Synergy Controller Data Logging Capacity Calculations

Tidal Engineering's Synergy Controllers provide state-of-the-art usability and connectivity for environmental test control and data acquisition and combine the functions of a chamber controller and a data logger.

This application note describes capacity calculations for the Synergy Controller's Logging system. The Synergy Controller's built in data logger is key to many of the Synergy Controller's more powerful capabilities. With the ability to capture individual log files for each test and deliver this information in table (CSV) and chart (PDF) format through a variety of network protocols as well as with removable storage media helps these controllers "Delivers Test Results".

The Synergy Controller records process data, alarms, machine diagnostics, etc. to a flash memory device called the Storage Card. This information can be later exported to a USB Flash Drive, automatically delivered via e-mail, etc. for use in test reports and system troubleshooting as mentioned above. This application note can be used to estimate the number of history records and the record time available on the Synergy Controller's Storage Card.

The number of records depends on the number of bytes available on the Storage Card and the amount of data that is logged per sample.

There are several ways to determine the number of bytes available on the Storage Card:

1. The Storage Card query : "? SCINFO".
    The response format is Total: xxxxxxxxx Free: xxxxxxxxx where the xxxx is the number of bytes
    For example Total: 3038248960, Free: 3027140608

2. On x86 models like the Synergy Compact and VersaTenn V, plug in a PS/2 keyboard and reboot the controller. Press F5 while booting to enter the DOS and then type CLS and Enter to clear the screen. Type "DIR" and press Enter until the "Bytes Free" data line comes into view.

The "Available Storage" is displayed on the bottom of the About folder in the Maintenance screen as shown on the left.

To determine the amount of data that can be logged and how long before the log file is filed, use the following table and formulas. Table 1 below lists the Storage Card sizes available on various controller models.

Table 1 Storage Card Capacities

Models	Total	Notes
x86 Synergy Compact and VersaTenn V	8 MB	Original Models
x86 Synergy Compact and VersaTenn V	32 MB	2003 and later
Synergy Micro	256 MB	Original Model
Synergy Micro	2 GB	2008 and later
Synergy Micro 2	2 GB	All Models
Synergy Nano	2 GB	All Models
Synergy Quattro	2 GB	All Models

Table 2 below lists typical information that can be logged. Each data point requires a specific amount of storage space on the Storage Card. In addition, there are a number of overhead bytes per sample for time and other housekeeping data.

For example, assume that we want to record CH1 Actual (Temperature) and CH2 Actual (Humidity) readings.

Capacity can be calculated as follows:

Samples=X/(Y+Z)

Where:

X=2 M Bytes available on flash disk (Approx. available space when VT V ships).

Y=21 Bytes (Number of bytes of overhead per sample).

Z=12 Bytes (Number of bytes required per sample, 6 for CH1 and 6 for CH2.

Thus, the number of samples that can be stored are calculated:

Samples=X/(Y+Z)

Samples= 2,097,152/(21+12)

Samples=63,550

If we record 60 samples per hour we will have the capacity to record for 1,059 hours.

Hours = Samples/Sample Rate

Hours = 63,550/60
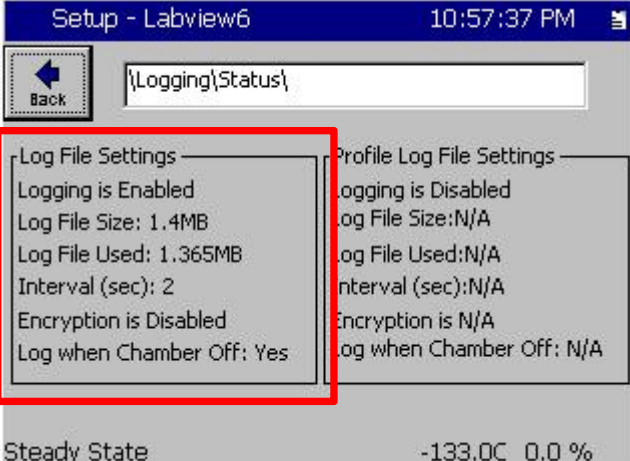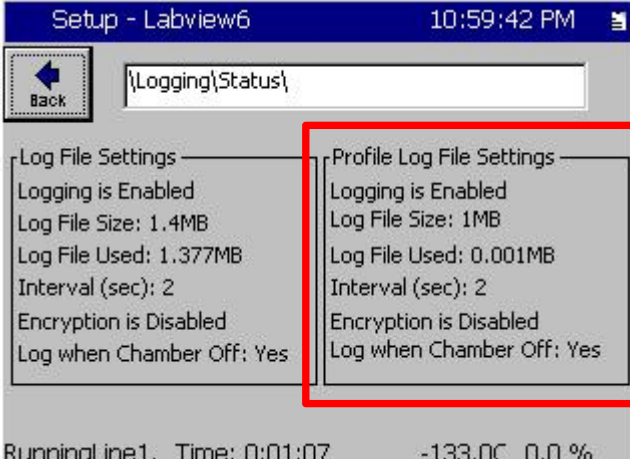
Hours = 1,059

