

# INSTRUCTION MANUAL



## **Raven X Airlink Cellular Modem**

---

**March 2008**



Copyright © 2008  
Campbell Scientific (Canada) Corp.

## WARRANTY AND ASSISTANCE

This equipment is warranted by CAMPBELL SCIENTIFIC (CANADA) CORP. ("CSC") to be free from defects in materials and workmanship under normal use and service for **twelve (12) months** from date of shipment unless specified otherwise. \*\*\*\*\* **Batteries are not warranted.** \*\*\*\*\* CSC's obligation under this warranty is limited to repairing or replacing (at CSC's option) defective products. The customer shall assume all costs of removing, reinstalling, and shipping defective products to CSC. CSC will return such products by surface carrier prepaid. This warranty shall not apply to any CSC products which have been subjected to modification, misuse, neglect, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied, including warranties of merchantability or fitness for a particular purpose. CSC is not liable for special, indirect, incidental, or consequential damages.

Products may not be returned without prior authorization. To obtain a Return Merchandise Authorization (RMA), contact CAMPBELL SCIENTIFIC (CANADA) CORP., at (780) 454-2505. An RMA number will be issued in order to facilitate Repair Personnel in identifying an instrument upon arrival. Please write this number clearly on the outside of the shipping container. Include description of symptoms and all pertinent details.

CAMPBELL SCIENTIFIC (CANADA) CORP. does not accept collect calls.

Non-warranty products returned for repair should be accompanied by a purchase order to cover repair costs.



**CAMPBELL SCIENTIFIC**  
C A N A D A C O R P .

11564 - 149 street - edmonton - alberta - T5M 1W7  
tel 780.454.2505 fax 780.454.2655

[www.campbellsci.ca](http://www.campbellsci.ca)

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>Introduction .....</b>                   | <b>2</b>  |
| <b>2</b> | <b>Specifications .....</b>                 | <b>2</b>  |
|          | 2.1 Modem Specifications.....               | 2         |
|          | 2.2 Base Station Requirements .....         | 3         |
|          | 2.3 Datalogger Site Equipment .....         | 3         |
| <b>3</b> | <b>Configuration.....</b>                   | <b>4</b>  |
|          | 3.1 Establish Cellular Service .....        | 4         |
|          | 3.2 Program the Modem.....                  | 4         |
| <b>4</b> | <b>Activation Wizard .....</b>              | <b>5</b>  |
| <b>5</b> | <b>Set Up Modem using Ace Manager. ....</b> | <b>10</b> |
| <b>6</b> | <b>Setup LoggerNet .....</b>                | <b>12</b> |
| <b>7</b> | <b>Connections to the Datalogger .....</b>  | <b>14</b> |

# 1 Introduction

The Raven X Airlink Cellular Modem is a full-duplex cellular modem that communicates with a base station PC via the Evolution Data Optimized (EV-DO) network, with fallback to 1X Code Division Multiple Access (CDMA) and Public Switched Telephone Network (PSTN). The Raven X modem is for use on the Telus network only.

The Raven X is a rugged, intelligent wireless data platform designed to enable real-time, two-way communications with remote assets. The AirLink Embedded Operating System (ALEOS) is the power inside the Raven. ALEOS has its own embedded TCP/IP stack which enables transmission of serial data from non-IP devices. ALEOS enables several functions including remote configuration and diagnostics, packet assembly and disassembly (PAD) for UDP or TCP, and telemetry protocol spoofing and conversion.

## 2 Specifications

### 2.1 Modem Specifications

|                                  |   |
|----------------------------------|---|
| Technology:                      | CDMA EV-DO Revision A   |
| With Fallback To:                | CDMA 1x EV-DO Release 0<br>CDMA 1xRTT<br>PSTN IS-95                           |
| Band:                            | 800 Mhz Cellular, 1900 Mhz PCS  |
| Transmit Power:                  | 200 mW max  |
| EVDO Throughput:                 | 450 Kbps - 1.4 Mbps   |
| RS-232 Data Rates:               | 1200 bps to 230.4 kbps  |
| Input Voltage:                   | 9 to 28 Vdc   |
| Input Current:                   | 85 to 270 mA  |
| Typical Current Drain at 12 Vdc: | 90 mA dormant connection (idle for 10 to 20 seconds), 239 mA transmit/receive |
| Operating Temperature Range:     | -30° to +70°C (10% duty cycle limit above 60°C)                               |
| Operating Humidity:              | 5% to 95% non-condensing  |

|                        |  |
|------------------------|--|
| Serial Protocols:      | AT Commands, PPP, SLIP, UDP, TCP             |
| Serial Interface:      | RS-232, DB9-F                                |
| Ethernet Interface:    | 10/100 Mbps RJ-45                            |
| RF Antenna Connectors: | 50 Ohm SMA                                   |
| Status LED's:          | Network, Signal, Activity, Service and Power |
| Dimensions:            | 116mm x 35mm x 63mm                          |
| Weight:                | <1 lb (<0.5 kg)                              |

