



Data Logging Technologies

## User Manual



# Introduction

Welcome and congratulations on your decision to invest in a **borgtech CPL2** Data Logger.

Borgtech prides itself on producing the highest quality products and services providing unprecedented levels of customer support.

In fact our technology was birthed and produced from direct consultation and collaboration with end users.

These friends have kindly supported us in the various facets of development, design and testing of our products.

It is our sincere hope that you have many years of excellent service and satisfaction from our product.

Come visit us on the web at [www.borgtech.com.au](http://www.borgtech.com.au)

This manual is organised in sections dealing with each aspect of the use of the PC software and Logger Hardware.

Any feedback you may have for improvement will be appreciated and taken into full consideration, so send us an e-mail.

For further queries e-mail [support@borgtech.com.au](mailto:support@borgtech.com.au)

We would love to hear from you...

*To God and to all who laboured with us, who have supported us in the development process, we are eternally gratefull.*

***Thank you***

*the borgtech team*

# Licensing

The software is a licensed product and requires a license code to unlock it. It includes a 7 day trial period where all features are available. After this period, it will not run unless a valid license has been obtained.

When the program is licensed it will run normally and display the licensee information on the main screen after startup and also on the About dialogue box.



When the program is running in trial mode, it will display the license screen. This screen shows the number of days remaining for the trial license and allow you to enter license details.

A license consists of the user name, the license number and the unlock code. The username is given to **borgtech** who will issue the license number and the unlock code. Once entered and verified, they do not need to be entered again.



Looking at the license dialogue box, you can see where to enter the license information.

## Validating

Click on **Validate** to have the license information verified and to unlock the program.

Within the trial period you may click on **Continue Evaluation**. This option is not available once the trial period has expired.

Once the trial period has expired, the software will not run unless a valid license is entered. This is not circumvented by installing and reinstalling the software. Only a valid license will unlock the software.

## Basic Concepts

### Communications

The **borgtech Data Loggers** use wireless data communications conforming to the IEEE 802.15.4 standard and operate in the 2.4GHz license free band.

This allows you to poll on demand and upload data without the need for a wired connection. This also provides user safety, data accuracy and gives greater convenience by using standard communication technologies.

The PC side uses a wireless USB interface that installs as a serial communications port. It uses the FTDI USB serial port drivers. These are generic drivers and will require you to OK their use with windows. They do not install as WHQL certified drivers by default. Just accept the dialogue boxes (there should be 2 of them) and you will be done.

### Selecting the Com port

The first time you use the software you will need to select the Com port. The dialogue for this is shown below.



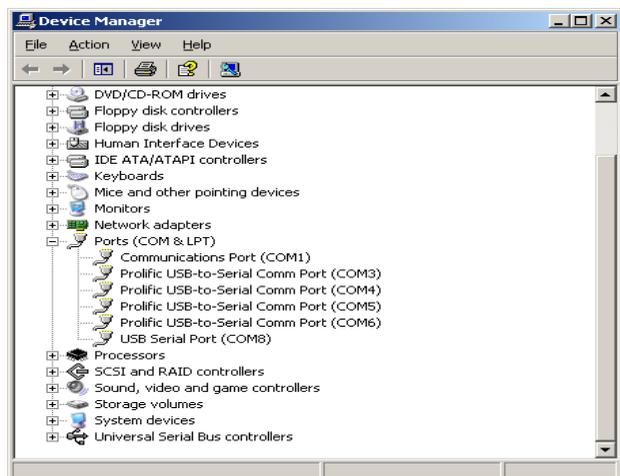
There will be an initial short delay while all the possible ports are scanned. Only the ports that exist and are available on your PC will be shown on the dialogue. This process can take up to a minute on older systems.

If the software simulated LED on the left side of the “Serial Port” selection box is red, then the port is not available for use or it doesn't exist on your PC. Change to another port until you find one that gives a green light. This will usually be above COM3. Many PCs with built in serial ports use COM1 and COM2 for their own system purpose also the inbuilt modem is usually assigned as COM3 by the operating system. New USB based ports usually start at COM4 onwards. Keep this in mind while selecting your appropriate port.

