (Integrated Circuit Card Identifier) number.

**show euiccid**

Returns the modem EUICCID number.

**show phone**

Returns the modem phone number.

**show smssca**

Returns the modem SMSSCA (SMS Service Center Address) number.

**show bat**

Returns the modem current battery voltage.

### **show state**

Returns the modem state in English. Values returned could include (but not limited to) "Power off.", "Powering up.", "Powered up.", "SIM authorized.", "Setting baud rate.", "Waiting for baud rate.", "Baud rate set.", "Baud rate failure.", "Power off. Waiting for retry.", "Powered up. SIM auth failure.", "Querying modem.", "Waiting for network registration.", "Configuring modem.", "Dialing.", "Dialing (retry).", "Dialled.", "PPP negotiation.", "Network ready.", "PPP closing.", "PPP paused.", "PPP dropped.", "Terminal AT command mode.", "Firmware update mode.", "Shutting down."

### **show state num**

Returns the state number associated with show state values.

### **show usage today**

Returns the number of bytes used across the cellular network since midnight.

### **show usage yesterday**

Returns the number of bytes used across the cellular network during the previous day.

### **show usage month**

Returns the number of bytes used across the cellular network in the current month.

### **show usage lastmonth**

Returns the number of bytes used across the cellular network in the previous month.

### **show reg 3g**

Returns information on whether or not the modem is registered on the 3G network.

### **show reg gprs**

Returns information on whether or not the modem is registered on the GPRS network.

### **show reg lte**

Returns information on whether or not the modem is registered on the LTE network.

### **show rssi**

Returns the modem 3G signal strength information (RSSI).

### **show ecio**

Returns the modem 3G network signal quality (ECIO).

### **show rsrp**

Returns the modem LTE network signal strength (RSRP).



**show rsrq**

Returns the modem LTE network signal quality (RSRQ).

**show operator**

Returns the name of the cellular provider or network operator the modem is connected to.

**show acc tech**

Returns the access technology of the network that the modem is connected to.

**show band**

Returns the band number the modem is using to connect to the cellular network.

**show osupdate pending**

Returns information to the user letting them know if a newer operating system is available for the modem.

**show osupdate description**

Returns a description of the newer operating system for the user to review before installing.

**show osupdate priority**

Returns the priority of the operating system update.

**show osupdate progress**

Returns the progress of the CELL200 series OS update.

**show modupdate pending**

Returns information regarding the module firmware. Informs the user that an update is available.

**show modupdate description**

Returns a description of the module firmware update for user review.

**show modupdate priority**

Returns the priority of the module firmware update.

**show modupdate progress**

Returns the progress of the module firmware update.

**show device info**

Returns the modem device information. Information returned is extensive and includes many values returned in other terminal commands.

### **show ip info #net**

Returns the modems TCP/IP information for each network. When using the command, replace #net with **1** for the PPP connection and **2** for the Ethernet over USB (RNDIS) connection.

### **show cellular Info**

Returns the modem cellular information. Information returned is extensive and includes information from other terminal commands.

### **show time**

Returns the modem current time. Time returned by the modem is set by the cellular network.

### **show settings**

Returns all the settings of the cellular modem.

### **show cellular errors**

Returns an error information summary that can be used for troubleshooting.

### **show cellular log**

Returns a log of events for the device. Useful for troubleshooting.

### **show update check**

Returns information concerning the last update check.

### **show diagnostic report**

Returns a diagnostic report that is useful for troubleshooting. Combines the output of many other terminal troubleshooting commands.

### **show sms log**

Returns a log of SMS messaging logs.

## **C.3 Set commands**

Set commands are used to set specific settings in the device. Most settings will not take effect until the device is rebooted.

### **set apn ###**

Sets the APN (Access Point Name) in the device. Corresponds to the **APN** setting in the modem web configuration interface. ### is a string that corresponds to the APN issued by the cellular provider when the modem account was created.

### **set div ###**

Sets the modem antenna configuration. ### is a string. **Disabled** and **Enabled** are the only two values that are accepted.

### **set baud ###**

Sets the modem baud rate for the RS-232 port. ### is a number corresponding to the desired baud rate. Accepted values are **460800**, **230400**, **115200**, **76800**, **57600**, **38400**, **19200**, **14400**, **9600**, **4800**, and **2400**.

### **set mode ###**

Sets the modems operating mode. ### is a string. Accepted values are **PPP** and **Serial Server**.

