



Dendrometer Increment Sensor DBL60

ICT International PTY LTD <http://www.ictinternational.com.au/>
PO Box 503
Armidale NSW 2350
Australia
Phone; [61] 2-67726770
FAX; [61] 2-67727616
Email; sales@ictinternational.com.au

Index

1	General Description	3
2	Specifications	4
3	Installing the DBL60 and Getting Started	5
3.1	DBL60 Sensor Installation	5
3.2	Installing the Mini32 Software	8
3.3	Unzipping the USB to Serial Port Files and Installing	9
3.4	Establishing Infrared Communication with the DBL60	11
3.5	Establishing Communication with the DBL60	12
4	Setting up the Logging Configuration	13
4.1	Other options within Setup	14
4.2	File naming conventions in Mini32	16
4.3	Drawing & Exporting Files in Mini32	18
4.4	Shortcut keys in Mini32	19
5	Maintenance	20
5.1	Power Drop-outs	20
5.2	Memory Capacity	20
5.3	Battery Replacement	20
6	Warranty	20

1 General Description

The DBL60 is a Dendrometer Increment Sensor designed for long-term use onsite in monitoring and recording stem growth.

A stainless steel tape is used to encircle the tree trunk combined with a rotary position sensor and because no invasive fixing parts are required, no damage is caused to the tree.

The DBL60 is designed for long-term environmental use, is housed in UV resistant plastic and is watertight. All metal parts are made from stainless steel and anodised aluminium. The Lithium-ion battery is able to provide up to five years of continuous use.

The sensor stores data to the memory of a data logger contained within the DBL60 at intervals defined by the customer. Because of the potential of temperature to affect tree growth an internal temperature sensor is also provided, so both trunk increments and temperature can be logged and recorded.

The logger is capable of recording 50,000 values, translated into readings and time, this means that if both trunk increment and temperature logging options are being used, the logger is capable of gathering data for up to three years at hourly intervals. Longer, if only the trunk increment option is required to be used.

The DBL60 logger uses non-volatile type memory, so the measured data is safe even in the case of a full battery discharge. There are two memory-operating options, either the logger stops logging once the memory is full (Overwrite Disable), or newest data overwrites oldest data (Overwrite Enable). These options can be set up during Initialisation. Once the DBL60 is installed on a tree, a full Initialisation should be carried out and the required Configuration defined and sent to the logger.

This software also allows easy access to view data, draw and export to common file formats such as text or Excel. A USB/IrDA infrared adaptor is used to communicate via PC with the logger; see Section 3.2 for details.

The Mini32 Software is used with many other sensors and loggers, any options appearing greyed out and not available in the software are not relevant to this application of the software with the DBL60 sensor and logger.

2 Specifications

Increment Sensor Type	Rotary
Range	64mm Circumference
Linearity	2% of full scale
Resolution	1 μ m
Tape Strength	15 to 20 N in the whole range
Operating Range	
- Temperature	-30 to 60°C
- Humidity	0 – 100%
Temperature Sensor Accuracy	\pm 2 deg.C
Data Logger	
- Memory Capacity	50,000 values
- Measuring Intervals	10 min to 24 hours
- Averaging (storing) Interval	10 min to 24 hours
- Internal Clock Accuracy (-10 to 40°C)	\pm 1 min/month
- Input Voltage Resolution	16-bit
Battery	Lithium LS14250CN 3,6 V; 1000mAh
- Storage Life Time/Idle (not logging)	approx 5.5 years
- When Measuring Once/Hour	approx 5 years
- When Measuring Once/10 Minutes	3 years
Size	100x70x100mm
Weight (Including Battery)	approx 300gms

3 Installing the DBL60 and Getting Started

3.1 DBL60 Sensor Installation

The DBL60 is fixed to the tree trunk with 12mm wide stainless steel tape, provided in a 15m spool. Using a pair of tin snips cut a piece of tape 25cm longer than the circumference of the tree taking care not to crumple the tape.



Figure 1

Fold one end of the stainless steel tape back on itself and slide onto the central pin on the DBL60, then wrap the remaining tape around the trunk.



Figure 2

As for all electronics to guard against severe extremes of temperature it would be prudent to mount the DBL60 on the southern side of the tree [in the Southern hemisphere] and Northern side of the tree [in the Northern hemisphere]. Pass the end of the tape through the back of the DBL60 as shown in Figure 3.



Figure 3

Insert the tape below the binder bar as shown in Figure 4.



Figure 4

Turn the head of the DBL60 counter clockwise in order to get at least 5mm on the scale as shown in Figure 5.



Figure 5

Then fold the tape over the binder bar and bend sharply back as shown in Figure 6, so that the tape cannot slip.



Figure 6

The tape must remain under tension, ensure it is, and then check that the tape is still at the 5mm scale position, as shown in Figure 7.



