INSTRUCTION MANUAL

9522B
Iridium L-Band Data Modem

July 2011

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Disclaimer

This manual addresses the concerns of interfacing another manufacturer's product with Campbell Scientific Dataloggers. At the time of writing the information in this manual is currently accurate and up-to-date. However, changes to the manufacturer's product are beyond our control. Such changes may affect equipment setup, configuration, and even safe use of the product. This manual should be used in conjunction with the original manufacturer's technical information concerning product use and safety. If you encounter out-of-date, incomplete, or incorrect information, please contact us so we can attempt to remedy the situation.

Because this product is manufactured by another company, their warranty applies. Contact the original manufacturer for warranty information, and servicing.

Our website (www.campbellsci.ca) lists the updated manuals.

1. Overview

1.1. General Description and Modes of Operation

The Iridium satellite network consists of a constellation of 66 satellites situated in 6 planes in low-earth orbit. Each plane is populated by 11 satellites in polar orbits, giving the Iridium network excellent coverage in high latitudes that equatorial satellites often cannot reach.

Iridium provides 5 different services: dial-up data, Short Burst Data (SBD), Short Messaging Service (SMS), Internet Connection, and Router Based Unrestricted Digital Internetworking Connectivity Solution (RUDICS). For the purposes of this manual only dial-up data will be discussed as this is the preferred method of connecting with Campbell Scientific dataloggers. However, while other services may not be directly relevant to datalogger operations, the end user may find them valuable. Please contact your Iridium service provider with questions on these methods.

1.2. Modem Models and Accessories

The Iridium Satellite System used with Campbell Scientific consists of the modem, data/power kit (C2462), SC932A, data cables, antenna and power supply. The base and remote stations utilize the same modem type, which both require a change to their configuration. The recommended connection of the remote modem for all dataloggers is via the CS I/O port in a modem enable configuration.

Warning:	**It is not recommended to use the null modem cable (i.e. cable with 2 male connectors) supplied with the C2462 to make an RS232 connection to the datalogger.**

Power/Data kits are required to connect the modem to the datalogger or computer and an appropriate power source. For remote applications where AC power is not available it is recommended to operate the modem on a schedule to avoid discharging the battery power supply.

The antenna used for both Iridium modems is the SAF5350A mast mount antenna. For best signal reception the antenna should be mounted so that it has an unobstructed view of the sky and horizon. Reception quality changes as satellites move overhead so it is critical that the view be clear. See Section 4 of this manual for information about checking signal quality.

For the ease of installation the C2626 right angle sma adaptor is used between the 9522B antenna connector and the SAF5350A antenna cable.

The antenna mounts to a ¾" diameter pipe which can be connected to a horizontal arm using a nu-rail connector. The nu-rail connector used will depend on the type of horizontal pipe. For a ¾" pipe, use #L1017, for a 1" pipe use #L1049.

Base Station	Remote Station
9522B L-Band Data Modem	**9522B L**-Band Data Modem
SAF5350A antenna plus cable	**SAF5350A** antenna plus cable
C2626 Right Angle SMA adaptor (may be required depending on installation)	**C2626** Right Angle SMA adaptor
C2462 (use L10873 – sold separate)	**C2462** (use L10873 supplied with SC932A)
Iridium **SIM card** (comes with modem)	**SC932A & L14394** Mounting Bracket (for datalogger CS I/O communication port)
C2440 mounting kit for SAF5350A antenna	Iridium **SIM card** (comes with modem)
	C2440 mounting kit for SAF5350A antenna

Table 1: Equipment List for Base and Remote Stations

1.3. *Hardware Overview*

Figures 1 and 2 display the hardware typically used for both a Base and Remote station. At this time the datalogger, the power supply, and other peripherals are not shown. Please refer to Appendix B for a thorough description of the installation procedure for both the Base and Remote stations.

Warning:	**Be sure that the SAF5350A antenna is connected to either of the modems before applying power, as damage to the equipment may occur.**

Hardware	*Description*	*Colour*	*Connection*
9522B	Antenna		"ANT" SMA connector to antenna cable using C2626 adaptor
	C2462 Interface		26-pin ribbon cable connector
C2462	Power Control	Orange	Control Port Datalogger (5V power trigger)
	Power Control Reference	Black	G - Datalogger
	Modem Power	Red	+12V (Direct to Station Power Supply)
	Power Reference	Black	G (Direct to Station Power Supply)
SC932A	"DCE Device"	L10873	9-pin connector of C2462
	"Datalogger"	SC12	CS I/O port of Datalogger

Table 2: Remote Station C2462 Wiring

Hardware	Description	Colour	Connection
9522B	Antenna		"ANT" SMA connector to antenna cable
	C2462 Interface		26-pin ribbon cable connector
C2462	Power Control	Orange	Control Port Datalogger (5V power trigger)
	Power Control Reference	Black	G - Datalogger
	Modem Power	Red	+12V (Direct to Station Power Supply)
	Power Reference	Black	G (Direct to Station Power Supply)
	9-pin Connector	L10873	Connect to PC

Table 3: Base Station C2462 Wiring

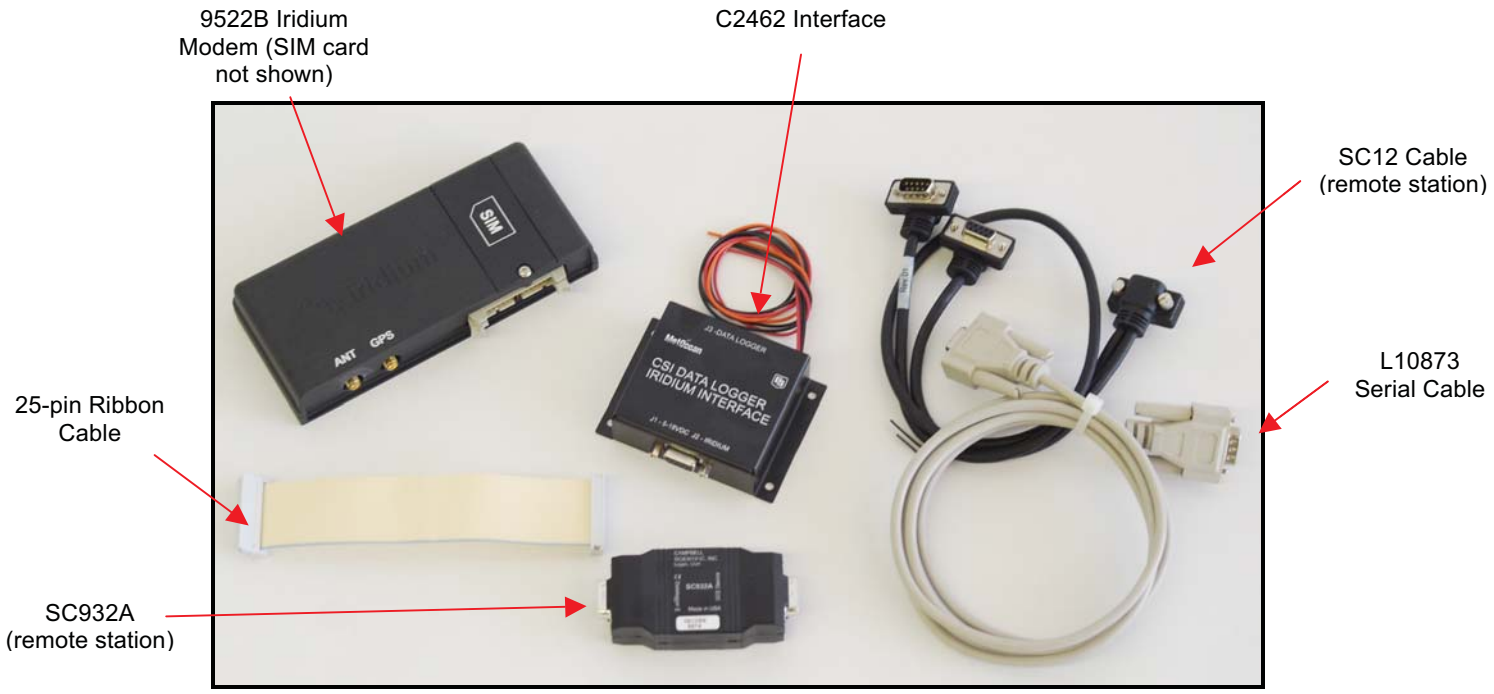

Figure 1: Base & Remote Station Components

Warning:	**When installing the SC932A be sure that it is orientated properly with both the C2462 and the datalogger. If this is not done communications will not work.**

