

OpenSerialDataExplorer

(based on version 2.1)

Users Guide

Winfried Brüggmann, February 2010

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Introduction

The OpenSerialDataExplorer is a tool to gather, view and analyze data which comes from devices with a serial data port. The application itself runs on several operating system with 32 or 64 bit processor (Linux, Windows, Mac OS) and is enabled for national language support. Actual English and German is packaged. Devices might be data logger, measurement devices, charging devices or similar.

A fundamental idea for the development is the system comprehensive thought. For none Windows user the same functionality should be made available as it is today by using LogView for Windows. This is the reason to base the implementation on Java using the free available RXTXcomm library, for the serial communication and the eclipse SWT library for the graphical user interface. For both libraries a native interface for Windows, Linux and Mac OS is available. For development the eclipse IDE (integrated development environment) together with the Java 6 runtime is used.

What is the naming for serial interfaces on different operating systems:

Operating system	USB to serial	Built-in
Windows	COM5 and higher	COM1 through COM4
Linux	/dev/ttyUSB0 and higher	/dev/ttyS0 through /dev/ttyS3
Mac OS X	/dev/tty.usbserial	n/a

Why the name Open...

In fundamental there are two reasons. The OpenSerialDataExplorer makes all interfaces for device communication and the data model are freely available (Java-doc). Later it is possible to license the project under General Public License (GPL). This will also makes the source code available for every one. This will finally gives everybody the power to enhance the applications (for own needs) with new functionality, add new devices and fix errors. The device specific components are separate modules and are bind dynamically during runtime (plug-in). This enables developer to develop the device plug-ins disconnected from the main application. There is a sample implementation which can be used as entry point. To implement a device plug-in three facets are touched: the device itself, knowledge how to use the device and a communication specification (of course programming knowledge).

A few words to Java

A Java applications lives within extra for it started "Virtual Machine" (VM), this runtime environment is as fist approximation equal for all different system platforms. Therefore a Java application can be executed everywhere, where a Java runtime exist. The VM provides the available memory. Different to an application written in C a Java application can only use the memory provided by the JVM what is different to the system wide provided memory. This means while starting the JVM for an Java application the memory consumption limits must be provide (-Xms/-Xmx). If no values are provided, a maximum value of 128 Mbyte is used as default. A VM sounds like a system sandbox where there is no possibility to break through barriers. Would this the truth, there would probably no serial communication and no graphics library. Prior to announcement of the just in time compilers (JIT) Java applications are slow and came with its own visualization skin. Actual Java applications are very close to applications written in other programming languages in viewpoint of comfort and speed. Using the "Java Native Interface" it is possible to communicate direct with hardware device drivers. In this area mostly C applications are used to execute this job. This is the case with RXTXcomm and as well SWT. Using Java a very big number of freely available libraries are available as well as libraries provided by GPL license. All of his can be used in commercial applications as well.

Used Directories

Which directories are created during installation are described in the README file. More important are the directories used during runtime of the application storing settings, log files and graphics templates.

As base directory the application is using:

- Windows %APPDATA%\username\OpenSerialDataExplorer
- Linux /home/username/.OpenSerialDataExplorer
- MAC OS /Users/username/Library/Application/OpenSerialDataExplorer

At this start point for directories the following is used and created

- Devices for device properties (XML) and device pictures
- GraphicsTemplates for files describing the graphical properties like line color, number format, etc.
- Logs for trace log files, do not mix with the device log data files

This should enough as overview. Later in this document we will dive deeper in details.

The Main Application Window

In the title bar of the application the name of the application itself and if applicable the loaded file name, the associated device name and the communication port name is displayed. As usual for this type of application a menu bar as well as a tool bar is available. The central area is build from windows reachable by tabs. This area will present the data in several form. The graphical view which presents the data using curves is the real main view. All other windows are detail views in other representation form.



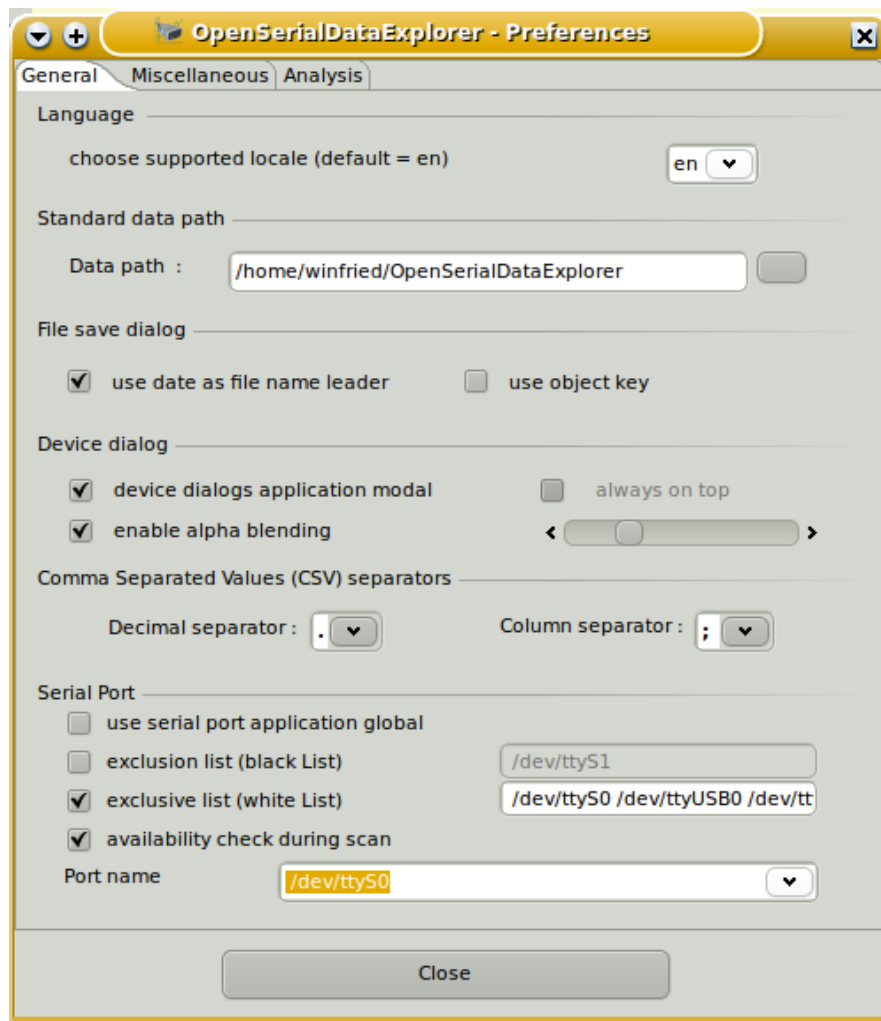
At the bottom there is a status bar to display serial communication status, like connected, receiving and transmitting. Aside the communication port status a progress bar is placed to show progress of long therm operations. The rest of this status area is used to display warning messages or measurement results.

The Preferences Dialog

General Tab

The settings dialog is used to configure:

- The language to be used
- The data path, where the application is looking for and placing the device specific log data files and file links.
- The file save dialog might be use the current date and/or object name as leader of the file name. This will help to find files.
- Behavior of the device dialogs. A primary modal behavior is some times not handy, if some adjustments are the place in parallel while gathering data. Some times this cost more effort while programming this.
- Decimal separator and list separator characters. This might be different then the character used from system locale to work together with the spread sheet programs. This adjustment is used for import/export of CSV files, but has no influence while importing [CSV2SerialAdapter](#) files.



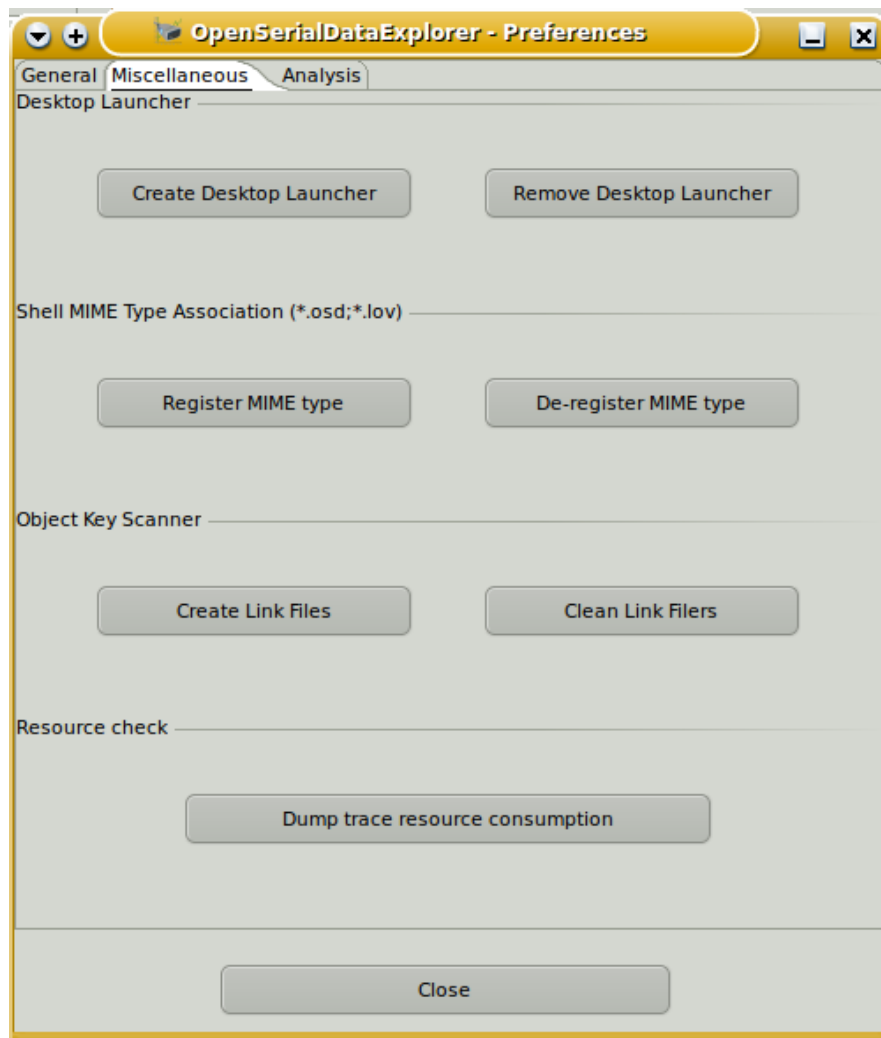
- While opening this dialog it scans for available serial ports and updates the results delayed. The delay can be reduced on slow systems by switching off the availability check. If this is the case used ports are displayed too which might not be used in future. At UNIX based systems this is not relevant. This adjustment reflect also to the device selection dialog which also scans for available serial ports.

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- If system wide only one serial port is available it is possible to configure global serial port usage, but in most cases the single available port will be found automatically.
- Using black-list or white-list configuration it is possible to configure according personal problematic ports. This configuration is also valid for the device selection dialog, where device individual ports are selected. Configure the black-list will ignore ports declared. On the other hand the white-list will exclusive use the configured ports. Using the white list it is possible to miss ports dynamically configured by the system.

Miscellaneous Tab

Pushing the buttons will create a desktop launcher icon or remove it from desktop. The other two buttons enable the OpenSerialData MIME type registration to associate the file endings *.osd and *.lov or remove this registration.



The button "Create Link Files" will scan all OSD files under the configured folder and create all missing object directories as well as the associating link files. The button "Clean Link File" will delete object related link files but not the object description files nor the object related directories. This function helps to move data files to different system/platform or for backup purpose.

Analysis Tab

Using the analyze tab only adjustments for problem analysis can be found. After a program failure function a trace log entry should appear which may help to find the reason for it appearance. Pay attention, modifying trace log level away from INFO will result in slowed down execution an may lead in

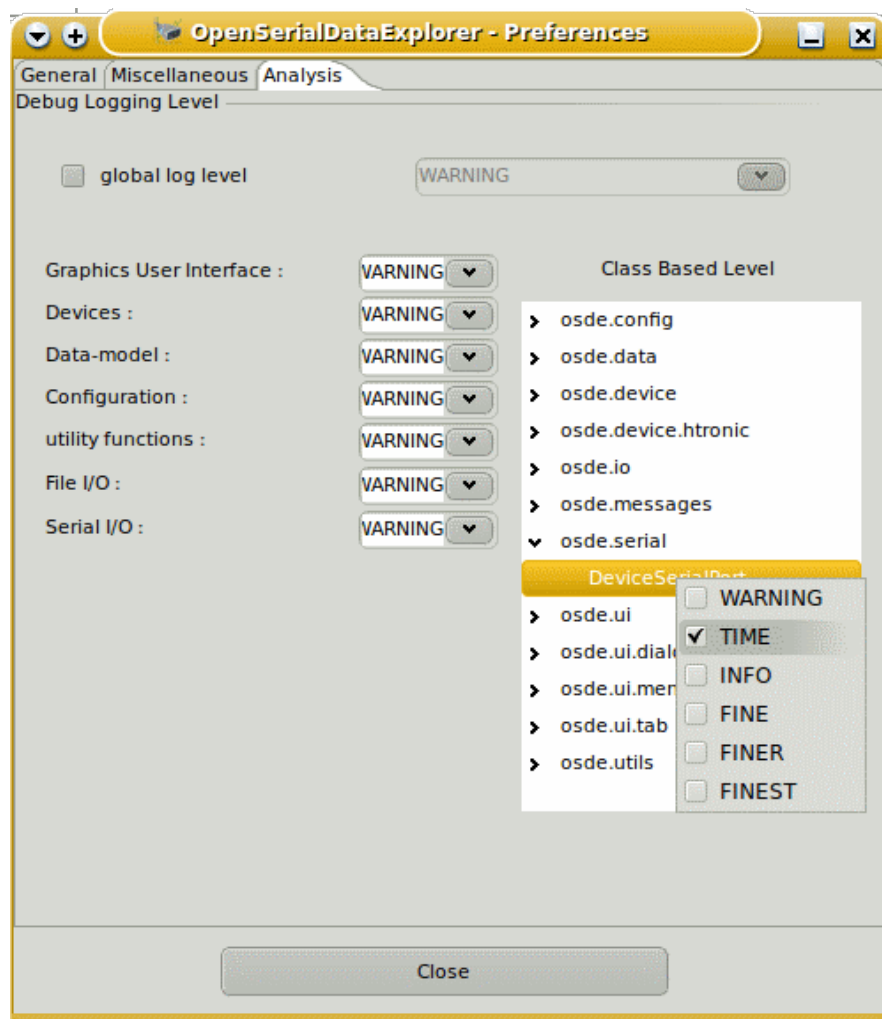
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unknown side effects. So adjust this values using this knowledge. The adjustments are scaled in detail level,

- SEVERE writes only program execution errors,
- WARNING writing errors and warnings, (default)
- TIME writing errors, warnings and time relevant log statements
- INFO writing errors, warnings and some informational,
- FINE writing all errors warnings and informational, in addition traces of the level fine,
- FINER writing more than FINE
- FINEST writing more than FINER

The below described part allows to configure the log level class based. To keep the log file content small do not adjust the log level above FINE. Otherwise the amount of log statements is very high.

