Instruction Manual

Model 8025 Series Datalogger
(Micro-800)

Multi-Channel Datalogger

Warranty Statement

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Table of Contents

Appendix

Figures

OVERVIEW

The MICRO-800 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 an internal Geokon Model 8032 Multiplexer. 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 datalogging system consists of the Campbell Scientific CR800 datalogger, an internal multiplexer and an External Multiplexer port. Multiplexers expand the system by increments of 16 or 32 channels depending on the instrument type and configuration. The standard model 8025-2 Micro-800 datalogger can support one (1) internal Multiplexer and (1) external Multiplexer. The External Multiplexer port can also be used to Daisychain up to eight (8) Multiplexers (please see 8032 Manual for more information). The standard model 8025-4 and 8025-5 dataloggers are identical to the model 8025-2, but are configured for 32 VW gages only (8025-4) or 32 Thermistors only (8025-5). The standard model 8025-3 Micro-800 datalogger can support two (2) internal 16 channel Muliplexers and has 32 cable enties.

1.0   HARDWARE

The controller portion of the MICRO-800 datalogger consists of a Campbell Scientific CR800 Measurement and Control Datalogger. To gain an understanding on the workings and capabilities of the CR800 it is necessary to read the Overview section of the CR800 Operator's Manual. The CR800 Operator's Manual is available as a pdf file on the Campbell Scientific Resource CD supplied with the datalogger.

A Campbell Scientific AVW200 Vibrating Wire Interface provides the required excitation and signal processing for the vibrating wire sensors connected to the Datalogger. The AVW200 uses spectral analysis to find the resonant frequency of the Vibrating Wire Gage. The AVW200 is also used to measure the thermistor used in Geokon's vibrating wire instruments. For complete specifications of the AVW200 see the AVW200 Instruction Manual on the Campbell Scientific Resource CD.

A dual-mode battery charging circuit board is used to provide the charging voltage for proper maintenance of the installed lead acid battery. The circuit board contains fused protected terminal blocks used to provide a nominal 12VDC supply for devices such as the CR800 and Model 8032 Multiplexer board. In some cases a Solar Charge Regulator may be used in place of the dual-mode charger.

The Model 8032 Multiplexer board expands the number of channels that can be read by the MICRO-800 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-800. The Model 8032 multiplexer can be configured for 16x4 or 32x2 channels depending on application. Please see Appendix F for more information on the Geokon Model 8032 multiplexer.

A 12V – 7Ah lead acid battery is used to provide power for the datalogger. The battery is provided to supply 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 (5) years.

1.1   INSTALLATION

The recommended method of installation involves attaching the enclosure (MICRO-800) to a fixed structure, such as a wall, in an upright position (**Figure 1**). Mounting dimensions shown in inches.

Figure 1

1.2   Power

After the Datalogger is installed the charger can be plugged into the AC mains and the On/Off switch S1 on the Charge Regulation circuit board switched to the "On" position (**Figure 2**). It is recommended that the charger be left plugged in at all times (**Section 3.1).**
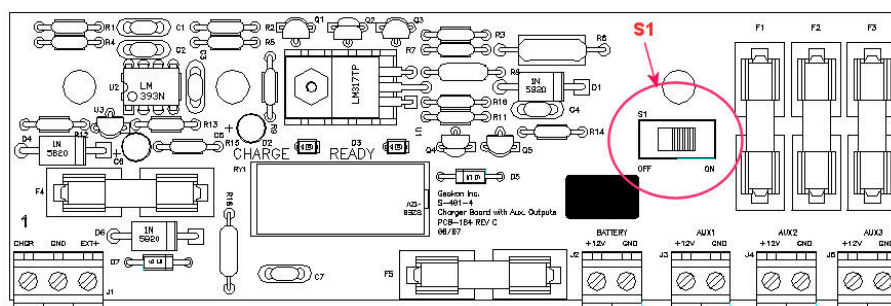
Figure 2

1.3   Earth Ground

An earth grounding lug is supplied on the exterior of the Micro-800 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 6' to 8' copper grounding rod connected to the Dataloggers grounding lug with a large gauge wire (12 AWG or larger) is recommended. The earthing connection should be made as close to the Datalogger as possible.

1.4   Gages

At this time the vibrating wire sensors can be connected to the multiplexer. Please refer to Appendix F for the appropriate connection description.

1.5   Communications

Standard communications with the Datalogger is established by connecting the supplied serial cable to the RS-232 port **(Figure 3)** and the COM port on a computer, or a USB port on the computer by using the provided USB to Serial converter cable.
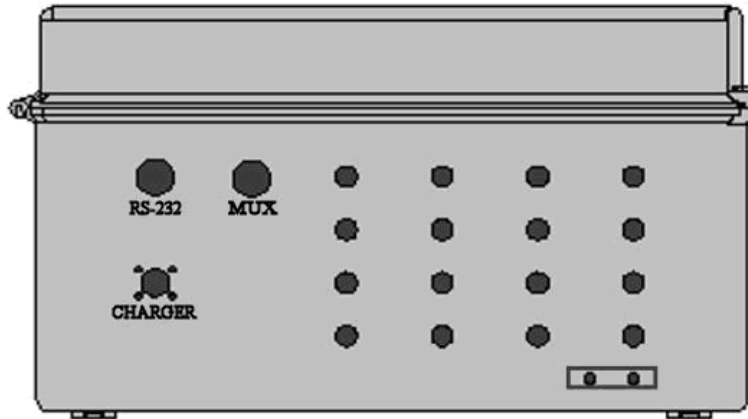
Figure 3

2.   SOFTWARE

The Micro-800 Datalogger is operated by a download file that is generated by a software program. The software package the MICRO-800 Datalogger may be supplied with is either MultiLogger software (developed by Canary Systems, Inc, New London, NH) or 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.

3.   BATTERY MAINTENANCE

3.1   AC Power

The MICRO-800 is supplied with an external AC to DC power supply for maintaining the charge of the battery and providing power to the Datalogger and peripherals. It is imperative that the power supply 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 datalogging system, depending 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.

3.2   Solar Power

If AC mains power is not available, a properly sized solar panel can be used to provide power to maintain the charge state of the battery and provide power to the Datalogger and peripherals. The size of the solar panel is determined by geographic location of the Datalogger, hardware configuration, and the sensor scan interval.

3.3   External Battery

Additionally, a large external battery, such as a deep cycle marine battery, may be connected to the Datalogger via the supplied external power cable to provide power to the Datalogger and peripherals. When this type of battery is connected to the Datalogger the internal Datalogger battery is automatically 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 recommend 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 the factory for information.**

3.5   Fuses

There are five fuses on the dual mode charger board of the MICRO-800 (**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 (mega-ohms) 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. All five fuses are 2 amp SLO-BLO 5x20mm. Consult Appendix D.3. for fuse assignments.

4.   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.

- **Cannot communicate with the Datalogger.**

Suggestions:

1.   The wrong communication cables are being used or the cables in use are defective. Consult Appendix D.1.2 to verify cable pinout. Consult the factory for interfacing information.

2.   The internal battery could be dead. Charge overnight and try again. If it still doesn't work check the voltage across the terminals of the battery. If the voltage is still below 10 volts the battery may need to be replaced.

3.   The wrong communication port is being used on the host computer (default is COM1). Consult the appropriate software manual for instructions on changing the communication port.

4.   The communication port on the host computer is defective. Verify the functioning and configuration of the COM port by using it with another RS-232 device, such as a modem or serial printer.

5.   The Datalogger Auxiliary Fuse on the Dual-Mode Charger board is blown. Refer to Appendix D.3 for proper fuse replacement.

- **The system battery voltage and panel temperature read odd numbers.**

Suggestions:

1.   The system battery could be low. Charge and check again (see previous section).

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

- **The internal battery measurement does not increase and charging LED (Yellow = Charging and Green = Charged) does not light when the AC adaptor is plugged in.**

Suggestions:

1.   The adaptor may be damaged. Check the output pins of the adaptor with a voltmeter.

2.   The charger fuse is blown. Consult Section 3.5 for checking and/or replacement.

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

- **The Datalogger will not operate on external power.**

Suggestions:

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

2.   The external power or battery fuse is blown **(Section 3.5)**.

- **Loss of CR800 program and/or data.**

Suggestions:

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

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

- **Sensor readings show -99999 or are unstable.**

Suggestions:

1.   The wrong sensor type has been selected. Check the model number of the sensor against the software setting **(Section E.1)**.

2.   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.

3.   If all sensors on a particular multiplexer are erratic or returning "-99999" perhaps the multiplexer or interface cable has been damaged / unplugged.

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

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

- **The sensor readings show OVERRANGE all the time.**

   Suggestions

1.   The "Sensor Type" selected for that particular channel is "None". This is applicable for users of MultiLogger **(Section E.1)**. Please refer to the MultiLogger manual.

2.   A scan has not been initiated yet because of the "Start Time" setting (MultiLogger users only).

3.   "Update" has not been run (MultiLogger users only).

APPENDIX A - SPECIFICATIONS

A.1   CR800 Measurement and Control Module
Power requirements: 9.6 to 16 VDC
Analog measurement current drain: 27.6 mA
Processing current drain: 16.2 mA
Quiescent current drain: .6 mA
Operating temperature: -25° to +50° C
Processor: Hitachi H8S 2322
Memory: 2Mb ROM, 4Mb RAM
Storage capacity:2,000,000 Final Storage Locations
Real time clock accuracy: ±3 minutes per year
Expansion capability: up to 2x 32 channel multiplexers (single ended)
System battery: 12 V, 7 Ahr lead acid
Communication: RS-232 115200 baud, 8 data bits, no parity, 1 stop bits

A.1.1   Analog Inputs
Configuration: 3 differential or 6 single-ended
Voltage measurement accuracy: 0.06% of FSR for 0° to 40°C
Voltage measurement ranges and resolution:

Range	Resolution
±5.0 V	1330 µV
±2.5 V	667 µV
±250 mV	66.7 µV
±25 mV	6.7 µV
±7.5 mV	2 µV
±2.5 mV	.67 µV

Common mode range: ±5 VDC
DC common mode rejection (CMRR): >100 dB
Maximum input voltage: 16 VDC

A.1.2   Excitation Outputs
Configuration: 2 switched output channels
Excitation range: ±2.5 V
Excitation resolution: 0.67 mV
Excitation accuracy: 0.06% of FSR for 0°C to 40°C
Output current: 25 mA @ 2.5 VDC

A.1.3   Pulse Inputs
Configuration: two 24 bit
Maximum count rate: 16.7×10^6
Maximum input voltage: +/-20 VDC
Modes: Switch closure, high frequency pulse, low level AC

A.1.4 Control Ports

Configuration: 4 digital I/O ports
Input/output resistance: 100kΩ/330Ω, respectively
Input "high" level: 3.8 V to 5.3 V
Input "low" level: -0.3 V to 1.2 V
Output "high" level: 5 V ±0.1 V
Output "low" level: <0.1 V

A.1.5 Model 8032 Multiplexer (See the Appendix F complete specifications)

A.1.6 AVW200 Vibrating Wire Interface (See AVW200 Manual for complete specifications)

Power requirements: 9.6-16 VDC
Vibrating Wire measurement current: 25 mA
Quiescent current: .3 mA

APPENDIX B - SHIP LIST

B.1 Hardware

The following equipment is included with the system:

- External Power cable
- DB-9 to 10 pin Bendix RS-232 Cable
- USB to RS-232 Adapter
- Small regular screwdriver
- Spare slo-blo fuses (5), 2 amp
- AC Adaptor (110 VAC or 220 VAC)

The following manuals are included:

- MICRO-800 Instruction Manual
- Campbell Scientific Resource disk

Optional accessories:

- COM220 Landline Phone Modem with manual (access Datalogger via phone line)
- Cellular Phone Modem with manual
- Short Haul Modems with manual (current loop communication device)
- MD485 RS-485 Multidrop Interface with manual (Datalogger networking)
- Solar Panel with mounting hardware, charger, and manuals
- RF Modem with manuals (wireless Datalogger communication)

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

APPENDIX C – DATA STORAGE

C.1   Input Locations

Default explanations for the Input/Final Storage location usage in MultiLogger unless user configured;

