

VALEPORT LIMITED
RapidSV & RapidSVLog
Operating Manual

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1 **INTRODUCTION**

This manual covers the basic specifications, deployment and maintenance procedures for the:

- RapidSV *Sound Velocity Profiler*

This product has been designed to operate with Valeport's own RapidSV log operating software; the instrument can also be controlled by sending commands directly, using a suitable terminal emulation program such as HyperTerminal.

The product has been designed to be simple to use and maintain, as well as being small and lightweight for easy handling and deployment.

2 SPECIFICATIONS

Dimensions:

	Housing Ø	Overall length	Weight (titanium)
<i>RapidSV</i>	50mm	515mm	3kg (in air)

Communications:

Bluetooth communications with paired Bluetooth dongle

Can be used with third party Bluetooth dongle but only in manual operation mode via HyperTerminal.

For best results the Valeport dongle should be always be used. The dongle should automatically install on most windows installations. If it does not install automatically then suitable drivers can be downloaded from:

<http://www.ftdichip.com/Drivers/VCP.htm>

Materials:

Part	Material
Main housing	Titanium (2000m)
Nose	Aluminium-Bronze
Space Rods	Carbon Composite
Acoustic Reflector	Titanium
SV Transducer	Ceramic transducer behind polycarbonate window.
Pressure Transducer	Stainless steel diaphragm with acetal protective cover.
Temperature sensor	PRT in titanium housing with polyurethane backing.

Power:

Internal Single "C" cell, either 1.5v alkaline or 3.6v Lithium

Acoustic Frequency:

Single sound pulse of 2.5MHz frequency.

Memory:

Each instrument is fitted with a 256Mb solid state memory. Capacity is over 10m lines of data

Performance:

Sensor		miniSVP
Sound Velocity	<i>Range</i>	1375 – 1900m/s
	<i>Accuracy</i>	±0.02m/s
	<i>Resolution</i>	0.001m/s
Pressure	<i>Range</i>	10, 50, 100, 200
	<i>Accuracy</i>	±0.05% range
	<i>Resolution</i>	0.001% range
Temperature	<i>Range</i>	-5 to +35°C
	<i>Accuracy</i>	±0.01°C
	<i>Resolution</i>	0.001°C

Operating Modes:

Rapid Mode: The rapidSV has a special mode designed for rapid profiling. Once the instrument is set into run mode, no data is logged until a trigger depth is reached (i.e. 2 metres below the surface). When the probe stops descending and rises by a defined amount (i.e. 1m) data stops logging until the instrument is interrupted or switched off.

NB: timestamp stored in R-mode files is defined as when the data is logged from, not when the file is created.

Continuous mode: The rapidSV will log data at the defined rate from when the instrument is set into run mode or switched on. Data will be logged at that rate until the instrument is interrupted or switched off.

Profile mode: The rapidSV will log data at the defined pressure interval, (i.e. every 0.25 dBar), both on the upcast and downcast of the profile.

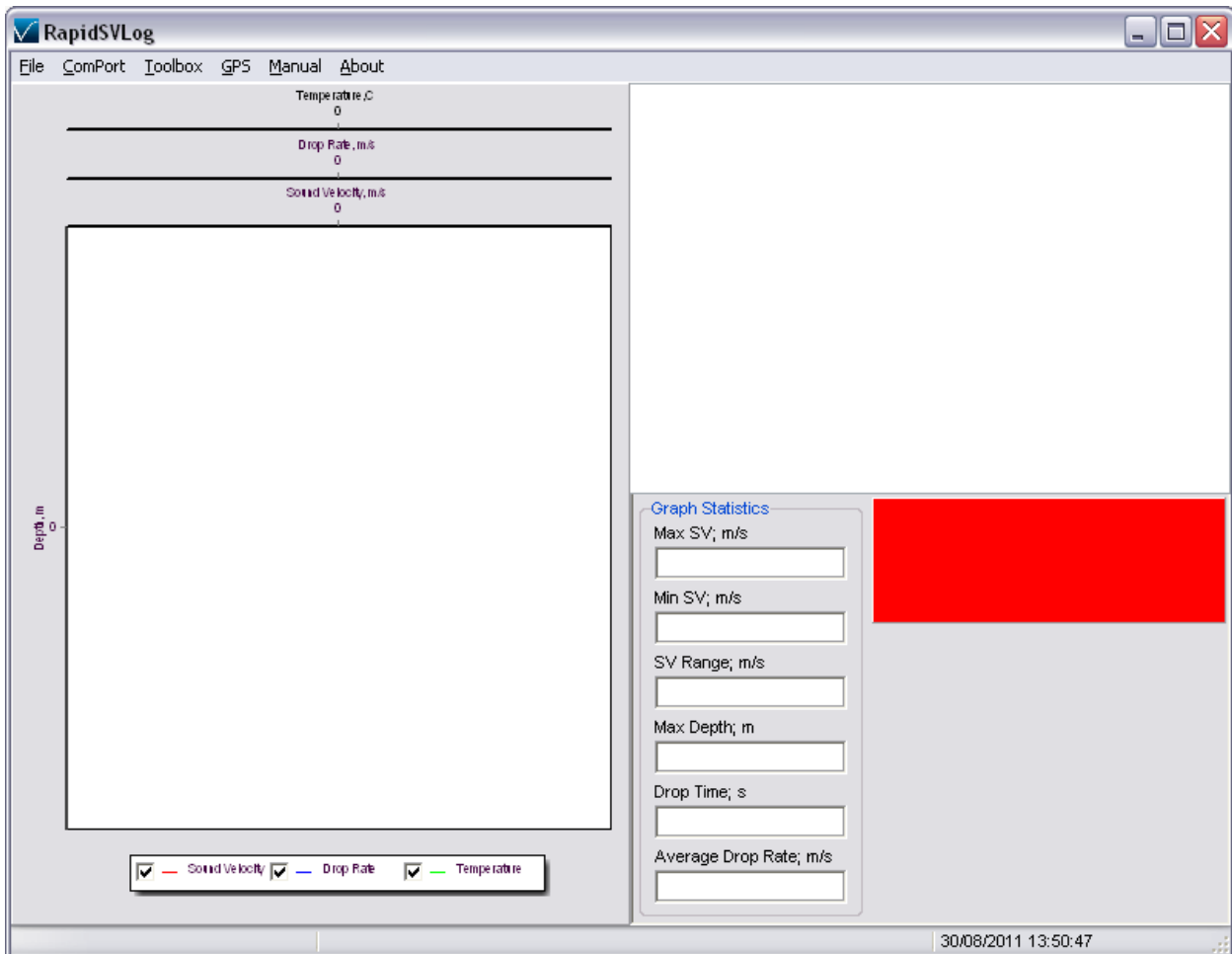
When used in conjunction with RapidSVlog, the rapidSV will automatically be run in rapid mode.

