

**Robertson Geologging
WinLogger Software
Operating Manual**

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0.0 Revision History

This manual documents the WinLogger software version 266.

Manual Version	Date	Changes
11	20.11.00	Minor changes for enhancement and bug correction to version 266
10	20.11.00	Add warning on damage from printer installations
9	12.09.00	Documents software version 261 which is primarily bug clearance
8	23.12.99	Include Windows printer feature, software version 250.
7	10.12.99	Include HPFS sonde method, software version 245.
6	02.12.99	Updates to dialogues and methods for new software version 245, excluding HPFS sonde method.
2.5	02.08.99	Minor corrections (CAR 405) and format changes for harmonisation
2.4	24.03.99	New dialogues and graphics to document the revised user interface presented by moving sonde selection into the toolbar. New System Settings dialogue. Also other minor modifications and corrections. Software version 219
2.3	14.11.98	Modifications to sonde database, cable settings and user functions. Add CBL features.
2.2	09.09.98	Update to include Full-waveform sonic operation.
2.1	26.07.98	Covers modifications to user interface in bug clearance and enhancement.
2.0	09.12.97	Changes to dialogues for release version 172
1.0	30.09.97	Initial edition for evaluation users.

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1.0 Installation

The RG WinLogger Version 1.0 software runs under the Windows95 or Windows98 operating systems only. ***In this manual any reference to Windows95 is taken to mean either Windows95 or Windows98 because of the high level of functional compatibility.*** Do not attempt to install the software on WindowsNT, and it will not install on 16-bit Windows platforms. The minimum recommended computer system is a Pentium150 (or compatible) with 16Mb of RAM and an 800X600 display adaptor with at least 8bit colour depth. A separate laptop or desktop computer with a PCMCIA adaptor is necessary for the MicroLogger system interface. No other system resources are assumed.

The WinLogger software is designed to function compatibly upon either the MicroLogger or VideoLogger system. There are differences in the hardware used by these two systems, but there is no difference in the user interface or logging procedures.

The WinLogger software is delivered on 8 diskettes, or a CD-ROM. Use the **Start/Run** dialogue to start the SETUP.EXE application from Disk 1 of the delivered set. On CD-ROM, the SETUP.EXE application will appear in the 'Disk 1' directory, but no other redirection is necessary. Note that it is necessary to specify whether the target system is MicroLogger/VideoLogger1 (black case) or VideoLogger2 (blue case) during the installation process. A range of demonstration logs is installed and a complete set of resources (sonde import files and user functions) for the product range to date is available to avoid the necessity of contacting RG if additional sondes are to be installed in the database.

For MicroLogger Users:

Windows95 incorporates an effective Device Manager, which will ensure that the necessary drivers are loaded as soon as new hardware is introduced. Typically, the first time the MicroLogger Link Adaptor is inserted into the PCMCIA slot the user will be requested to insert a disk containing the appropriate driver. The driver diskette is also supplied with the software set. No configuration parameters are normally required, except to select card type, which is LA012.

Software and hardware is supplied pre-configured for VideoLogger systems.

1.1 Uninstalling the Software

To remove the WinLogger software, use the Add/Remove Software dialogue from the Control Panel. Note that any logs or components which have been added by hand or during system operation will not be removed by this process, and should be deleted manually, if required.

1.2 Hardware, Printers etc.

The minimum system configuration mentioned above is easily provided by desktop or portable models, and suitable systems may be supplied by RG.

The interface to the RG MicroLogger is provided by a PCMCIA adaptor. This is a highly-standardised interface, which ensures that the MicroLogger link can be attached to any suitably-equipped computer. Portable models will incorporate the PCMCIA adaptor socket as standard, for network, modem or other attachment. Desktop models may have an adaptor fitted as an option.

VideoLogger systems carry a pre-configured RG LogPort or VTIC controller on the system bus.

Hard copy to high-speed thermal printer is supported in real-time, and for replay. Two types of printer are supported, and the characteristics of both are very similar. For compatibility with PCL2 predecessor systems, the GULTON WELLOGGER is supported, but note that this printer is now discontinued by its original manufacturer. In addition, a replacement interface card is required, and this is incompatible with the PCL2 system. The alternative printer is the PRINTREX model 820, which comes with a Centronics parallel interface as standard, and uses a normal PC printer cable. The Printrex printer is integrated within the VideoLogger system. Drivers can be installed for these printers to appear as Windows devices, if required, although no driver is necessary for use with WinLogger software.

1.3 Printing to Windows Devices

As mentioned in the section above, the real-time and replay hard copy facilities of this software do NOT require the Printrex or Gulton printer to be installed as a Windows device. However, for use on the VideoLogger where alternative imaging applications are operated, it is necessary to have a Windows-compatible print device installed, and the Printrex will normally be set up in this way.

Replaying logs to Windows print devices is also possible, subject to certain limitations on image logs. Drivers for such printers must be installed as required.

Warning:

The use of external printers for Windows printing will involve the installation of driver software as determined by the printer manufacturers. RG can not warrant that the installation of any Windows printer or print-type device (e.g. PDF writer etc.) will not interfere with the operation of the WinLogger software.

In particular, the installation of the Hewlett Packard HP950 series printer causes irreversible changes to the operating system which prevent the normal Printrex setup from working correctly. There is currently no solution to this problem apart from re-installation of the entire operating system and applications to a clean-formatted hard disc drive.

2.0 Compatibility

The RG WinLogger Version 1.0 software creates logs in a slightly different format from its PCL2 predecessor systems. The .LOG files are entirely compatible, but the header data is recorded in a different fashion. For this reason there is a facility for exporting a log in PCL2 format - a V106 compatible header is synthesised from the native format, which is quick because no data processing takes place. The .HDR and .LOG files are thus accessible to processing packages which expect input from PCL2 logging systems. To export from WinLogger in PCL2 format, open the log for replay, then click **File / Export**. It is also possible to use the toolbar icon for this task.

Logs recorded on PCL2 systems are directly compatible with WinLogger software, and they may be replayed without any conversion process being applied by the user. A header of the appropriate type (.HED) will be created automatically when the log is opened.

3.0 Getting Started

Connect the equipment and power-up as shown in the appropriate hardware operating manual. Clicking the icon from the desktop will start the WinLogger application. Loading will take several seconds, because the link to the micrologger is first tested, and then used to download its operating software.

A MicroLogger should be connected and powered-on when the software is started, otherwise the user will be warned with a dialogue box. Corrective action may then be taken, and the connection retried. Otherwise the MicroLogger will be assumed to be inoperative, and reduced functions will be available. VideoLogger hardware will be available for use as soon as power is applied.

3.1 Opening Desktop Display

When the WinLogger software starts, the display has pull-down menu headings, a tool-bar, a status bar at the bottom of the screen, and a winch-control display. The display can be modified by using the **View** pull-down menu. Check against the items listed, as required. **Note that no dialogues concerned with the system, winch or sonde operation will be presented if the logging hardware is not present, powered up and properly initialised.**

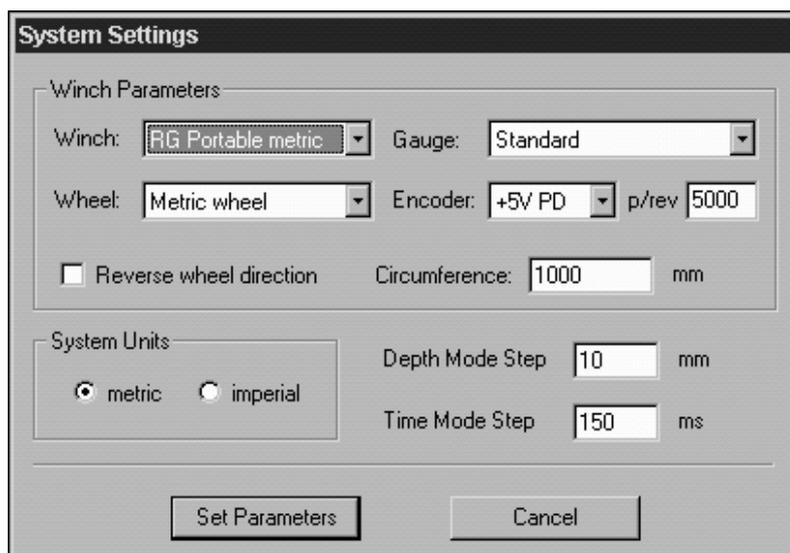
The opening display allows the user to control the winch, if it is a SmartWinch, and to monitor depth and speed. See the section entitled Winch Operation for full details.

3.2 Configuring System Parameters

Initially, the user will most likely be concerned with setting the operational characteristics of his logging system. The software allows the electrical and mechanical parameters to be set under programme control. The parameters will be memorised for subsequent logging jobs.

The WinLogger system will use either metric or imperial (English) depth units. For compatibility in operation, measurements such as the depth-measure wheel circumference are given in units of one-thousandth of the basic depth measure unit, i.e. millimetres (mm) or millifeet (mft).

Start the configuration dialogue by pulling down **Tools/Change System Settings**, and you will see the following display. It is essential that all the selections are made correctly to prevent erroneous operation of your system. Some options are redundant within the current product range, but exist for future compatibility.



- Select System Units:
Metric or imperial (english) units can be selected with the labelled 'radio buttons'. This will select the measure wheel type, and other parameters automatically. **Take care that the automatic options are correct before proceeding.**
- Select the Winch type:
Options are RG400, RG2000, RGPortable (metric), RGPortable (imperial). Note the different designation of depth wheel options for the (Smart) portable winches which use a common size of depth measure wheel, but must be configured differently.

- Select the Encoder type: The encoder type is crucial. RG 2000, 600 and 400 metre winches use a 5V PD, 1000/rev encoder. The Smart Portable winch uses a 5V PD, 5000/rev encoder. **Do not select a**

12V encoder for use with RG systems The PU and PD options refer to line termination with pull-up and pull-down resistance.

- Select the Circumference: Type the size of the depth measure wheel into the dialogue box. RG 2000 metre winches use a 1000 mm wheel, RG 600 and 400 metre winches use a 500 mm wheel. The RG Smart Portable winch has a 400mm wheel (imperial equivalent 1312mft). Default circumferences may be set automatically when metric/imperial option is exercised - but this can be overridden if the selection was wrong.
- Select the Depth Mode Step: Sample interval is 10 mm for metric logs, and 50 mft for imperial logs. For imperial BHTV logs the interval is reduced to 40 mft. This change is not made automatically.
- Select the Time Mode Step: Normally the time mode step will be 150 milliseconds for compatibility with PCL2 systems, but the user may modify this within reasonable limits. Note that RG sondes may malfunction if they are not interrogated within a 460 millisecond period.

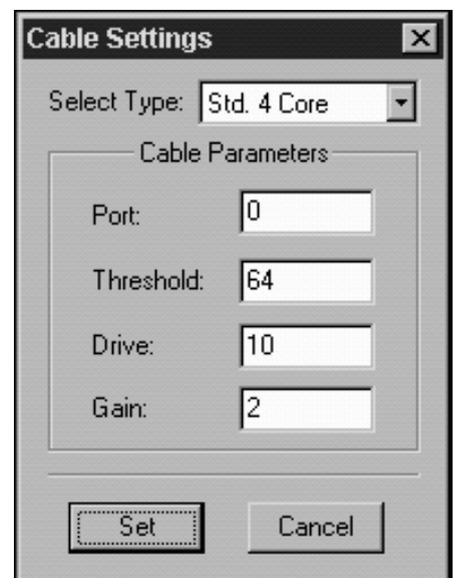
When you are satisfied with your selections, click **Set Parameters** to set up your selections, and close the dialogue.

The opening display allows the user to control the winch, if it is a SmartWinch, and to monitor depth and speed. See the section entitled Winch Operation for full details. Check your selections by moving the cable or measure wheel for a calibrated distance and observing the correct change on the system depth display. The next section explains the tool for checking the sonde communications.

