PROJECT:	**HREC 33083**
Document Title:	SLE Logger® v1 Datasheet
Document Number:	TSP00002
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Abstract:

This technical specification contains all necessary specification for version 1 of the SLE Logger® v1 designed and developed for research purposes only.

Document Revision History

Rev No.	Change No.	Description of Change	Chk'd By	Chk'd Date	Approv'd By	Approv'd Date
1	00005	Initial introduction	LP	6 FEB 2014	DT	

SLE Logger® v1

- Stand-alone RS232 serial data logger
- Data sampled without time stamp
- MicroSD Card for high capacity data storage in easily removable and transferable format
- Simple to configure for a wide range of devices
- Compact, economical and robust design
- Low power consumption
- Internal Battery (9Vdc) powered operation
- Stored data files simple to read with standard PC office software

Overview

The SLE Logger v1 is a versatile serial data logger for sampling RS232 data.
Data is stored on a removable MicroSD Card, enabling remote data logging without the need for direct connection to a PC. After logging, the memory card can be simply inserted in a card reader, to view and analyse the data on a PC; no special software is required.
Each data record is recorded with a carriage return between samples. A new file is generated each time the unit is powered ON. The default file format is .TXT; other file extensions may be specified.
The SLE Logger v1 is ideal for field data acquisition due to its low power consumption, high capacity data storage and internal battery power operation.
The SLE Logger v1 can be configured to operate in Listen-Only (LO) Mode only.
As the name suggests, LO Mode will not transmit any data to the connected device and will only record all incoming RS232 data. The TX pin is unused on this model.

Applications

Data acquisition from medical devices, instruments and sensors outputting RS232 data, such as:

- ✓ Ventilators and Infusion Pumps
- ✓ Environmental sensors - temperature, humidity, pressure, noise, pollution etc
- ✓ GPS & other NMEA devices
- ✓ Weighing balances & floor scales

More SLE Logger Models

SLE Logger v2 - RS232 data recorder with polling and time-stamping
SLE Logger v3 - 2 Channel Analogue Output data logger
SLE Logger v4 - 12 Channel Analogue Output data logger
SLE Logger v5 - for logging of cycle records from medical decontamination devices

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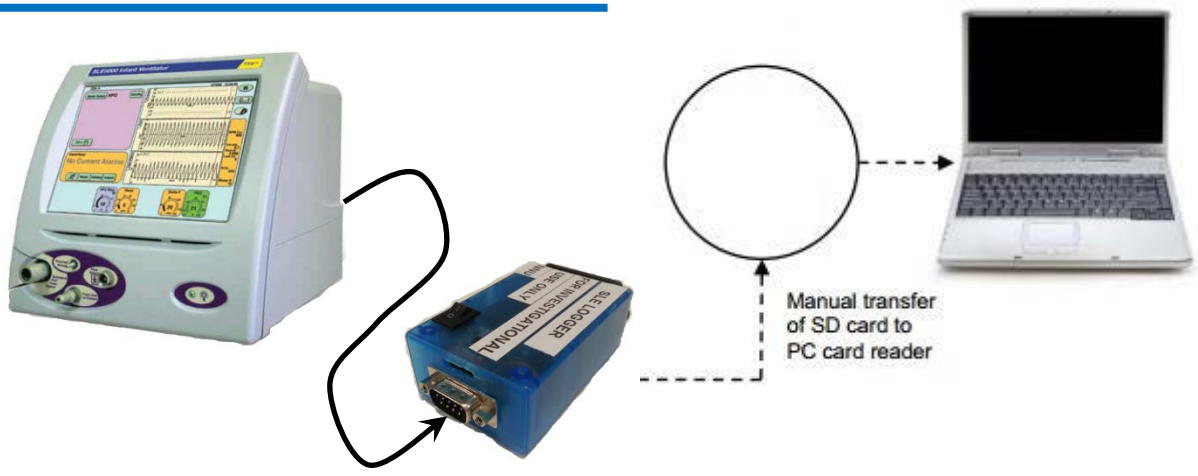
SLE Logger® v2 Specification