Input Storage #	Label	Explanation
1	Logger ID	Datalogger ID 1-9999
2	Year	Year when last readings taken
3	JulianDay	Julian Day (1-365) when last readings taken
4	Time-HHMM	Time (24 hour) when last readings taken
5	Seconds	Seconds when last readings taken
6	DecimlDay	Decimal Day when last readings taken
7	ElapsdHr	Elapsed Hours from "Start" (if "Log" selected as "Scan Interval")
8	ElapsdMin	Elapsed Minutes from "Start" (if"Log" selected as "Scan Interval")
9	ElapsdSec	Elapsed Seconds from "Start" (if "Log" selected as "Scan Interval")
10	Battery	Datalogger battery voltage
11	PanelTemp	Datalogger panel temperature (°C)
47-78	Mx1	Readings from Gages on Mux #1

C.2   Data Storage

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

	Total Arrays
1 Multiplexer Array Storage	20,700
2 Multiplexer Array Storage	12,257
3 Multiplexer Array Storage	8,686
4 Multiplexer Array Storage	6,701
5 Multiplexer Array Storage	5,457
6 Multiplexer Array Storage	4,593

C.3   Data Storage Example

If data is stored once a minute:

	Minutes	Hours	Days	Total Arrays
1 Multiplexer Overwrite Time:	20,685	344.8	14.4	20,700
2 Multiplexer Overwrite Time:	12,244	204.1	8.5	12,257
3 Multiplexer Overwrite Time:	8,722	145.4	6.1	8,686
4 Multiplexer Overwrite Time:	7,633	127.2	5.3	6,701
5 Multiplexer Overwrite Time:	5,450	90.8	3.8	5,457
6 Multiplexer Overwrite Time:	4,586	76.4	3.2	4,593

If data is stored once an hour:

	Minutes	Hours	Days	Total Arrays
1 Multiplexer Overwrite Time:	1,241,454	20,690.9	862.1	20,700
2 Multiplexer Overwrite Time:	735,407	12,256.8	510.7	12,257
3 Multiplexer Overwrite Time:	521,196	8,686.6	361.9	8,686
4 Multiplexer Overwrite Time:	403,022	6,717.0	279.9	6,701
5 Multiplexer Overwrite Time:	327,413	5,456.9	227.4	5,457
6 Multiplexer Overwrite Time:	275,573	4,592.9	191.4	4,593

If data is stored once a day:

	Minutes	Hours	Days	Total Arrays
1 Multiplexer Overwrite Time:	29,795,034	496,583.9	20,691.0	20,700
2 Multiplexer Overwrite Time:	17,650,067	294,167.8	12,257.0	12,257
3 Multiplexer Overwrite Time:	12,507,876	208,464.6	8,686.0	8,686
4 Multiplexer Overwrite Time:	9,651,092	160,851.5	6,702.1	6,701
5 Multiplexer Overwrite Time:	7,858,073	130,967.9	5,457.0	5,457
6 Multiplexer Overwrite Time:	6,613,913	110,231.9	4,593.0	4,593

APPENDIX D – SYSTEM WIRING

D.1   CR800 Wiring (8025-2, 8025-3 and 8025-4)

CR800 Connections	MUX 1 Interface Cable	MUX 2 Interface Cable	AVW200 SDI-12 Interface Cable	CR800 Power Cable	Description
AG	Green & Black	Green & Black	NC	NC	Analog Ground
12V	Blue	Blue	NC	NC	12 VDC Output
G	Violet	Violet	Blue's Black	NC	Ground
C1	Gray	NC	NC	NC	Digital I/O Port 1 / RESET
C2	NC	Gray	NC	NC	Digital I/O Port 2 / RESET
C3	NC	NC	Blue	NC	Digital I/O Port 3 / SDI-12 Communication
C4	White	White	NC	NC	Digital I/O Port 4 / Clock
PWR In +12V	NC	NC	NC	Red	+12VDC Power
PWR in G	NC	NC	NC	Black	Power Ground

D.1.1   AVW200 Wiring (8025-2, 8025-3 and 8025-4)

AVW200 Connections	Color	MUX Interface Ribbon Cable	CR800 Datalogger	Description
1V +	Brown	Conductor 1	NC	Vibrating Wire +
1V -	Red	Conductor 2	NC	Vibrating Wire -
1T+	Orange	Conductor 3	NC	Thermistor +
1T-	Yellow	Conductor 4	NC	Thermistor -
SCI12	Blue	NC	C3	SDI-12 Communications
G	Blue's Black	NC	G	Ground
12V	Red	NC	12V	+12VDC Power
G	Red's Black	NC	G	Ground

D.1.2 CR800 Wiring (8025-5)

CR800 Connections	MUX 1 Interface Cable	MUX 2 Interface Cable	CR800 Power Cable	Description
AG	Green & Black	Green & Black	NC	Analog Ground
12V	Blue	Blue	NC	12 VDC Output
G	Violet	Violet	NC	Ground
C1	Gray	NC	NC	Digital I/O Port 1 / RESET
C2	NC	Gray	NC	Digital I/O Port 2 / RESET
C4	White	White	NC	Digital I/O Port 4 / Clock
*VX1	Brown	Brown	NC	Excitation 1 / Thermistor +
*SE2	Red	Red	NC	Single Ended Channel 2 / Thermistor -
PWR In +12V	NC	NC	Red	+12VDC Power
PWR in G	NC	NC	Black	Power Ground

* NOTE: The Thermistor is read using Single Ended Channel 2 and Excited with VX1 through a bridge completion circuit.
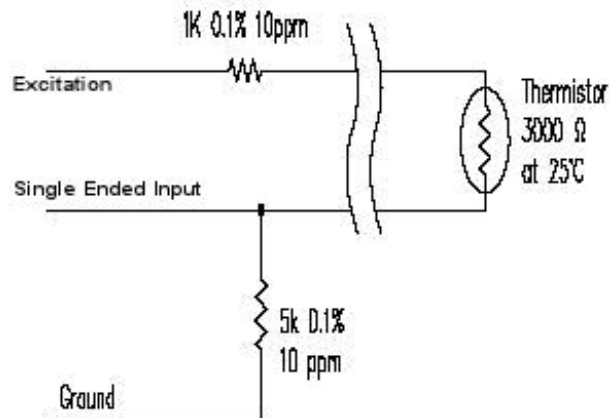
D.1.3 RS-232 Connector Wiring

10-Pin Bendix	Color	Description
A	White	Ground
B	Green	Transmit
C	Orange	Receive
D	Yellow	RTS
E	Blue	CTS
G	Violet	DTR

D.1.4 Charger Wiring

Pin	Description	Wire Color
A	Charger + (14-22 VDC Input)	Grey
B	Ground	Blue
C	Battery + (12 VDC Output)	Violet

D.2   Cables

D.2.1 AC Charger (110VAC/220VAC)

Pin	Description	Condor - Wire Color
A	Charger + (14-22 VDC Input)	Black with White Stripe
B	Ground	Black

D.2.2 External Power Cable

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

D.3   Fuses

Fuse	Description
F1	12VDC Auxiliary 1
F2	12VDC Auxiliary 2
F3	12VDC Auxiliary 3
F4	External Battery
F5	Battery

D.4 **Multiplexer Connector Wiring**

10-Pin Bendix	Color	Description
A	Brown	Vibrating Wire +
B	Red	Vibrating Wire -
C	Orange	Thermistor +
D	Yellow	Thermistor -
E	Green	Analog Ground
F	Blue	+12 VDC
G	Violet	Ground
H	Grey	MUX Reset
J	White	MUX Clock
K	Black	Analog Ground

APPENDIX E –LOGGERNET QUICKSTART 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-1000 and Micro-800 Dataloggers reading Vibrating Wire and MEMS tilt sensors; other configurations and sensor outputs are available 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 pre-configured 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 (.CR1/.CR8) 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 Gage 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, the CRBasic program files are located on the Geokon USB Thumb Drive. The file types are ".DLD" and ".CR1"/".CR8.", 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 drop-down list of all the categories on the LoggerNet toolbar. Hovering over a category will display a list of applications related to that category.

With the Launch Menu open, hover over "Main" and press "Setup" from the resulting list of applications.
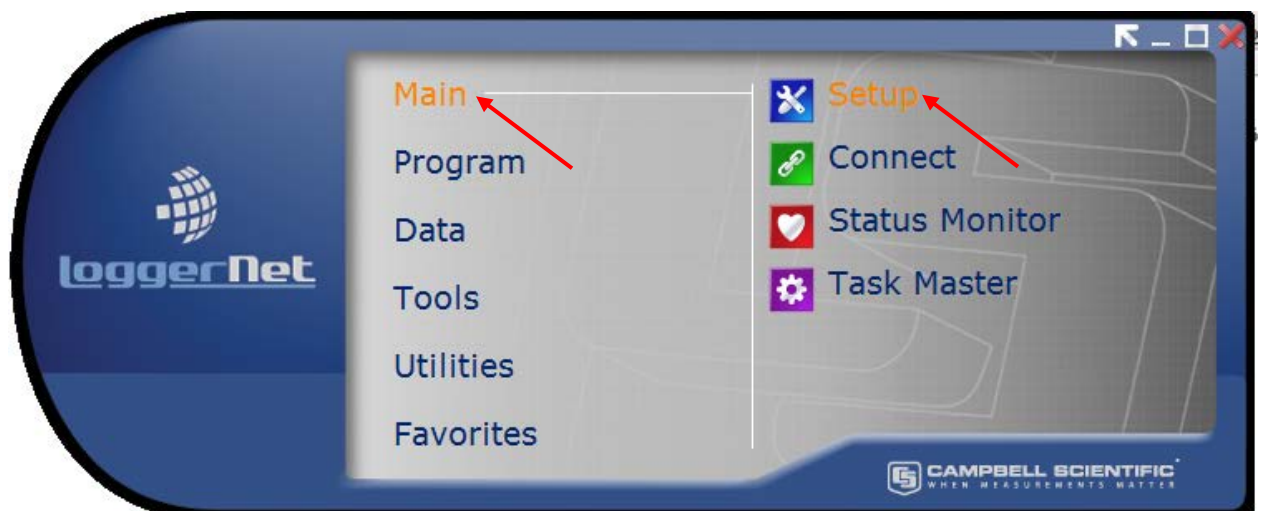
By default, the EZ View of the Setup Screen is displayed. To change the viewing method press the "Std View" icon at the top right of the Setup Screen. This Quick Start will show the "Std View" of the Setup Screen. To add a communication port, press "Add Root" button.
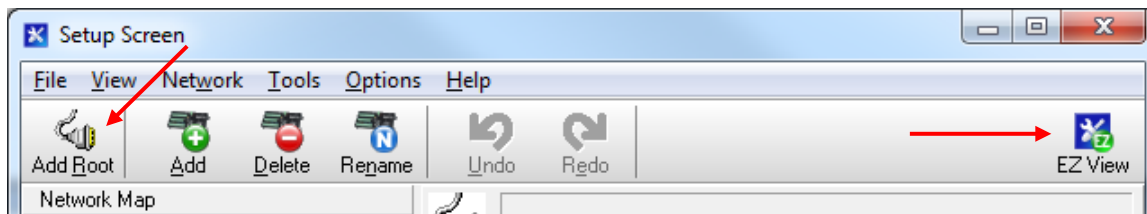