- the global setting of the "trace log" level, is in normal the level INFO
- Graphical user interface, here all statements are included called during main window execution
- Devices, all statements called during device relevant execution
- Data model, all executions involved by the data model itself
- Utility functions, all the helper functions, drawing curves, calculate check sum, etc.
- File I/O, function calls involved in file input/output
- Serial I/O, will used a memory logger above the level INFO to archive a low performance impact. As logical consequence the memory usage of the application is higher as before. It might be required to start the application using "java -jar -Xmx512m OpenSerialDataExplorer.jar" where the maximal memory usage is limited to 512 Mbyte.



The class based log level allows to set a logging level for selected class(es) which reduce the amount of

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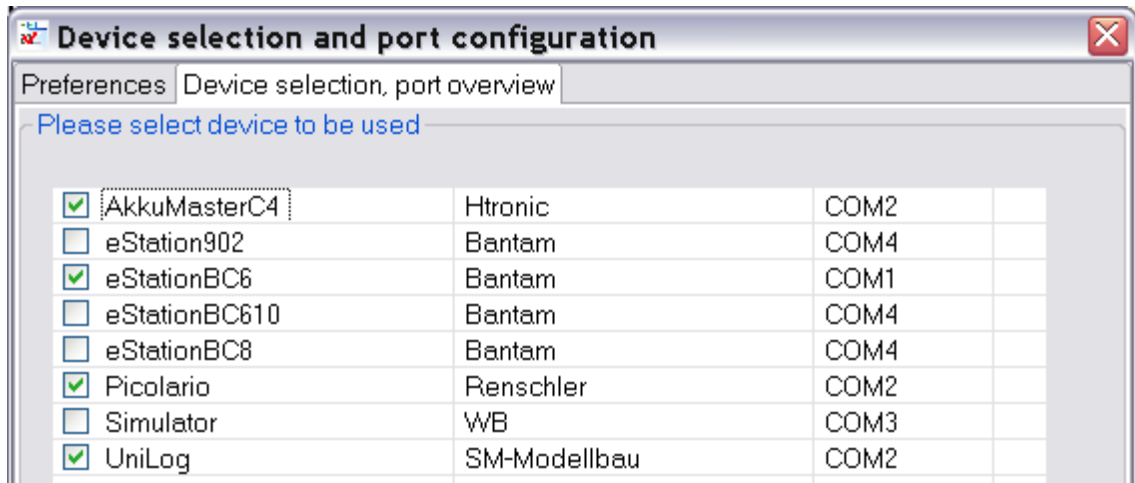
trace statements and helps analyzing class centric. A context menu enables the log level selection. Closing the settings dialog will activate the adjusted trace level.

In every case only three level of trace log files are written with a limited size. The files in this rolled approach will over write after a certain amount of statements.

Hint: In case of error please have a look into the trace log files this will give help indicators to fix the problem (refer to [Used Directories](#)).

The Device Selection Dialog

Using the device selection dialog the devices are chosen which are available for the application. The device selection and port overview all devices are listed which are found by available device properties XML file in the "Devices" directory.



The selection of the active device will be done with the "Preferences" tab.

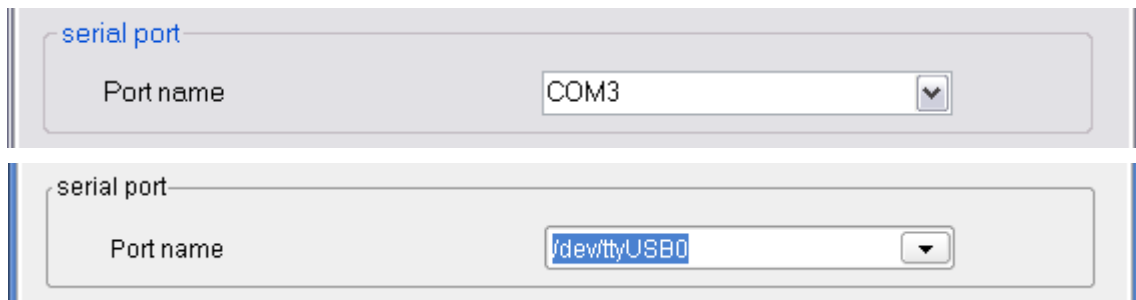


The selection of the active device can be done in several places on this tab. First place is the combo box direct above the device picture or with the slider at right hand side of the combo. The picture of the just selected device will be shown. Additional information related to the device is shown at the right hand side of the picture. Direct underneath this device info two selections are available to configure device specific behavior regarding device dialog and communication port.

Hint : Another possibility selecting the active device is using the next-/previous- device buttons in the tool bar.

Underneath the device picture the serial port must be selected. Is there only one serial port available at the current system this port will be selected for communication purpose automatically. The pictures below showing a port selection with COM4 using a Windows system and a port of a serial to USB adapter of a Linux system /dev/ttyUSB0.

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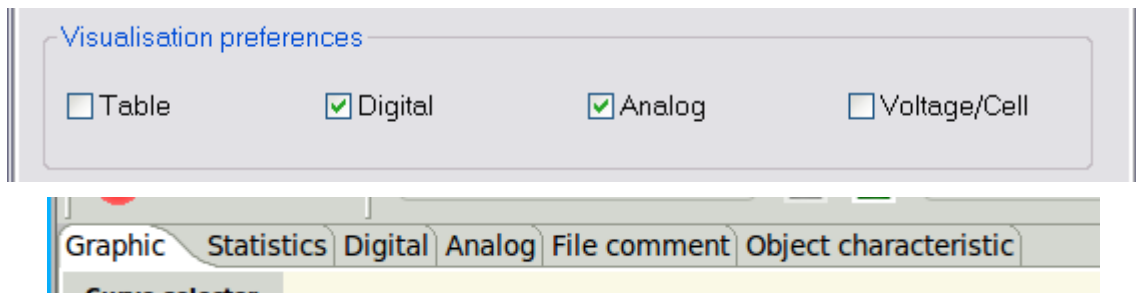
serial port

Port name COM3

serial port

Port name /dev/ttyUSB0

With the “visualization preferences” group the visibility of some application tabs can be configured. Some of this selections have significant influence to the runtime. Switching of the table view update can reduce execution time dramatically if big data collections are in use. Big data collections make the table view more unclear than a small one.

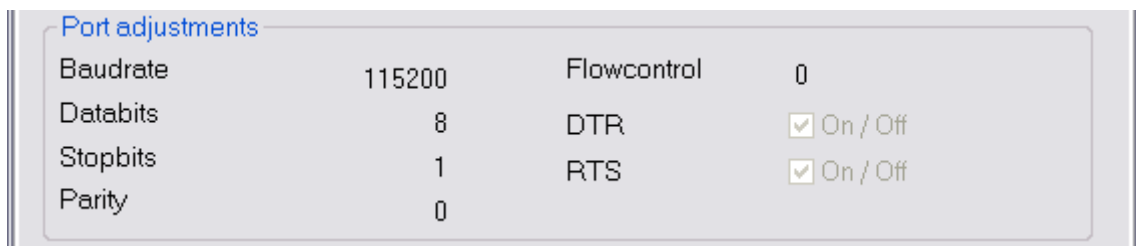


Visualisation preferences

☐ Table ☒ Digital ☒ Analog ☐ Voltage/Cell

Graphic Statistics Digital Analog File comment Object characteristic

The check boxes in the middle, Digital and Analog, are used mainly for live data measurements and have less sense for devices without this capability. If a device does not have live data capability or data are read from file the end values of the curve are displayed. The visualization of single cell voltages makes only sense for device with the capability to show this, mainly Lithium battery charger or balancer.



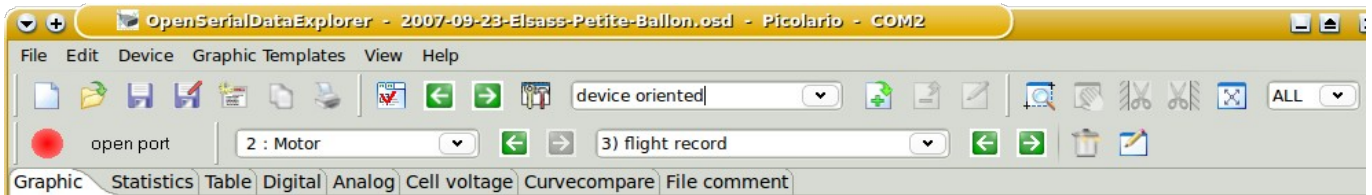
Port adjustments

Baudrate	115200	Flowcontrol	0
Databits	8	DTR	<input checked="" type="checkbox"/> On / Off
Stopbits	1	RTS	<input checked="" type="checkbox"/> On / Off
Parity	0		

At the lower area the serial communication parameters are displayed without the possibility to change it. Required changes can only be done by editing the device properties XML directly.

Menu- and Tool- Bar

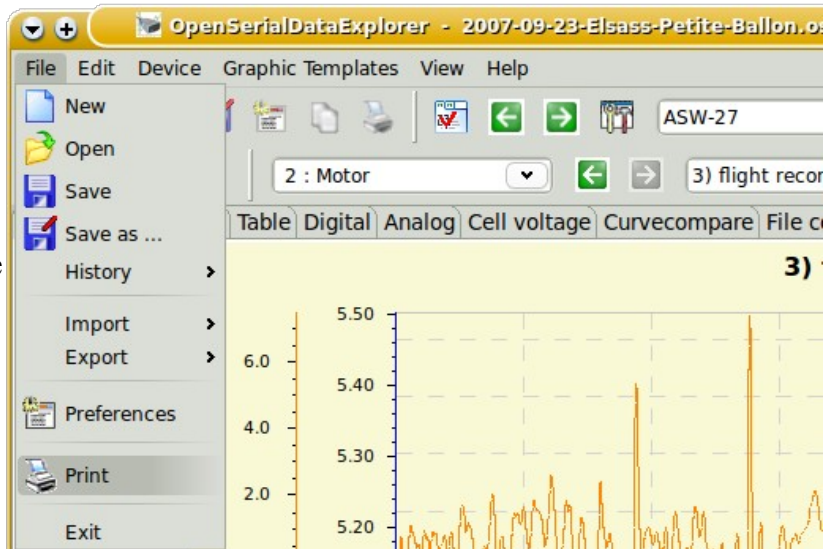
The menu bar make all elements available to manage the application. The tool bar enable the most often used elements using icons to make it more intuitive.



"File" Menu

From the file menu all action are triggered with a file as base

- "New" initializing the application for the active device, are data available which are not saved this operation must be committed
- "Open" opens a file open dialog to select a file to be loaded. If the file does not fit to the active device the operation has to be committed.
- "Save" opens a file save dialog, are the data already saved overwrite commitment or renaming is required
- "Save as..." opens a file save dialog to use a new name to save the data
- "History" showing the list of last used files with a maximum of 10 entries
- "Import" offers the possibility to import comma separated values files (CSV) with absolute or raw data
- "Export" offers the possibility to export comma separated values" (CSV) files as absolute values or raw data



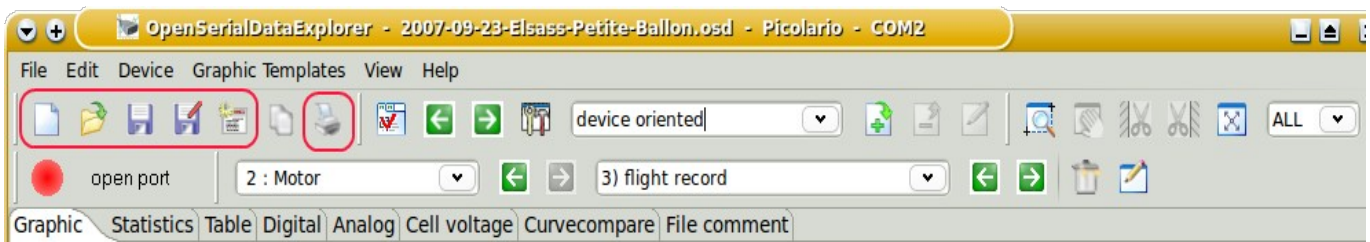
1	Picolario;Thermal
2	Time [sec];Voltage [V];Height [m];Slope [m/s]
3	0,000; 5,054;0,000;0,000
4	0,050; 5,054;0,000;0,000
5	0,100; 5,054;0,000;0,000
6	0,150; 5,054;0,000;0,000

1	Picolario;Thermal
2	Time [sec];Voltage [---];Height [---]
3	0,000; 93,000;3535,000
4	0,050; 93,000;3535,000
5	0,100; 93,000;3535,000
6	0,150; 93,000;3535,000

- "Preferences" opens the preferences dialog to configure application properties
- "Print" opens a print configuration dialog to initiate printing
- "Exit" close the application

Hint : Absolute during CSV export means the same form as displayed in the table view. Raw means the data are equivalent to the data read from the device. While reading raw data the values are adapted if required according the device properties file, just as the data would be gathered from the device.

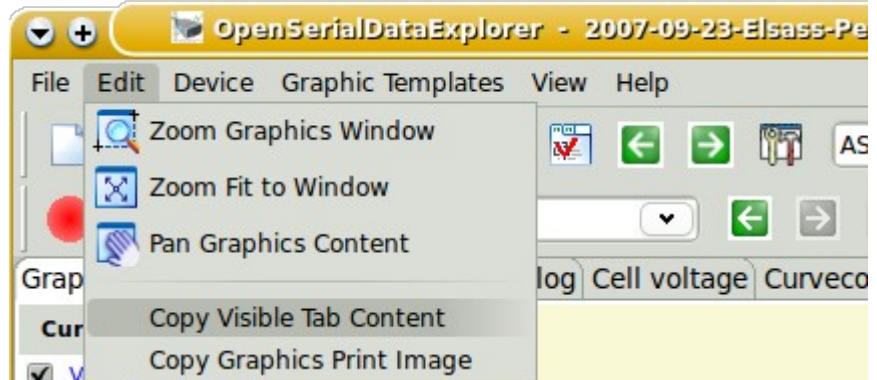
All functions of the file menu are available by the tool bar.



"Edit" Menu

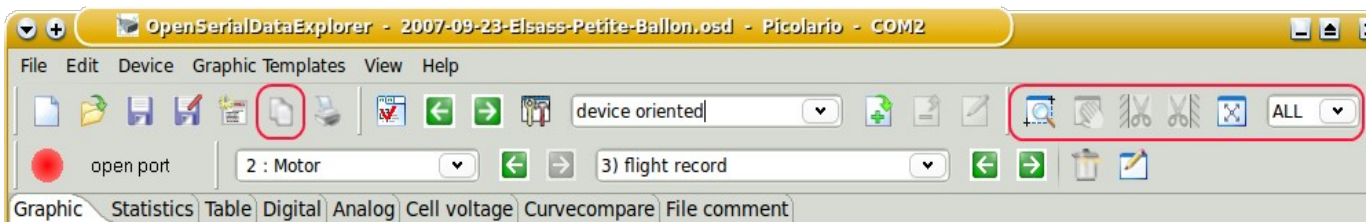
Using the edit menu the graphical data can be zoomed or shifted.