Physical	Dimensions	Width: 54mm Depth: 86 mm Height: 31mm (excluding power switch)
	Weight	50g (w/o battery), 90g (w/ battery)
	Enclosure Material	GP ABS (UL94-HB) plastic and acrylic
I/O Capability	Transmission standard	RS232 / TIA-232 compatible, 8-bits
	Transmission speed	19200 Baud (default) or selectable from 2400, 4800, 9600, 38400, 57600 or 115200 Baud
	Interface acceptance	DE-9
Data Storage	Data Storage Card	Removable MircoSD Card (Class 10 only)
	Data Capacity	16GByte (max)
	File System	FAT16/32 with 8.3 file names. Sector size 512 Bytes
	Data Sample	Records only the data between specified start and end characters, or all characters.
	Data logging interval	Default is to log every data sample output by the device/sensor or select logging interval from 1 to 60 seconds
Audible/Visual Indicators	LED Indicators	Green (solid): Power ON Blue (solid): Writing to memory card Blue (alternating): No memory card found.
	Audible Beeper	N.A. (not loaded)
Real Time Clock	Accuracy	±40 ppm at 25°C
	Backup battery	CR2032
Power	Power Requirement	3.3 Vdc to 12 Vdc
	Battery	9 Vdc PP3 Battery (Primary Disposable 6LR61)
	Current at 9Vdc	2 ma idle, 8 mA at maximum recording rate
	Connection	GP ABS (UL94-HB) plastic and acrylic
Environmental	Temperature Range	Operating: 20°C to 30°C Storage: 10°C to 40°C
	EMC	CE marked - EMC directive 2004/108/EC FCC/CFR 47: Part 15:2004

Example of SLE Logger v2 Application



SLE5000 Logger Analyser v1 PC Program

The SLE5000 Logger Analyser PC program is a program that:-

- Can open the raw TXT files that are found on the SLE Logger Memory Card.
- Translate the data and present the data for viewing.
- Generate Basic Reports detailing initial settings, setting changes and alarms.
- Export the data to LabChart compatible TXT file format.
- Export the data to Excel compatible CSV file format.

Depending on the version of SLE Logger used, some MANUAL pre-processing is necessary prior to using the analyser program:-

Step 1: Check for incomplete data records
Sometimes the SLE Logger is placed onto or removed from the ventilator while a data transmission is in progress. This will generate incomplete records. Simply open the RAW TXT file in Notepad and check the first and last lines of the file. If the line doesn't have all data length as per all other lines, then delete the line as required.

Step 2: Add Date and Time Entry:
If the file contains Date and Time information per line entry (i.e. SLE Logger v2 and above), the RAW TXT file can be used as is. When using the SLE Logger v1 (no date and time stamping functionality), the analyser program needs to know the start and stop times of the RAW TXT file recording. To do this, simply open the RAW TXT file in Notepad and add the Start and Stop times as per Appendix A.

Step 3: Open the Analyser Program
Open the Analyser Program. For help on the installation of the software, see Appendix B. The first screen, as shown in Figure 3.1 below appears and then an "Enter File Name:" dialogue box pops up asking for which file to open. By default, the program will be trying to open a TXT file that is located in the folder
"..\Original Data". (If this folder doesn't exist, the program will take you to another default location depending on the last use of the Agilent VEE Runtime program.)

Step 4: Choose a TXT file to process
Select the TXT file you want to analyse and then press the "Open" button, or double-click the file you want to open. If you choose "CANCEL" at this stage, the program with quit.

Step 5: Loading File to Memory
At this stage, the program is checking the TXT file format (syntax) while loading the file into the computer memory. If the TXT file is not in the correct format s expected, the program will fail with an error code. This is also the stage when the program checks the TXT file length to determine if the file length is excessively long and truncates the file to the first 100,000 records (~29hours). If truncation is necessary, there will be a pop-up indicating so.

Step 6: Processing Data...
At this stage, the program will translate the data using the communications protocol given in the SLE5000 User Manual. It is where values are converted into real measurements, not just their digital representation.

