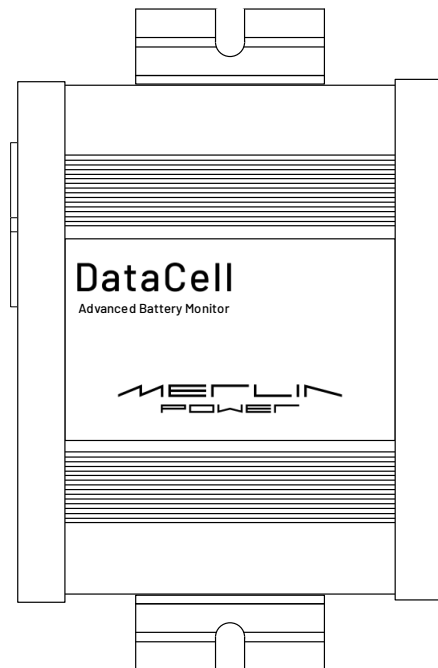


DATACELL I PROGRAMMING GUIDE

Revision: A



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VERSION HISTORY

Revision	Implemented By	Revision Date	Approved By	Approval Date	Status
1.0	J. Hortop	04/10/2013	J. Hortop	04/10/2013	Initial Release
2.0	J. Hortop	07/10/2013	J. Hortop	07/10/2013	For Review
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A	M. Harrison	15/03/2024	L. Harris	15/03/2024	Updated

Please ensure that the version of this document you are using is current. Merlin Equipment reserves the right at any time, whether documented within this guide or elsewhere to change, modify or withdraw features and specifications.

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INTRODUCTION

DataCell I is a complete battery monitoring system. The system provides high levels of monitoring of batteries and electrical systems and is designed with minimum power consumption in mind.

DataCell I has been designed for use within mobile platforms, (e.g. vehicles, boats, trailers) but equally could be used for monitoring of batteries within static locations.

DataCell I provides the following information for 1, 2, 3 or 4 independent battery banks (number of batteries monitored dependent on model):

- Battery Voltage
- Battery SoC% (State of Charge %)

The DataCell I has the following additional outputs:

- 1) RS232 data output. This output is used for:
 - Programming the unit from a PC
 - Outputting battery information to Merlin Software
 - Running data logging using Merlin Software
 - Interfacing with 3rd party equipment
- 2) MerlinNet data output. This output is used for:
 - Connection to a Battery Management Display Panel
 - Connection to other Merlin compatible devices e.g. PowerBank

DataCell I can be used in various different ways, the most popular include:

- As a 'conventional' battery monitor in conjunction with the Display Panel.
- As a PC interfaced battery monitor (displaying data on the M-Power software or on Merlin Dashboard Software).
- As a discrete module where no user interaction is required.

Please take the time to read and understand this manual before commencing configuration.

HOW DATACELL I WORKS

Caution: DataCell I is designed for 12 and 24V DC common negative ground systems. Do not use on positive ground systems. For installations with multiple battery banks, each must share a common ground. Multiple individual batteries can be monitored but with independent DataCell I units.

DataCell I uses a very different method of calculating battery state of charge compared to a conventional battery monitor. It is important that you understand how it works so that you are able to make the most of your DataCell I.

Model Based Calculation: DataCell I uses the proven Merlin SmartGauge technology of advanced battery modelling and monitoring techniques to determine the state of charge (SoC) of your battery bank as a percentage of its true, currently available, capacity.

By directly displaying the SoC as a percentage of the remaining battery capacity, DataCell I provides significant advantages over conventional shunt-based battery monitors.

Shunt based battery monitors work in the following manner: Starting from a 'known' point (usually 100% charged) and knowing the amp hour capacity of the battery, they count amps out of the battery (during discharge) to determine the amp hours left in the battery (and mathematically, a State of Charge in %).

The problem is that the number of amp hours available from a battery change significantly with temperature, type, age and condition of battery as well as how the battery is physically charged/discharged. This creates an inherent inaccuracy with shunt-based amp hour counting battery monitors.