Once you have assigned the port you will need to wake a logger and see if it connects. If it does, there will be a second beep and the it will appear on the Start Screen.

**Note:** If you want to manually check the ports available then you can use Windows 'Device Manager'. This is opened using *Start >Control Panel* then opening the *System* applet and going to the *Hardware* tab. Expand the *Ports* section to see the available communications ports. If other ports are shown on the Ports dialogue for the software that means that another program has taken control of the port and it is not available for use.

Here is what the device manager looks like.

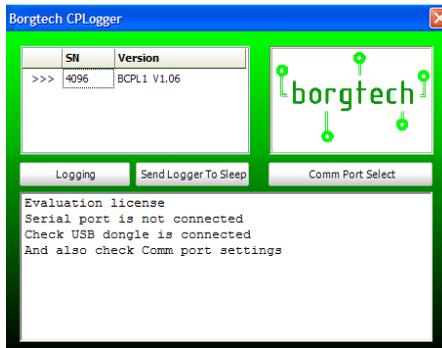


Once you have established the port to use, put the dongle into the same USB port and the same Com port will be assigned to it by the PC. This avoids a lot of frustration with the Com port number changing. It is a feature of Windows rather than the CPLlogger software.

## Attaching the logger

A data logger must attach itself to a PC or laptop before it can communicate. If the PC software is already running then this happens automatically and the logger will appear on the screen showing its serial number and software revision. Click on the line with the logger SN and it will be selected and its device information will be displayed in the text box below it.

The start dialogue below shows a logger attached to the PC software and the device information for it.



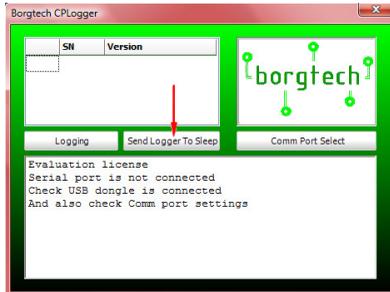
To conserve power, the loggers leave their wireless communications modems off most of the time. They only turn them on under one of the following circumstances:

- when new batteries are installed
- when a magnet is used to wake the unit

Once on, the radio modem will shutdown if it does not manage to attach within 30 seconds. Just wake it with the magnet near the base of the unit if this happens. It should then attach within 5 seconds.



Once it has attached, the radio modems are kept actively turned on for 2 minutes after the last user transaction. The typical power consumption is much higher (about 400x) with the radio modem actively on, as compared to it being on sleep mode, so to get the best performance from your batteries, turn the units to the sleep, low power mode once you have finished performing all required tasks.

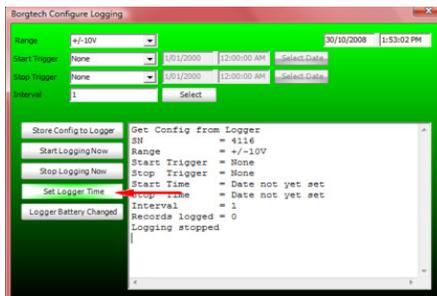


See the **Basic Operations** section on how to select a logger if more than one is attached.

## Time Management

The loggers contain a battery backed RTC (real time clock) that keeps the time of the day accurately. However it can drift slightly over time and not every PC has exactly the same time on it. So for best operation, it is preferable to synchronise the logger clock to match the PC clock before starting a new run.

The **Set Logger Time** button on the configure logging dialogue does this. The device information shows the current time according to the logger and so you can check this against the PC time which is shown at the top centre of the main dialogue.

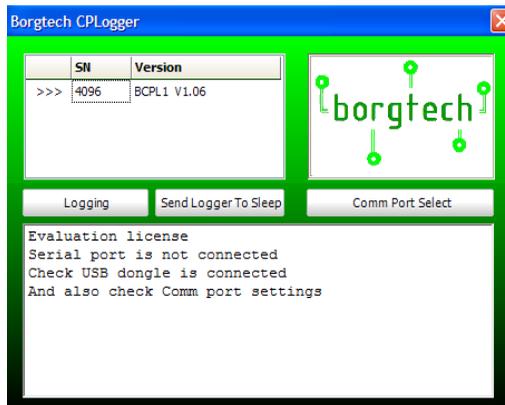


# Basic Operations

The basic operations of the unit allow you to:

- select a logger
- check the device information
- check the software version
- configure logging
- poll the logger for its current reading
- get the log from a logger
- load and view existing data files
- sending a logger back to sleep
- updating the logger software

The *start dialogue box* that appears when the program is running is as follows.