Each Datalogger will communicate via RS232. Select connection type "ComPort", "PakBusPort (Other Loggers)", "CR1000" or "CR800Series" and press "Close".
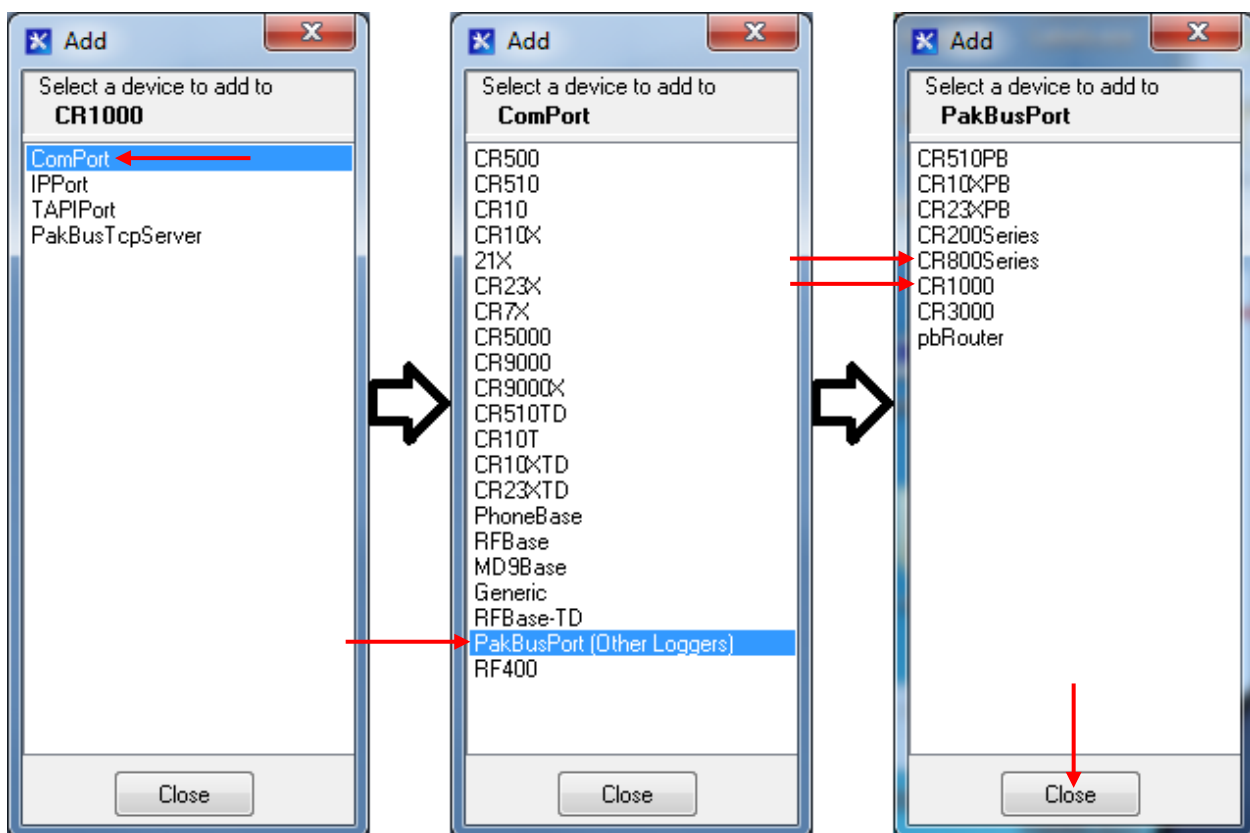
Select "ComPort" under the "Network Map", select the communications port to connect to the Datalogger in "ComPort Connection".

CONDITIONAL NOTE: IT MAY BE NECESSARY TO PRESS "COMMUNICATIONS ENABLED" TO OPEN THE COMMUNICATIONS PORT.
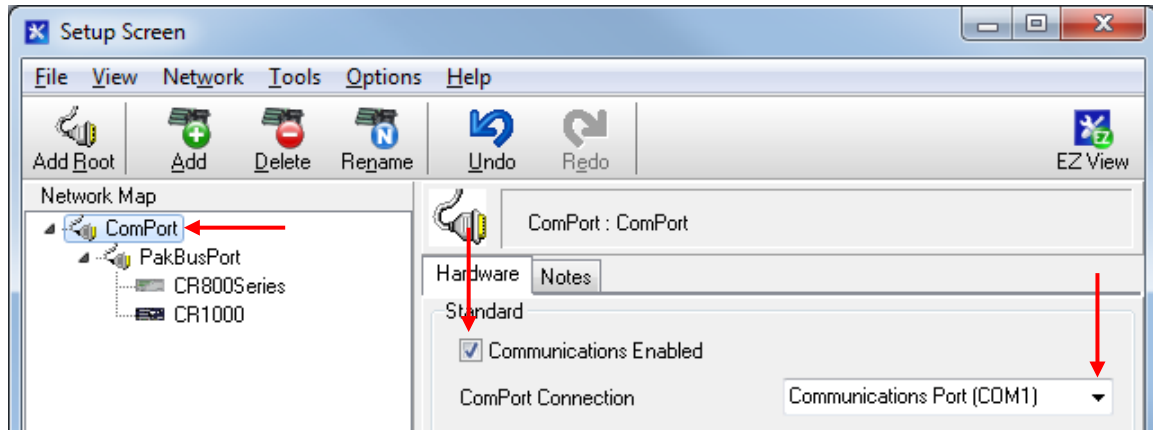
COM NUMBERS VARY WITH COMPUTER , USB DEVICES AND SERIAL ADAPTERS. REFER TO THE COMPUTER DEVICE MANAGER IF UNSURE OF WHICH COM NUMBER TO USE.

Select "PakBusPort" under the "Network Map", in "Maximum Baud Rate" for direct connection to the Datalogger select "115200".
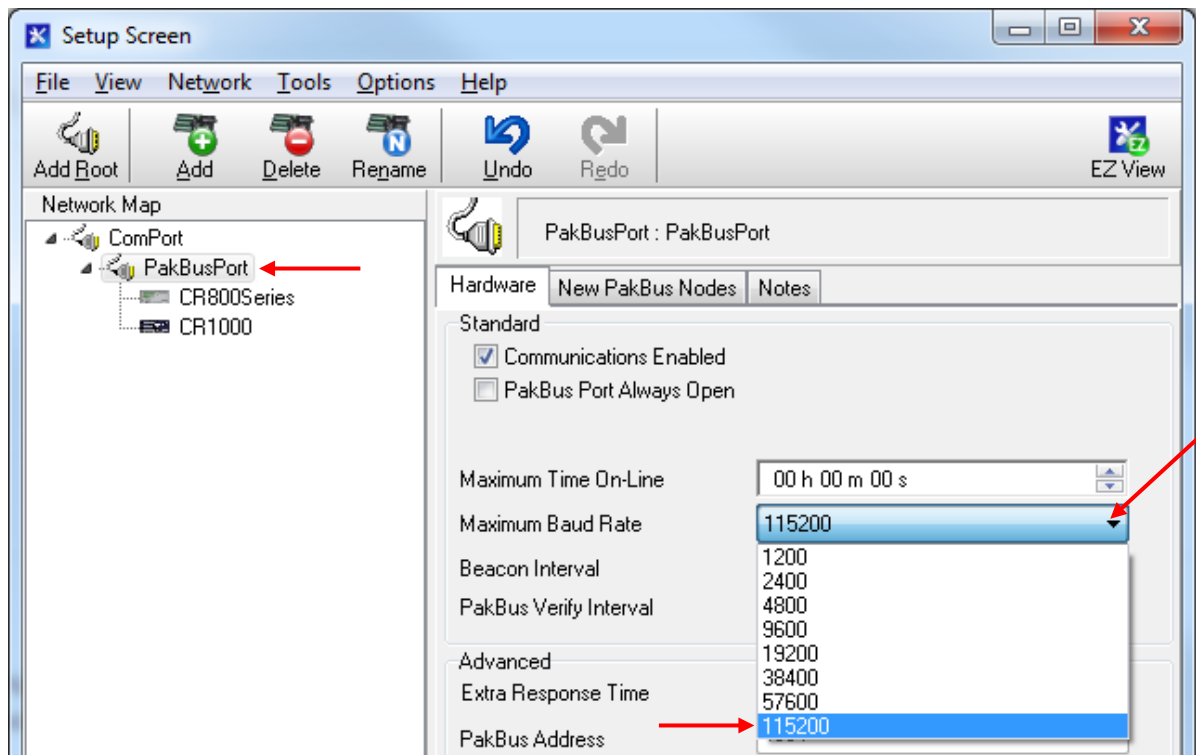
WHEN FINISHED, PRESS THE "APPLY" BUTTON AT THE BOTTOM LEFT OF THE SETUP SCREEN TO SAVE ALL SETTINGS.

E.2.3   Connecting to the Datalogger

With the LoggerNet Launch Menu open, hover over "Main" and press "Connect".
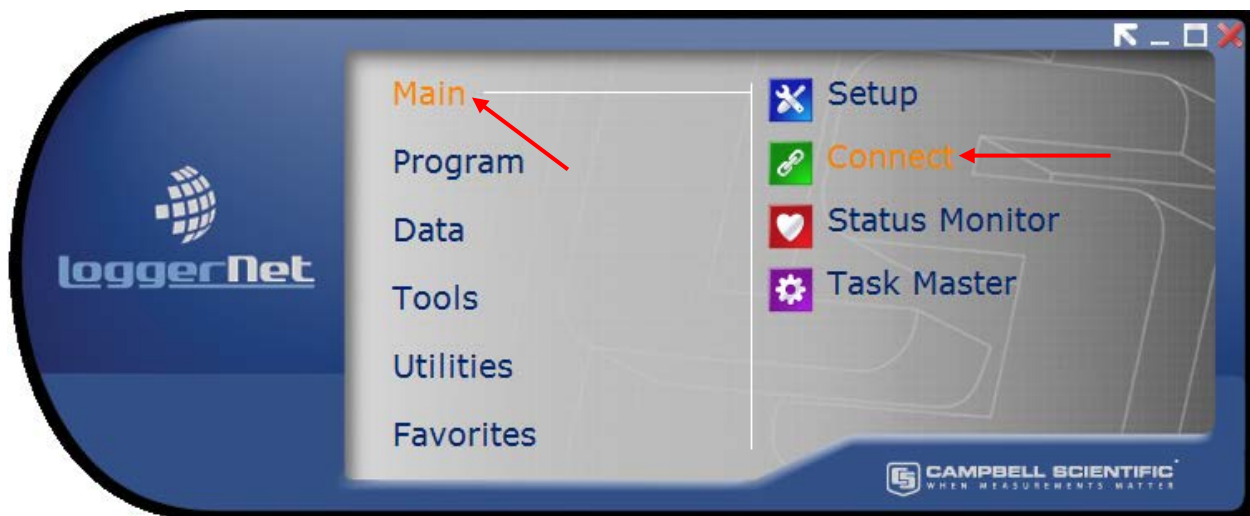
Select the Datalogger to communicate with under "Stations" and press the "Connect" button.
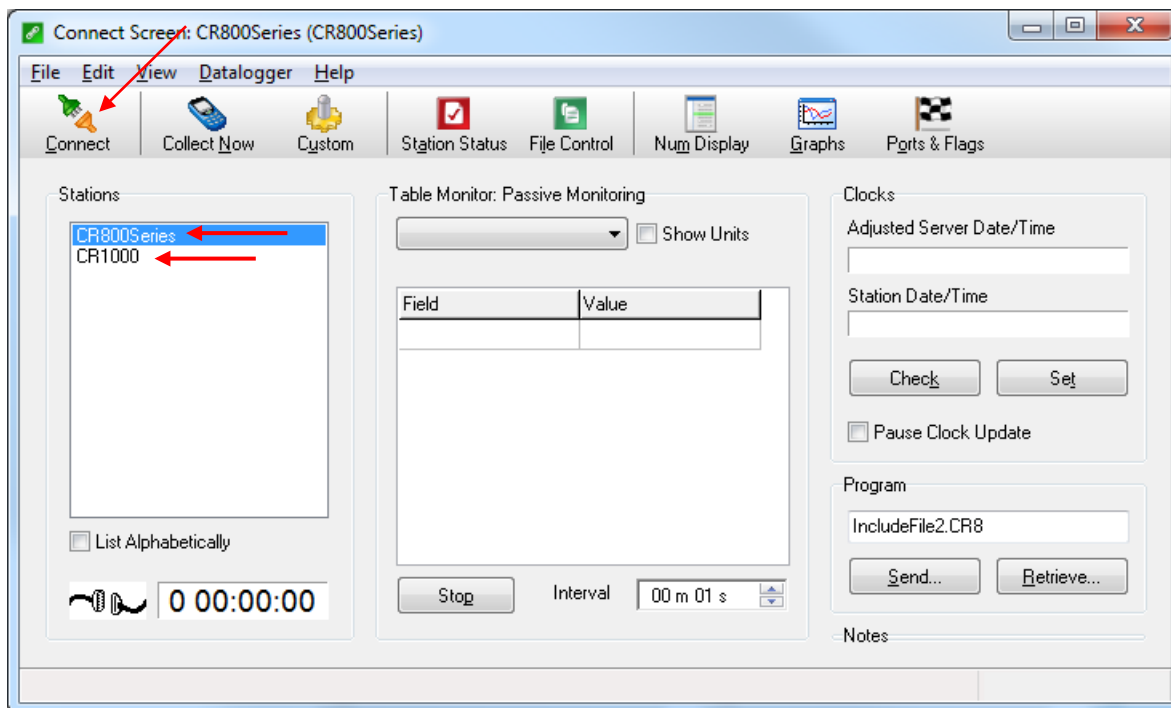
E.3   Modifying the Datalogger Program

Navigate to the Include(.DLD) file on the end user's computer
C:\Campbellsci\CRBasicEditor. Optional changes to Scan Interval, Zero Readings, Gage
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   Editing the CRBasic Program