## 2.2 Base Station Requirements

- Pc with active internet connection, running Campbell Scientific Loggernet or PC400 software
- Subscription to the Telus EV-DO Network with coverage at the Datalogger site

## 2.3 Datalogger Site Equipment

- Raven X modem—including DC power cable. The modem is configured using the Telus Setup Wizard and Ace Manager prior to installation. The setup wizard and Ace Manager can be downloaded from [www.Airlink.com](http://www.Airlink.com)
- Datalogger—CR510, CR10(X), CR23X, CR7, CR1000, CR3000, CR5000, or CR2XX
- SC105 or SC932A Interface—connects the modem to any dataloggers' CS I/O port
- L18863 Null Modem Cable—connects the modem to the CR23X, CR2XX, CR1000, CR3000 or CR5000 RS-232 port
- L6227 – Mounting plate for mounting on backplate of your environmental enclosure. With this mount you will also require a Velcro strap (L5207) to strap the Modem to the plate.

Note: It is possible to mount the Raven X directly to the backplate using the top two mounting holes of the modem and two screws with grommets supplied with the mount. This, however, is a tight fit.

- Antenna—the following antennas are available from Campbell Scientific, sites near the edge of coverage may require the Yagi antenna. Contact a CSC Applications Technician for help in determining the best antenna for your application.
  - C2083 3dBd External Omni Antenna (800 MHz and 1.9 Mhz bands) – requires C2360 Surge Suppression Kit and RG8 NM/NM cable
  - L14454 Yagi 8 dBd Cellular Antenna with 10' Cable (800 Mhz only) - requires C2360 Surge Suppression Kit
  - C2100 Omnidirectional Antenna 3dBd w/10ft Cable w/Mount (supports 800 MHz and 1.9 GHz band) – Requires the C2364 TNC – SMA adapter
- Power Supply (see power considerations)
- Environmental Enclosure— ENC 10/12, ENC 12/14, or ENC 16/18

## 3 Configuration

### 3.1 Establish Cellular Service

Prior to contacting the cellular service provider, have the following information on hand:

1. Electronic Serial Number (ESN). The ESN is found on the unit label.
2. Contact the provider; tell the account representative that you would like to open a new account. Ask for an EV-DO/1X Data Plan account with a Dynamic IP. The provider will give you a 10-digit phone number that will be used to program the modem at a later time.

NOTE: The service provider does not need the Raven modem to activate the account.

### 3.2 Program the Modem

1. For the following steps you will need to download AceManager, Modem Doctor and an Activation Wizard (that is matched to your selected carrier provider) from the Utilities page at:

[http://www.sierrawireless.com/support/support\\_and\\_downloads.aspx?id=17,23,1,1](http://www.sierrawireless.com/support/support_and_downloads.aspx?id=17,23,1,1)

2. Each provider has a specific Wizard. Please ensure you have downloaded the Wizard that corresponds to your provider.

4. You will also need a working template file (.xml) to program the modem. This file is available by contacting a Campbell Scientific Canada Applications Technician at 780-454-2505 or by downloading it from the Campbell Scientific Website at:

<http://www.campbellsci.ca/CampbellScientific/Download.html>

There are different templates available for different dataloggers. Please be sure to choose the proper one.

5. Connect the modem to a COM port on the PC using a direct RS232 Connection and attach a dual band antenna to the Raven.

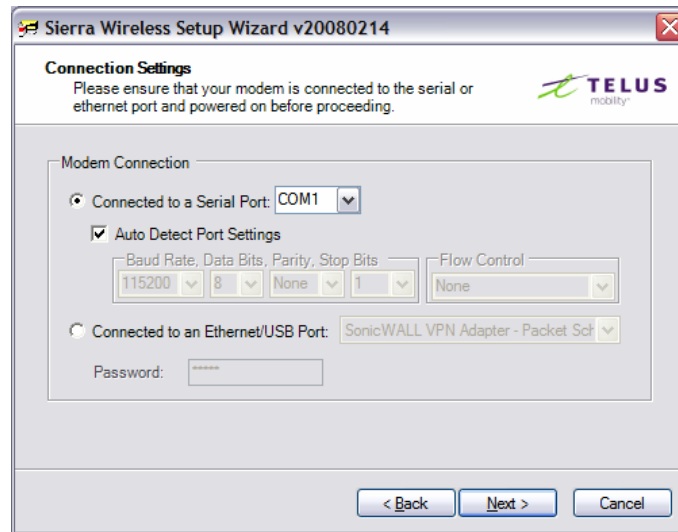
6. Start the Activation Wizard.

## 4 Activation Wizard

1. Click Next to continue through the Wizard.



2. Make sure that the “Connect to a serial port” radio button is selected, the proper COM port is selected and that the “Auto detect port settings” check box is selected. Now click “Next”. The setup wizard will now attempt to establish a connection with the modem.