### **set sdc ###**

Sets the modem SDC address for the CS I/O port. ### is a number. Accepted values are **7**, **8**, **10**, and **11**.

### **set listen port ###**

Sets the listening TCP/IP port of the modem for use in Serial Server mode. ### is a number. The accepted range is 1 through 65535.

### **set billing ###**

Sets the billing day that will be used to roll over the data usage statics in the modem. ### is a number. Accepted values are 1 to 31.

### **set roaming ###**

Sets the roaming capabilities of the cellular modem. ### is a string. Accepted values are **Auto** and **Disabled**.

### **set ipprotocol ###**

Sets the TCP/IP protocol used by the modem when communicating with the cellular network. ### is a string. Accepted values are **IPv4**, **IPv6**, and **IPv4/IPv6**.

### **set ppp user ###**

Sets the modems PPP protocol username. ### is a string.

### **set ppp pass ###**

Sets the modems PPP protocol password. ### is a string.

### **set comms watch**

This command is interactive and allows the user to watch or do a trace on a specific modem interface. The user is expected to select a number corresponding with the interface they wish to view.

## C.4 Action commands

Action commands are used to perform actions on the modem such as entering low power mode, rebooting, checking for updates, clearing usage, and so forth.

### **deep sleep**

Puts the modem into low power mode. Modem will not respond across the cellular network.

### **wakeup**

Brings the modem fully back online. Usually done on a schedule after a deep sleep command has been issued.

### **reset module**

Resets the cellular chipset only.

### **reboot**

Forces the modem to reboot.

### **refresh network**

Forces the modem to refresh its connection to the cellular network. Useful for when the network goes stale (long periods of inactivity).

### **check update**

Starts the process that checks for both a new CELL200 series OS, and module firmware.

### **start modupdate**

Starts the module firmware update in the device. This is an over the air update.

### **start osupdate**

Starts the CELL200 series operating system update process.

### **clear usage**

Resets the usage counts in the modem.

### **clear logs**

Resets all the logs in the modem.

# Appendix D. Updating the operating system and firmware

---

Campbell Scientific updates data logger and CELL200 series operating systems (OS) as new features are developed and bugs fixed. It is recommended that before deploying instruments, you check operating system versions and update them as needed. This section applies to updating the CELL200 series module operating system. Refer to your data logger manual for information on updating its OS.

The CELL200 series itself uses two operating systems. The first is the Campbell Scientific CELL200 series operating system. We will refer to that as the **CELL200 series OS**. The second is contained in the cellular radio module; we will refer to that one as the **module firmware**. One or both may need to be updated from time to time.

## CAUTION:

To prevent data loss, collect all data from the data logger before proceeding to update the data logger operating system and cellular module firmware.

Updating the module firmware is done over the air (OTA), even with a direct USB connection to the data logger. Therefore, it can take from 5 minutes to several hours depending on signal strength between the cell tower and the CELL200 series, cellular network congestion, and OTA server availability. OTA updates use some of the cellular device data plan for each attempt. Care should be taken to plan accordingly to avoid cellular data plan overages.

## D.1 Using the web interface (cell.linktodevice.eu)

### NOTE:

Instructions in this section assume that the steps in [Pre-installation](#) (p. 2) have been completed. Cellular service must be setup before web access using [www.cell.linktodevice.eu/](http://www.cell.linktodevice.eu/) is available.

### NOTE:

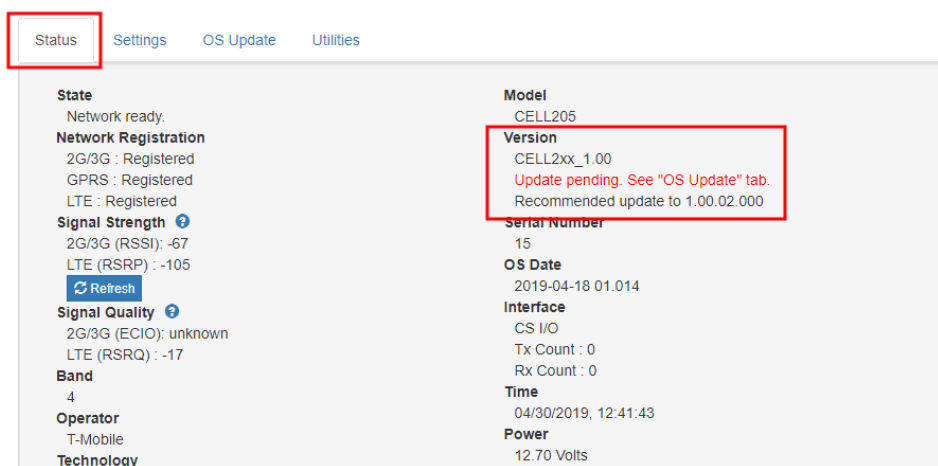
This section applies to modules set up in serial server mode with a public static IP account.