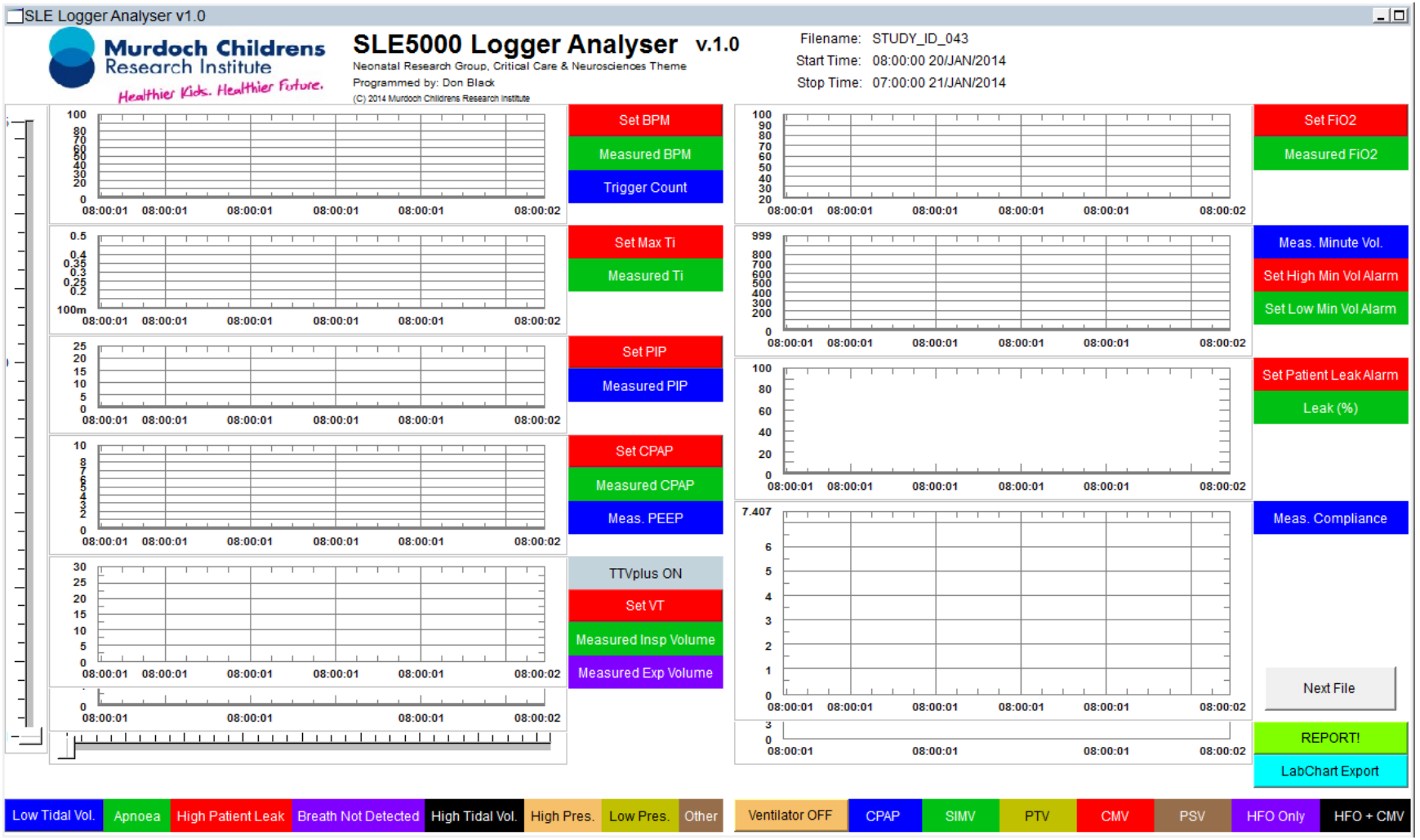


Figure 3.1: SLE5000 Logger Analysis v1.0 PC Program User Interface

Step 7: Generating Records...
The program now is going to generate data records (an array of Records) for faster analysis, presentation and exportation. The stage is to check the Stop Time given at the top of the TXT file with the expected stop time.

NOTE! The analysis program relies heavily on the Start Time given at the beginning of the TXT file when using the SLE Logger v1 device only!

The Stop time is not so important but a cross-check is made to confirm that the data recorded is aligned to the expected stop time. The analyser program knows the expected study time duration, given the number of records found, and this may differ to the MANUAL entry made for a SLE Logger v1 situation.

The program will briefly indicate (2 seconds) the discrepancy between the MANUAL stop time and the expected stop time if the difference is less than 10minutes. If the difference is greater than 10 minutes a "Time Stamps Error" pop-up appears asking if the user would like to:

1. Use the Time Stamps as per the TXT file (YES) - i.e. use a different sampling rate to match the Start and Stop times, or
2. Ignore the significant difference between the Stop Time and the expected stop time (NO) - i.e. use the known sampling rate for all the data.