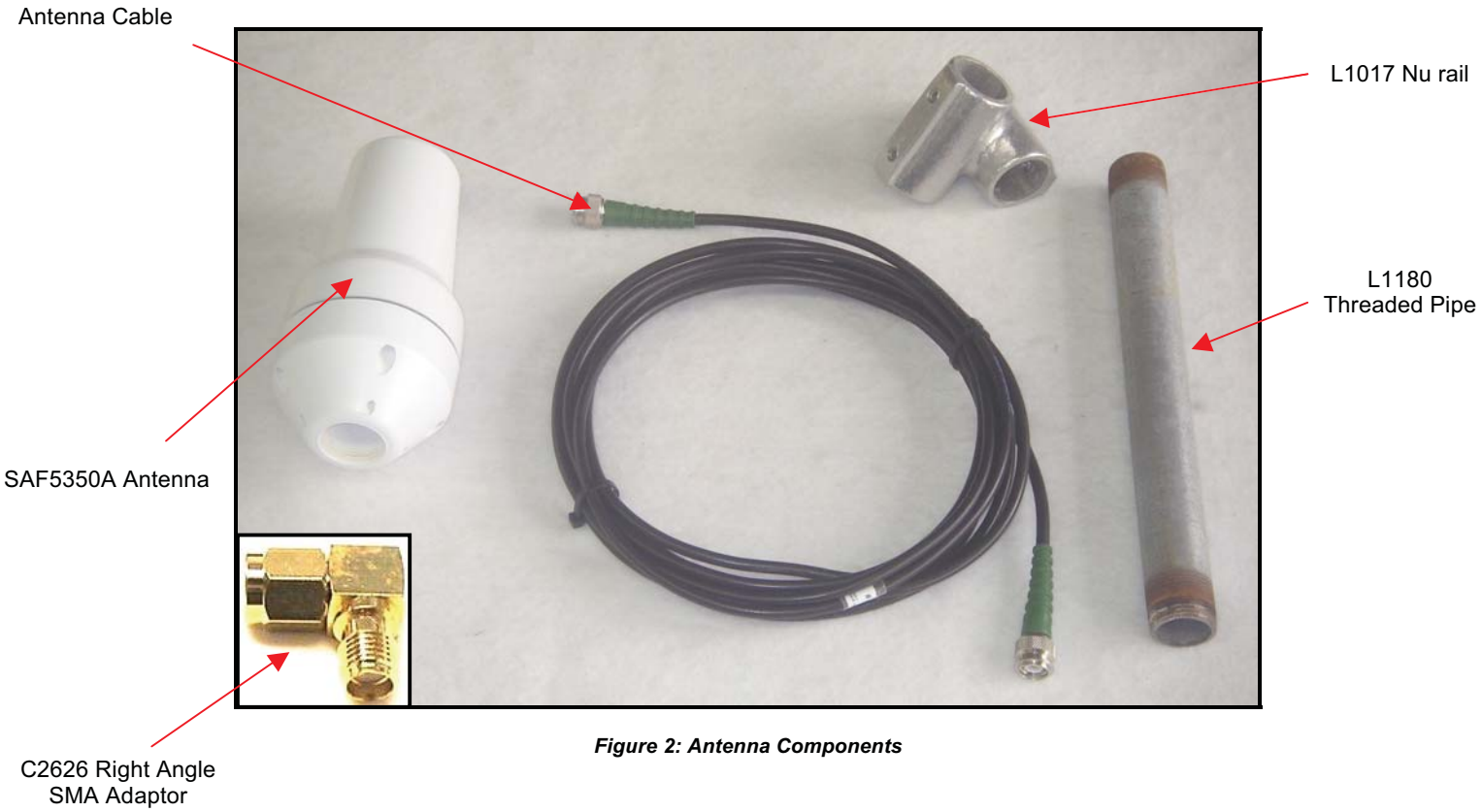

Figure 2: Antenna Components

1.4. *Power Consumption*

The Iridium Modem typically draws 333mA at 12 volts during transmission (max. 2500 mA). The standby current is 125mA (12 volts). The C2462 will be used to control power to the modem with the use of 5V trigger on a datalogger control port (CP: orange wire, G: Black). It is recommended that a separate power source be used for the modem to avoid catastrophic loss of data in case of power failure. The C2462 must draw power directly from the 12V power supply (power +: Red, power -: Black)

1.5. *Where it works*

Unlike other satellite systems the Iridium satellite system is located in a low polar orbit, giving the system complete global coverage.

Their relatively low altitude (780 km) means that they are situated close to transmitting modems and therefore require less transmission energy. Additionally, the Iridium network consists of 66 satellites in eleven planes with an extra 6 satellite reserved as backups. This redundancy potentially gives the iridium system excellent reliability versus other systems that rely on two or three satellites.

2. Iridium SIM card & Modem Setup

2.1. *Iridium SIM Card Use*

Please note that the new SIM cards that come with the Iridium modems are already unlocked. The SIM cards can be activated through Joubeh Technologies at:

21 Thornhill Dr.
Dartmouth, NS, CANADA
B3B 1R9
T: (902) 405-4428
www.joubeh.com

If you require that the SIM card be unlocked please see Appendix C. This should be done before going to the field.

2.2. *Setup of Iridium Modems*

Once the SIM cards are unlocked (Appendix C) it is necessary to set up the base and remote modems using a terminal emulation program such as ProComm, Hyperterminal. The following examples are taken using Hyperterminal, which comes standard with the Windows XP operating system.

2.2.1. Step 1: Hardware Connections

Connect the Iridium Satellite Modem to the C2462 and connect a serial cable from the C2462 to a COM Port on your computer. Connect the C2462 to the power supply.

2.2.2. Step 2: Start Hyperterminal

Open a new session of Hyperterminal from the Start Menu under: Start, All Programs, Accessories, Communications (Figure 4).

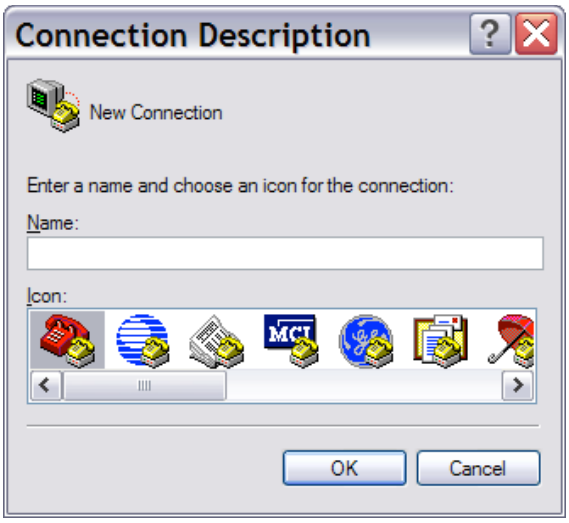

Figure 4: Starting Hyperterminal

Choose a name for the connection. For this example we will use the name ‘Iridium Modem’. Click OK (Figure 5).

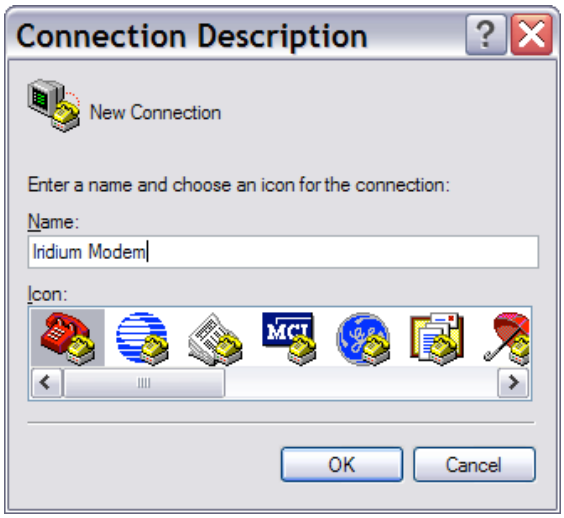

Figure 5: Hyperterminal Session Name

2.2.3. Step 3: Hyperterminal Connection Type

After clicking OK the next screen should resemble Figure 6. This screen allows you to select what type of connection you will establish.