All the logger functions are accessed through this dialogue box and the ones that follow it.

## **Selecting a Logger**

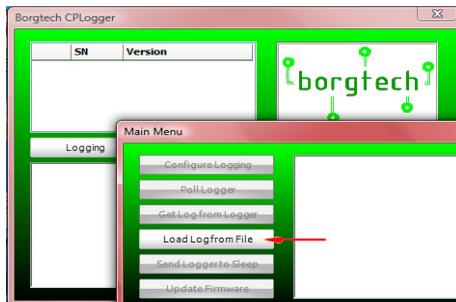
If only one logger is attached, then it is selected by default. This is shown by the selection indicator which looks like this >>> in the left hand column of the device list panel which also shows the serial number and the logger software version. (See picture above)

If more than one logger is attached, the selection can be moved by clicking on the logger you want to select. The selection indicator will move to the logger. If there are more than 4 loggers attached, scroll bars will appear so you can scroll down to loggers not in view at the time.

To select a different logger click anywhere on the line that contains the logger's serial number to select it and the >>> will move to that line.

Although several loggers may be attached it is advised to work with only one logger at a time. This simplifies the operations and ensures that the upload of logs, setup of runs, updating of firmware and polling of loggers works without interruption.

Some operations are only possible if a logger is attached. The **Logging** button will show the Main Menu dialogue with only the ability to load a log from a data file if there are no loggers attached.



## Checking Device Information

When you click on the logger to select it, the device information will be displayed.

This includes:

- Serial Number
- The current time according to the logger
- Date of the last RTC battery change (service information - this is separate to the main batteries which power the logger)
- Date the next calibration is due

- Date of the last battery change for the main batteries (useful for seeing what the typical battery changeover time is for your specific application)
- The current battery voltage (should be above 3.8V for reliable unit operation and above 4.5V if the batteries are new)
- The logging status

The remaining actions are all accessed through the Main Menu which is opened by clicking on the **Logging** button on the start dialogue.

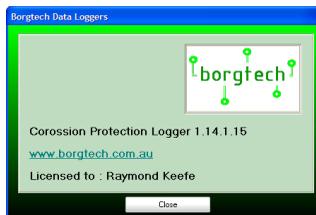
The Main Menu looks like this:



## **Firmware & Software Version**

The firmware version of the logger is shown in the attached logger list on the first screen. The software version for the PC software is shown in the **about** dialogue. To open this click on the **borgtech logo** and it will open the about dialogue. See below.

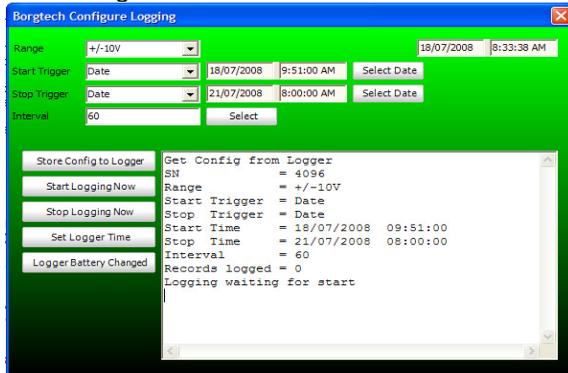
The software version is shown on the top line. From this dialogue you can also go the **borgtech** web site by clicking on the link of the Borgtech logo. The bottom line shows the licensee name. Use '**Close**' to close the window when you are done.



## Configure Logging

To configure the logger for a new logging run, click on the **Configure Logging** button. This will open the dialog that lets you set up a new logging run, or you can manually start, stop and run from the PC.

