GEOKON®

Instruction Manual

Model 8600-1

Micro-6000 Multi-Channel Datalogger

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1. OVERVIEW

The MICRO-6000 Datalogger is designed to support the reading of a large number of GEOKON Vibrating Wire Instruments for various unattended data collection applications through the use of GEOKON's Model 8032 Multiplexers. Weatherproof packaging allows the unit to be installed in field environments where inhospitable conditions prevail. The Nema 4X enclosure also has a provision for locking to limit access to responsible field personnel.

A basic Datalogger system consists of the Micro-6000 Datalogger and a Multiplexer. Multiplexers expand the system by increments of 16 or 32 channels depending on the instrument type and configuration. The standard Micro-6000 Datalogger can support up to six Multiplexers. The External Multiplexer ports can also be used to "daisy-chain" up to eight Multiplexers each (please see 8032 Manual for more information).

2. SOFTWARE

The Micro-6000 Datalogger is operated by a download file that is generated by a software program. If required, GEOKON supplies LoggerNet software (developed by Campbell Scientific, Logan, Utah). Please refer to the manual supplied with the software for instructions on installing the software and creating the required download file for Datalogger operation. A basic starter CRBasic program (STARTPROG) can be provided upon request. LoggerNet 4.3+ is required for the CR6 Datalogger.

3. HARDWARE

The controller portion of the MICRO-6000 Datalogger consists of a Campbell Scientific CR6 Measurement and Control Datalogger. To gain an understanding on the workings and capabilities of the CR6 it is necessary to read the Overview section of the CR6 User Manual. The CR6 User Manual is available in pdf format at:

https://s.campbellsci.com/documents/us/manuals/cr6.pdf

The CR6 Datalogger provides the required excitation and signal processing for the Vibrating Wire sensors connected to the Datalogger. The CR6 uses Campbell Scientific's VSpect spectral analysis to find the resonant frequency of the GEOKON Vibrating Wire Gauge. The CR6 is also used to measure the thermistor used in GEOKON's Vibrating Wire instruments. For complete specifications of the Vibrating Wire Measurements please refer to the CR6 Datalogger User Manual.

A provided IP68 rated Regulated AC charger is used to provide the charging voltage for proper maintenance of the installed lead acid battery. An internal power distribution circuit board contains fused terminal blocks used to provide a nominal 12 VDC supply for the CR6 Datalogger and accessories. A regulated Solar panel can be used in place of the regulated AC charger assuming the maximum short circuit current does not exceed six amps.

The Model 8032 Multiplexer expands the number of channels that can be read by the MICRO-6000 Datalogger. The channel switching is accomplished by mechanical relays mounted on the underside of the circuit board and the transducer connections are accomplished by friction locking terminals. Power, Reset and Clocking for the Multiplexer are supplied by the MICRO-6000. The Model 8032 Multiplexer can be configured for 16x4 or 32x2 channels depending on the application. Please see the Model 8032 Instruction Manual for more information.

A 12V - 7Ah lead acid battery is used to provide power for the Datalogger. The battery supports operating power for a limited period of time should the AC or solar power, used to maintain the battery, be interrupted. Under normal operating conditions and proper maintenance, the life expectancy of the battery is approximately five years.

3.1 Installation

The recommended method of installation involves attaching the various enclosures (MICRO-6000 and Multiplexers) to a fixed structure, such as a wall, in an upright position (Figure 1). Mounting dimensions shown in inches.

Figure 1 - Typical Micro-6000 Configuration

3.2 Power

After the Datalogger is installed the GEOKON Regulated AC Charger or Regulated Solar Panel can be connected to the three-pin charger port on the Datalogger. The supply voltage to the Micro-6000 will be "Off" by default and the On/Off switch SW1 on the Power Distribution circuit board should be switched to the "On" position (Figure 2). The Internal Lead Acid battery will charge in either position. It is recommended that the charger be left plugged in at all times (See Section 4.1 for more information). Additionally, a GEOKON Unregulated AC Charger or Solar Panel can be used as the three-pin charger port is also wired to the CR6 built in Charge Regulator.
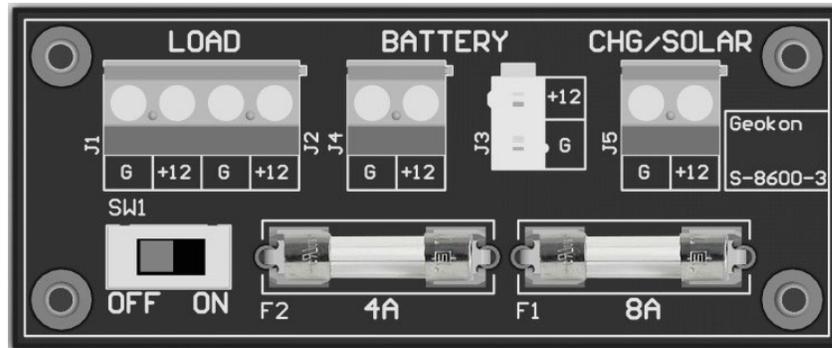
Figure 2 - Power Distribution Circuit Board

3.3 Earth Ground

An earth grounding lug is supplied on the exterior of the Micro-6000 enclosure to connect the system to earth ground (Figure 3). A grounding rod can be driven (or other suitable attachment to earth utilized) to ground the system and provide a path to earth for protection against a lightning strike or other transient voltage. A two to two and a half meter (six to eight foot) copper grounding rod connected to the Dataloggers grounding lug with a large gauge wire (12 AWG or larger) is recommended. The earth connection should be made as close to the Datalogger as possible.
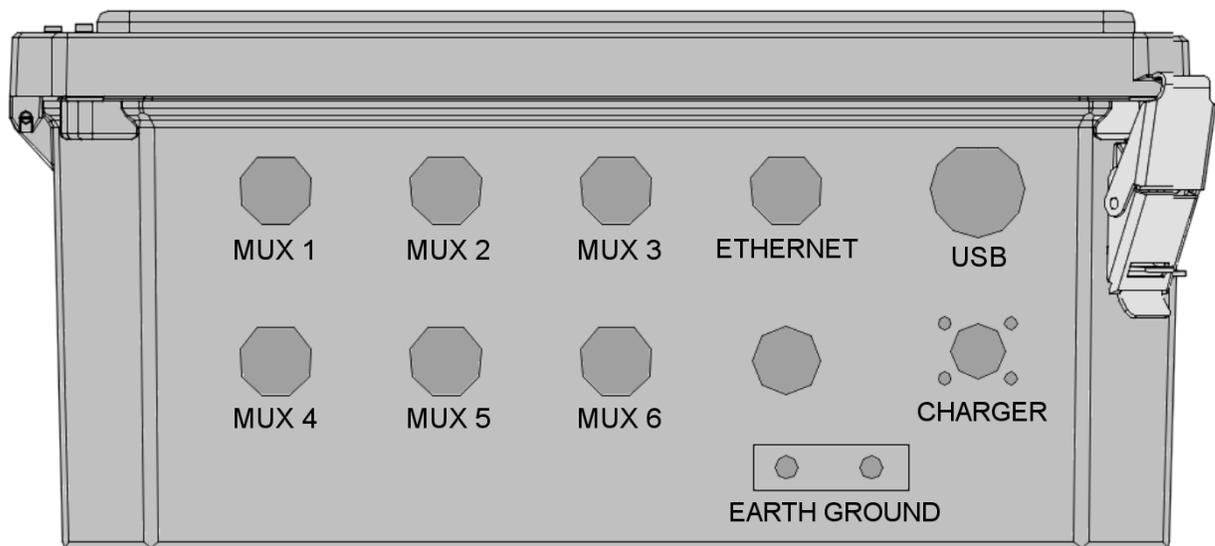
Figure 3 - Typical Bottom View MICRO-6000

3.4 Gauges

Following enclosure installation, GEOKON Vibrating Wire sensors can be connected to the Multiplexer(s). Please refer to the Multiplexer instruction manual for the appropriate connection description. Addition Start Guides can be provided for other types of gauges or custom configurations.

3.5 Multiplexers

Following sensor and installation, connections between a Datalogger and Multiplexer(s) can be made using the model 8032-5 interconnect cable. Each Multiplexer employed is connected to the appropriate weather tight 10-pin Bendix connector mounted on the enclosure (Figure 3). Each connector on a standard Datalogger is prewired to control and read the external Multiplexers.

3.6 Communications

3.6.1 USB communication

Standard direct communications with the Datalogger is established by connecting the Micro-6000 USB port (Figure 3) to an available USB port on the computer. A one-meter (three foot) COM-113 USB A-A Male cable is supplied with every new order.

A USB Driver for the CR6 must be installed prior to communications. The Device Configuration Utility can be found under Utilities on the main LoggerNet Screen.

3.6.2 Ethernet communication

Ethernet communications with the Datalogger is established by connecting the Micro-6000 Ethernet port (Figure 3) to an available Ethernet port on the computer. A two-foot COM-132 Ethernet 10/100 Base-T Crossover cable is supplied with every new order.

The CR6 must first be programmed with the user assigned IP Address using Device Configuration Utility (available on Campbell Scientifics Web site). Select the correct Device Type (CR6) and connect. Make necessary changes to the Ethernet tab and save (Figure 4). The IP Address, Subnet Mask, and IP Gateway should be provided by your Network Administrator or IT personnel.
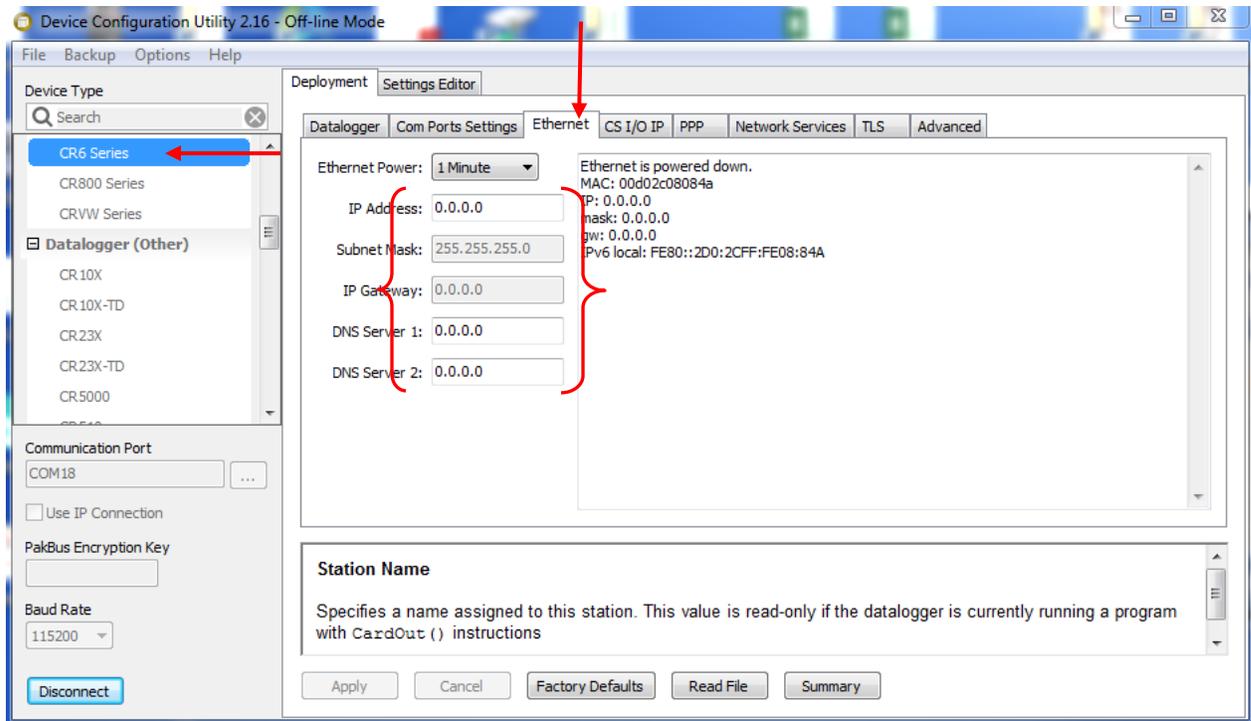
Figure 4 - Ethernet Settings

After the device configure utility has been setup, LoggerNet Software must be configured.