Figure 6: Hyperterminal Connection Type

Click on the pull down tab next to the box marked 'Connect using'. Select the COM port to which the modem is currently connected. In this example we use COM3 (Figure 7). Click OK.

Figure 7: Hyperterminal ComPort Connection

2.2.4. Step 4: Hyperterminal Port Settings

As in Figure 8 this screen allows you to select the port settings required for communications between the Datalogger and modem.

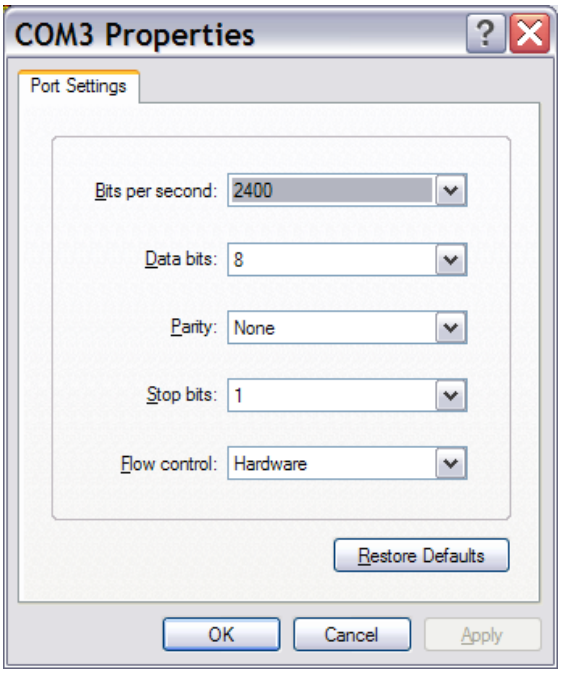

Figure 8: Hyperterminal Port Settings

2.2.5. Step 5: Configuring Port Settings

Select 19200 bits per second (Baud rate) if you are using a modem set at 19200 Baud, which is recommended for the CR800 series, the CR1000, and CR3000 dataloggers (Figure 9). Note that the modems by default are set to autobaud. Click Apply, and then click OK.

Note:	**The datalogger being used at the remote station will dictate which baud rate will be used. For example if you are using a CR10X, then you will set the modem to 9600 Baud.**

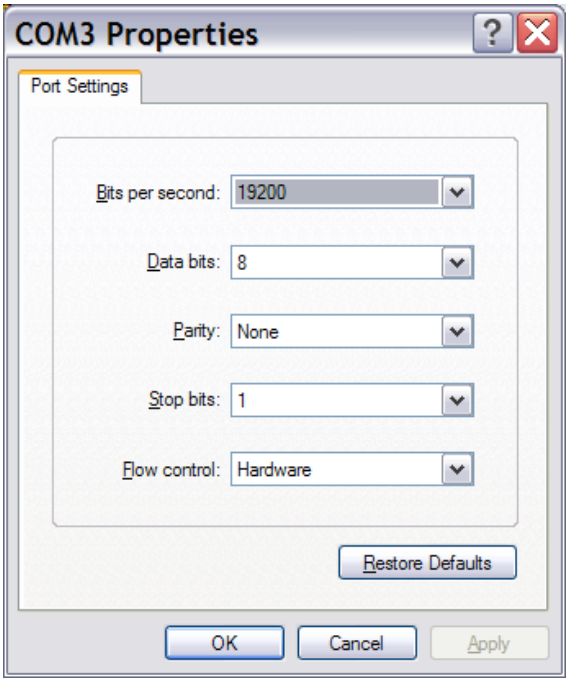

Figure 9: Port Settings Configured

2.2.6. Step 6: Hyperterminal Communications

Once you have clicked OK you should be connected to the modem (Figure 10). The counter in the bottom left hand corner of the screen will inform you that you are connected and begin counting up from 0.

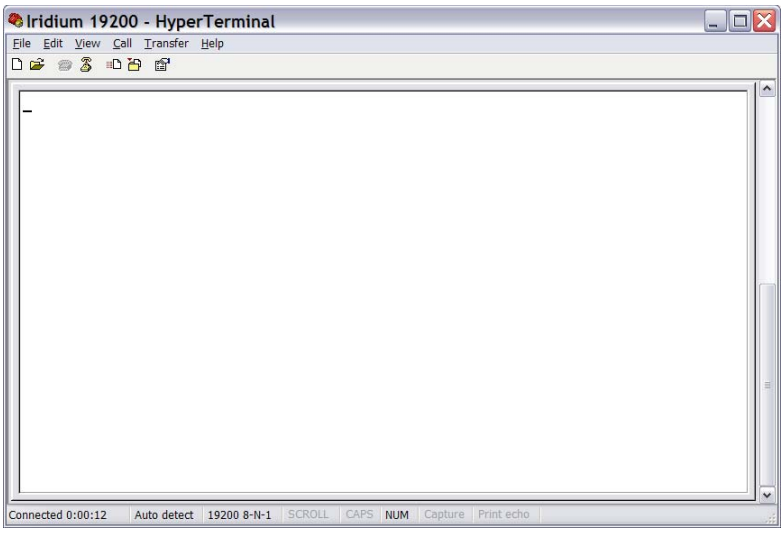

Figure 10: Hyperterminal Screen

Type the following command string that correlates to the datalogger and/or Baud rate being used:

CR1000: **AT&F0 S0=1 &D0 +IPR=6,0 V0 &K0 &W0 &Y0**
CR10X: **AT&F0 S0=1 &D0 +IPR=5,0 V0 &K0 &W0 &Y0**

The appropriate command string will need to be used in both modems.

Press “Enter” once the string has been input. See Figures 11 and 12 for an example.

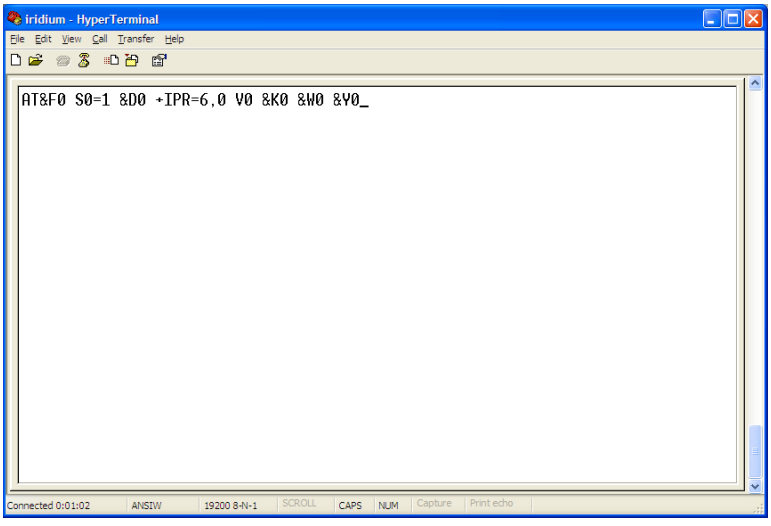

Figure 11: CR1000 AT Command String

The modem should return a 0 in the place of the first character (Figure 12).