To overcome this, conventional meters often have an automatic reset feature. When certain parameters are met (usually referred to as the "charged parameter") the monitor assumes the battery is 100% charged and automatically resets. It takes a very long time to reach 95% plus of charge (under extreme circumstances this can take days) which means that unless the platform is plugged into shore/grid power, the battery monitor won't reset. Typically, accuracy error is around 10% so, if auto reset doesn't occur, it's easy to end up with a compounded battery monitor error of 20, 30 or even 50% within a very short period of time.

Because DataCell I does not use amp hour counting as a basis to determine SoC, DataCell I is not subject to these errors. These include: No synchronisation error, no shunt to install, just two cables per battery required for installation and State of Charge information is always accurate.

Battery Models: DataCell I is designed for lead/acid batteries including:

Conventional wet lead/acid
Semi Sealed Lead/Calcium Batteries
Sealed Lead/Acid Batteries
AGM (Absorbed Glass Matt)
Gel
Spiral (Optima, Cyclon etc.)

DataCell I needs certain parameters to be set to function correctly. These are set within the Merlin software.

BEFORE YOU BEGIN

COMPUTER / SOFTWARE COMPATIBILITY

Merlin 'DataCell and Monitor' software is designed to operate on a PC running Windows XP or later. . It should not be used on other devices such as Mac or partitioned systems as this may cause configuration issues.

FTDI CONVERTER

DataCell I uses an RS232 Serial Link to connect to your laptop or personal computer. This must be used in conjunction with the supplied FTDI USB/Serial Connector. Do not connect the DataCell I directly to a serial port on your PC.

NOTE: Due to the significant variances in quality and configuration of USB converters, DataCell I will only operate with an approved FTDI Converter. This is supplied with the unit. If additional converters are required, they may be sourced directly from your Dealer, Merlin or FTDI directly.

DataCell/PowerBank/PowerBank Combi Programming Kit: Merlin Part Number 19-5004

PROGRAMMING CABLE CONNECTION

To carry out programming, connect the DataCell I to a USB socket on your PC via the programming cable and FTDI adapter cable.



Fig 1: Programming Cable & FTDI Converter

The FTDI converter connects to a USB socket on your PC. The 4-pin RJ11 connector connects to RS232 socket on the DataCell I.

PROGRAMMING

DataCell I is factory shipped pre-configured for the number of battery banks as ordered. However the unit must be configured for battery voltage, type, etc. The remainder of the set-up procedure is completed through software as detailed below:

Ensure that the Merlin 'DataCell and Monitor' software is installed upon your PC or laptop. This is either supplied with the device or available for download from the Merlin Power website.

Before connection of the programming cable, ensure that the applicable FTDI device driver is installed on the PC. This is available either direct from the Merlin Power or FTDI websites.

Once the FTDI driver is installed, please carry out the following:

- Plug the FTDI USB/Serial Converter into a free USB port in your PC.
- Wait for up to one minute for your PC to recognise the new device.
- Windows may find the saved driver automatically. If asked for a location of the driver, point windows to the saved Driver file.
- Once completed, windows will provide a "This device is ready for use" message. Click start and type in "Device Manager". Device Manager can also be found in your Windows Control Panel. When open, look for "Ports", click on this - the COM ports that the PC is using will be displayed. Against one of these USB Serial Converter will be displayed. Note down the COM port number assigned.
- You are now ready to connect the DataCell I to your PC.

NOTE: These instructions are for first time use. The PC should automatically recognise the FTDI converter and the driver etc. It will also remember the COM port assigned. Therefore, if you power down your PC and repower it later, DataCell I should automatically be found by the PC (provided that the converter remains plugged into the same USB socket).

If the FTDI converter has been unplugged from the computer and plugged back in again, windows may assign a different COM port number. You may need to click "Refresh Comm Ports" under the "Settings" tab in the software.