To add a communication port in LoggerNet, press the "Add Root" button and then select "IPPort" (Figure 5).

Figure 5 - Add Communication Port

Next, Select "PakBusPort (Other Loggers)" (Figure 6)
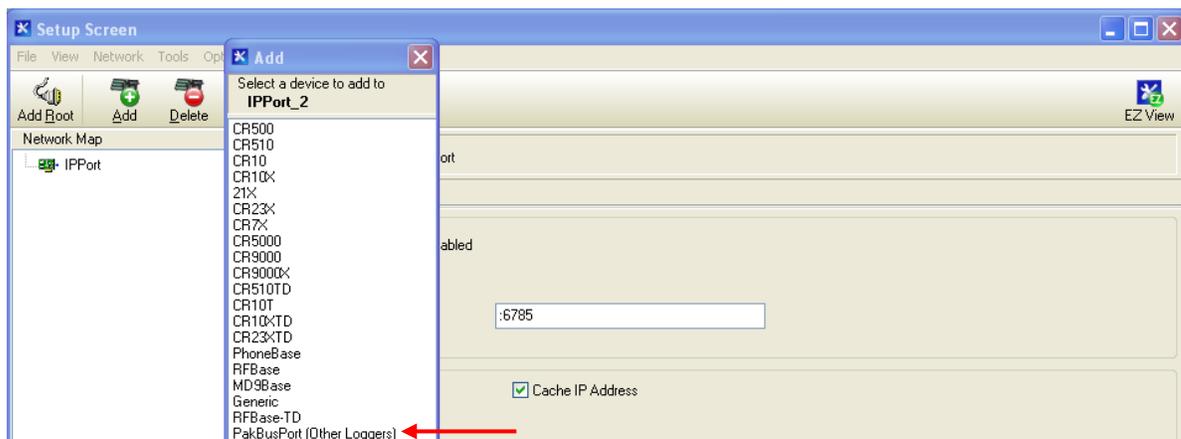
Figure 6 - Select "PackBusPort"

Finally, select "CR6 Series" and then click "Close" (Figure 7).
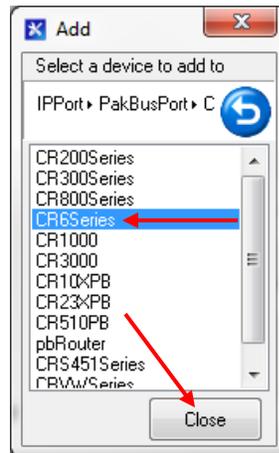
Figure 7 - Select CR6Series

After closing the "Add" window, press the "**Apply**" button located at the bottom left of the Setup Screen.

Next, enter the IP Address. The IP Address must be followed by "**:6785**" (see Figure 8). which represents the default port of the CR6 10/100 Ethernet.
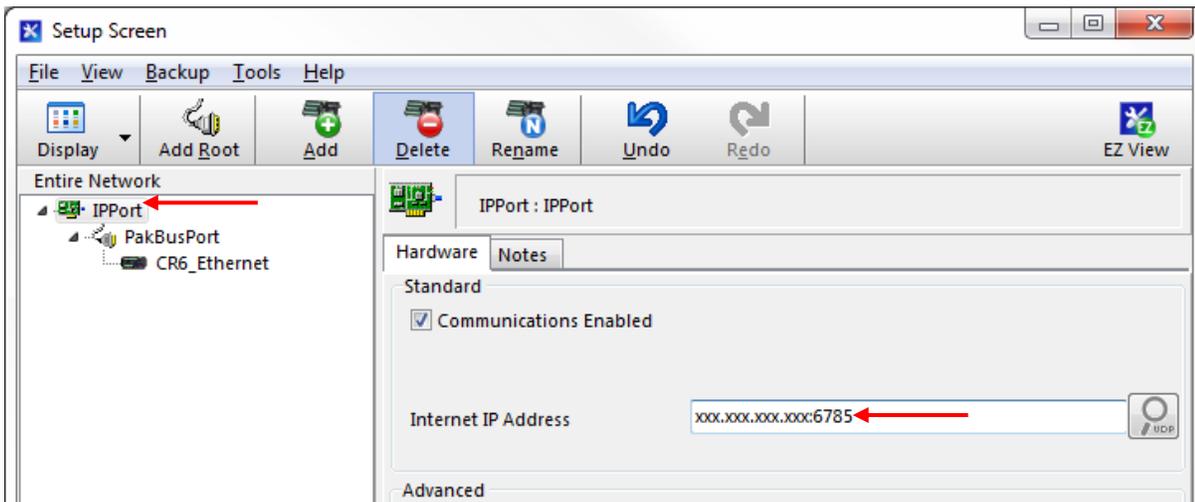
Figure 8 - Add IP Address

When finished, press the "**Apply**" button at the bottom left of the Setup Screen. Minimize or close the Setup Screen and go back to the LoggerNet Launch Menu.

4. BATTERY MAINTENANCE

4.1 AC Power

The MICRO-6000 is supplied with an external AC to DC Rain Proof Regulated Smart Charger for maintaining the charge of the internal battery which provides power to the Datalogger and peripherals. It is imperative that a regulated charging source remain connected to the Datalogger as the battery installed in the Datalogger is only provided as a temporary source of power should the power supply be disconnected or mains power interrupted. Actual run time, solely on battery power, will vary for each Datalogger system and depends on the hardware configuration and sensor scan interval. If the battery voltage drops below 9.6 volts operation of the Datalogger will become erratic as evidenced by communication problems and possible improper measurements. Additionally, a GEOKON unregulated AC charger can be used as the three pin Charger port is also wired to the CR6 built in Charge Regulator.

4.2 Solar Power

If AC mains power is not available, a properly sized regulated solar panel can be used to provide power to maintain the charge state of the battery. The size of the solar panel is determined by geographic location of the Datalogger, hardware configuration, communications interval and the sensor scan interval. Additionally, a GEOKON Unregulated Solar Panel can be used as the three pin Charger port is also wired to the CR6 built in Charge Regulator.

4.3 External Battery

Additionally, a large external battery, such as a deep cycle marine battery, can be connected to the Datalogger via the supplied external power cable to provide power to the Datalogger and peripherals. When using this type of battery, the internal battery should be manually disconnected from the system to prevent parasitic drain on the external battery.

4.4 Battery Replacement

If the internal Lead Acid Battery has failed <u>it is recommended that the unit be returned to the factory for service by GEOKON personnel.</u> However, with skilled personnel and appropriate tools, it is possible for the user to replace the battery. Consult the factory for information.

4.5 Fuses

There are two fuses on the internal Power Distribution Board of the MICRO-6000 (Figure 2). Once removed and with the power switch off, a fuse can be checked visually and with an ohmmeter. A gap may be evident (with some discoloration) if the fuse needs replacing. This can be verified by a high resistance measurement (megaohms) with an ohmmeter. If fuse needs replacing, insert one of the supplied replacement fuses. If there are no replacement fuses available, consult the factory or they can be purchased from an electrical supply house. The F1 charger fuse is an eight amp SLO-BLO 5x20 mm and the F2 fuse is a four amp SLO-BLO 5x20 mm. Consult Appendix D.6 for fuse assignments.

5. TROUBLESHOOTING

This section will NOT attempt to cover all possible problems that could be encountered in the course of Datalogger operations. Consult the factory if other problems arise or remain unresolved.

Symptom: Cannot communicate with the Datalogger:

✓ The USB Driver for the CR6 has not been installed on the host computer. See LoggerNet - Utilities - Device Config Utility.

✓ Verify the CR6 USB Driver has been properly installed.

✓ The wrong USB communication port is being selected in the LoggerNet Setup Screen (refer to Device Manager of PC for assigned COM Port). Consult the appropriate software manual for instructions on changing the communication port.

✓ The USB communication port on the host computer is defective. Verify the functioning and configuration of the COM port by using it with another USB device, such as a camera or cellular phone.

✓ The Datalogger Load Fuse (F2) on the Power Distribution Board is blown. Consult Section 4.5 for checking and/or replacement.

Symptom: The system battery voltage and panel temperature read odd numbers:

✓ The system battery could be low. Charge and check again (see Section 4, Battery Maintenance).

✓ A disruptive current loop may be operating as a result of improper grounding or excessive noise. Consult the factory for more information.

Symptom: The internal battery measurement does not increase when charging:

✓ The AC Regulated Charger may be damaged. Check the output pins of the adaptor with a voltmeter.

✓ The Charger fuse (F1) of the Power Distribution Board is blown. Consult Section 4.5 for checking and/or replacement.

✓ The internal battery is no good. Consult the factory.

✓ The Regulated Solar Panel may be damaged, obstructed or have poor sun exposure. Check the output pins of the adaptor with a voltmeter. Verify Solar Panel is not obstructed.

Symptom: The Datalogger will not operate on external power:

✓ The external voltage supply is below operating limits. If the external source is a battery, charge it. If it is a power supply, check the output with a voltmeter.

✓ Verify both Load and Charger Fuses on Power Distribution Board (Refer to Section 4.5).

Symptom: Loss of Micro-6000 program and/or data:

✓ The system has experienced a voltage dropout or surge which disrupted operations.

✓ The surge originated as a result of lightning. Install appropriate grounding. Install lightning protection devices on all incoming and outgoing lines (consult factory).

✓ Verify .CR6 Program is running on the Datalogger (See Appendix E).

Symptom: Sensor readings show "NAN" or are unstable:

✓ The wrong sensor type has been connected. Check the model number of the sensor against the requested sensor list.

✓ The cable(s) to the sensor(s) have been damaged permitting moisture and debris to enter the jacket. Wires may be shorted together. Inspect the cable and perform Ohm test to check for short circuits.

✓ If all sensors on a particular Multiplexer are erratic or returning "NAN" perhaps the Multiplexer or cable has been damaged. Inspect the cable. Try another cable to verify proper functioning.

✓ The sensor(s) have ***been*** damaged. For example, overrange on a vibrating wire sensor can cause erratic readings.

✓ There is an electrical noise source nearby. Move the sensor, cables, and Datalogger away from the noise source. Install grounding devices. Consult the factory.

APPENDIX A. SPECIFICATIONS

A.1 Model 8600-1 Datalogger

Analog Inputs	12 single-ended or 6 differential with ±5000 mV, ±1000 mV, ±200 mV ranges 24 bit ADC
Analog Outputs	±2.5 V or ±2.5 mA ranges 12 bit DAC
Analog Accuracy	±(0.04% of reading + 2 microvolts), 0-40 °C
Analog Resolution	50 µV (±200 mV range, differential measurement, input reversal, 5 Hz f_{N1})
Static Frequency-Analyzed Vibrating Wire	12 V p-p 100-6000 Hz (Spectral analysis technique)
Vibrating Wire Accuracy	±0.013% of reading
Vibrating Wire Resolution	0.001 Hz RMS
Thermistor Accuracy	±0.25% of reading
Temperature Range	-40 to +80 °C
Battery	12 V, 7 Ah Gel Cell
LxWxH	392 x 352 x 161 mm (15.43 x 13.85 x 6.34 in.)

Table 1 - 8600-1 Specifications

A.2 CR6 Measurement and Control Module

Please refer to Campbell Scientifics Specification for the CR6 Datalogger

https://s.campbellsci.com/documents/us/product-brochures/s_cr6.pdf

A.3 Model 8032 Multiplexer

Please refer to the GEOKON Model 8032 Multiplexer Manual.

http://www.GEOKON.com/content/manuals/8032_Terminal_Board_and_Multiplexer.pdf

APPENDIX B. SHIP LIST

B.1 Hardware

The following equipment is included with the system:

- External Power cable
- USB A Type Male to Male, one-meter length
- Ethernet 10/100 Base-T Crossover Cable, two-foot length
- Small regular screwdriver
- Three spare Slo-Blo fuses, four and eight amp
- AC Smart Regulated Charger Rain Proof

The following manuals are included:

- MICRO-6000 Instruction Manual
- Campbell Scientific Resource disk
- 8032 Multiplexer Instruction Manual (if Multiplexers provided)

Optional accessories:

- Cellular Phone Modem Install Kit with Start Guide (Modem Provided by Customer)
- Micro-SD memory Card
- Regulated Solar Panel with mounting hardware
- RF Modem with manuals (wireless Datalogger communication)
- Datalogger Starter CRBasic Program
- Custom CRBasic Programming
- WIFI Communications Modem
- RF Whip or High Gain Antennas with mounting hardware

Consult the factory for additional information on any of the optional accessories.