Figure 7

3.2 Installing the Mini32 Software

Run the Mini32 software's executable file (mini_401_19.exe); which should have been provided with your sensor, onto the PC and/or Laptop where it will be used, the executable file should be installed to the following location C:\Program Files\EMSoft.

If using a zipped file, extract all files first to the C:\Windows\Temp directory, then run the Mini32.msi file this file will start the auto installer in Windows. Restart your Laptop or PC.

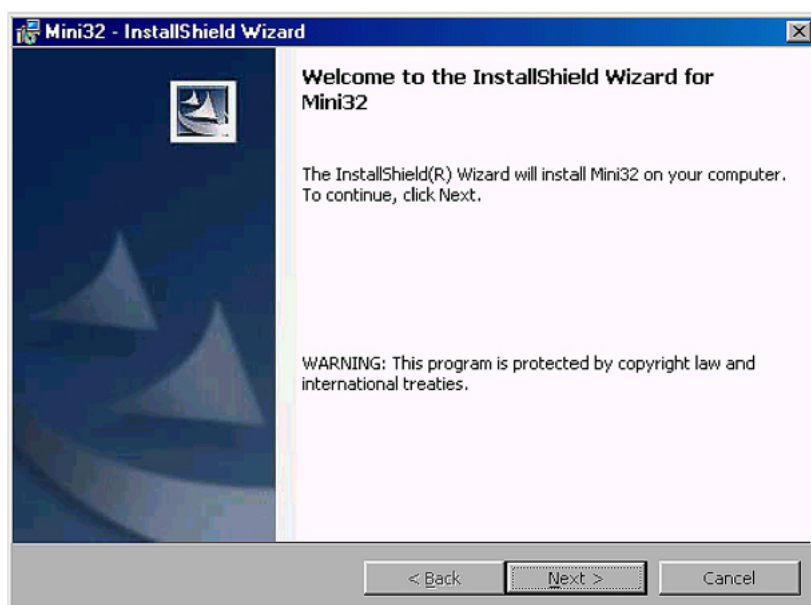


Figure 8

Once installed the welcome window should look like Figure 9, notice that the working directory is defined as C:\Computer Name\Desktop\EMSdata\, to change simply click the blue button to browse and define another location.

Notice also that the default COMM Port setting is COMM Port 1, you will need to check this later once the USB to Serial connector is set up

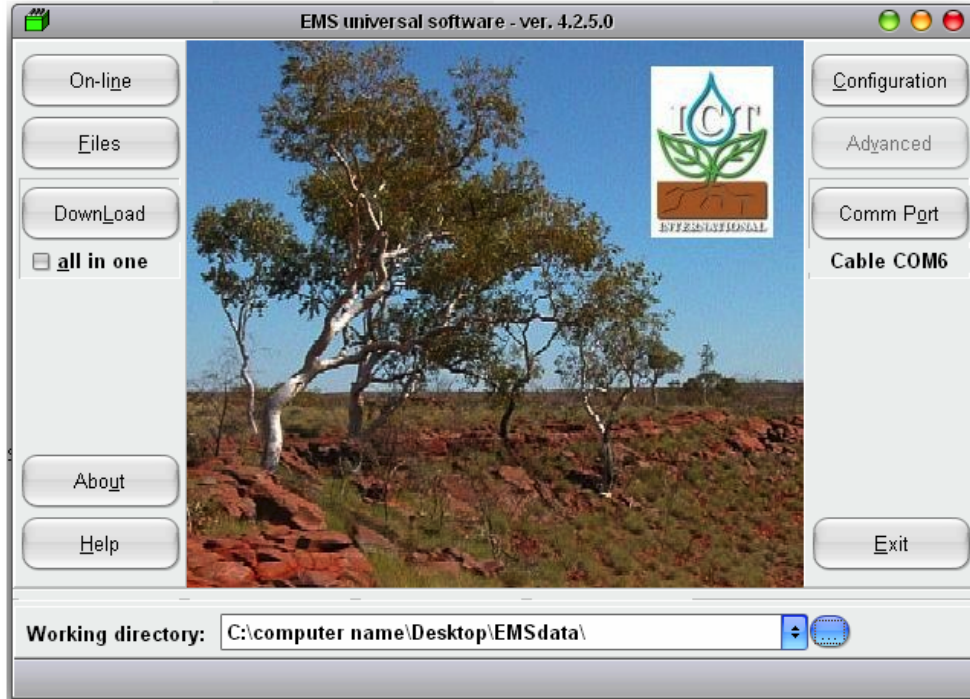


Figure 9

3.3 Unzipping the USB to Serial Port Files and Installing

To set up the USB to serial port cable, firstly plug in the cable into the computer where it will be installed. You should receive a message saying that Windows has found new Hardware and is trying to locate the software. If you have a reasonably recent model computer the drivers may be in the Windows driver database. If not you will need to either download the Zip file containing the drivers from the ICT Website and install them, or install them from the disk supplied.

