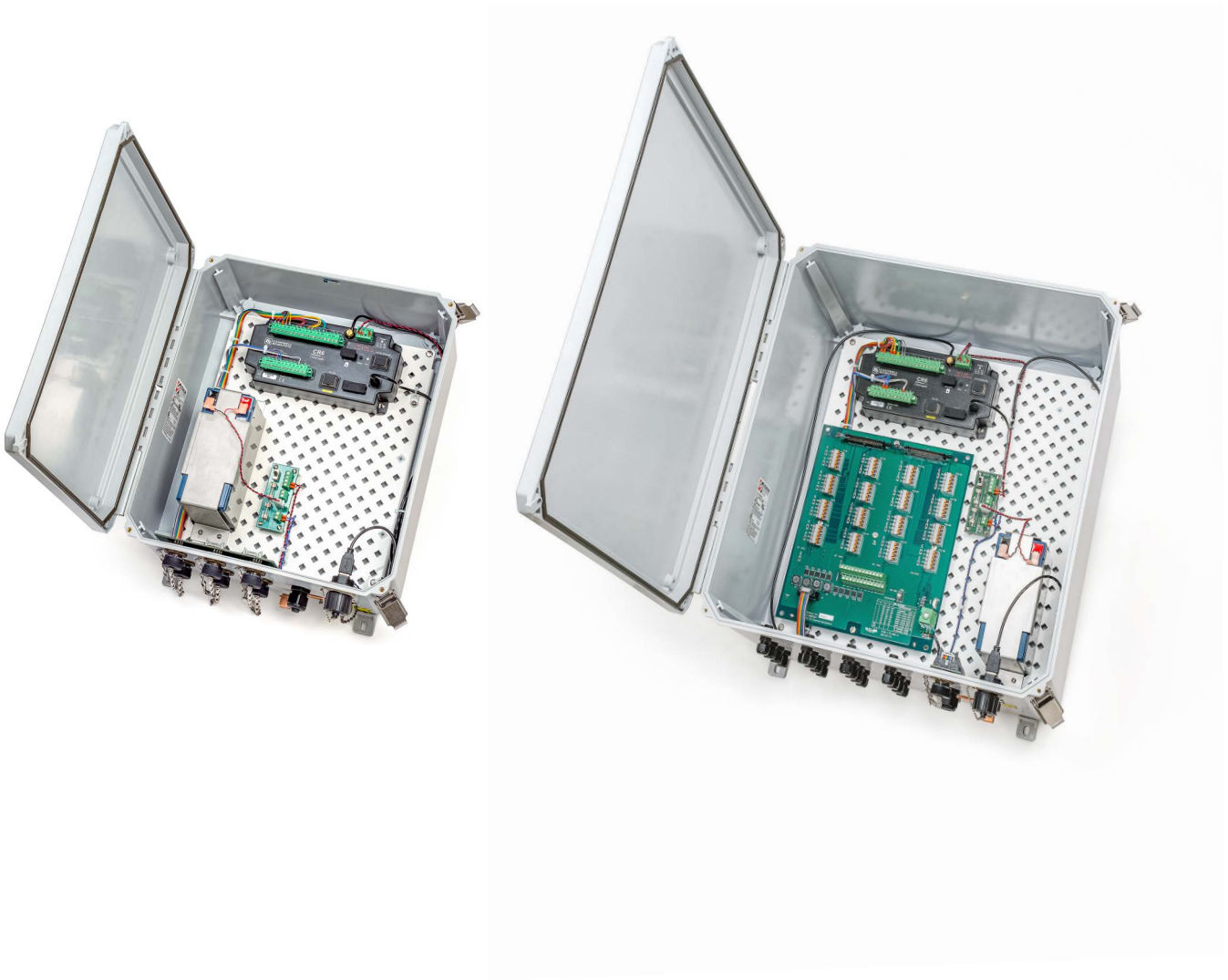
Model 8600 Series

Micro-6000 Multi-Channel Data Logger

Instruction Manual



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1. INTRODUCTION

The Model 8600 MICRO-6000 Data Logger 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 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. Two variations of the Model 8600 are available.

- **Model 8600-1:** Used with external GEOKON Model 8032 Multiplexers (purchased separately), the standard data logger can support up to six multiplexers. Where additional capacity is required it is possible to connect up to eight multiplexers, in a "daisy-chained" fashion, to each multiplexer input port on the data logger.

- **Model 8600-2:** Incorporating an internal GEOKON Model 8032 Multiplexer, this data logger offers an all-in-one solution.

Each multiplexer supports 16 or 32 channels depending on the instrument type and configuration. 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. See the Model 8032 Instruction Manual (geokon.com/8032) for more information.

Power, Reset and Clocking for the multiplexer(s) are supplied by the data logger. The data logger 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 and creating the required download file for data logger operation. A basic starter CRBasic program (STARTPROG) can be provided upon request. LoggerNet 4.3+ is required for the CR6 data logger.

The controller portion of the data logger consists of an internal Campbell Scientific CR6 Measurement and Control System. 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:

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

The CR6 provides the required excitation and signal processing for the vibrating wire sensors connected to the data logger. The CR6 uses Campbell Scientific's VSpect spectral analysis to find the resonant frequency and thermistor measurement of the GEOKON vibrating wire sensor.

A provided IP67 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 data logger 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.

A 12V - 7Ah lead acid battery is used to provide power for the data logger. 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.

2. INSTALLATION

The recommended method of installation involves attaching the various enclosures (data logger and multiplexers as required) to a fixed structure, such as a wall, in an upright position (Figure 1). Mounting dimensions of the Model 8600 Data Loggers are shown below.

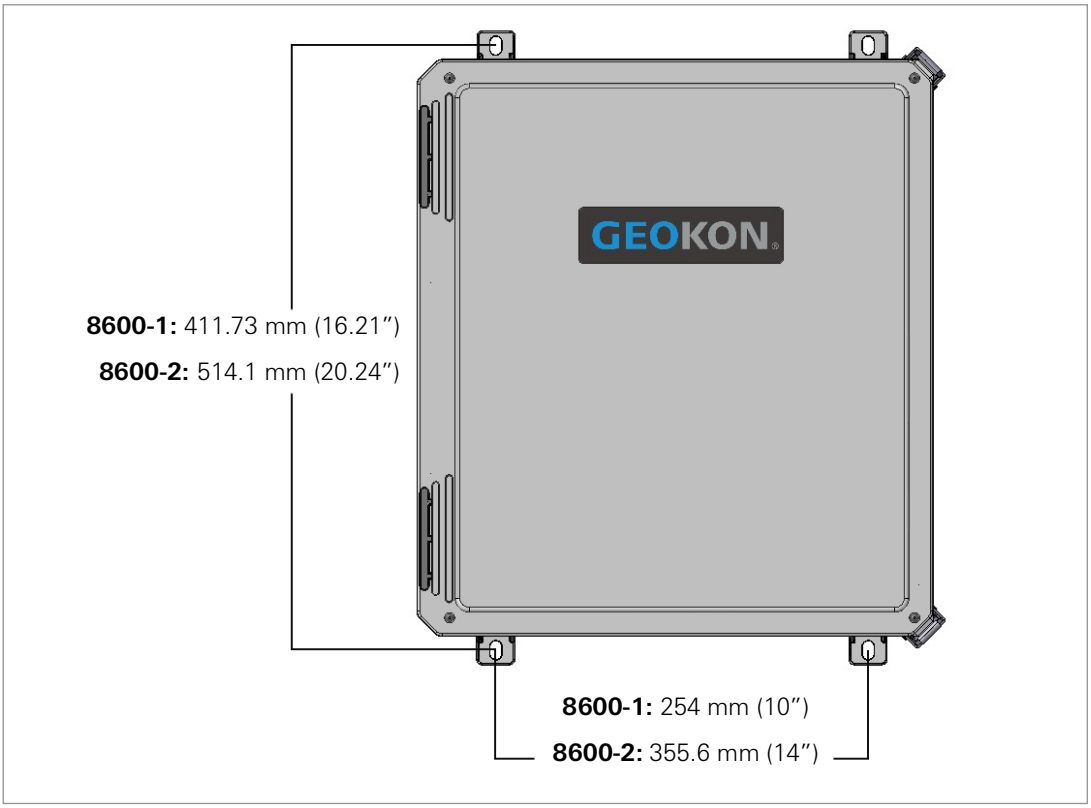


FIGURE 1: *Typical Data Logger Configuration*

2.1 POWER

After the data logger is installed, the GEOKON regulated ac charger or regulated solar panel can be connected to the three-pin charger port on the data logger. The supply voltage to the data logger 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 3.1 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.