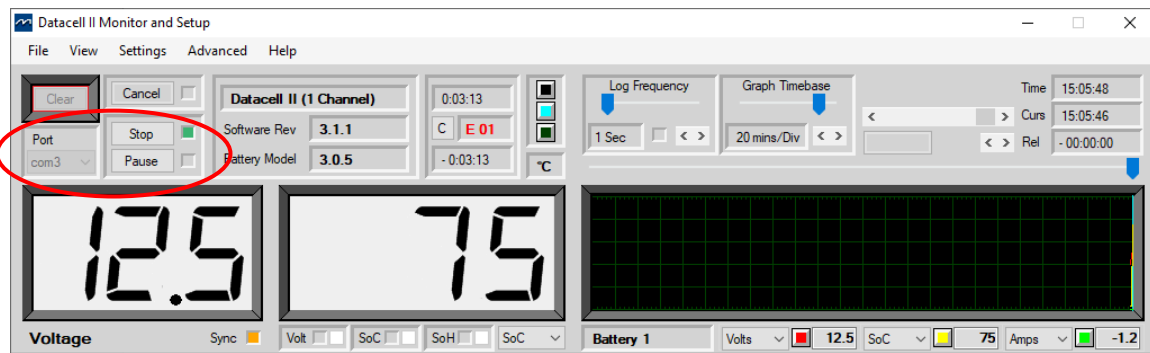
If, when reconnecting the USB converter (perhaps because in normal use you will use the DataCell remote panel), the PC doesn't seem to 'find' the converter ensure that:

1. You have plugged in the converter without the DataCell I connected.
2. You have waited up to 1 minute for the PC to find the converter and load the driver.
3. Go to Device Manger, check under Ports to see which COM port has been assigned to the USB Converter.

Once installed, connect the programming cable to the DataCell I ECU via the RS232 connection. Open the Merlin DataCell Monitoring software.

Establishing Communication

Click the "Stop" button and choose the COM port you noted down previously in the upper left corner of the window.



Click the 'Start' button, ensure that communication has been established (data will be displayed).

If a COM port is not displayed the software will not be able to communicate with the DataCell I.

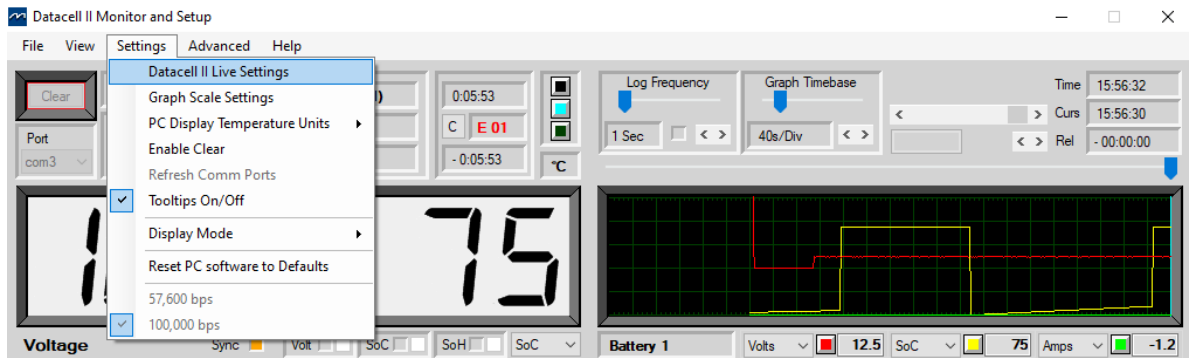
If no data is not displayed, click 'Stop', 'Settings', 'Refresh Comm Ports', choose Comm Port and click 'Start'. You may have to do this more than once.

DataCell Live Settings – Master Functions

DataCell I must be properly configured to provide accurate and meaningful battery data. Configuration tells DataCell I what type of batteries are being monitored and allows you to set alarms and, alarm thresholds.