Unzip the Zip file for the USB to serial port cable and extract the files to the following location, C:\Program Files\EMSoft. This is the default location to where the Mini32 software installs to.

Use the Windows Add New Hardware Wizard, and follow the prompts to install the drivers



Figure 10

Restart the Computer for the changes to take effect.

The next step is to establish a connection with the data logger and to enable the infrared communications with the DBL60. To do this, the right COMM Port setting needs to be selected in the Mini32's COMM Port settings on the PC.

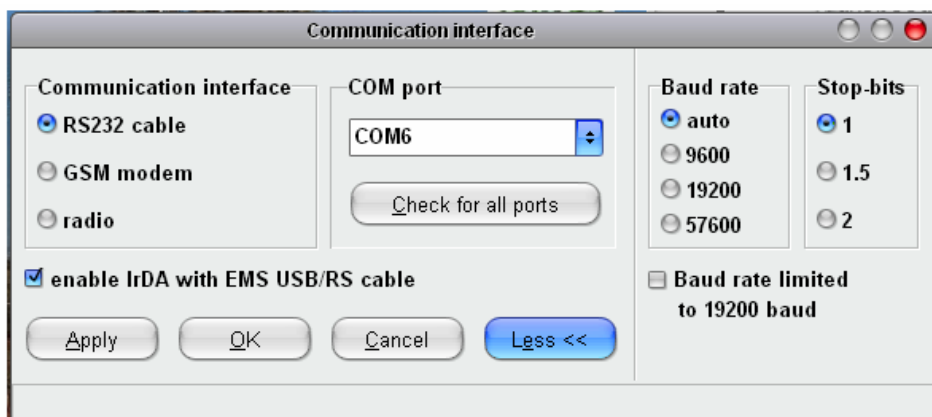


Figure 11

Open the Mini32 Software and from here click on the COMM Port button and apply the settings as shown above. In this case the COMM Port used is COMM Port 1 although this will not necessarily be the same on every PC, click on the 'Check for all ports' button, then choose the appropriate port from the options available in the dropdown menu. You will be asked during this process to establish connection with the datalogger. (See Figure 16 and the associated instructions above the image for how to do this.)

In the Available COM Ports window press 'Test'. You will see the Communication Process window (Figure 12) briefly before the appropriate COMM Port and the DBL60 are successfully found. Once you go through the process of testing you will see Minikin DBL60 appear under test result in the Available COM Ports window, as in Figure 13.



Figure 12

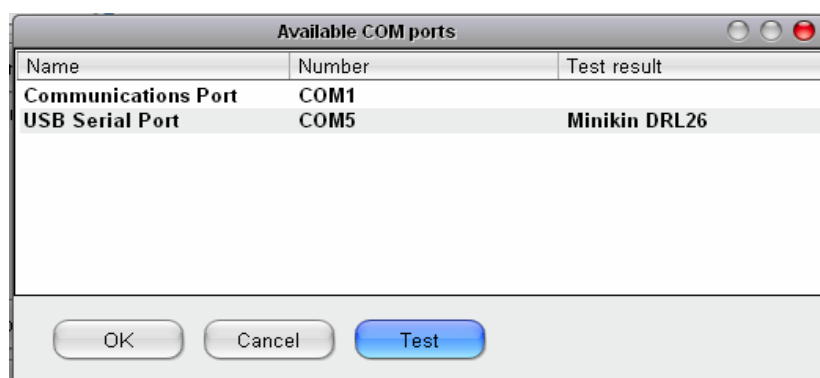


Figure 13

Select the COMM Port that resulted in the above message click OK, then Apply and then OK.

3.4 Establishing Infrared Communication with the DBL60

The data logger has no power switch, the system is activated by software which is in turn enabled by a EMS USB/IrDA cable connected to a PC.

To conserve power, data loggers spend most of their time in sleep mode. In order to wake up the logger, a magnetic head is connected to a serial port to USB connector. The magnetic head is mounted in the grey connector attached to the USB to serial port connector, shown here on the left hand side.



Figure 14

The EMS USB/IrDA cable serves as an ordinary USB to RS232 cable with a built in infrared transceiver. The two LED diodes indicate the status of the communication process, red indicates that signal is being successfully transmitted from the computer to the logger and the green LED diode indicates that the signal is being successfully transmitted from the data logger to the computer.

You must establish a connection before commencing communications with the sensor for setup or data retrieval. The steps required in order to do this is are; firstly the Mini32 Software needs to be installed on the PC being used to communicate with the DBL60, and secondly the drivers for the EMS USB/IrDA cable also need to be installed on the same directory and the same machine. Both these files are either supplied on disk or downloadable from the ICT Website;
<http://www.ictinternational.com.au/>.