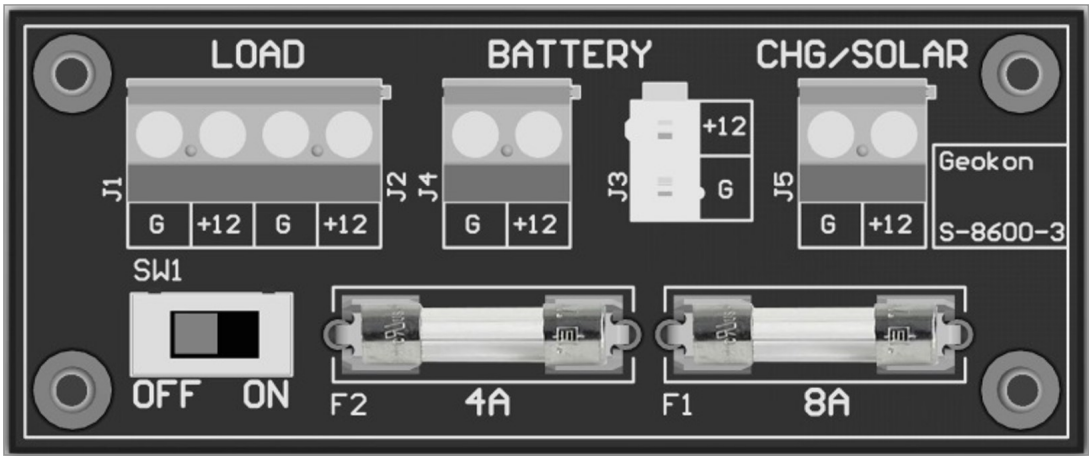


FIGURE 2: *Power Distribution Circuit Board*

2.2 EARTH GROUND

An earth grounding lug is supplied on the exterior of the data logger enclosure to connect the system to earth ground (Figure 3). A copper grounding rod at least six feet in length should be driven into the soil to a minimum depth of three feet, as close to the device as possible. Alternatively, any other suitable earth ground attachment may be used. Connect the grounding rod to the mounting bracket or the copper grounding lug on the exterior of the device with a 12 AWG or larger wire. This will provide a path from the device to earth ground in the event of a lightning strike.



FIGURE 3: *Typical Bottom View of the 8600-1 (Top) and 8600-2 (Bottom) Data Loggers*

2.3 GAUGES

Following enclosure installation, GEOKON vibrating wire sensors can be connected to the multiplexer(s). Please refer to the Model 8032 Instruction Manual (geokon.com/8032) for the appropriate connection description. Additional start guides can be provided for other types of gauges or custom configurations.

2.4 EXTERNAL MULTIPLEXERS (MODEL 8600-1 ONLY)

Following sensor and installation, connections between a Model 8600-1 Data Logger and Model 8032 Multiplexer(s) can be made using the Model 8032-5 Multiplexer 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 Model 8600-1 Data Logger is pre-wired to control and read the external multiplexers.

2.5 COMMUNICATIONS

2.5.1 USB COMMUNICATION

Standard direct communications are established by connecting the data logger USB port (Figure 3) to an available USB port on the computer with the provided 1 m (3') Model COM-113 USB A-A Male Cable.

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.

2.5.2 ETHERNET COMMUNICATION

Ethernet communications are established by connecting the data logger Ethernet port (Figure 3) to an available Ethernet port on the computer with the provided 0.6 m (2') Model COM-132 Ethernet 10/100 Base-T Crossover Cable.

The CR6 must first be configured with the user assigned IP Address using Device Configuration Utility (available on Campbell Scientifics Web site, https://www.campbellsci.com/devconfig):

1. Select the correct device type (**CR6**) and connect. Make necessary changes to the Ethernet tab and save. The IP Address, Subnet Mask, and IP Gateway should be provided by your network administrator or IT personnel.

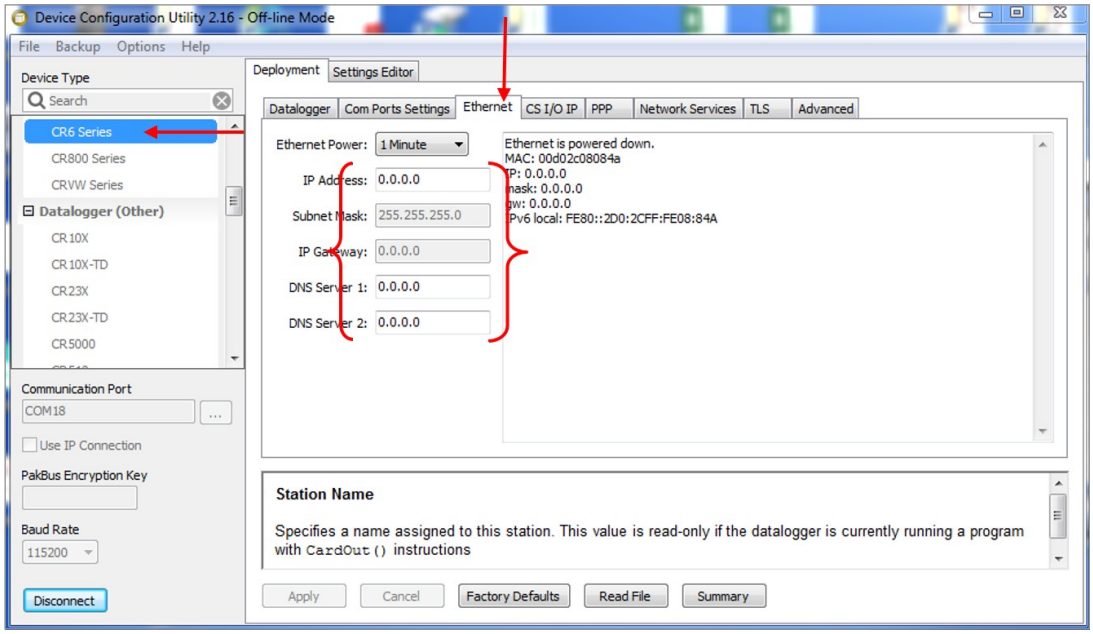


FIGURE 4: *Ethernet Settings*

2. After the device configure utility has been setup, LoggerNet software must be configured. To add a communication port in LoggerNet, select **Add Root** and then select **IPPort**.



FIGURE 5: *Add Communication Port*

3. Select **PakBusPort (Other Loggers)**.

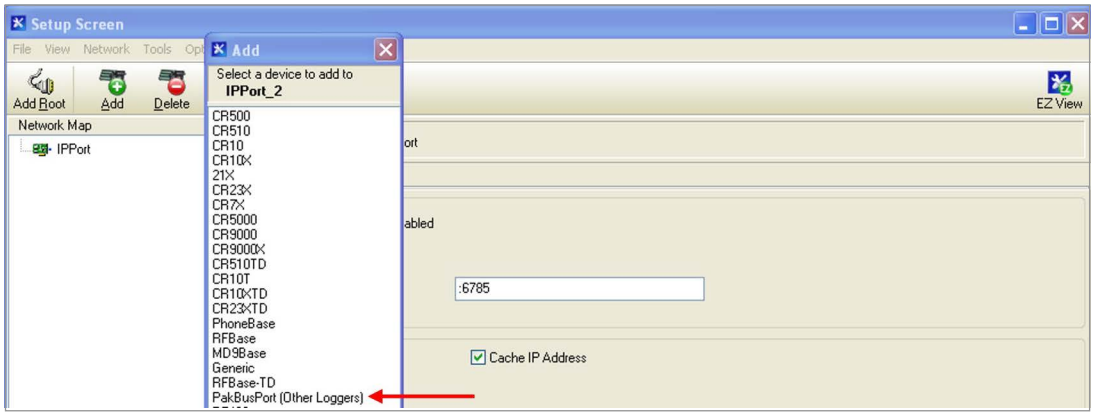


FIGURE 6: *Select "PackBusPort"*

4. Select **CR6Series** and then select **Close**.

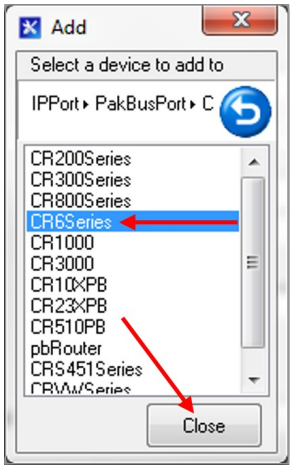


FIGURE 7: *Select CR6Series*

5. Select **Apply** located at the bottom left of the setup screen.
6. Enter the IP Address. The IP Address must be followed by "**:6785**", which represents the default port of the CR6 10/100 Ethernet.

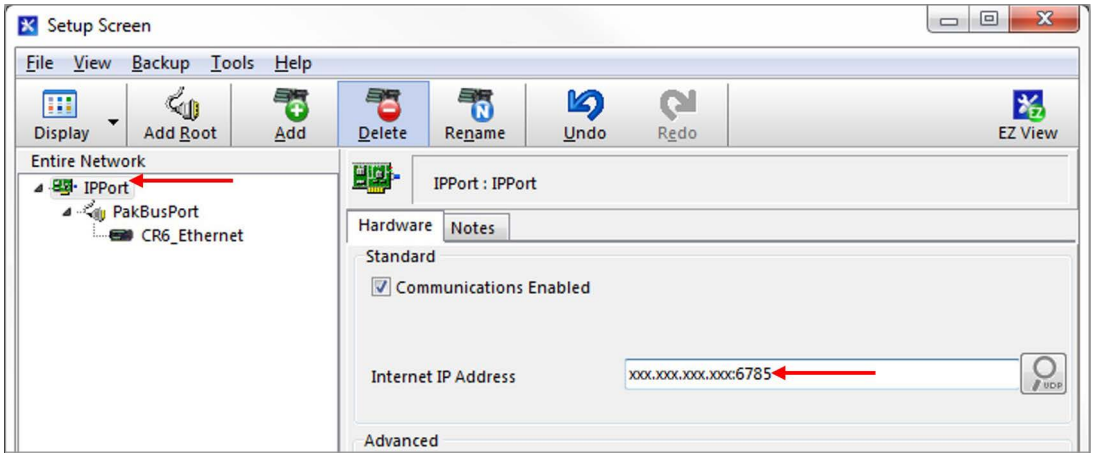


FIGURE 8: *Add IP Address*

7. Select **Apply** located at the bottom left of the setup screen. Minimize or close the setup screen and go back to the LoggerNet launch menu.