The actual time will typically be less than this since other data stored on the machine, such as profiles, will reduce the number of available bytes. In addition, other data stored in the history file will reduce the number of samples that can be saved. Other data recorded in the file are alarm conditions and header information saved when the Synergy Controller is restarted.
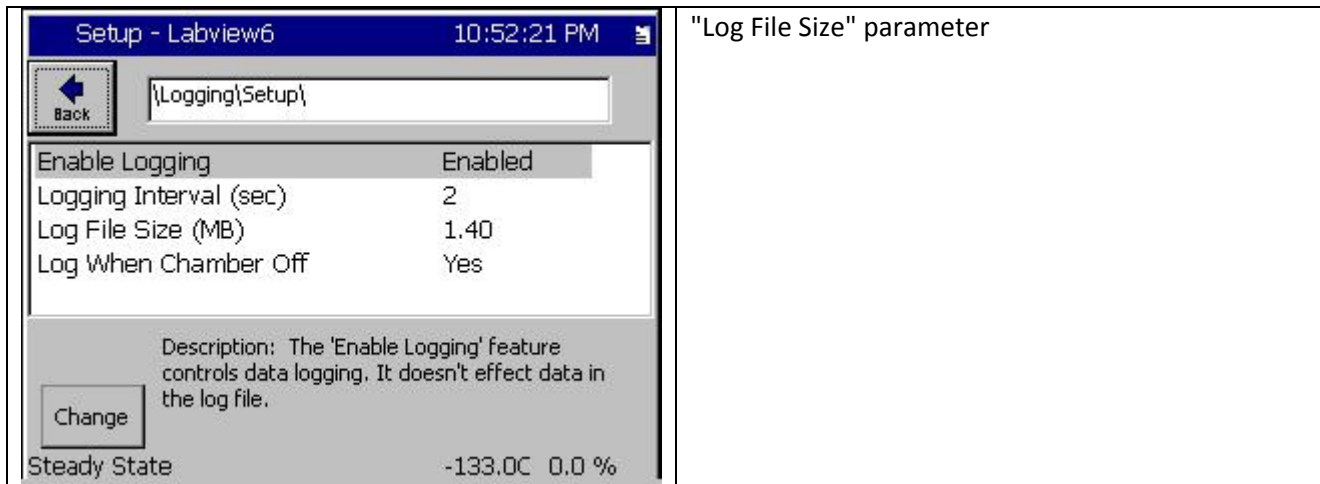
Table 2, Log data sizes