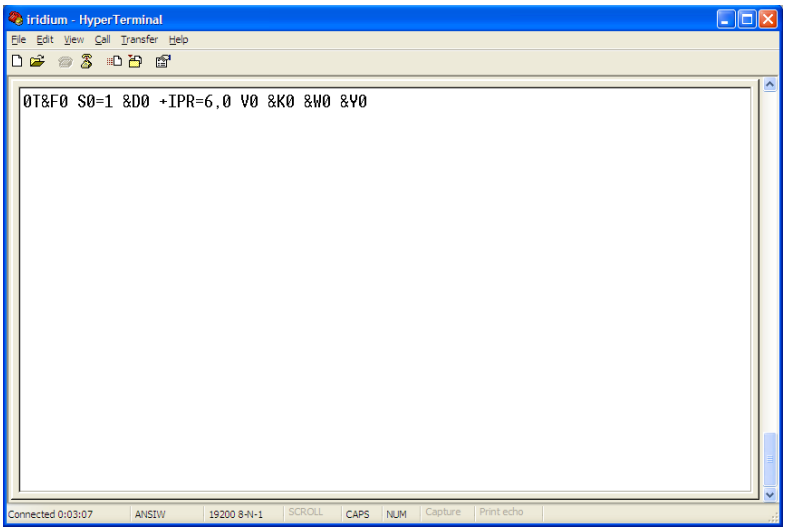

Figure 12: Modem Reply to Command String

To ensure that the settings have been stored in the modem type the command: **AT&V**

The modem will return the following as seen in Figure 13 and should include the elements just added.

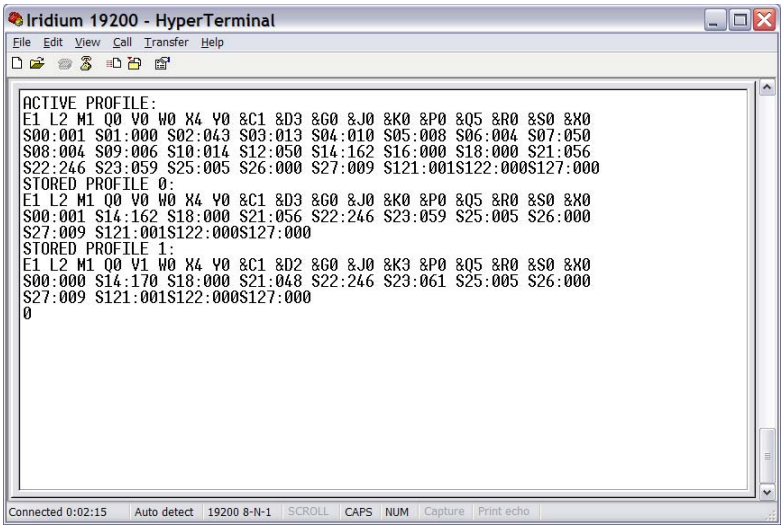

Figure 13: Modem Setting Confirmation

This is a summary of the currently active modem profile and ensures that when power is cycled to the modem it will have the correct auto-answer, DTR, and flow control settings. Exit Hyperterminal and save your settings for later.

3. LoggerNet Configuration

This Section deals with the proper software setup of a remote station in Campbell Scientific's LoggerNet datalogger support software. All screenshots are based on the CR1000 datalogger. Please note that the array based dataloggers (i.e. CR10X) can also be configured in a similar fashion in LoggerNet.

3.1.1. Step 1: LoggerNet Setup

Start the LoggerNet software package and open the Setup applet from the main menu. Start the configuration by clicking on the Add Root button. From the "Add" submenu make the following selections:

- ComPort,
- PhoneBase,
- PhoneRemote,
- Generic,
- PakBusPort
- CR1000

Finally click the close button in "Add" submenu. Your setup tree should appear as in Figure 14.

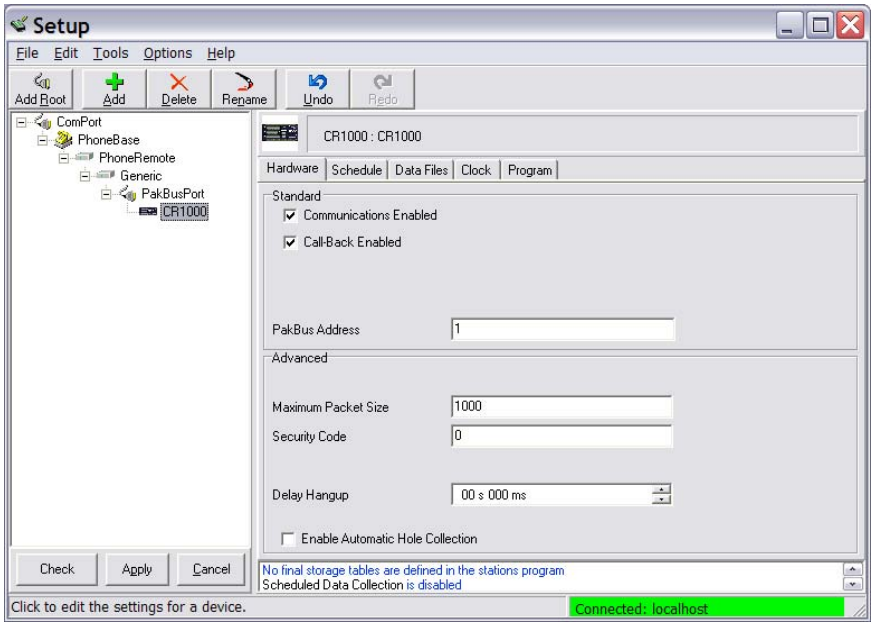

Figure 14: LoggerNet Setup Tree

3.1.2. Step 2: ComPort Configuration

With the Setup tree entered, you will now need to complete the configuration of each element. Start with selecting the ComPort element at the root of the tree (Figure 15). Be sure that the Com Port Connection is correct for the computer used as part of your Base Station, and make sure that the Communications Enabled box is checked. Under Delay Hangup, add a delay of 200 ms. This will prevent LoggerNet from hanging up whenever there is a slight lag in transmission time, which is common in Satellite applications.

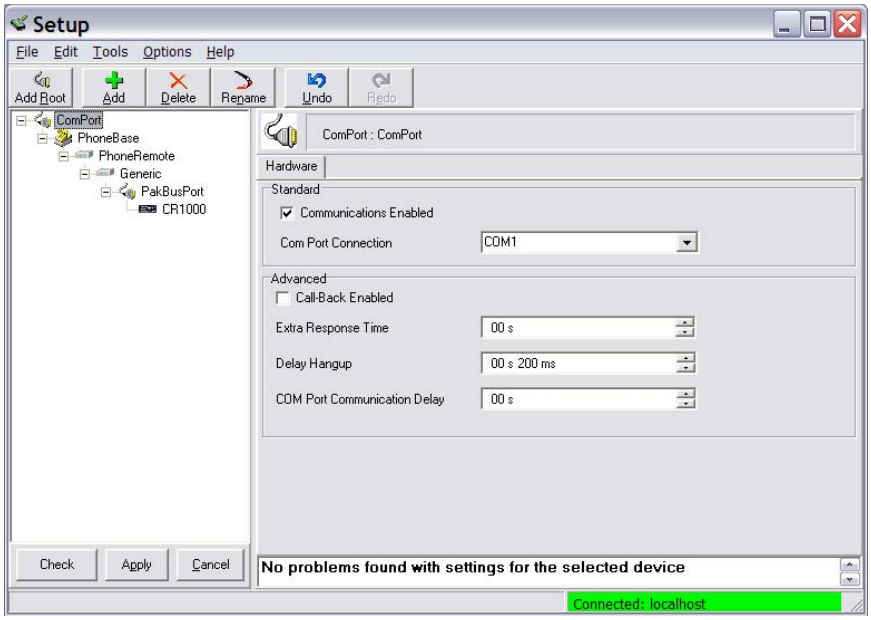

Figure 15: ComPort Configuration

3.1.3. Step 3: PhoneBase Configuration

Select the PhoneBase element as in Figure 16. Be sure the Communications Enabled box is checked. Adjust the Maximum Baud Rate to 19200 Baud (9600 for a CR10X) and add a 200 ms delay. You will need to configure a custom modem initialization string for use with the base modem. Click the Edit Modem Database button. Click the New button, name the string, leave the Reset string blank, and insert only &C0 as the initialization string. Be sure to save the new string (Steps not shown). Move to the PhoneRemote element once complete.

