SGT Engineering

www.slsargent.com

Four Channel Frequency Datalogger Operator's Manual

Introduction

This datalogger was designed for measuring and recording sensors which output a frequency related to water content such as Campbell Scientific's CS615 probe. Four switched 5 vdc outputs are available to enable (activate) the sensor(s) prior to measurement. A programmable delay can be set by the user to allow for the sensor output to stabilize prior to starting the measurement. The measurement period is adjustable from 1 to 65,535 milliseconds.

System requirements

Personal computer/laptop running Windows 95, 98 or NT with HyperTerminal installed.

6-18 vdc power supply.

9 pin RS-232 cable (male/female connectors).

Checking to see if HyperTerminal is installed on your computer

1.) From the Desktop, double click on the "My Computer" Icon, open the control panel folder and double click on the add/remove programs icon.

2.) Select the windows setup tab.

3.) Highlight the communications row, and click details.

4.) If the HyperTerminal box is checked, you're all set. If not, place a check in the box, press ok, then ok again to begin the installation (you may need your Windows disk/CD to complete the installation).

Creating a new HyperTerminal connection

1.) The HyperTerminal folder is typically located in c:\programs\windows\accessories. If you cannot find it try doing a file search for HyperTerminal.

2.) Open the HyperTerminal folder and double click on the Hypertrm.exe icon.

3.) You will be asked to give your new connection a name and icon.

4.) Next the phone settings box will appear. All you're concerned with here is that the connection method is set to an available serial port (typically COM1 or COM2). If your computer has a modem installed, make sure you select a different serial port to use.

5.) Next the COM port settings box will appear. Set the bits per second to 19,200-baud, no parity, 8 data bits, 1 stop bit and no flow control. Press ok when finished.

6.) Now select the file tab at the top left of the screen. Choose properties/settings/emulation. Under emulation select auto detect. Click the ASCII setup button; make sure the boxes “wrap lines that exceed terminal width and echo typed characters locally” are checked.

7.) When finished, exit HyperTerminal, being sure to save your new connection. When your new HyperTerminal connection is restarted, the new settings will be in effect.

8.) Plug a 9-pin serial cable into the logger and to the appropriate serial port.

9.) Attach a suitable power supply to the 2-input terminal block of the logger (6-18 vdc). The polarity is marked on the circuit board next to the terminal block (+, -).

10.) Start your new HyperTerminal connection.

11.) Press the reset button on the logger.

*** A shortcut can be added to the desktop for running your new HyperTerminal connection.**

The dataloggers current time, date, voltage, identification number and the percent of memory used so far will appear on the screen, followed by the main menu.

Time 00:00:29 Date 10/09/01

Voltage = 12.7 vdc ID# 11 Memory is _ % full

(1) Measure (2) Read Data (3) Setup (4) Erase (5) Log
>

Setting up the logger

Once communication with the logger is established you have sixty-five seconds to make a selection before the logger begins logging. Pressing any key before the sixty-five seconds expires will reset the timer back to zero. If your not finished communicating with the logger and its begun logging, simply push the small reset button on the circuit board or cycle the logger power off and on.

Main Menu

(1) Measure (2) Read Data (3) Setup (4) Erase (5) Log
>

Typing a number between 1 and 5 will execute the corresponding instruction. To abort an instruction, simply push the reset button.

(1) Measure

Typing “1” instructs the logger to enable the sensor(s), pause a specified period of time before beginning the measurement, then take the measurement(s) and display the result(s). Values will not be recorded during this measurement sequence. The value displayed will be the number of cycles counted during the measurement period. With the period set to 1,000 milliseconds, the value returned is in hertz.

(2) Read Data

Typing “2” takes you to the collect new (1) or collect all (2) menu. Typing “1” instructs the logger to read out the data collected by the logger starting at the beginning of memory. Pressing “2” instructs the logger to dump the entire memory. Commas are printed between columns so it can be brought into a spreadsheet as a comma-delineated file. The first column contains the measurement(s), the second contains the time it was collected (hours/minutes) and the third contains the date (mm/dd/yy).

(3) Setup

Typing “3” takes you to the setup options menu

(1) Measurement Options
(2) Set Clock
(3) Logger ID# 01
(4) Log Interval 5 minutes
(5) Main menu
>

Measurement Options

Current Configuration

(1) Recording 4 channel(s)
(2) Measurement period 1000 milliseconds
(3) Excitation delay 150 milliseconds
(4) Back
>

Typing “1-4” allows changing the number of channels for recording (1-4), Changing the measurement period from 1 to 65535 milliseconds and changing the excitation delay prior to measurement from 0 to 65535 milliseconds. Typing “4” takes you back to the previous menu.

Changing the number of channels for recording will reset the internal data memory pointer to zero.

***** Make sure you have collected your data before changing the number of channels to measure *****

The number of channels selected for recording, measurement period and excitation delay values are non-volatile and so are retained in the absence of power.

Set Clock

The clock runs on a 24-hr format. The clock uses only two digits for the year, 2001 would be set as 01.

For example: If it’s 6:30pm on the 23rd of October, 1988, then key in “ 8 8 1 0 2 3 1 8 3 0”

Enter Year (YY):	88	enter the year
Enter Month (MM):	10	enter the month
Enter Day (DD):	23	enter the day
Enter Hour (HH):	18	enter the hour
Enter Minute (MM):	30	enter the minute

The logger will print out the new time and date for confirmation.