3. Please verify that the Proper modem is displayed and that the ESN number is correct. You can reference the ESN on the modem to verify this. If the proper information is not displayed, click “Back” and try again. Once this screens shows the proper information click “Next”.



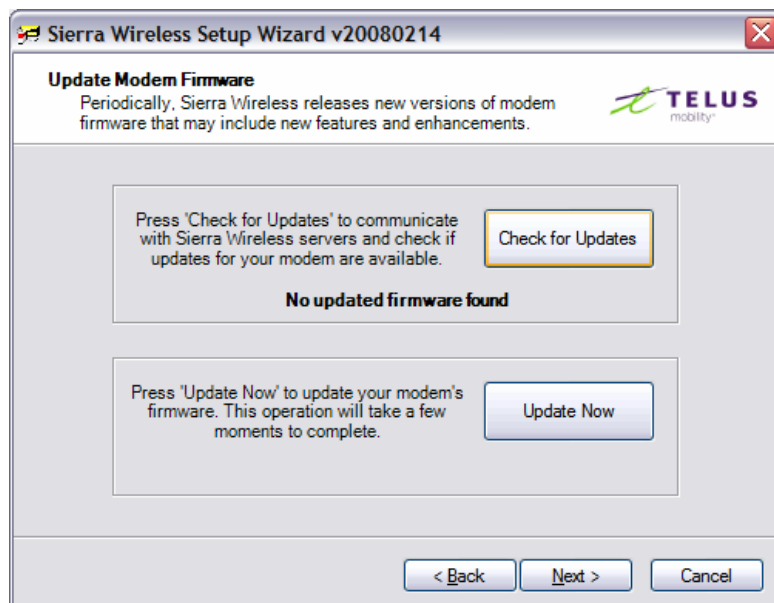


4. Please ensure that only the following check boxes are selected: Update Firmware, Activate Modem (Manual)\* and Test Modem Setup. Once these boxes are selected, click “Next”.

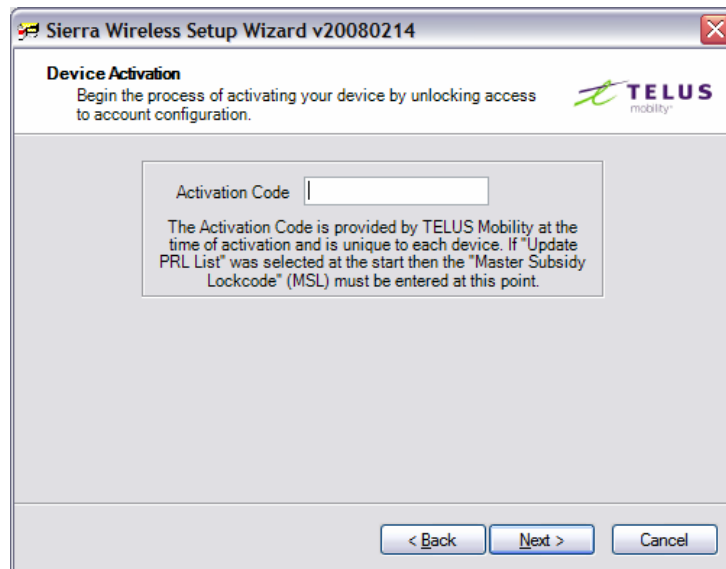


\*NOTE: The Activate modem (OTASP) can be used to automatically pull down the needed information from the network. This is however not recommended as it will not pull down the 1X network settings which are needed to work in those areas where EV-DO coverage is not available.

5. Click “Check for Updates” and if there are updates available, press the “Update Now” button. Once completed, click “Next”.

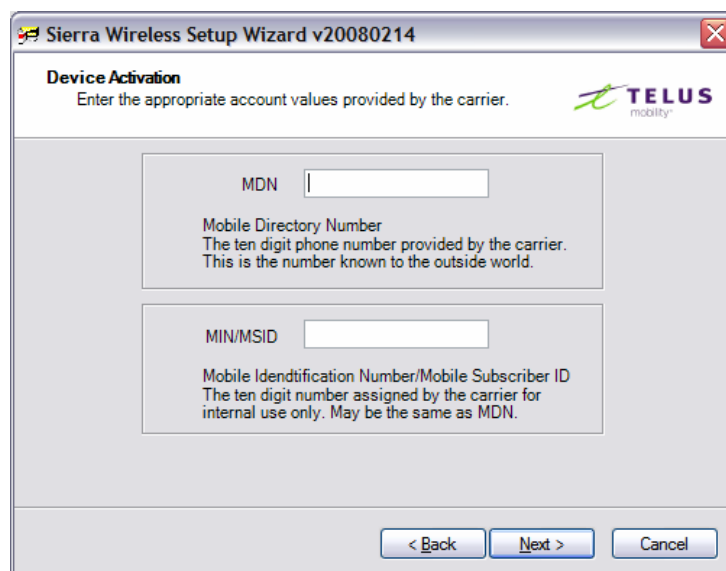


6. A 6-digit Master Lock Code (Master L/C number) is written on the box the Raven X modem was shipped in, as well as on the modem body. Enter this code in the Activation Code Text Box. If the Lock Code only has 5 digits put a “0” in front of the number to make it 6 digits, as the lock code must always be 6 digits. Once completed, click “Next”.