- "Zoom Graphics Window", activated the capability to enlarge curve areas to enable detail views or detail measurement
- "Zoom Fit to Window" resets the graphics content to fit whole data
- "Pan Graphics Content" enables shift of enlarged graphics content to position area of interest
- "Copy Visible Tab Content" will copy an image of the just visible tabulator into clipboard
- "Copy Graphics Print Image" will copy the content of curve graphics or curve compare graphics as it would be printed into the clipboard

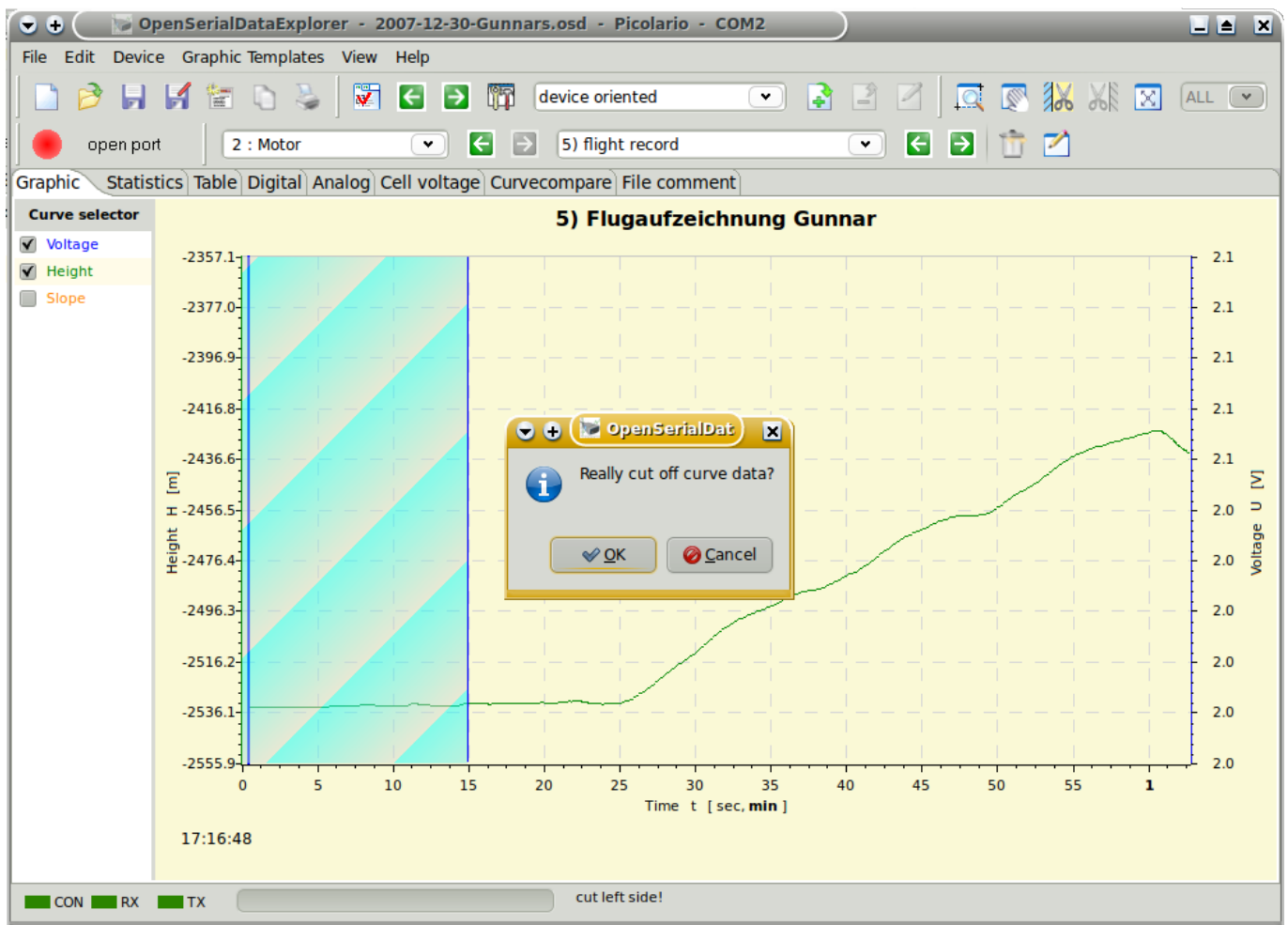


Hint : Copy and change fore- and back-ground color is also available for all tab windows using the context menu

All the functions to manipulate the graphical view are available by the tool bar. The tool bar gives additional capability to cut other edges and switch display to the last amount of curve points. Buttons are activated if this operation is permitted.



The sample below showing a positioning of transparent area, the area to be cut. A pop-up dialog ask for commitment. This will create an copy of the original data set with the cut edge. The user can decide each case to delete the untouched data set by itself.



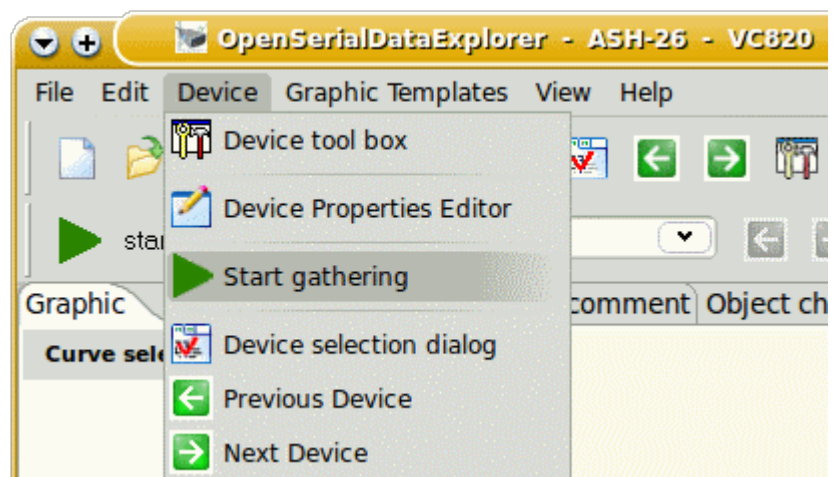
Data sets with cut edge have an under bar character appended to its name. The original data set is still available.

Hint : Data set names may edited after pushing the edit button as documented [here](#).

"Device" Menu

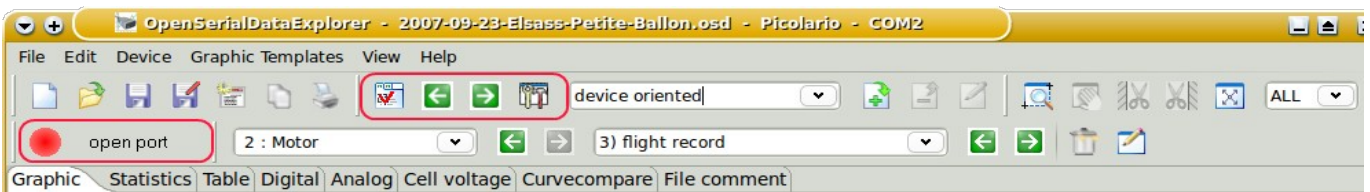
This menu enables device specific operations

- "Device tool box" opens the device dialog of the active device
- "Device Properties Editor" opens the device properties editor to adapt device properties (not all property changes will update results dynamically)
- "Open/Close Port"; "Start/Stop Gathering"; "Import data" activates the configured function for the actual device
- "Device Selection Dialog" opens the dialog to select a device
- "Previous Device" switch to the previous device in the device list
- "Next Device" switch to the next device in the device list

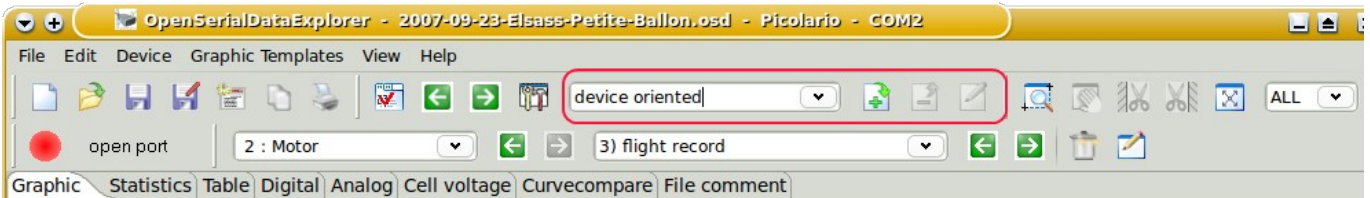


All device specific functions are reachable using tool bar buttons.

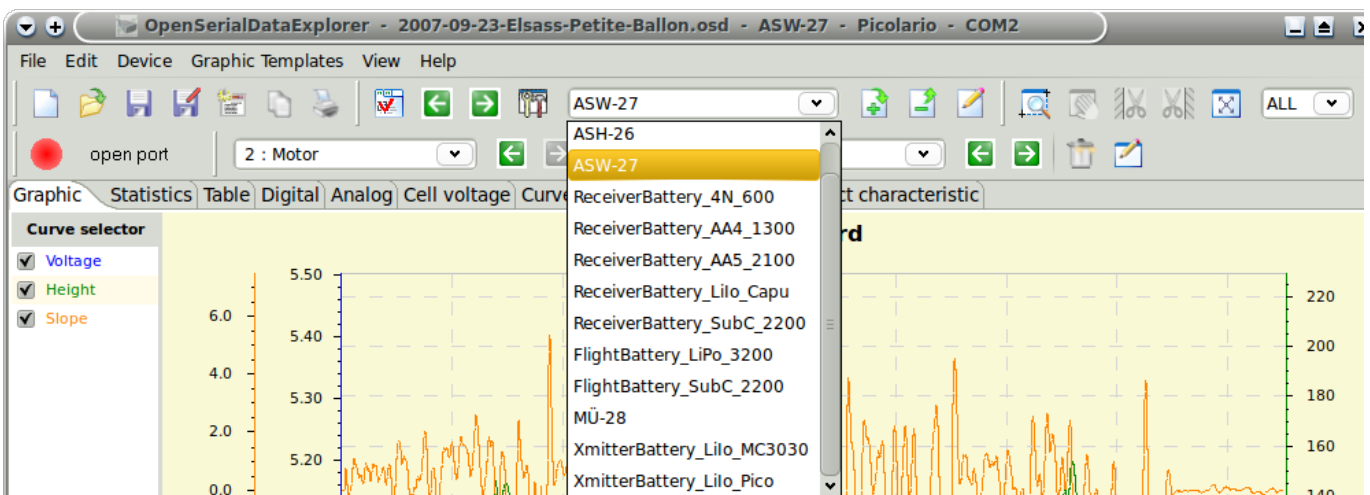
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In addition there is a way not to sort your data according devices only, instead you can define and use objects across all devices. Using "device oriented" there is no change at all.



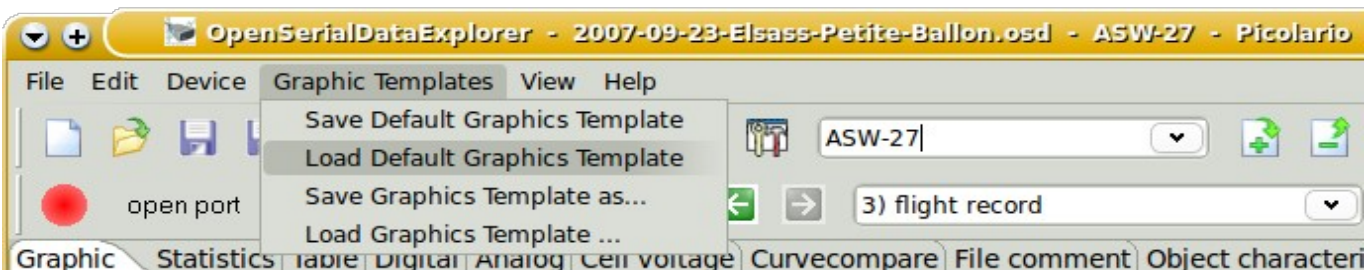
But if chosen or, using the plus sign, create a new object key, a new tab window, [Object characteristic](#), appears. Within this tab it is possible to describe the object, which is actual selected. While selecting an object key the usage of the object key for the actual data set will be queried. Independent of the answer, starting from now, only data files are displayed while opening which contains this object key.



"Graphics Templates" Menu

Using this menu graphics templates are managed. Graphics templates contains graphics visualization properties.

If available and applicable a graphics template will applied according the device and channel configuration. Graphics templates contains properties regarding the once adjusted by the context menu of the curve selector, like line color, number format, ... The directory to the graphic template files "GraphicsTemplates" under the application configuration path.



- "Save Default Graphics Template", stores a template according channel configuration and device (DeviceName_ChannelConfigurationNumber.xml)
- "Load Default Graphics Template" loads a template according channel configuration and device

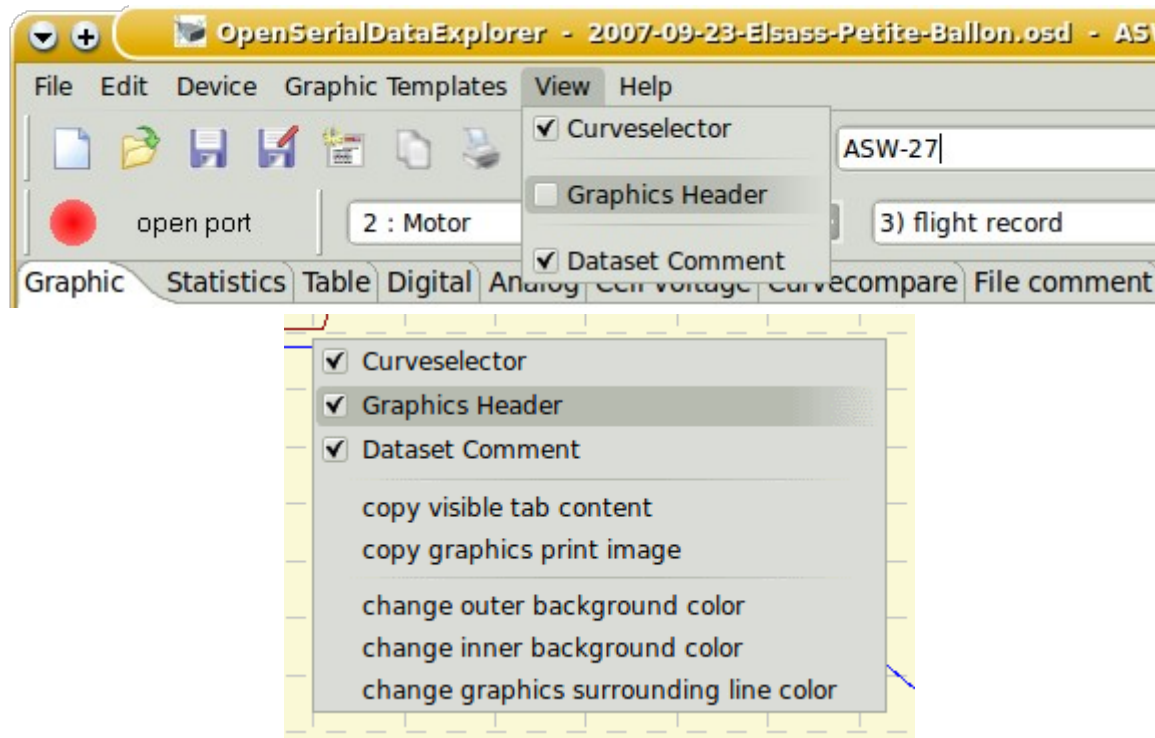
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(DeviceName_ChannelConfigurationNumber.xml)

- "Save Graphics Template as ..." opens a file save dialog to save a graphics template with a given name
- "Load Graphics Template" opens a open file dialog to select a graphics template to be applied

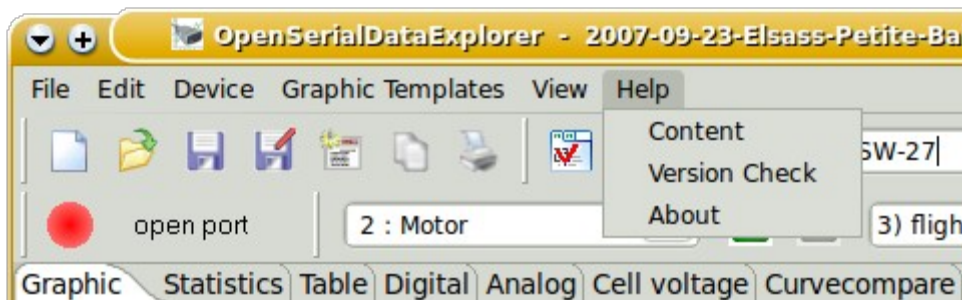
"View" Menu

With this menu the curve selector can be hide or made visible. In addition a graphics header and data set comment can hide or made visible. This can be done using the context menu as well.