The dialogue looks like this:



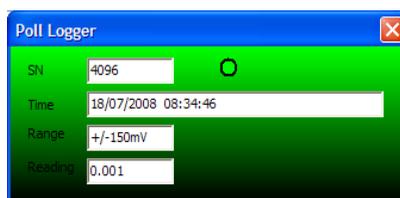
When this first opens it reads the current configuration from the logger. If it doesn't succeed or the logger went back to sleep. Close it, wake the logger again with the magnet, select the logger and work your way back here by clicking on **Logging** then **Configure Logging**.

If the current details are all you wanted to know then you can close the dialogue. For more details on how to configure a logging run see the **Logging** topic further on.

## Polling a Logger

To continually poll a logger for its current readings click on the **Poll Logger** button. This will open the graph and also show the poll dialogue. Polling begins immediately unless the logger is offline. If it is, wake it again with the magnet and try again.

The poll dialogue is shown below:



It shows the raw data read from the unit. The readings are updated once a second and if the reading was also logged by the logger then it will appear marked as a heavier green diamond on the graph. It does not interfere with any logging that is going on so you can poll a logger to confirm the data is being logged correctly without adversely affecting the logging run.

The Graph will update and show the last 50 data points while polling. Once you have stopped polling, you can explore the data more thoroughly or even save it to disk.

To stop polling, either click on the **Stop** button on the graph (lower right corner) or close the poll dialoge. This will stop the polling but the data will still be retained. The **Stop** button will now change to say **Save**.

To save the data, click on the **Save** button on the graph. Also, if you close the graph and there is unsaved data, it will give you the chance to save it then.

See the **Graph** topic for more details on using the graph.

## *Collecting a Log*

If the logger has a log on board, then you can collect the log and view it on the graph. From there you can also save it to a file. Even if the logger is still logging you can collect the readings so far, without affecting the logging.

If there is no data to get the software will give an error message, otherwise the data will be transferred to the PC. It is not deleted from the logger until the start of a new run so you do not need to worry about it being interrupted and losing you data. The data can be retrieved again.

Once the data is transferred the graph will appear. If a lot of data needs to be transferred, a progress dialogue will appear. See below:



## **Load & View Existing data files**

This can be done directly from the main screen without any logger attachment needed. This allows you to load data already saved to your local disk or network directory back into the borgtech software graph for review.

Click on the button and you will be able to select the file and load it for examination or to save into a different file format for transfer into other analysis software.

## **Sleep Mode**

To conserve battery life you can send the logger to sleep rather than waiting for it to go to sleep after 2 minutes. This also simplifies the handling of multiple loggers by ensuring that only the logger you need to interact with is awake.

## **Updating the Logger Firmware**

From time to time borgtech may upgrade its firmware code by e-mailing or posting on its web an update file. If there is a firmware update available and you want to update the logger with it,

Then download the file and use this button.



You will be asked to select the new firmware file and then the logger will be updated. This takes less than a minute. If the logger was asleep then wake it and try again.

Do not shut down the logger software, unplug the dongle or change the logger batteries while doing this. If you do then you might need to get the logger serviced to recover.

Any logs stored in the logger will still be there however if you were logging when the update started the log will stop. Alternatively you may stop any active logging from the configure logging menu prior to commencing the update.

# Logging

The logger records voltage readings. Because it is battery operated and not electrically connected to anything else it does not disturb the voltages being read and so does not introduce any errors that may occur as a result of these other types of connections.

In addition, the ability to poll the logger in real time without adding any disturbing connections is a further advantage. Readings are the same whether polled or recorded independently by the logger.

Real time monitoring can be conducted during a logging run and will not disturb the logging run in any way. The real time values are recorded on the PC at 1 second intervals regardless of the logging interval.