3 RAPIDSVLOG

RapidSVlog has been designed to work specifically with the RapidSV. It will automatically configure the instrument, control communications and download profiles collected by the RapidSV.

3.1 SETTING UP RAPIDSVLOG

3.1.1 COMMUNICATIONS



Select the ComPort menu, and then the ComPort the USB Bluetooth dongle has been assigned to (Windows will automatically assign a port).

Once the ComPort has been selected, the toolbox menu will become active.

3.1.2 PAIR RAPIDSV WITH BLUETOOTH DONGLE

The Valeport bluetooth adaptor supplied with the RapidSV is paired in the factory to the probe. Once the probe is paired to a key, it will automatically create a connection when

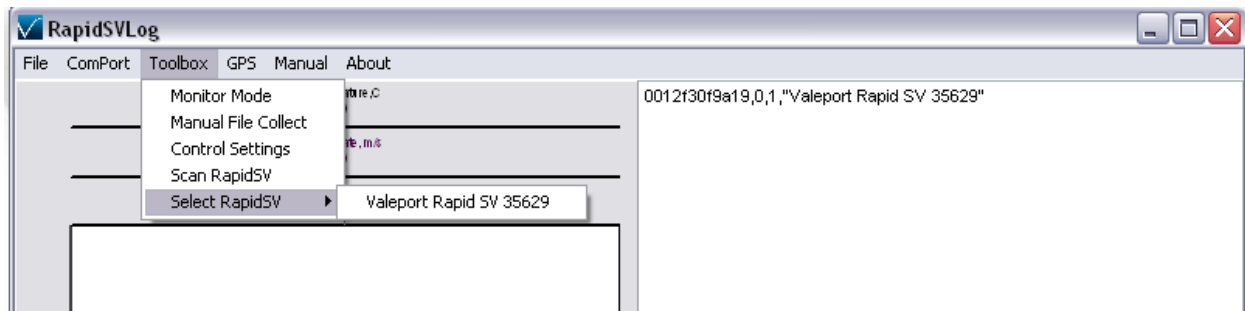
the key and probe are within range. This pairing can be updated with the following procedure.

Select *Toolbox > ScanRapidSV*.

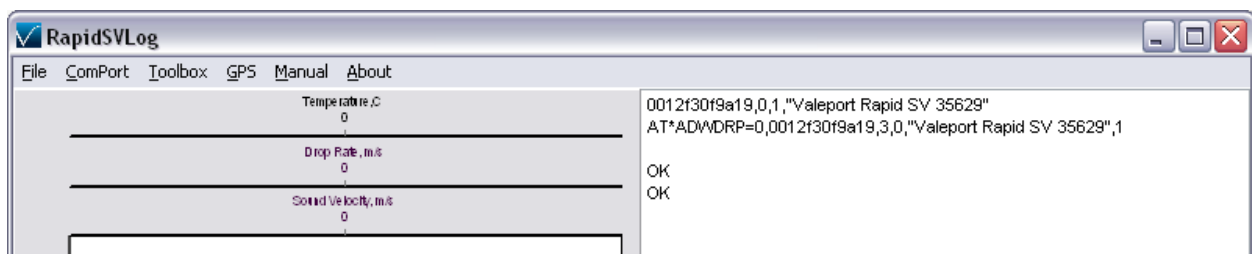
RapidSVlog will forget any previous associations and scan for any active RapidSV instruments within range. Ensure your RapidSV is switched on by removing the magnetic key and within range.

The LED on the key will turn orange while scanning and a list of active RapidSV instruments will appear in the status window.

Select *Toolbox > SelectRapidSV*



Check the RapidSV that you wish to work with. Only one RapidSV can be paired with a USB adaptor at a time.