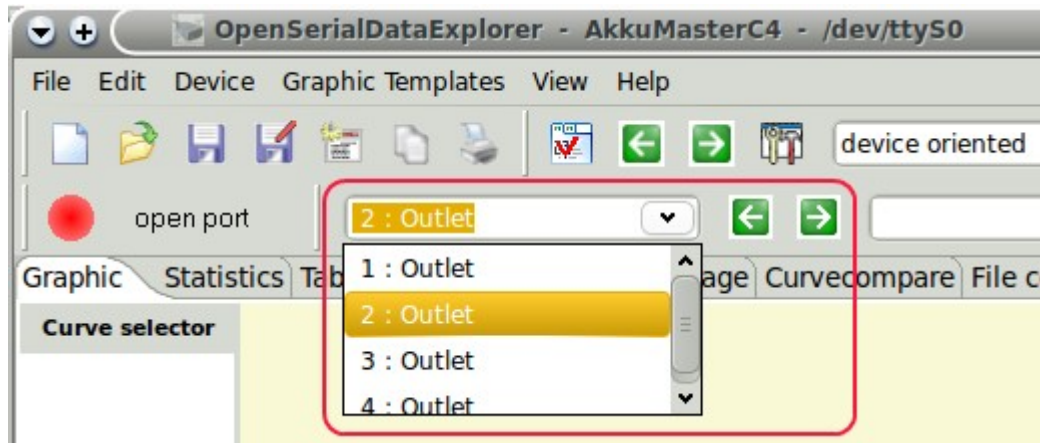
"Help" Menu

Using the help menu this text can be reached and the about dialog can be opened to check the version number of this application. Selecting the version check the home page of the OpenSerialDataExplorer can be reached to check if a newer version is available. No personal data are getting transferred to the Internet, only the URL is called.

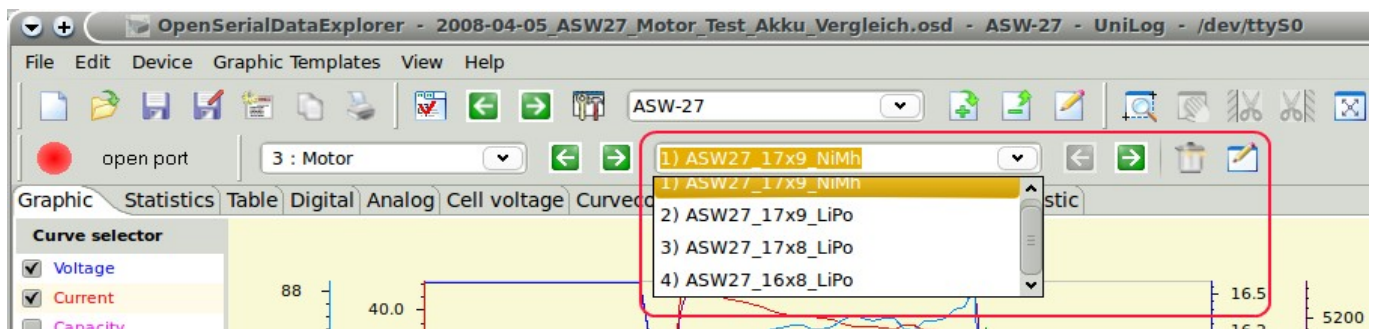


Channel-,Configuration-, Data set-Toolbar

Depending on the device properties and implementation the left hand side combo box represents a device outlet or a data set configuration. The buttons beside the combo switch to previous or next data channel or configuration if applicable.



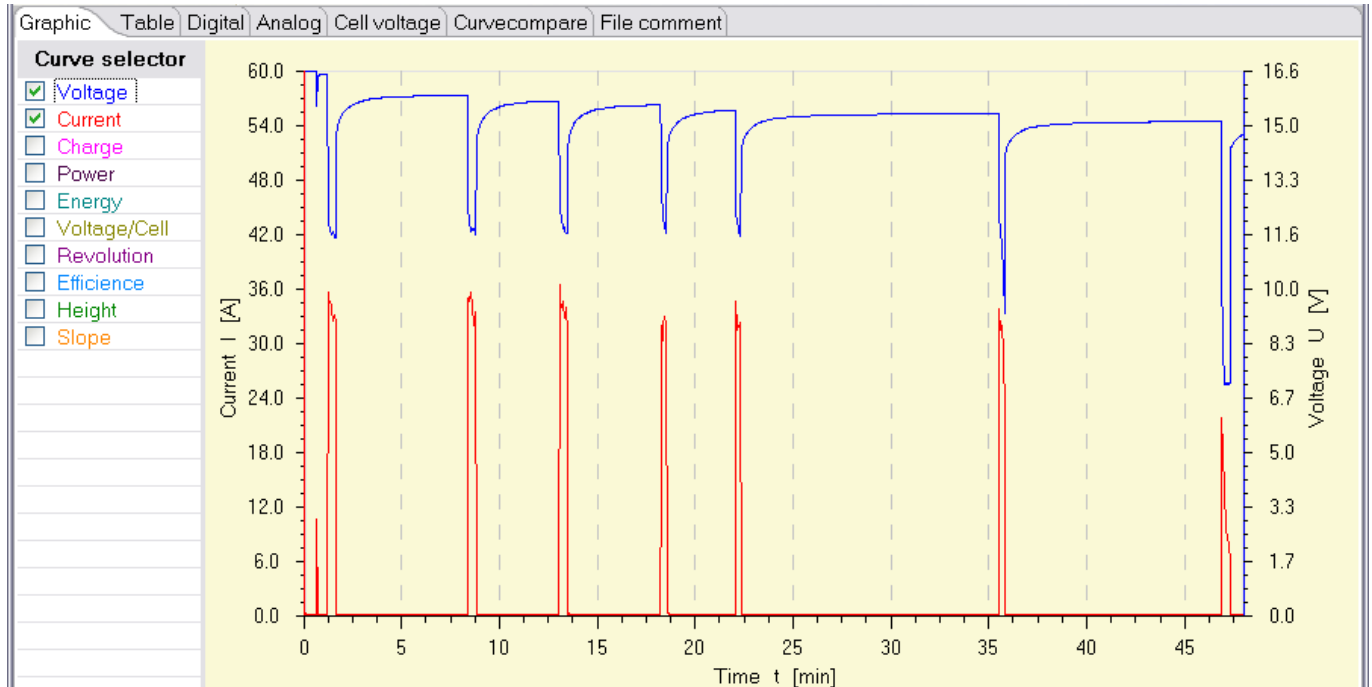
The data set to be displayed can be selected by the other combo box. Analog to the channel configuration there are buttons to switch to previous or next data set if applicable.



At the right hand side there are buttons to enable data set name editing or deletion. After pushing the edit button the cursor within the data set name field is activated for editing, a hit to enter commits this operations.

Graphics View

The graphics view represents the real main window of the application. Here the data sets are represented as curves. With checking the individual curve names it will toggle curve visibility. Many curves displayed might reduce clearness. This is the reason to have this check-box in direct access.



The curve names are colored equal to the curves to see direct relationship. The curve selector represents in this terms the legend and enables visual activation by a mouse click.

Much more configuration possibilities are accessible using the curve selectors context menu. It enable configuration of visibility properties as well as scaling properties.

The Curve Selector Context Menu

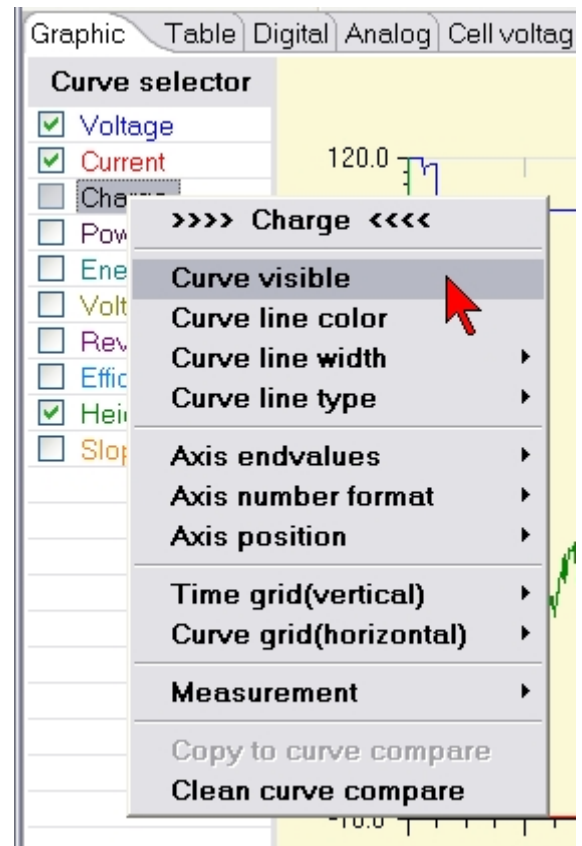
The curve selector context menu gets activated by selecting a curve name with the right mouse button. On top of the context menu the name of the selected curve is written which is in focus. All adjustments and visualization changes are applied to just this curve.

Using the context menu **Curve visible** the curve can be made visible or invisible. While the curve is invisible and some properties get changed it will be visible afterwards. As sample an invisible curve should be measured, the curve gets visible and the measurement point are displayed.

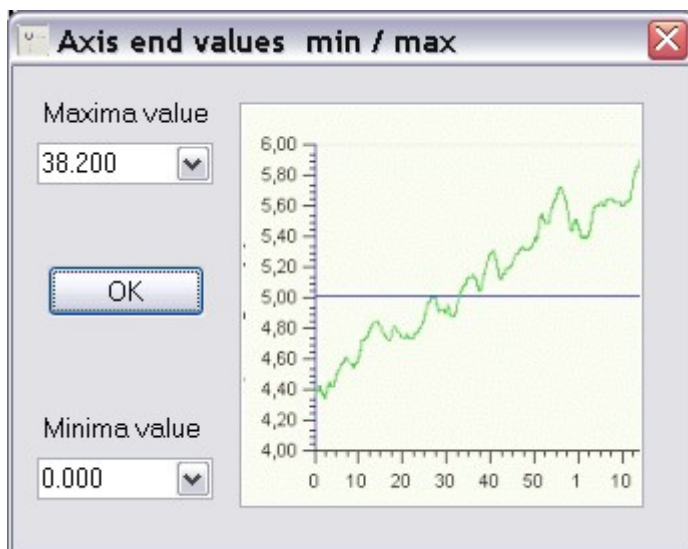
Selecting **Curve line color** a color selection dialog pops up to choose the curve color. The selected color gets also used for drawing the base line of the vertical scale of this particular curve to get easy color match. This color is used to display the digital numbers and the circle base line of the analog display.

Adjusting **Curve line width** the curve gets differentiated from the others.

Changing the **Curve line type** will only small change the visibility. Since the most curves have such small difference between data points there are only small impression changes. This has to be tested individually.



The next block **Axis end values** manipulates the scales. **Automatic** uses the real minimum and maximum values of the curve. **Rounded**, rounds depending on the values in use. The selection of **starts at 0** can be used together with “rounded” or “automatic”. The starting point of the scale is set to zero.

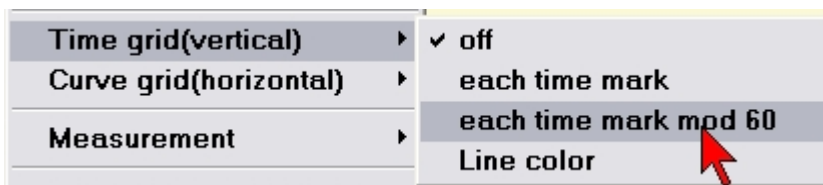


While selecting **manual** a small dialog gets active to enable adjustment of the end values. Values can not only be changed by combo box selection; it can be overwritten as well. Pushing the OK button or hitting the enter button of the keyboard will close the dialog and make the changes active.

With the menu **Axis number format** the precision of the displayed values gets adjusted. Too many digits might suggest a precision that is not real by means of the measurement device itself.



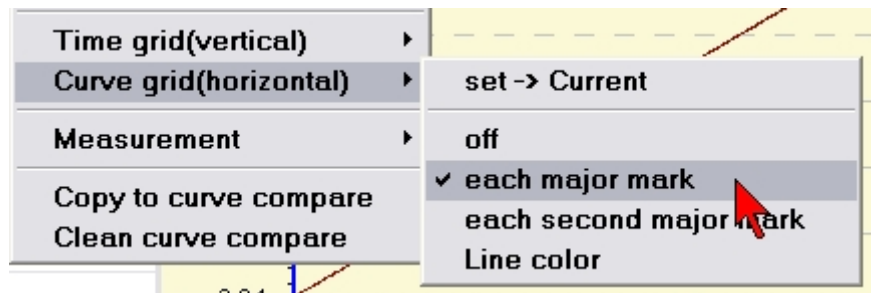
Axis position defines the side where the scale of this measurement is displayed.



The context menu to adjust grid lines enables displaying vertical, time line and horizontal, for the measurement. The color adjustments enables to leaf the grid lines in background. For **vertical grid lines**, time line related, the “mod 60” reduces the grid lines to

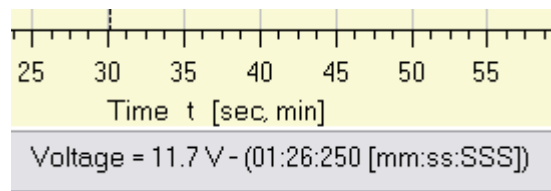
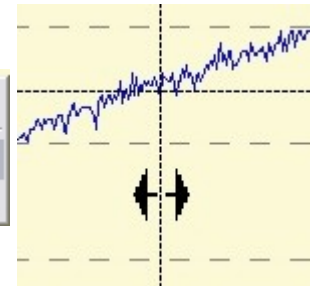
minutes (60 sec) or hours(60 min) depending on the time line scale.

Horizontal grid lines are bound to only one measurement. The curve name used to adjust this will be displayed. Each second will only draw a grid line each second major scale mark.