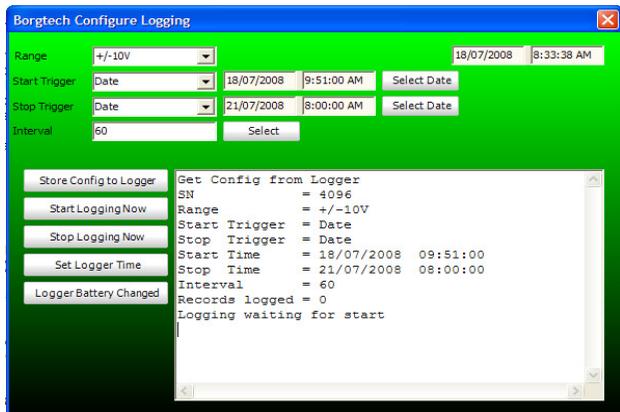
The graph shows values which also logged by the logger run as bolder mark than the rest of the values so you can correlate readings.

More on this is covered in the **Graph** topic.

## **Logging Run Basics**

A logging run is carried out by the logger itself. Voltage readings are taken at the specified interval and recorded in the internal non-volatile memory. Even if the battery becomes depleted, all the readings taken up to that point are still intact and can be retrieved.

A logging run is defined using the Log Configuration dialogue accessed by the **Configure Logging** button.



When it first loads, the logger is interrogated to retrieve its existing log configuration. This gives the basic details of a logging run including:

- Serial Number of logger .
- Voltage range
- Start trigger: how the run will start or was started
- Stop trigger: how the run will stop or was stopped
- Start time: the time at which the run started
- Stop time: the time at which the run stopped
- Interval: the time in seconds in between each reading
- Records logged – number of records stored
- Logging state - stopped, waiting to start or logging

With this information all the relevant details about the readings themselves can be determined at a glance.

If a logger does not respond because it has gone to sleep then close this window, wake the logger, make sure it is selected and come back to this point again via the **Logging** and **Configure Logging** buttons.

The information read from a logger is used to update the fields at the top of the window.

## **Configuring a New Run**

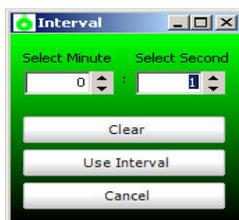
Before beginning a new log run, a small number of decisions need to be made by the user:

- What voltage range is to be used
- What is the time interval between readings
- How will the run be started
- How will the run be stopped

Once these are decided, the run can be set up.

The Range is selected using the range drop down box.

The interval is set by the interval field. Either enter the interval in seconds or use the **Select** button next to it to input it in minutes and seconds.



The run can be started either **Immediately** by the PC, at a set time and date, or using the magnet. To start it using the PC select **None** as the start trigger. In this case you do not need to select a time. If no time is selected the time field is greyed out and can be ignored.

To start a run with a magnet select **Magnet** as the start trigger. Use this option for on test site or later activation. The time field can again be ignored.

Note: Don't forget to get your magnet before leaving

To start a run at a specific time, select **Date** as the trigger then select a date and time. Use **Select Date** to open this dialogue and set the date and time for the run to start.



The date is selected from the Calendar field. Use **Go To Now** to set the fields to the current date and time.

Cycle through the months using the inner set of arrows at the top or the outer set of arrows to cycle through the years. Click on a day and it will become the date to use.

This will be reflected in the final result field on the left.

The time is selected with the Hour and Minute fields. The up and down arrows increment and decrease these fields. A number can be typed in directly or a default 0s is used.

Click on **Use Date and Time** to use the value or click on **Cancel** to abort the selection. Either way you end up back at the Log Configuration dialogue.

Stopping a run is configured the same way with one additional option. If the Stop Trigger is left as **None** then the logger will stop when one of these occur:

- the memory is full
- it is manually stopped from a PC
- the batteries are depleted

Click on **Store Config to Logger** to store the log run details in the logger. Up until then it appears on the PC dialogue but the logger has not been changed yet. If it has gone to sleep and it is the only logger that was attached, then bring it awake and let it attach again using the magnet. Don't exit from this dialogue while the logger is waking up. You will lose your settings because the dialogue reads back the logger's settings when you open it again. Once the logger is re-attached you can finish the operation.

### ***Starting a Run Manually***

Once the log run definition has been saved to the logger, use the **Start Logging Now** button to start the run manually. This can be done at any time. Even if the start was set to Date or Magnet a manual start will override these settings as long as the logging hasn't already started. If it has started, then the manual start is just ignored.