3.3 Cable Settings Dialogue

Because the different winches may be spooled with various cable types or lengths, it is important to be able to modify the electrical parameters of the cable. Click on menu option **Tools/Cable Settings** to open the dialogue. This dialogue can also be reached from the **Tools/Test Sonde** dialogue, and a full explanation of the fields and values will be given there, since it covers the use of the diagnostic tools.

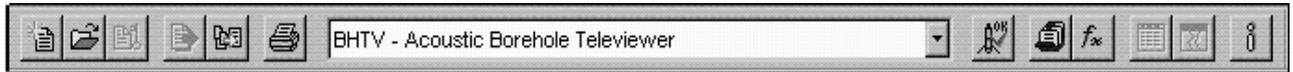
- Select the **Cable Type**: **This option is not available when sonde power is applied, in order to prevent damage to the logging system hardware by switching types with power applied.** There are several cable types which describe different physical and electrical setups. This is clearly the most important detail to establish. Only two types are normally of interest on RG systems, **Std 4 Core** and **Monocable**.
- **Port** should be left set to the system default of 0. This feature is reserved for system expansion.
- **Threshold** is used to configure the communications levels and the detection threshold for pulse-type analogue sondes. This parameter is clearly linked to the gain of the data receiver, see sections below.
- **Drive** controls the duration of the downhole communication pulses, and hence their amplitude at the remote end of the cable. Downhole communication is used to request data from sondes and/or change their operating mode.
- **Gain** controls the amplification applied to pulses received at the surface.
- Press **Set** to implement the changes and terminate the dialogue.



In order to visualise the effect of these parameters there is an additional dialogue called the **Test Cable IF**, which should be used if setting reasonable values does not result in satisfactory communication. See the following section for a complete description.

3.4 Sonde Selection Dialogue

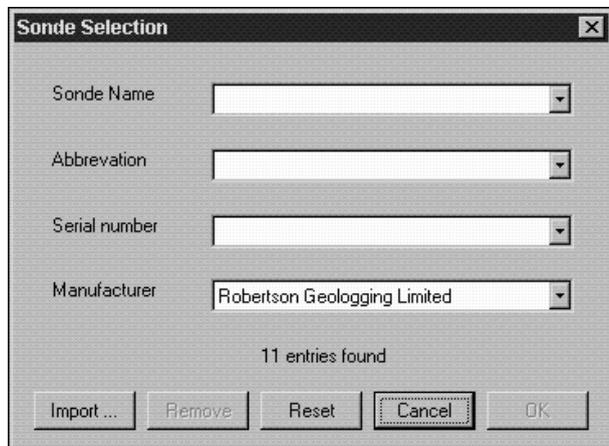
A new feature in build-versions of WinLogger from 213 onwards is the global sonde selection menu. The current sonde will always be displayed in a list box on the tool bar. Sondes can be selected in two ways - by scrolling through the entries in the list box on the tool bar, or by clicking **Tools/Select Sonde**.



The first method allows the user to select a sonde from its full name and mnemonic only, whereas the dialogue opened from the pull-down menu will allow selection by any of the key fields, including serial number.

The new global sonde selection method means that there are minor changes to other dialogues - but it is no longer necessary to select the sonde type when going to make a log for example. It also means that ALL the operating parameters are available to any part of the application (such as Sonde Test) and that any ambiguity regarding power supply or communication mode is resolved.

It is therefore important to change the global sonde selection before energising if the sonde attached to the logging cable is changed.



To use the menu drop-down method, click on **Tools/Select Sonde**. You will see the adjacent dialogue.

Selections may be made from any of the key fields by clicking on the drop-down list box arrow and clicking on the item required.

Note that selections in one box will affect the options available from other boxes. For example, if a sonde name is selected in the topmost box, only sondes of that type will be shown in the Serial number box.

Two other controls are present on the dialogue which are used for importing and removing sondes from the database. These controls will be described completely in the section on the Sonde Database, later in this manual.

3.5 The System Printer

It was stated earlier that two types of printer were acceptable for real-time use, the GULTON WELLOGGER and the PRINTREX 820. It is necessary to select which printer is attached. Please note the comments in section 1.2 regarding printer options. Pull down the **File/Real-Time Printer Setup** menu option.

The necessary parameters are Printer Type and Port details. Note that this device is driven directly by the WinLogger software, and is not available as a Windows print device unless installed as such separately (a Windows95 device driver for the PRINTREX 820 is available through RG).

- Printer type - check either Gulton or Printrex, as appropriate
- Printer Port - check the appropriate port
- Print Medium - check the appropriate medium that is loaded in the printer. Both printer types have the ability to make a darker image on heavyweight film media used for dyeline reproduction of log prints.
- BHTV bitmap processing - check the boxes for Floyd-Steinberg dithering of the image (a greyscale rendering algorithm), and/or Adaptive normalisation (to maximise contrast in the image). Additional options are available through the View menu pull-down - see later section.

The user may then test the printer connection by clicking the **Test Printer** control. A rectangular box with the legend Printer Test OK will be produced if the printer is properly powered and cabled to the computer system. VideoLoggers will normally use LPT2 for the internal Printrex printer.

Click **Apply** if the settings have been changed and you wish to proceed immediately to a printer test.



The log header is printed in API style on hard copy only. Header details may be examined when replaying logs through the **View/Show Log Header** menu item.

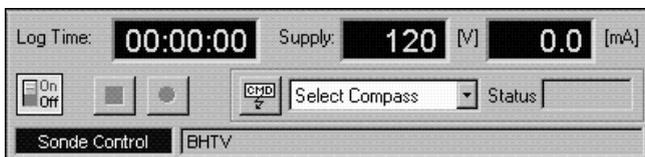
The log header is not printed automatically on every occasion as was the case previously, and there is no longer a method of selecting header components e.g. comments for inclusion or exclusion. At the end of every log or replay when printout is selected the user will be asked whether a log header is required.

The log header contains a space for the logging company logo, and this is available for modification as required. The artwork must be rendered as a monochrome Windows bitmap of dimensions 397 X 396 pixels and stored in the file LOGO.BMP. The default contents of this file is the RG logo.

Save the new settings and return to the main menu with **OK**, or click **Cancel** to exit without making any changes.

3.6 Sonde Control Window

So long as the logging system interface is properly initialised, you should find the Sonde Control Window displayed at the top of the screen. If it is not displayed, ensure that the **View/Sonde Control** menu item is checked. It is possible to move this window to another part of the screen, if required, but the default position is at the top, right hand side.



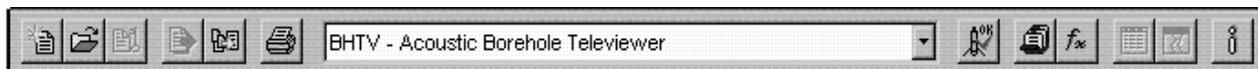
The window is described in full in a later section, but for now it is just the Sonde Power ON/OFF control which is of interest. Click the ON/OFF switch to apply power as demanded by the sonde which is currently selected in the tool bar window. Once sonde power is applied the power lamp of the MicroLogger will start flashing, and the display will read out the voltage and current at the winch connector.

Note that while power is on the sonde selection and the cable-type settings will be locked to prevent incorrect power being applied to the attached sonde.

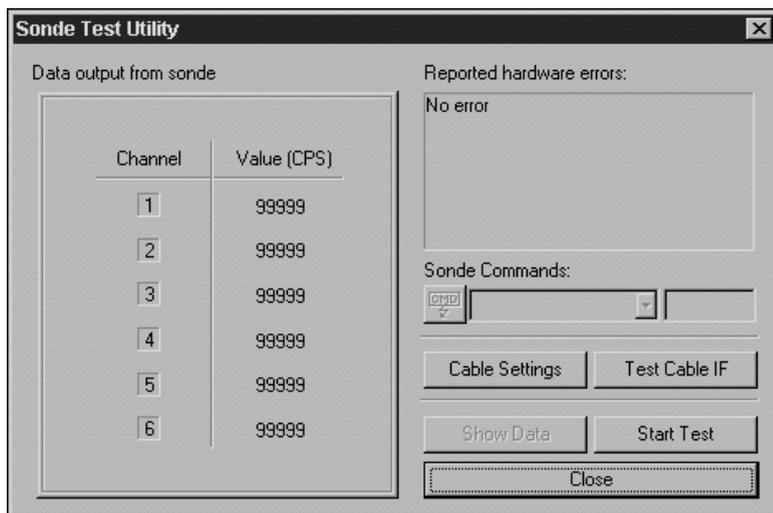
Click the ON/OFF switch again to de-energise the logging cable.

3.7 Sonde Test Dialogue

If the basic setup of the system as documented above is correct, proceed to test out the system by cabling a sonde through the winch and starting the following dialogue. Also, to test the connection and operation of any sonde, start by pulling down **Tools/Test Sonde**, or click the toolbar icon.



The Sonde Test Dialogue has a number of controls, which will be explained below. It is necessary to select the sonde type **before** starting the Sonde Test dialogue. This is to ensure that the correct communications and sonde power options are selected. **Note that it is possible to damage a sonde by applying excessive voltage if the correct type is not selected.** The default sonde type is always shown on the Tool Bar. Turn ON sonde power.



- Click **Start Test**. If power is not yet applied to the sonde, a warning message will be displayed. Power can be switched ON and OFF through the Sonde Control window while this dialogue is active.

When communication is established, the box marked **Reported Hardware Errors** will display progress messages. Normally, the messages will be **MCS:No error** and **DSP:No error**. If the sonde is not communicating properly, then the message will change to **DSP:Receiving bad data**.

- Sonde data will be displayed automatically for Borehole Televiwer and Full-Waveform Sonic selections. To see the data from other sonde types, click on **Show Data**. The left-hand data display area will be updated on a regular timebase, showing just the raw count data, or a scrolling display for the Televiwer and Full-Waveform sondes. For the latter modes, the small display and reduced colour-palette make interpreting the data difficult, and the facility should only be used for checking communication, not as an objective test of sonde function.
- To command the sonde, select the required command from the **Sonde Commands** scroll box in the Sonde Control window and click the **CMD** control at the side. The command will be then be sent to the sonde. Note that certain commands may result in a temporary cessation of communication, and the **Reported Hardware Errors** box will then display a bad data message. Certain commands will need a qualifier, such as televiwer gain and blanking.
- The **Start Test** control is renamed to **Stop Test** as soon as the logger is commanded into its operating mode. Clicking on **Stop Test** will return the micrologger to a quiescent state, but the dialogue will not be closed.

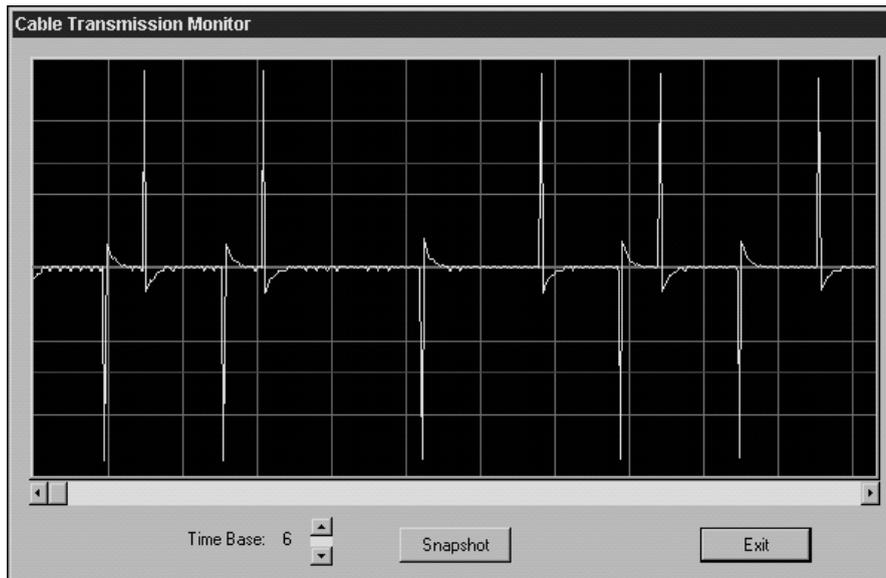
Two more controls are available in this dialogue, **Cable Settings** and **Test Cable IF**. These are provided here because they are so closely associated with the Sonde Test facility, which also provides all the operating environment for their objective use. The **Cable Settings** dialogue has already been covered, **Test Cable IF** is in the next section.