3.5 Establishing Communication with the DBL60

Once all the above is set up a data connection can then be established by waving the EMS USB/IrDA unit's magnetic head near the sensor's IR transmitter. A sticker marked IrDA on the cylindrical sensor body indicates the right place to hold the head of the cable near as shown below in Figure 15.



Figure 15

To activate you must first touch the DBL60 with the grey magnetic end of the cable just above the IrDA sticker.

Then turn the USB cable on it's side and point the arrows on the left hand side of the serial end of the cable to the IrDA sticker on the DBL60 to begin communications.

When the IR transmitter is activated a red light comes on just visible underneath the hat of the DBL60 as Figure 16 illustrates. This is hard to see outdoors. The following image also illustrates the position the USB cable should be in, relative to the DBL60, in order for them to begin successful communications,



Figure 16

The end of the cable should only be a few centimetres away, but should not touch the DBL60. Typical working distance should be no more than 60cm's within a 45° deflection in all directions from the IrDA sticker.



Figure 17

If you receive an error message such as the one above, provided the cable and batteries are ok, it simply means that you are not holding the cable correctly, see the explanation and Figure 16 above.

Once a connection is established, this connection is then maintained until the program is closed. The connection can however be lost because of interruption to the Infrared beam, caused by excessive distance or by an obstacle between the two units lasting more than 15 seconds.

4 Setting up the Logging Configuration

Open the Mini32 software and press the Configuration button, this will open the Setting Up window. Set both measurement and storing intervals under the Period fields as required. Available options range from 10 minutes to 24 hours. If you would like to store an average measurement, then the measurement interval can be set to a more frequent interval than the storing period.

Next to the 'device code' field add the last two digits of the Serial number of your DBL60. Figure 18 below, illustrates a typical setup for a DBL60.

To turn on each channel double click appropriate channel under description and click 'Channel On'. Leave the Range and Gauge settings as the default, these settings are pertinent to particular sensors, and as explained earlier the Mini32 software can be used with a range of different sensors.

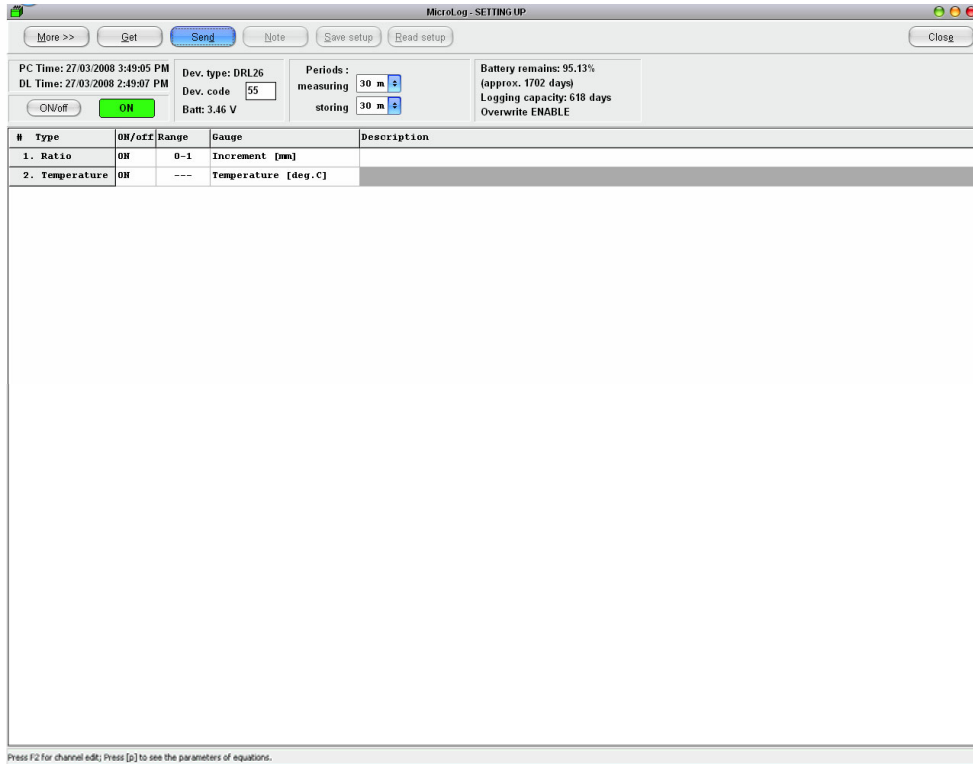


Figure 18

If you wish to add descriptions to either the increment or temperature sensors, double click in the appropriate line under the 'Description' field relevant to the sensor you need to add a description to. Another window appears, add your description, and then click Apply when finished.

In order to send the configuration setup to the logger, click the Send button; you should receive a confirmation message that this has been carried out successfully.

4.1 Other options within Setup

For more options click the More button. Notice that on the right hand side of the Setting Up window the percentage of battery power left, logging capacity of the logger and memory operating settings are displayed. To change the memory operating settings from Overwrite ENABLE, to Overwrite DISABLE, click the Init button, click 'memory overwrite disable', and click OK to activate. Once successfully carried out Overwrite DISABLE is displayed on the right hand side, as shown in Figure 20.