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

```
SampleIncludeFile.DLD - Notepad

File  Edit  Format  View  Help
'--------------------------------------------------------------
'Scan Interval in seconds
'--------------------------------------------------------------
Const ScanInSec = 60

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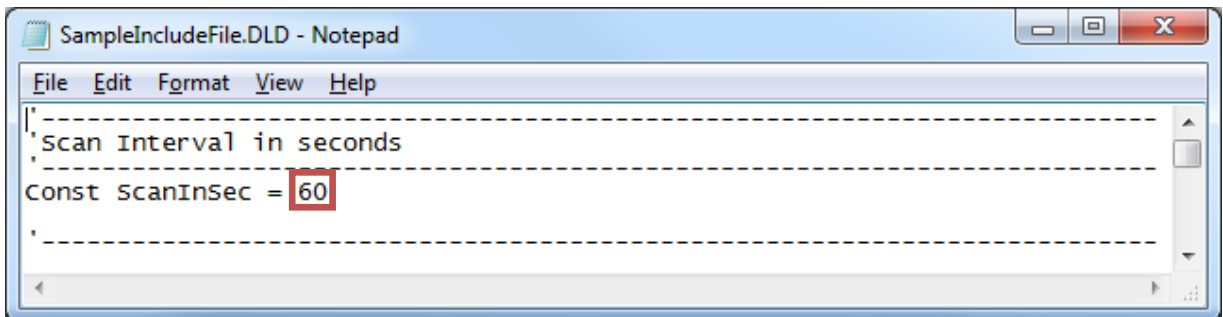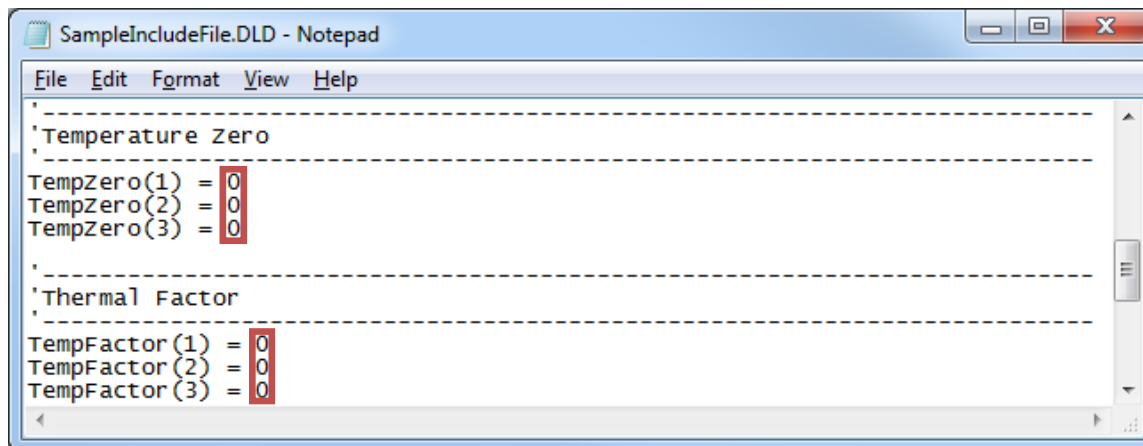
Zero Readings & Gage Factors
Default values for Zero Readings are 0 and Linear Gage Factors are 1. The default
settings read in Digits for Vibrating Wire sensors and Volts for MEMS tilt sensors. Zero
Readings and Gage Factors can be added if the user requires the Datalogger to store
engineering units.