1. Connect a USB cable between your module and computer.
2. Connect the **Cellular** antenna.
3. Connect the **Diversity** antenna, if used. (Not required. See [Antenna connections](#) (p. 29).)
4. Open a web browser and go to: [www.cell.linktodevice.eu/](http://www.cell.linktodevice.eu/).

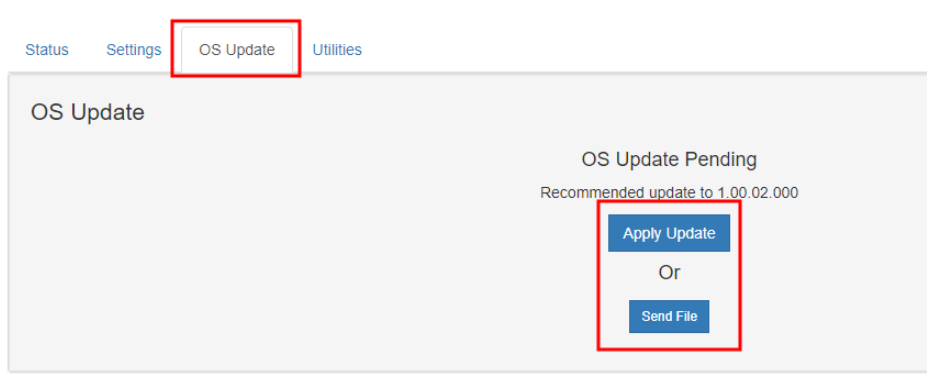
**TIP:**

If your computer does not respond to the DNS server correctly, browse to 192.168.86.1.

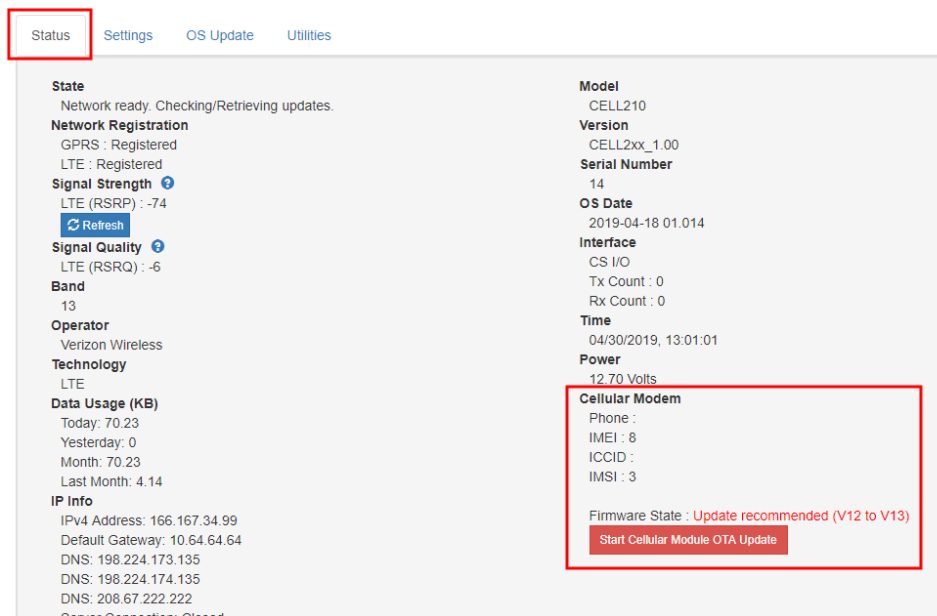
5. When a new CELL200 series OS is available you will see a red notification in the **Version** field of the **Status** Tab.



6. Select the **OS Update** Tab. Clicking the **Apply Update** button will retrieve the CELL200 series OS from the Campbell Scientific website and begin the update process. If you already downloaded the OS from the Campbell Scientific website to your computer you can click the **Send File** button and follow the prompts.



- When new module firmware is available you will see a red notification in the **Cellar Modem** field of the **Status** Tab. To begin the update process, click the red **Start Cellular Module OTA Update** button.