The screenshot shows the 'Device Activation' window of the Sierra Wireless Setup Wizard. The title bar reads 'Sierra Wireless Setup Wizard v20080214'. The window has a header with the TELUS mobility logo. Below the header, the text says 'Device Activation' and 'Begin the process of activating your device by unlocking access to account configuration.' In the center, there is a text box labeled 'Activation Code' with a single character cursor. Below the text box, a paragraph explains: 'The Activation Code is provided by TELUS Mobility at the time of activation and is unique to each device. If "Update PRL List" was selected at the start then the "Master Subsidy Lockcode" (MSL) must be entered at this point.' At the bottom, there are three buttons: '< Back', 'Next >', and 'Cancel'.

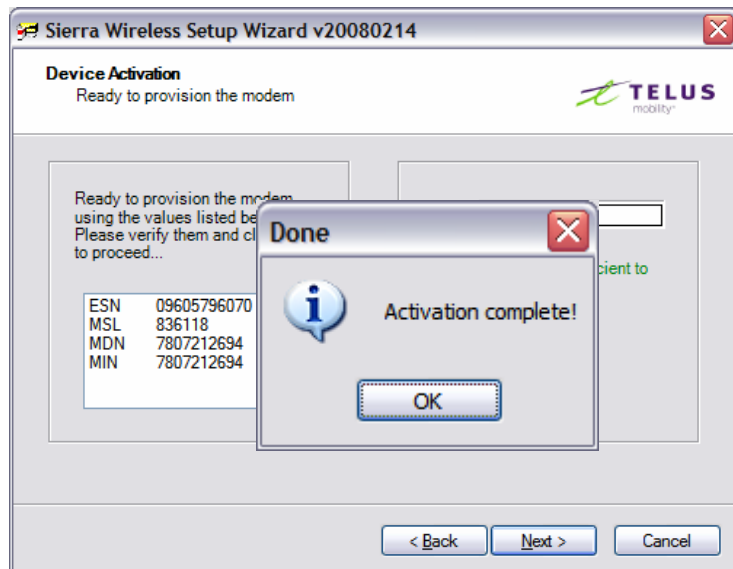
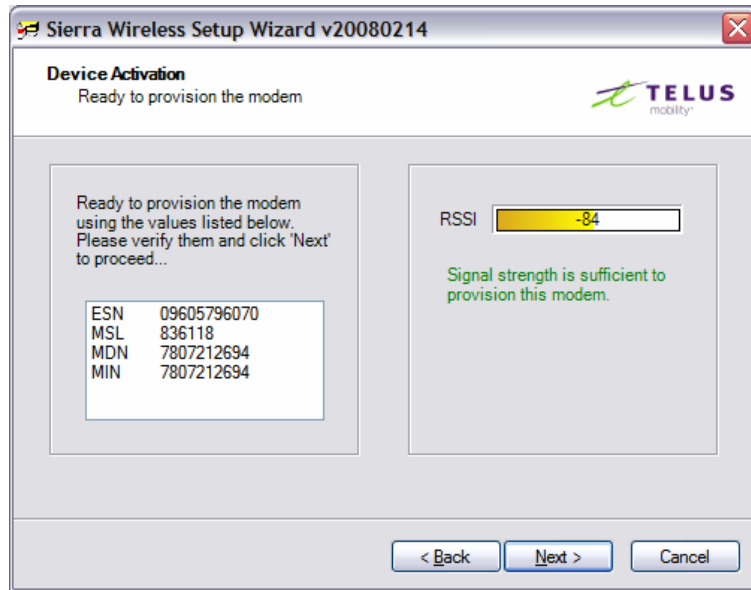
7. Enter the 10 digit phone number you were provided with by the carrier in the MDN and MIN/MSID text boxes. Once completed click “Next”. This will begin the provisioning of the modem on the network.



The screenshot shows the 'Device Activation' window of the Sierra Wireless Setup Wizard. The title bar reads 'Sierra Wireless Setup Wizard v20080214'. The window has a header with the TELUS mobility logo. Below the header, the text says 'Device Activation' and 'Enter the appropriate account values provided by the carrier.' In the center, there are two text boxes. The first is labeled 'MDN' and has a single character cursor. Below it, the text says 'Mobile Directory Number' and 'The ten digit phone number provided by the carrier. This is the number known to the outside world.' The second text box is labeled 'MIN/MSID' and has a single character cursor. Below it, the text says 'Mobile Identification Number/Mobile Subscriber ID' and 'The ten digit number assigned by the carrier for internal use only. May be the same as MDN.' At the bottom, there are three buttons: '< Back', 'Next >', and 'Cancel'.