```
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
```
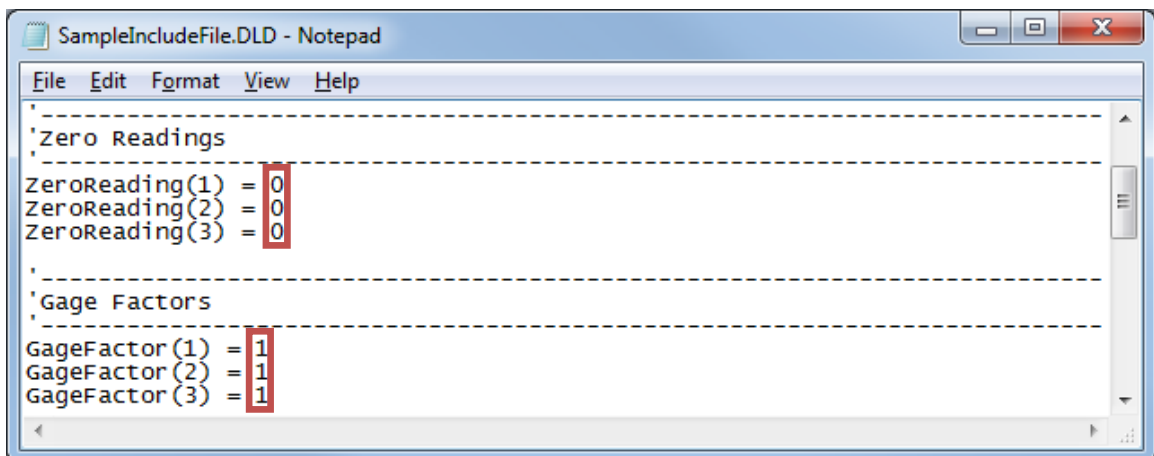
Temperature Zero Readings & Thermal Factors
NOTE: TEMPERATURE ZERO AND THERMAL FACTORS ARE USED FOR TEMPERATURE CORRECTION. TEMPERATURE CORRECTION MAY BE USED TO COMPENSATE FOR CHANGES IN A GAGE'S READINGS DUE TO TEMPERATURE CHANGE. TEMPERATURE EFFECT ON READINGS VARIES ON DIFFERENT MODELS OF GAGES AND TEMPERATURE CORRECTION IS OFTEN NOT REQUIRED. DEPENDING ON THE GAGE MODEL TEMPERATURE CORRECTION MAY NOT BE AVAILABLE AND SOME GAGE 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.
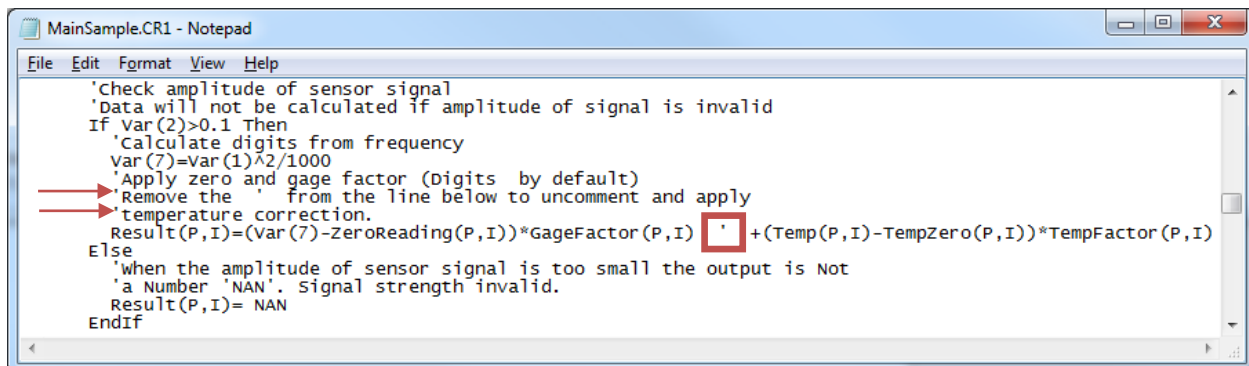
Navigate to the Main(.CR8/.CR1) file C:\Campbellsci\CRBasicEditor. Open the Main(.CR8/.CR1) file with notepad and uncomment the line specified in the code for all model gages that temperature correction is required.
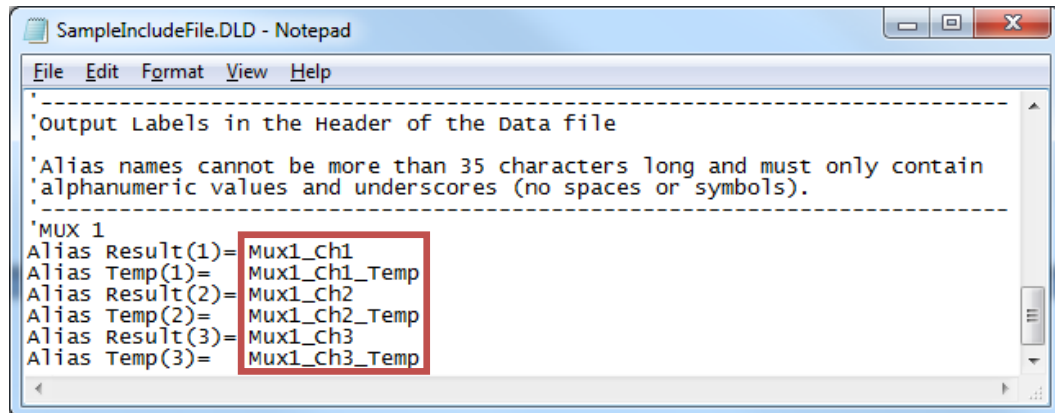
Output Labels
Default Alias names correspond with the Direct or Multiplexer channel for each specific gage. Alias names get displayed in the Header of the Data file, and can be modified by the user.

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

SAVE THE INCLUDE FILE IF MODIFIED.

E.3.2   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 (.CR8/CR1) program file must be sent to the Datalogger each time the Include.DLD file is updated.
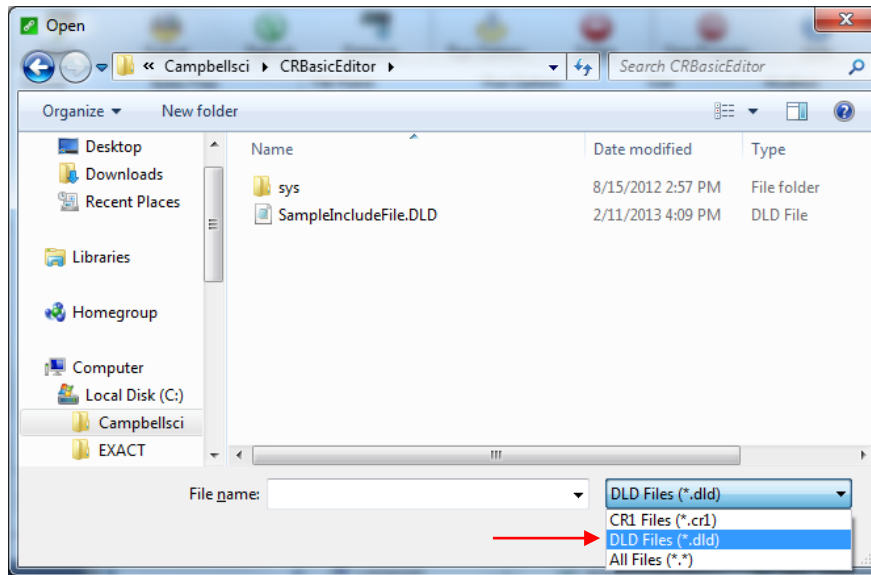
Sending the Include file (.DLD)
From the "Connect Screen" press "File Control" and press "Send" to transfer the Include(.DLD) file to the Datalogger.
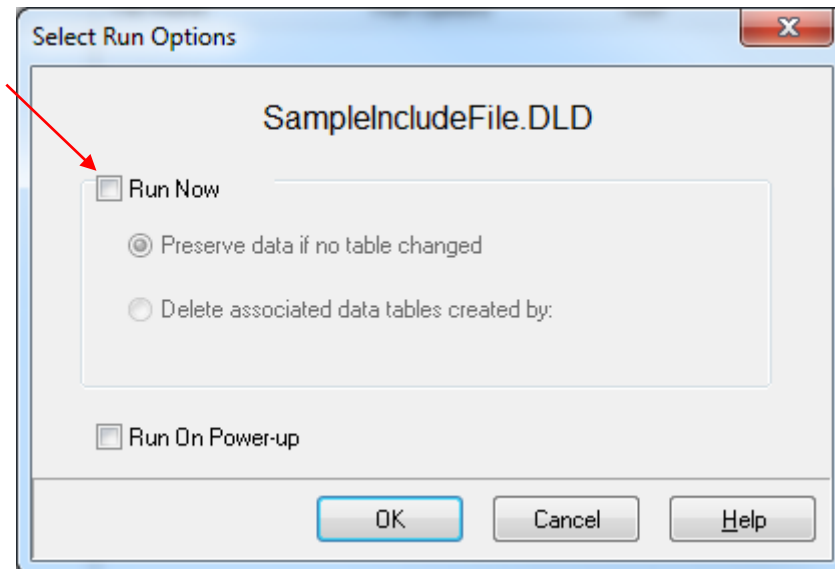
NOTE: EACH DATALOGGER HAS A UNIQUE INCLUDE(.DLD) AND MAIN(.CR8/.CR1) FILE
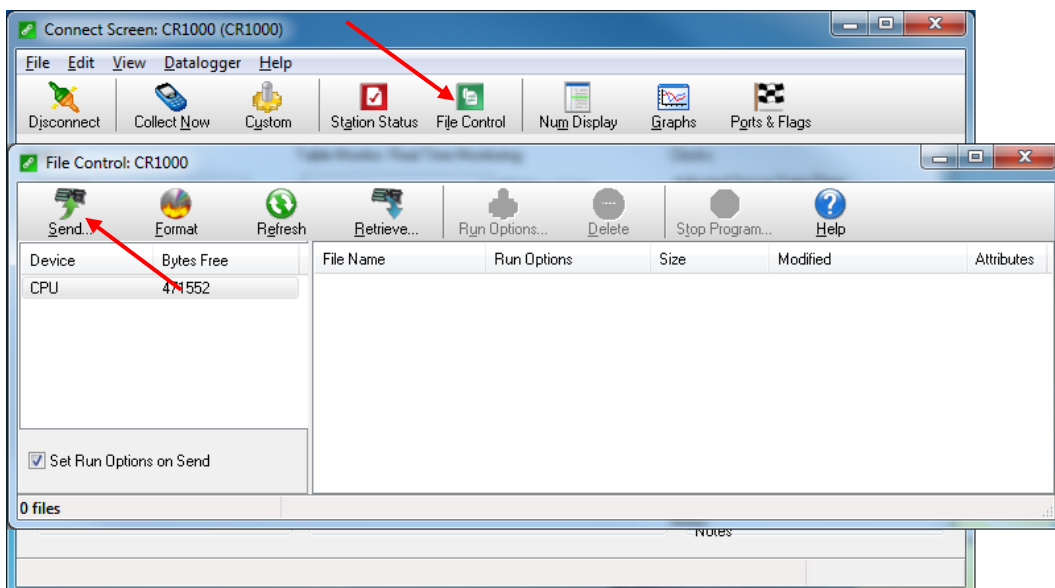
Select DLD file type to make the Include(.DLD) file visible in
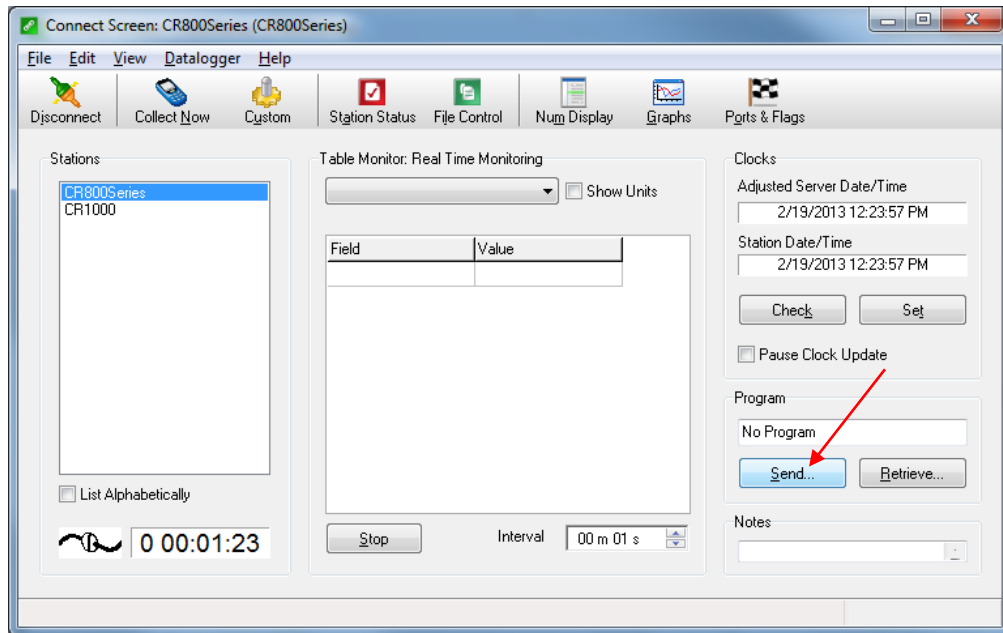C:\Campbellsci\CRBasicEditor.

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

Sending the Main program file (.CR8/CR1)
To send the Main(.CR8/CR1) CRBasic Program from the "Connect Screen" press "Send" and select the Main(.CR8/CR1) program file in C:\Campbellsci\CRBasicEditor.

NOTE: EACH DATALOGGER HAS A UNIQUE INCLUDE(.DLD) AND MAIN(.CR8/CR1) FILE
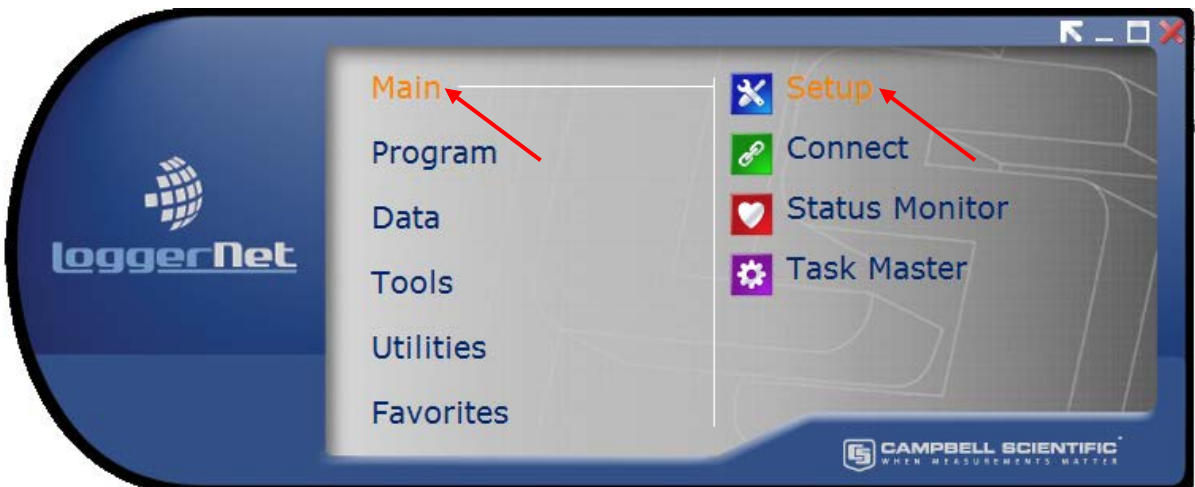

When sending the Main(.CR8/CR1) program file through the "Connect Screen" the program runs automatically.

E.4   Data Handling

E.4.1   Data Collection Configuration
With the Launch Menu open, hover over "Main" and press "Setup" from the resulting list of applications.

Select the Datalogger "CR1000"/"CR8000Series", "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.
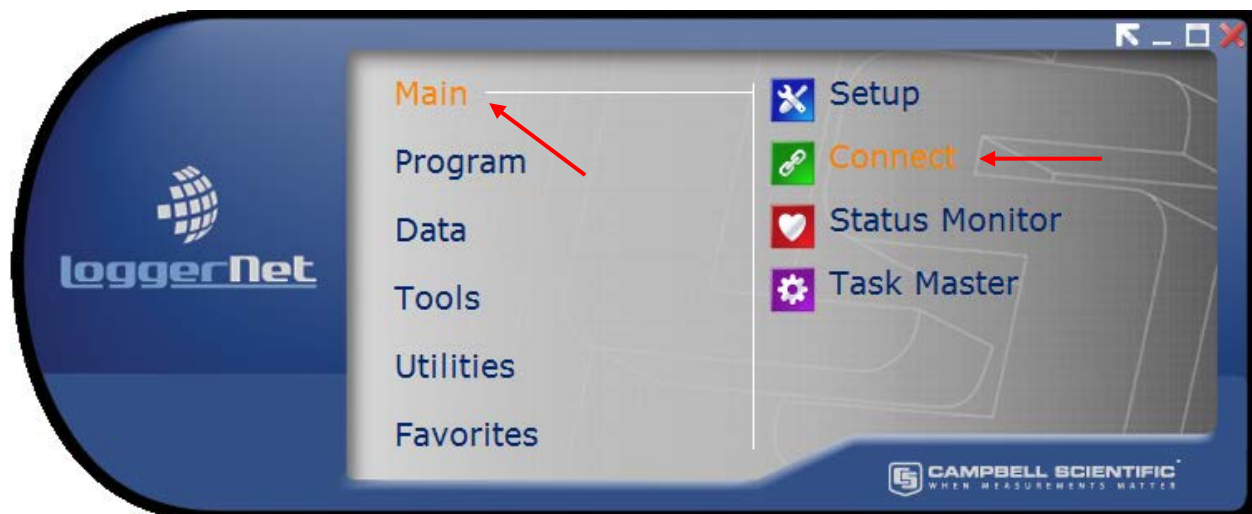
COLLECTED DATA TABLES ARE SIGNIFIED WITH A GREEN CHECK MARK.
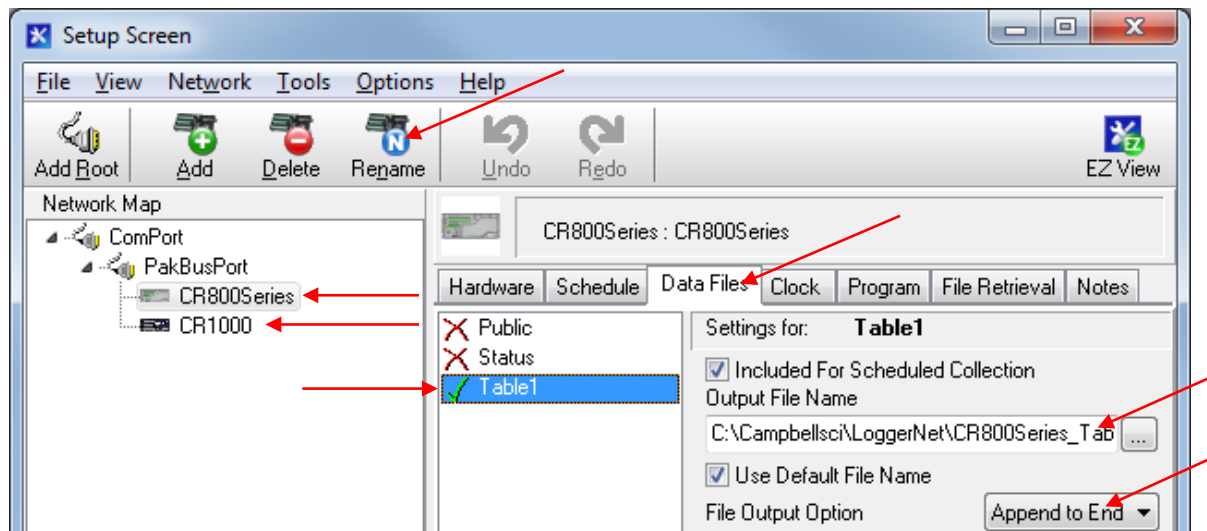
WHEN FINISHED, PRESS THE "APPLY" BUTTON AT THE BOTT OM LEFT OF THE SETUP SCREEN TO SAVE ALL SETTINGS.

E.4.2   Live Monitoring
With the LoggerNet Launch Menu open, hover over "Main" and press "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".
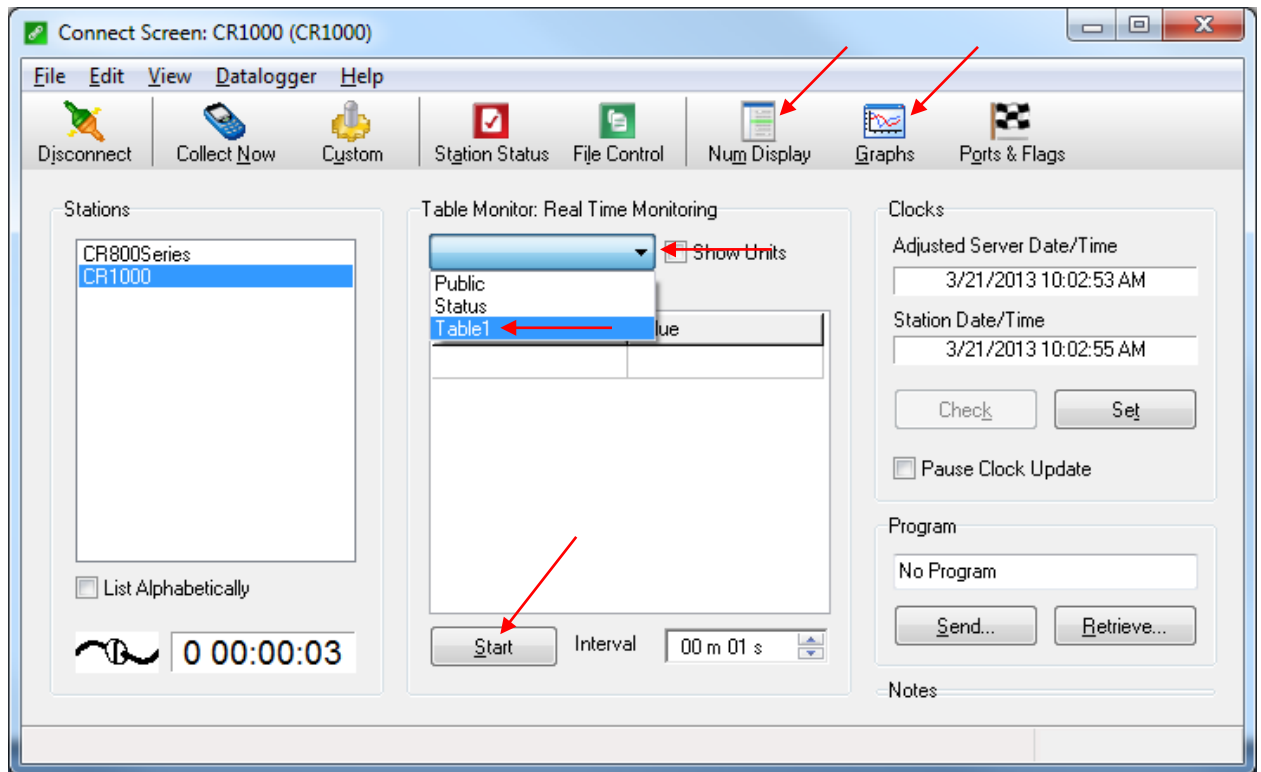
E.4.3   Collecting Data

Pressing "Collect Now" collects and stores Data on the computer. After collecting Data a "Data Collection Results" screen will open.
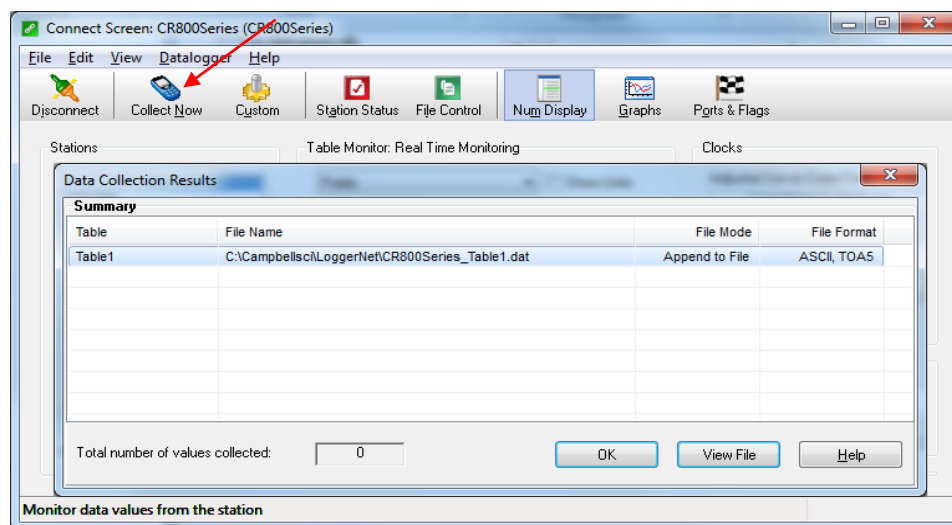
PLEASE SEE LOGGERNET MANUAL FOR MORE SPECIFIC DETAILS REGARDING USE OF THE SOFTWARE.

APPENDIX F –8032 MULTIPLEXER Manual

The following Appendix includes excerpts from the Model 8032 Multiplexer manual that apply to the Micro-800. A complete version of the Model 8032 Multiplexer Manual can be found at WWW.GEOKON.COM.

THEORY OF OPERATION

The Model 8032 Multiplexer expands the number of channels that can be read by the MICRO-800 Datalogger or MICRO-1000 Datalogger. Channel switching is accomplished by mechanical relays mounted on the underside of the circuit board and the transducer connections are accomplished by friction locking spring-loaded terminals mounted on the top side of the circuit board.