NOTE! It is advised that the difference is ignored and to use the known sampling rate!

The program then re-processes the data and attaches time stamps to all records, ready for display.

Step 8: Presentation of Data
Now that all the data has been "crunched", it can now be displayed. See figure 8.1 below for example.
The basic functionality is as follows:

- The leftmost slide bar is used for ZOOM.
- The left side bottom slide bar is used for POSITION.
- The left side displays (from top down):
    - BPM settings and measurements
    - Inspiration Time settings and measurements
    - PIP settings and measurements
    - PEEP settings and measurements
    - Tidal Volume settings and measurements (including TTV ON/OFF)
    - Various Alarms.
- The right side displays (from top down):
    - FiO2 settings and measurements
    - Minute Volume settings and measurements
    - Leakage settings and measurements
    - Compliance
    - Ventilator Modes of Operation

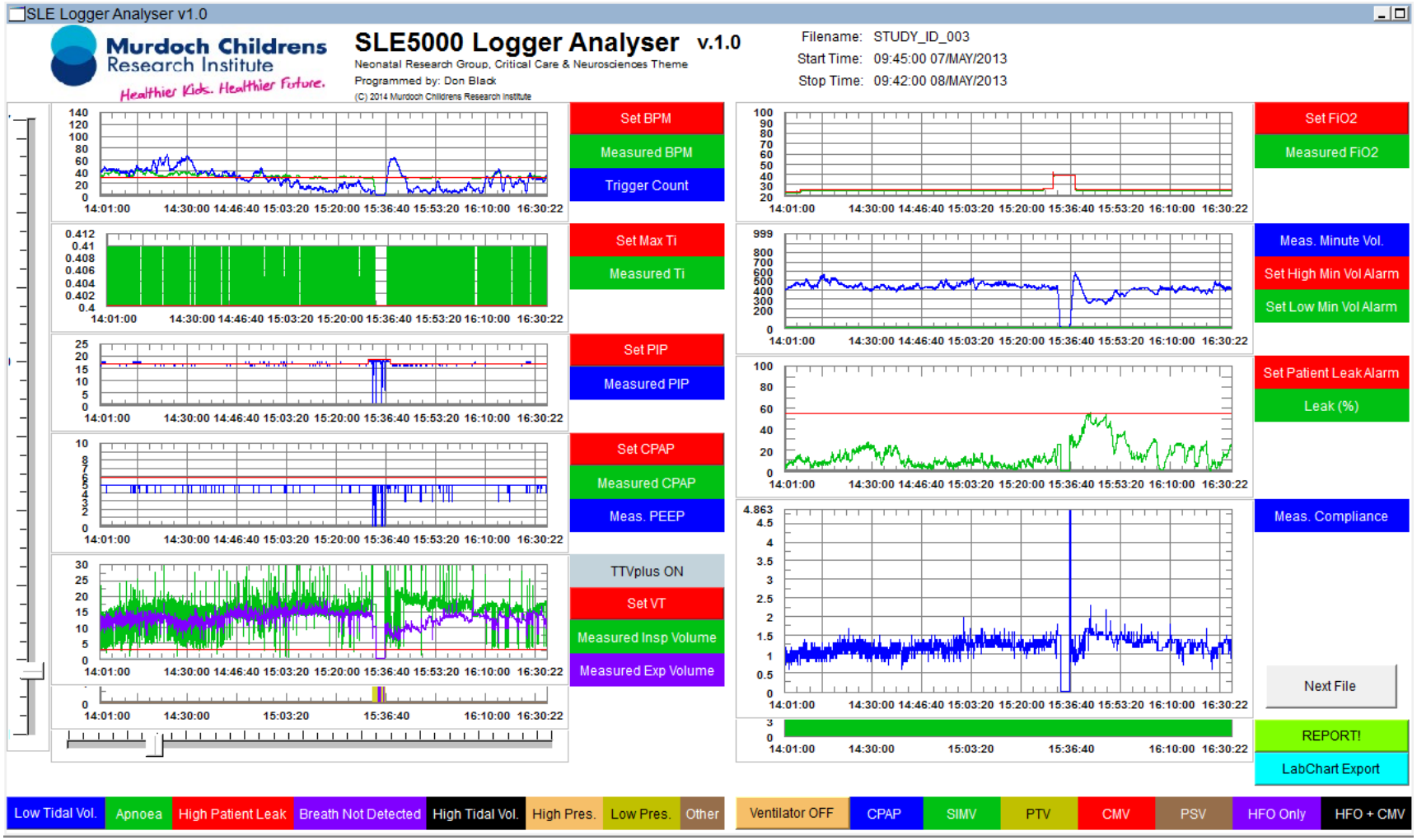


Figure 8.1: Presentation of Data

The lower right hand corner of the user interface shows three (3) buttons:-

- Next File - used to load the next file or exit the program
- REPORT! - used to generate a basic report from the study data recorded
- LabChart Export - used to translate the data to LabChart TXT file format (for further analysis in ADinstrument LabChart).

Step 9: Report
After viewing the data, press the REPORT button found in the lower right hand corner of the program to generate a basic report (and save the file in the REPORT folder) that contains:-

- The start settings of the ventilator
- Any subsequent changes
- The final settings of the ventilator
- The number of Alarms during the entire recording

Step 10: Export to LabChart
The data can be exported to a LabChart compatible text file format for further analysis and manipulation in ADinstruments LabChart program. Press the "LabChart Export" button in the bottom right hand corner of the program to start this export.