8. Verify that you have Sufficient Signal to proceed and that the settings you have entered are correct using the list on the Left. If you have made an error click “Back” until you have reached the setting that requires changing and proceed as before.

After verifying everything is correct, click “Next”. It will take a few seconds for the next screen to appear as the modem will now send the settings to the modem and reset. A new window will appear letting you know the activation was completed. Click “OK”.



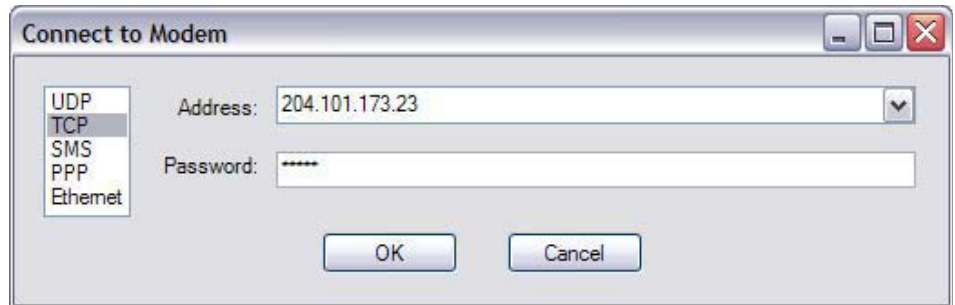
9. The next screen will let you know that the modem has registered on the network and that it has obtained an IP address. This process can take up to 1 minute to complete. Be sure to write down the modem's IP address as we will use it to program the advanced settings of the modem.



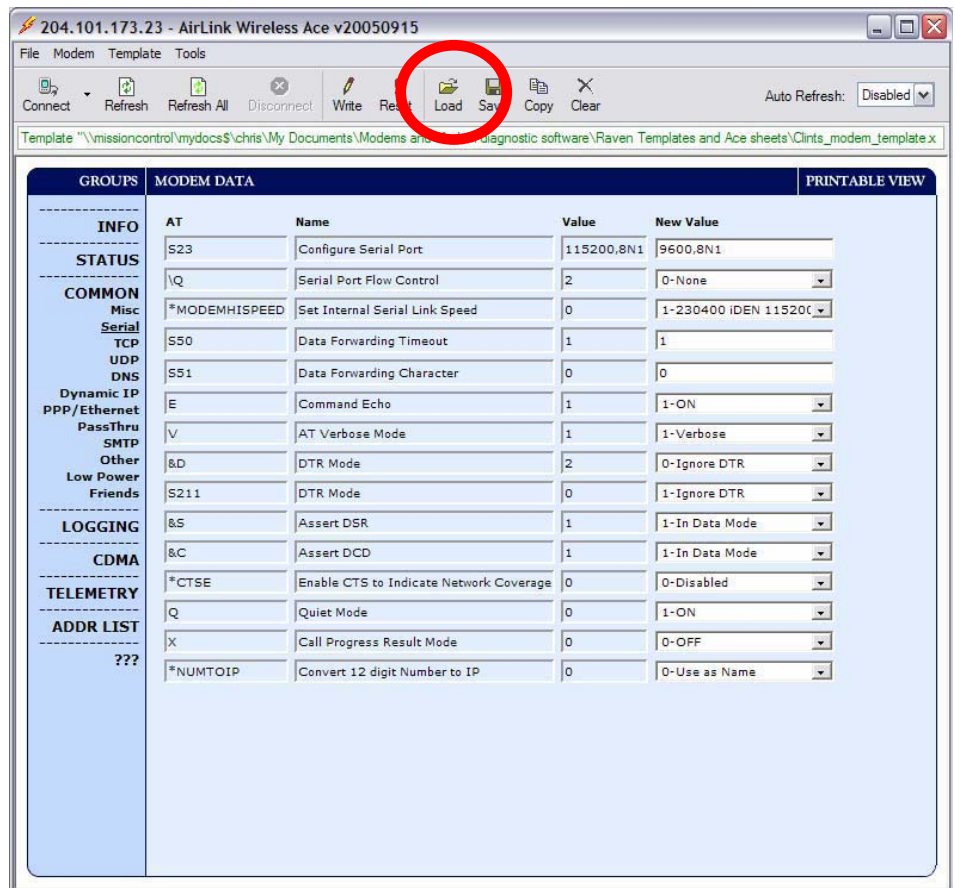
10. At this point the modem is now ready for advanced programming using AceManager. These following steps need to be completed fairly quickly as the modem is on a dynamic IP network and the IP address can change at any time.