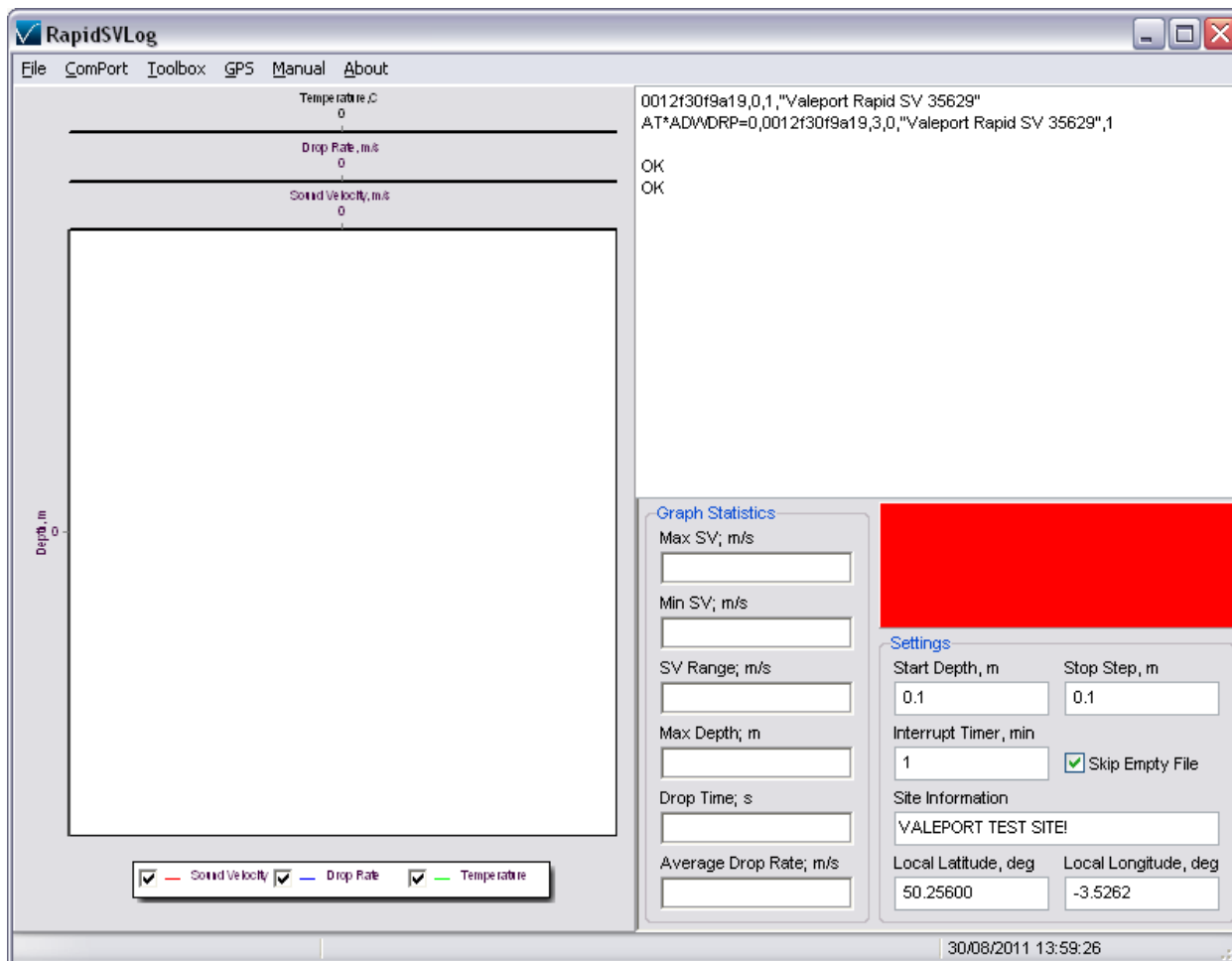


Status window will update if pairing is successful and the LED on the key will turn to blue.

Once a RapidSV and USB adaptor have been paired, they will automatically connect whenever in range. RapidSVLog does not need to be open for this to happen. For more control or troubleshooting, HyperTerminal can be used to configure the RapidSV. See section 4 for details.