Data	Max. Size	Description
CH1 Actual	6 bytes	Temperature
CH2 Actual	6 bytes	Humidity
CH3 Actual	6 bytes	Pressure
CH1 Setpoint	6 bytes	Temperature
CH2 Setpoint	6 bytes	Humidity
CH3 Setpoint	6 bytes	Pressure
CH1 Heat PID	4 bytes	0 to 100%
CH2 Heat PID	4 bytes	0 to 100%
CH3 Heat PID	4 bytes	0 to 100%
CH1 Cool PID	4 bytes	0 to 100%
CH2 Cool PID	4 bytes	0 to 100%
CH3 Cool PID	4 bytes	0 to 100%
Machine Sensor 1	4 bytes	Low Stage Pressure, Low Side
Machine Sensor 2	4 bytes	Low Stage Temperature, Low Side
Machine Sensor 3	4 bytes	Low Stage Pressure, Hi Side
Machine Sensor 4	4 bytes	Low Stage Temperature, Hi Side
Machine Sensor 5	4 bytes	High Stage Pressure, Low Side
Machine Sensor 6	4 bytes	High Stage Temperature, Low Side
Machine Sensor 7	4 bytes	High Stage Pressure, Hi Side
Machine Sensor 8	4 bytes	High Stage Temperature, Hi Side
UUT Device 1	56 bytes	8 Thermocouple readings
UUT Device 2	56 bytes	8 Thermocouple readings
UUT Device 3	56 bytes	8 Thermocouple readings
UUT Device 4	56 bytes	8 Thermocouple readings
UUT Device 5	56 bytes	8 Thermocouple readings
UUT Device 6	56 bytes	8 Thermocouple readings
UUT Device 7	56 bytes	8 Thermocouple readings
UUT Device 8	56 bytes	8 Thermocouple readings

The following screen shots available on Synergy Controller Application Version 3.0.0 and newer can be used set the "Log File Size" limit and monitor the available storage card capacity and current History log file size and Profile Log File size.

Maintenance - Labview6 10:49:05 PM **\About** Synergy Controller Copyright 2012 Tidal Engineering Application Version 3.0.14 Build 943 Help Version 3.0.5 RunTime: 385:58 (hh:mm) Olympic Firmware Part: TE1363 Olympic V2.0.42 S/N 04/1201 Operating System WinCE Build: Part: TE2144 Date: 06/18/12 Version 5.0.E Support Visit www.TidalEng.com for updates, application notes and support, or call (973) 328-1173 Available Memory: 9596928, **Available Storage: 2012512256**	Available Storage
Setup - Labview6 10:57:37 PM **\Logging\Status** **Log File Settings** Logging is Enabled Log File Size: 1.4MB Log File Used: 1.365MB Interval (sec): 2 Encryption is Disabled Log when Chamber Off: Yes Profile Log File Settings Logging is Disabled Log File Size:N/A Log File Used:N/A Interval (sec):N/A Encryption is N/A Log when Chamber Off: N/A Steady State -133.0C 0.0 %	The Status of the free running "History" Log File is displayed on the left side of the screen. Note that parameters in the Profile Log File Status on the right side of the screen are N/A because not profile logging is occurring because a Profile (program) isn't running.
Setup - Labview6 10:59:42 PM **\Logging\Status** Log File Settings Logging is Enabled Log File Size: 1.4MB Log File Used: 1.377MB Interval (sec): 2 Encryption is Disabled Log when Chamber Off: Yes **Profile Log File Settings** Logging is Enabled Log File Size: 1MB Log File Used: 0.001MB Interval (sec): 2 Encryption is Disabled Log when Chamber Off: Yes RunningLine1. Time: 0:01:07 -133.0C 0.0 %	The parameters in the Profile Log File Status on the right side of the screen are active in the screen at the left because a Profile is running and profile logging is occurring.

Prior to Version 3.0.0, the logging system segments the total capacity of the Storage Card into two files of equal size and discards the oldest portion when the "Log File Size" limit is reached. Note that the "Log File Size" is set in the Settings\Logging\Setup folder as shown below.

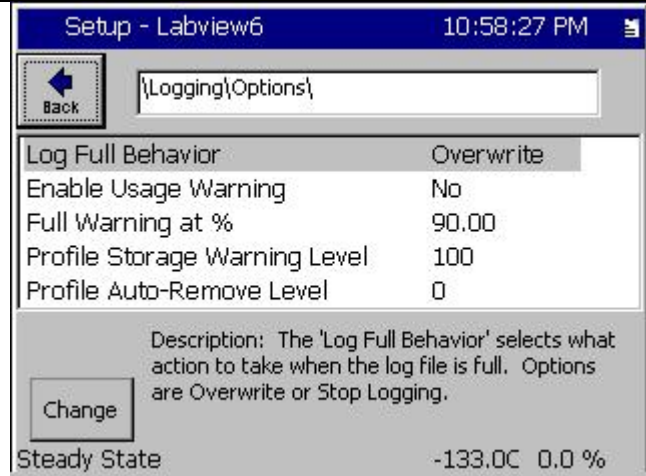|	
Setup - Labview6 10:52:21 PM ◄ Back \Logging\Setup\ Enable Logging Enabled Logging Interval (sec) 2 Log File Size (MB) 1.40 Log When Chamber Off Yes Description: The 'Enable Logging' feature controls data logging. It doesn't effect data in the log file. Change Steady State -133.0C 0.0 %	"Log File Size" parameter