## 5 Set Up Modem using Ace Manager.

1. The next steps program the Raven to function in IP mode.
2. Start AceManager and select the Connect tab in the upper left corner of the menu selection bar. This connection is a wireless connection using IP addressing.
3. Connect using the IP address you obtained from the setup wizard and default password as shown.

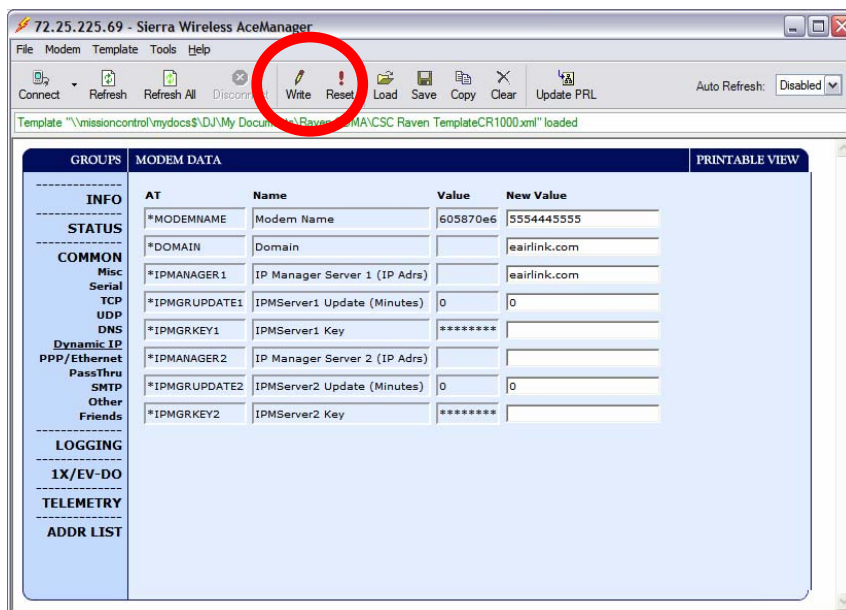


4. The next step assumes that you have a working template to load into the modem. This template is available by contacting a Campbell Scientific Canada Applications Technician at 780-454-2505. Use the “Load” option to select the template to load into the modem.



5. The new file parameters will appear in the “New Value” boxes as shown above.
6. Click on the Dynamic IP Text in the list on the left. You can now modify the settings to allow you to use the Dynamic IP. Enter the 10 digit phone number into the Modem Name field, and the

following domain into the Domain and IPManager fields as shown below. (eairlink.com)

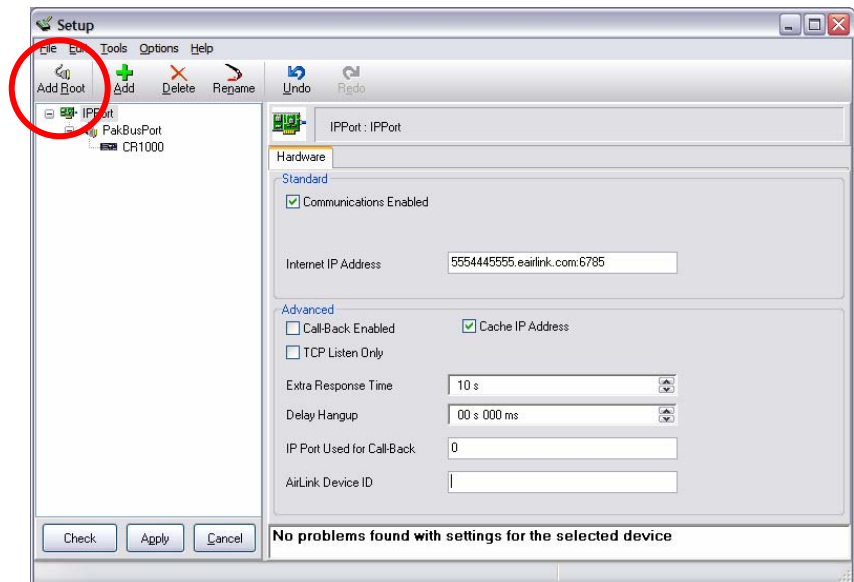


7. Once these fields have been filled in click on the write button to commit the changes to the modem. At this point the modem is fully programmed to communicate to a Campbell Scientific datalogger using a wireless IP connection.
8. Turn off the power to the modem and disconnect from the PC. Turn the power back on and the modem will register itself on the network within 2 minutes. To confirm this, make sure that the Network and Service light is solid. If the Network light is flashing the modem has not registered. If the Service light is not lit but the Network light is, the modem has registered on the network however there is no EV-DO coverage and the modem has registered on the 1X network. If the Modems Network light is not solid after this time contact Campbell Scientific Canada at 780-454-2505 for advanced support.