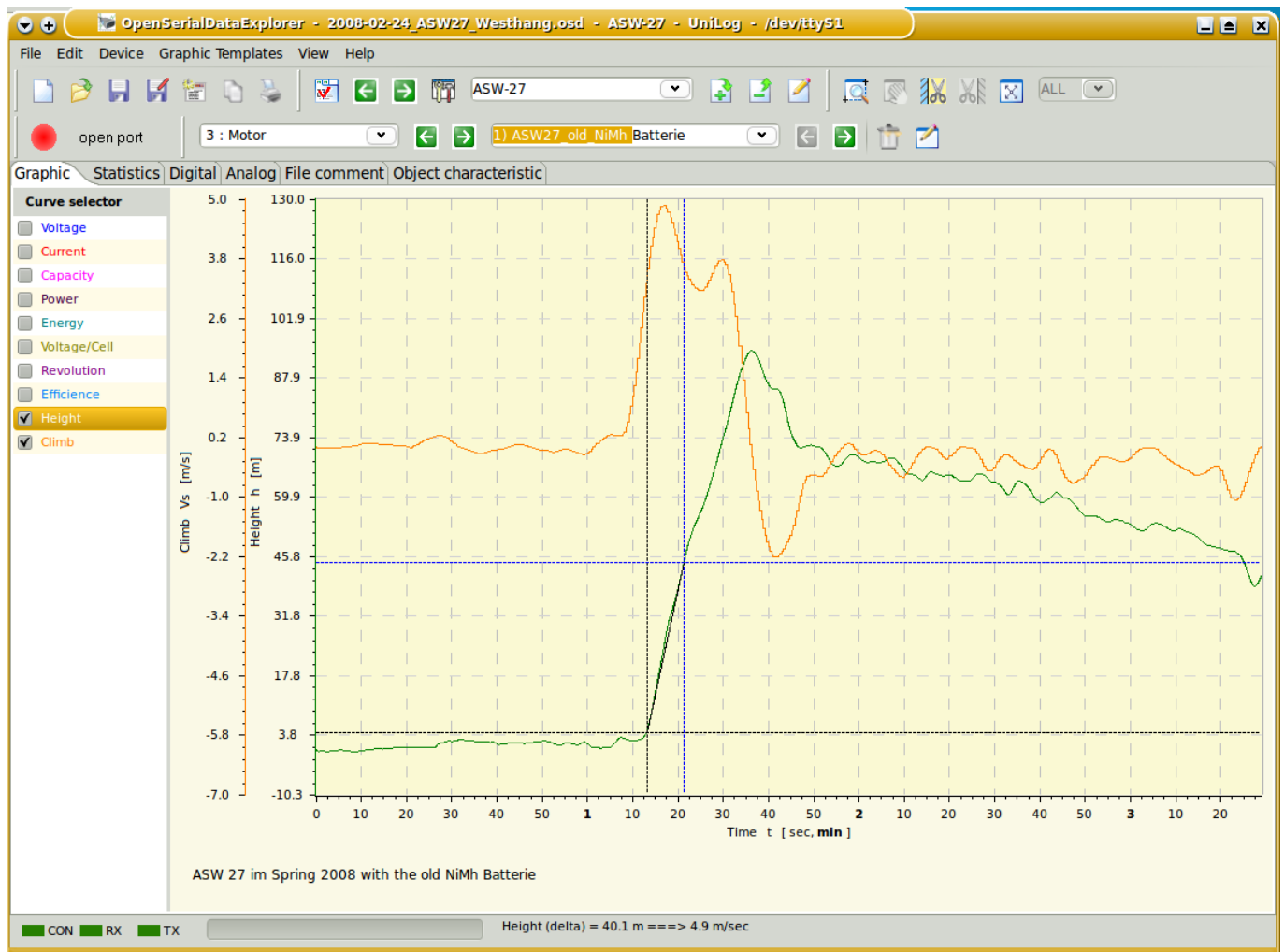
The context menu **Measurement** it is possible to measure curve points with snapping crossing hairlines. To do this select the menu **measure**

curve point. To move the hairlines position the mouse pointer direct over the vertical line. While the mouse pointer changes to arrows push the mouse button and move the hairlines to the point of interest. Meanwhile the measured value is displayed in the status bar.



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To **measure point difference** the difference between two point are measured using two different crossed hairlines. The delta value and unit gets displayed in the status bar.



As measurement hairlines black and blue hairlines are displayed. Adjust both as described before to measure a single curve point value. Especially in zoomed curved this makes sense. As additional information the starting point of the zoomed area is displayed.

Copy to curve compare
Clean curve compare

The last sections in the context menu are used to copy selected curves into the compare window **Copy to curve compare**. The last entry allows to clean the curve compare view by selecting **Clean curve compare**.

This entry gets active when at least one curve is within this area.

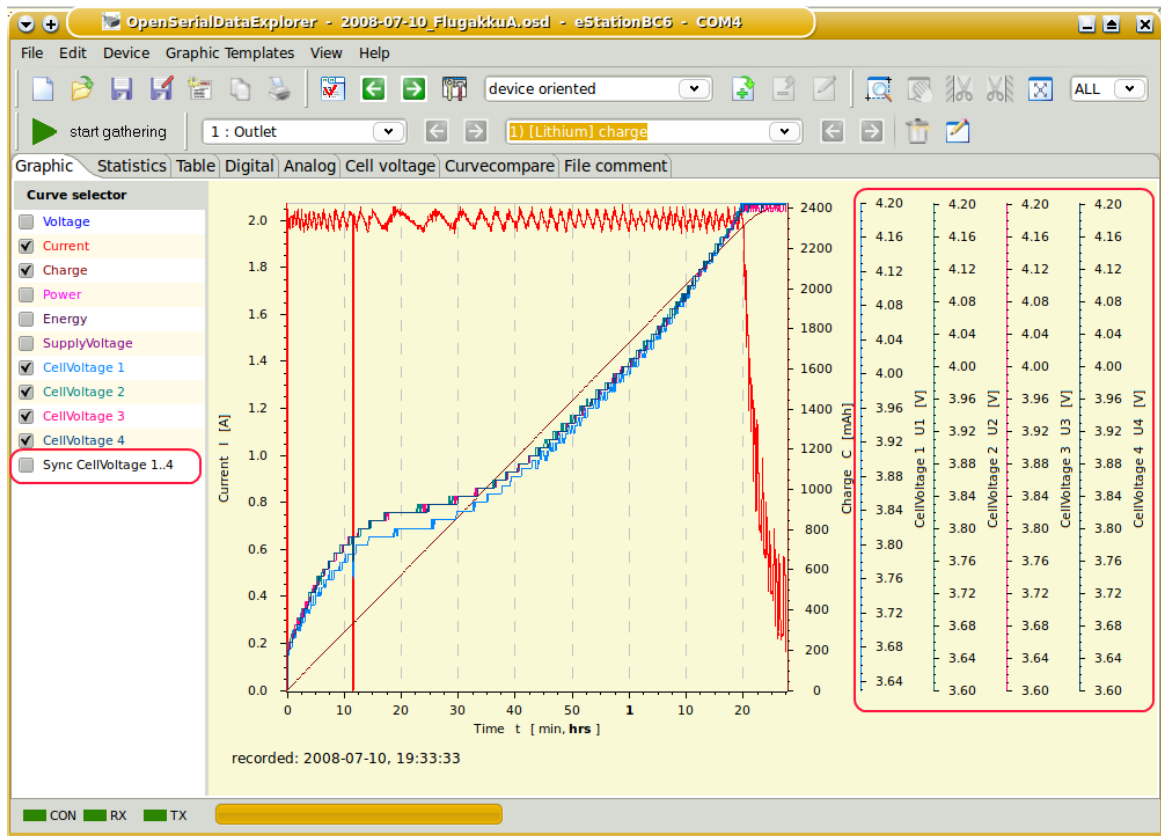
Hint : The actual release allows comparing curves of same type and same time base. It is senseless to compare voltage with height as example. In case of none matching curves the application will display a warning message.

Curve scale synchronization

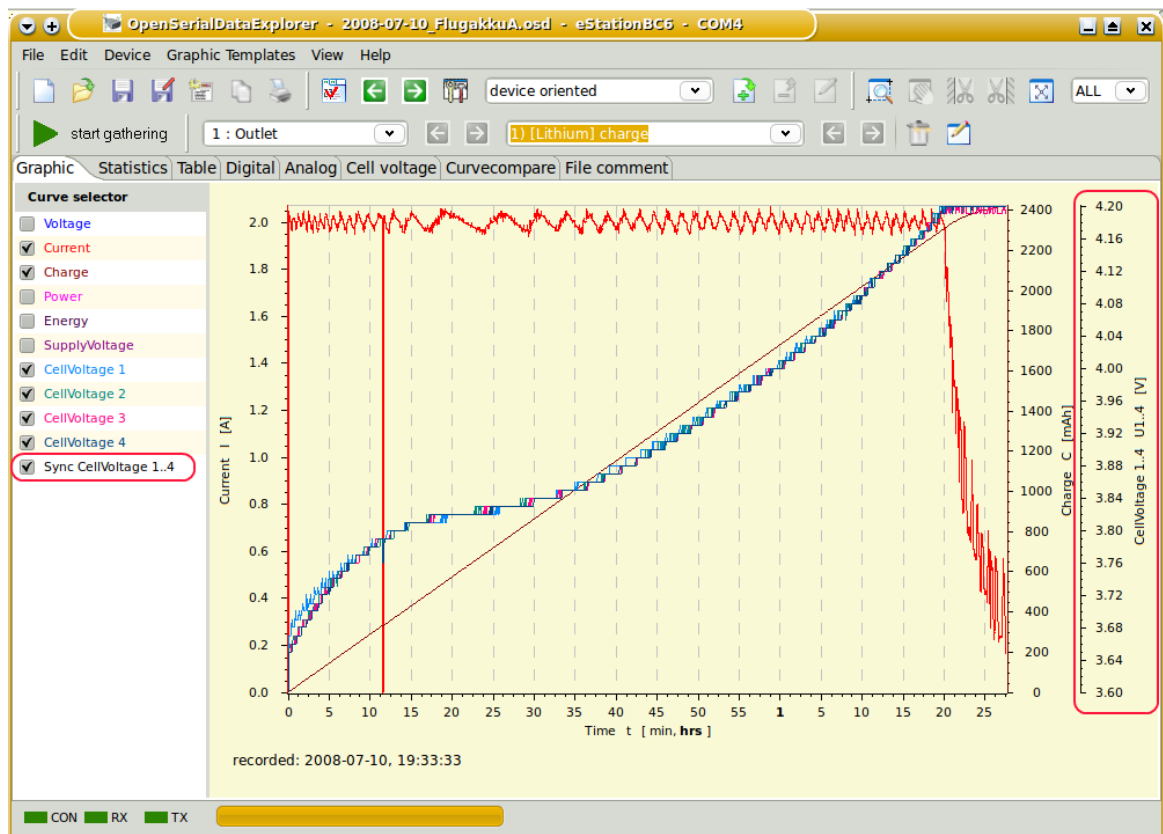
If there are curves of similar type an extra selectable entry within the curve-selector will be displayed. Selecting this entry the scales of the curves will be merged while synchronizing the end values. As sample

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voltage curves of Lithium cells are named. The comparison of the two following screen shots should make this more clear.



This will make more room for the curve display itself and the minimum and maximum values are the same. Through this the curves are easy comparable and a manual adjustment using the context menu is obsolete.

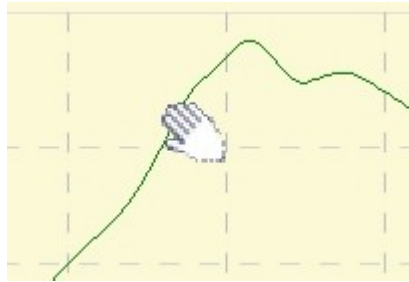


Zooming and Positioning of Graphics View



Activating **zoom** function changes the mouse pointer to a cross hair. Pushing the left mouse button defines a corner of the area to be zoomed. While keep the mouse button pushed and move the cursor a rectangle gets visible which defines, after releasing the mouse button, the area to be zoomed.

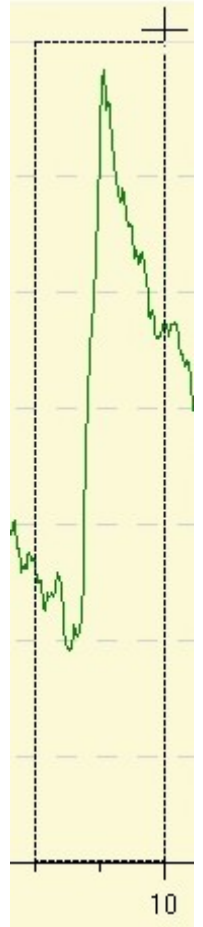
Hint : If its required to zoom only in one direction the start and end corners can be positioned outside the curve client area. While a section is zoomed it is possible to zoom another section again.



< /P>

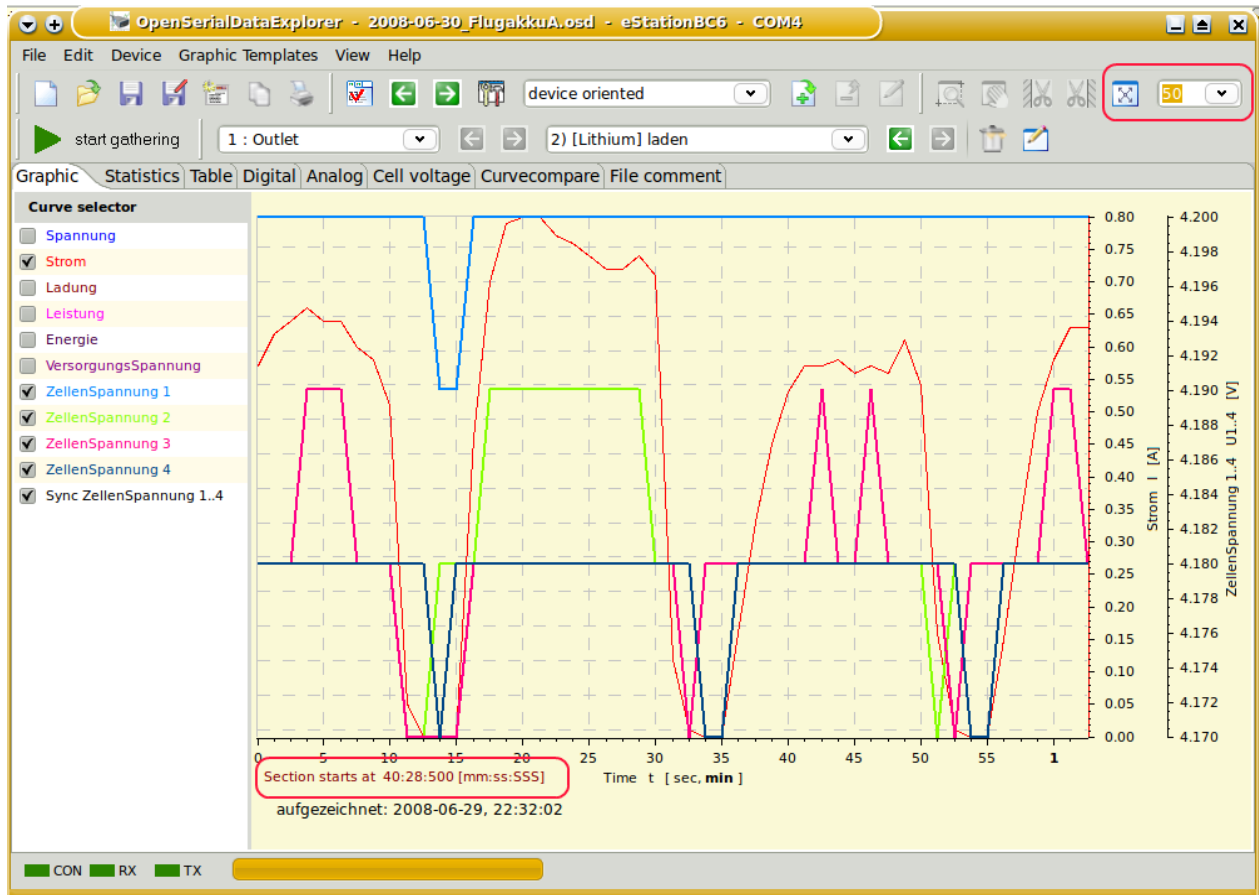
The pan mode changes the mouse pointer into a hand. While keep the mouse button pushed the curves can be moved.