A dialogue box will appear, asking for the section of data to be exported. The radio buttons in the top left have no functionality in version 1 of the program. Select the appropriate times as required, making sure that the selection actually exists WITHIN the loaded data - else a pop-up will appear saying that there is a select error. When done, press the "OK" button to continue.

The next dialogue box is where the user can select what data to export. Three types of data can be exported - Settings, Measurements and Alarms. There is no limit to the number of channels to export, but LabChart has a limitation of only loading the first 32 channels. To select a channel, simply click on the name and click again to de-select it from export. When all required channels have been selected, press the "OK" button to continue. If "Cancel" button is pressed, the default channels are selected.

The program starts to export the data to a LabChart Text file in the *LabChart* folder. When complete, the dialogue box will disappear from the screen.

Step 11: Quit the SLE5000 Logger Analyser Program
When done, to exit the program select the "Next File" button and then click "Cancel" when the filename request appears. The program will then close.

Step 12: LabChart File Check

Now that the LabChart export has been successful, run LabChart and load the appropriate study ID TXT file (NOT the *.adicht* file!). LabChart will then ask:

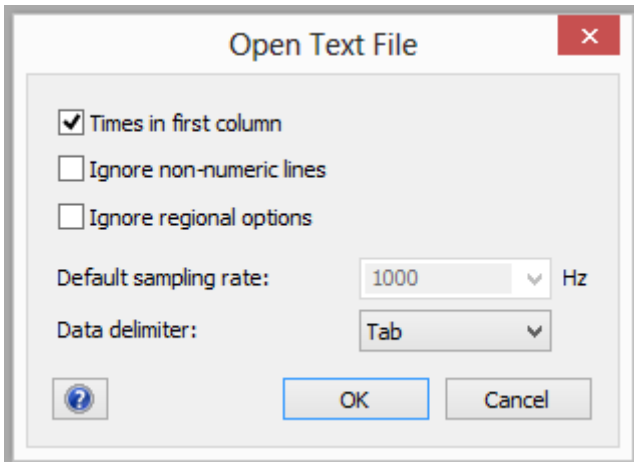


Figure 12.1: LabChart TXT file open dialogue box

Leave the defaults and press the "OK" button. LabChart will then load the file:

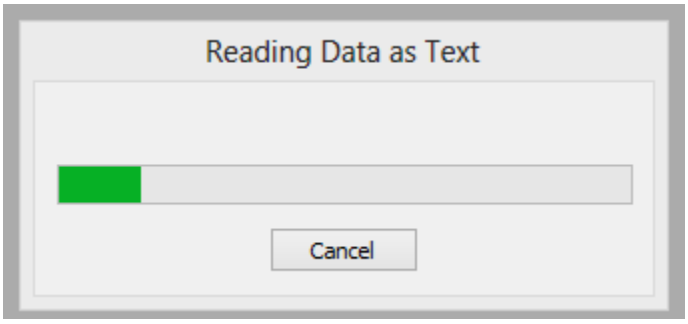


Figure 12.2: LabChart Loading file

Once loaded:

- Press Ctrl-U to auto scale the waveforms.
- Change the date/time display by clicking on <Setup>, <Display Settings...> and then "Time of Day" radio button, and then "OK".
- Click the Save button and save as a ".adicht" file format.