To finish the sonde test mode, click on **Close**. Sonde power must be turned off separately through the Sonde Control window.

3.8 Test Cable Interface

Setting up the communications parameters on a wireline logging system has traditionally been a job for screwdriver and oscilloscope. This is no longer applicable for a system whose downhole communications are handled by a digital signal processor and programmable amplifiers. The necessary tools are therefore provided as part of the software's user interface. Clicking on the **Test Cable IF** control of the **Sonde Test** dialogue triggers a virtual oscilloscope which shows the data on the communications interface.

Since the communication and power parameters of the sonde under test have already been established, the MicroLogger can be instructed to apply the correct supply voltage to the logging cable, and data communication will proceed in time mode. The downhole data is never seen on the screen but its success can be inferred from the presence of uphole data. The following picture illustrates the screen under typical conditions.



There are three controls:

- **Exit** will close the dialogue and remove sonde power.
- **Snapshot** will freeze the display. Pressing the control again will resume continuous monitoring.
- **Timebase** is used to expand the horizontal axis. If the timebase is kept at 1, the waveform displayed will show sinusoidal changes of amplitude resulting from undersampling of the waveform. The maximum expansion is 10.

The waveform is symmetrical about the central horizontal line. Moving the cursor up and down across the display window will show a value for the current amplitude in the upper border. Values range between +/- 128 across the whole vertical range. Red lines showing the position of the current threshold will be displayed in the upper and lower half of the display. They are always symmetrically disposed. The uphole communication waveform appears as a yellow trace, which must exceed the levels indicated by the red lines for successful operation. If it is necessary to change the cable settings to establish communication, return to the **Cable Settings** dialogue, see above. It is an iterative process.

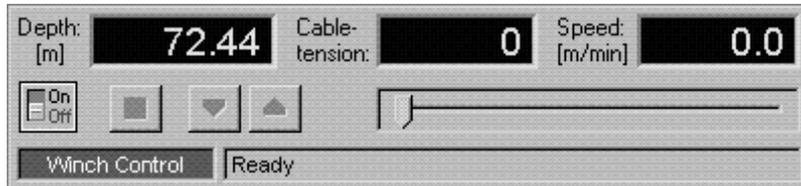
What the user should try to achieve is a waveform whose amplitude occupies about 80% of the range available - change the **Gain** to do this. The range is 0-31 for MicroLogger, and 0-3 for VideoLogger systems.

Once the amplitude of the uphole data has been set at this level, use the cursor to indicate the level at which the **Threshold** should be set. This should be at about 50% of the peak height. The range is 0-127

If no signal can be seen, it may be because the downhole signals are not reaching the sonde. Try increasing the **Drive**. The range is 0-127. If no signal can be seen with the drive near maximum, then another fault exists or the cable is set to the wrong type.

4.0 Winch Control Window

Unless it is disabled through the **View/Winch Control** pull-down menu, the Winch Control Window will be on display at all times when the micrologger is cabled and operating. The data display is self-explanatory, with actual depth in appropriate units, cable speed and cable tension (when the cable tension hardware is installed). When the speed control pointer is being dragged, the TARGET speed will be shown in blue numerals. At all other times, the ACTUAL speed will be shown in yellow numerals.



Beneath the readout boxes are the controls. These are designed for the control of the Smart winch range, and have no function when the Micrologger is attached to a conventional winch of RG, or other manufacture.

Initially, the winch controls will be grey and inactive. To enable the Smart winch, press on the **ON/OFF** control. The remaining function buttons will then be made active. From the left they are:

- Stop Click to stop and apply brake. There is no need to slow down first!
- Set Direction Downhole Click to select downhole cable travel.
- Set Direction Uphole Click to select uphole cable travel.
- Set Target Speed Click to left or right of pointer, or drag it to change cable speed.

The Smart winches have microcontrollers to co-ordinate winch operations in a safe and controlled manner, so it is no longer necessary to take account of the speed controller's settings when changing direction, for example.

To move downhole from rest:

- Set depth display with **Tools/Initialise Depth System**
- Click **ON/OFF** to enable the controls
- Drag pointer to the desired speed - target speed will be shown in blue (maximum 25m/minute)
- Click downhole direction selector - winch speed will increase until the target is reached
- Adjust winch speed by moving the pointer if required
- Click Stop at the required depth - winch will slow automatically and apply brake. Target speed pointer will be reset to zero automatically.

To move uphole from the previous borehole position:

- Drag pointer to the desired speed - target speed will be shown in blue
- Click uphole direction selector - winch speed will increase until the target is reached
- Adjust winch speed by moving the pointer if required
- Click Stop at the required depth - winch will slow automatically and apply brake
- Click **ON/OFF** to disable the controls.

At the bottom of the window, is the window name and status message display area. Messages indicating bad winch communications etc. will be displayed here. Error and warning messages will be displayed on a red background. In particular, when any winch is commanded to move in a direction contrary to that expected by the prevailing log mode, the message 'Bad winch direction' will be displayed.

5.0 Sonde Control Window

The sonde control window is normally displayed at all times unless it is disabled through the **View/Sonde Control** menu item.

Three data windows are presented - elapsed log time, power supply voltage and supply current. The supply current reading is useful for diagnostic purposes, and for monitoring operations such as caliper opening or closing.



In the centre of the window there are the active controls. From the left they are:

- Power ON/OFF. Until power is switched ON, the remaining controls will be grey and inactive.
- Stop Logging, blue square
- Start Logging, red circle
- Sonde Command selector and control
- Sonde Status window.

At the bottom of the window, is the window name and message display area. In the example above, the name of the sonde is displayed. Messages indicating bad communications etc. will be displayed here. Error and warning messages will be displayed on a red background.

To command the sonde, select the required command from the scroll box and click the CMD control at the side. The command will then be sent to the sonde. Note that some commands may result in a temporary cessation of communication, and this will be reported in the message display area as bad communication.

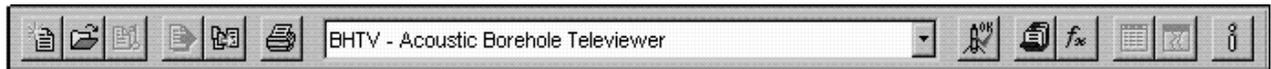
Certain commands require a qualifier, such as televiewer gain and blanking. The Status area will show the current setting, and the operator must change the value in the Status window to that required before clicking the CMD control.

Note: The RG caliper sonde, and other sondes which incorporate caliper mechanisms do not give a direct indication of caliper open/closed status. In addition, they will cease to communicate for the whole duration of motor operation. It is therefore difficult to know whether the arms are open or closed - and the status message is not necessarily an accurate indication. The actual state of the caliper arms should be established from the sequence of operations and observation of count values. Sonde operation manuals will give detailed guidance on this point.

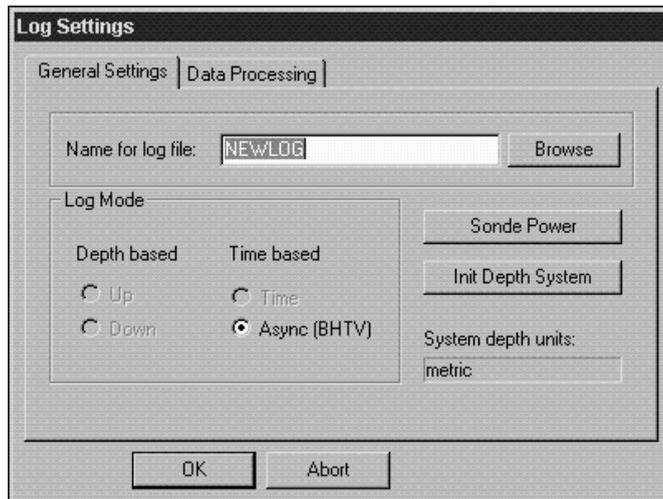
In the latest versions of WinLogger software, the sonde power can be turned ON from the Sonde Control window at any time when it is active. The power will then be maintained through a series of logs, whereas in the previous versions the power would automatically be turned OFF at the end of a log run. This feature is of value when making test, main and repeat sections of log with the Acoustic Televiewer or Full-Waveform Sonic sondes, which will retain their gain settings, and essential with Gyro sonde which must be powered at all times until the end of the logging session.

When the power is ON, the sonde selection dialogues will be locked to prevent incorrect voltages being applied to the attached sonde.

6.0 Making Logs



Logging is initiated through the **File/New Log** menu pull-down, or by clicking the **New Log** icon on the tool bar. The Log Settings window will be displayed. The sonde should be selected from the drop-down list box on the tool bar **before** entering the **New Log** dialogue. The sonde selected will remain current until it is changed by selecting a new one from the drop-down list.



The Log Settings profile-sheet has two tabs:

General Settings Tab:

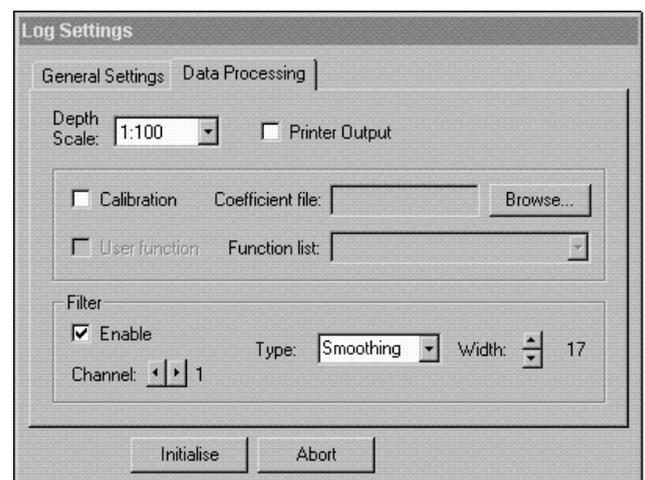
- **Log File Name** - The system will select a new name for the log automatically, which is unique. If the user chooses another name, then the system will issue a warning if it is not unique. There is also a **Browse** facility. The default location for log data is in the directory \winlogger\data.
- **Log Mode** - The target log mode must be set now, the normal options are UP / DOWN / TIME. There is another option for Borehole Televiewer sondes only, Asynchronous Mode - where data is gathered continuously regardless

of cable direction. It is not possible to select this mode manually, as it is an automatic property of the Borehole Televiewer sonde and is not applicable to other sondes.

There are also controls marked Sonde Power for turning on sonde power (as defined for the sonde already selected) and Init Depth System for initialising depth before starting to log.

Data Processing Tab:

- **Depth scale** - Select from the set of scales presented in the scrolling list box. The scale selected will have an effect on the screen presentation as well as the hard copy (if selected).
- **Printer Output** - Check this box for hard copy in real-time.
- **Calibration** - check this box and use the **Browse** facility to select a calibration file. The format for calibration file names is to use the four-digit sonde mnemonic and serial number fields to synthesise a full file name. E.g. 3ACS1234. Note that the check box for Calibration and Filter will be unavailable for Televiewer logs as these options may not be applied.
- **User Function** - check this box and use the **Function List** facility to select the required algorithm. Usually there will be only one User Function for a particular sonde.



- **Data Filters** - If filtering is enabled, check the box if required, then the width can be modified by selecting the appropriate channel of sonde output and modifying the value through the spin box marked Width.

Note that the sonde which is selected may make some options inappropriate. In that case, the dialogue involved will be grey, and inaccessible, e.g. filtering or calibration for a Televiewer sonde.

Calibration is used only to apply a polynomial transformation to the raw data. An example might be gamma ray normalisation to API units or caliper response to inches. Any other transformation requires a User Function. See the later chapter on the subject of implementing a User Function algorithm. Note that the input to a User Function will usually be a calibrated log channel. The form of the transformation is as follows:

$$y = a + bx + cx^2 + dx^3$$

where:

y is the calibrated output,

x is the raw log response

a, b, c, d are the coefficients taken from the calibration file.