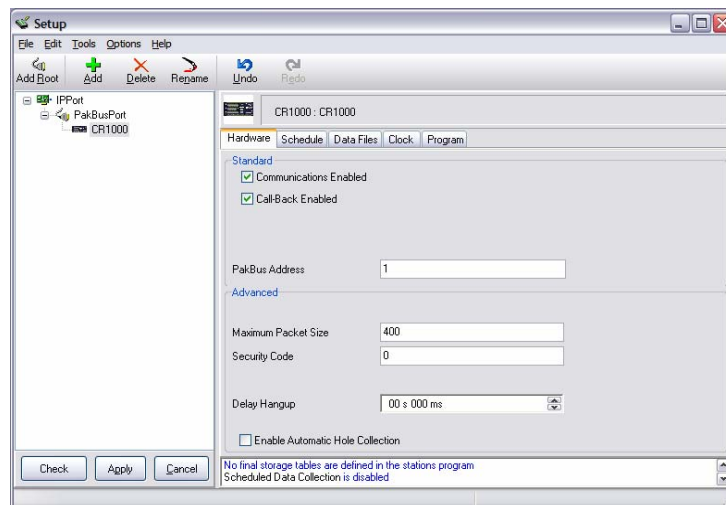
## 6 Setup LoggerNet

1. Select Add Root | IP Port
2. Add a Datalogger to the IP Port
3. On the IP Port page:

- a. Select Communications Enabled.
- b. In the Internet IP Address field, enter the IP address of the modem followed by .airlink.com and the Device port ID. This number is 6785 and is found in the “Common” tab settings of the Raven modem (see below).
- c. Change the maximum baud rate to one supported by the datalogger; in this case for the CR1000 it is 115200.
- d. Extra response time should be 10 - 12 seconds.
- e. Click “Apply”.



4. Click on the CR1000 and change the Maximum Packet size from the default 1000 to 400 bytes. Please also make sure that the proper Pakbus address is in the Pakbus address field.
5. Click “Apply”.



## 7 Connections to the Datalogger

1. If connecting to a CR1000, CR800 or CR23X and you would like to connect to the RS232 port you will require a null modem cable, Campbell Scientific part number L18663.
2. Connect one end of the Null Modem Cable to the Raven X modem and the other to the datalogger's RS232 port.
3. If connecting to any datalogger's CS I/O port you will require an SC932A interface from Campbell Scientific. Connect the supplied black SC12 cable to the datalogger side of the SC932A interface and then to the CS I/O port of the datalogger. Connect the DCE Device side of the SC932A interface to the Raven X modems RS232 port using the supplied straight through serial cable L10873.



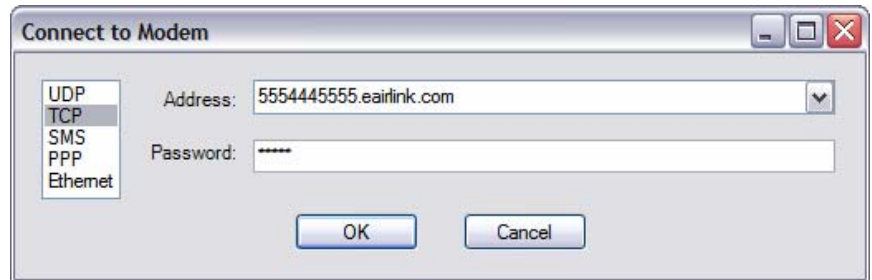


4. In some cases it may be desirable to connect using the Ethernet interface available on the Raven X. To do this you will require a CR1000 or CR3000 with an NL115 Ethernet/Compact Flash Module or any datalogger using the NL100. A crossover Ethernet cable is needed to connect the two devices.

The NL115 is DHCP enabled and so there is no need to change any settings for the two to function together. Once the Crossover cable is connected to the NL115 the Raven X will send its current public IP address to the NL115 for it to use.

If the NL100 is to be used, the following changes are needed for the device to work together since it is NOT DHCP enabled.

5. Using AceManager, connect to the Raven X using the phone number and domain used in Loggernet and the default password. Do not enter the Port number.



6. Once the settings are retrieved from the Raven X, click on the Ethernet/PPP test in the list on the left.

7807212694.eairlink.com - Sierra Wireless AceManager

File Modem Template Tools Help

Connect Refresh Refresh All Disconnect Write Reset Load Save Copy Clear Update PRL Auto Refresh: Disabled