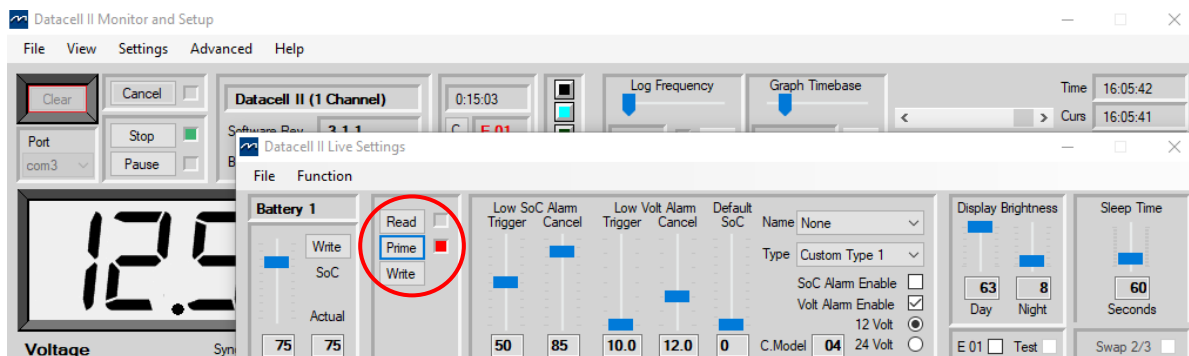
DataCell I is configured "On the Fly". This means that your PC talks directly to the microprocessor within the ECU.

- Click “DataCell Live Settings” box under the “Settings” tab.



The DataCell Live Settings box will appear. To prevent accidentally changing settings, three buttons are provided labelled:

- a) Read: This reads and displays the current settings from DataCell I.
- b) Prime: Unlocks the settings in the window. Once prime is selected, you can adjust settings.
- c) Write: Writes the settings that you have changed back to the DataCell I internal memory.



Click the ‘Prime’ button, and configure the following settings:

1. Battery Name: Batteries can be named using preselected names from the drop-down box (e.g. Engine, Auxiliary etc).

Note that this is the name that will be transmitted to any connected devices (e.g. a DataCell LED or LCD Panel).

2. Battery Type: Those available as in standard shipped product are:
 - Deep cycle: Wet cell, antimony lead acid.
 - Gel: Cell lead acid (a type of VRLA – Valve Regulated Lead Acid).
 - AGM: Absorbed Glass Matt (another type of VRLA).
 - Hybrid: Calcium/antimony (usually marked as dual purpose or “leisure”) lead acid.
 - Carbon Fibre: Lead acid.
 - Maintenance Free: (wet cells but no way to top up the electrolyte) lead acid.
 - Custom Type.

Note: Genuine AGM's have the electrolyte held in a glass mat but with additional chemicals in the battery. They require higher charge voltages and the off-load terminal voltages will be similar to gel cells. Only this type requires DataCell I to be set to AGM Type 1.

There are other Glass Mat type batteries without the additional chemicals. This type usually has charge voltages very similar to flooded wet cell batteries.

The off-load terminal voltages will also be very similar to flooded wet cell batteries. If your AGM batteries are of this type, then DataCell I should be set to AGM Type 2

Custom Battery Models: Certain customers may have requested custom battery models for specific makes and models of batteries. If this is the case, Merlin Power will have provided the custom battery model. See Loading Custom Battery Types on page 13.

3. Battery Voltage: 12 or 24V depending on battery bank voltage.

Note: Maximum displayed for 12V setting is 19.3V.

4. Default SoC (State of Charge):

The "Default SoC" slider sets the State of Charge value that the DataCell I would assume if power is lost or reset. We normally recommend that this is set at 75%. However, for safety critical applications, it should always be set to zero.

5. Low Voltage Alarm:

Trigger and cancel alarm levels are set and enabled from this page.

Note: Volt Alarm Enable box must be checked for this alarm to function.