The calibration file is a simple ASCII text file which has the following types of entry:

```
[General]
LastModified=27/08/97
Sonde=3ACS
SerialNo=1234

[Channel1]
LastCalibration=08/28/97
NextCalibration=08/28/97
CalibrationInterval=0 days
CalibrationMethod=Polynom
Coefficient0=0.0
Coefficient1=1.0
Coefficient2=0.0
Coefficient3=0.0
```

The section [General] is used to record the last update, sonde type and serial number. None of these fields are actually used by the software in its present version, and it is not necessary for the fields to describe the sonde to which it is applied. The fields are written when calibration is performed by the system for the first time, and will be correct if written in this way.

There will be as many sections [Channelx] as there are outputs defined for the sonde, normally it will be six. Each comprises a pair of date fields and expiry criteria, enabling software to detect the expiry of calibration validity for sondes whose response ages quickly. There is also a field for calibration method, so that a method other than the polynomial described above can be implemented. These features are not implemented in the current version.

The fields [Coefficient0] to [Coefficient3] are the coefficients of the polynomial expression given above, coefficient0 = a, coefficient1 = b and so on. Note that the polynomial method can automatically cope with linear, quadratic and cubic expressions simply by setting the coefficients of the higher powers to zero.

The coefficient file can be browsed (and even modified) from the **Tools|Edit Calibration File** menu item. This powerful and flexible calibration method is thus very approachable for the system specialist. The same set of coefficient data is stored in the HED file for use when replaying data, and it is not necessary to copy calibration files to other desktops when used only for replaying logs.

Click **Initialise** when all the pre-log options are set correctly. They are not accessible when logging.

6.1 Logging Screen

The main logging screen will be displayed once **Initialise** has been pressed.

Short-cuts to commonly-required functions:

- To change the scale limits: Double-click on the **numbers** in the track header. A dialogue box will open for the new value to be typed in.
- To change the colour of the curve: Double-click the **colour tab** at the left-top of the track header. A colour-selection dialogue box will open.

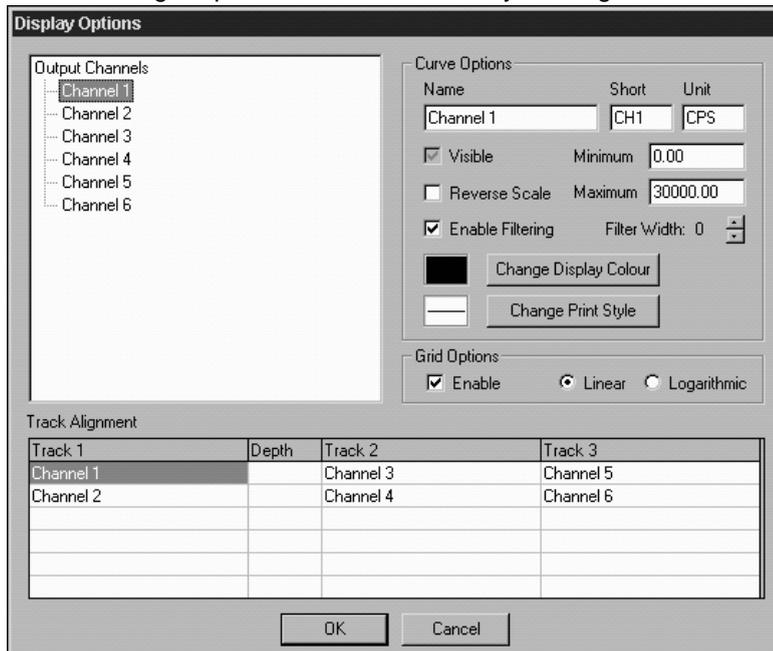
The full Display Options dialogue, illustrated below is reached by pulling down the menu-selection **View/Display Options**. Note that it is only active when a log file is open, or replaying. There is also an icon on the Tool Bar, if it is enabled.



Or, the dialogue can be reached by double-clicking the curve name at the top of the track header. The Display Options dialogue allows the user to set grid options, curve-positioning, colours, line-styles, scales and filtering.

Note that settings made through the Display Options dialogue in this context will not be retained by the system for subsequent logs. To make permanent changes to the display, use the facilities of the Sonde Database manager, documented in a later

Select the log output channel of interest by clicking its name in the left hand display box. By default, the first log channel will be highlighted on entry.



The name of the curve and its unit of measurement can be modified by overtyping in the Name and Unit boxes, as can the right- and left-hand display-scale values. Note that the scale can be reversed left-to-right by checking the **Reverse Scale** button. *It is not possible to obtain this presentation by typing into the boxes as the values will be rejected.*

Click **Change Display Colour** and **Change Print Style** for access to the necessary dialogue.

Grid-style can be modified, or disabled by checking the appropriate Track Options boxes. If a logarithmic presentation is required, select the name of one of the curves in the required track, then click the

Logarithmic 'radio-button' in the track options area. The Minimum and Maximum scale values will be changed automatically to a fit the decade-based display grid which will be placed in the track. The number of decades displayed is chosen automatically depending upon the scales in force at the time, and may be changed by increasing or decreasing the upper and lower scale limits. *Please note that it is not possible to select limits such as 2-2000 for display.* Such entries will be disallowed. When the number of decades is changed, all curves playing in the track will automatically have their limits changed to suit the new display.

To disable a curve, or move it between tracks, use the **Track Alignment** facility, which works like a spreadsheet. The highlighted output channel can be removed from the display by clicking the cell in which it appears. It can be inserted by clicking a cell in a new track. A curve may be extended across tracks 2 and 3 by inserting it next to an existing instance of that curve in track 2 or 3. However, a curve may only appear once in a display.

Clicking OK will close the dialogue and update the log display window.

To start logging, turn on sonde power through the Sonde Control Window (section 4.0) and click the Start Logging (Record) button. If the log mode is TIME or ASYNC, then log data will start to scroll immediately. If the log mode is Up or Down, then movement of the winch should be initiated through the Winch Control Window, or manually if it is not a SmartWinch.

Modify the curve scales as necessary to get the required display as the log is made. The settings current at the end of the log will be retained for future replay. If scales are changed in the middle of a log, then the screen will be redrawn according to the new values, and hard copy will have a new scale bar printed for each curve affected by the change. To assist in setting the scales to the required limits, a window can be opened to display the instantaneous data readings from the sonde in both calibrated and raw log units. Click on the toolbar icon indicated below, or use **View/Channel Display** to open the window. It is not good practice to leave this window open for longer than absolutely necessary as it will slow the logging application and may lead to data buffer overflow and data loss. The Channel Display is only relevant to standard 'Six-Channel' type sondes, and can not be selected for other log types.



Data channel:	Raw Value:	Calibrated Value:
1- SHN	0 CPS	0 Ohm M.
2- LON	0 CPS	0 Ohm M.
3- NGAM	0 CPS	0 API Cs.
4- NULL	0 CPS	0
5- SP	0 CPS	0 Millivolt
6- SPR	0 CPS	0 Ohm

The window that opens will display the names of the data channels, the raw log response and the calibrated response when appropriate. **This window should not be used for monitoring the data continuously**, only for a quick look at the data for diagnostic purposes or if there is doubt about the scale values required. The data values are all zero in this example because the sonde was not active at the time of the screen snap-shot.

There is no interaction with this window, and it should be closed as soon as possible by clicking the close control at the top right corner.

At the end of the required section, click the Stop Logging control. and close the log by pulling down **File/Close** or using the close icon from the toolbar.



If the log is complete, turn off the sonde power from the Sonde Control and remove the sonde from the logging cable.

6.2 Logging Screen Global Options

The main logging screen will differ depending upon the sonde type which is in use, e.g. six-channel, acoustic televiewer or full-waveform sonic. A number of settings are possible which relate to particular display options for the sonde type, other options being greyed out as they are not relevant.

Wraparound, when a curve goes beyond the limits specified in the scale limits specified in the display options, can be enabled and disabled globally through the **View/Wrap Curves** menu item. This option is only relevant to six-channel logs although the menu entry is available at all times.

Image Normalisation for acoustic televiewer is only accessible when a log of the correct type is open, either for logging or replay. There are three menu items which relate to this topic:

- **Invert BHTV colours**
The default presentation is for dark colours in the palette to represent low amplitude and short transit time. This behaviour can be reversed if require by selecting this option.
- **Normalise BHTV Amplitude**
Frequently, an image log is dominated by areas with very similar brightness, so that details are obscure and difficult to interpret. Under such circumstances, normalisation can be applied so that the dynamic range of the image is artificially increased to the maximum possible. This method is also referred to a 'contrast stretch', as it ensures that the lightest and darkest parts of the image are represented by the lightest and darkest colours available on the display, whatever the actual colour of the original image. Please note that rapid changes in the image content, such as missing data or pronounced features, may introduce horizontal banding artifacts as the normalisation algorithm adjusts to the new image content. The power of the processing algorithm is limited by the requirement to operate in real time as the image is acquired.
- **Normalise BHTV Transit Time**
Exactly the same method can be used to enhance the transit time log. However, Frequently, an image log is dominated by areas with very similar brightness, so that details are obscure and difficult to interpret. Under such circumstances, normalisation can be applied so that the dynamic range of the image is artificially increased to the maximum possible. This method is also referred to a 'contrast stretch', as it ensures that the lightest and darkest parts of the image are represented by the lightest and darkest colours available on the display, whatever the actual colour of the original image. Please note that rapid changes in the image content, such as missing data or pronounced features, may introduce horizontal banding artifacts as the normalisation algorithm adjusts to the new image content. The power of the processing algorithm is limited by the requirement to operate in real time as the image is acquired.

6.3 Specialised Logging Modes

As discussed above, certain sondes give rise to modifications of the normal six-channel presentation. None of these change the basic requirement for at least two tracks with an associated depth scale.

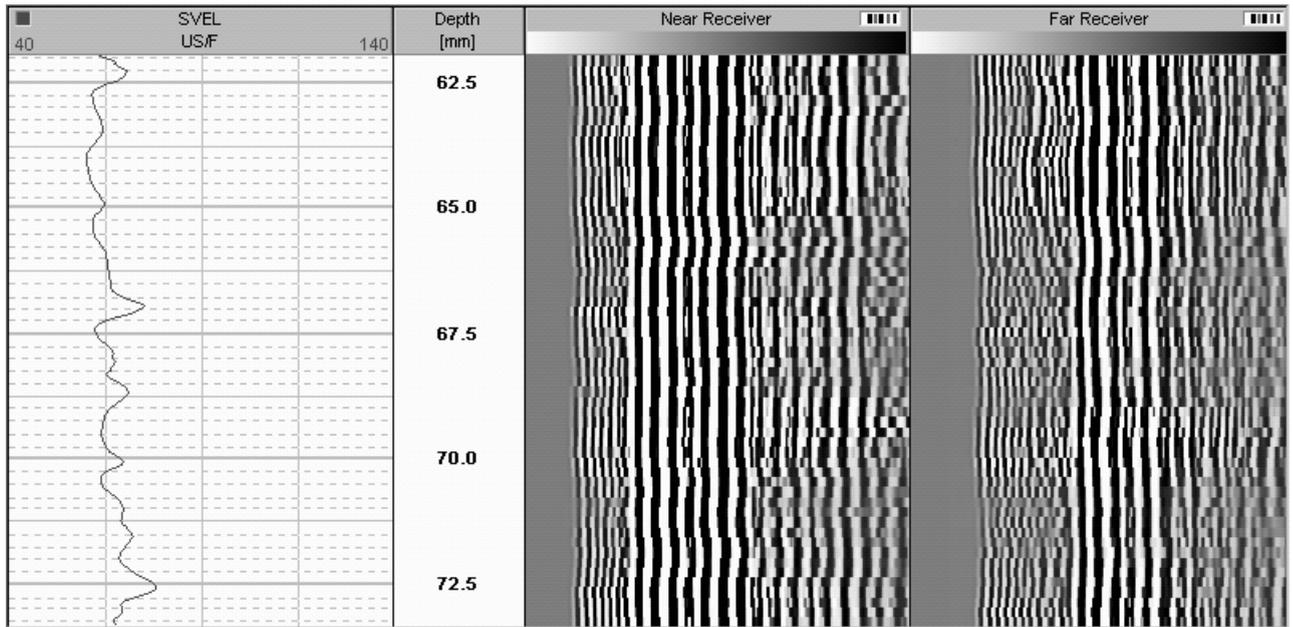
For sondes such as the Heat-Pulse Flowmeter or Gyroscopic Verticality, such a presentation may be inappropriate. The main logging interface will therefore change to include new presentations for such sondes, and this section will be expanded to cover those changes.