3. MAINTENANCE

3.1 AC POWER

The data logger 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 data logger and peripherals. It is imperative that a regulated charging source remain connected to the data logger as the battery installed in the data logger 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 data logger system and depends on the hardware configuration and sensor scan interval. If the battery voltage drops below 9.6 volts, operation of the data logger 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.

3.2 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 data logger, 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.

3.3 EXTERNAL BATTERY

Additionally, a large external battery, such as a deep cycle marine battery, can be connected to the data logger via the supplied external power cable to provide power to the data logger 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.

3.4 BATTERY REPLACEMENT

If the internal lead acid battery has failed it is recommended that the unit be returned to the factory for service by GEOKON personnel. However, with skilled personnel and appropriate tools, it is possible for the user to replace the battery. Consult GEOKON for information.

3.5 FUSES

There are two fuses on the internal power distribution board of the data logger (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 Section C.8 for fuse assignments.

4. TROUBLESHOOTING

Should difficulties arise, consult the following list of problems and possible solutions. For additional troubleshooting and support visit geokon.com/Technical-Support.

SYMPTOM: CANNOT COMMUNICATE WITH THE DATA LOGGER

- ☐ 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 data logger load fuse (F2) on the power distribution board is blown. Consult Section 3.5 for checking and/or replacement.

SYMPTOM: SYSTEM BATTERY VOLTAGE AND PANEL TEMPERATURE READ ODD NUMBERS

- ☐ The system battery could be low. Charge and check again (see Section 3.4).
- ☐ A disruptive current loop may be operating as a result of improper grounding or excessive noise. Consult the factory for more information.

SYMPTOM: 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 3.5 for checking and/or replacement.
- ☐ The internal battery is defective. Consult GEOKON.
- ☐ The regulated solar panel may be damaged, obstructed or have poor sun exposure. Check the output pins of the adapter with a voltmeter. Verify solar panel is not obstructed.

SYMPTOM: THE DATA LOGGER 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 3.5).

SYMPTOM: LOSS OF THE DATA LOGGER 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.
- ☐ Verify .CR6 Program is running on the data logger (See Appendix D).

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 data logger away from the noise source. Install grounding devices.

APPENDIX A. SPECIFICATIONS

A.1 MODEL 8600 SPECIFICATIONS

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 to +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
MEMS Sensor Limit	500 Sensors
Thermistor Accuracy	±0.25% of reading
Temperature Range	-40 to +70 °C
Battery	12 V, 7 Ah Gel Cell
Dimensions	Model 8600-1: 392 x 352 x 161 mm (15.43 x 13.85 x 6.34") Model 8600-2: 502 x 461 x 263 mm (19.76 x 18.15 x 10.35")

TABLE 1: *Model 8600 Micro-6000 Multi-Channel Data Logger Specifications*

A.2 CR6 MEASUREMENT AND CONTROL MODULE

Please refer to Campbell Scientifics Specification for the CR6 Data Logger:

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

A.3 MODEL 8032 MULTIPLEXER

Please refer to the Model 8032 Instruction Manual (geokon.com/8032).

A.4 PARTS LIST

Included with Data Logger	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
	External Power Cable
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 data logger communication)
	Data logger Starter CRBasic Program
	Custom CRBasic Programming
	WIFI Communications Modem
	RF Whip or High Gain Antennas with mounting hardware

TABLE 2: *Model 8600 Micro-6000 Multi-Channel Data Logger Parts List*

APPENDIX B. DATA STORAGE

Total Arrays of Data that can be stored per 16 channel multiplexer. Each array contains all data stored at each read interval. **For the Model 8600-2, refer only to the "1 Multiplexer Array Storage" data, as this version contains a single internal multiplexer.**

# 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 3: *Total Number of Arrays Available per Multiplexer*

B.1 DATA STORAGE EXAMPLES

B.1.1 OVERWRITE TIMES WHEN DATA IS STORED ONCE A MINUTE

# of Multiplexers	Minutes	Hours	Days	Total # of 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 4: *Amount of Time Until Data Overwrite Occurs when Data is Stored Every 60 Seconds*

B.1.2 OVERWRITE TIMES WHEN DATA IS STORED ONCE AN HOUR

# of Multiplexers	Hours	Days	Years	Total # of 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 5: *Amount of Time Until Data Overwrite Occurs when Data is Stored Every 60 minutes*

B.1.3 OVERWRITE TIMES WHEN DATA IS STORED ONCE A DAY

# of Multiplexers	Hours	Days	Years	Total # of 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 6: *Amount of Time Until Data Overwrite Occurs when Data is Stored Once per Day*

APPENDIX C. SYSTEM WIRING

C.1 MODEL 8600-1 CR6 WIRING

CR6 Connections	MUX Interface Ribbon Cable	MUX Enable Ribbon Cable	CR6 Power Cable	Discription
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 Enable1
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 7: *Model 8600-1 CR6 Wiring*

C.2 MODEL 8600-2 CR6 WIRING

CR6 Connections	Internal MUX 1 Interface Ribbon Cable	CR6 Power Cable	Discription
U1	Brown	NC	Vibrating Wire +
U2	Red	NC	Vibrating Wire -
U3	Orange	NC	Thermistor +
U4	Yellow	NC	Thermistor -
U5	Gray	NC	MUX Enable1
C4	White	NC	MUX Clock
12V	Blue	NC	MUX 12 VDC
G	Violet	NC	Ground
AG	Black and Green	NC	Analog Ground
PWR IN 12V	NC	Red	CR6 12 VDC
PWR IN G	NC	Black	CR6 Power Ground

TABLE 8: *Model 8600-2 CR6 Wiring*

Note: Ports U1 and U2 are used for vibrating wire when the data logger is configured for 32 ea. vibrating wire gauges. U3 and U4 are used when the data logger is configured for 32 ea. thermistors.

C.3 POWER DISTRIBUTION BOARD WIRING

Power Distribution Board	Pin	CR6	Wire Color	Description
NC	A	CHG +	Gray	Unregulated Charger
G (CHG/SOLAR)	B	NC	Blue	Ground
+12 (CHG/SOLAR)	C	NC	Violet	Regulated Charger / External Battery

TABLE 9: *Power Distribution Board Wiring*

C.4 CHARGER PORT WIRING

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

TABLE 10: *Charger Port Wiring*

C.5 UNREGULATED CHARGER WIRING

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

TABLE 11: *Unregulated Charger Wiring*

C.6 REGULATED CHARGER DEFAULT WIRING

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

TABLE 12: *Regulated Charger Default Wiring*

C.7 EXTERNAL POWER CABLE WIRING

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

TABLE 13: *External Power Cable Wiring*

Note: Disconnecting the internal battery is recommended when powered by external battery.

C.8 FUSE DESIGNATIONS FOR POWER DISTRIBUTION BOARD

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

TABLE 14: *Fuse Designations for Power Distribution Board*

APPENDIX D. LOGGERNET QUICK START GUIDE

Campbell Scientific's LoggerNet software is used to communicate with the data logger, program user specific settings and collect data stored in the data logger memory. LoggerNet is designed to be used with GEOKON Model 8600 Micro-6000 Data Loggers 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 data logger 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.

D.1 GETTING STARTED

D.1.1 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.

D.1.2 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 data logger via USB, the USB drivers must be installed. Device config must be Version 2.10 +.

1. In the launch menu, hover over **Utilities** and select **Device Config Utility**.

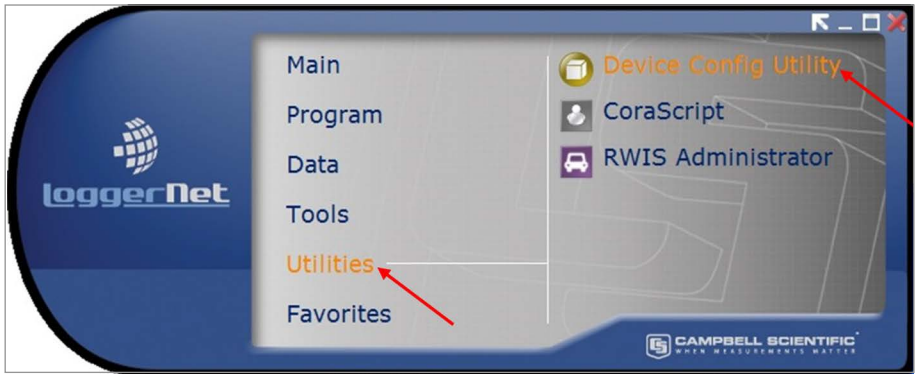


FIGURE 9: *Launch Menu, Device Config Utility*

2. 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.