6. Low SoC (State of Charge) Alarm:

Trigger and cancel alarm levels are set and enabled from this page.

Note: SoC Alarm Enable box must be checked for this alarm to function.

7. Display Brightness: Set the display illumination levels for Day and Night.

Note: Default setting is 63 Day / 8 Night respectively.

8. Sleep Time: Time (seconds) that the display will remain illuminated for after last button press.

9. E01 Check Box: Used to enable / disable 'E01' alarm. E01 alarm indicates when battery power has been disconnected to the DataCell I.

Configuration for your first battery bank is now complete. Select the “Write” button to write the new settings to the DataCell ECU. Repeat these steps for battery banks 2 to 4 (as applicable).

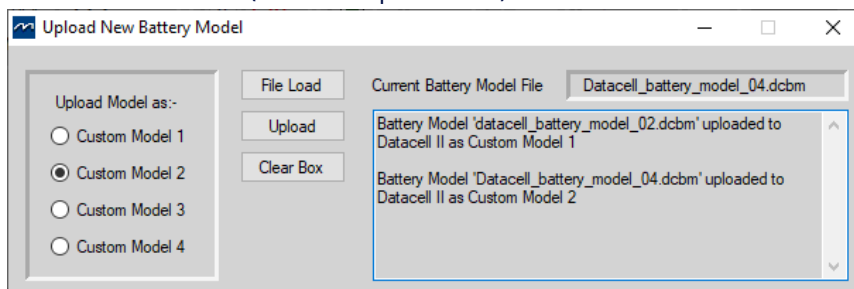
Loading Custom Battery Models

Where applicable, Merlin may be able to provide custom battery models for specific battery types which have been laboratory tested. Specific battery models are available for download from the Merlin Power Website.

DataCell I uses a battery model to calculate battery SoC (For model-based calculation). Where standard models are not being used (as selected within the DataCell software), each battery channel will require its own custom model to use.

This means that for a two channel DataCell I you will need to upload the battery model in twice (one for each channel), for a four channel DataCell I you will need to upload the battery model in four times (assuming each channel is using this custom battery type).

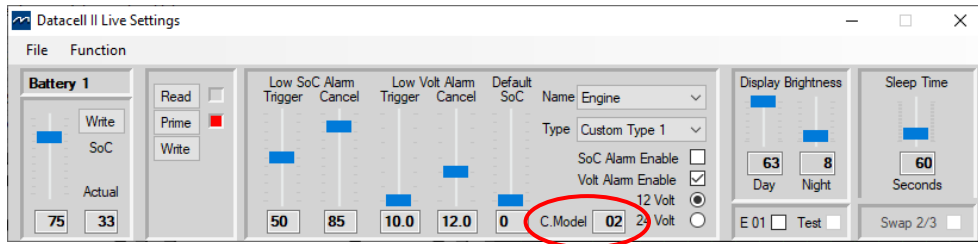
1. Download the battery model and save the file (.dcbm) in a known location on your PC.
2. Under the ‘Advanced’ menu, click on ‘Upload Battery Models’.
3. A new window will open. You now have the ability to upload up to 4 separate battery models to the 4 battery channels. You will be able to assign a different custom model to each channel if applicable.
4. Click on ‘File Load’ and select the battery model from your saved location.
5. Select the relevant battery channel (you wish to upload the battery model to) from the left-hand side window. To clarify, ‘Custom Model 1’ is for battery channel 1, Custom Model 2’ is for battery channel 2.
6. Click on ‘Upload’ . The right-hand window will now show which Battery Model has been loaded into which channel (see example below):



Battery Model 02 loaded into Custom Model 1 (Battery Channel 1), Battery Model 04 loaded into Custom Model 2 (Battery Channel 2).