APPENDIX C. DATA STORAGE

C.1 Data Storage

Total Arrays of Data that can be stored per 16 Channel Multiplexer. Each array contains all Data stored at each read interval.

# of Multiplexers	Total # of Arrays Available per Multiplexer
1 Multiplexer Array Storage	496,652
2 Multiplexer Array Storage	269,611
3 Multiplexer Array Storage	185,026
4 Multiplexer Array Storage	140,841
5 Multiplexer Array Storage	113,690
6 Multiplexer Array Storage	95,316

Table 2 - Total Number of Arrays Available per Multiplexer

C.2 Data Storage Example

C.2.1 Overwrite Times when Data is Stored Once a Minute

	Minutes	Hours	Days	Total Arrays
1 Multiplexer Overwrite Time:	496,652	8,277	344	496,652
2 Multiplexer Overwrite Time:	269,611	4,493	187	269,611
3 Multiplexer Overwrite Time:	185,026	3,083	128	185,026
4 Multiplexer Overwrite Time:	140,841	2,347	97	140,841
5 Multiplexer Overwrite Time:	113,690	1,894	78	113,690
6 Multiplexer Overwrite Time:	95,316	1,588	66	95,316

Table 3 - Amount of Time Until Data Overwrite Occurs when Data is Stored Every 60 Seconds

C.2.2 Overwrite Times when Data is Stored Once an Hour

	Hours	Days	Years	Total Arrays
1 Multiplexer Overwrite Time:	496,652	20,693	56.6	496,652
2 Multiplexer Overwrite Time:	269,611	11,233	30.7	269,611
3 Multiplexer Overwrite Time:	185,026	7,709	21.1	185,026
4 Multiplexer Overwrite Time:	140,841	5,868	16	140,841
5 Multiplexer Overwrite Time:	113,690	4,737	13	113,690
6 Multiplexer Overwrite Time:	95,316	3,971	10.9	95,316

Table 4 - Amount of Time Until Data Overwrite Occurs when Data is Stored Every 60 minutes

C.2.3 Overwrite Times when Data is Stored Once a Day

		Hours	Days	Years	Total Arrays
1 Multiplexer Overwrite Time:		571,200	496,652	1,359.7	496,652
2 Multiplexer Overwrite Time:		308,664	269,611	738.2	269,611
3 Multiplexer Overwrite Time:		211,800	185,026	506.6	185,026
4 Multiplexer Overwrite Time:		161,232	140,841	385.6	140,841
5 Multiplexer Overwrite Time:		130,128	113,690	311.3	113,690
6 Multiplexer Overwrite Time:		109,104	95,316	261	95,316

Table 5 - Amount of Time Until Data Overwrite Occurs when Data is Stored Once per Day

APPENDIX D. SYSTEM WIRING

D.1 CR6 Wiring

CR6 Connections	MUX Interface Ribbon Cable	MUX Enable Ribbon Cable	CR6 Power Cable	Description
U1	Brown	NC	NC	Vibrating Wire +
U2	Red	NC	NC	Vibrating Wire -
U3	Orange	NC	NC	Thermistor +
U4	Yellow	NC	NC	Thermistor -
U5	NC	Brown	NC	MUX Enable 1
U6	NC	Red	NC	MUX Enable 2
U7	NC	Orange	NC	MUX Enable 3
U8	NC	Yellow	NC	MUX Enable 4
U9	NC	Green	NC	MUX Enable 5
U10	NC	Blue	NC	MUX Enable 6
C4	White	NC	NC	MUX Clock
12V	Blue	NC	NC	MUX 12 VDC
G	Violet	NC	NC	Ground
AG	Black and Green	NC	NC	Analog Ground
PWR IN 12V	NC	NC	Red	CR6 12 VDC
PWR IN G	NC	NC	Black	CR6 Power Ground

Table 6 - CR6 Wiring

D.2 Charger Port Wiring

Pin	Description	Wire Color
A	Unregulated Charger	Gray
B	Ground	Blue
C	Regulated Charger / External Battery	Violet

Table 7 - Charger Port Wiring

D.3 Unregulated Charger Wiring

Pin	Description	Wire Color
A	Unregulated Charger	Red (Black Smooth)
B	Ground	Black (Black Rough)
C	No Contact	NC

Table 8 - Unregulated Charger Wiring

D.4 Regulated Charger (Default)

Pin	Description	Wire Color
A	No Contact	NC
B	Ground	Black(Black Rough)
C	Regulated Charger/External Battery	Red(Black Smooth)

Table 9 - Regulated Charger Default Wiring

D.5 External Power Cable

Pin	Description	Wire Color	Clip
A	No Connection	NC	No Connection
B	Ground	Black	Black
C	Battery+(12 VDC)	Red	Red

Table 10 - External Power Cable Wiring

NOTE: Disconnecting the Internal Battery is recommended when powered by External Battery.

D.6 Fuse Designations for Power Distribution Board

Fuse	Description
F1	Eight Amp Charger/External Battery
F2	Four Amp Battery/Load

Table 11 - Fuses Designations for Power Distribution Board

APPENDIX E. LOGGERNET QUICK START GUIDE

E.1 Overview

Campbell Scientific's LoggerNet Software is used to communicate with the Datalogger, program user specific settings and collect Data stored in the Datalogger memory. LoggerNet is designed to be used with GEOKON Micro-6000 Dataloggers reading Vibrating Wire and MEMS tilt sensors; other configurations and sensor outputs are available upon request. Upon request GEOKON provides the user with a generic Start Program to simplify acquiring Data without the need to be proficient in Campbell Scientific CRBasic programming code. The Start Program(s) will be preconfigured with a default Scan Interval and will store Raw Units by default. Each Start Program will have two associated files on the factory supplied USB flash drive. The first is the Main CRBasic program (.CR6) and includes all programming code required to read and store Data according to the Datalogger configuration. The Main CRBasic program does not require modification by the user in most cases. The second file is the Include (.DLD) text file and is used by the Main program to import user specific parameters. The Include file allows program parameters such as the Scan Interval, Zero Readings, Linear Gauge Factors, Data File Header Labels and Temperature Correction factors to be modified by the user.

E.2 Getting Started

E.2.1 Program Files

After installing LoggerNet (must be the most recent version), the CRBasic program files are located on the GEOKON USB Thumb Drive. The file types are ".DLD" and ".CR6", these files should first be copied to the end users computer in C:\Campbellsci\CRBasicEditor.

E.2.2 Connection Setup

The Launch Menu provides a list of all the categories on the LoggerNet toolbar. Hovering over a category will display a list of applications related to that category.

Prior to the first time any computer connects to a Micro-6000/CR6 Datalogger via USB the USB drivers must be installed. Device Config must be Version 2.10 +

With the Launch Menu open, hover over "Utilities" and press "Device Config Utility" from the resulting list of applications.
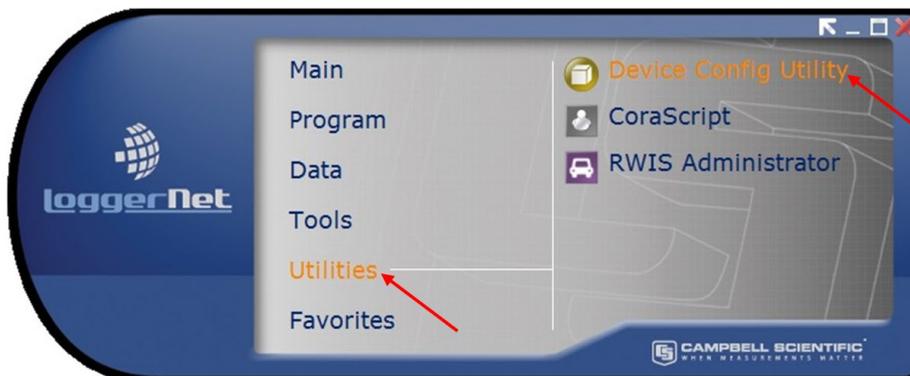
Figure 9 - Launch Menu, Device Config Utility

In Device Type, Select "CR6" from the datalogger group. Within the CR6 pane use the "install the USB driver" hyperlink to install the USB drivers. Follow the steps in the Device Driver Installation Wizard.
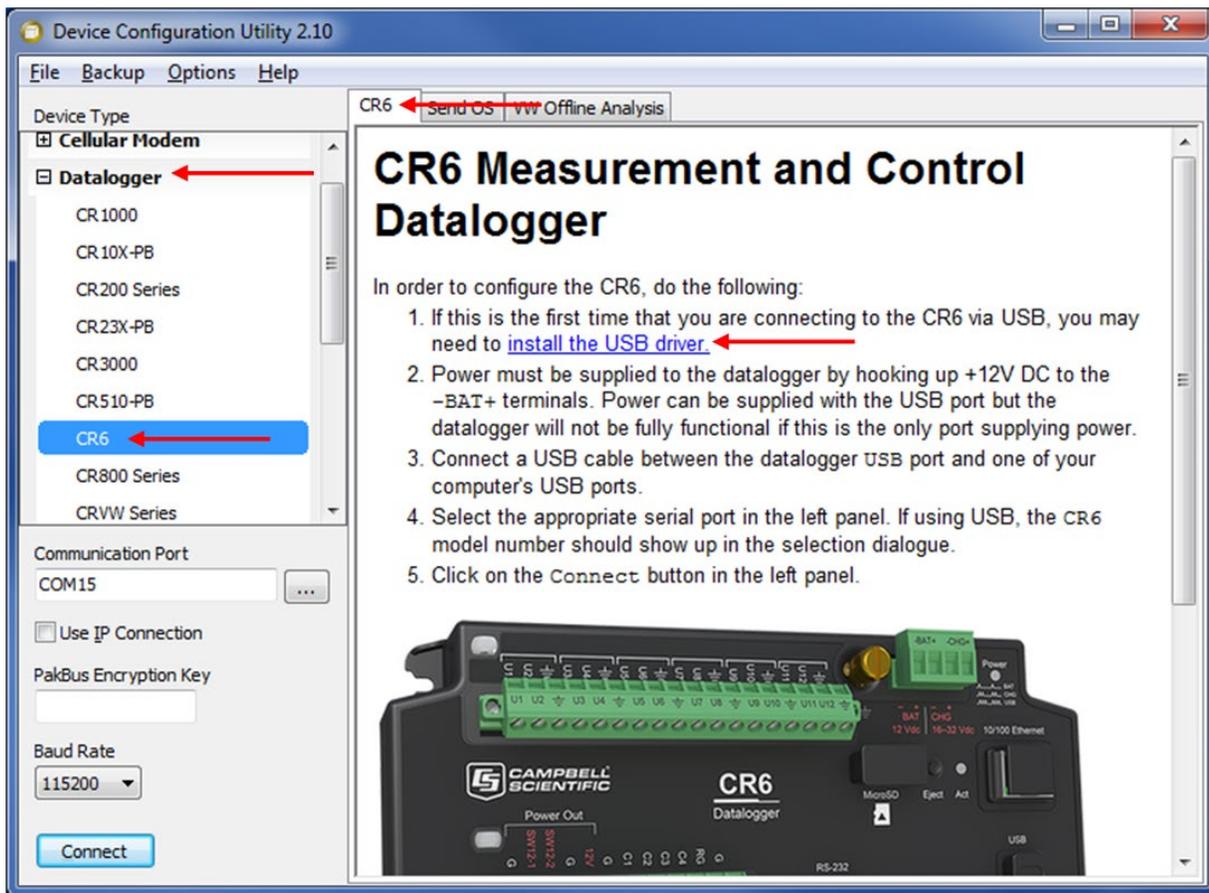

Figure 10 - Install Device Driver

With the Launch Menu open, hover over "Main" and press "Setup" from the resulting list of applications.
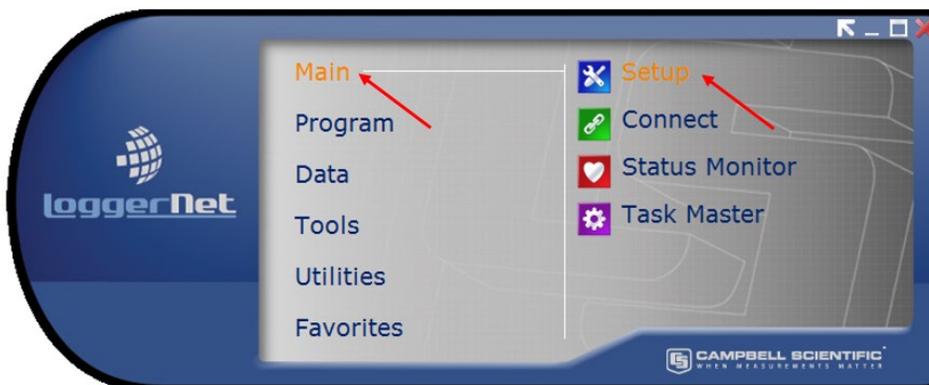

Figure 11 - Launch Menu, Setup

By default, the EZ View of the Setup Screen is displayed. To change the viewing method, press the "Std View" icon at the top right of the Setup Screen. This Quick Start will show the "Std View" of the Setup Screen.