3.1.3 **INSTRUMENT SETTINGS**

Select *Toolbox > Control Settings*

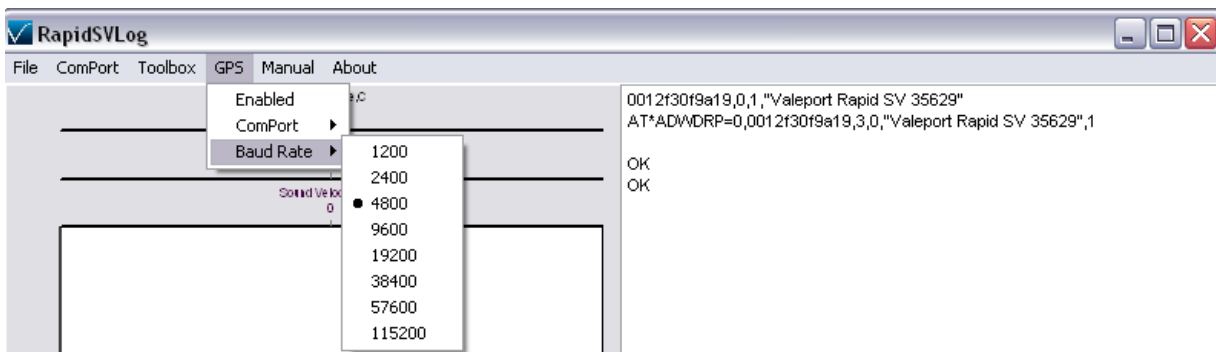
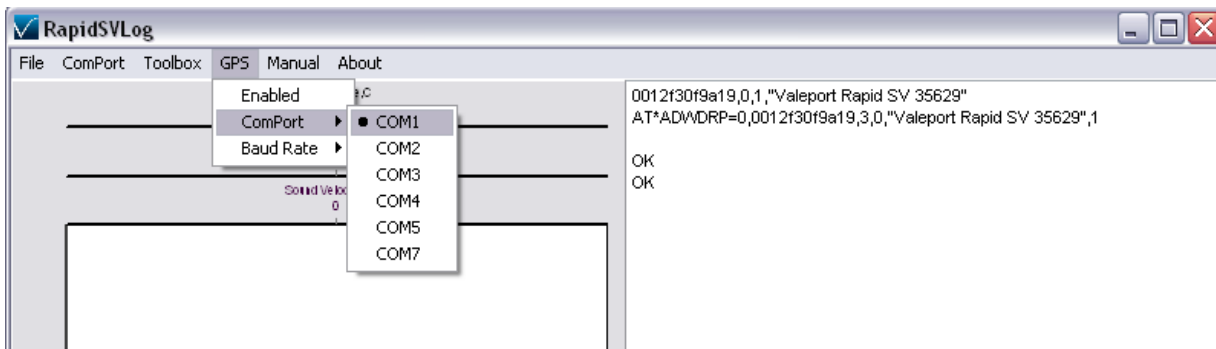


- Start Depth:** the depth at which the RapidSV will start to log data.
- Stop Step:** the upward movement of the RapidSV that will stop data logging
- Interrupt timer:** the time window for deploying the instrument. 60 seconds before the end of this window, RapidSVlog will display a countdown and the status bar will turn amber. When the countdown reaches zero, if the instrument is in range and switched on it will be interrupted, files downloaded and reset ready to deploy.
- Skip empty file** Files without data in will not be downloaded from the instrument
- Site Information:** text field in file header, i.e. survey name
- Local Latitude:** Used for manual input of profile position
- Local Longitude:** Used for manual entry of profile position

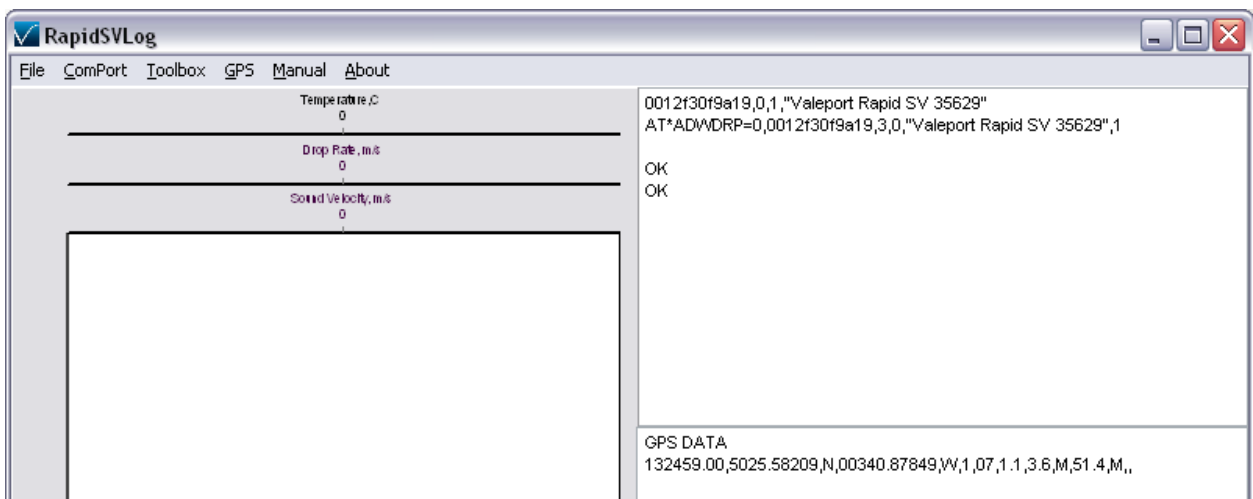
3.1.4 GPS SETTINGS

RapidSVlog has the functionality to import a NMEA 0183 GGA GPS feed to append position information onto the collected SV profiles. It does this by recording the GPS feed and matching the timestamp on the collected file with the collected positional data. When the GPS logging is activated, the RapidSV probe will be synchronised to GPS time rather PC time.

To set up a GPS feed, select the COM port and Baud Rate of the GPS feed:



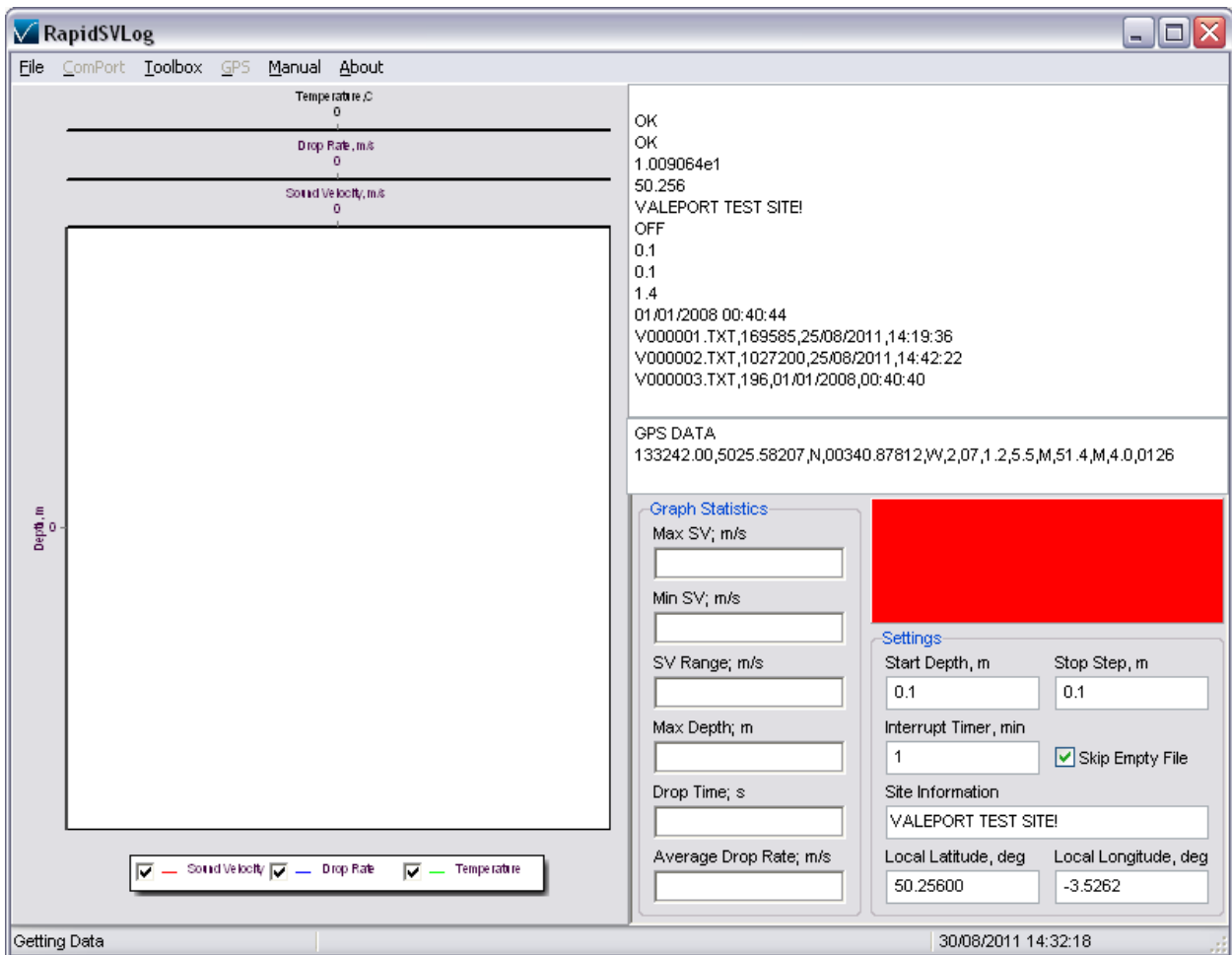
Once the correct COM port settings have been selected, enable the GPS. A window will appear centre right. Check the position is correct and updating.



3.1.5 MONITOR MODE

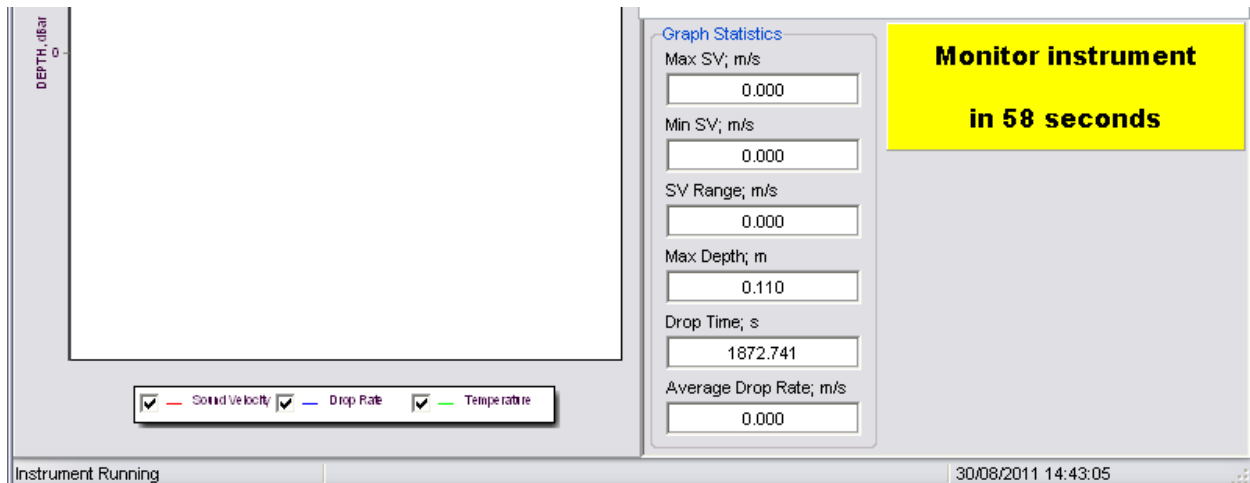
Monitor mode will set RapidSVlog into a loop that will automatically connect to the RapidSV when it comes into range, check the settings on the instrument, download any collected files, configure the instrument, and set into run mode.