Two switching configurations are supported, 16 channels of 4 conductors or 32 channels of 2 conductors. For the 8032-C, these configurations are set by a DipSwitch on the top side of the circuit board. A second DipSwitch selects whether the 8032-C is being used with a datalogger or GK-403 Readout Box

To protect against lightning or EMI/RFI induced transients, each channel is protected by an integrated lightning protection system, incorporating 230V tripolar plasma surge arrestors, 150V bipolar plasma surge arrestors, 10uH inductors and 16V transient voltage protection diodes. See Appendix A for complete specifications on these components.

Supported switching arrangements:
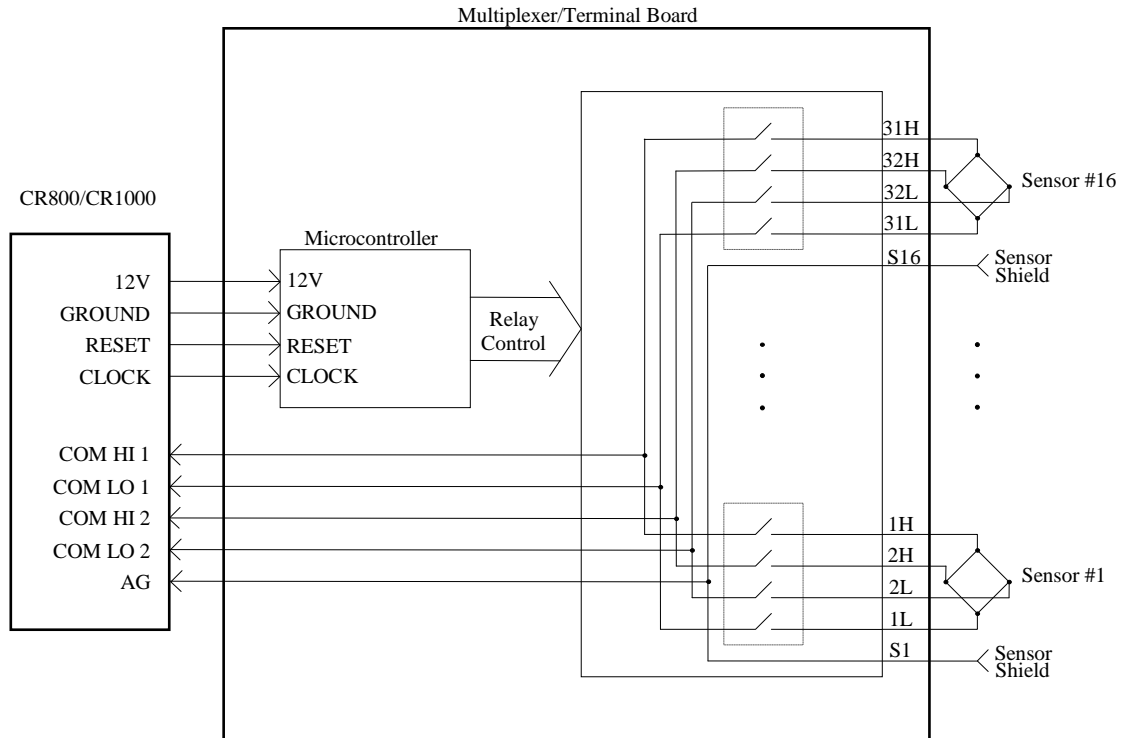

Figure 1 - 16 Channel Switching Block Diagram

The 16 channel 4 wire switching configuration is typically used to multiplex 4 wire sensors such as resistance strain gage load cells. It is also used to switch connections for instruments which have more than one sensor integral to them, such as vibrating wire pressure transducers with an integral thermistor for measuring temperature.
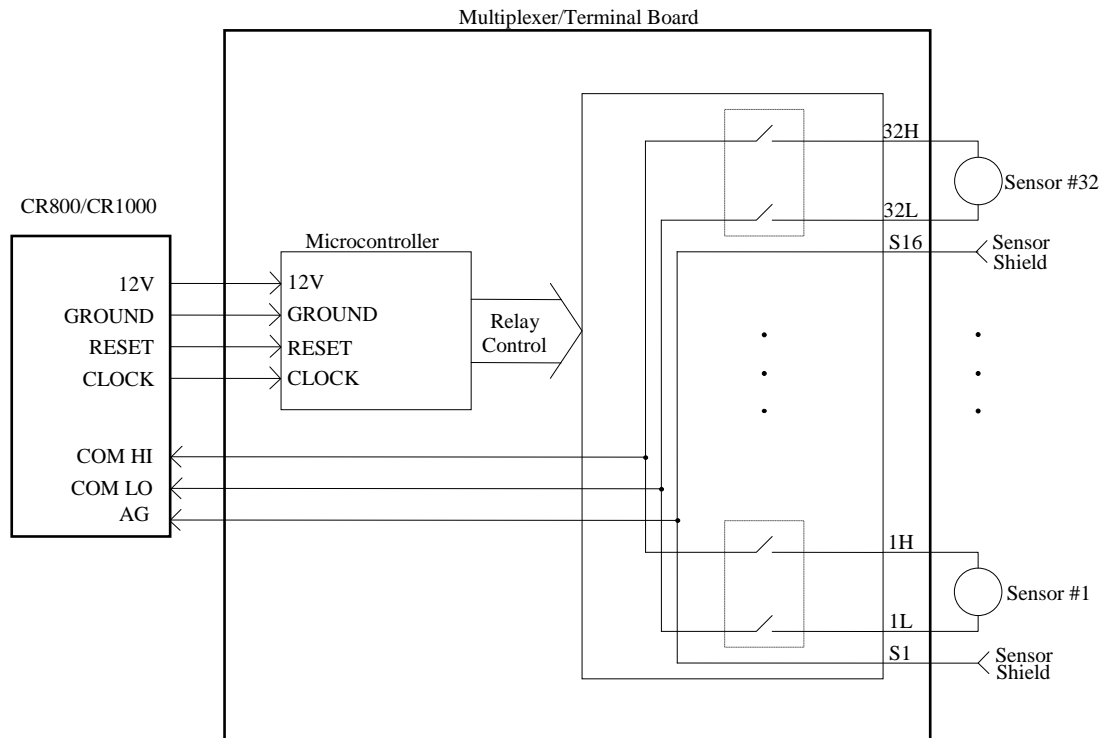
Figure 2 - 32 Channel Switching Block Diagram

The 32 channel 2 wire switching configuration is typically used to multiplex 2 wire sensors such as a vibrating wire pressure transducers, thermistors or thermocouples.

The multiplexer is powered by a nominal 12 VDC supply. Two control lines (RESET and CLOCK) determine how channel selection is accomplished. Two schemes are supported - one when connected to the GK-403 Vibrating Wire Readout Box and the other when connected to MICRO-800 or MICRO-1000 dataloggers. See the following sections explaining how each mode operates.

Figure 3 illustrates the DIP switch SW1 position 1 for switching between 16 and 32 channel operation. SW1 switch 1 ON = 32 channel, OFF = 16 channel. In Figure 3, 32 channel mode is chosen:

Figure 3 - 16 or 32 Channel Selection

Figure 4 illustrates the DIP switch SW2 for switching between a GK-403 or Datalogger application. "DATALOGGER"" is the default SW2 position:

SW2
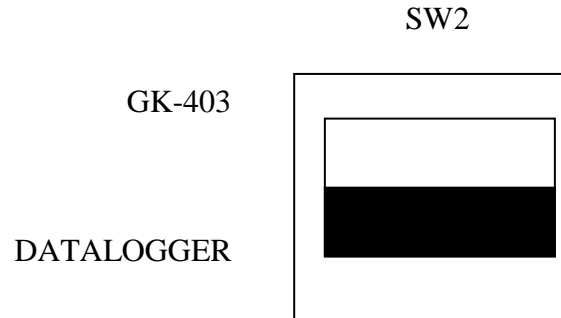
GK-403

DATALOGGER

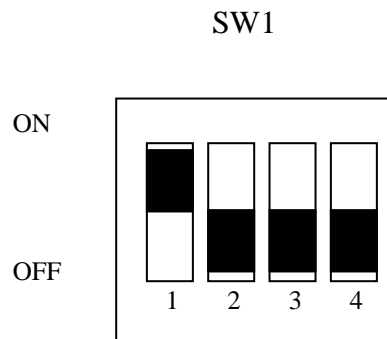Figure 4 – GK-403/DATALOGGER Selection

MICRO-1000 / 800 (CR1000 / CR800) Mode of Operation

The MICRO-800 and MICRO-1000 (which respectively utilize a CR800 and CR1000 controller, manufactured by Campbell Scientific, Inc. of Logan, Utah) mode of operation uses two control lines to operate the multiplexer. The RESET line enables the multiplexer and activates the MICRO-800/MICRO-1000 mode of clocking. Pulses received on the CLOCK line sequentially increment the channels while the RESET line is held high. See the timing diagram below;

The CLOCK line sequentially advances the channels beginning with channel 1. Note the timing diagrams below for 16 and 32 channel switching, respectively.

T1
T2
T3

Reset

Clock   Pulse 1   Pulse 2   Pulse 31   Pulse 32

No Channel   Channel 1   Channel 16   No Channel
Selected   Selected   Selected   Selected

Timing: T1 = 50 mSec(min.)
        T2 = 2 mSsec(min)
        T3 = 2 mSsec(min)

Figure 7 - 16 Channel MICRO-800/MICRO-1000 Channel Selection Timing

Timing: T1 = 50 mSec (min)
         T2 = 2 mSec (min)
         T3 = 2 mSec (min)

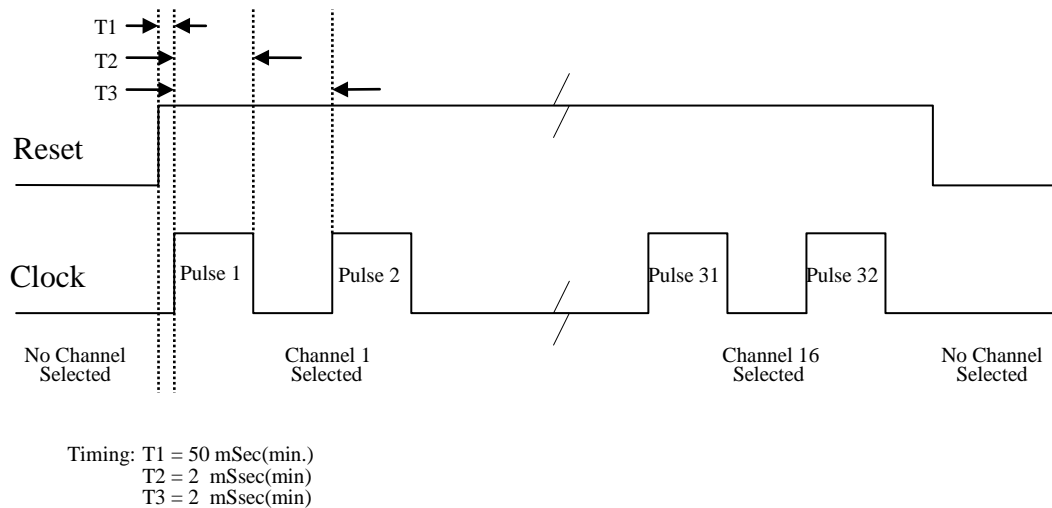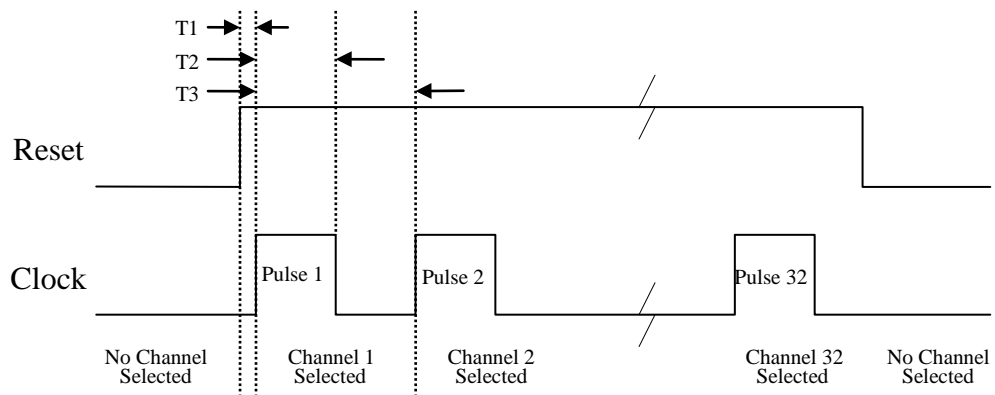Figure 8 - 32 Channel MICRO-800/MICRO-1000 Channel Selection Timing

WIRING

Actual gage connections to the terminal board will vary depending on the instrument type and cable used. Note the following tables to get the general idea.

Terminal Board	Vibrating Wire with Thermistor	Resistance Strain Gage Bridge	Linear Potentiometer (with Remote Sense)
1H	VW Sensor #1	S+ from Bridge #1	Excitation Pot #1
1L	VW Sensor #1	S- from Bridge #1	Wiper Output Pot #1
2H	Thermistor #1	P+ to Bridge #1	Remote Sense Pot #1
2L	Thermistor #1	P- to Bridge #1	Ground Pot #1
S1	Shield Drain Wire from Sensor #1	Shield Drain Wire from Bridge #1	Shield Drain Wire from Pot #1
3H	VW Sensor #2	S+ from Bridge #2	Excitation Pot #2
3L	VW Sensor #2	S- from Bridge #2	Wiper Output Pot #2
4H	Thermistor #2	P+ to Bridge #2	Remote Sense Pot #2
4L	Thermistor #2	P- to Bridge #2	Ground Pot #2