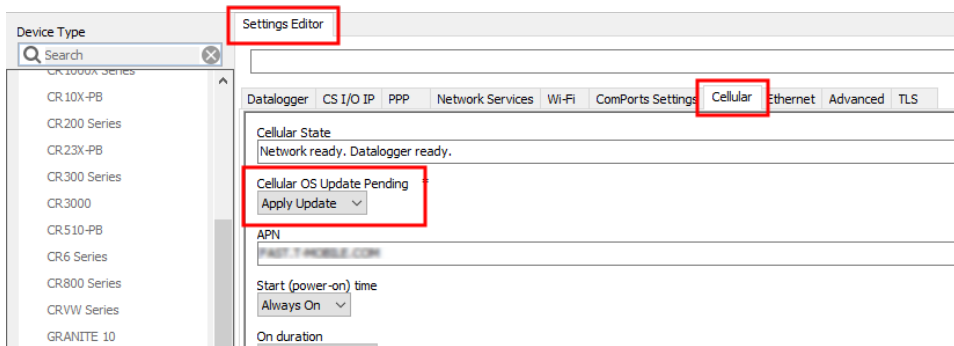
## D.2 Using Device Configuration Utility

### NOTE:

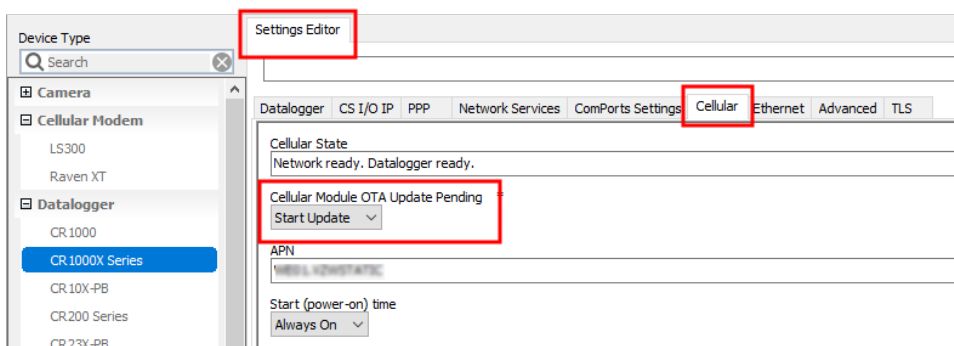
This section applies to modules set up in integrated PPP mode which requires data logger operating system 03.00 or later for the CR1000X, 09.00 or greater for the CR6 series, and 08.00 or later for the CR300 series.

1. Connect the **Cellular** antenna.
2. Connect the **Diversity** antenna, if used. (Not required. See [Antenna connections](#) (p. 29).)
3. Connect your data logger to the CELL200-series module RS-232 or CS I/O port. See [Wiring and connections](#) (p. 25).
4. If not connecting through CS I/O, provide power to the CELL200 series.
5. Connect a USB cable between your data logger and computer.
6. Connect to your data logger by using Device Configuration Utility.

7. When a new CELL200 series OS is available, in the **Settings Editor** on the **Cellular** Tab you will see a field called **Cellular OS Update Pending**. This field does not appear unless an update is available. Select **Apply Update** to begin the process, or **Ignore** to update at another time.
8. **Apply** to save your changes.



9. When new module firmware is available, in the **Settings Editor** on the **Cellular** Tab you will see a field called **Cellular Module OTA Update Pending**. This field does not appear unless an update is available. Select **Start Update** to begin the process, or **Ignore** to update at another time.
10. **Apply** to save your changes.





# Appendix E. 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. 2).

## E.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](http://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 Micro-SIM (3FF) (6 position / contacts) card must be installed inside of the module as described in [Install the SIM card](#) (p. 3). 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.

## E.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](http://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](http://www.blu-tel.com)

Phone number: (877) 422-2616, or Email box: [i2gold@blu-tel.com](mailto: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 Micro-SIM (3FF) (6 position / contacts) card must be installed inside of the module as described in [Install the SIM card](#) (p. 3). 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 F. Cellular module regulatory information

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## F.1 Important information for North American users

**NOTE:**

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.

**WARNING:**

Changes or modifications to this device not expressly approved by Campbell Scientific could void the user's authority to operate this equipment.