When RapidSVlog is set into monitor mode, a number of messages will be displayed in the status window as the software interrogates the instrument for current settings, downloads any files previously collected and sets the instrument into run mode.



During this mode, RapidSVlog will display data and statistics from the last collected profile. See section 3.2

Once the instrument is set into run mode the status bar will turn green, signifying the instrument is ready to deploy. 60 seconds before RapidSVlog will start attempting to interrupt the instrument the status bar will turn yellow with a countdown timer.

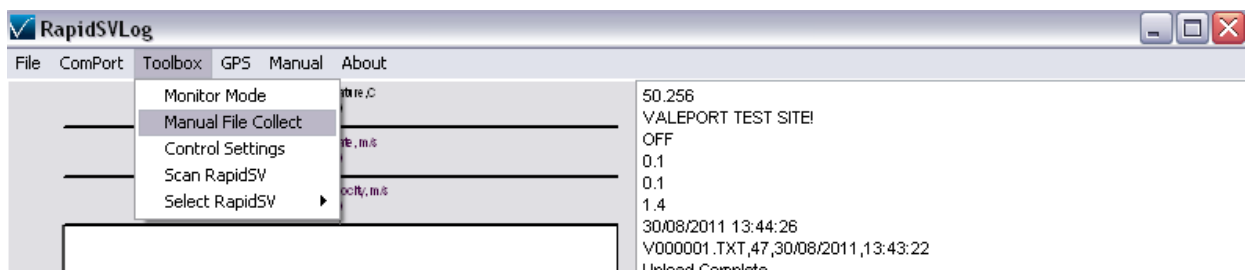


It is not recommended that the instrument is deployed in this period as the RapidSV will not collect data in an interrupted state.

After the countdown timer has expired, RapidSVlog will try to interrupt the instrument until it successfully finds the paired RapidSV and starts the cycle again, or is taken out of monitor mode.

RapidSVlog can be taken out of monitor mode at any time.

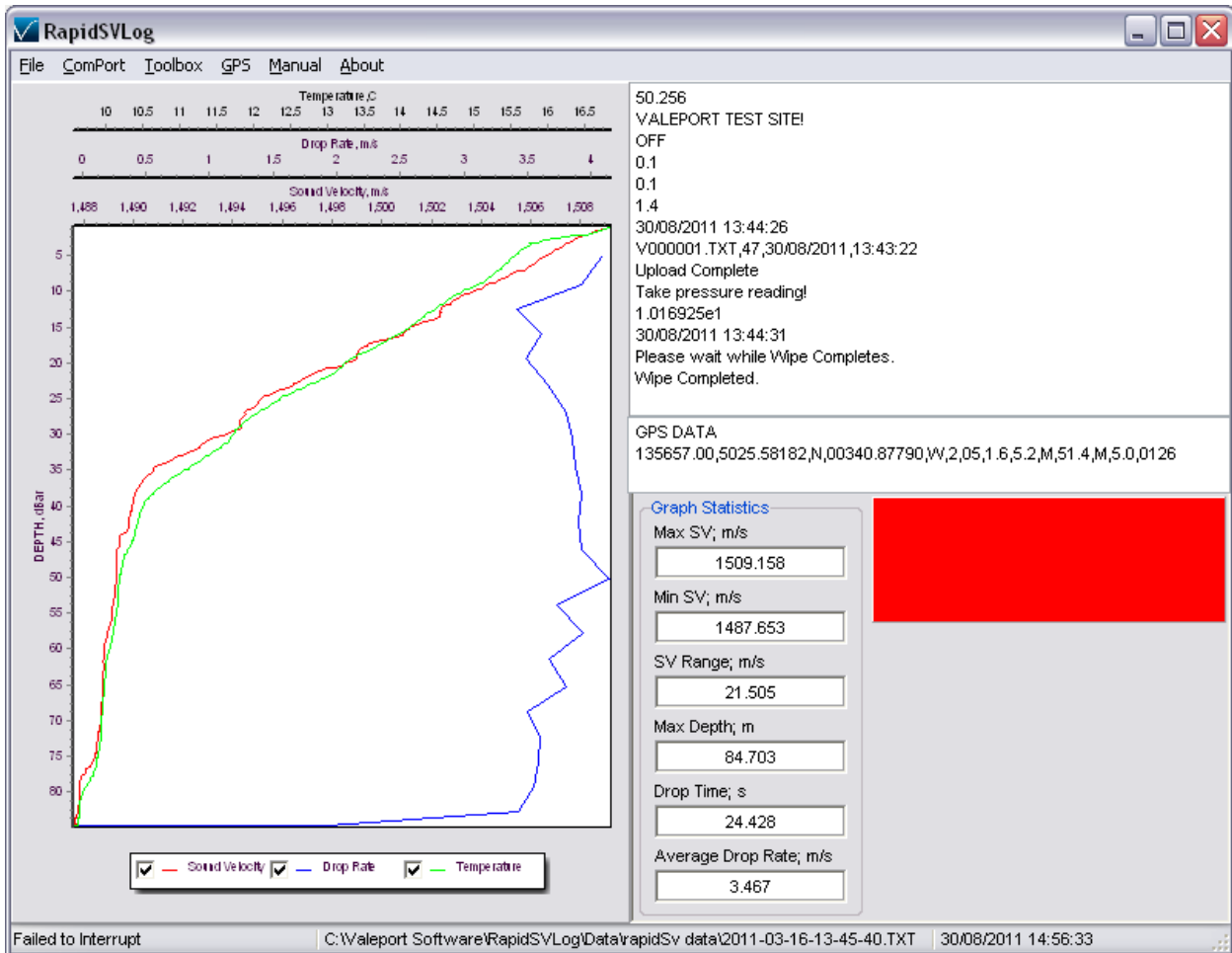
3.1.6 MANUAL FILE COLLECT



To conduct a single download of any files and to set up the RapidSV, manual file collect can be selected. This will perform the same operations as monitor mode, but not repeat them.