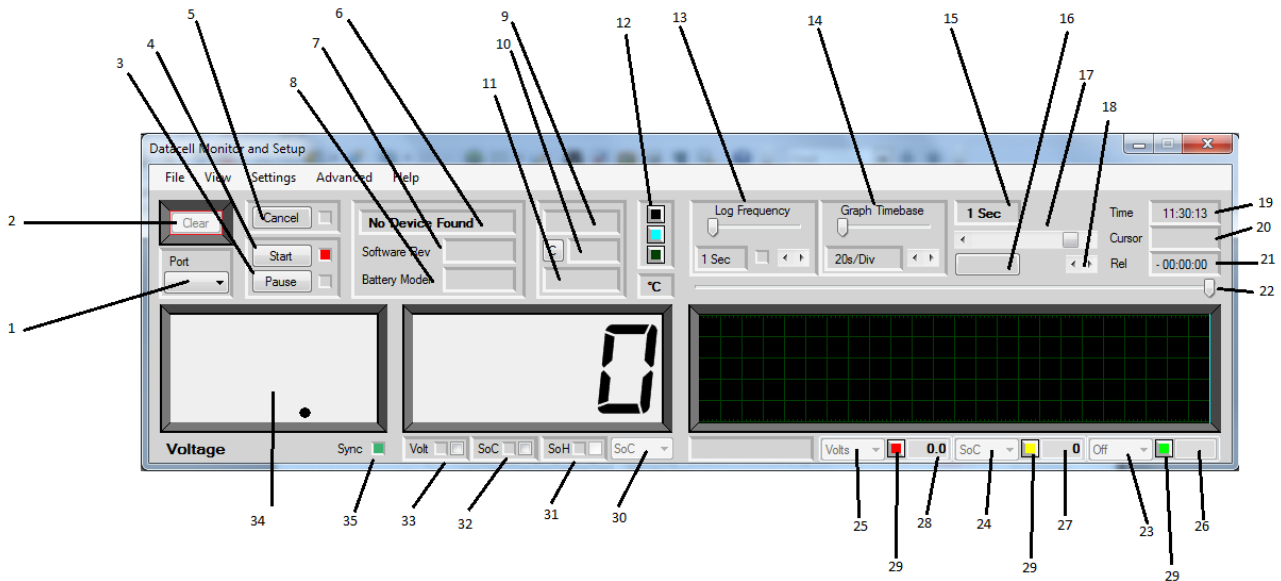
7. Repeat until you have loaded in all battery models for each channel you wish to use a custom model for. For example: if you have a 4 channel DataCell I and wish to use a custom model type in two of the channels (and the standard battery types for the others), you will need to upload the battery model twice.
8. Close the window, click on ‘Settings’ and select ‘DataCell Live Settings’. The Live Settings Window will open. For each applicable battery channel, click ‘Prime’, under Type, select Custom Type (numbered 1 for channel 1, etc) . Repeat for each battery which you wish to use custom models for.

Battery custom model number will now be displayed in the 'C.Model' window:



SOFTWARE USE

The following screenshots from DataCell I software show how the software can be used for diagnostics & data logging.



Main Screen Key:

1. COM port selector.
2. Clears the main graph display. This button has to be enabled under 'Settings' 'Enable Clear' to prevent accidental erasure.
3. Pause simply pauses the graph display. Pressing "Resume" will immediately update the graph and continue with no gaps.
4. Stop/Start. Stops and starts data reception from DataCell.
5. Cancel. If communication with DataCell fails (comms lead pulled out etc) the software will sound an alarm and this button will flash red. Clicking it mutes the audible alarm.
6. Displays the device currently connected (i.e. DataCell I 4 Channel).
7. Displays the software revision of the attached device (not the PC software revision).
8. Displays the battery model of the attached device.
9. Total operation time. Displays the time DataCell has been operating since power up.
10. Either "Normal" or "E 01". E 01 means power has been lost at some point since it was last cleared. This error can only be cleared by clicking the "C" to its left.
11. Total time since E 01 error was generated.
12. Colour buttons. Allows the graph colours (graph background, cursor and graticule) to be changed.
13. Log frequency: How often data is written to file when the software is data logging.
14. Graph Timebase: Time per graph division.
15. No Longer Available.
16. If the cursor and graph are not at the home position (i.e. the cursor at far right and the graph is positioned so that the far right is "Now") this button will flash and display "Home". Clicking the button will force the graph to the home position.