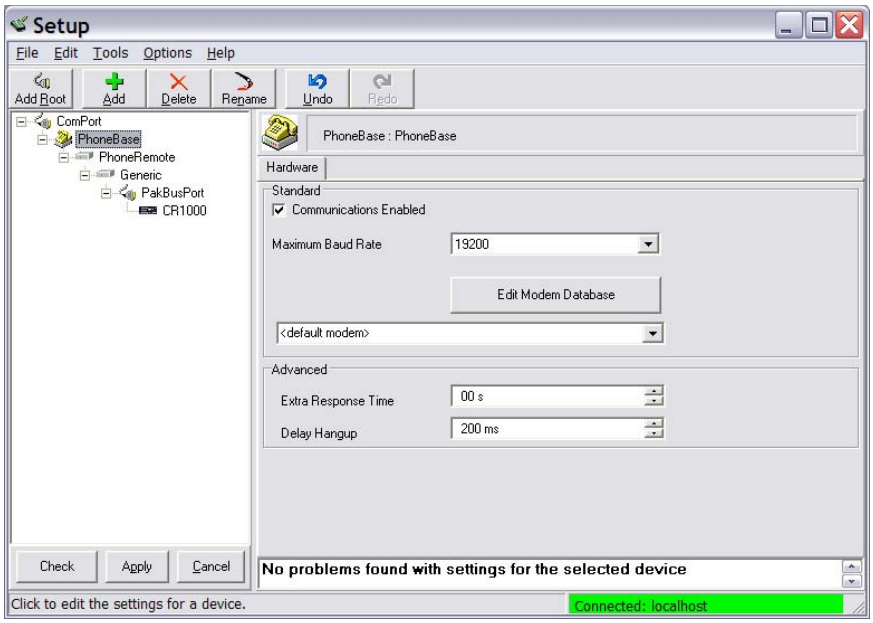

Figure 16: PhoneBase Configuration

3.1.4. Step 4: PhoneRemote Configuration

In the Delay section add 200 ms and in the Phone Number section type “00” followed by the 12 digit data number supplied with the SIM card installed in the modem you will be dialing (Figure 17). Make sure that the Communications Enabled box is checked.

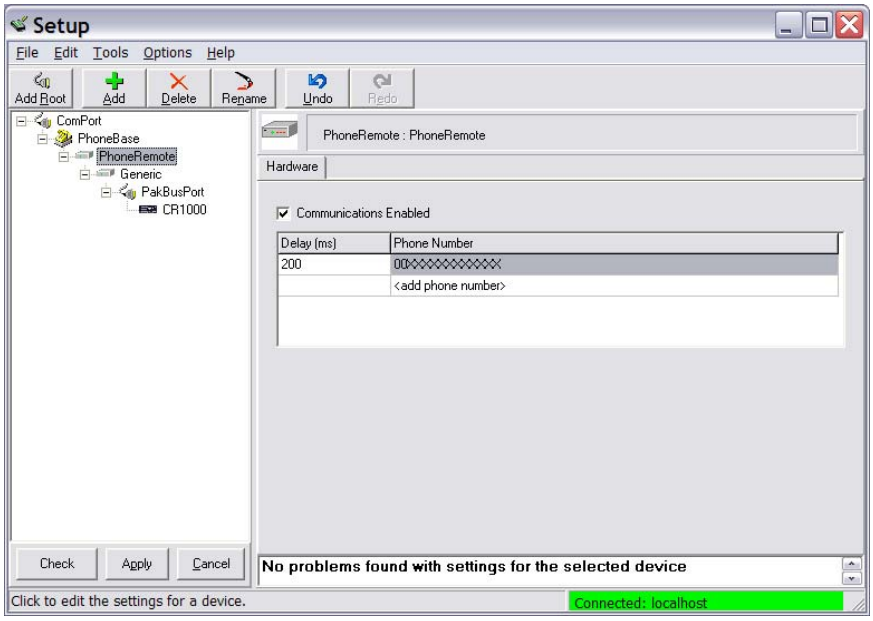

Figure 17: PhoneRemote Configuration

3.1.5. Step 5: Generic Hardware Configuration

In the Generic element be sure that the Communications Enabled box is checked, change the Maximum Baud Rate to 19200 (9600 for a CR10X), add 2 seconds to the Extra Response Time, and add 200 ms to the Delay Hangup (Figure 18). The remaining settings can be left in their default state. Once complete move to Step 6 to finish the configuration of the Generic element.

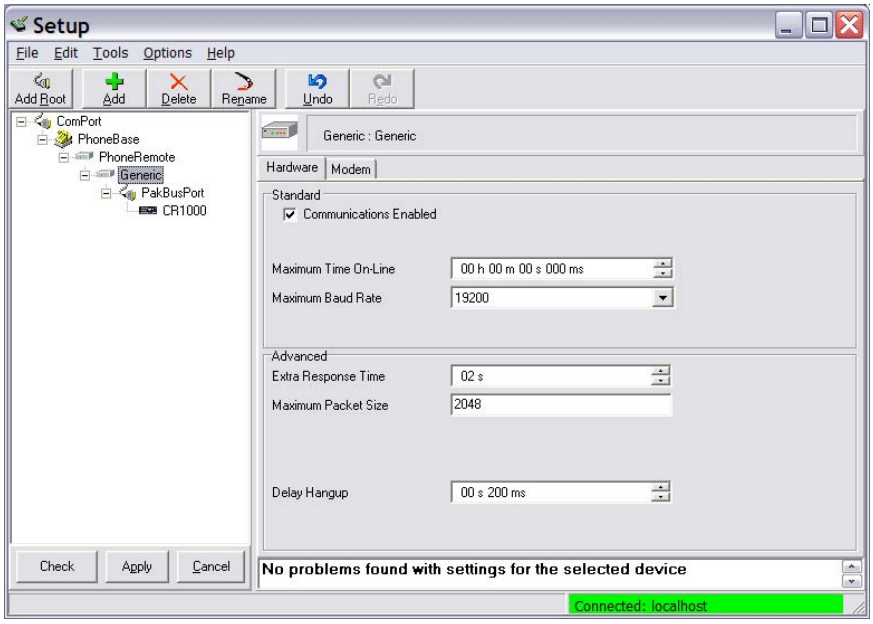

Figure 18: Generic - Hardware Configuration

3.1.6. Step 6: Generic Modem Configuration Continued

Click on the Modem tab located next to the Hardware tab (Figure 19). In the Dial Script box enter D8000. This will program the software to expect an 8 second delay in communications, which is common in many satellite applications. The remaining settings can be left in their default state.

If you are communicating with a PakBus datalogger, follow the configuration listed in Step 7. Otherwise ignore Step 7 and move to Step 8.

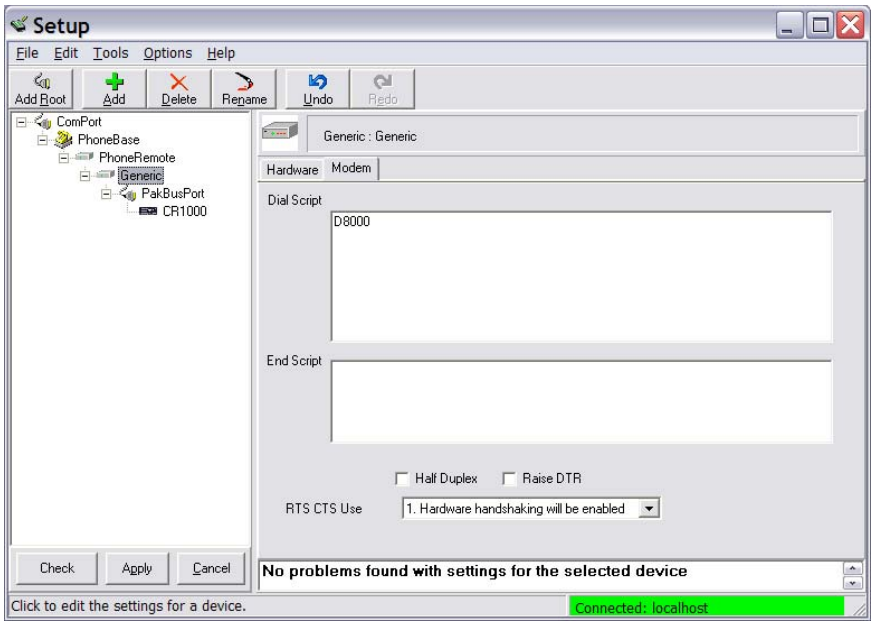

Figure 19: Generic - Modem Configuration

3.1.7. Step 7: PakBusPort Configuration

As in Figure 20, be sure the Communications Enabled box is checked, change the Maximum Baud Rate to 19200 (9600 for a CR10X), and add a 200 ms delay under Delay Hangup. You may change other settings in this configuration to suit your particular application. Once complete move to Step 8 in order to configure the datalogger.