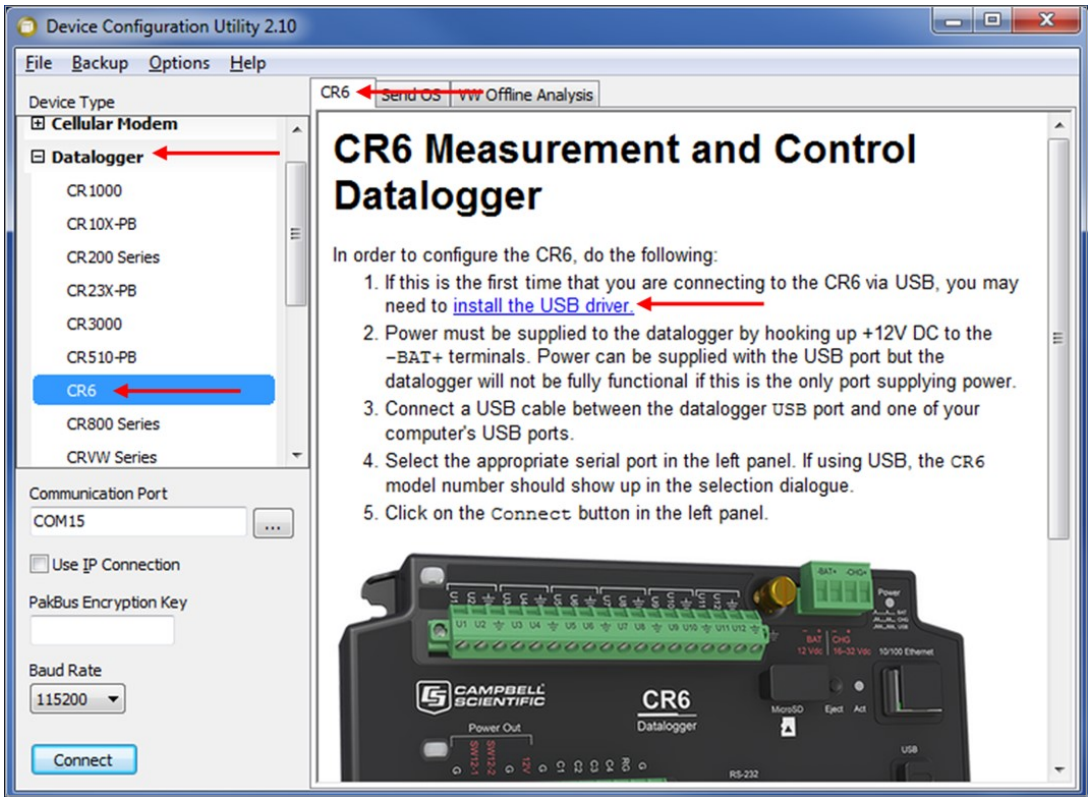


FIGURE 10: *Install Device Driver*

3. In the launch menu, hover over **Main** and select **Setup**.

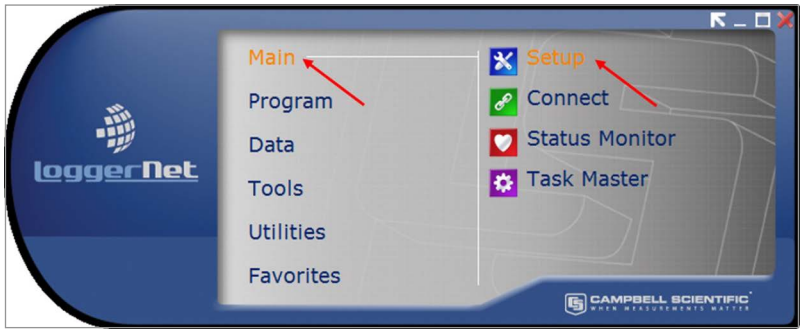


FIGURE 11: *Launch Menu, Setup*

4. 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.

5. To add a communication port, select **Add Root**.

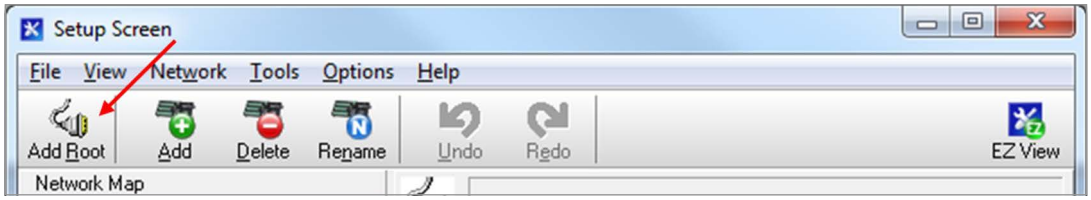


FIGURE 12: *Add Communications Port (Root)*

6. Each Micro-6000 Data Logger will communicate via USB. Select connection type **ComPort**, **PakBusPort (Other Loggers)**, **CR6Series** and then **Close**.

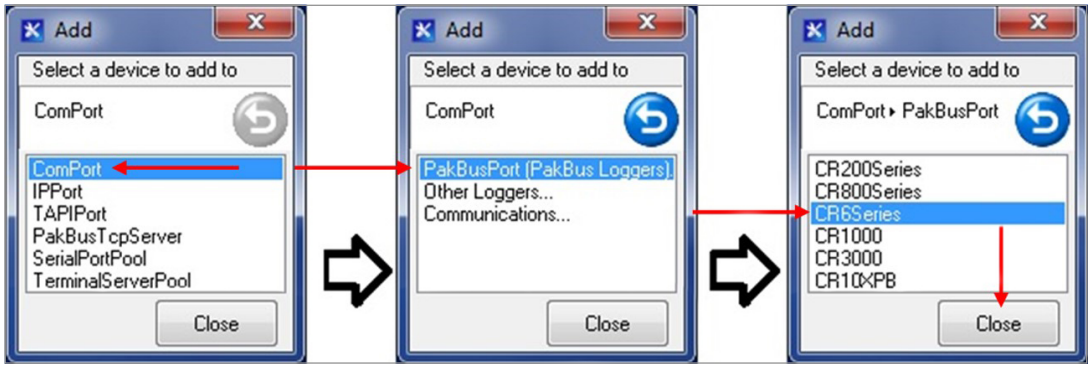


FIGURE 13: *Select Device to Add*

7. Select **ComPort** under **Entire Network**, select the communications port to connect to the data logger in **ComPort Connection**.

Note: It may be necessary to press **communications enabled** to open the 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.

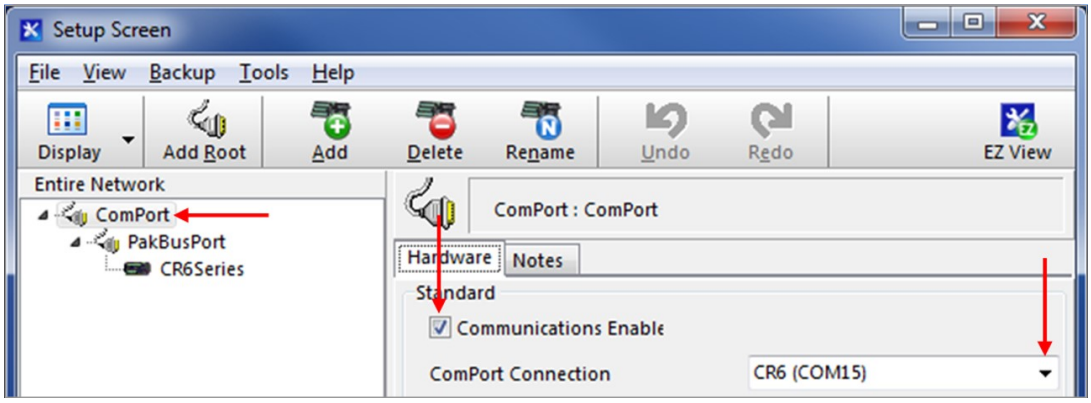


FIGURE 14: *Select Communications Port*

8. Select **PakBusPort** under **Entire Network**, in **Maximum Baud Rate** for direct connection to the data logger select **115200**.