To add a communication port, press "Add Root" button.

Figure 12 - Add Communications Port (Root)

Each Micro-6000 Datalogger will communicate via USB. Select connection type "ComPort", "PakBusPort (Other Loggers)", "CR6Series and press "Close".
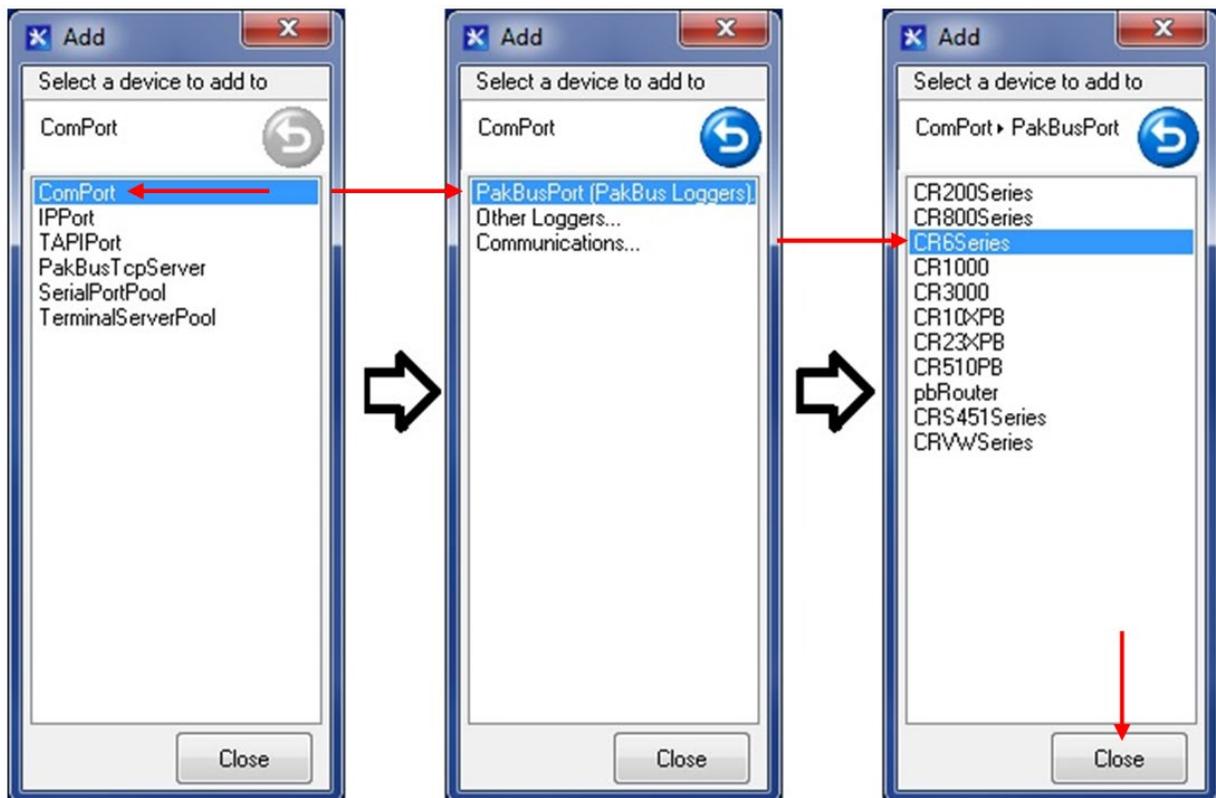
Figure 13 - Select Device to Add

Select "ComPort" under the "Network Map", select the communications port to connect to the Datalogger in "ComPort Connection".

CONDITIONAL NOTE: IT MAY BE NECESSARY TO PRESS "COMMUNICATIONS ENABLED" TO OPEN THE COMMUNICATIONS PORT.

20
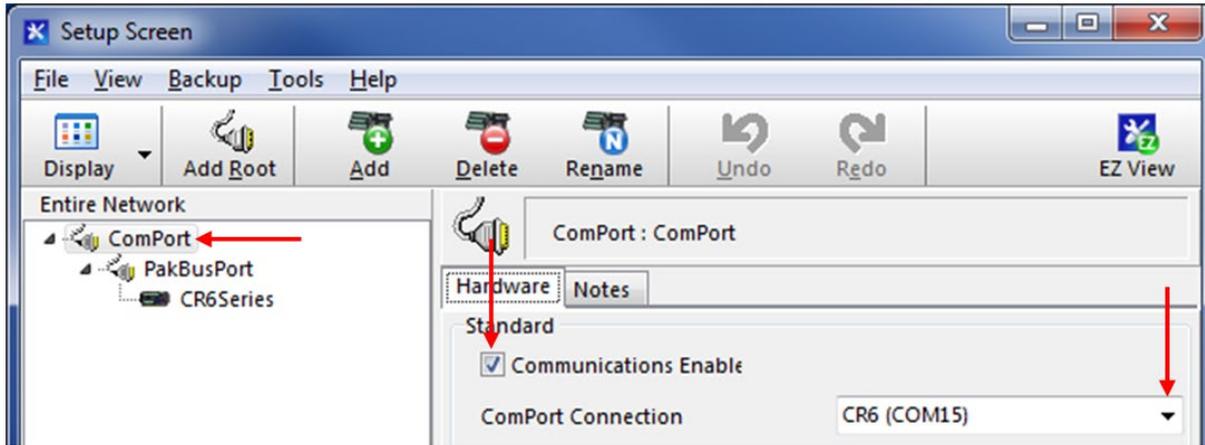
Figure 14 - Select Communications Port

COM NUMBERS VARY WITH COMPUTER, USB DEVICES AND SERIAL ADAPTERS. REFER TO THE COMPUTER DEVICE MANAGER IF UNSURE OF WHICH COM NUMBER TO USE.

Select "PakBusPort" under the "Network Map", in "Maximum Baud Rate" for direct connection to the Datalogger select "115200".
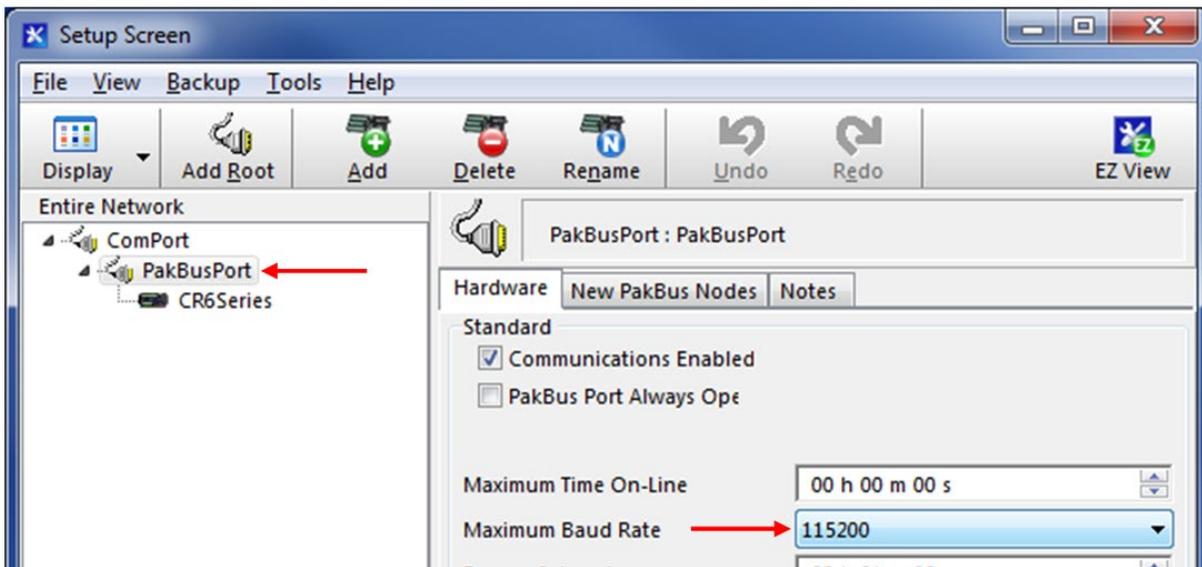

Figure 15 - Select Maximum Baud Rate

WHEN FINISHED, PRESS THE "APPLY" BUTTON AT THE BOTTOM LEFT OF THE SETUP SCREEN TO SAVE ALL SETTINGS.

E.2.3 Connecting to the Datalogger

With the LoggerNet Launch Menu open, hover over "Main" and press "Connect".
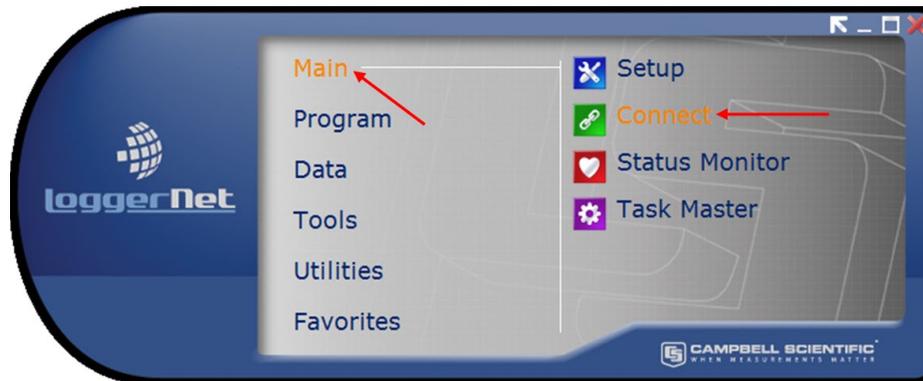
Figure 16 - Launch Menu, Connect