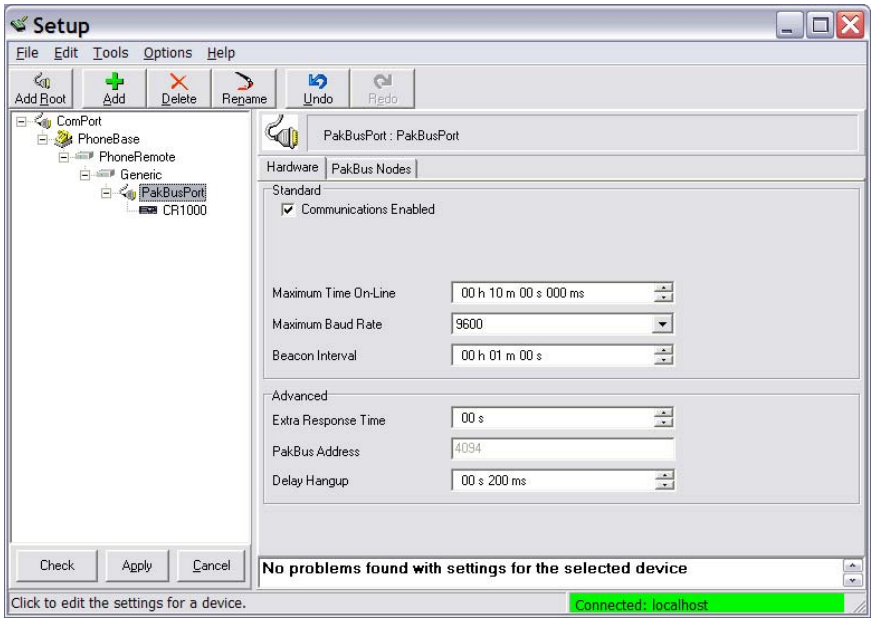

Figure 20: PakBus Port Configuration

3.1.8. Step 8: CR1000 Configuration

Be sure that the Communications Enabled box is checked and that the PakBus Address is correct for the datalogger being used. Add 200 ms under Delay Hangup (Figure 21).

Once all configuration are complete click the Apply button in the lower left hand corner. The station is now set up in LoggerNet.

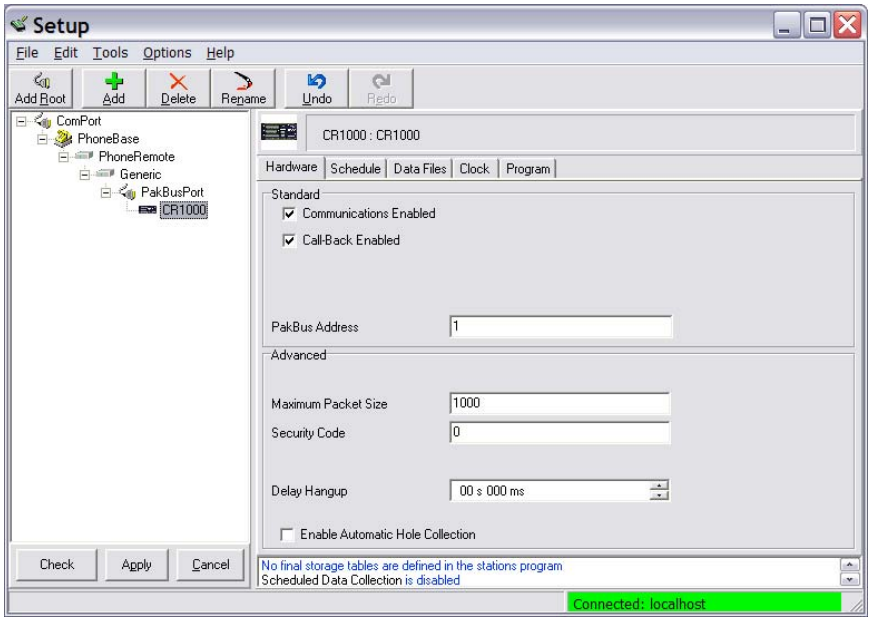

Figure 21: CR1000 Configuration

4. Remote Modem Configuration

As a matter of system redundancy it is recommended that the following programming be used as part of your datalogger program. If this programming is not used it is possible that the remote modem may lose it's configuration. If this occurs remote communication will no longer be available.

The program example is for a CR1000, but is adaptable to the CR800 series, and CR3000 dataloggers. The example is for a solar powered site where power management is a concern. Modem power is controlled by the C2462 via Control port 1. The modem is powered up twice per day for 15 minutes each time. During this time the modem is sent it's configuration via the CS I/O port and the remainder of the time is used for actual communications.

For details on programming for the CR10X contact Campbell Scientific. Please note that the interface between the CR10X and the C2462 requires the use of SC932A CS I/O to RS232 DCE interface.

```
'CR1000 Series Datalogger

'Declare Public Variables
'Variables for Iridium Configuration
Public SetupStr As String * 51
Public configure_modem As Boolean

'Main Program
BeginProg

 'Ensure the control port used to trigger power to the modem is set as an output.
 'In this example control port 1 is used to turn power on/off for the modem.
 PortSet (1,1)
 PortSet (1,0)

 Scan (5,Sec,3,0)

  'Activate Iridium Modems at Noon & Midnight Daily for 15 minutes each time.
  'Allow modem warmup time & check settings (5 minutes) & data transmissions (10
minutes)
  ' *** Use intervals that are applicable for your application ***

  If TimeIntoInterval (715,720,Min) Then PortSet (1,1)
  If TimeIntoInterval (10,720,Min) Then PortSet (1,0)

  'Allow the modem 1 minute for warm up before sending settings. Once settings are
  'sent to the modem allow another 4 minutes to ensure the modem is registered on
  'the network before attempting communications.
  If IfTime (716,720,min) Then configure_modem = true

  If configure_modem = true Then
```

```
    SerialOpen (ComME,19200,0,0,2000)
    Delay (0,1,Sec)

    'Send the correct settings
    SetupStr = "AT&F0 S0=1 &D0 +IPR=6,0 V0 &K0 &W0 &Y0" & CHR(13) & CHR(10)
    SerialOut (ComME,SetupStr,"",0,0)
    configure_modem = false
    SerialClose (ComME)
  EndIf

 NextScan
EndProg
```

5. Troubleshooting Tools and Tips

Problem: I have intermittent successful connections between the remote and base station modem. The signal strength is weak and the data transfer speeds are slow.

Solution: The antenna may not have a complete 180° view of the sky. Some objects and debris such as snow and trees can interfere with communications. Make sure that there are no obstructions to the antennas when installing. You may need to reposition or elevate your antenna to obtain the best reception.

The Signal Quality AT command can be used to confirm signal strength during the installation/repositioning of the antenna. This will require the use of a laptop connected to the C2462 interface and a terminal emulator. Once the terminal emulator is connected the following command can be entered to check signal strength:

AT+CSQ

The modem should return a value of between 0 and 5 within 10 seconds. Attempt to get the largest value during your installation/repositioning.

Problem: LoggerNet immediately brings back an error message saying that communications with the station have failed.

Solution: Sometimes PakBus© beacons sent to other stations by LoggerNet interfere with successful communications using Iridium Satellite Modems. Either turn PakBus© beaconing off or disable communications with your other stations when you attempt to download using Iridium. This can be accomplished in the Setup applet in LoggerNet. Finally, reboot LoggerNet to clear the communications queue of any tasks.