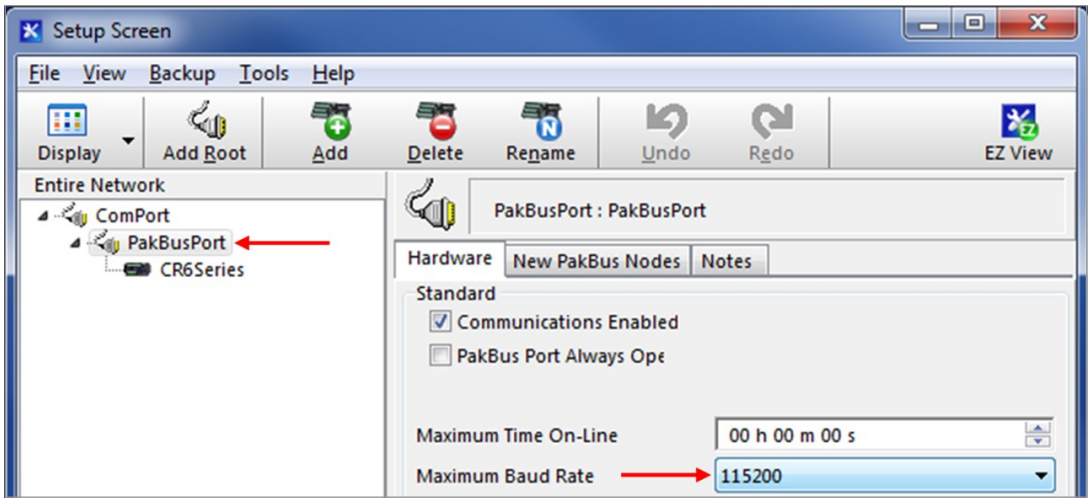


FIGURE 15: *Select Maximum Baud Rate*

9. Select **Apply** at the bottom left of the setup screen to save all settings.

D.1.3 CONNECTING TO THE DATA LOGGER

1. In the launch menu, hover over **Main** and select **Connect**.

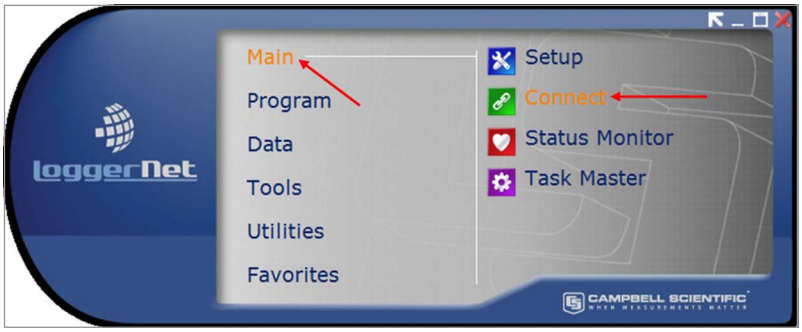


FIGURE 16: *Launch Menu, Connect*

2. Select the data logger to communicate with under **Stations** and select **Connect**.

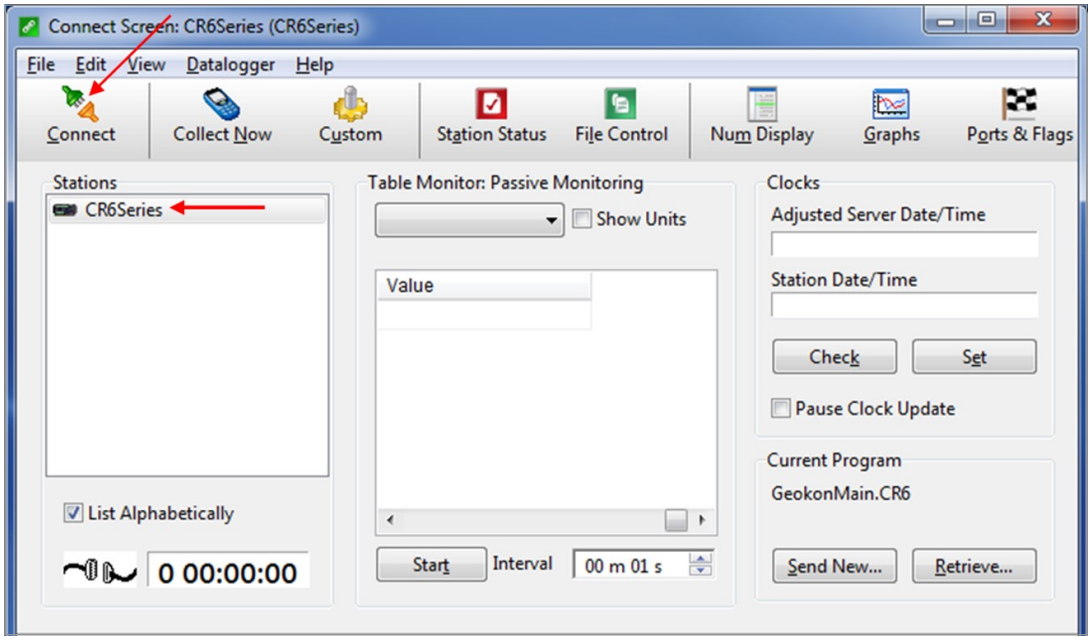


FIGURE 17: *Connect to the CR6*

D.2 MODIFYING THE DATA LOGGER 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 data logger configuration has a unique (.DLD) file.

Warning! Only change values **after the "=" sign**.

D.2.1 SCAN INTERVAL

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

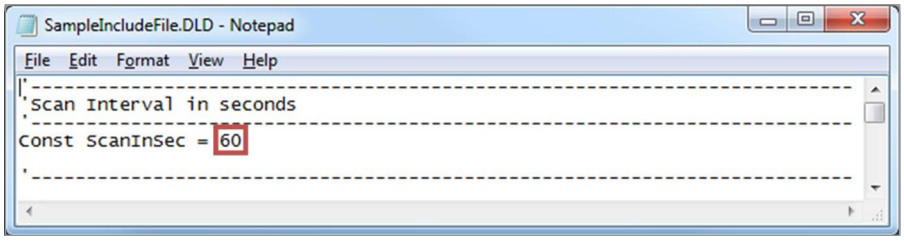


FIGURE 18: *Set the Scan Interval*

D.2.2 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 data logger to store engineering units.

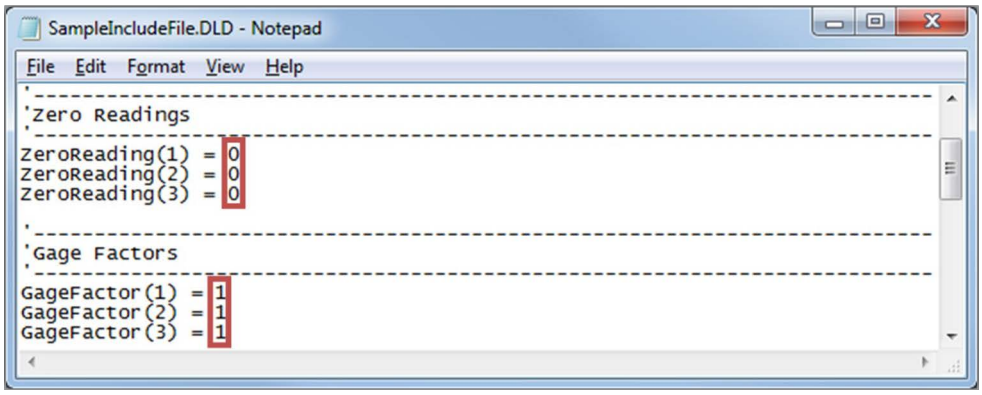


FIGURE 19: *Set Zero Readings and Gauge Factors*

D.2.3 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 data logger to use temperature compensation.

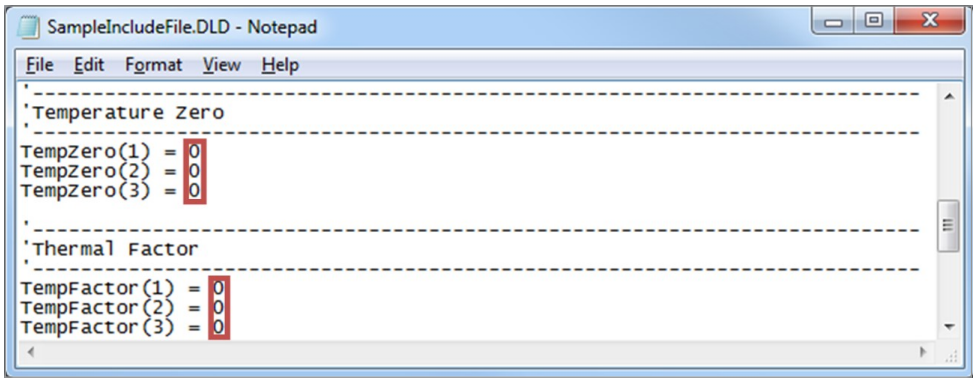


FIGURE 20: *Set Temperature Zero and Thermal Factor*

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.

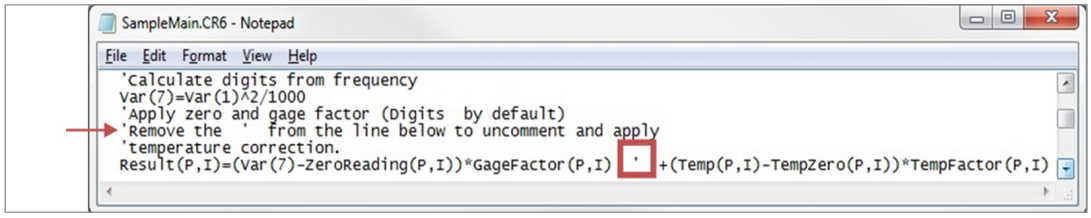


FIGURE 21: *Uncomment Specified Line*

D.2.4 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 and saved by the user.

Warning! 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.

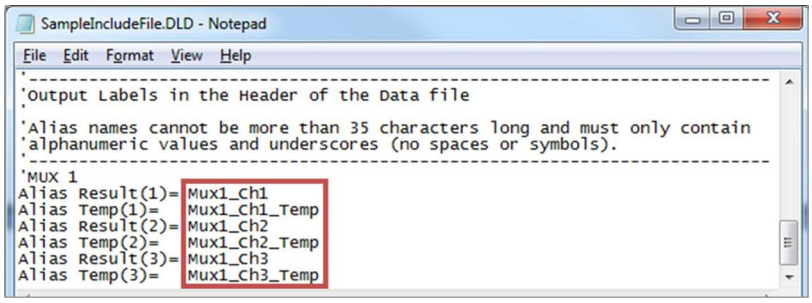


FIGURE 22: *Alias Names*

D.3 UPLOADING FILES

The Include.DLD file must be saved when modified. After modification, send the .DLD to the data logger. Send the Main (.CR6) program file to the data logger each time the .DLD file is updated.

D.3.1 SENDING THE INCLUDE FILE (.DLD)

1. In the launch menu, hover over **Main** and select **Connect**.

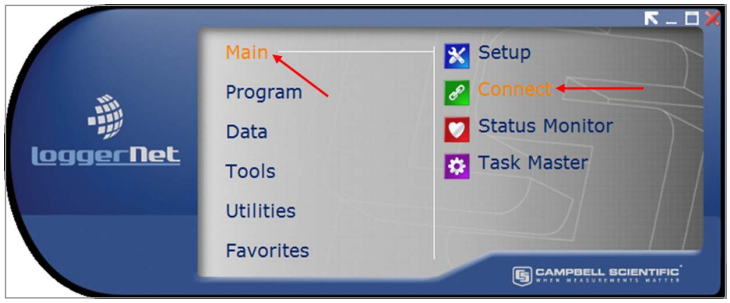


FIGURE 23: *Launch Menu, Connect*

2. Select **File Control** and select **Send** to transfer the Include (.DLD) file to the data logger.

Note: Each data logger has a unique Include (.DLD) file.