Reset the zoomed section using the fit to window function.



Oscilloscope mode

To display a zoomed section of the last measured values, while gathering data, a pull down menu can be used to adjust the size of measurement points to be used. The resulting view is similar to an oscilloscope.



At the menu tool bar the pull down is marked up which just show a selection of the last 50 measurement points to be displayed. Below the time scale the time value of the masking time frame will be displayed. This gives an overview about the total time consumption of the measurement. The sample showing four balanced voltage curves of Lithium cells.

In opposite the [Cell Voltage Window](#) displays only the last actual measurement.

Statistics View Window

The statistics window shows statistic values for all measurements which can be displayed graphically. The device properties file hold all configuration required to calculate statistic values. Configure a trigger will enable to reference all statistic calculation to the measurement point within. In addition a trigger will enable to summarize all maximal values within the trigger area. This is shown in the sample screen shot below by height. Declaring a comment for each line of measurement it is possible to make clear referencing trigger.

Beschreibung
2008-05-23 Slide wind from east at Maurener Tal

1) Measurement : 2008-05-23 10:30 o'clock Maurener Tal, wind 0-15 Km/h east direction, upcoming clouds

Measurement	Unit	Minimum	Average	Maximum	Standarddeviation	Miscellaneous
Time	[HH:mm:ss:SSS]	0	---	42:17:750	---	Interval = 250.0 ms , Motor run time = 05:00:500 [mm:ss:SSS]
Voltage	[V]	12.7	13.9	16.4	---	(Values refer to current trigger range)
Current	[A]	---	32.5	43.9	---	Number of climb flights = 12 (Trigger: current > 2 A + > 5 sec.)
Capacity	[mAh]	0.0	---	2711.6	---	
Power	[W]	---	452.7	648.5	112.812	(Values refer to current trigger range)
Energy	[Wh]	0.0	---	37.8	---	
Voltage/Cell	[V]	3.2	3.5	4.1	0.147	(Values refer to current trigger range)
Revolution	[1/min]	---	5815	6601	---	(Values refer to current trigger range)
Efficiency	[%]	---	68	---	34.681	(Values refer to current trigger range)
Height	[m]	-2.2	---	294.7	---	Sum motor driven height = 1062.8 [m] Energy/Motoheight = 35.55 [mWh/m]
Slope	[m/s]	-0.8	3.3	6.6	1.374	(Values refer to current trigger range)
Velocity	[km/h]	0	59	159	15.260	
Tempintern	[°C]	20.7	24.4	26.6	1.990	(Values refer to current trigger range)

Should the statistics configuration being adapted for some case the [DevicePropertiesEditor](#) must be used called from menu bar or as stand alone application.

Table View Window

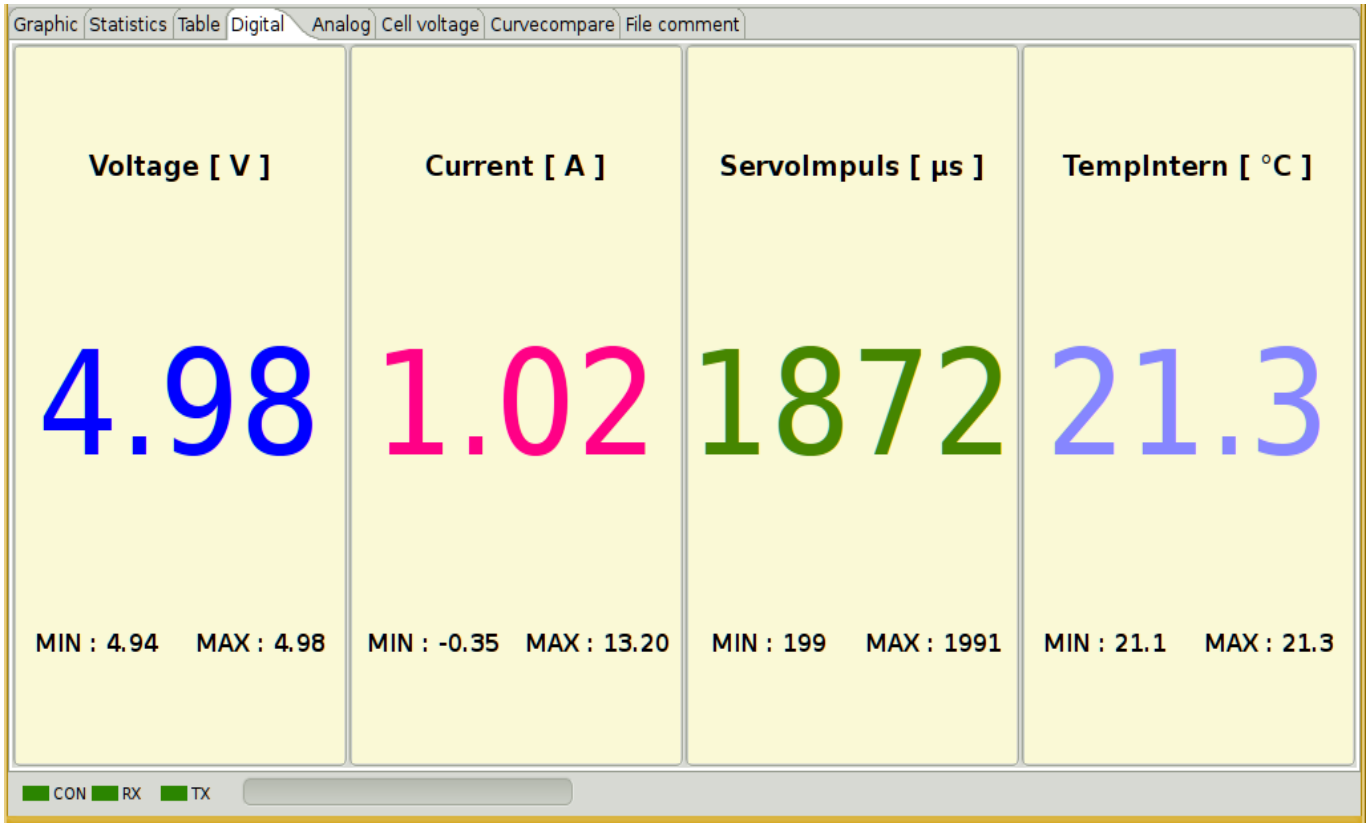
The table is showing all data even if a curve is invisible. Depending on the amount of data the size of the table can be real big.

Graphic	Statistics	Table	Digital	Analog	Cell voltage	Curvecompare	File comment	
Time [sec]	Voltage [V]		Current [A]		Charge [mAh]	Power [W]	Energy [Wh]	SupplyVoltage [V]
0.000	4.650		1.000		60.000	4.650	0.279	12.260
1.250	4.650		1.000		60.000	4.650	0.279	12.250
2.500	4.650		1.000		61.000	4.650	0.283	12.260
3.750	4.650		1.000		61.000	4.650	0.283	12.260
5.000	4.650		1.000		61.000	4.650	0.283	12.260
6.250	4.650		1.000		62.000	4.650	0.288	12.260
7.500	4.650		1.000		62.000	4.650	0.288	12.260
8.750	4.650		1.000		63.000	4.650	0.292	12.260
10.000	4.650		1.000		63.000	4.650	0.292	12.260
11.250	4.650		1.000		63.000	4.650	0.292	12.260
12.500	4.650		1.000		64.000	4.650	0.297	12.250
13.750	4.650		1.000		64.000	4.650	0.297	12.250
15.000	4.650		1.000		65.000	4.650	0.302	12.260
16.250	4.650		1.000		65.000	4.650	0.302	12.260
17.500	4.650		1.000		66.000	4.650	0.306	12.260
18.750	4.650		1.000		66.000	4.650	0.306	12.250
20.000	4.650		1.000		66.000	4.650	0.306	12.250
21.250	4.650		1.000		67.000	4.650	0.311	12.260
22.500	4.650		1.000		67.000	4.650	0.311	12.260
23.750	4.650		1.000		68.000	4.650	0.316	12.250
25.000	4.650		1.000		68.000	4.650	0.316	12.250

The calculation and formatting consumes time and memory. Big amount of data making the table unclear. This is the reason to have the capability to disable this calculation individual for each device ([visibility configuration](#)).

Digital View Window

The digital view should be set to display actual measurement values during data being captured. For example a charger will query every few seconds a new measurement, this can be displayed and with the big letters its easy to read. The color of the numbers match the color which is adjusted in graphics view.

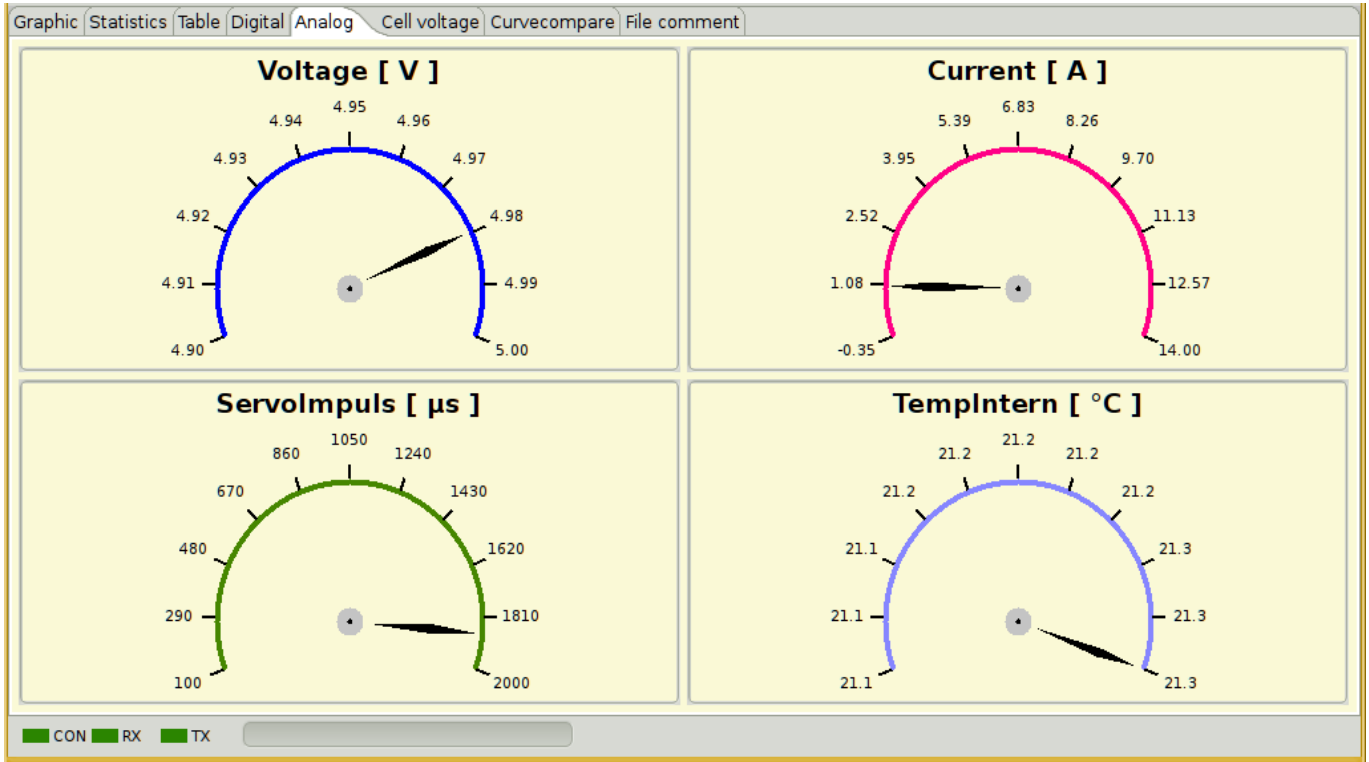


As mentioned no calculation are done only the measured values are displayed. The precision of the values match the adjustment of the precision of the graphics view.

Hint : Displayed values represent active and visible measurements from graphics context menu, the same precision is used as configured.

Analog View Window

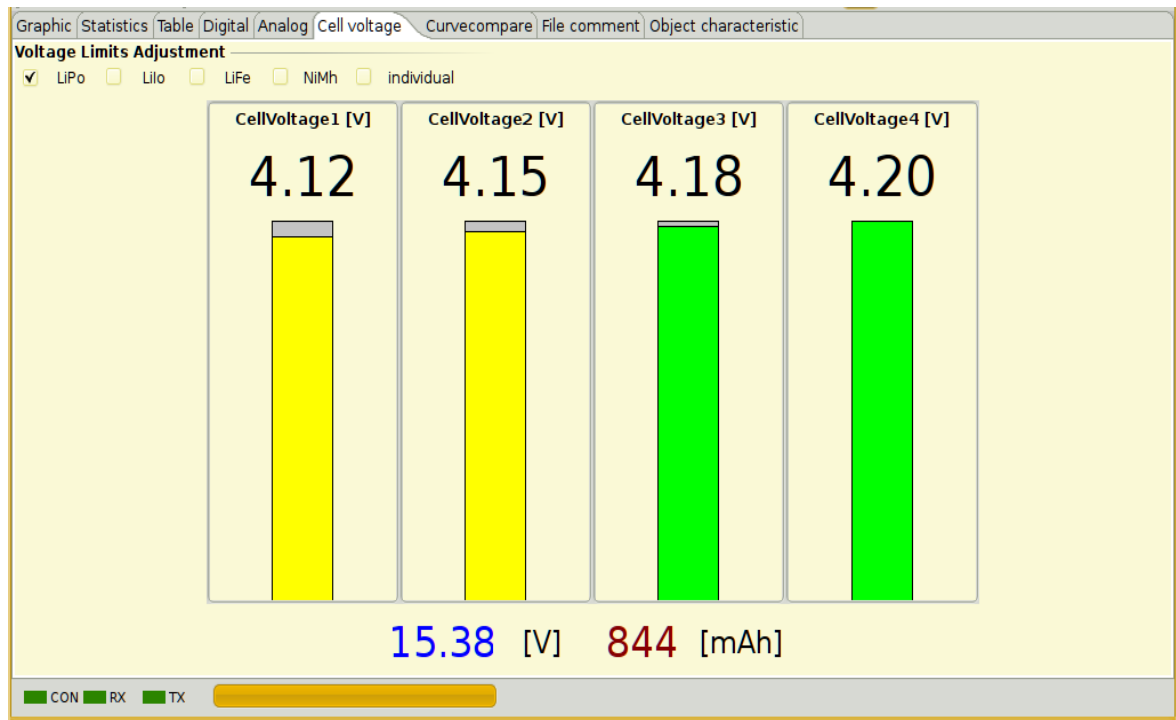
Similar to the digital view the analog view displays active measurements selected in the graphics view curve selector context menu. The screen shot below is showing the same measurement as shown for the digital view to make it comparable. The color of the scale circle matches the color of the measurement chosen in the graphics view curve selector context menu. To avoid continuous change the end values of the scale are rounded values. The rounding algorithm is the same as the algorithm used if applied to a curve in graphics view.