17. Adjusts the position of the graph window over the graph. This can also be done by clicking in the graph and dragging the graph to the required position.
18. Cursor fine adjustment.
19. Current time according to the PC system clock. If the PC clock is wrong, so too will this be. This time clock is used to time stamp logged data.
20. The time at the current cursor position. This was the time according to the system clock when that data was received.
21. The time of the cursor relative to the right-hand side of the graph.
22. Cursor adjustment.
23. Not used for DataCell I
24. Not used for DataCell I
25. Not used for DataCell I
26. Not used for DataCell I
27. Displays the graph data at the position of the cursor for this graph line. For DataCell 1 this will always be SoC.
28. Displays the graph data at the position of the cursor for this graph line. For DataCell 1 this will always be Volts.
29. Sets the graph colour for this function.
30. Selects the function of this "LCD". For DataCell 1 this is fixed to SoC.
31. Not used for DataCell I
32. If a SoC alarm has been set in DataCell, and that alarm has triggered, this LED will light up. An audible alarm will also sound. Clicking in the checkbox will cancel the audio. The alarm will remain triggered.
33. Does the same as 32 (above) but for a low Volt alarm.
34. 'LCD'
35. Sync Indicator – Not used for DataCell I

DataCell I Datalogging Functions:

Whilst the DataCell I is connected to a PC, you are able to Datalog all measured and calculated data to an Excel spreadsheet file. This is particularly useful for diagnosing electrical issues on your platform. The following logging features are available under the 'File' Menu:

Log as Spreadsheet File

Log all incoming / calculated data to a CSV (Comma Separated Values) spreadsheet file. You will be asked to select file location for the saved document.

Note that if the 'Log Frequency' is set to a very short duration (e.g. 1 Second) you will receive a file size warning. Depending on datalogging requirement a longer duration may be suitable. Note that battery information generally only changes over longer periods of time, so a log frequency of 1-5 minutes is normally perfectly acceptable in some instances.

Logging will continue until you stop it. This can go on for as long as you like (or until the spreadsheet file is filled up). Whilst logging is active, the 'LED' in the 'Log Frequency' box will illuminate. To stop logging uncheck the box in the same menu.

Note that the PC must be powered and 'on' for the logging to continue. Power save options may need to be disabled to stop computer going to sleep.

Save as Spreadsheet File

This is almost identical to “Log as Spreadsheet File” except in this case all the data currently in the PC (which will be displayed on the graph) will be saved as a spreadsheet file. Once saved the file is closed. Note: The graphs will only show the last 24 hours of activity.

This option will also save data that has been loaded in as a “DataCell Session” (see below)

Save as DataCell Session

This is similar to “Save as Spreadsheet File” except this doesn't save the file as a spreadsheet file. It saves it in a simple proprietary format which can be loaded back into the DataCell PC software for later analysis. This option saves what is already there then closes the file.

Load DataCell Session

This loads in a previously saved DataCell Session. Notice that it is “greyed out”. In order to activate it you need to stop reception from DataCell. This is to prevent you accidentally overwriting your current reception data with a saved file.

Save Screenshot

This saves a picture of the main screen as a bitmap image.

Error Codes & Product Help:

The ‘Help’ menu provides information on displayed Error Codes and DataCell Software information. For more information on the DataCell I Product (including product manuals) please visit our website: www.merlin-power.com



If your product requires troubleshooting or warranty service, contact your merchant. If you are unable to contact your merchant, or the merchant is unable to provide service, contact Merlin directly at: Merlin Equipment Ltd, Clyst Court, Hill Barton Industrial Estate, Exeter, Devon, EX5 1SA, United Kingdom. Tel: +44 (0) 1202 697979.