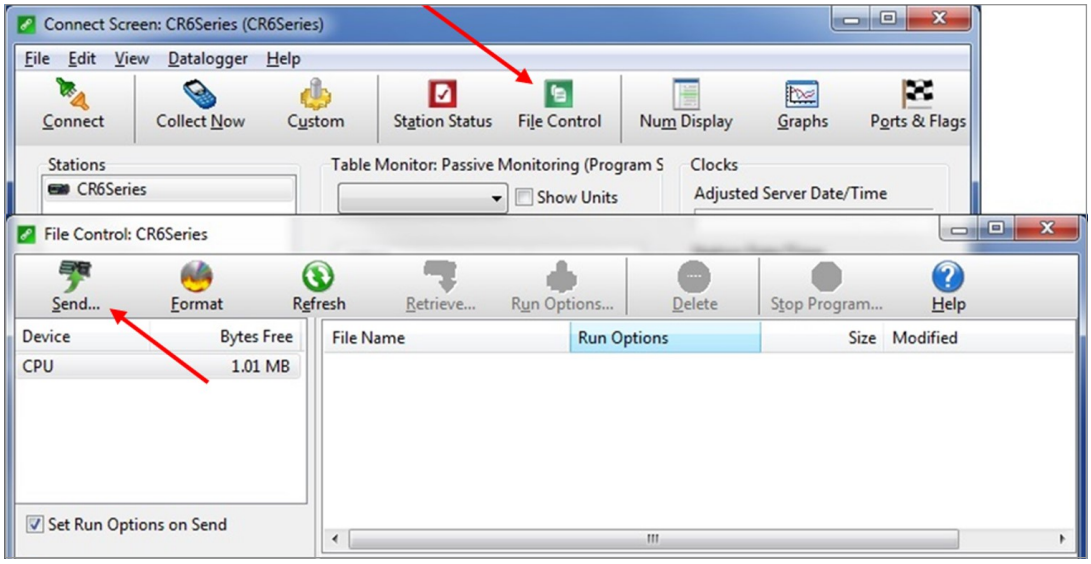


FIGURE 24: *Transfer File to Data Logger*

3. Select **DLD Files (*.dld)** to make the Include (.DLD) file visible in C:\Campbellsci\CRBasicEditor. Select the file.

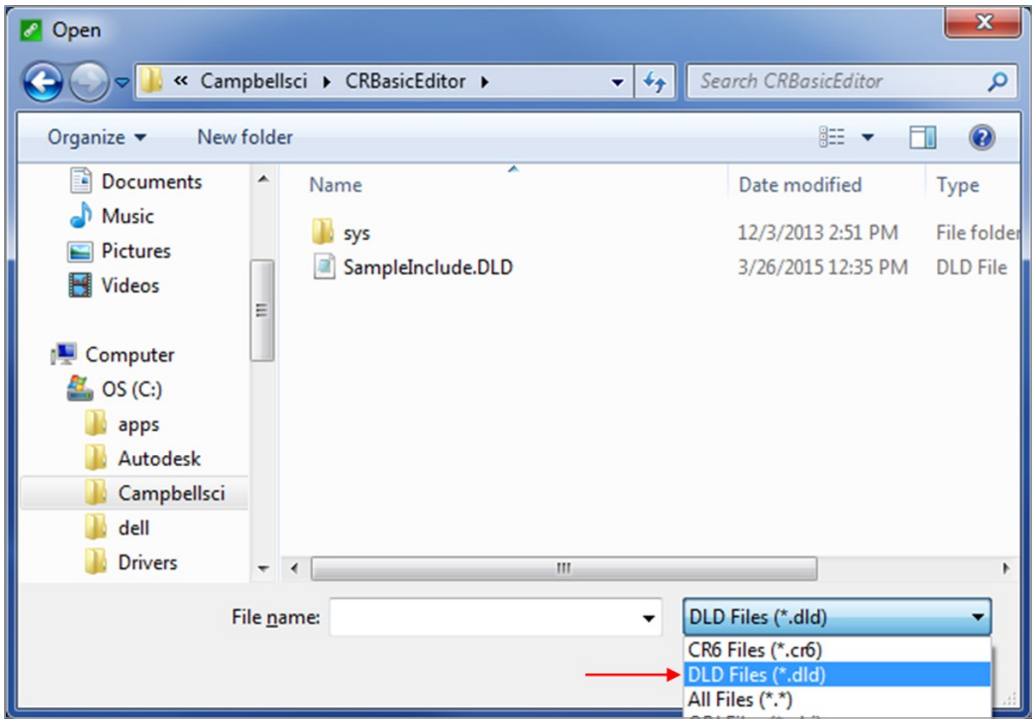


FIGURE 25: *Select DLD File Type*

4. Uncheck **Run Now**, the Include (.DLD) file cannot run the data logger. Select **OK**.

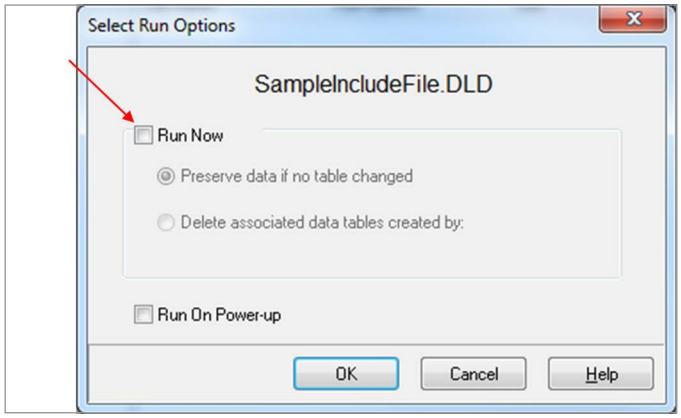


FIGURE 26: *Uncheck "Run Now"*

D.3.2 SENDING THE MAIN PROGRAM FILE (.CR6)

1. In the launch menu, hover over **Main** and select **Connect**.

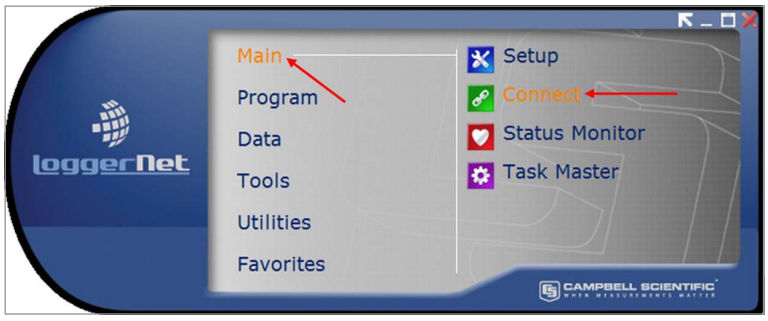


FIGURE 27: *Launch Menu, Connect*

2. Select **Send** and select the Main (.CR6) program file in C:\Campbellsci\CRBasicEditor. When sending the Main (.CR6) program file the program runs automatically.

Note: Each data logger has a unique Main (.CR6) file.

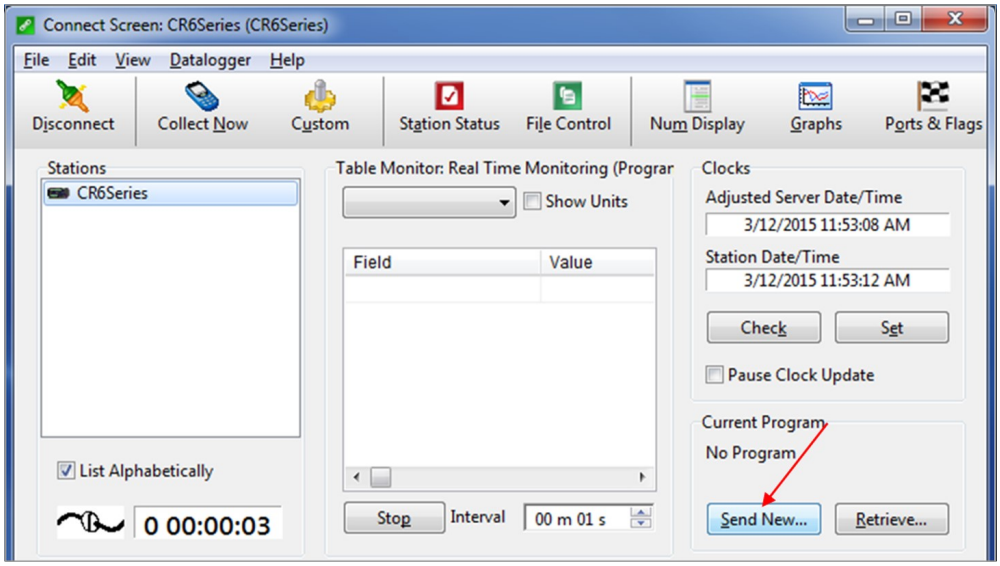


FIGURE 28: *Send the Main CRBasic Program File*

D.4 DATA HANDLING

D.4.1 DATA COLLECTION CONFIGURATION

1. In the launch menu, hover over **Main** and select **Setup**.

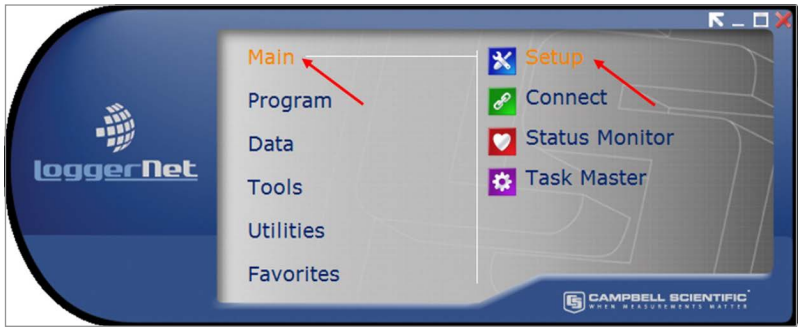


FIGURE 29: *Launch Menu, Setup*

2. Select the data logger **CR6Series**, **Data Files** tab then select **Table1** (Figure 30).

   Data loggers can be renamed by selecting the **Rename** option. Renaming the data logger 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.