S2	Shield Drain Wire from Sensor #2	Shield Drain Wire from Bridge #2	Shield Drain Wire from Pot #2
• • •	• • •	• • •	• • •
31H	VW Sensor #16	S+ from Bridge #16	Excitation Pot #16
31L	VW Sensor #16	S- from Bridge #16	Wiper Output Pot #16
32H	Thermistor #16	P+ to Bridge #16	Remote Sense Pot #16
32L	Thermistor #16	P- to Bridge #16	Ground Pot #16
S16	Shield Drain Wire from Sensor #16	Shield Drain Wire from Bridge #16	Shield Drain Wire from Pot #16

Table 1 - 16 Channel Multiplexer/Terminal Board Wiring

Terminal Board	Vibrating Wire	Thermistor	Thermocouple
1H	VW Sensor #1	Thermistor #1	Thermocouple #1
1L	VW Sensor #1	Thermistor #1	Thermocouple #1
2H	VW Sensor #2	Thermistor #2	Thermocouple #2
2L	VW Sensor #2	Thermistor #2	Thermocouple #2
S1	Shield Drain Wires from Sensors 1&2	Shield Drain Wires from Thermistors 1&2	
3H	VW Sensor #3	Thermistor #3	Thermocouple #3
3L	VW Sensor #3	Thermistor #3	Thermocouple #3
4H	VW Sensor #4	Thermistor #4	Thermocouple #4
4L	VW Sensor #4	Thermistor #4	Thermocouple #4
S2	Shield Drain Wires from Sensors 3&4	Shield Drain Wires from Thermistors 3&4	
• • •	• • •	• • •	• • •
31H	VW Sensor #31	Thermistor #31	Thermocouple #31
31L	VW Sensor #31	Thermistor #31	Thermocouple #31
32H	VW Sensor #32	Thermistor #32	Thermocouple #32
32L	VW Sensor #32	Thermistor #32	Thermocouple #32
S16	Shield Drain Wires from Sensors 31&32	Shield Drain Wires from Thermistors 31&32	

Table 2 - 32 Channel Multiplexer/Terminal Board Wiring

Figure 10 depicts the terminal board to which gage connections are made. If the terminal board is equipped with manual switches, connectors J1 and J2 will have ribbon cables that are connected to the switch boards.

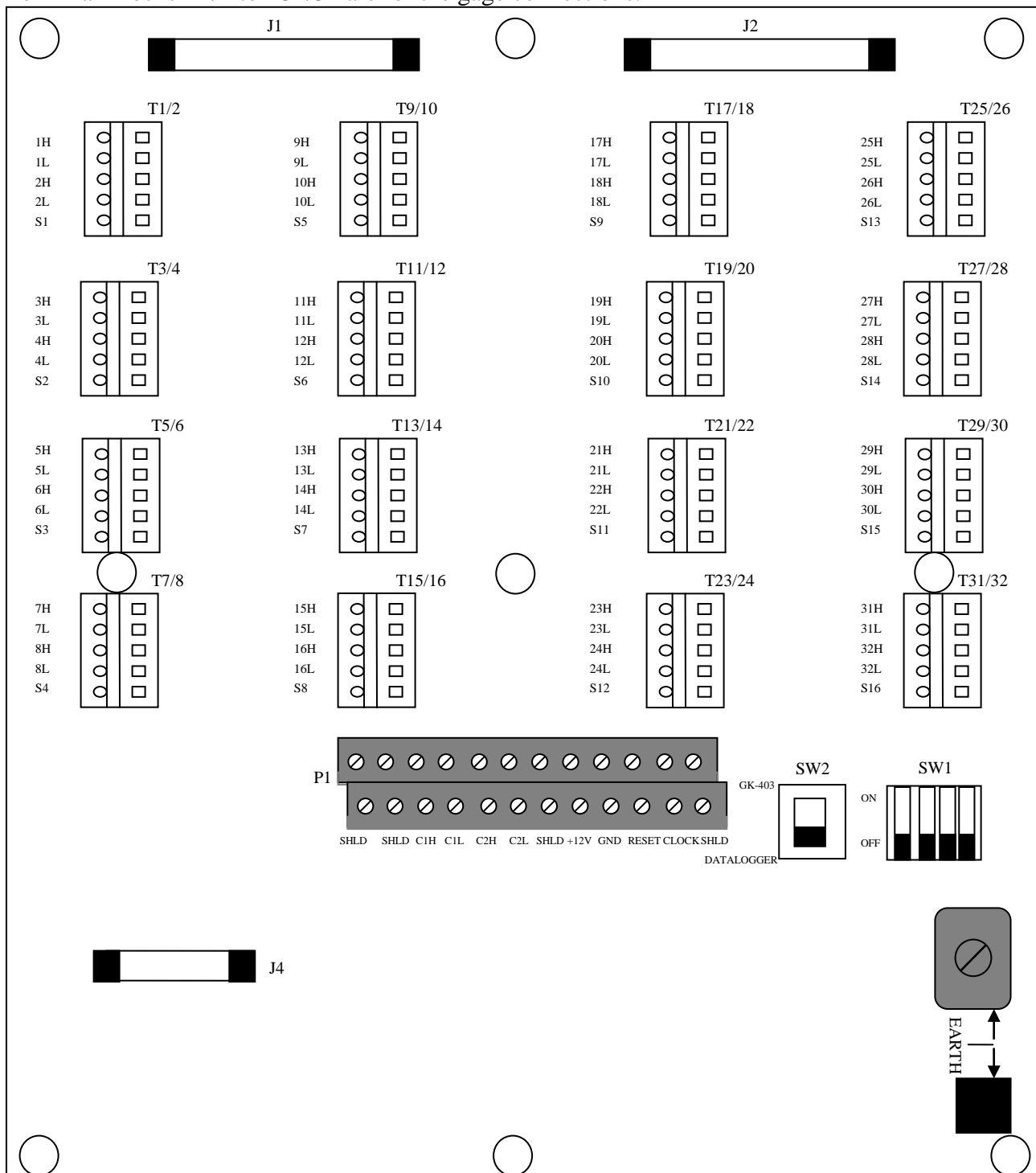Terminal Blocks T1/2 to T31/32 are for the gage connections.

Figure 10- Terminal Board Layout

TROUBLESHOOTING

Below are some commonly experienced problems along with possible remedial action. Contact the factory if any problem remains unresolved or additional help is required.

A particular channel on the multiplexer appears to be malfunctioning.

- Check sensor connections on the terminal board. Clean if corrosion exists.

- Try moving the sensor wired to the suspect channel to another channel to verify the malfunctioning of the channel (as opposed to the sensor).

No channels are working.

- Inspect circuit board for shorts, opens, or other damage.

- Is moisture present on circuit board? If so, install desiccant to absorb.

Channel selection appears to be random.

- Has corrosion built up on the circuit board? Clean if necessary.

- Is there a source of electrical noise nearby? Move multiplexer or noise source if possible.

SPECIFICATIONS

A.1 General
Power Requirements: 10-16 VDC (unregulated)
Quiescent Current (MICRO-800/MICRO-1000 mode): 80 μA (16CH mode)
                                      130μA (32CH mode)

Quiescent Current (GK-403 mode): 12 mA
Channel Activated Current: 30 mA
Control Line Input Impedance: 100 kΩ (CLOCK), 100 kΩ (RESET)
Control Line Input Levels: TTL or RS-232 (±9 VDC)
Transient Protection: 16 VDC Transzorbs
Operating Temperature: −40 to +60° C

A.2 Relays
Type: NAIS TXS2SA-4.5V DPDT non-latching
Power: 11.1 mA @ 5VDC (55.5 mW)
Contact Type: Gold clad silver alloy
On Resistance: 100 mΩ
Coil Resistance: 405 Ω
Maximum Switching Power: 30W (resistive)
Maximum Switching Voltage: 110 VDC
Maximum Switching Current: 1 A
Operate Time: ≈5 msec Max.
Release Time: ≈5 msec
Switching Life: 5×10^7 operations (mechanical)
              2×10^5 operations (electrical @ 30W)
Ambient Temperature: −40 to +70°C

A.3 Tripolar Plasma Surge Arrestor
Nominal DC Breakdown Voltage: 230V
Surge Life: 100 (10/1000 ms pulse @ 200 A)
Maximum Surge Current: 5 kA per side (8/20 μs pulse)
Insulation Resistance: 10^9 Ω
Operating Temperature: −65 to +125° C

A.4 Bipolar Plasma Surge Arrestor
Nominal DC Breakdown Voltage: 150V
Maximum Surge Current: 1 kA (8/20 μs pulse)
Insulation Resistance: 10^{10} Ω
Operating Temperature: −65 to +125° C

A.5 Inductor
Rated Current: 4A
Inductance: 10µH (±20%)