### ***Stopping a Run Manually***

Use the **Stop Logging Now** button to stop a run already in progress. If the logger is waiting to start (waiting either for the right time or a magnet) then it will stop the run with no data recorded. If the run is already stopped then the manual stop is ignored. A manual stop will override a programmed stop time or stop on magnet setting.

### ***Starting a Run Magnetically***

To prevent accidental starts or stops, the magnet must be held next to the unit for at least 2 seconds. The unit will then beep 13 times to indicate it has started. Withdraw the magnet once it has started. If the ambient noise is very high the beeps might not be easily audible, so holding the magnet in place for a little longer and lowering the unit closer to your ear may be advisable. The reason for lots of beeps is to make it more likely to be heard.

### ***Stopping a Run Magnetically***

The magnet must be held next to the unit for at least 2 seconds. The unit will then beep 14 times to indicate it has stopped. Withdraw the magnet once it has stopped. If the ambient noise is very high use the method described previously or else manually stop using the PC.

**Note:** Once a run is stopped it can not be restarted with a magnet. You must use a PC to configure a new run.

## ***Starting a Run by Date & Time***

If the log trigger is using the date setting then the log run will start as soon as the start date has been reached. If you used a start date and time from the past then the run will start as soon as you download the settings to the logger. The logger will beep 3 times when the logging begins.

## ***Stopping a Run by Date & Time***

If the stop trigger is using the date setting then the log run will stop as soon as the stop date has been reached or passed. If the stop time was in the past then it will stop immediately. The logger will beep 4 times when stopping.

## ***Setting the Time***

Use **Set Logger Time** to synchronise the selected logger time with the current PC time. It is a good idea to do this before configuring a new run. You will be asked to confirm the operation.

## ***Battery Changeover***

This is optional and the logger does not do anything with the information except remember it.

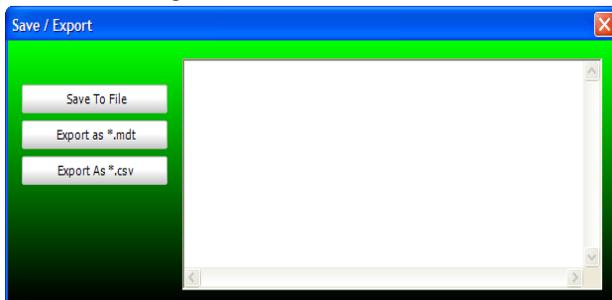
If you want to determine actual battery service life in your specific application, use this to set the item when you change the batteries and monitor battery voltage using the device information on the Start Dialogue.

This will allow you to work out the real service life for your usage and predict changeover intervals. The battery life estimates for the logger assume premium grade alkaline cells are used. Rechargeable or alternative batteries may have reduced service life.

# File Handling

The File Dialogue is used to save new records from a logger or export records into another file format.

The File Dialogue is shown below.



## *Saving Records*

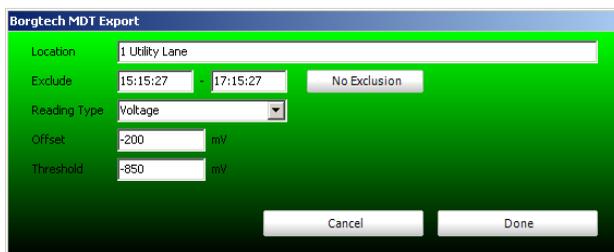
This is done the same as loading them from file. Use **Save** and then browse to where you want to save them.

## *Exporting Records*

Records already loaded, either from a file or from the logger, can be exported into other formats. There is a generic CSV format and the MDT format is also supported. These record types cannot be read back so make sure you also have the data saved using the **Save** button.

## *MDT Export for GN-Winchart*

For .MDT file extension export for the GN-WinChart, the following dialogue will appear and allow you to enter data specifically required for that format.