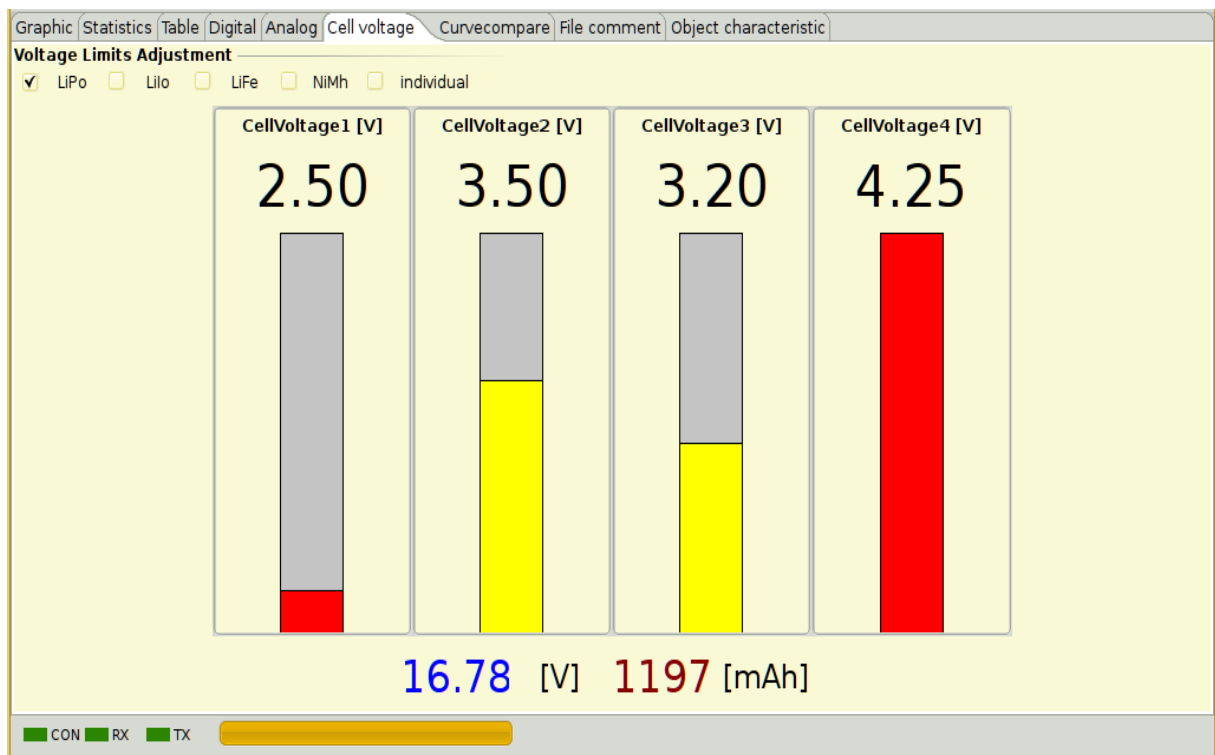
Hint : Displayed values represent active and visible measurements from graphics context menu, the same precision is used as configured.

Cell Voltage Window

The cell voltage view can only be used if the device enables this measurements. In most cases this comes true for Lithium battery cells charger. The voltage values are displayed as value and as bar graph.



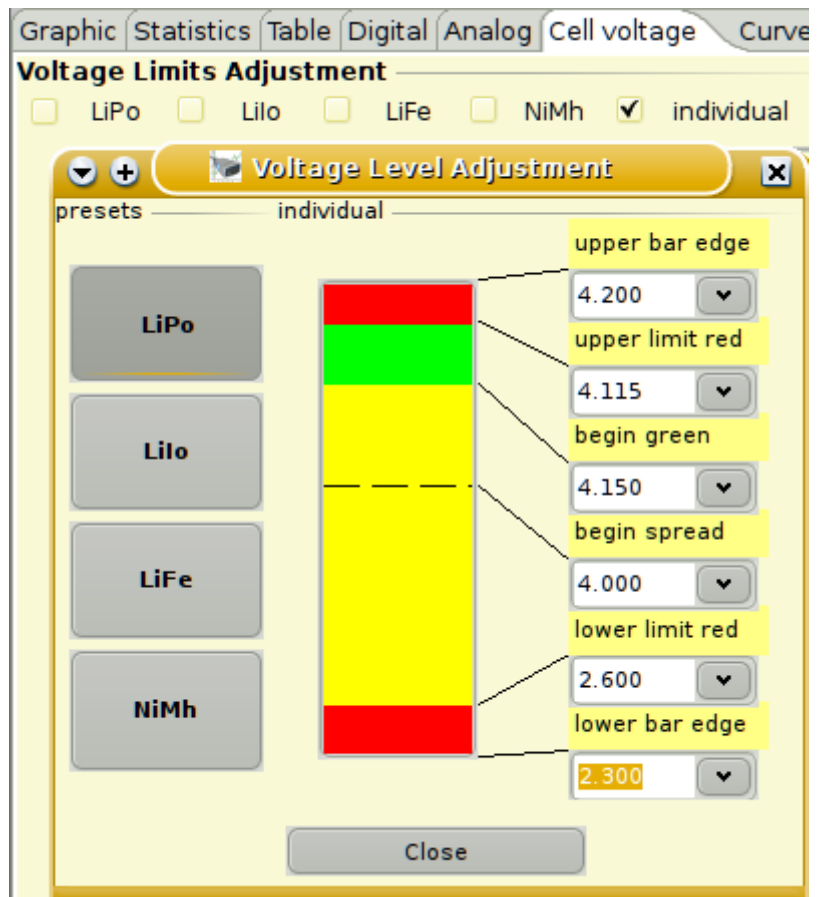
If the voltage values of the displayed cells has only a small difference the bar graph will spread to make differences more visible. If a cell voltage is lower than 2.60 Volt or above 4.20 Volt the bar color will change to red. If the cell voltage is between 2.60 and 4.20 Volts the bar is colored yellow. The bar color changes to green if the cell voltage is exact 4.20 Volt.



The pictures should make this more clear.

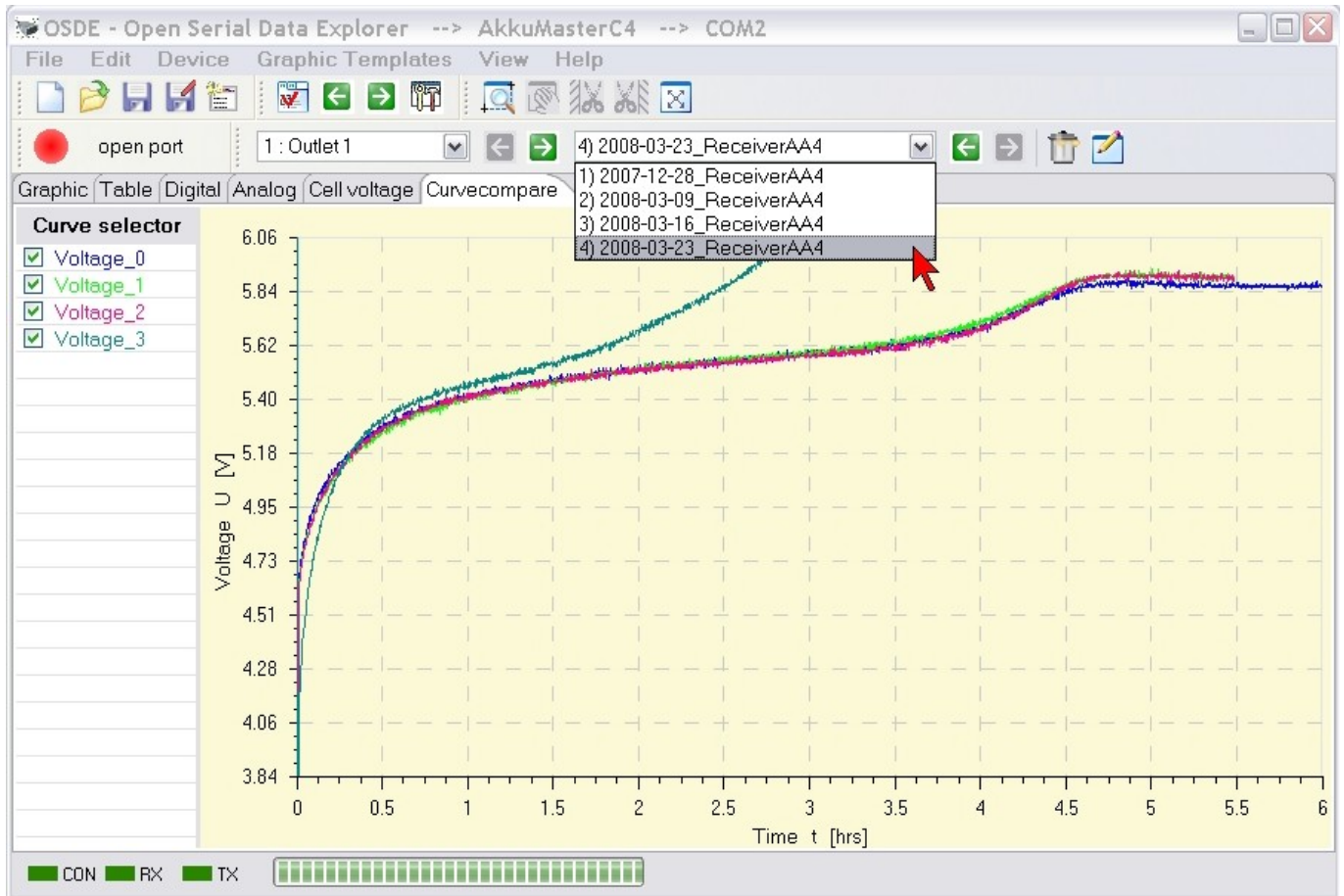
It is possible to configure the battery cell type regarding its voltage levels simply by selection for the popular types. If the connected device gives information about connected Lithium cell types the right selection will be done automatically. If this is not the case it must be done manually, so it is always a good idea to check the cell type selection. If a cell type is in use which is not directly selectable, individual settings can be configured. The dialog which enables after selecting "individual" shows all predefined cell types' limits and enables your own cell type level configuration.

Hint : Should more than one measurement point be displayed, use the [Oscilloscope mode](#).



Curve Compare Window

As the name says the compare windows purpose is to compare curves with each other. The screen shot showing collected curves of an battery over a time period where the battery gets used. Comparison of curves makes only sense if the preconditions of the measurements are almost equal. Only the difference of the curve form regarding charge time and voltage level indicates a damage.

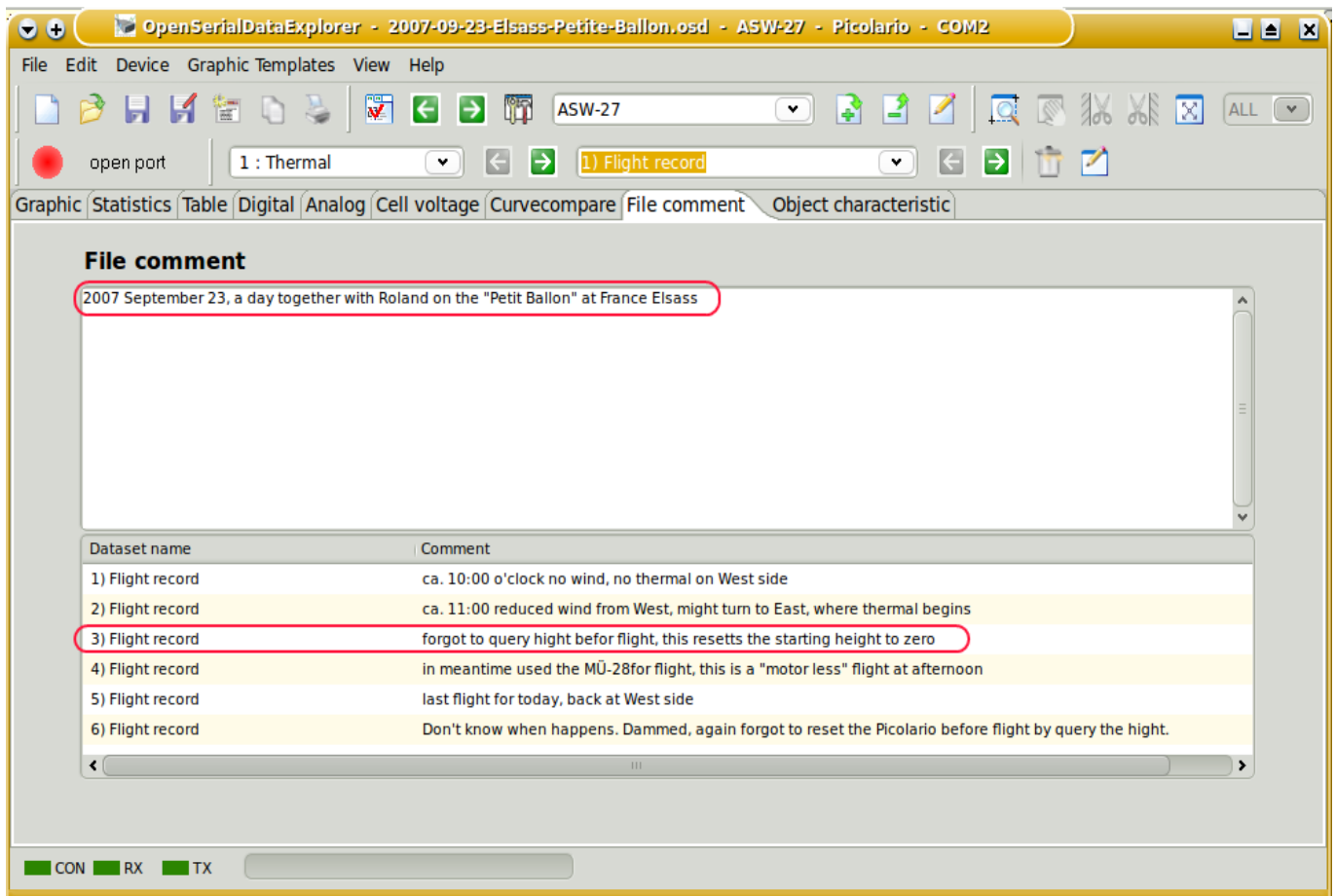


Within the compare window it is possible to zoom and measure, equals to the functions in the graphics view.