Appendix A: Date and Time

Examples:
Known Start and Stop Times:
08:35:00 08/JAN/2014
07:45:00 09/JAN/2014

Unknown Start Time with Known Stop Time:
08:35:99 21/JUL/2013
07:45:00 23/JUL/2013

Known Start Time with Unknown Stop Time:
08:35:00 21/JUL/2013
07:45:99 23/JUL/2013

Time Stamp Header Information:
Line 1 contains the start time.
Line 2 contains the stop time.
Line 3 onwards is the recorded data.

Time Stamp Format:
HH:MM:SS<SPACE>DD/MMM/YYYY

where:
HH=Hour in 24Hour format using two characters. E.g. 00, 01, 02, ... , 12, 13, 14,...23.
MM=Minutes using two characters. E.g. 00, 01, 02, ... , 10, 11, 12,...59.
SS=Seconds using two characters. E.g. 00, 01, 02, ... , 10, 11, 12,...59.
<SPACE>=One space bar character.
DD=Day of Month. E.g. 00, 01, 02, ... , 12, 13, 14,...31.
MMM=Month of year. E.g. JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC.
YYYY=Year using four characters. E.g. 1999, 2000, 2001,....2100.

NOTE:
If a start or stop time is not known accurately, just put in what you roughly know ....BUT CHANGE THE SECONDS TO "99". This will tell the analysis program that the time (be it the start or stop) is not exactly known. A value of "99" can only be in one of the time stamps, not both - i.e. you need to fix the data to either a known start time or known stop time.

Appendix B: Installation and Folder Locations

Go to the Agilent website and download the latest Agilent VEE Runtime engine. This is a similar engine to that of MATLAB, JAVA, SilverLight, ... Use the default installation options (this will install the MATLAB runtime engine also).

Once installed, locate the SLE5000 Logger Analyser VXE program. The folders around this program should be as follows:-