D.C.R.: 25mΩ MAX (at 20°C)

A.6 Transient Voltage Suppressor (Transorb)
Rated Power: 1500W
Peak forward Surge Current: 200A
Reverse Standoff Voltage: 16.0V

A.7 Transducer Connection Maximum Operating Voltage Levels:
Common-mode Voltage/Earth Ground: 16V(max)
Differential-mode Voltage (Channel # 'H' – Channel # 'L'): 16V(max)

A.8 Reset and Clock Maximum Operating Voltage Levels:
Single-ended Control Voltage/System Ground: 16V(max)

CONNECTOR AND CABLE WIRING

J4	Inside Color	10 Pin Bendix	Description	8032-5 (TAN) Cable Wire Color
1	Brown	A	COM HI 1	White
2	Red	B	COM LO 1	White's Black
3	Orange	C	COM HI 2 (16 channel)	Red
4	Yellow	D	COM LO 2 (16 channel)	Red's Black
5	Green	K	Analog Ground	Shield Drain Wires – all pairs plus overall
6	Blue	F	+12 Volt Power	Yellow
7	Purple	G	Power Ground	Yellow's Black
8	Grey	H	RESET (DATALOGGER) SENSE (GK-403)	Green
9	White	J	CLOCK	Green's Black
10		E	No Connection	Blue & Blue's Black (unused)

Table B.1 – J4 (I/O) Connector

P1 Terminal	Label	Description
1,2	SHLD	SHIELD
3,4	SHLD	SHIELD
5,6	C1H	COM HI 1
7,8	C1L	COM LO 1
9,10	C2H	COM HI 2 (16 channel)
11,12	C2L	COM LO 2 (16 channel)
13,14	SHLD	SHIELD
15,16	+12V	+12 Volt Power
17,18	GND	Power Ground
19,20	RESET	RESET
21,22	CLOCK	CLOCK
23,24	SHLD	SHIELD

Table B.2 – P1 (I/O) Connector

Note: P1 is a "stacking" type connector. Odd number terminals are read left to right on the bottom row. Even numbered terminals are read left to right on the top row.

DAISYCHAIN OPERATION

Up to (8) 8032's may be "daisychained" together using a common RESET and CLOCK control line. This may be advantageous in situations where either there are not enough control ports available on the Micro-800/MICRO-1000 datalogger for the number of multiplexers desired, or to reduce the number of cables required to implement a large multi-channel system.

SW1 located on the Terminal Block side of the circuit board determines the address of each multiplexer and the corresponding signal channels. As many as 256 2-conductor channels or 128 4-conductor channels may be accessed per RESET line.

SW1 Setting			Channels Accessed
2	**3**	**4**	
OFF	OFF	OFF	1-32 (32 channel mode) , 1-16 (16 channel mode) **DEFAULT MUX1**
OFF	OFF	ON	33-64 (32 channel mode) , 17-32 (16 channel mode) **MUX2**
OFF	ON	OFF	65-96 (32 channel mode) , 33-48 (16 channel mode) **MUX3**
OFF	ON	ON	97-128 (32 channel mode) , 49-64 (16 channel mode) **MUX4**
ON	OFF	OFF	129-160 (32 channel mode) , 65-80 (16 channel mode) **MUX5**
ON	OFF	ON	161-192 (32 channel mode) , 81-96 (16 channel mode) **MUX6**
ON	ON	OFF	193-224 (32 channel mode) , 97-112 (16 channel mode) **MUX7**
ON	ON	ON	225-256 (32 channel mode) , 113-128 (16 channel mode) **MUX8**

Table D.1 – Daisychain Operation/Channels Accessed

The following example on the next page is a schematic representations of the daisychain configuration with multiplexers configured for 32 channels. The figure D-1 shows 3 multiplexers sharing the same control ports, and a single cable is used to interconnect them.
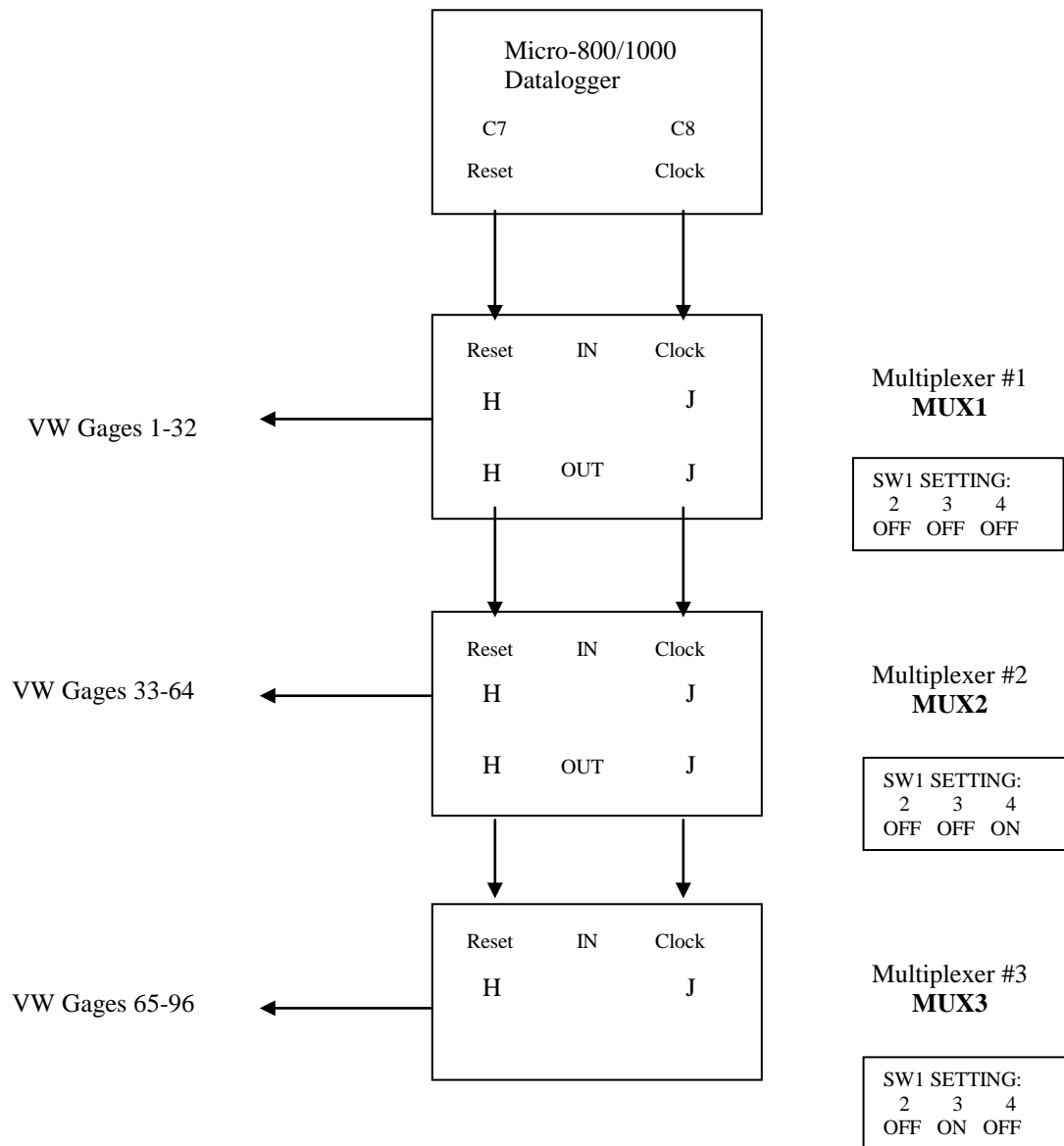
Figure D.1: Daisychain Configuration

MAXIMUM 8032-5 (TAN CABLE) CABLE LENGTHS

The 8032 Multiplexer is a low power device, that when combined with a Micro-800 or Micro-1000 Datalogger can be physically located at a considerable distance from that Datalogger.

Still, there are limits to the maximum distance – mostly due to the voltage dropped by the 8032-5 MUX cable over its length. Factors such as ambient temperature, number of 8032 Multiplexers (Daisy-Chain configuration) and system battery voltage need to be considered in determining the maximum 8032-5 cable length.

For a single 8032 Multiplexer under normal operating conditions (System Battery = 12V, ambient temperature = 20°C), the maximum recommended cable length from the Datalogger to the 8032 Multiplexer is 4588 feet (≈1400m). Figure E.1 displays the maximum recommended cable length for various Datalogger, Battery Voltage and ambient Temperature combinations.
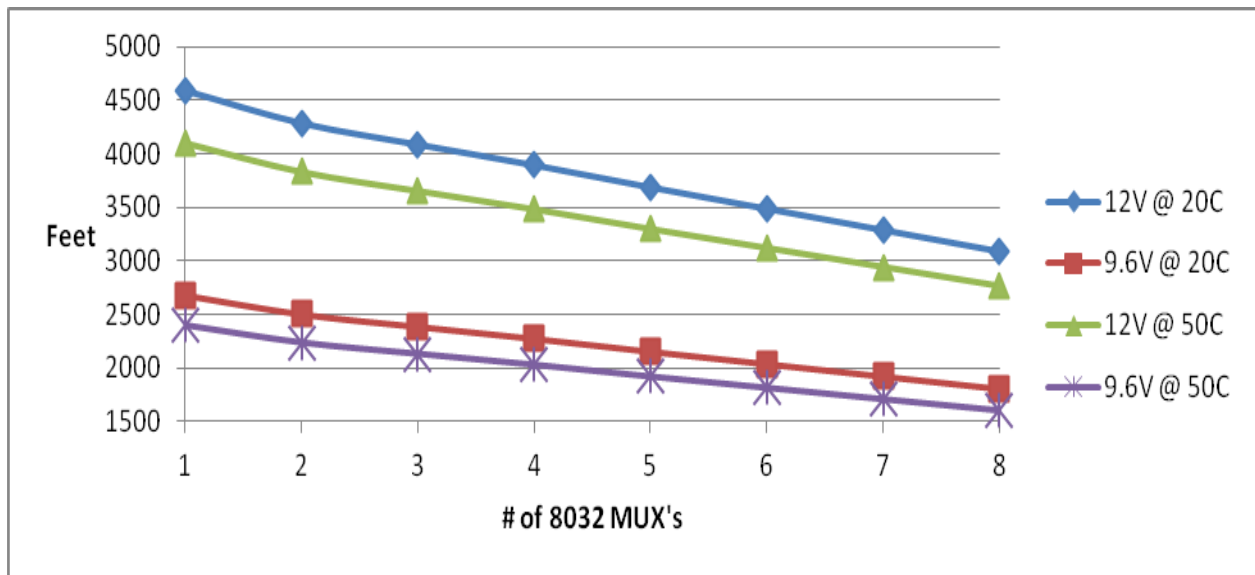

Figure E.1: Recommended Maximum Cable Length