Warning - save your data before carrying out any functions with the Init button, all data will be lost afterwards. In order to save data click out of the More and Configuration windows back to the Main Screen and click the Download button and follow the prompts.

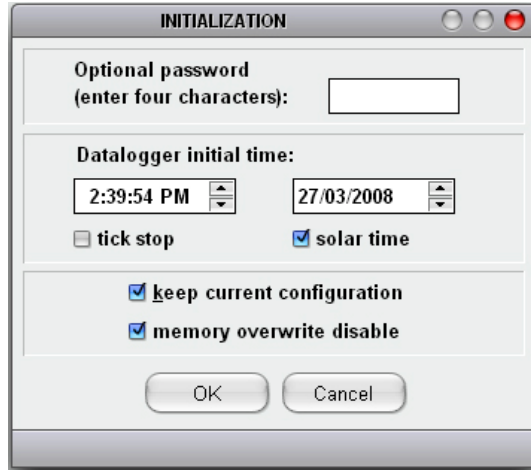


Figure 19

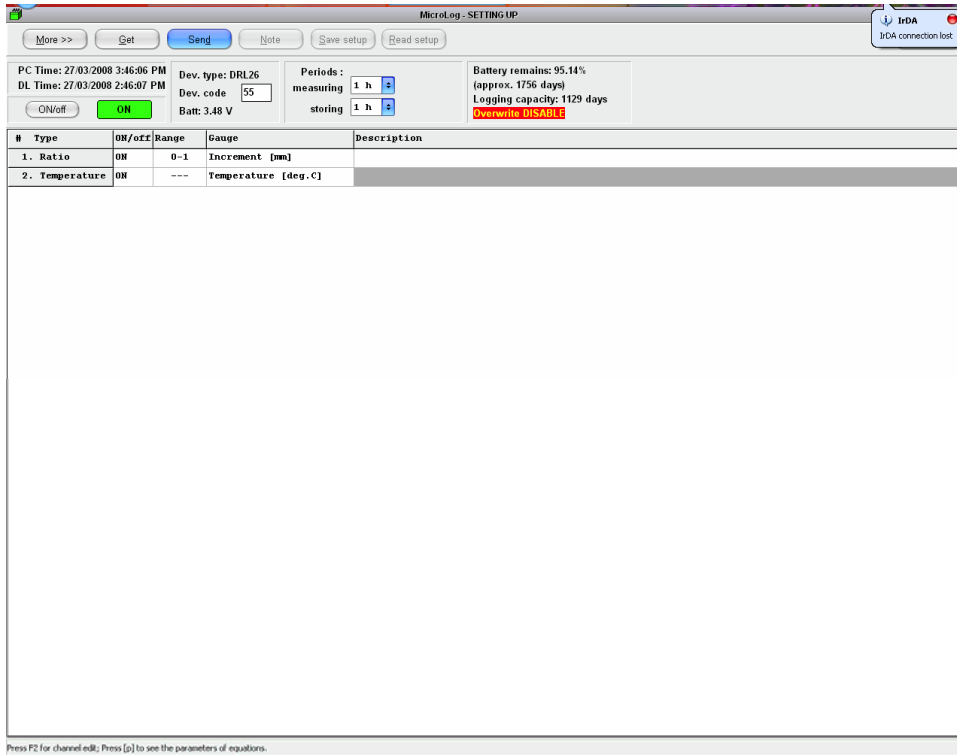


Figure 20

Notice in Figure 20, the IrDA status being displayed on the right hand side of the window.

To carry out a data logger reset, click the Init button. Initialisation resets all system variables to factory defaults. In order to carry out a full software default reset, make sure that 'keep current configuration' and 'memory overwrite disable' are *NOT* ticked, and then click OK.

Please note that the system will automatically call for an Initialisation once the battery voltage has dropped below 2.9Volts (after a battery replacement or because of total discharge).

The data logger time, date and a four letter password can also be set up within the Initialization window.

In the case of a sensor being moved to another location, or in the event that collected data is not considered reliable, or when the memory is full, a full memory erase should be carried out.

In order to carry this out, from the Setting Up menu, first make sure that Overwrite is disabled (see above), click the More button, then click the RAM clear button. You will receive confirmation once this has been carried out successfully, once again all data will be lost so please backup your data first.