Problem: Loggernet makes several attempts to connect to the remote station with no success. The failure is not immediate and the Loggernet LogTool may show a “No Carrier Detected” error.

Solution: It is possible that the base modem has lost it’s configuration. Resend the configuration as shown in Section 2.2 of this manual and attempt communications again.

Problem: I am using Iridium to communicate through the CS I/O port on my datalogger. Whenever I try connecting with the datalogger LoggerNet reports that communication with the station has failed. This message takes several seconds to appear.

Solution: You may have connected your SC932A device backwards at the remote station. When you install the SC932A it is imperative to make sure that the device is connected in the proper way. Follow the label on the device for the proper connections.

6. Appendix A: Sample Data Transfer Calculations

Note:	**The calculations below are based upon maximum theoretical throughputs. Real world transmission times for the Iridium Satellite Network have proven to be as much as twice as slow.**

When transmitting the data back from the station, the power consumption of the modem must be taken into account in order to avoid excessive discharge of the battery power supply. To get an idea of what the transmission time and associated power drain might be for a typical metrological station, consider the following example:

A station measures wind-speed and direction, precipitation, temperature and relative humidity, solar radiation, and barometric pressure. The datalogger is a CR1000. The monthly data file contains 2 data tables; a small maintenance table and a 30 parameter meteorological data table. The size of a monthly ASCII data file is 124Kb.

If the station's data were downloaded monthly, the time (T) for the data transfer could be calculated as shown below:

$\mathbf{T}_{(Download)}$ = File size (Kb) / Transfer Rate (72 Kb/min)

With a file size of 124 Kb and a transfer rate of 72 Kbytes per minute, the download time is approximately 2 minutes.

If the data were downloaded daily, the file would be much smaller, approximately 5KB. A daily data transfer time would be approximately 5 seconds. Please note that a 4 to 15 second connection time should be added to the above times to account for the initial connection time.

Table 2 below shows the transfer time depending on whether data is collected daily, weekly or monthly.

Collection Interval	File size (Kbytes)	Transfer time
Monthly	124	2 minutes
Weekly	35	30 seconds
Daily	5	5 seconds

Table 2: Data Transfer Time Estimates

The CR10X datalogger generates data arrays which are very similar in size to the table-based dataloggers. For example the station mentioned above generates a 124 Kb meteorological data table and a 2 Kb maintenance table each month. If a CR10X is employed to measure the same parameters the data arrays would be the same size.

Power Calculation

Note:	**When configuring a power supply (i.e. solar panel and battery) for a remote station it essential to design with the worst case scenario in mind. This will help to ensure that the station will perform as expected.**

The power calculation for data transfer can be carried out now that the transfer time is known. The modem has the following power consumption characteristics:

- 0 mA when powered off
- 300 mA stand-by
- 800 mA transmit (2500mA max)

The time slot for powering the modem must be long enough to allow for the complete downloading of the datalogger's data. Refer to Table 2 or make your own calculation based on the collection interval you intend to use.

It is advisable to make the time slot longer than the minimum download time required to allow for initial connection times and possible retries. It is also advisable to arrange the time slot during a time of day when the power supply is its most robust. For a solar powered station this would be the early afternoon.

The periods of power consumption in a day can be divided up as follows:

Period A: the modem is powered off – 0 mA
Period B: the modem powered up in stand-by mode –300mA
Period C: the modem is transmitting the data – 2500mA

Now consider a 35 Kbyte data file size and a datalogger programmed power time slot of 1 hour; the Periods above become:

Period A = 24 hours - Period B – Period C
Period B = 30 minutes – Period C
Period C = 30 Seconds (from Table 2)

We can substitute in the Period B and C values to obtain all Periods:

Period A = 23 hours = 0.0 Ah/Day
Period B = 29.5 minutes @ 130 mA = 0.1475 Ah/Day
Period C = 30 Seconds @2500mA = 0.0208 Ah/Day

The total draw for the data transfer is the sum of the periods, 0.1683 Ah/Day, one day per week.

Note:	**The Ah/Day value is obtained by multiplying the minutes in the Period by the current draw in Amperes and dividing the product by 60.**

7. Appendix B: Hardware Installation

The hardware shown in this Appendix consists only of hardware listed in Table 1. Although it may be possible to use other hardware, it will not be addressed in this Appendix.

Warning:	**Do not connect power to either modem until installation is complete, as damage to the equipment may occur.**

7.1. *SIM Card Installation*

These installation steps apply to both the Base and Remote modems. Be sure that the correct card is installed in the proper modem. Start by removing the cover on the top of the modem (Figure 22). This will require the use of either a 5/64 Allen Key.

Open the card slot by pushing the card holder away from the end labelled “Lock”, until it is able to flip up. Place the card in the slot in the proper orientation shown in Figure 23. The card notch will need to line up with the notch of the card slot. Close and lock the card slot into place (Figure 24). Once complete, replace the housing cover.

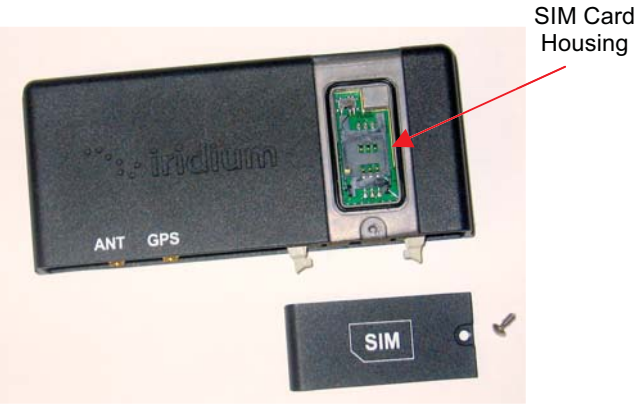

Figure 22: SIM Card Housing

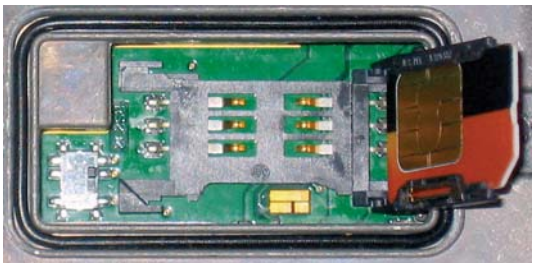

Figure 23: SIM Card Slot

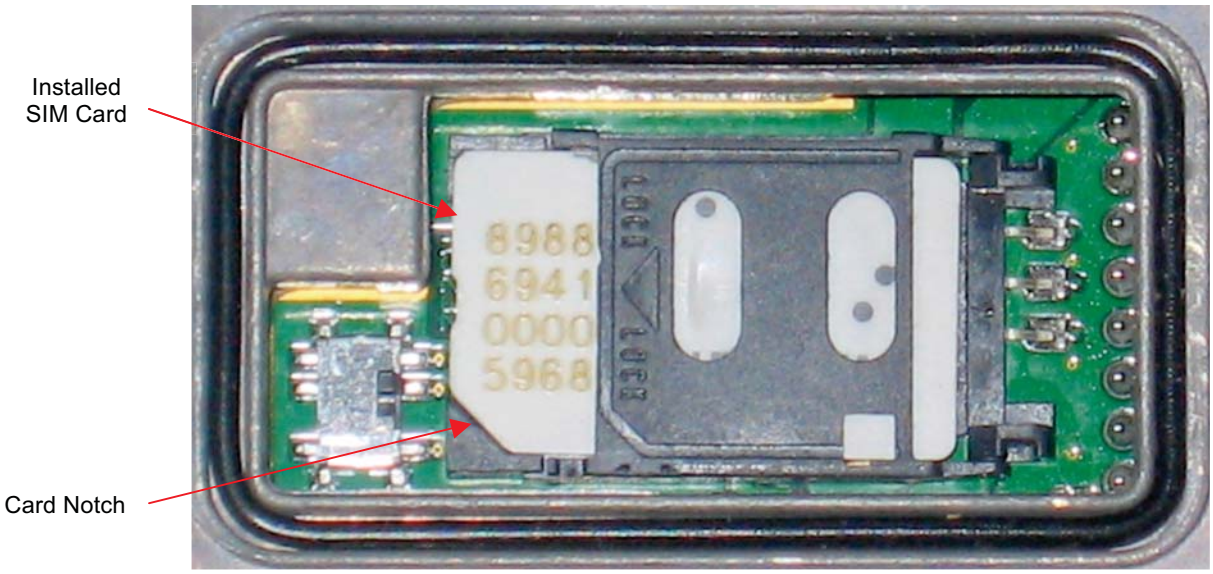

Figure24: Installed SIM Card

7.2. *Antenna Installation*

These instructions apply to both the Base and Remote stations. This installation does not have to precede the modem installation. It should be conducted in the most convenient and logical order.