Select the Datalogger to communicate with under "Stations" and press the "Connect" button.
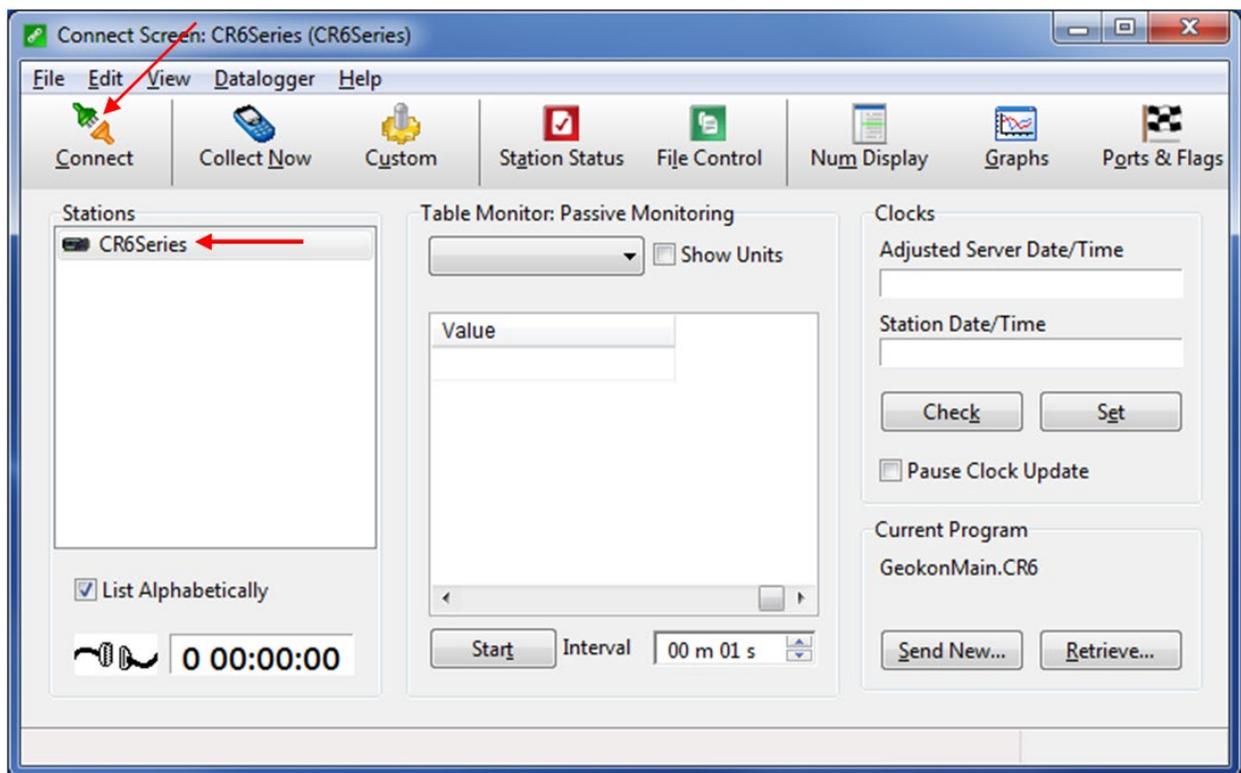

Figure 17 - Connect to the CR6

E.3 Modifying the Datalogger Program

Navigate to the Include (.DLD) file on the end user's computer C:\Campbellsci\CRBasicEditor. Optional changes to Scan Interval, Zero Readings, Gauge Factors and Alias names can be made by opening the Include (.DLD) file with Notepad. Each Datalogger configuration has a unique Include (.DLD) file.

WARNING: ONLY CHANGE VALUES AFTER THE "=" SIGN.

E.3.1 Scan Interval

The number entered in the Scan Interval section determines how often the Datalogger will read the gauges and store data. The Scan Interval is in seconds.

```
SampleIncludeFile.DLD - Notepad

File  Edit  Format  View  Help

'-----------------------------------------------
'Scan Interval in seconds
'-----------------------------------------------
Const ScanInSec = 60

'-----------------------------------------------
```
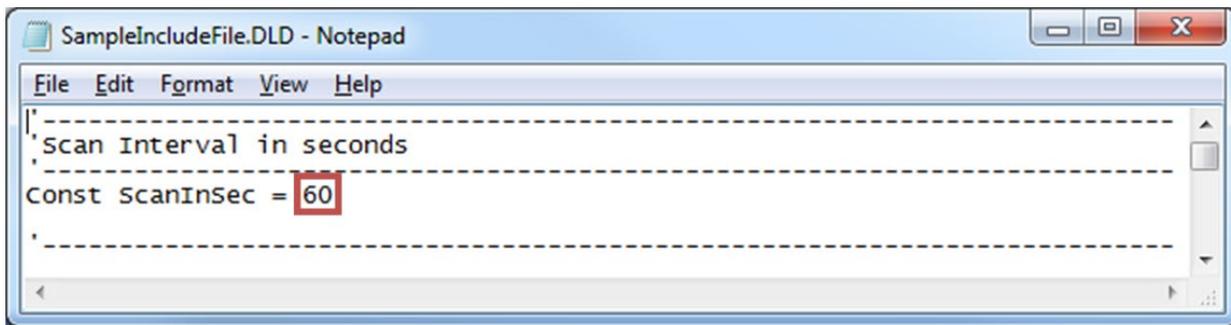
Figure 18 - Set the Scan Interval

E.3.2 Zero Readings and Gauge Factors

Default values for Zero Readings are 0 and Linear Gauge Factors are 1. The default settings read in Digits for Vibrating Wire sensors and Volts for MEMS tilt sensors. Zero Readings and Gauge Factors can be added if the user requires the Datalogger to store engineering units.
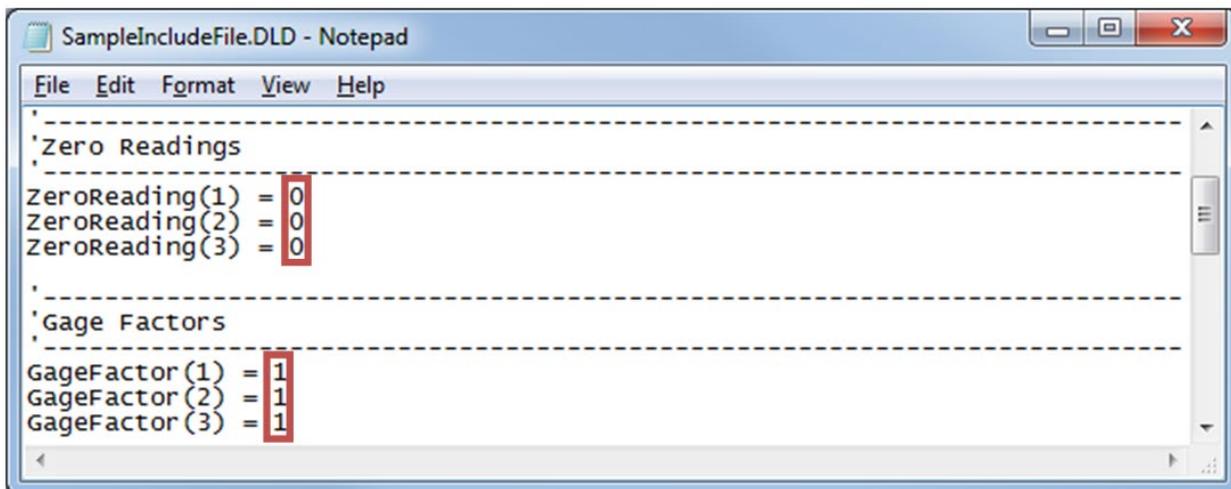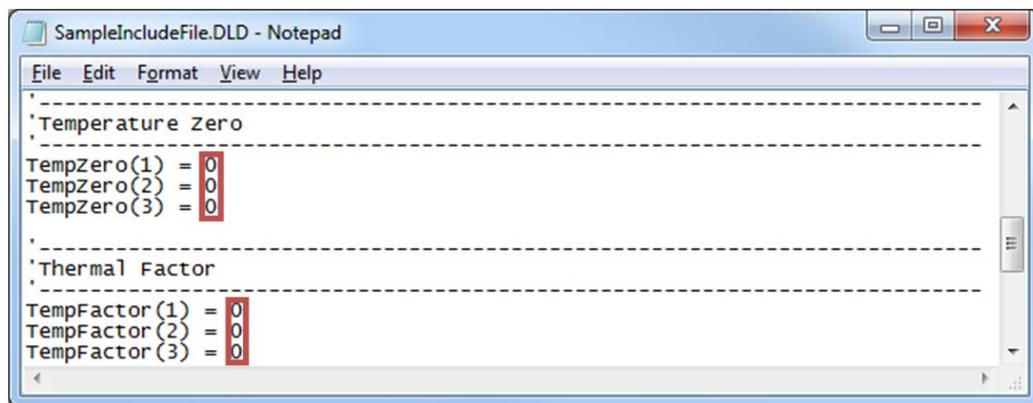
```
SampleIncludeFile.DLD - Notepad

File  Edit  Format  View  Help

'-----------------------------------------------
'Zero Readings
'-----------------------------------------------
ZeroReading(1) = 0
ZeroReading(2) = 0
ZeroReading(3) = 0

'-----------------------------------------------
'Gage Factors
'-----------------------------------------------
GageFactor(1) = 1
GageFactor(2) = 1
GageFactor(3) = 1
```

Figure 19 - Set Zero Readings and Gauge Factors

E.3.3 Temperature Zero Readings and Thermal Factors

NOTE: TEMPERATURE ZERO AND THERMAL FACTORS ARE USED FOR TEMPERATURE CORRECTION. TEMPERATURE CORRECTION CAN BE USED TO COMPENSATE FOR CHANGES IN A GAUGE'S READINGS DUE TO TEMPERATURE CHANGE. TEMPERATURE EFFECT ON READINGS VARIES ON DIFFERENT MODELS OF GAUGES AND TEMPERATURE CORRECTION IS OFTEN NOT REQUIRED. DEPENDING ON THE GAUGE MODEL, TEMPERATURE CORRECTION MAY NOT BE AVAILABLE; SOME GAUGE MODELS REQUIRE A DIFFERENT FORMULA TO COMPENSATE. TEMPERATURE CORRECTION IS COMMENTED OUT IN THE MAIN PROGRAM FILE BY DEFAULT.

Default values for Temperature Zero Readings and Thermal Factors are 0. Temperature Zero Readings and Thermal Factors can be added if the user requires the Datalogger to use temperature compensation.

Figure 20 - Set Temperature Zero and Thermal Factor

Navigate to the Main (.CR6) file C:\Campbellsci\CRBasicEditor. Open the Main (.CR6) file with notepad and uncomment the line specified in the code for all model gauges that temperature correction is required.
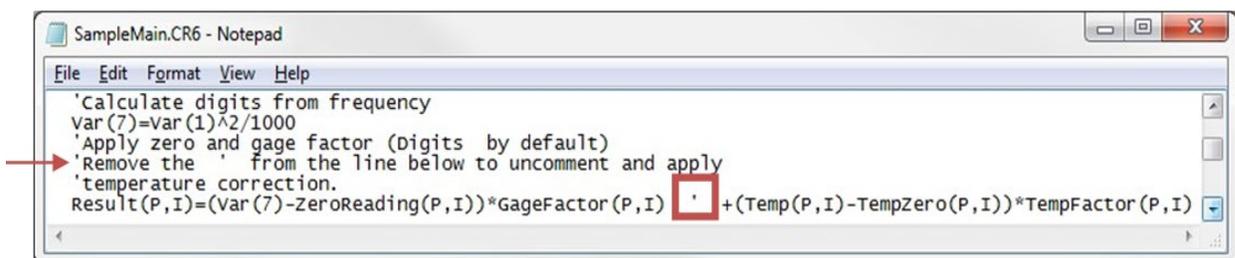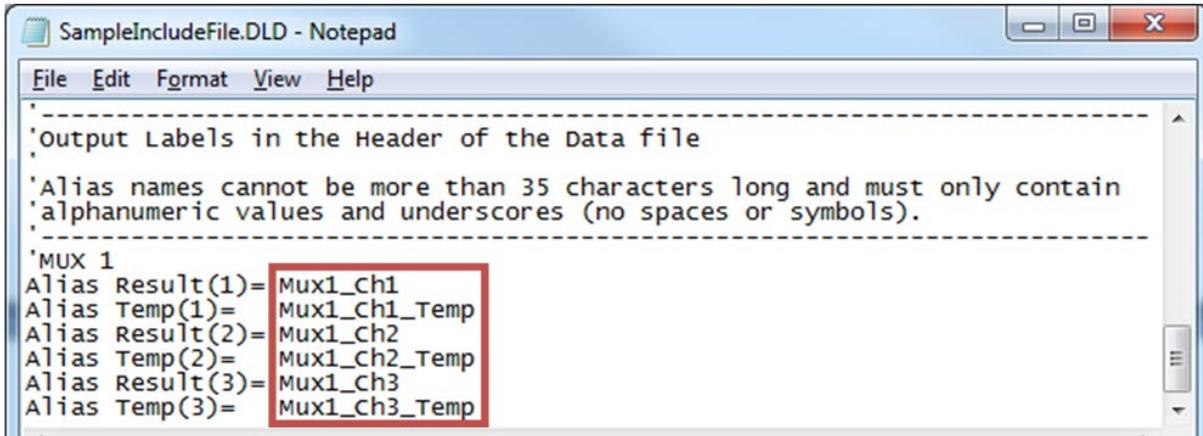

Figure 21 - Uncomment Specified Line

E.3.4 Output Labels

Default Alias names correspond with the Direct or Multiplexer channel of each gauge and are displayed in the Header of the Data file. Alias names can be modified by the user.