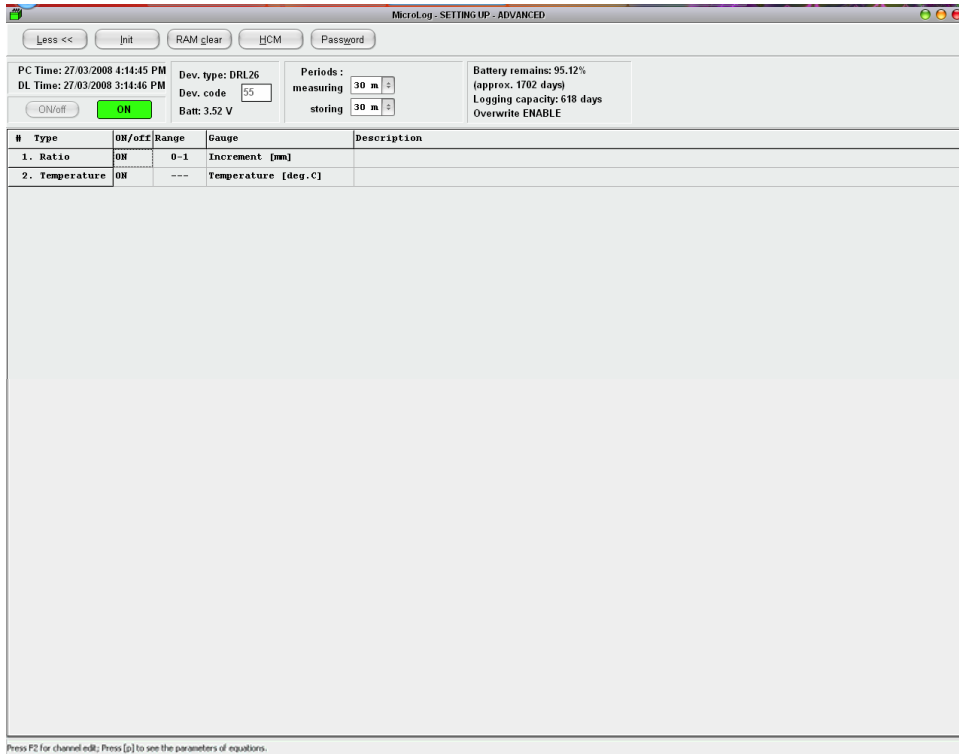


Figure 21

The HCM (Hardcopy of Memory) button in the Setting Up window should only be used in the case of problems with data conversion after downloading data. This may be caused by a corrupt data structure due to unforeseen external factors.

In this case the entire memory content can be saved to a file and be sent back to the manufacturer for free encoding. Click the HCM button, and you will be prompted to confirm a location for the '.hcm' file. You will receive confirmation once this has been carried out successfully.

4.2 File naming conventions in Mini32

All data in memory from the logger is automatically saved to the following location; C:\Windows\Desktop\EMSdata\, the file is by default named with the last two digits of the serial number of the device as a prefix, followed by year, month, then day.

For example a typical file name would be 34_2007_10_07.hex. File names can be changed and you can name these files according to your own specific needs in order to identify your data.

Hex files contain all the stored data and complete configuration details, including the last battery voltage and data logger time in compressed format. Hex files are however not suitable for data manipulation and exporting, so the software creates another file with a '.dcv'

extension. It is the dcv file that will be used by the software while editing, exporting and drawing functions.

In the event that information is accidentally corrupted it is reasonably easy to revert back to the original data by re-opening the '.hex' file, and saving it with a .dcv extension, carry this out from the Files menu. The .hex files should always be retained for backup purposes, so in order to do this without losing the backup, create a copy of the file first and then rename it with a .dcv extension.

To carry out a data download, establish communications with the DBL60, click the Download button from the Mini32 welcome screen and follow the prompts for the amount of days to download, then download and save your data.

To access existing files for data manipulation after download, from the Mini32 welcome screen click the Files button and the following window appears, Figure 22 shows clearly the two types of files available for use.

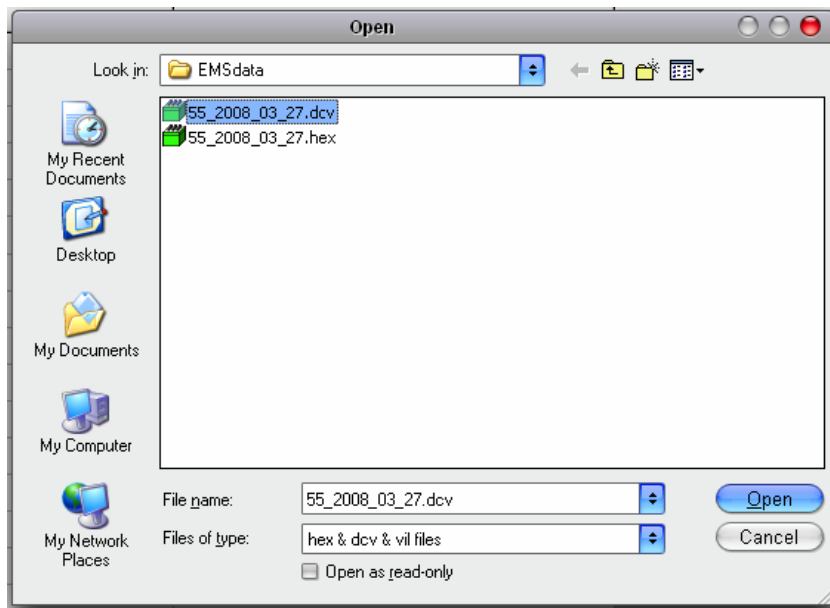


Figure 22

4.3 Drawing & Exporting Files in Mini32

When you open a File with extension .dcv, the following window opens, then by clicking Drawing button, you can go to the Graphics or Export options in the Mini32 Software. To represent you data graphically click the Drawing button, then on the next screen click Draw again.