6.3.1 Full-Waveform Sonic

For complete hardware information regarding the Full-Waveform Sonic sonde (FWVS), please read the appropriate sonde manual.

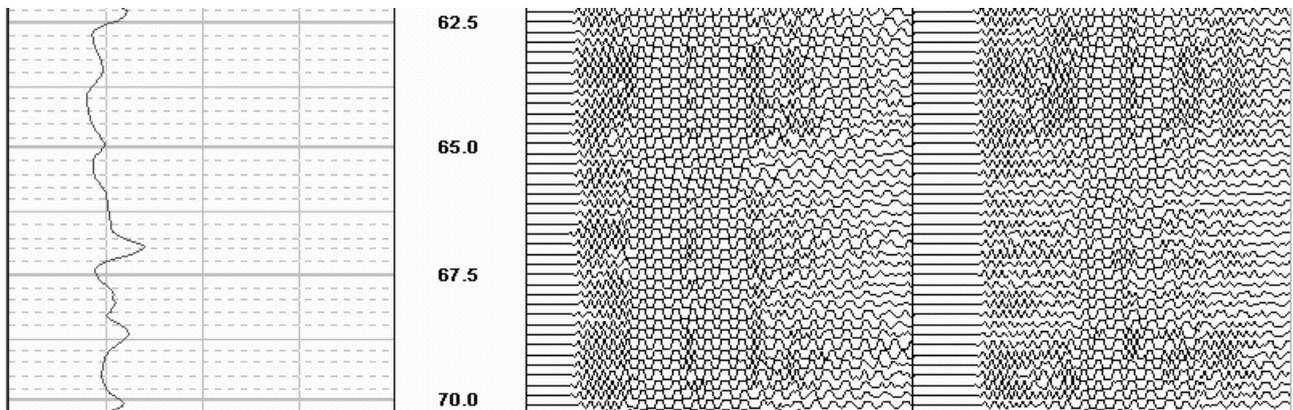
For logging the FWVS there are a few additional points beyond those discussed above for six-channel sondes. Selection of the special logging mode is done automatically through the sonde selection. Initially the only difference to be noted is that it is not possible to select downhole logging direction. This is because the sonde does not move easily when the centralisers are attached, and progress down the borehole can be somewhat erratic.

The display of full-waveform data display is not as flexible as the normal six-channel data, and the Near and Far receiver waveforms can not be moved from track to track. An example of the presentation is given below.



If the display options dialogue is opened, the parameters for the waveform data will not be modified, even if the values are changed on the screen. Although the vertical scale may be varied, the 20cm (1ft) sample interval of the data will make a very coarse, blocky presentation at scales greater than 1:200.

The screen display may be toggled between waveform trace and VDL presentations if required by double-clicking on the small control at the top right of the track. Here is a sample of the same data replayed as a 'wiggly' trace.



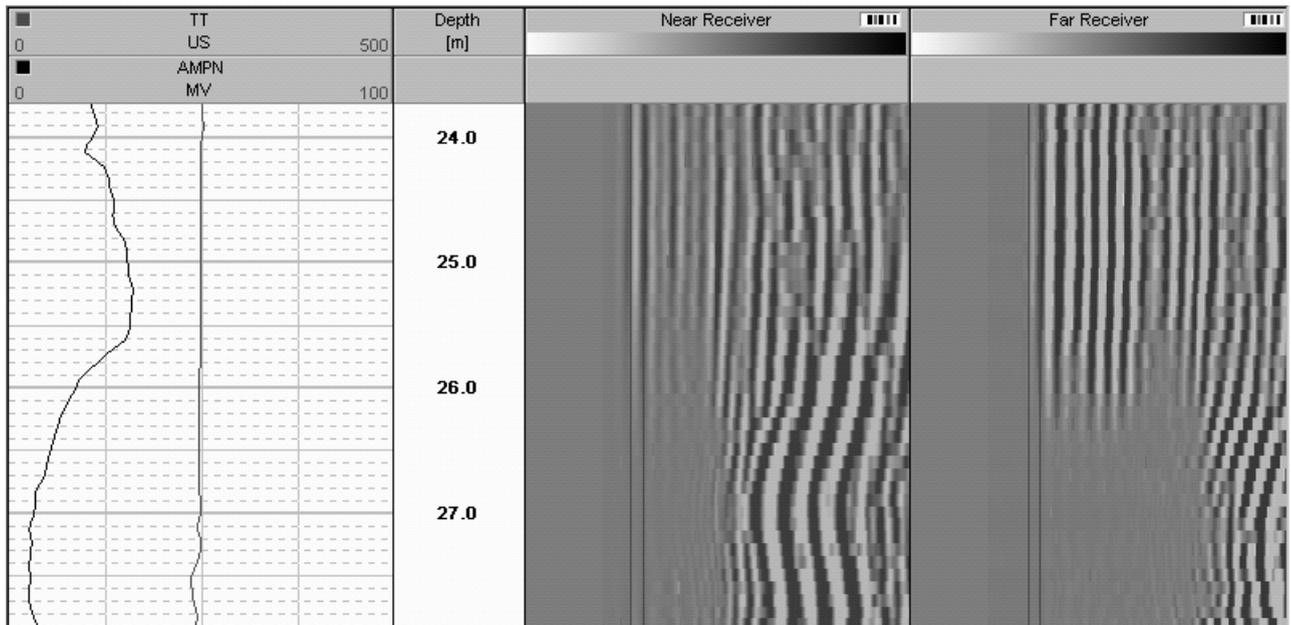
Any of the transit time channels from the sonde may be displayed in track 1, though it is customary only to show the compressional wave velocity (slowness) channel. No other display is possible in tracks 2 and 3.

Remember that the logging speed must be kept below 4 metres/minute (12feet/minute) for both FWVS and CBL logging.

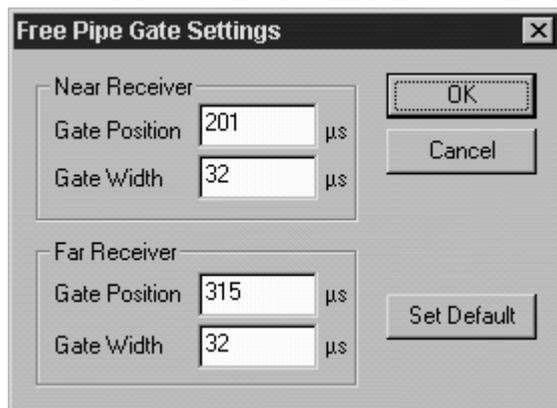
6.3.2 Full-Waveform Sonic - CBL

The CBL mode of the full-waveform sonic sonde is enabled by importing a new sonde to the database (FWSC), then logging with the different sonde description. There is no barrier to logging cased boreholes with the full-waveform sonde, but there will be no facility for sampling the incoming waveform to extract the first arrival amplitude (attenuation) values, and this information can not be extracted at replay time.

The CBL mode of operation of the sonde therefore serves mainly to enable the processing of the waveform information within the arrival gate. The amplitude and apparent travel time of the wavelet in the arrival gate for both near and far receivers is extracted and written to the separate log file by the surface software. The waveform data for both receivers is also recorded, as with the full-waveform sonic log, but the format is somewhat different as the acquisition period is only 1 mSec compared with the 2 mSec of the FWVS. This in turn means that the waveform data can be sampled at 10cm (0.5 foot) intervals.

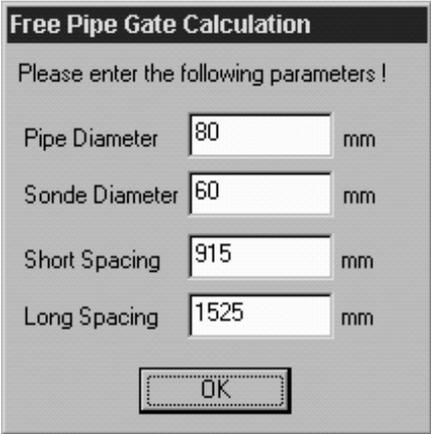


The figure above shows the typical CBL presentation, including the position of the arrival gate. During logging the gate position can be altered by dragging with the mouse. The position of the gate should, however, only be changed if there is a change in casing diameter or fluid properties, since there is a theoretical position for the gate which can be determined by logging a length of 'free' casing, i.e. fluid-filled and NOT cemented. It will not necessarily be the case that an arrival will be shown in the gate, since good cementing may result in almost total attenuation. Under such circumstances, the low amplitude is exactly what should be logged!



Where 'free' pipe is not available, there is a utility which can be used to set the gate position based upon the geometry of the sonde and casing, and the ideal fluid velocity.

Start the utility with **Tools/Sonic FPG Settings** (only available in CBL logging/replay context) and the current gate settings can be seen, or else the calculation dialogue will open automatically. If you wish to recompute the settings, click on **Set Default** and the calculation dialogue will open. Simply set the values for the named parameters and click on OK.



The image shows a software dialog box titled "Free Pipe Gate Calculation". It contains a prompt "Please enter the following parameters !" followed by four input fields, each with a label and a unit "mm". The fields are: "Pipe Diameter" with value "80", "Sonde Diameter" with value "60", "Short Spacing" with value "915", and "Long Spacing" with value "1525". At the bottom of the dialog is an "OK" button.

Parameter	Value	Unit
Pipe Diameter	80	mm
Sonde Diameter	60	mm
Short Spacing	915	mm
Long Spacing	1525	mm

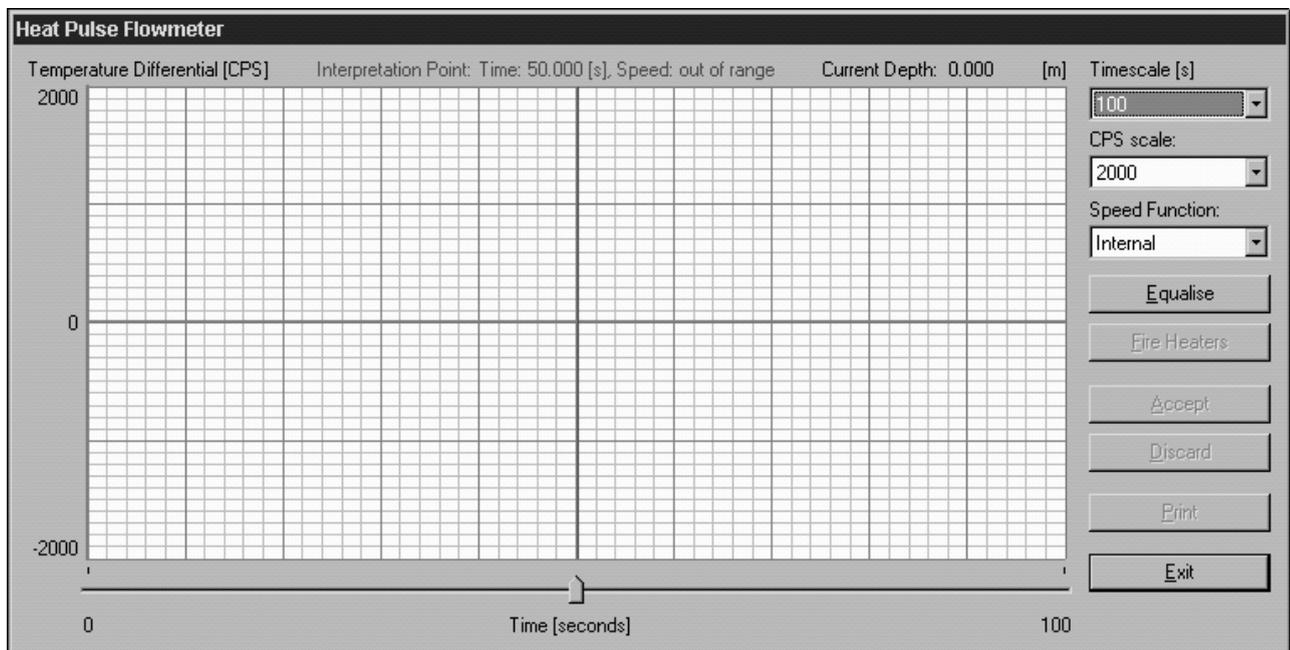
6.3.3 Heat-Pulse Flowmeter

For complete hardware information regarding the Heat-Pulse Flowmeter Sonde please read the appropriate sonde manual.