3.2 DATA DISPLAY

RapidSVlog can display profile data and a statistical summary from collected profiles. In monitor mode, the last downloaded profile will be displayed. Historical profiles can also be viewed (File > Open File)



The graph display will show a Sound Velocity profile, Drop Rate profile, and Temperature profile if available. The statistics pane will show Max/Min/Range of sound velocity as well as maximum depth reached, drop time and average drop rate.

The graph can be zoomed in on by clicking & dragging right/down on the area of interest. To reset zoom, click & drag up and left.

Individual axes control can be modified by clicking on the axes.

Parameters can be individually turned on and off with the check boxes at the bottom of the graph.

3.3 FILE LOCATIONS

The default file location is:

C:\Valeport Software\RapidSVLog\Data\Valeport Rapid SV xxxxxx

Where xxxxxx is the serial number of the instrument. Within this folder, folders will be created by date and files are named by time of collection in the following format:

YYYY-MM-DD-hh-mm-ss.txt

3.3.1 BACKUP FILE LOCATION

A backup file location can be set using the menu

File > Backup file location.

No sorting by instrument or date will happen in this location. If the backup location is not available, the software will only save data in the default location.

3.4 DATA FORMATS

Each time the instrument is turned on or set into run mode, it will output a file header in the following format. Each logged file therefore contains this header information.

Now: 19/02/2008 14:55:00	<i>The current date and time</i>
Battery Level: 1.4V	<i>Internal battery level (guide only)</i>
MiniSVP: S/N 27838	<i>Instrument Type and Serial Number</i>
Site info: VALEPORT TEST SITE	<i>Site information</i>
Calibrated: 14/01/2008	<i>Date of last calibration</i>
Latitude: 52.999286	<i>Latitude for Pressure / Depth conversion</i>
Mode: R16	<i>Current operating mode</i>
Tare: 0	<i>Current Pressure Tare value</i>
Pressure units: dBar	<i>Current Pressure Units (dBar, metres or feet)</i>

Data follow the formats, as described below.

<u>RapidSV example</u>	10.351	1506.739	
<u>RapidSVT example</u>	10.351	21.488	1506.739

- Data is presented in the order: Pressure, Temperature (if fitted), SV
- Pressure data format is dependent on sensor range, and may be any of the following. Leading zeroes are included, so it is a fixed length string:
 - PPPP.P (e.g. 0123.4 dBar)

- PPP.PP (e.g. 012.34 dBar)
- PP.PPP (e.g. 12.345 dBar)
- The temperature data (if fitted) is given to 3 decimal places. Value is in °C and leading zeroes are included; signed if negative:
 - 21.456
 - 02.769
 - -01.174
- Sound Velocity (miniSVP) is given in m/s, as a fixed length string with 3 decimal places. In air, the sensor reads 0000.000

3.4.1 GPS LOGGING

When GPS is logging, the GPS position will be written into the header file in place of the Latitude field and will have the following format. All other fields and formats remain the same:

Now: 30/08/2011 15:18:27
Battery Level: 1.5V
Rapid SVP: S/N 35629
Site info: VALEPORT TEST SITE!
Calibrated: 31/03/2011
Latitude: 50.4263716666667 Longitude: -3.6812995
Mode: R32;1
Tare: 10.1693
Pressure units: dBar

4 DATA REQUESTS AND OUTPUT FORMATS

The RapidSV is designed to be used with Valeport's RapidSVlog software. However, the instrument will respond to a series of text commands that are detailed here. Note that this list is not comprehensive, but will allow the standard functions of the instrument to be accessed. For more detailed information, please contact Valeport Ltd.

Notes

- Communication settings of the instrument are:

Baud Rate:	57600
Data Bits:	8
Parity:	None
Stop Bits:	1
Flow Control:	None

- HyperTerminal must be set to '*Send Line Ends with Line Feeds*'
- All commands must be confirmed using "Carriage Return" or "Enter" on the keyboard, with the exception of the "Stop" command (#).
- All commands are echoed back by the instrument as they are typed

4.1 STOP COMMAND

The instrument can be stopped at any time by sending the '#' character. The instrument returns a '>', and waits for a further command.

4.2 RUN COMMANDS

R1 Collects rapid profile at 1 Hz

R2 Collects rapid profile at 2 Hz

R4 Collects rapid profile at 4 Hz

R8 Collects rapid profile at 8 Hz

R16 Collects rapid profile at 16 Hz

R32 Collects rapid profile at 32 Hz

(NB. R32 Only available if temperature is not fitted or disabled)

M1 Performs continuous measurement at 1Hz

M2 Performs continuous measurement at 2Hz

M4 Performs continuous measurement at 4Hz

M8 Performs continuous measurement at 8Hz

M16 Performs continuous measurement at 16 Hz

M32 Performs continuous measurement at 32 Hz

(NB. M32 Only available if temperature is not fitted or disabled)

M Performs continuous measurements at previously used rate

Pn.nn Performs profile at a depth increment of n.nn, as set by the operator, in the current profiling units (see command #018).

e.g.: P0.25 takes a reading every 0.25 dBar, metres or feet as appropriate

4.3 RAPID PROFILE SETTINGS

#130;NN.N Start Depth (Logging on, Bluetooth off/on)

#132;NN.N Stop Step (Logging off when depth decreases by amount. Should signify bottom of profile.)