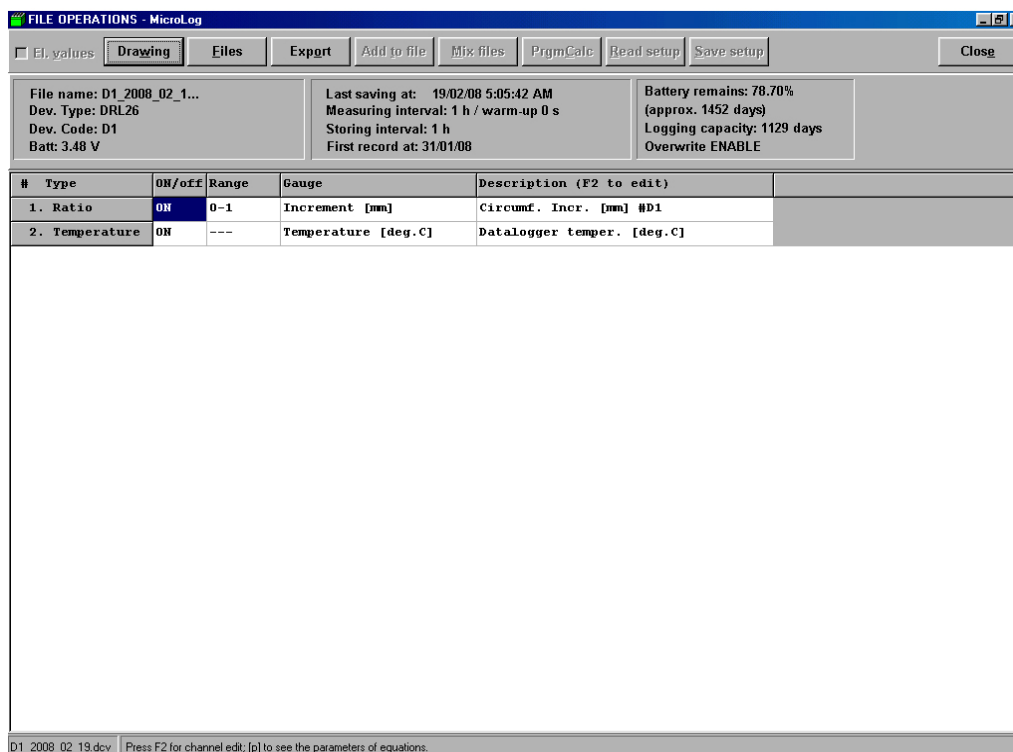


Figure 23

The data contained in the .dcv file as shown in Figure 24 is represented graphically in the form of a graph, it is also possible from this window to erase certain portions of the data and rescale.