(X)Id#

Typing “3” will allow for a unique identification number to be entered. The Id number is the first item printed when the data is read out. Two values must be entered and must be in the range of 0 – 9, A - F

The logger ID# value is retained in non-volatile memory.

(I)nterval

Typing “4” allows for the logging interval to be changed

Log intervals can range from 1 minute to 1440 minutes in one-minute increments.
Units are in minutes (1 day = 1440 minutes)

Example

For a collection interval of three hours, type 1,8,0, then press enter. The logger will print out the new interval for confirmation.

The log interval is non-volatile; it’s retained in the absence of power.

(4) Erase

Typing “4 ” Instructs the logger to erase the data file markers. The datalogger will ask for confirmation before erasing and then the main menu will appear. The logger does not actually erase the data, but merely resets the data storage pointer to the beginning. Entering the data menu and selecting “2” will force the logger to unload the entire memory, ignoring the internal data storage pointers.

Collecting Data

The following is a general procedure for using HyperTerminal for data collection.

1.) Create a folder on the desktop to keep your data files in.

2.) Open the data folder and choose file/new/text document.

3.) Name the new text document something like “NL070402.txt”. This could stand for NelsonLake data collected on July fourth, 2002. The file must retain the txt extension.

4.) Plug the RS232 cable into the logger and to the PC.

5.) Press the reset button on the logger to establish communication.

6.) I start my new HyperTerminal connection, then select transfer, capture text and browse to the folder, which contains the text file (NL070402.txt), select this file and click the start button. At this point anything printed on the screen will be captured to the file.

7.) Then press “2” to read data, followed by a 1 or 2 depending on whether you want the current data or to dump the entire memory.

8.) The logger will then print the data to the screen and consequently to the text file.

9.) Then close HyperTerminal and open the data file with Windows notepad/wordpad to make sure the data was successfully transferred.

I generally download multiple loggers in the field on the same day. Once you have created your data file and have transferred your first data file; HyperTerminal will default to this file the next time it's started. This is a good thing, when I reach my next logger, I plug it in, start HyperTerminal, choose transfer/text capture/start and I'm ready to download the data. The data from this logger will be appended to the end of the original text file.

This is where the logger ID# comes in so you know which data set is from each logger.

For processing the data, import it into a spreadsheet as a comma delineated file. Then it's easy to create a formula, which can be applied to the entire column of data for converting it to the appropriate units.

Wiring Panel

Power to the logger is applied to the 2-terminal block connector. The polarity is marked on the circuit board. The rear of the logger has a terminal block with 14 connections. Four are for ground connections (GND); Four are counter channels (F1, F2, F3, F4), Four are switched outputs (E1, E2, E3, E4) for enabling sensors and two marked (+) which reflect the datalogger voltage and are reverse polarity protected and current limited to 200 milliamps.

Installation

The datalogger should be mounted in an enclosure to protect it from the elements, primarily moisture. A single point, earth ground should be provided to protect the logger and sensors from nearby lightning activity. A 12 gauge wire should be connected from the grounding rod to one of the terminal blocks labeled GND.

Electrical Specifications

Logger Operating Voltage	**6 - 18 vdc**
Current Consumption	**7 ma while communicating and downloading data** **7 milliamps plus sensor requirements while measuring and recording** **Less than 200 microamps while logging.**
Input Channels F1, F2, F3 ,F4	**16 bit counter channels.** **Measures counts in the range of zero to 125,000 Hz** **The Input signal must pass through a threshold of 1.40 vdc to be accurately counted.**
Input Channel Impedance	**> 100 k ohm ***
Input Voltage Range	**0 to + 5 vdc ****
Switched Output Channels E1, E2, E3, E4	**Switched from ground to + 5 vdc during measurement through a resistance of 500 ohms.**

Measurement Accuracy	**+ or – 2 Counts**
Measurement Resolution	**1 Count**
Operational Temperature Range	**-10 to 60 degrees Celsius**
Real Time Clock Accuracy	**+ or – 1 minute per week (typical)**

*** Input channel impedance > 15 K ohms for voltages greater than 5.7 vdc or less than -0.7 vdc**
*** Datalogger input channels can tolerate + - 10 vdc**

A 3-volt lithium coin cell backs up the real time clock when the datalogger is not powered. The coin cell will keep the clock running for up to ten years in the absence of power.

Suitable Replacement Batteries

CR1225, BR1225 Available at RadioShack

The real time clock stores the memory address pointer in its internal ram. Anytime the battery is removed or replaced, the erase command "4" must be executed to initialize the data pointer to a known location (zero). The real time clock must also be reset to the proper time after battery replacement.

All Input and output channels are protected from brief transient voltages or shorts through a combination of current limiting resistors, Zener diodes and 1,500-watt transorbs.

Data storage

The maximum number of time and date stamped measurements that can be recorded is dependent upon the number of channels selected for recording.

Recording one channel	**37,448**
Recording two channels	**29,120**
Recording three channels	**23,824**
Recording four channels	**20,160**

If these values are reached, the datalogger will suspend logging and enter a low power state (200 microamps). The Indicator LED will blink every 10 seconds when the memory is full. Data will be retained in the absence of power for up to ten years.

Indicator LED

A blue LED is used as a status indicator. When the logger is first powered up, it will blink several times in quick succession. While logging, the LED will blink briefly every three seconds.