Note: Collected data tables are signified with a green check mark.

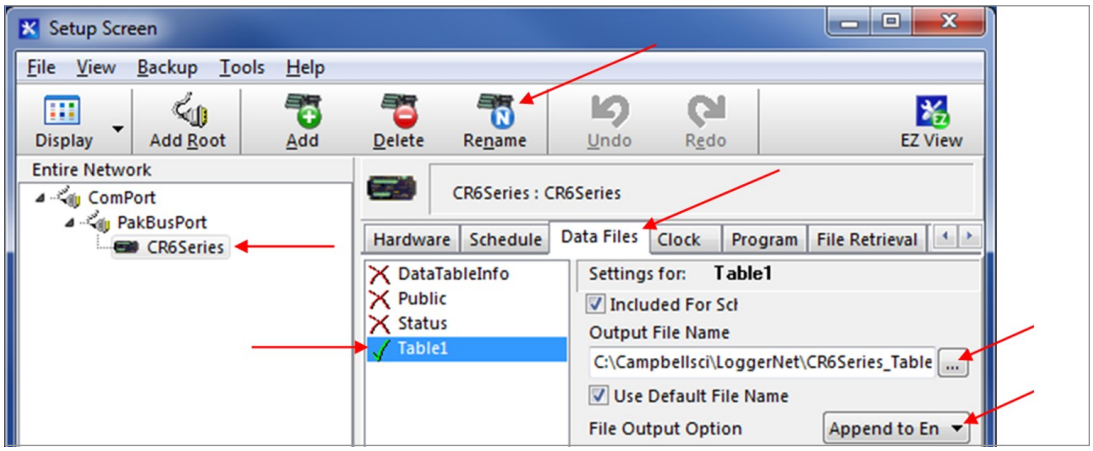


FIGURE 30: *Data Files Tab*

3. Select **Apply** at the bottom left of the setup screen to save all settings.

D.4.2 LIVE MONITORING

In the launch menu, hover over **Main** and select **Connect**.

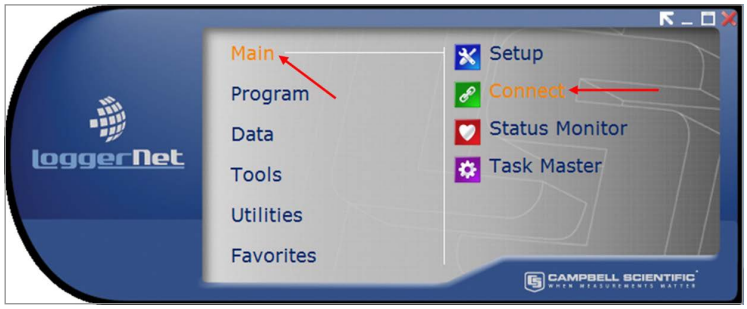


FIGURE 31: *Launch Menu, Connect*

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.

Note: It may be necessary to start monitoring by pressing "**Start**".

If unexpected **NAN** readings appear, refer to Section 4.

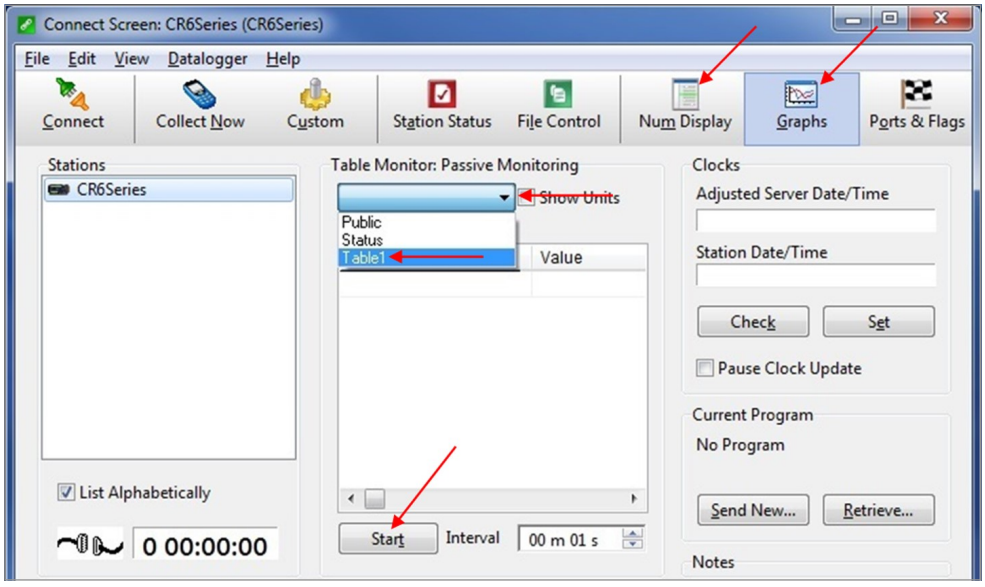


FIGURE 32: *Live Monitoring*

D.4.3 COLLECTING DATA

Selecting **Collect Now** collects and stores data on the computer. After collecting data a **Data Collection Results** screen will open.

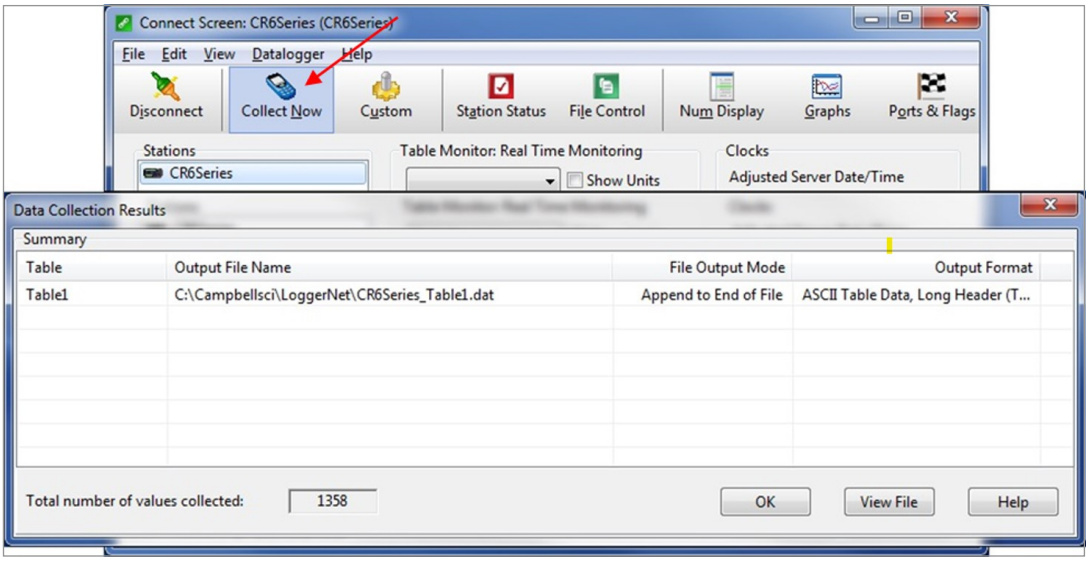


FIGURE 33: *Collecting Data*

Please see the LoggerNet manual for more specific details regarding use of the software:

https://help.campbellsci.com/loggernet-manual/home.htm

APPENDIX E. CELLULAR MODEM COMMUNICATIONS

E.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 sourcing cellular modems, GEOKON suggests one of the following models, available from Sierra Wireless Intelligent Gateways:

A list of modem distributors can be found at http://www.sierrawireless.com.

- **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 data logger, 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:** http://www.GEOKON.com/content/software/Raven_XT_Verizon_CSI.zip
- **AT&T LS300:** http://www.GEOKON.com/content/software/LS300G_ATT_CSI.zip
- **RV50:** Please contact GEOKON Directly depending on Network.

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

- Access Wireless Data Solutions

  http://www.accesswds.com

  orders@accesswds.com

  (813) 751-2039

- Industrial Networking Solutions

  http://www.industrialnetworking.com

  (972) 248-7466

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

E.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 pre-installed for plug and play of the antenna and customer supplied modem.

1. Secure the modem in the mounting bracket using the Velcro mounting strap.
2. Secure the SMA bulkhead cable to the modem SMA connector and antenna secured on the outside of the enclosure.
3. Connect the Modem RS-232 port to the data logger CPI port using the provided CPI to RS-232 null modem cable.
4. Connect the power supply cable provided with the modem 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.