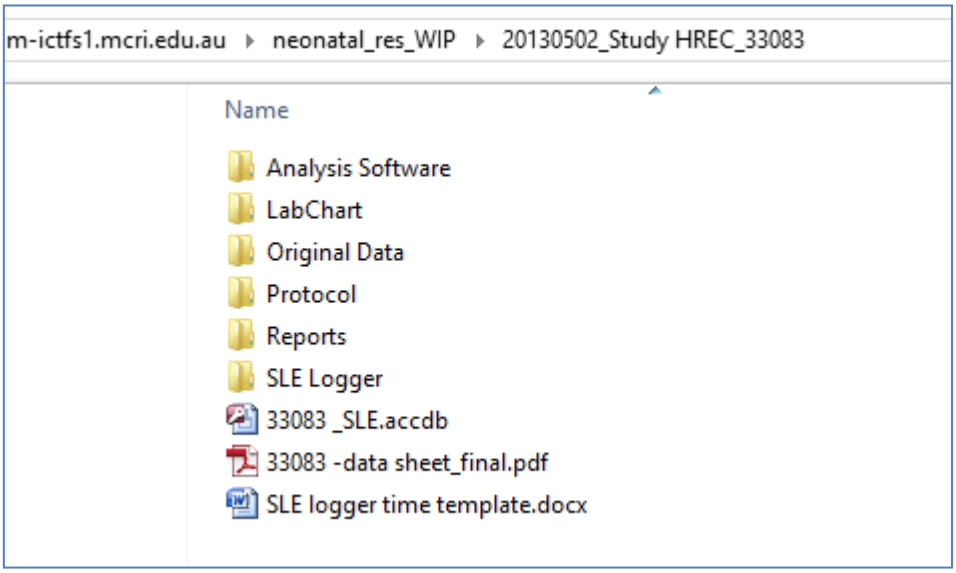
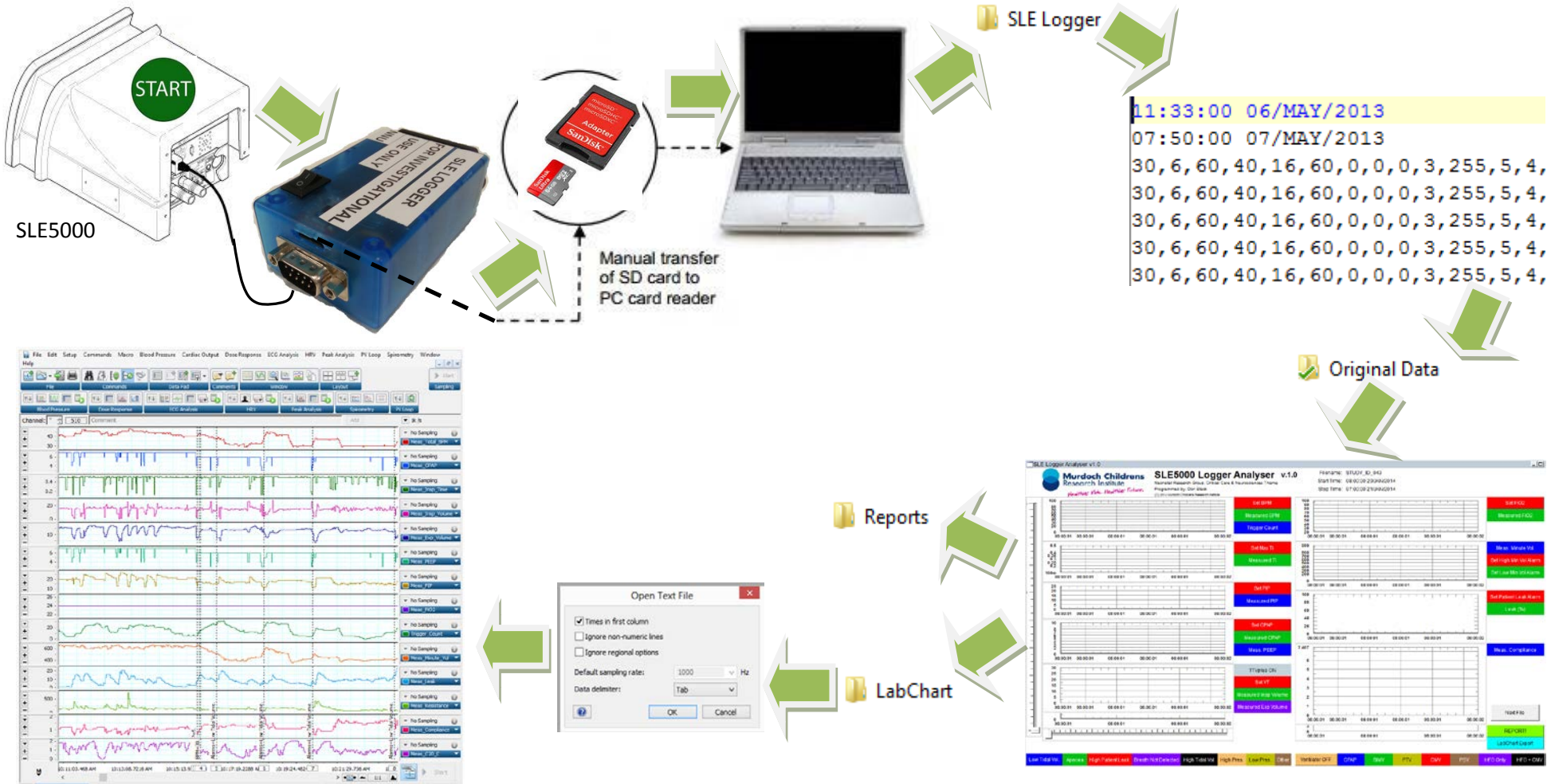


Figure B.1: Folder Layout

The *Analysis Software* folder contains the SLE5000 Logger Analyser VXE program.
The *LabChart* folder contains the exported LabChart TXT files, generated by the analyser program.
The *Original Data* folder contains the RAW TXT files that have been checked, with Date and Time stamps added to the start of the file.
The *Protocol* folder is not used by this system.
The *Reports* folder contains TXT reports generated by the analyser program.
The *SLE Logger* folder contains the RAW TXT files as found on the SLE Logger memory card.

Appendix C: Data Flow



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