In addition, the required log file size should take into account any used log file capacity to be sure that the logging system will not reach the "Log File Size" limit during a test. Export the History file to USB Flash Disk or FTP and then then clear the History on the Storage Card using the "Maintenance/File Utilities" folder before a long test if the test data capacity calculated will be close to the limit. This practice can be helpful to prevent loss of the oldest data.

After Version 3.0.0, the logging system segments the total capacity available into 25 files and so when the "Log File Size" limit is reached on these versions, a smaller portion of the oldest data is lost (1/25) . Alternatively, the logging system can be optionally set to stop logging when this limit is reached. See the figure below.

In all Synergy Micro 2, Synergy Nano, and Synergy Quattro controllers, the Storage Card capacity is 2 GB which is 256 times greater than the capacity available on the original Synergy Compact and VersaTenn V. In these newer systems Storage Card capacity doesn't usually come into play when calculating record time. On these units, it's the "Log File Size" which is the determining factor. In Version 3.0.0, the "Log File Size" can be programmed up to 100 MB.

In the latest Version 3.0.0 software, Synergy Controllers can create multiple profile log files for individual tests in addition to the free running History file. In previous versions, only the free running History file was available. Profile warnings and Auto Delete features can be programed to help manage the number and capacity of the profile logs that are automatically generated in these systems. See figure below.

Log Full Behavior, **Enable Usage Warning**, and **Full Warning at %** settings apply to the free running History file

Profile Storage Warning Level feature and **Profile Auto-Remove** (Delete) features apply to the individual Profile logs.

Related Application Notes

Synergy Controller AppNote 2 Data Logging Capacity Calculations

Synergy Controller App Note 45 Using the FTP Server

Synergy Controller App Note 60 Graphing Synergy Log Files in Microsoft Excel

Synergy Controller App Note 72 Thermocouple Data Acquisition with Synergy UUT Modules

Synergy Controller App Note 84 E-Mail Features

Synergy Controller App Note 85 Synergy Controller Logging Features

Synergy Controller App Note 90 Synergy Controller Network Printing

Synergy Controller App Note 99 Synergy Server Feature

About the Synergy Controller Family

Tidal Engineering's Synergy Controllers, including the Synergy Micro 2, Synergy Quattro, and the ¼ DIN Synergy Nano provide state-of-the-art usability and connectivity for environmental test control and data acquisition and combine the functions of a chamber controller and a data logger. They are designed to improve test efficiency by supporting both factory automation and test and measurement protocols and standards.

Synergy Controller feature highlights includes:

- ➔ Color touch screen
- ➔ Ethernet, RS-232 and GPIB communications
- ➔ Built in 100 MB Data logger with USB drive support
- ➔ Data Acquisition, up to 64 T-type thermocouples (Optional)
- ➔ Built-in Web Server for remote control; WebTouch Remote ™
- ➔ Compatible with Synergy Manager for PC based control, monitoring and programming.
- ➔ Built-in FTP Server for factory automation and test and measurement applications

For more information regarding these controllers please see the full Synergy Controller Technical Manual on our website at http://www.tidaleng.com/synergy.htm

About Tidal Engineering

Headquartered in Randolph, NJ, Tidal Engineering Corporation has been designing and building award-winning embedded hardware and software for test and measurement and data acquisition applications since 1992. The company is recognized for technical expertise in such areas as Embedded IEEE 488, and turnkey SCADA (Supervisory Control and Data Acquisition) systems.

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