## F.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.

**WARNING:**

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 in the following tables for the device used.

| Device  | Frequency Band | FCC ID<br>XMR201606EC21A |
|---------|----------------|--------------------------|
| CELL205 | WCDMA Band 2   | 9.5 dBi                  |
|         | WCDMA Band 4   | 6.5 dBi                  |
|         | WCDMA Band 5   | 14.9 dBi                 |
|         | LTE Band 2     | 9.0 dBi                  |
|         | LTE Band 4     | 6.0 dBi                  |
|         | LTE Band 12    | 10.7 dBi                 |
| CELL210 | LTE Band 4     | 6.5 dBi                  |
|         | LTE Band 13    | 10.6 dBi                 |

## F.3 EU

Campbell Scientific hereby declares the CELL200-series devices are in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU" (RED Directive).

The CELL215 displays the CE mark.



### **WARNING:**

Changes or modifications to this device not expressly approved by Campbell Scientific could void the user's authority to operate this equipment.

### **WARNING:**

This product is only to be installed by qualified personnel.

## F.4 Declaration of conformity

The Declaration of Conformity made under Directive 2014/53/EU" (RED Directive) is available for viewing at: [www.campbellsci.eu/cell215](http://www.campbellsci.eu/cell215).





# Global Sales & Support Network

*A worldwide network to help meet your needs*



## Australia

*Location:* Garbutt, QLD Australia  
*Phone:* 61.7.4401.7700  
*Email:* [info@campbellsci.com.au](mailto:info@campbellsci.com.au)  
*Website:* [www.campbellsci.com.au](http://www.campbellsci.com.au)

## Brazil

*Location:* São Paulo, SP Brazil  
*Phone:* 11.3732.3399  
*Email:* [vendas@campbellsci.com.br](mailto:vendas@campbellsci.com.br)  
*Website:* [www.campbellsci.com.br](http://www.campbellsci.com.br)

## Canada

*Location:* Edmonton, AB Canada  
*Phone:* 780.454.2505  
*Email:* [dataloggers@campbellsci.ca](mailto:dataloggers@campbellsci.ca)  
*Website:* [www.campbellsci.ca](http://www.campbellsci.ca)

## China

*Location:* Beijing, P. R. China  
*Phone:* 86.10.6561.0080  
*Email:* [info@campbellsci.com.cn](mailto:info@campbellsci.com.cn)  
*Website:* [www.campbellsci.com](http://www.campbellsci.com)

## Costa Rica

*Location:* San Pedro, Costa Rica  
*Phone:* 506.2280.1564  
*Email:* [info@campbellsci.cc](mailto:info@campbellsci.cc)  
*Website:* [www.campbellsci.cc](http://www.campbellsci.cc)

## France

*Location:* Vincennes, France  
*Phone:* 0033.0.1.56.45.15.20  
*Email:* [info@campbellsci.fr](mailto:info@campbellsci.fr)  
*Website:* [www.campbellsci.fr](http://www.campbellsci.fr)

## Germany

*Location:* Bremen, Germany  
*Phone:* 49.0.421.460974.0  
*Email:* [info@campbellsci.de](mailto:info@campbellsci.de)  
*Website:* [www.campbellsci.de](http://www.campbellsci.de)

## South Africa

*Location:* Stellenbosch, South Africa  
*Phone:* 27.21.8809960  
*Email:* [sales@campbellsci.co.za](mailto:sales@campbellsci.co.za)  
*Website:* [www.campbellsci.co.za](http://www.campbellsci.co.za)

## Southeast Asia

*Location:* Bangkok, Thailand  
*Phone:* 66.2.719.3399  
*Email:* [thitipongc@campbellsci.asia](mailto:thitipongc@campbellsci.asia)  
*Website:* [www.campbellsci.asia](http://www.campbellsci.asia)

## Spain

*Location:* Barcelona, Spain  
*Phone:* 34.93.2323938  
*Email:* [info@campbellsci.es](mailto:info@campbellsci.es)  
*Website:* [www.campbellsci.es](http://www.campbellsci.es)

## UK

*Location:* Shephed, Loughborough, UK  
*Phone:* 44.0.1509.601141  
*Email:* [sales@campbellsci.co.uk](mailto:sales@campbellsci.co.uk)  
*Website:* [www.campbellsci.co.uk](http://www.campbellsci.co.uk)

## USA

*Location:* Logan, UT USA  
*Phone:* 435.227.9120  
*Email:* [info@campbellsci.com](mailto:info@campbellsci.com)  
*Website:* [www.campbellsci.com](http://www.campbellsci.com)