| GROUPS    | MODEM DATA    |                          |                          | PRINTABLE VIEW |
|-----------|---------------|--------------------------|--------------------------|----------------|
|           | AT            | Name                     | Value                    | New Value      |
| COMMON    | *HOSTPRIVMODE | Use Private IP           | 0                        |                |
|           | *HOSTPRIVIP   | Host Private IP          | 192.168.13.12            |                |
|           | *HOSTPEERIP   | Modem Local IP           | 192.168.13.31            |                |
|           | *HOSTNETMASK  | Host network mask        | 0.0.0.0                  |                |
|           | *HOSTAUTH     | Host Authentication Mode | 0                        |                |
|           | *HOSTUID      | Host User ID             | ZCFzUUeLycb2ug01L+3Ikww= |                |
|           | *HOSTPW       | Host Password            | ZCFzUUeLycb2ug01L+3Ikww= |                |
|           | *DHCPSEVER    | DHCP Server Mode         | 1                        |                |
|           | Dynamic IP    |                          |                          |                |
|           | PPP/Ethernet  |                          |                          |                |
| LOGGING   |               |                          |                          |                |
| 1X/EV-DO  |               |                          |                          |                |
| TELEMETRY |               |                          |                          |                |
| ADDR LIST |               |                          |                          |                |

- Use the drop down list for the New Value of “Use Public IP”. Change this value to “Use Private IP”.

Enter the Host Private IP as 192.168.13.12

Enter the Modem Local IP as 192.168.13.31

7807212694.eairlink.com - Sierra Wireless AceManager

File Modem Template Tools Help

Connect Refresh Refresh All Disconnect Write Reset Load Save Copy Clear Update PRL Auto Refresh: Disabled

| GROUPS    | MODEM DATA    |                          |                          | PRINTABLE VIEW   |
|-----------|---------------|--------------------------|--------------------------|------------------|
|           | AT            | Name                     | Value                    | New Value        |
| COMMON    | *HOSTPRIVMODE | Use Private IP           | 0                        | 1-Use Private IP |
|           | *HOSTPRIVIP   | Host Private IP          | 192.168.13.12            | 192.168.13.12    |
|           | *HOSTPEERIP   | Modem Local IP           | 192.168.13.31            | 192.168.13.31    |
|           | *HOSTNETMASK  | Host network mask        | 0.0.0.0                  |                  |
|           | *HOSTAUTH     | Host Authentication Mode | 0                        |                  |
|           | *HOSTUID      | Host User ID             | ZCFzUUeLycb2ug01L+3Ikww= |                  |
|           | *HOSTPW       | Host Password            | ZCFzUUeLycb2ug01L+3Ikww= |                  |
|           | *DHCPSEVER    | DHCP Server Mode         | 1                        |                  |
|           | Dynamic IP    |                          |                          |                  |
|           | PPP/Ethernet  |                          |                          |                  |
| LOGGING   |               |                          |                          |                  |
| 1X/EV-DO  |               |                          |                          |                  |
| TELEMETRY |               |                          |                          |                  |
| ADDR LIST |               |                          |                          |                  |

8. Click on Misc in the list on the left. Change the DPORT to 3000. This makes sure that any information sent to the modem from Loggernet on port 6785 will get passed through the Ethernet port and not trapped by the modem.

7807212694.eairlink.com - Sierra Wireless AceManager

File Modem Template Tools Help

Connect Refresh Refresh All Disconnect Write Reset Load Save Copy Clear Update PRL Auto Refresh: Disabled

Write successful

| GROUPS           | MODEM DATA      |                                  |                                 | PRINTABLE VIEW   |
|------------------|-----------------|----------------------------------|---------------------------------|------------------|
| <b>INFO</b>      | <b>AT</b>       | <b>Name</b>                      | <b>Value</b>                    | <b>New Value</b> |
| <b>STATUS</b>    | *DATE           | Date and Time                    | 03/05/2008 18:06:36             |                  |
| <b>COMMON</b>    | OPRG            | Enable Over-the-Air Programming  | 1                               |                  |
| Serial           | *NETPHONE       | Phone Number                     | 7807212694                      |                  |
| TCP              | *STATICIP       | Force Static IP                  | 0.0.0.0                         |                  |
| UDP              | *PORT           | Device Port                      | 6785                            | 3000             |
| DNS              | *NETU           | User ID                          | 7807212694@1x.telusmobility.com |                  |
| Dynamic IP       | *NETPW          | Network Password                 | 09605796070                     |                  |
| PPP              | *NETALLOWZEROIP | Allow Last Byte of net IP = Zero | 1                               |                  |
| Internet         | *HOSTPAP        | Request PAP                      | 0                               |                  |
| Passing          | S53             | Destination Address              |                                 |                  |
| SMTP             | S53             | ion Port                         | 0                               |                  |
| Other            | S53             | Default Dial Code                | T                               |                  |
| Friends          |                 |                                  |                                 |                  |
| <b>LOGGING</b>   |                 |                                  |                                 |                  |
| <b>1X/EV-DO</b>  |                 |                                  |                                 |                  |
| <b>TELEMETRY</b> |                 |                                  |                                 |                  |
| <b>ADDR LIST</b> |                 |                                  |                                 |                  |

9. Following the settings outlined in the NL100, setup the device using the Fixed IP address of 192.168.13.12