WARNINGS: ALIAS NAMES CANNOT BE MORE THAN 35 CHARACTERS LONG AND MUST ONLY CONTAIN ALPHANUMERIC VALUES AND UNDERSCORES (NO SPACES OR SYMBOLS). ALIAS NAMES MUST BEGIN WITH AN ALPHA CHARACTER

Figure 22 - Alias Names

SAVE THE INCLUDE FILE IF MODIFIED.

E.4 Uploading Files

The Include.DLD file must be saved when modified. After modification, the Include.DLD must be sent to the Datalogger using the File Control Menu in the LoggerNet Connect Screen. The Main (.CR6) program file must be sent to the Datalogger each time the Include.DLD file is updated.

E.4.1 Sending the Include file (.DLD)

From the "Connect Screen" press "File Control" and press "Send" to transfer the Include (.DLD) file to the Datalogger.

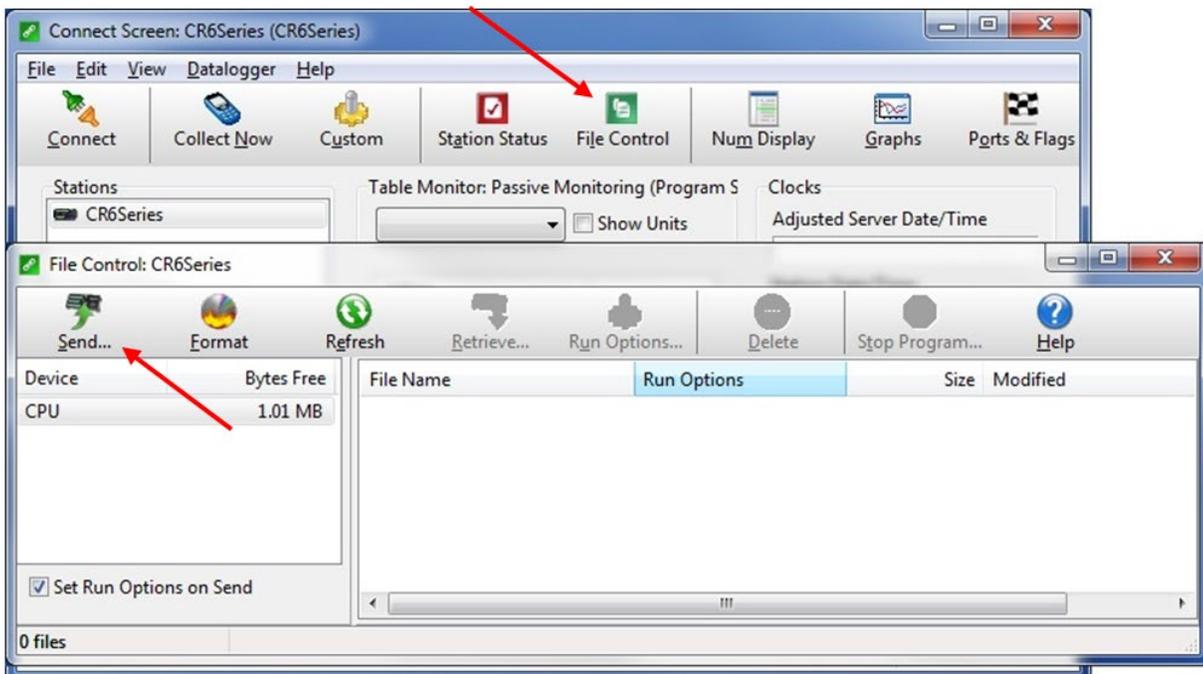NOTE: EACH DATALOGGER HAS A UNIQUE INCLUDE (.DLD) AND MAIN (.CR6) FILE

Figure 23 - Transfer File to Datalogger

Select DLD file type to make the Include (.DLD) file visible in
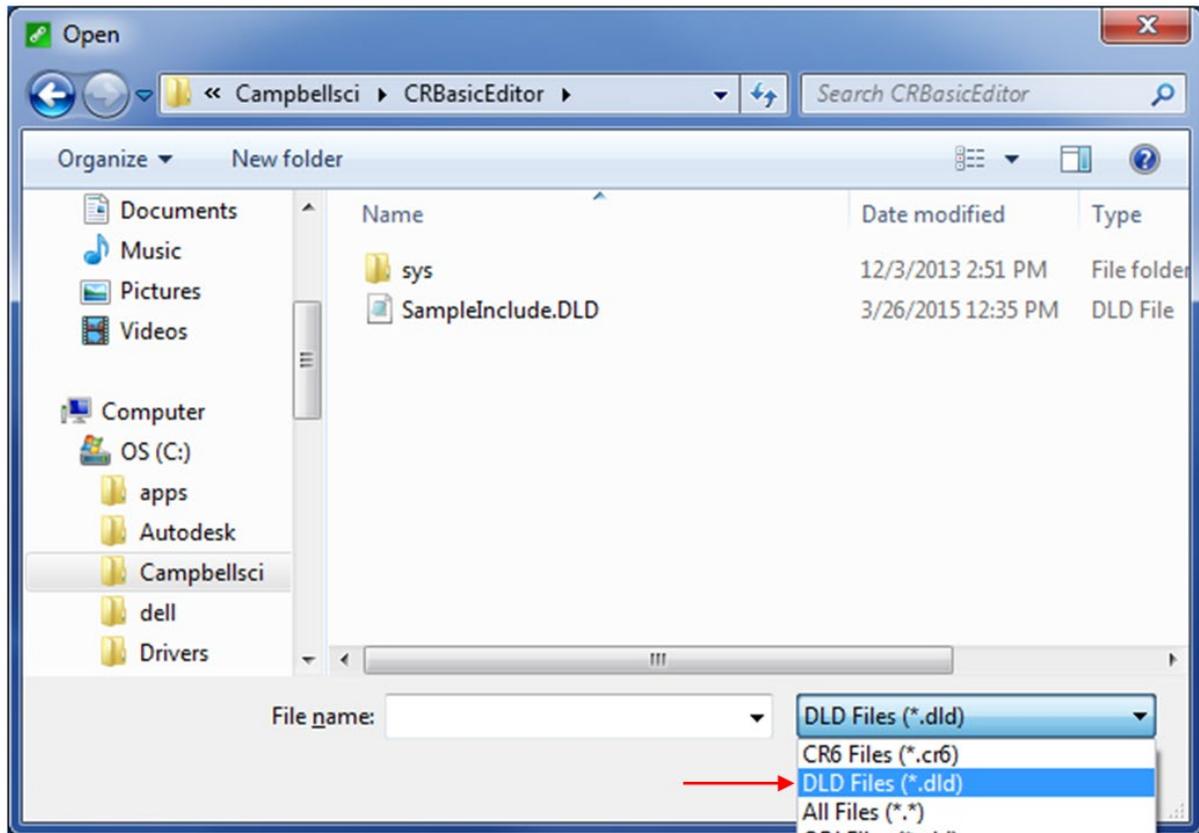C:\Campbellsci\CRBasicEditor.

Figure 24 - Select DLD File Type

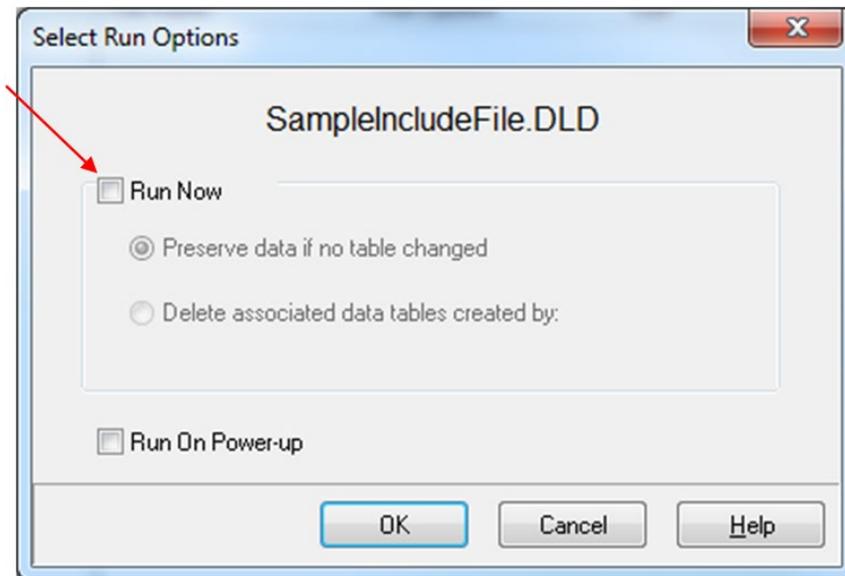Uncheck "Run Now", the Include (.DLD) file cannot run the Datalogger.

Figure 25 - Uncheck "Run Now"

E.4.2 Sending the Main program file (.CR6)

To send the Main (.CR6) CRBasic Program from the "Connect Screen" press "Send" and select the Main (.CR6) program file in C:\Campbellsci\CRBasicEditor.

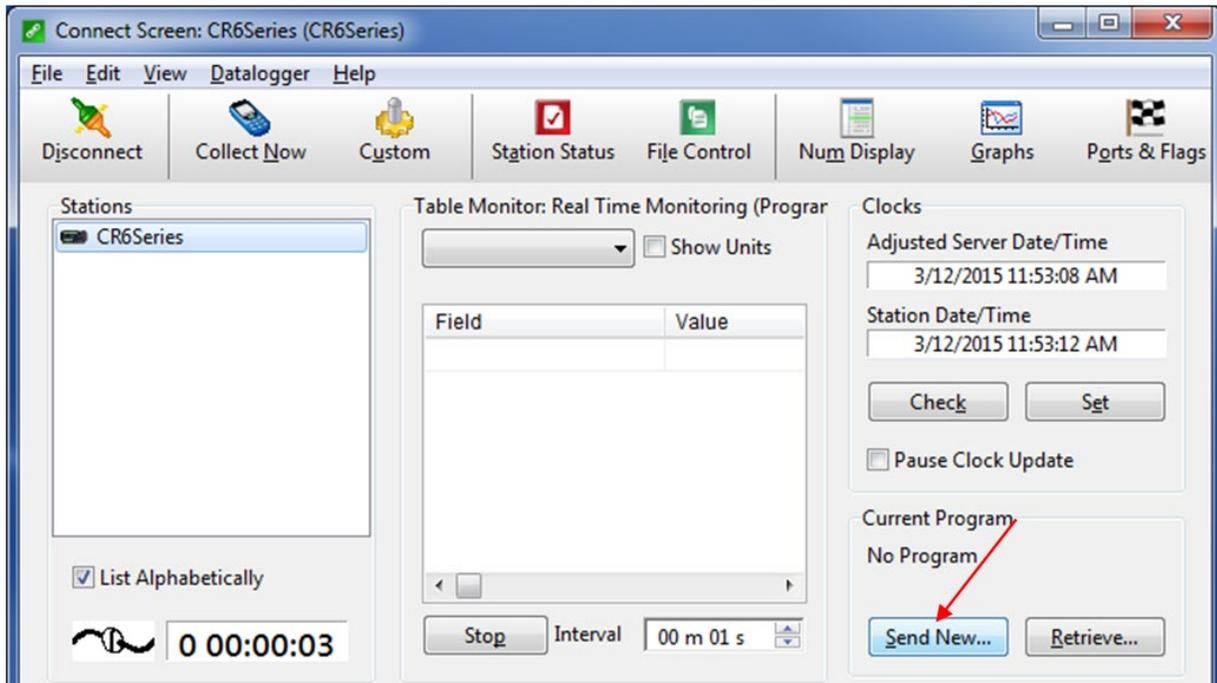NOTE: EACH DATALOGGER HAS A UNIQUE INCLUDE (.DLD) AND MAIN (.CR6) FILE

Figure 26 - Send the Main CRBasic Program File

When sending the Main (.CR6) program file through the "Connect Screen" the program runs automatically.