This allows you to enter:

- A text string describing the location. This data can be in any format and will appear exactly as you type it.
- The exclude fields allow you to specify a time range that is to be ignored.
- The Reading Type can be voltage or current shunt and the remainder of this dialogue changes depending on which type it is.
- After selecting the Reading Type, you can enter with the earth stake offset in mV or the current conversion ratio in A per 10mV units.
- And the assessment threshold is then entered in either mV or A.

You can then select where to save the file and it will be exported in the .MDT format. The statistical analysis is not done on the exported data since this can be done using the importing software.

Note: Programs that import .MDT data require the filename to conform to the old DOS 8.3 file format. So make the filename a maximum of 8 characters to avoid import errors.

## **CSV Export**

For the .CSV file extension export option only the records, their date and time are exported.

The format is:

Reading in V as a floating point number, Data in the order of Year/Month/Day Hour:Minute:Second (YYYY/MM/DD 24HH:MM:SS),

An example line is:

*7.09508 1e-02, 2007/10/29 16:57:54*

# Graph

The graph windows allows you to look at the loaded records. Unless real time monitoring is in progress, you can freely navigate around the records. In real time monitoring this is overridden and the last 50 records are always displayed.

## *Navigation Concepts*

The records are stored internally and only viewed on the graph as required. So the user can explore the graph in any way required and it will not alter the stored records.

The graph is sizable and can be made as large or as small as you like. This is particularly useful on wide screen LCD displays where you can take advantage of the wider display area to show either more records or more detail. The initial size of the graph is conservatively designed to suit a standard 17" PC monitor.

There are 3 ways in which the mouse can be used to directly navigate using the graph and the left mouse button:

- **Select** - where dragging a select box around an area in the graph window will zoom in fit that data to the current window
- **Pan** - where you can drag the data backwards, forwards, up or down
- **Zoom** - where dragging left to right expands the item scale and right to left contracts it; up and down are used to expand or contract the voltage scale

The Zoom mode is very powerful for getting to exactly the range and level of detail you want.

Use the radio buttons at the top left of the graph to set the type of mouse action to use when the left mouse button is used to drag over the graph.

## *Paging*

Where there are many data points (we support up to 1e6 or 1,000,000 records) then the graph can be adjusted into pages of information.

The **Fit** button will make sure all data is visible.  
The **Fit X** button will make sure all data is present across the time range.

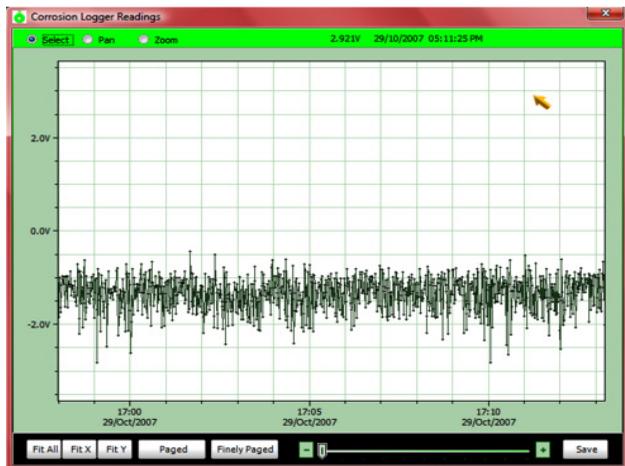
The **Fit Y** button will make sure that all data is present across the voltage range.

The **Paged** button will break it up into 10 pages unless there are less than 50 data points.

The **Finely Paged** button will break it up into 50 pages unless there are less than 500 data points in which case it uses the **Paged** settings.

In paged or finely paged modes a horizontal navigation control appears that allows you to move from page to page. You can drag the centre control or use the left and right buttons to step backward or forward through the pages.

Note: Closing the graph does not erase any data.



At the top right of the bar above the graph the current position of the mouse is reported whenever it is over the graph. As the mouse moves over the graph the current position is updated and displayed.

### **Saving the Graph Data**

The data displayed in the graph window can be saved or exported directly from the Graph window by using the **Save** button located on the lower right of the screen.

# Issues & Notes

USB not working: *Possible cause* - If you change the USB port by unplugging and replugging it then the COM port number assigned may have also been changed by the Operating System.