The Heat-Pulse Flowmeter is unusual in that it is never logged in depth mode. It is used to measure the time interval which elapses as the heated water is carried past the sensors, and thus is always logged in time mode. Traditionally, the one-minute interval marks on the paper were used to determine the time scale, but the method is inaccurate. A special logging mode which allows direct determination of elapsed time, and hence fluid velocity, is used for this sonde.

N.B. This logging method is only available in a development version which does not create a full log file as expected for normal time-mode logs. The output file contains the interpreted results in ASCII text only, and is suitable for input to Viewlog or spreadsheet software for display. **There is no replay facility within the WinLogger software.**

The special logging method is started automatically when the Heat-Pulse Flowmeter is selected and the user clicks on **File|New Log** or the toolbar icon. The following display will be seen:



In the new logging window the horizontal scale is time on a scale which can be selected from 10 seconds to 100 seconds in steps of 10 seconds through the **Timescale** list box. The vertical scale is of cps with differential applied. The vertical scale can be set through the **Diff Scale** list box. When logging starts, the first readings from the sonde will be used to set the centre value of the vertical scale automatically. Thereafter, the data will be presented as a positive or negative deviation from that 'null' value. Ideally, the data displayed will be a more or less flat line along the centre with a sudden deflection upwards or downwards when the heat-pulse reaches either detector, which will then decay slowly. The size of the 'kick' will depend upon environmental conditions such as the flow regime and water temperature, which is why a vertical scale may be chosen to suit a particular log session.

For ease of use, single button-clicks will send the necessary commands to the sonde to trigger a heat pulse. The display characteristics will change depending upon the exact context.

Clicking **Equalise** will send the command to the sonde to remove the null offset between the two thermistor circuits. The data received from the sonde will then be displayed on the screen in real time so that the user can determine whether borehole conditions are stable. If the borehole fluid is turbulent with fluctuating water

temperatures, then the log will not be intelligible. Conversely, if the fluid is stable, then a flat response will be received. When the user is satisfied that stable, reliable readings are possible, move on to the next stage.

Clicking **Fire Heater** will first send an equalise command, followed immediately by the fire command. The data that will be displayed should show a 'kick' after a time depending upon the flow regime. As the heat pulse passes the thermistor, the log trace will return towards the centre line. When it is determined that the heat-pulse has been observed, draw the pointer along the time scale to the mid-point of the initial log trace deflection, which corresponds with the arrival of the heat-pulse at the detector. Then click **Accept**, which will cause the time to be converted to a flow speed according to the selected algorithm and written to the output file. If the log trace cannot be interpreted, click on **Discard** and repeat the operation as required. To print out the current log trace click on **Print**. This is the only permanent record available of the logging session apart from the summary TXT output file.

6.3.4 Acoustic Televiewer

For complete hardware information regarding the Acoustic Televiewer Sonde please read the appropriate sonde manual. Because the sonde manual is very descriptive of logging procedures, only very brief details will be given here.

The Acoustic Televiewer (BHTV) will be installed in the default sonde database. Note that the supply voltage to this instrument is 120V at the surface in order to accommodate a larger drop due to the high current demand. DO NOT energise other standard sondes at this voltage by failing to select the correct sonde type before turning on sonde power.

In common with the sonic modes described above, the BHTV has a specialised display format which cannot be modified. Nor is it possible to display any conventional log traces in any of the tracks of that display.

Note also that the sonde is logged in a special 'asynchronous' mode, which also cannot be altered.

Procedures for logging and replay are, otherwise, quite standard.

7.0 Replaying Logs

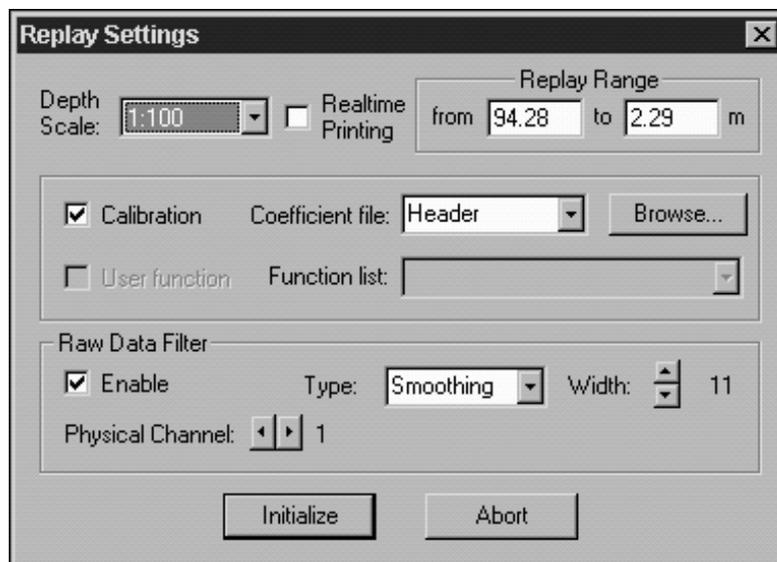
Select the log file through the **File/Replay Log** pull-down, or use the toolbar as shown below.



A file browse window will open, through which you can select the file of interest. At the bottom of the dialogue box is a selection box in which you must specify the type of file which you wish to replay. The default selection is Standard Log Files. The available options are:

- LOG Standard 6-channel RG logs
- BTV Borehole Acoustic Televiewer
- FWS Full-Waveform Sonic
- CBL Cement-bond Log

When the required log has been selected, the Replay Settings dialogue will open. This dialogue shows many of the parameters relating to the log that were recorded in the header file.

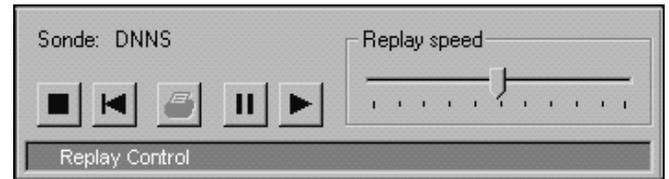


- The depth limits of the file are shown and may be modified for replay (when not recorded in Time mode) if required.
- The vertical scale required can be selected through the **Depth Scale** selection box. The screen display will not be exactly to this scale, but more or less data will be presented on the screen as requested. The vertical scale of the print to hard copy will be correct.
- If the log was made with calibration ON, the **Calibration** check-box will be filled. You may select a different calibration file with **Browse**.
- If a User Function is available for the designated sonde type, then it will be shown in the **Function List** box, and the check box will be filled if it was applied when logging, and the User Function is available on the system making the replay.
- Filters applied to the data may be modified by clicking through the **Physical Channel** number and changing the **Width** as required.
- Hard copy is enabled by checking the **Realtime Printing** box.

The general method of working is almost identical to that within log mode. All data processing options will be retained from the original log, but printer output must be selected in the check box if hard copy is required, otherwise output will be to the screen only. Click Initialise to continue with the selected log options.

The replay window that replaces the sonde control window has six controls:

- Stop: Terminates replay mode
- Rewind: Resets replay to the start of the log
- Print Direct: Disables screen display
- Pause: Freezes output for inspection
- Play: Start or continue replay
- Replay Speed: Controls speed of scrolling.



The controls listed are self-explanatory. In the screen-shot here, the **Print Direct** control is disabled, because hard copy was not specified in the replay. This control will disable the screen display for faster printing to hard copy, but is only active when hard copy is enabled. Direct print may be initiated at any point during normal replay, but may not be interrupted until the end of the log section.



When hard copy is specified, the log header will only be produced if the user requests it in real time. The previous method of globally enabling or disabling selected parts of the header is no longer

available. Instead the user will be prompted at the point of generating the header, and the complete header with comments will be produced at all times when requested. To print the header, click **Print Header** and then **Finish**. Otherwise simply click **Finish**.

The **Reset** control may be used to rewind the log to the start if a subsequent copy is required immediately.

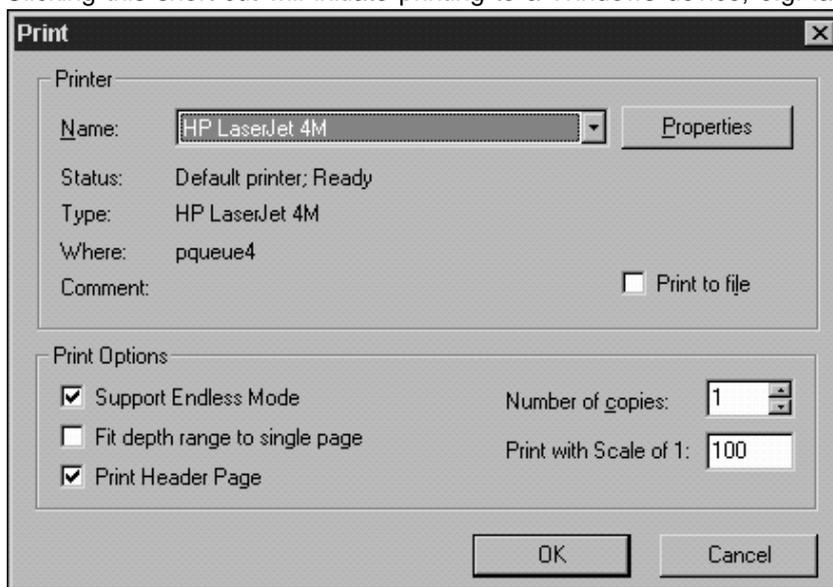
The header contents can be inspected at any time that replay is active by clicking on the **View/Show Log Header** drop-down menu item.

When the section is complete, click on **File/Close**, or the close log icon from the toolbar.

7.1 Replaying Logs to Windows Printers



When the file has been opened for replay as described above, the printer icon on the toolbar will become active. Clicking this short-cut will initiate printing to a Windows device, e.g. laser or ink-jet printer. The print layout is



fixed on the normal API style with three tracks and depth column.

The depth scale can be set to any required value, and support is available for devices such as the Printrex which have continuous roll media. There is a check box for fitting the entire log to a single page for summary purposes.

The log header is output in API style to a single, separate sheet if required.