E.5 Data Handling

E.5.1 Data Collection Configuration

With the Launch Menu open, hover over "Main" and press "Setup" from the resulting list of applications.
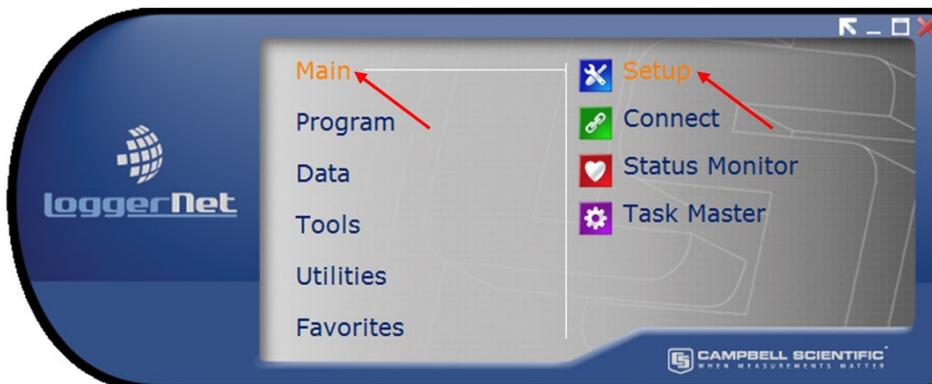

Figure 27 - Launch Menu, Setup

Select the Datalogger "CR6Series", "Data Files" tab then select "Table1". Dataloggers can be renamed by pressing "Rename" button. Renaming the Datalogger affects the name of the Data file. "Output File Name" option allows changing the file name, where to collect and store the Data file. "File Output Option" determines whether new Data collected is appended into one file, overwrites old Data, or creates a new file every time Data is collected.

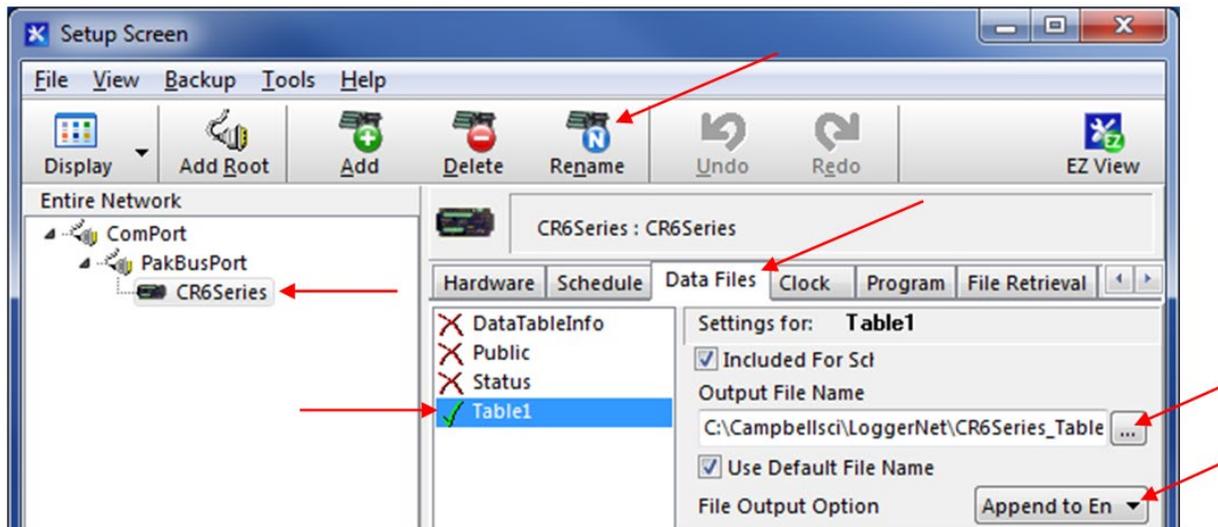COLLECTED DATA TABLES ARE SIGNIFIED WITH A GREEN CHECK MARK.

Figure 28 - Data Files Tab

WHEN FINISHED, PRESS THE "APPLY" BUTTON AT THE BOTTOM LEFT OF THE SETUP SCREEN TO SAVE ALL SETTINGS.

E.5.2 Live Monitoring

With the LoggerNet Launch Menu open, hover over "Main" and press "Connect".
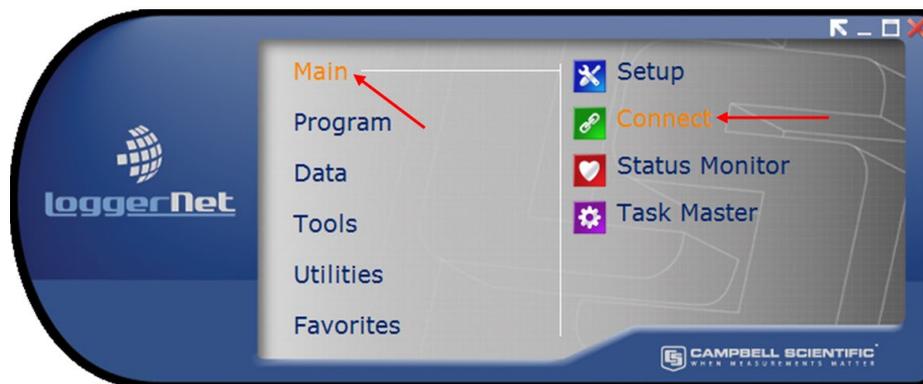

Figure 29 - Launch Menu, Connect

Once the program is running, most current readings can be viewed under "Table1" of the "Table Monitor" and "Num Display". "Graphs" can also be used to view live and historical Data.

CONDITIONAL NOTE: IT MAY BE NECESSARY TO START MONITORING BY PRESSING "START".

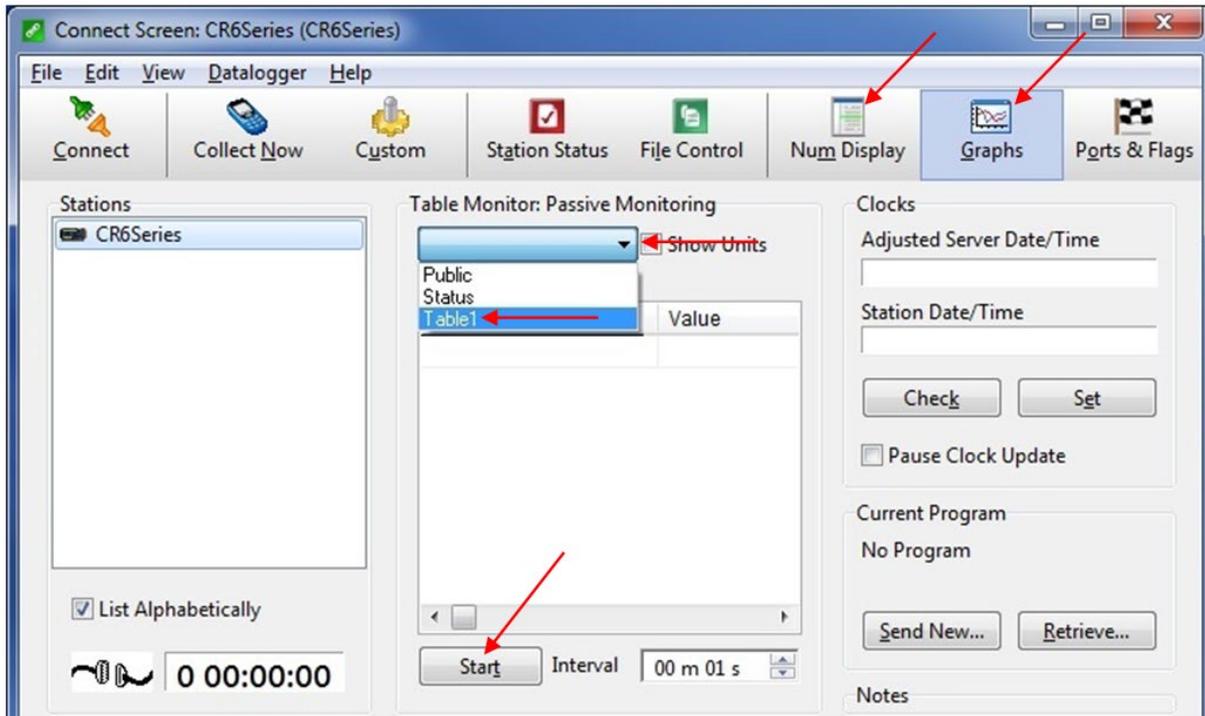If unexpected "NAN" readings appear, refer to Section 5 (Troubleshooting).

Figure 30 - Live Monitoring

E.5.3 Collecting Data

Pressing "Collect Now" collects and stores Data on the computer. After collecting Data a "Data Collection Results" screen will open.
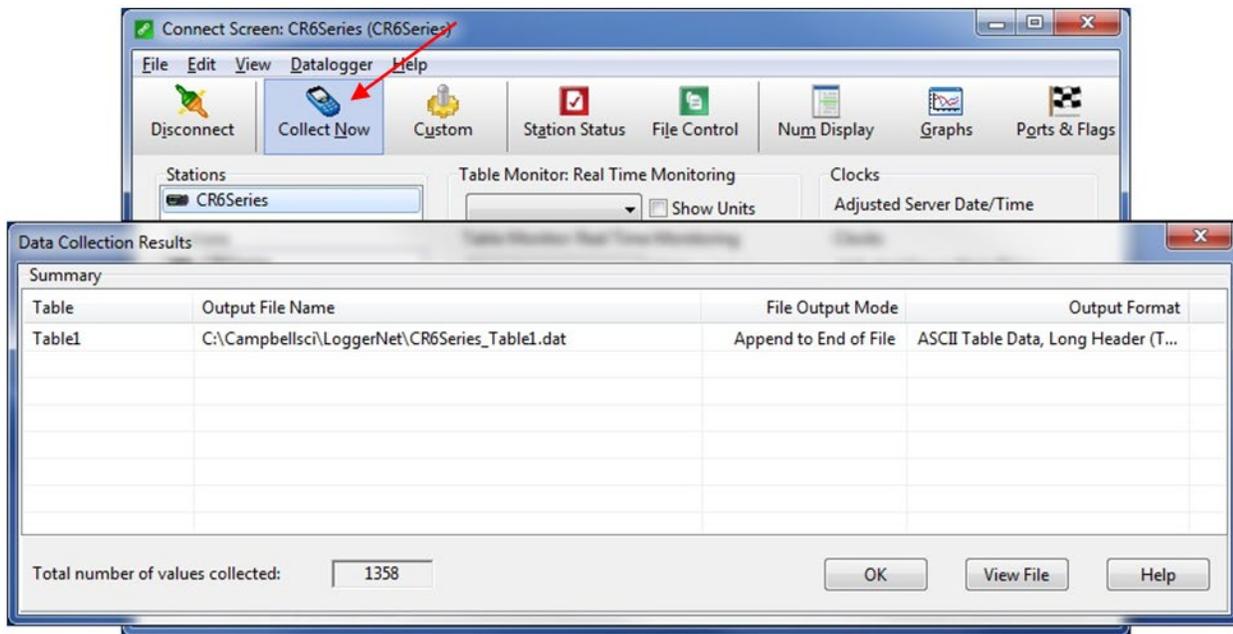

Figure 31 - Collecting Data

PLEASE SEE LOGGERNET MANUAL FOR MORE SPECIFIC DETAILS REGARDING USE OF THE SOFTWARE.