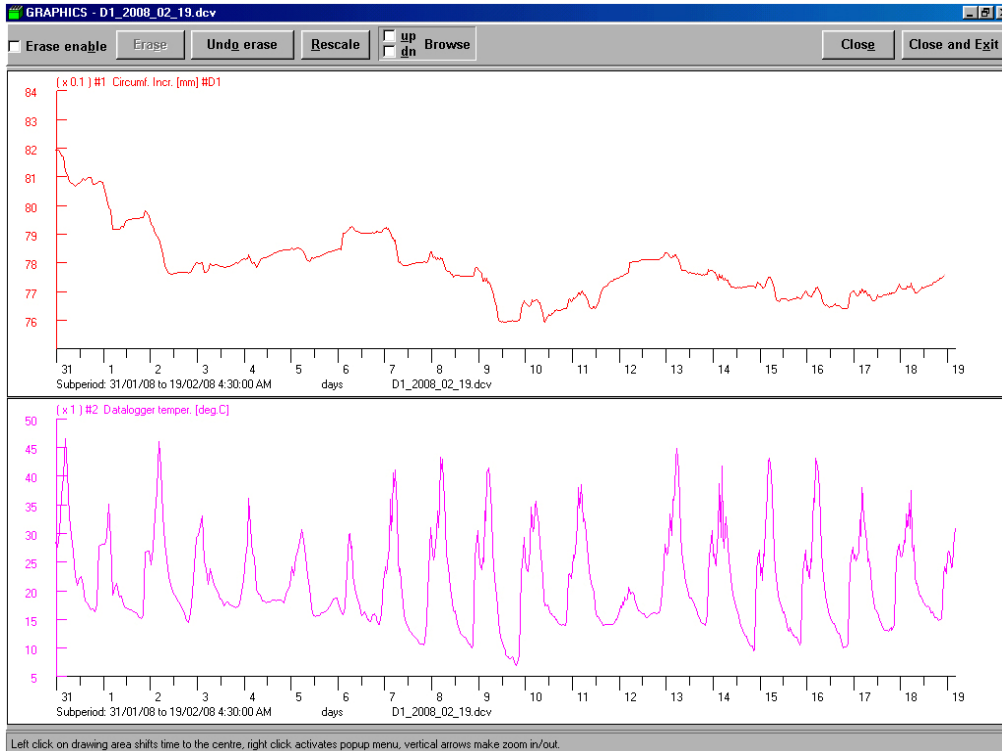
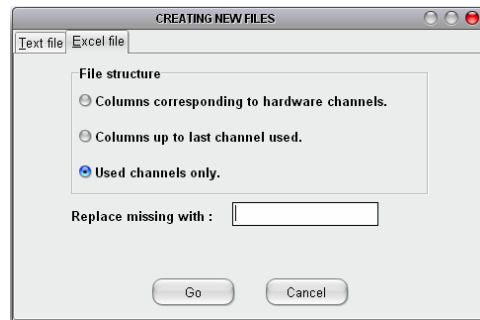
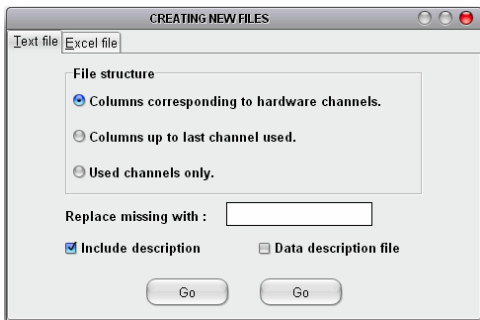


Figure 24

It is also possible to export data as an Excel file from the Mini32 software. Instead of clicking Draw from the File Operations window as shown in Figure 23, click Export instead and follow the prompts to export the data to Excel. The data can also be exported out as a straight text file. Options available to manipulate the data before export are shown in Figures 22 and 23, or alternatively for more options the manipulation can be carried out in Excel.



Figures 25 & 26

4.4 Shortcut keys in Mini32

Unlike most shortcut keys in software, in the Mini32 software there is no need to use the ctrl or alt keys in combination with the shortcut keys. In the Mini32 Software shortcut keys are simply the underscored letter in upper or lower case as displayed on the buttons. For example in order to activate the COMM Port button, simply press lower case o, and the COMM Port window opens. This is a very useful feature when using the software out in the field on laptops.

5 Maintenance

5.1 Power Drop-outs

It is always necessary to re-Initialize the data logger once the battery voltage drops below 2.9volts.

As batteries become older, or in the event of a used battery or a discharged/recharged battery being used, it is possible for the battery's state of charge to be overstated. The battery's 'state of charge' is able to be misrepresented, because the software always assumes the state of charge on initialization is based on the state of charge of a new battery's amp hour rating.

5.2 Memory Capacity

The number of days the battery is able to store data to memory can be estimated with the following formula.

$$N = 50000/(n*k)$$

[N = number of days, n = the number of averaged values in a day & k = the number of channels in use]

For example if both stem increment and temperature values were being stored to memory every hour, it would take 2.9 years to fill up the memory of the data logger.

5.3 Battery Replacement

Screw off the data logger lid to replace the battery in the DBL60, the lid contains the electronics separate from the main cylindrical body. You will need a 2.5 or 3mm small bladed screwdriver to screw the battery terminals.

Once the old battery is removed and the new battery installed, short circuit the DBL60 battery terminals with a metal tool such as a screwdriver, knife or key by holding the tool across both positive and negative battery terminals in order to make sure that the battery energy counter is reset, otherwise the state of charge will not be represented properly in the Mini32 software.

After replacing a battery the system will need to be initialized, please make sure you save your data first.

6 Warranty

ICT provides parts and labour warranty for the DBL60 for 12 months from date of purchase and guarantees all repairs free of charge for both the data logger and sensors during this time period. ICT does not accept responsibility for faults arising from incorrect handling, use of, or theft of the DBL60. The warranty covers battery failure for only three months from date of purchase.

The customer agrees that freight, in the event of failure is paid by the customer for return of the unit back to ICT and costs are covered by ICT for return of the unit back to the customer.

Contact details;

ICT International PTY LTD <http://www.ictinternational.com.au/>

PO Box 503

Armidale NSW 2350

Australia

Phone; [61] 2-67726770

FAX; [61] 2-67727616

Email; sales@ictinternational.com.au