The installation of the SAF5350A antenna and cable should begin with securing the Nu-rail to the threaded pipe, and then feed the antenna cable through the threaded pipe (Figure 25). Next loosen the four Phillips screws at the base of the antenna and separate the two pieces. Feed the antenna cable through the bottom half and secure the cable to the connector of the other half (Figure 26). Once the cable is in place, reattach the bottom half of the antenna and secure the four Phillips screws. Be sure to use the alignment notches on the two halves before securing the antenna together.

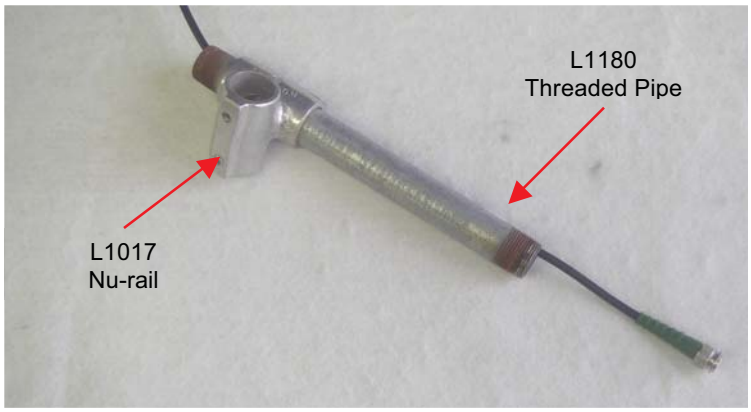

Figure 25: Antenna Mount and Cabling

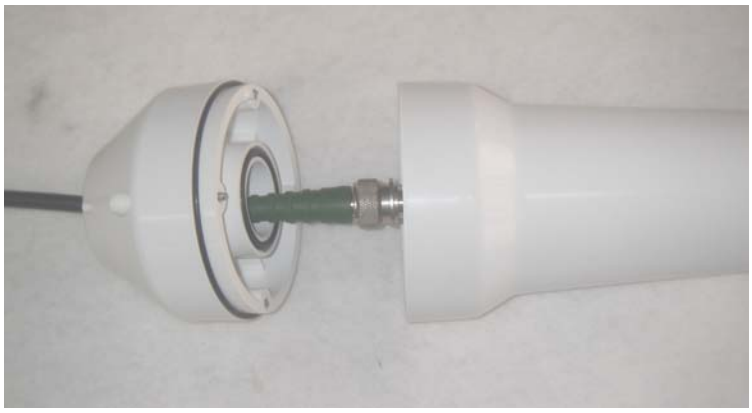

Figure 26: Antenna and Cable Connected

Thread the antenna onto the L1180 pipe, being sure not to cross the threads (Figure 27).

Figure 27: Antenna Attached to Mount

With the antenna attached to the L1180 pipe it is now possible to mount the unit to the structure to be used. As shown in Figure 28 the Nu-rail is mounted to a ¾" by 6' crossarm. It is also possible to use the 019WM or 019WMTOW, which are available from Campbell Scientific. These will allow you to mount the antenna to Campbell Scientific's standard suite of tripods and towers.

Secure the cable at the antenna, providing a dew loop, and secure the remaining cable to the mounting structure.

Figure 28: SAF5350A Antenna Mounted

7.3. *9522B Modem Installation*

The Base station installation should be conducted before proceeding to the field to conduct the Remote station installation. With the Base station installed first, it will provide the opportunity to test the communications from the Base station before going to, and/or while still in the field. If there is a malfunction, you may be able to address the problem without having to return to the Remote station.

The modem installation should employ the following steps:

1. Secure the L14394 mount and the 9522B interface in the enclosure in appropriate locations. Be sure to keep in mind all cable runs (i.e. antenna, power/control, and interface). The SC932A can be secured in the same L14394 as the 9522B.
2. Connect the ribbon cable of the 9522B interface to the modem. Connect the other end of the ribbon cable to the 9522B interface.
3. Connect the L10873 serial cable (base station) to the data port of the interface to the PC serial port. For the remote station connect the L10873 serial cable between the C2462 data port and the SC932A DCE port.
4. Connect the SC932A Datalogger port to the CS I/O port with a SC12 cable.
5. Connect the Antenna Cable to the “ANT” connector of the modem. Use the C2626 right anlge adaptor between the antenna cable and modem to reduce cable strain.
6. Connect the bare leads of the 9522B interface to datalogger and power supply. Start your connections with the power control leads. Be sure power is off an the power supply when making these connections.

Once all the items are attached, power can be applied to the modem.

8. Appendix C: Unlocking a SIM Card

There are two methods to unlock a SIM Card, and the equipment you have available will dictate which method is used.

8.1. *Handset Method*

To unlock the Iridium SIM card permanently using the Iridium Handset follow these instructions.

Install the SIM card, attach the antenna, and 9522B interface. Attach the handset as required. Apply power to the modem.

The handset will request the PIN number before proceeding. Once you enter the PIN number (default 1111) the modem will register itself. You will need to navigate the menus of the handset as follows:

- Find “PHONE SETUP”, click ok
- From this menu select “REQUIRE SIM PIN”
- Navigate until “OFF” is displayed, select by clicking ok
- Exit out of the menus once the PIN requirement is deactivated.

With the card unlocked you can continue with your modem setup.

8.2. *Terminal Emulator Method*

In order to unlock the SIM cards with this method you will need a terminal emulator like Hyperterminal. The configuration will need to be same as list in Section 2.2 of this manual. Refer to Section 2.2 for this setup.

NOTE: Both SIM Cards must be unlocked.

When conducting these steps you will need to have the SIM Card installed in the modem. The antenna must be connected, and have a sky view for communications with the satellite network. Finally the unit must be powered. Refer to the appropriate Sections of this manual for information about these requirements.

Once the modem and terminal emulator are ready enter the following command:

AT+CPIN? <Enter>

The command requests that the modem respond as to whether a password is required. The expected modem response is:

+CPIN: SIM PIN

The response confirms that the SIM Card PIN1 code is required to unlock the Card. If you get a different response, contact the SIM Card provider to determine if a different code is required. If you get a response of "**+CPIN: SIM PIN2**" this may mean that the Card is already unlocked or requires a different code.

The next step is to enter the PIN code for the SIM Card.

AT+CPIN="1111" <Enter>

The modem should response with an **"OK"** which means the PIN code has been accepted. This explanation assumes that the default code of "1111" is being used. If you get an "**ERROR**" reply, be sure that the command was entered as shown. If you continue to get an error response, contact the SIM Card provider to determine if a different code is required.

The next step is to enter the command to deactivate the PIN code requirement. If your PIN code is different from the "1111" then use this in the command in its place.

AT+CLCK="SC",0,"1111" <Enter>

The modem should respond with an **"OK"** which means the command has been accepted. If you get an "**ERROR**" reply, be sure that the command was entered as shown. If you continue to get an error response, contact the SIM Card provider for further information.

The final step should be to test that the SIM Card is unlocked and will remain unlocked. Start by powering down the modem and then reapplying power. Allow the modem to warm up for about 30 seconds. The test consists of attempting to dial the 12-digit data number for the other SIM Card in the terminal emulator.

ATDT00<12-DIGIT DATA #> <Enter>

If you are able to dial the number without getting a prompt for a PIN code then the code requirement is deactivated. The modem should respond with "**NO ANSWER**" after several seconds. This assumes the other modem is not communicating.