7.2 Merging Logs for Replay

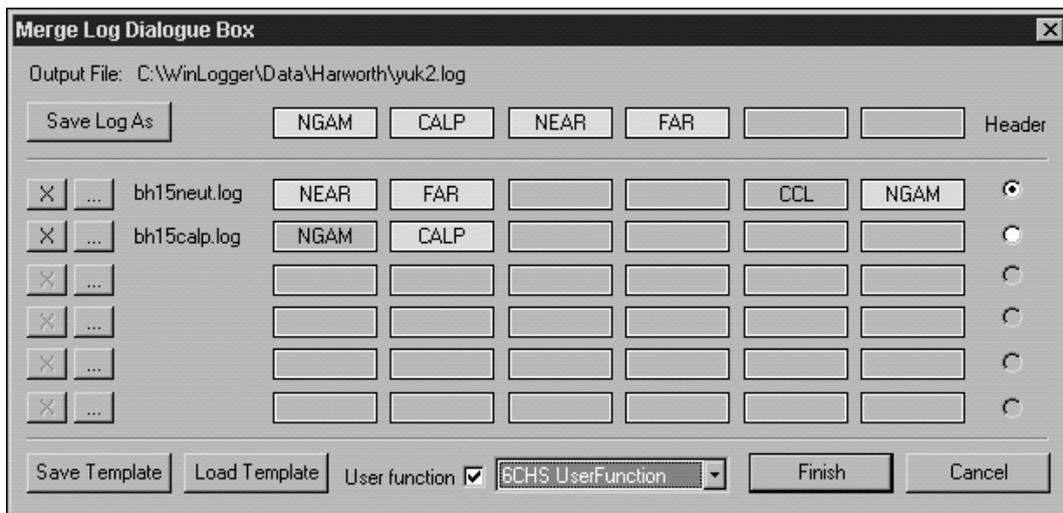
For simple log presentation tasks it is frequently required to join together two or more logs as a composite presentation. In order to avoid the requirement to use an external package such as Viewlog to achieve this task, the WinLogger software has been extended to make composite logs by merging selected channels from up to six logs. **This operation is limited to creating an output file of no more than six channels**, since the current data model and display method will not permit more than this number of curves. Details of measurement offset, calibration and presentation will be preserved from the original logs. In addition, a user function can be attached so that processing of the merged logs can be performed.

Select the merge log files dialogue through the **File/Merge Logs** pull-down, or use the toolbar icon:



A spreadsheet-style dialogue will open which allows the user to name the composite log and designate input files and data channels for output. Click **Save Log As** to choose the output file name.

In the upper part of the dialogue box is a diagrammatic representation of the output file record, initially it is empty. The central section contains space for six input file records, with buttons for input file selection at the left. On the right is a set of radio-buttons which allow the user to select which of the logs will contribute the log header data. By default the first log will be chosen. Here is a screen shot of the dialogue in use:



When a log input file is selected, its data channels will be displayed in the spreadsheet body. Up to six input files may be specified, but a maximum of only six output channels is permitted. Click on the channels of the input files to transfer them to the output record, which will be filled from the left hand side. Clicking the X control at the side of the input file record will delete it, and its outputs from the spreadsheet.

To attach a user function to the output file, check the **User Function** box and select the appropriate function in the list box. The user functions all refer to the default 6-Channel Sonde type, since there will be no sonde in the database which has the defined set of data channels. Creation and maintenance of the user functions will be covered in a later section.

When a complete output record containing all the required data channels has been created, it is possible to save the output record as a template. This is of value when repetitive suits of logs are run on a number of boreholes. To build up the output file automatically, simply click on **Load Template** first, then select the logs which contain the required data. As each file is loaded, the channels will be chosen automatically.

To create the composite output file, click on **Save Log As** in order to give it a name, then click **Finish**. The file will be created, and then be presented for replay in the usual fashion.

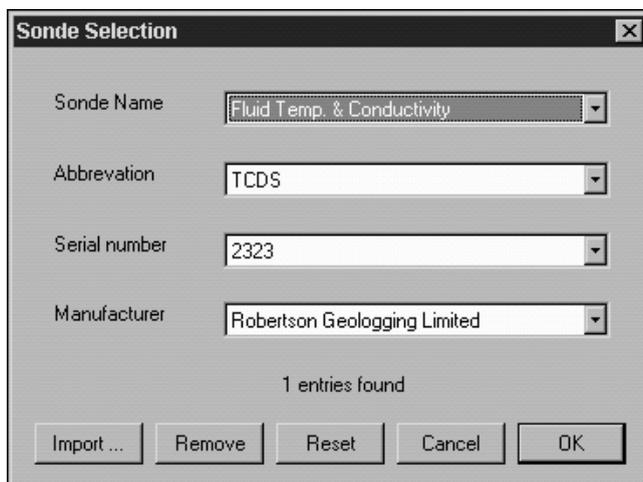
8.0 The Sonde Database

The Sonde Database is just part of the set of information which is used by the WinLogger software to interact with the complete logging system. We have seen in section 3.2 how to select and configure depth-measurement wheels and cable parameters. In this section we will see how to add new sondes to the installed database and modify the way in which they present data to the screen and hard copy. Start the sonde database dialogue with the **Tools/Sonde Database** pull-down, or use the toolbar as below.



8.1 Sonde Selection Dialogue

The introductory screen allows you to select the sonde of interest by one of four keys:



- **Sonde Name:** Click on the scrolling list box to display all sondes ordered by name.
- **Abbreviation:** Click on the scrolling list box to display the set of sondes ordered by customary 4-letter mnemonic.
- **Serial Number:** Click on the scrolling list box to display the set of sondes ordered by serial number. If a sonde type has been selected, then you may select only from items of that type.
- **Manufacturer:** Click on the scrolling list box to select the set of sondes by a particular manufacturer. You must then go on to select a sonde from one of the other boxes.

Please note that it is not possible to modify any of the fields on display at this stage.

When you have chosen the sonde whose properties you wish to modify, click on **OK** to proceed. The control is disabled until a sonde is selected.

The **Reset** control is used to undo any stages of selection if you wish to choose a different sonde. **Cancel** will close this dialogue immediately.

8.2 Importing a New Sonde to the Database

The Winlogger software will normally be delivered with the sonde database correctly configured for the client's application, but circumstances will arise which require a new sonde to be introduced. The way in which this is done is through a Sonde Import file, which will be supplied by RG. The structure and content of the sonde import file will not be given here.

Click **Import** to load the information into the database. The next screen will contain a file selection box, where you may browse to find the file required. Normally it will be distributed on diskette. *Do not attempt to install a second sonde with properties identical to one already installed.* If necessary, the import file may be modified with a text editor before import. More than one example of a sonde type with different serial numbers may coexist in the database.

The sonde should be installed automatically without further interaction. An 'Installed Successfully' message will be shown at the end of the process. Click **Reset** before attempting to attempting to explore the properties of the

new sonde. Properties such as the sonde serial number will seldom be correct on delivery, but may be changed to match the actual hardware after import. See below for details.

8.3 Removing a Sonde from the Database

When maintaining the sonde database it is occasionally required to remove a sonde from the database so that an updated description can be provided. The sonde database will not permit a sonde with an identical serial number to be imported.

Select the sonde in the usual way, then click on **Remove**. All reference to the sonde will then be deleted from the database. It will then be necessary to click **Cancel** to leave this dialogue, unless you continue with other operations, but the deletion will not be undone.

8.4 Modifying Sonde Properties in the Sonde Database

When the sonde has been selected, you will move on to the Sonde Base profile sheet. It has three tabs:

- Sonde Parameters: Basic properties which relate to the sonde.
- Data Channels: The properties of the individual measurements
- Display Layout: The position and properties of the graphical representation of the measurements.

The screenshot shows a dialog box titled "Sonde base" with three tabs: "Sonde Parameters", "Data Channels", and "Display Layout / Channel-To-Track-Assignment". The "Sonde Parameters" tab is active. It contains the following fields:

- Sonde Name: Electric Log with Gamma
- Abbreviation: ELXG
- Serial Number: 2071
- Manufacturer: Robertson Geologging Limited
- Number of Channels: 5
- Sonde Length: 250 cm
- Schematicfile: (empty field with a browse button "...")

At the bottom of the dialog are "OK" and "Cancel" buttons.

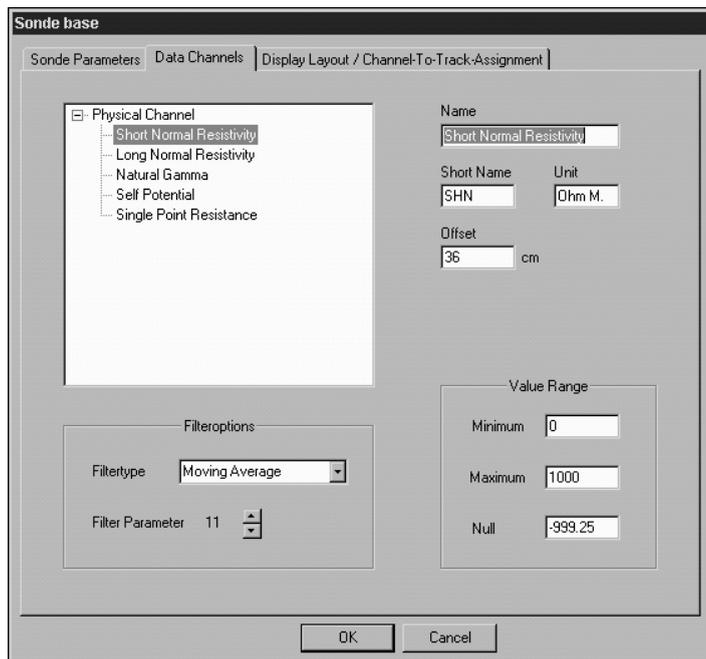
8.4.1 Sonde Parameters

The Sonde Parameters sheet is shown here. The information which it contains is the basic description of the sonde - its full name, abbreviation, serial number, manufacturer and length. Any of these properties may be changed to suit the particular circumstances of your system - although it is probable that the only item you will wish to change is the sonde serial number. Note that you may not change the number of channels of data which are presented by the sonde - this is fixed at installation time.

There is also an entry, with a browse control, to select the schematic picture of the sonde. This information does not exist for all sondes, but is intended for expansion in the future so that a pictorial representation of the sonde may be put into presentation copies of borehole logs for reference regarding detector positions, spacings and geometric considerations.

8.4.2 Data Channels

The Data Channels sheet is concerned with the names, offsets, filtering and display scale of the data outputs from the sonde. In the main display window you will see the outputs in the order of appearance in the data packet from the sonde. Note that there is no mention of any 'empty' data channels in the output from RG sondes. The settings established here will be used for all logs with this sonde type in future.



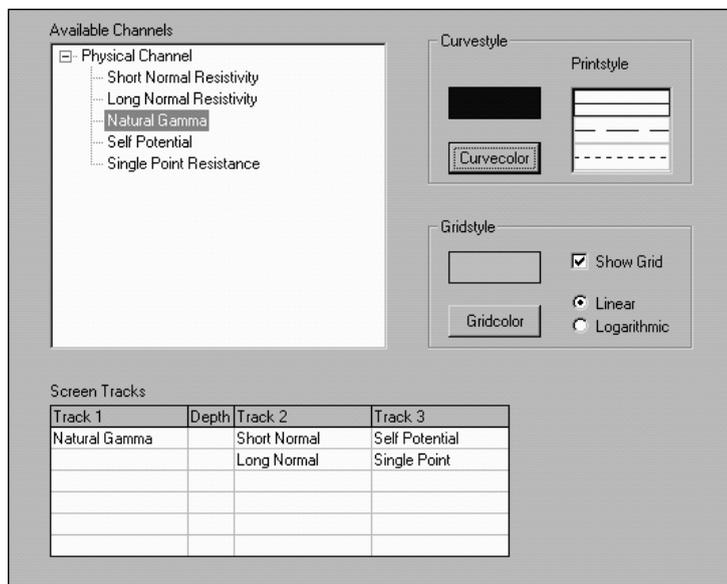
The display boxes surrounding the main window contain information relating ONLY to the highlighted data channel. Click on the channel name in the main window to select the channel of interest.

You may now change the labelled attributes of the data by typing into the edit boxes. The filter type is currently fixed as Moving Average. To change the length of the filter, click on the spin arrows and increase or decrease the value.

The Null value is the numerical value which will be recorded in calibrated logs when no data is available from the sonde - before the depth offset expires for example.

8.4.3 Display Layout

The properties discussed in the previous sections relate to the sonde, and the measurements which it makes. Those properties are not dependent upon the position which the data occupies on the screen. The following dialogue allows the user to place the data which has previously been described onto the log page and set attributes such as curve style and colour.



As with the last sheet, the attributes shown relate only to the curve whose name is highlighted in the **Available Channels** window.