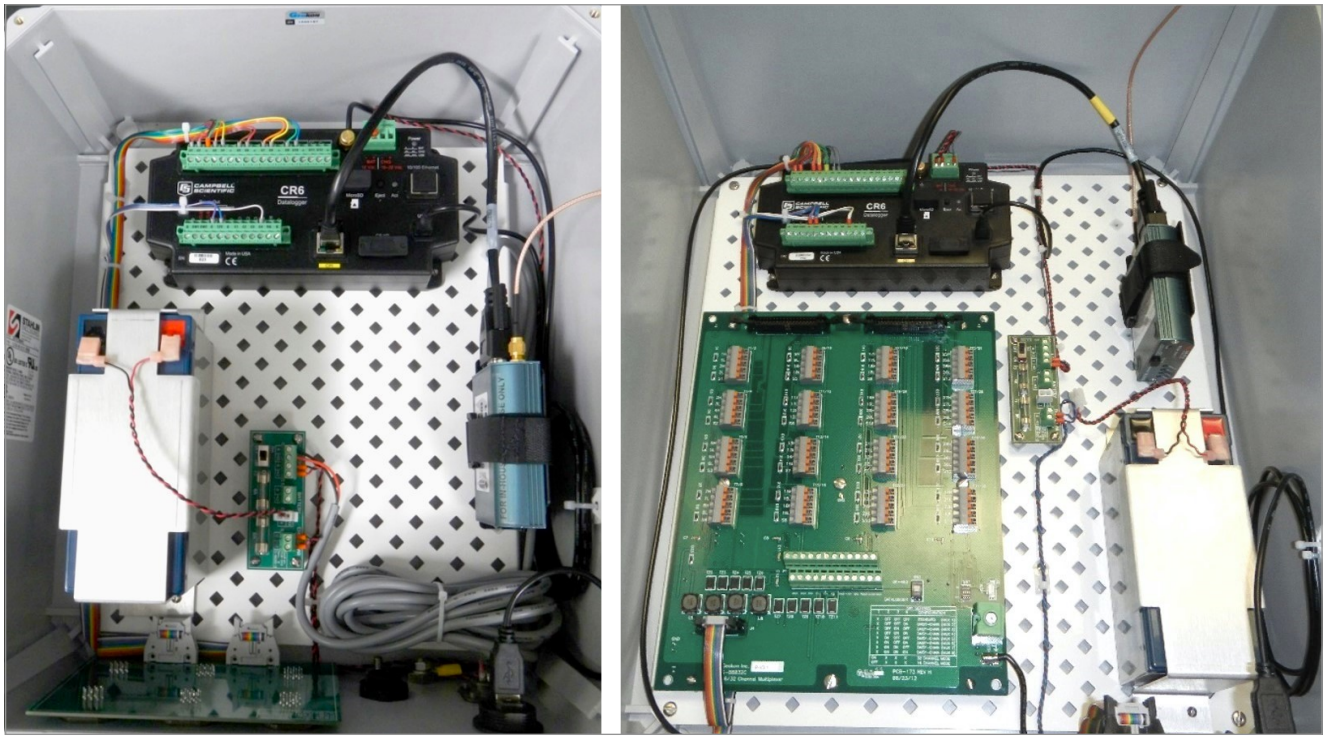


FIGURE 34: *Model 8600-1 (Left) and 8600-2 (Right) with Cellular Modem Installed*

E.3 COMMUNICATIONS

1. 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 data logger is represented.
2. Once the data logger (**CR6Series**) is added to the Network Map, press **Apply**. Select **IPPort** (Figure 35) and then Select **PakBusPort (PakBus Loggers)** (Figure 36).

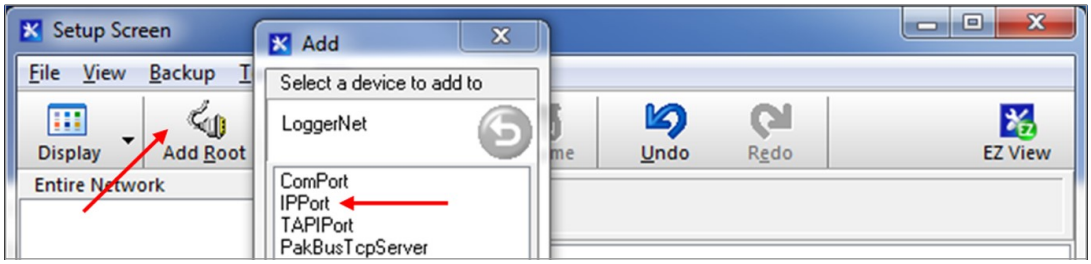


FIGURE 35: *Add Communications Port (Root) "IPPort"*

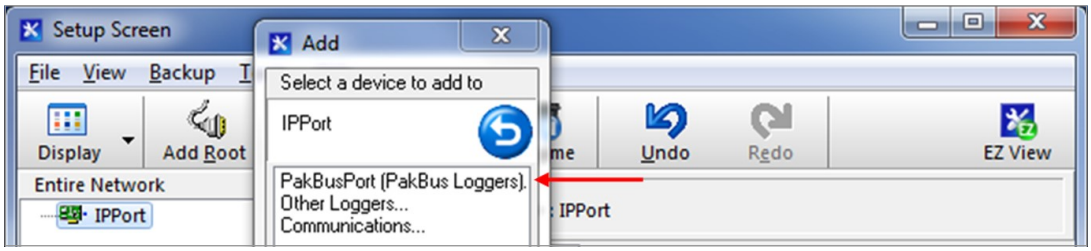


FIGURE 36: *Select "PakBusPort"*

3. Select **CR6Series**, then select **Apply**.

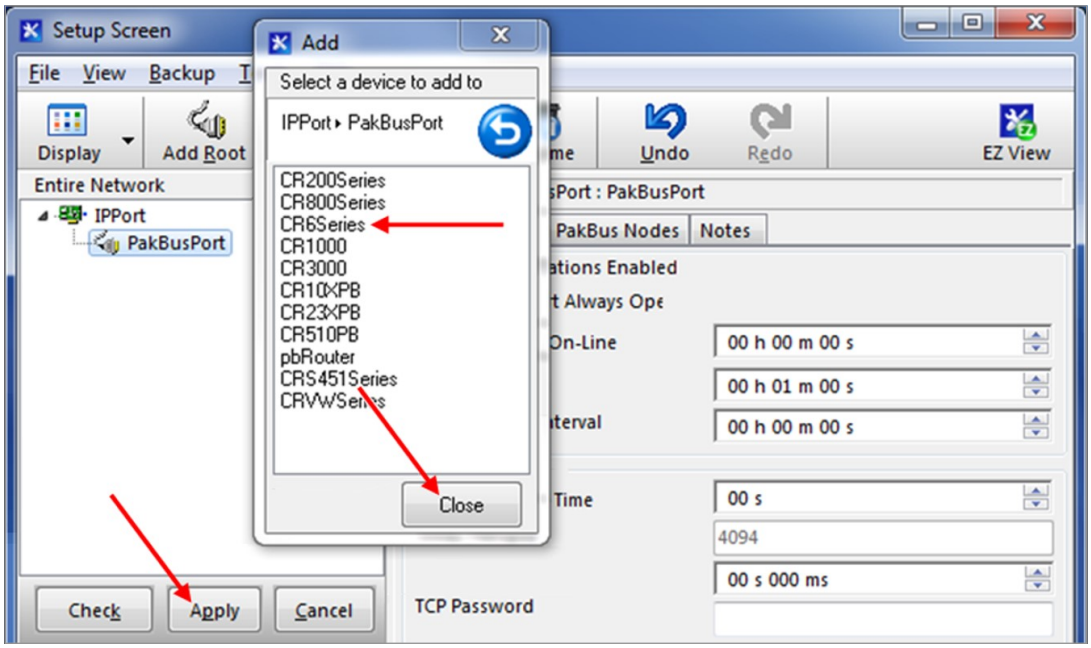


FIGURE 37: *Select Device to Add*

4. While still within the setup screen, the 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

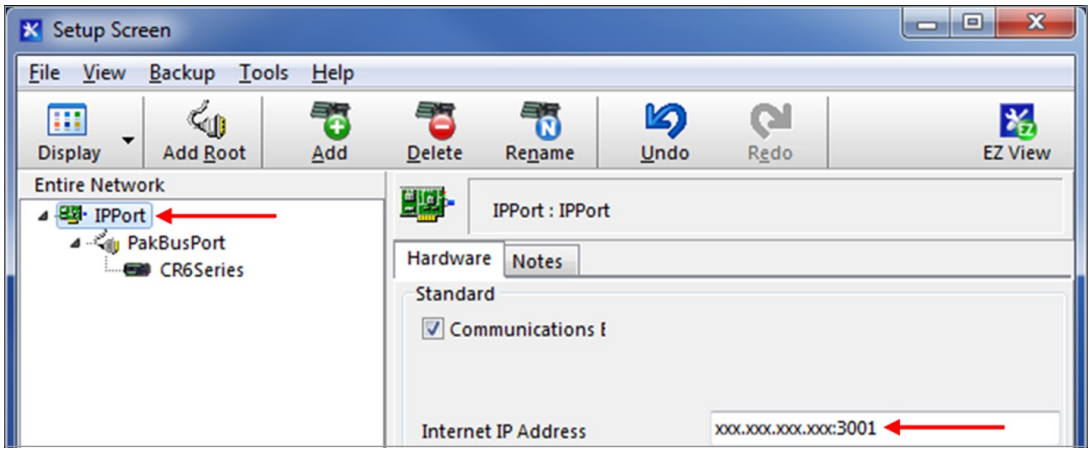


FIGURE 38: *Enter Internet IP Address*

5. Select **Apply** at the bottom left of the setup screen. Minimize or close the setup screen and go back to the LoggerNet launch menu.

GEOKON®

GEOKON
48 Spencer Street
Lebanon, New Hampshire
03766, USA

Phone: +1 (603) 448-1562
Email: teamsales@geokon.com
Website: www.geokon.com

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