4.4 PRESSURE UNITS

#018;0 Pressure is output in dBar

#018;1 Pressure is output in metres, calculated using simplified UNESCO formula

#018;2 Pressure is output in feet, calculated using simplified UNESCO formula

4.5 PRESSURE TARE

#009; Takes a single reading of the pressure sensor and uses the measured value as a Tare (note the ';' in the command)

#009;nn Sets the Pressure Tare to 'nn', a user specified value (entered in the chosen units as set with command #018)

e.g: #009;10.3 sets Pressure Tare to 10.3 dBar metres or feet.

#010 Instrument responds with current Tare value

4.6 SITE INFORMATION

#037;info Each data file may contain up to 58 characters of information about the deployment. Each file will use the same information until it is updated.

#038 Instrument responds with current site information

#016;lat Sets the instrument deployment latitude in decimal degrees, for use in pressure / depth conversion algorithm

4.7 INSTRUMENT INFORMATION

#032 Instrument responds with its software version number

#034 Instrument responds with its serial number

#138 Instrument responds with date of last calibration

4.8 LOGGER CONTROL

\$DIR	Outputs file table (list of data files)
\$CLR	Clears memory (use with caution!)
\$OCLK	Reads Current Date & Time
\$ICLK;<i>DD;MM;CC;YY;HH;MM;SS</i>	Sets Date & Time e.g.: \$ICLK;03;02;20;08;14;30;00 sets clock to 14:30:00 on 3rd February 2008
\$DEL;<i>filename</i>	Deletes specific file e.g.: \$DEL;File1
\$EXTT;<i>filename</i>	Performs simple text output data contained in specific file
\$EXTZ;<i>filename</i>	Performs Zmodem extraction of data contained in specific file
\$RN;<i>filename;newfilename</i>	Renames a file e.g.: \$RN;File1;MyData
\$FREE	Outputs amount of free memory
\$VOLT	Reads internal and external voltage levels

5 DEPLOYMENT

The RapidSV has been designed to be deployed with the Oceanscience UnderWay winch system. Using this deployment allows the rapidSV to collect profiles to ~400m whilst underway at up to 10kts. However, the RapidSV can be deployed on any winch system or deployment system. See Oceanscience documentation for guidance on deployment of the instrument.

RapidSV probes that have been supplied with the Oceanscience winch will be fitted with an adaptor and tail spool for attachment to the winch system.

RapidSV probes that are supplied independent of the Oceanscience winch will be supplied with adaptor to fit a shackle for attachment to a line.

5.1 SWITCHING ON/OFF

The RapidSV is switched on/off with a magnetic switch in the top of the instrument. The instrument is supplied with two magnetic keys. When the key is inserted, the instrument will be switched off.

To switch the instrument on, the key should be removed. It will take ~15 seconds for the instrument to initialise.

If both keys are lost, it will be necessary to remove the battery from the instrument to turn the power off.

5.2 COMMUNICATIONS

The rapidSV is supplied with a customised USB Bluetooth dongle. This is configured to communicate only with rapidSV probes and establish an automatic and robust link whenever it can see the rapidSV that it is paired with (see section 3.11 for details of how to change pairing).

6 BATTERIES

6.1 BATTERY LIFE

The instrument draws power continuously whilst running. When out of the water, the Bluetooth radio will also be switched on and drawing power. Battery life is calculated as though the Bluetooth module is always powered on:

Alkaline cells have a nominal capacity of 6000mAh. We assume 77% efficiency, giving a usable life of 4620mAh. With a 1.5v alkaline C cell, the current drain is 250mA.

$4620\text{mAh} / 220\text{mA} = \underline{18 \text{ hours}}$

Note that all battery calculation figures are estimated, and may vary according to deployment temperature and the inherent battery variability. Valeport accepts no liability for the failure of a battery to last for the expected lifetime.

6.2 CHANGING BATTERIES

Changing batteries in the rapidSV is very simple process. Note that all data is saved in non-volatile Flash memory, so data is secure during the battery change process.

- Remove grub screw, and carefully unscrew rear housing.
- Dry any moisture from around the Bluetooth/logger assembly.
- The Bluetooth/logger assembly can be carefully removed; there will be some resistance from the O-ring and wiper.
- Check for any water ingress to the instrument in the removal process. Dry if necessary.
- Replace the single C cell in the instrument; note that the cell should be inserted with the positive end upwards. Although it is possible to insert the battery incorrectly, it will not make contact.
- Check the o-ring on the logger pack for damage and debris. Clean it and smear lightly with silicon grease. Replace if necessary.
- Replace the logger pack, rotating slowly until the location pins align. Push the logger pack home.

The system clock will be reset during a battery change or after an extended period of storage with no battery fitted. If using RapidSVlog, the time/date will be automatically reset but if using in manual mode then please use the # codes defined in Section 4.8 to reset the clock.

Note that for planned periods of extended storage, the battery should be removed from the instrument to prevent accidental leakage.