APPENDIX F. CELLULAR MODEM COMMUNICATIONS

F.1 Supply

As there are many providers, and options, available with respect to the choice of cellular modems, GEOKON requires that the customer choose his/her modem, and provider of choice (or to add another modem to an existing account).

For customers with little or no experience <u>sourcing cellular modems</u>, GEOKON suggests one of the following models, available from Sierra Wireless Intelligent Gateways:
(A list of modem distributors can be found on the Sierra Wireless homepage:
<u>http://www.sierrawireless.com</u>)

RV50: The RV50 modem is the lowest power Modem available from Sierra Wireless and is compatible with CDMA, GSM and International Networks according to SIM card supplied by user. This modem is recommended in Solar Applications.

Raven XT: The Raven XT modem is available for **Verizon** Wireless only.

LS300: The LS300 modem can be used with **AT&T** when Verizon service is unavailable.

FX400: The FX400 series modems are preferred for **International** applications.

In most static applications, a 250 MB data plan will be sufficient to program the Datalogger, communicate regularly and collect the Text based data files. An Unrestricted Static IP address is recommended for most applications. When required, a Dynamic IP address can be used with a free IP Manager Service such as provided by Sierra Wireless (Airlink).

For standard, transparent RS-232 Communications, **a template** must be loaded after the modem is provisioned. The Modem supplier will load this template for you.
Verizon Raven XT: <u>http://www.GEOKON.com/content/software/Raven_XT_Verizon_CSI.zip</u>
AT&T LS300: <u>http://www.GEOKON.com/content/software/LS300G_ATT_CSI.zip</u>
RV50: <u>Please contact GEOKON Directly depending on Network</u>

For customers with little or no experience <u>configuring cellular modems</u>, GEOKON suggests contacting one of the following companies, who can provide and provision modems for use in North America:

Access Wireless Data Solutions
<u>http://www.accesswds.com</u>
<u>orders@accesswds.com</u>
(813) 751-2039

Industrial Networking Solutions
<u>http://www.industrialnetworking.com</u>
(972) 248-7466

If there are any doubts, concerns, or questions with respect to any of the above, please contact GEOKON. Any communication and or programming issues related to the operation of your Datalogger will be fully supported by GEOKON.

F.2 Install

Cellular modem install kits can be provided upon request. These install kits can accommodate most cellular modems and whip or high gain antenna options. A mounting bracket, antenna bulkhead / cable and RS-232 null modem adapter are preinstalled for plug and play of the antenna and customer supplied modem.

1) Modem is secured in mounting bracket using the Velcro mounting strap

2) SMA bulkhead cable is secured to modem SMA connector and antenna secured on outside of enclosure.

3) Modem RS-232 port is connected through a Null Modem cable to the Datalogger CPI port using the provided CPI to RS-232 Null Modem cable.

4) The power supply cable provided with the modem is connected to an empty Load terminal on the Power Distribution PCB board or directly to 12 V and G on the CR6 module. Switch 12 VDC power (SW12) can also be used to control the modem power at a given interval (programming required).

NOTE: Verify power cable wiring in the cellular modem manufacturer provided user manual. When using a Sierra Wireless Raven XT modem, the red wire is 12 VDC and Black is Ground (white is not used). When using the Sierra Wireless LS-300 or FX400 series, the Red and White wires are both tied to +12 VDC and Black is Ground.
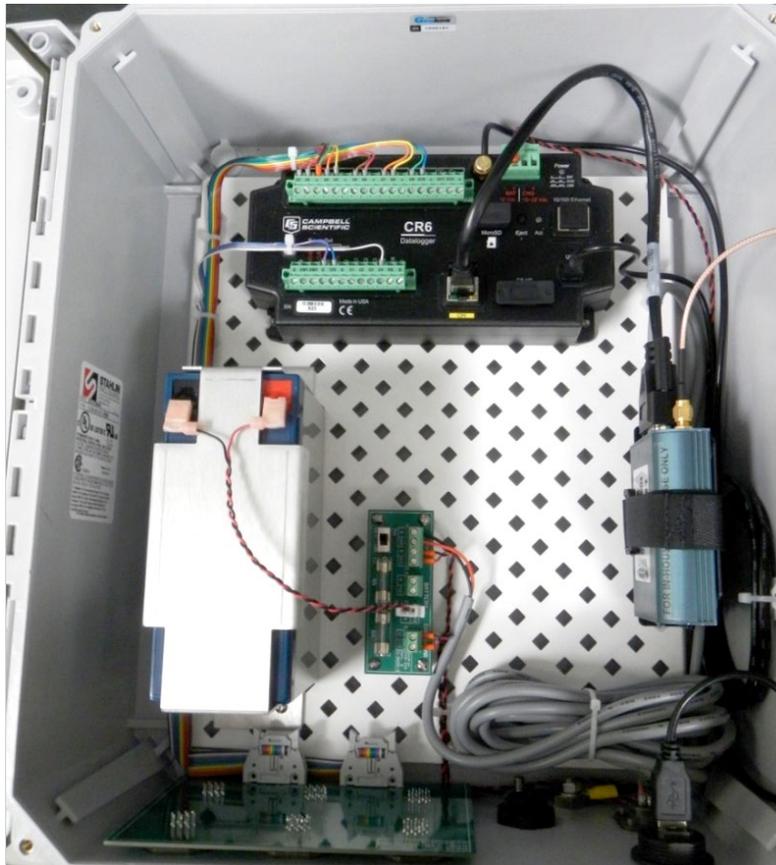

Figure 32 - Model 8600-1 with Cellular Modem Installed

F.3 Communications

To add a communication port based off the GEOKON Cell Modem Template, press the "Add Root" button and select a device. Continue selecting devices from the Add Box as shown until the communication link to the Datalogger is represented. Once the Datalogger (CR6Series) is added to the Network Map, press "Apply". Select "IPPort" (Figure 33) and then Select "PakBusPort (PakBus Loggers)" (Figure 34)
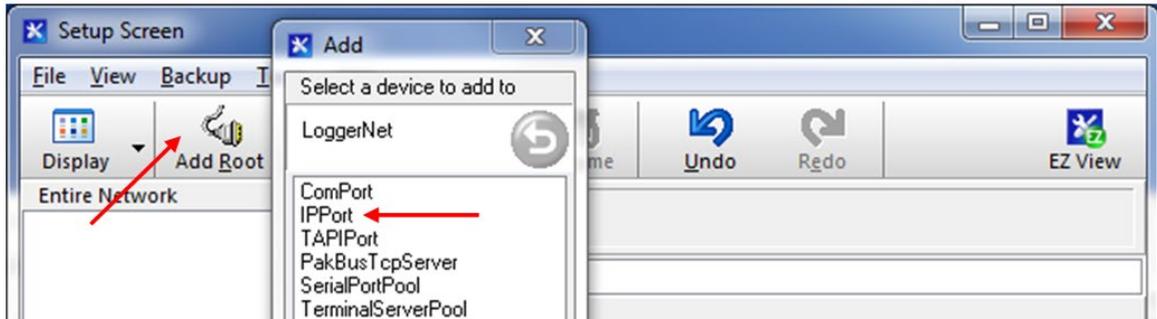
Figure 33 - Add Communications Port (Root)

Figure 34 - Select "PakBusPort"

Select "CR6Series". When finished, press the "Apply" button at the bottom left of the Setup Screen.
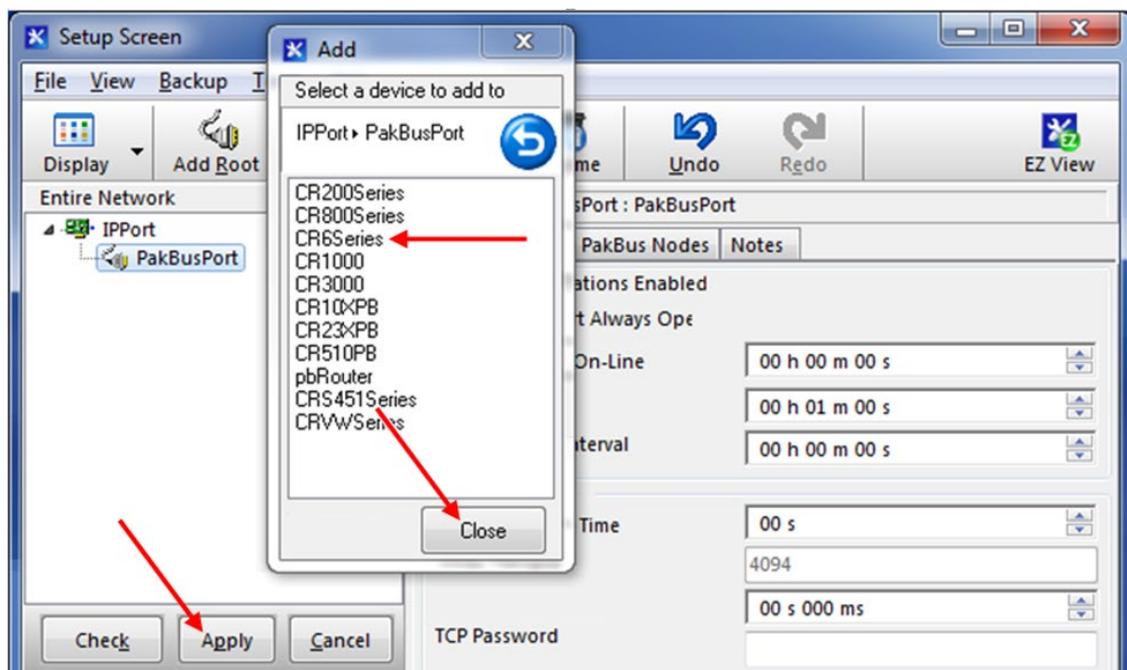
Figure 35 - Select Device to Add

While still within the Setup Screen, IP Address must be entered.
The Cell Modem IP Address must be entered as:

XXX.XXX.XXX.XXX:3001

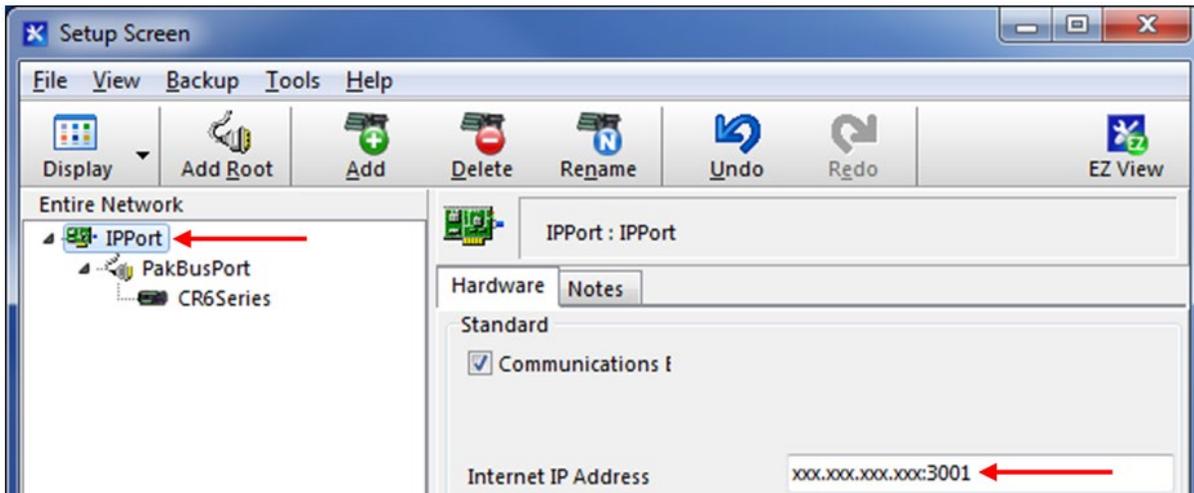**3001** represents the default port of the Cell Modem

Figure 36 - Enter Internet IP Address

When finished, press the "Apply" button at the bottom left of the Setup Screen. Minimize or close the Setup Screen and go back to the LoggerNet Launch Menu.