*Possible Solution* - Check the port dialogue box on the borgtech software and also in Win... Device Manager.

RTC battery: The RTC battery is separate to the main battery that powers the logger. It keeps the time even when the main batteries have been removed or depleted. It can only be changed as part of the routine service and calibration process performed by borgtech.

Winchart won't import the .MDT file:

*Possible Solution* - If GNWinchart won't import the MDT file, then check its name length. If it is longer than 8 characters you can rename it by using Windows Explorer. It should then import OK.

Changeover battery: Using a low speed power tool fitted with an Allen Key tip, hold the logger upright and remove the 4 cap screws. Be careful not to damage the rubber seal when removing the cap. To release the electronics and battery holder you will need to also undo the inner screw. Then simply replace the batteries and close all parts gently. *Please NOTE to keep seal intact do not over tighten the cap screws*

Care of Terminals: In order to maintain proper readings please make sure there is no fouling materials on terminal ends, especially if removing leads is common practice. Make sure that the test points are making good contact with logger terminals.

Calibration Service: All loggers are calibrated before initial purchase shipping. However borgtech recommends that a 6 monthly routine check and recalibration be performed on all loggers for factory compliance report and end user peace of mind.

Win Help in Vista: In most Windows Operating Systems you can access our help menu simply by pressing the 'F1' function key on your keyboard. Vista however does not include this functionality for this to work you will need to install the files included on your CD. Explore the folder and follow the instructions.

# IP & Warranty Overview

Intellectual Property: All IP and related items both in the software or hardware remain the property of borgtech and may not be copied, reproduced or an attempt made to break it's code.

Product must be used in no other manner than for the purpose it was made and sold for as stated in the documents provided at the time of purchase which can also be viewed from our website at [www.borgtech.com.au](http://www.borgtech.com.au).

Software and licence are not to be distributed or replicated in any form or part thereof or installed in more than a single machine per licenced user except where a written agreement is in place with borgtech prior to the installation.

Warranty limitation: A standard 12 months back to base warranty applies to defective parts or workmanship on our loggers. If such a defect exists, at its option borgtech may:

- (1) repair the product at no charge, using new or refurbished replacement parts,
- (2) exchange the product with a product that is new or which has been manufactured from new or serviceable used parts and is at least functionally equivalent to the original product,
- (3) or refund the purchase price of the product.

A replacement product or part assumes the remaining warranty of the original product from the date of replacement or repair onwards. When a product or part is exchanged, any replacement item becomes your property and the replaced item becomes borgtech's property. When a refund is given, your product becomes borgtech's property.

This warranty is limited and does not include manufacturer's recalibration services or onsite troubleshooting and does not include any other services or products implied or otherwise mentioned in this or any other communication.

Warranty is void if the product is misused or mishandled in any way contrary to the specifications given in this manual and any other communication sent out or given in any other way to the user in recommendation of use of the product by borgtech staff or any of our distributors whether directly or otherwise.

Borgtech is not responsible for direct, special, incidental or consequential damages or loss of life resulting from any breach of warranty or condition, or under any other legal theory, including but not limited to lost profits, downtime, goodwill, damage to or replacement of equipment and property, any costs of recovering, reprogramming, or reproducing any program or data stored in or used in conjunction with borgtech's products whether directly or otherwise, and any failure to maintain the confidentiality of data stored on the product.

Borgtech specifically does not represent that it will be able to repair any product under this warranty or make a product exchange without risk to or loss of programs or data.

Borgtech does not represent that its products are in any way intrinsically safe or otherwise compliant, although all perceivable safety features and protective inbuilt design measures have been taken into consideration. borgtech does not guarantee and is not responsible for direct, special, incidental or consequential damages or loss of life of any person or equipment resulting from the use of it's products.

Borgtech reserves the right to amend this warranty terms or parts thereof without further communication. It is therefore recommended that the client should visit borgtech's website to download the latest terms and conditions document.

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***borgtech***

Phone: +613 9731 1171

Fax: +613 9731 1181

[info@borgtech.com.au](mailto:info@borgtech.com.au)

<http://www.borgtech.com.au>

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