The parameters which relate to the curve are colour and print-style. Colour is changed by clicking on **Curvecolour** and following the standard dialogue. Print style is selected by clicking on one of the samples presented - solid, dashed or dotted.

Linear and logarithmic grid styles are defined and can be selected by checking one of the 'radio' buttons. The grid colour can be selected by clicking **Gridcolour**. If a track is selected for logarithmic grid, the left- and right-hand

scale values will be adjusted automatically to suit the decade-based display regime. The number of decades displayed will depend upon the right-hand scale value which was in force previously.

To disable a curve (Natural Gamma for instance, when the optional measurement is not included in a sonde), or move it between tracks, use the **Screen Tracks** facility, which works like a spreadsheet. The highlighted output

channel can be removed from the display by clicking the cell in which it appears. It can be inserted by clicking a cell in a new track. Note that a curve may only appear once in a display.

9.0 User Functions

User functions exist as a method of implementing data-processing algorithms which are specific to particular sondes, when those algorithms cannot be embodied within the normal polynomial calibration method. Examples are the computation of density from gamma-gamma logs and the temperature differential output.

The user function can be visualised as a black box, whose inputs are the depth-offset, filtered and calibrated outputs from the sonde, and whose outputs are the modified or combined measurements required for display. By definition, any output from a user function must also be on depth, and will not need filtering for display.

Because the outputs of the user function are not necessarily related to the inputs, a new description of the outputs is necessary, in addition to the description of the processing algorithm. The following sections will describe the necessary steps to defining a user function for a sample sonde.

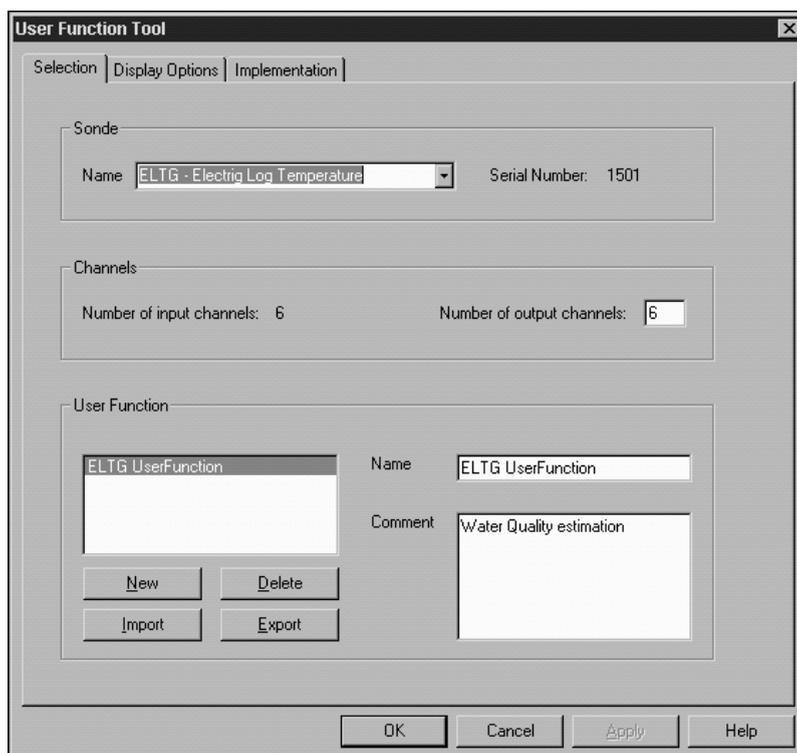
9.1 The User Function Tool



Start the dialogue by clicking pulling down the **Tools/User Function** menu item, or clicking the toolbar icon as shown above.

The User Function Tool is shown here. The first selection is the sonde type - scroll down the list of sonde names to find the one you require. *Note that it is only possible to manipulate user functions for sondes which exist in the sonde database.* If a user function exists for the selected sonde, then its name will be shown in the lower window. It is possible for a sonde to have more than one user function defined - for example the Spectral Gamma sonde might have both four- and five-windows solutions for K, U, Th concentrations. Each user function may have a short comment attached for identification, which will be displayed in the right hand display box.

It is now possible to delete a user function if required. Select the function in the lower left-hand window and click on **Delete**.



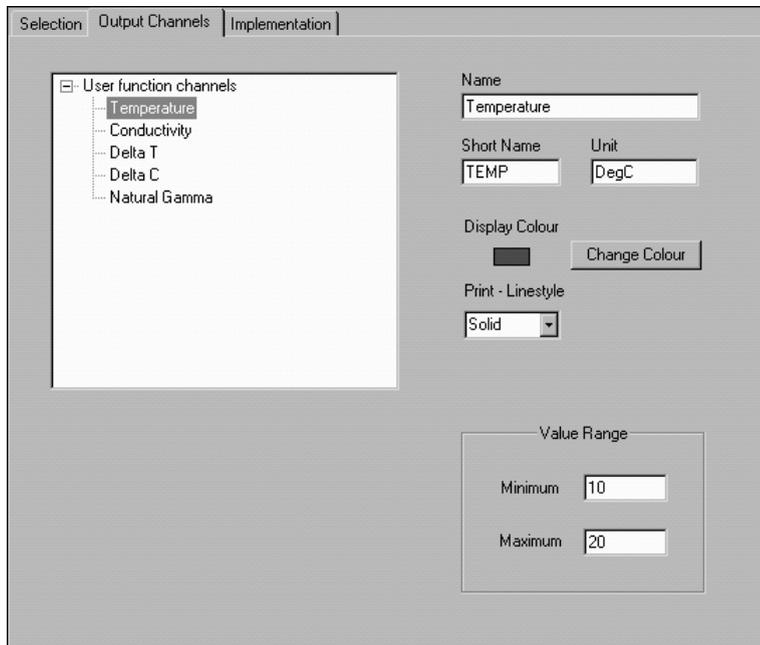
If there is no user function listed for the sonde, then click **New** to create the template. Enter text for the descriptive title in the **Name** box. Select the number of outputs which it will produce by typing in the **Number of Output Channels** entry box. The number of input channels will be determined by the sonde database entry.

You are now ready to move on to the Output Channels dialogue by clicking the tab at the top of the profile sheet.

9.2 Defining Output Channels

The output channel definition is a very similar operation to the original description of the sonde and its data outputs to the screen.

If the user function is a new one, the main display window will contain the defined number of data outputs (see last section). They will have the names OUTPUT1-X allocated by default. Otherwise, as here, the output channels will be named properly.



To change the output channel names and properties:

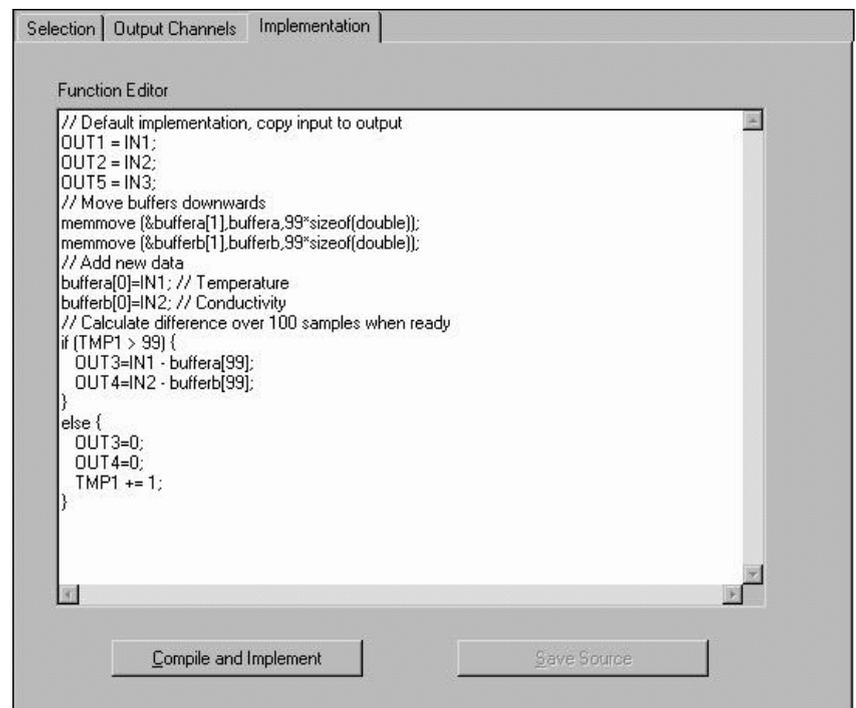
Click on the name in the main display window, and the remaining entry boxes on the screen will be set to display the data for that particular channel. It will then be possible to modify the name, mnemonic, units and display properties. The main display window will be updated when you move to another channel. *When the user function is enabled in the data processing options, these properties will override those normally defined for the sonde.*

When all the curves are set up as required, move on to the **Implementation** tab to define the algorithm.

9.3 Implementation of User Functions

If this is a new user function, then a skeleton of code will be present already. This is because it is necessary to pass the data through the user function even if there is no process to be applied to a particular channel.

The input channels will be named **IN1-X**, and the output channels will be named **OUT1-X**. *The name of the data channel is never used directly*, so appropriate notice must be taken of the order of definition of the inputs and outputs as defined in the Sonde Database and Output Channels dialogues respectively. In addition to the input and output variables, temporary variables named **TMP1-20** are pre-defined, and also storage areas **buffera** and **bufferb** which are 100 element arrays.



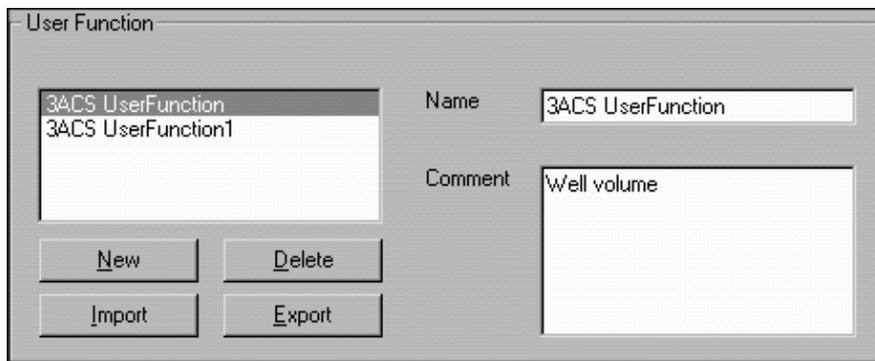
The active code is written in the 'C' language - entirely standard and accessible to anybody with modest programming skills. All the necessary variables have been pre-declared in a header file which is appended to the user-defined code, and is not accessible through this dialogue.

The code may be saved during editing by use of the **Save Source** control. When the code is complete, click on **Compile and Implement**. The code will be saved and compilation will proceed. If the user function code is syntactically correct you will be greeted with the message "Implementation Successful", otherwise "Syntax Error". Unfortunately, it is not possible to present an analysis of the error in a tool with this low level of sophistication.

You are now ready to test the user function with a pre-recorded log before going live with real-time implementation.

9.4 Importing User Functions

The text above has been concerned with the necessary detail of producing user function code from scratch. Unless the function is for a special purpose, it is probable that the necessary code will be written by RG and distributed to users. It is then only necessary to copy the code onto the target computer.



User functions are stored in the USERFUNCTION sub-directory of the WinLogger software directory. Each user function comprises three separate files with a common name, but differing extensions: INI, SRC, DLL. Note that the sonde must be present in the sonde database before this procedure is started. If necessary, import the sonde first (see the section

entitled Sonde Database). Note that there may be more than one user function for any sonde, and that the file name will simply be incremented as shown above in the selection dialogue.

User functions are distributed as a single file which is packed or unpacked by clicking on the **Export** or **Import** controls on the Selection tab of the User Function profile sheet. The **Export** control will normally be used only by RG for distribution of user functions to clients.

To import a user function from distribution media, simply click on **Import** control and use the file selection dialogue to browse for the distributed file. The file will be routed automatically to the correct location and may be used immediately without any requirement for implementation. The userfunction for existing products will usually be distributed as part of the installation process, and will be found in the Resources\UserFunction directory.