If grid lines are activated in the compare window this will be restored next time the application is re-started.

Hint : The application will not allow to compare curves with different unit. The curve compare window and its content will not be saved. The tabulator containing the curve compare window will be created while copying the first curve into the curve compare window.

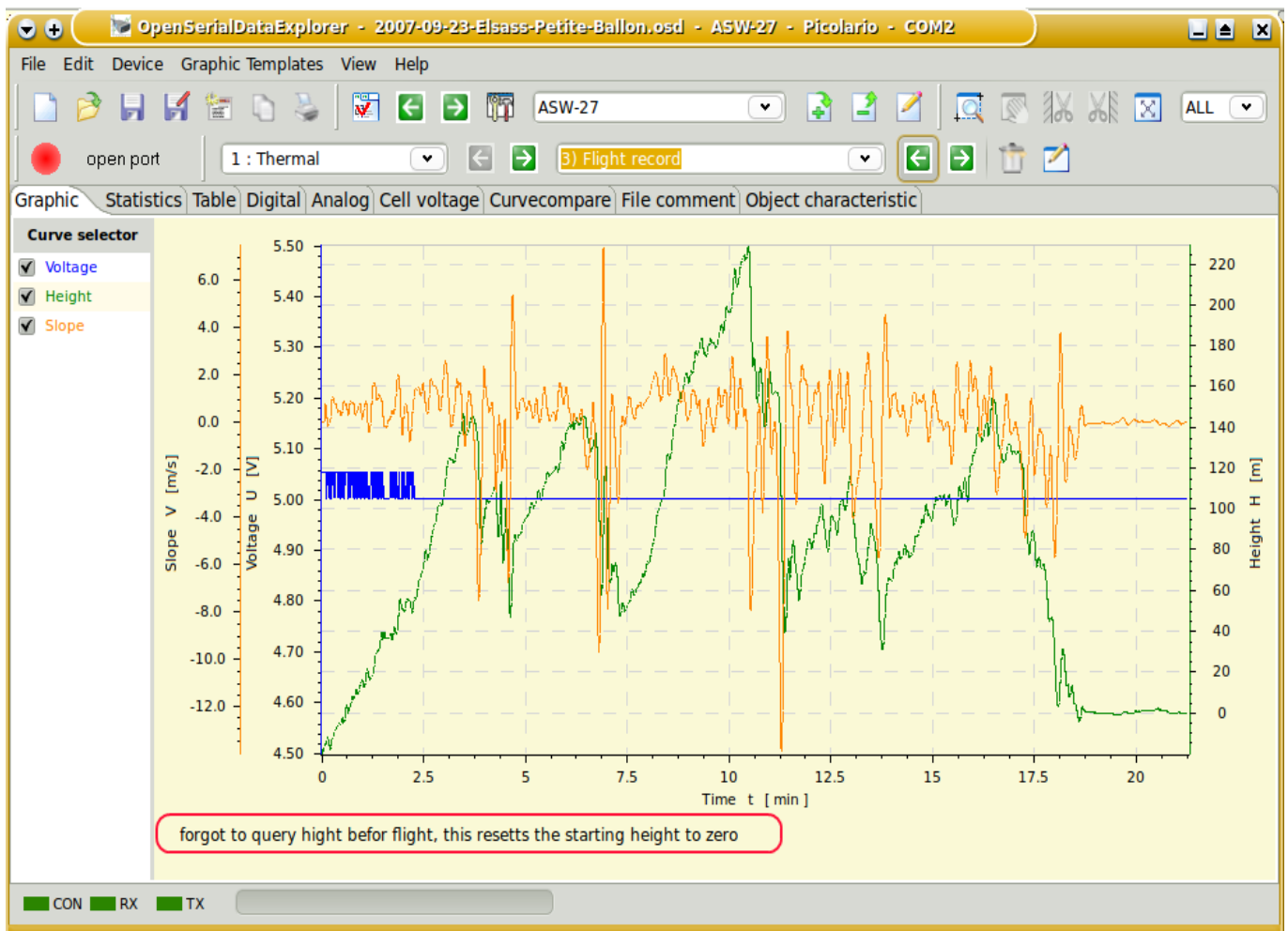
File and Data set comment window



At the file command window it is possible to comment things relevant for all the data sets. As starting point the actual date will be displayed. Initial this is the creation date of the file. This date might be modified of course, if the real data are created or logged at another day.

The file comment window will be viable by selecting its tab. The data set comment will be visible, in a lower table for all data sets part of this file.

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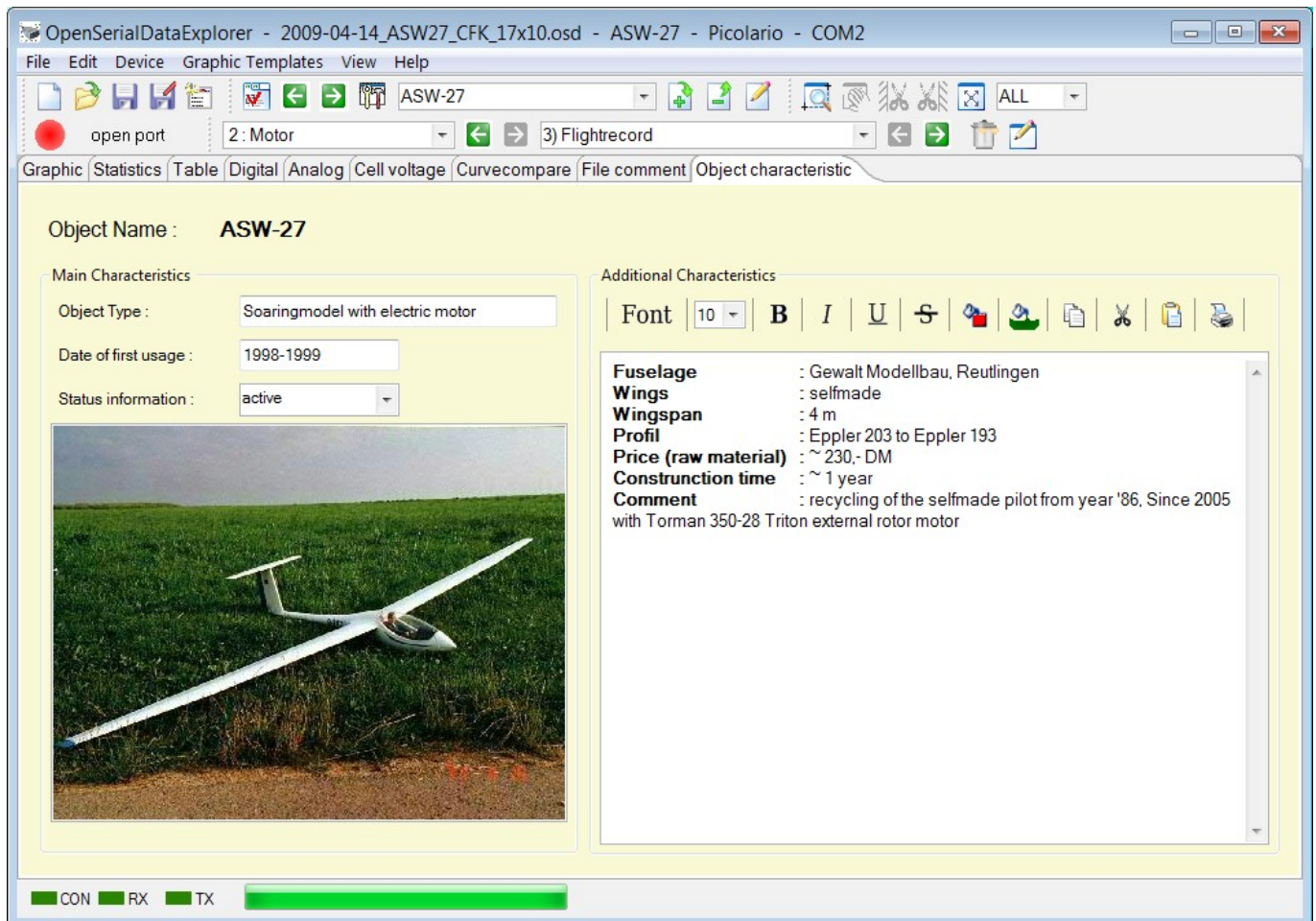


The data set comment is visible in graphical view below the graphs, if activated, and can be modified here directly. Data and time is displayed in default and can be modified if required. This time mark should be used as indicator at what time this data was created. This comment should be used to write some notes which are data set specific, like events why this is different to others.

Hint : All comments are stored in the data file and might be displayed again.

Object characteristic window

This display tab window allows to notice object characteristics to be used for related data records. This tab is visible only if an object key is selected in the tool bar.

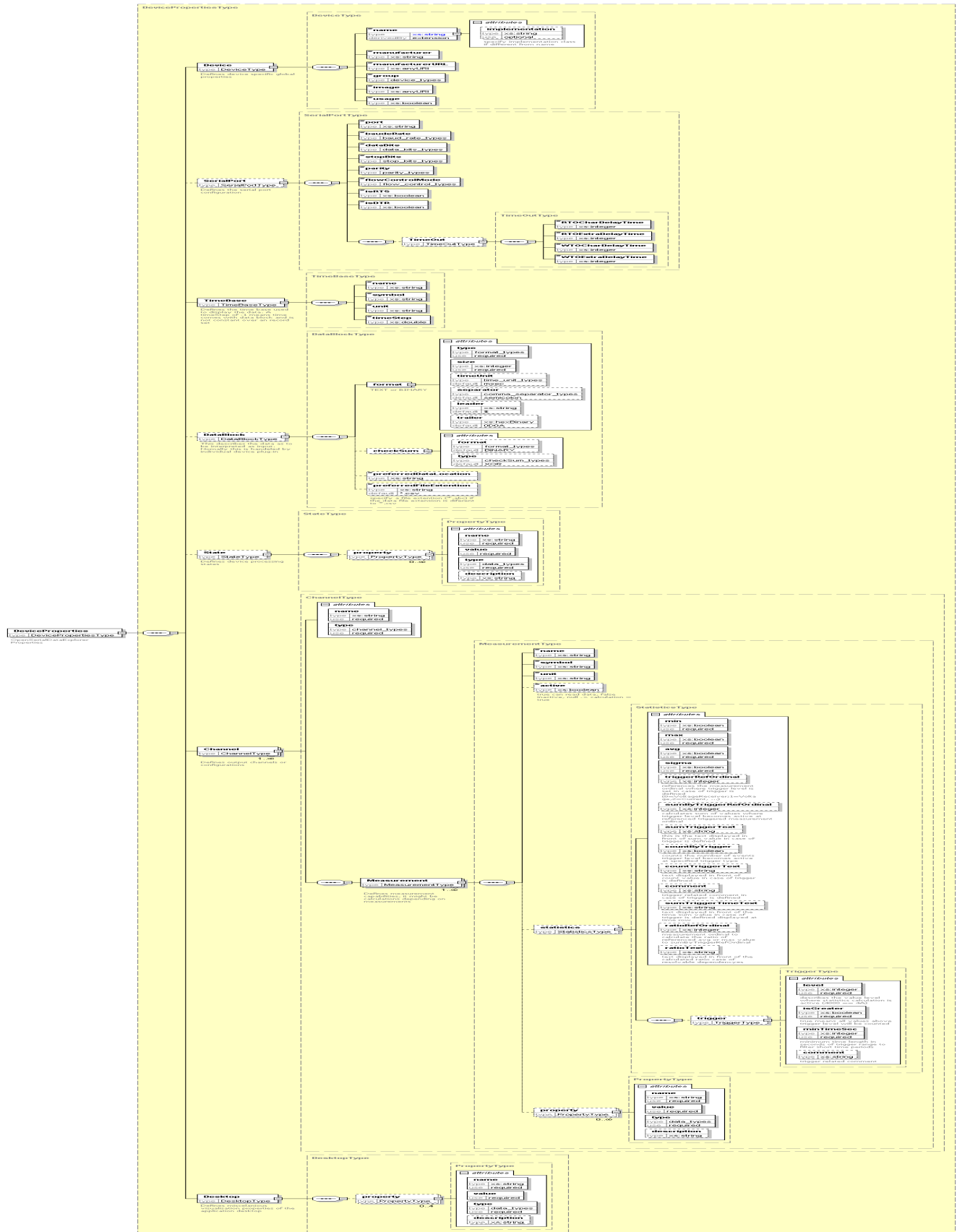


The edited content are saved automatically when the object key changes or the application is closed.

Hint : The object characteristic is related to many devices and data files and will be stored in an extra directory. Data files are still stored in the device directory and contain an object key. In the object directories are only file links pointing to the related device files.

Device Properties Files

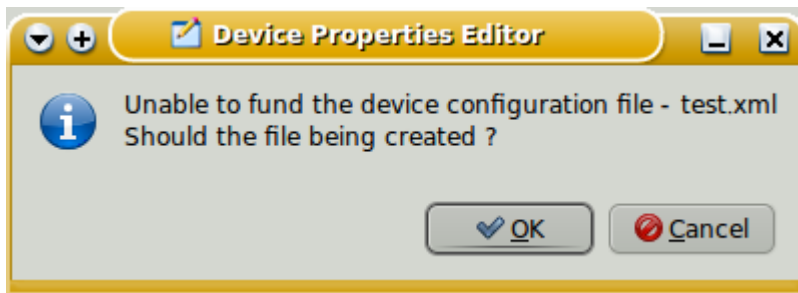
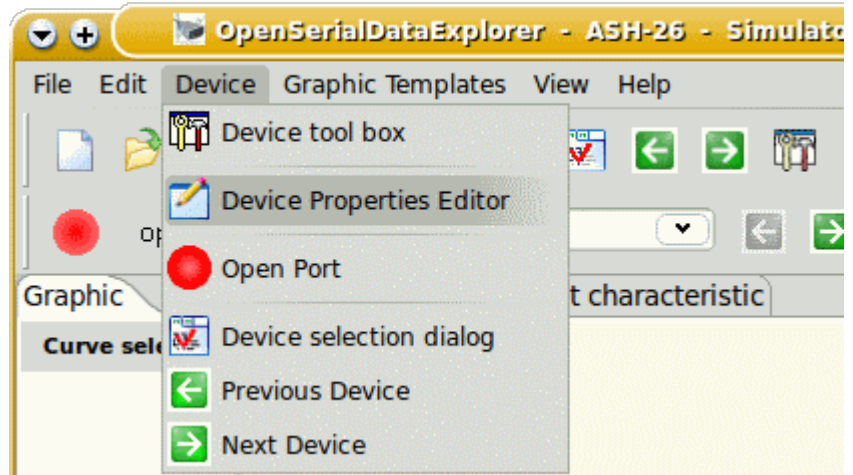
Device properties files are in XML (Extensible Markup Language). Using the XML together with a style sheet (XSD) it is secured to have it validated while reading. If a file is invalid regarding the style sheet it can not be read and will cause an exception. As information material below the actual XSD as picture.



DevicePropertiesEditor

Using the OpenSerialDataExplorer menu bar or started as standalone application it is possible to create new or modify existing device properties files. Doing this the device XML files are touched.

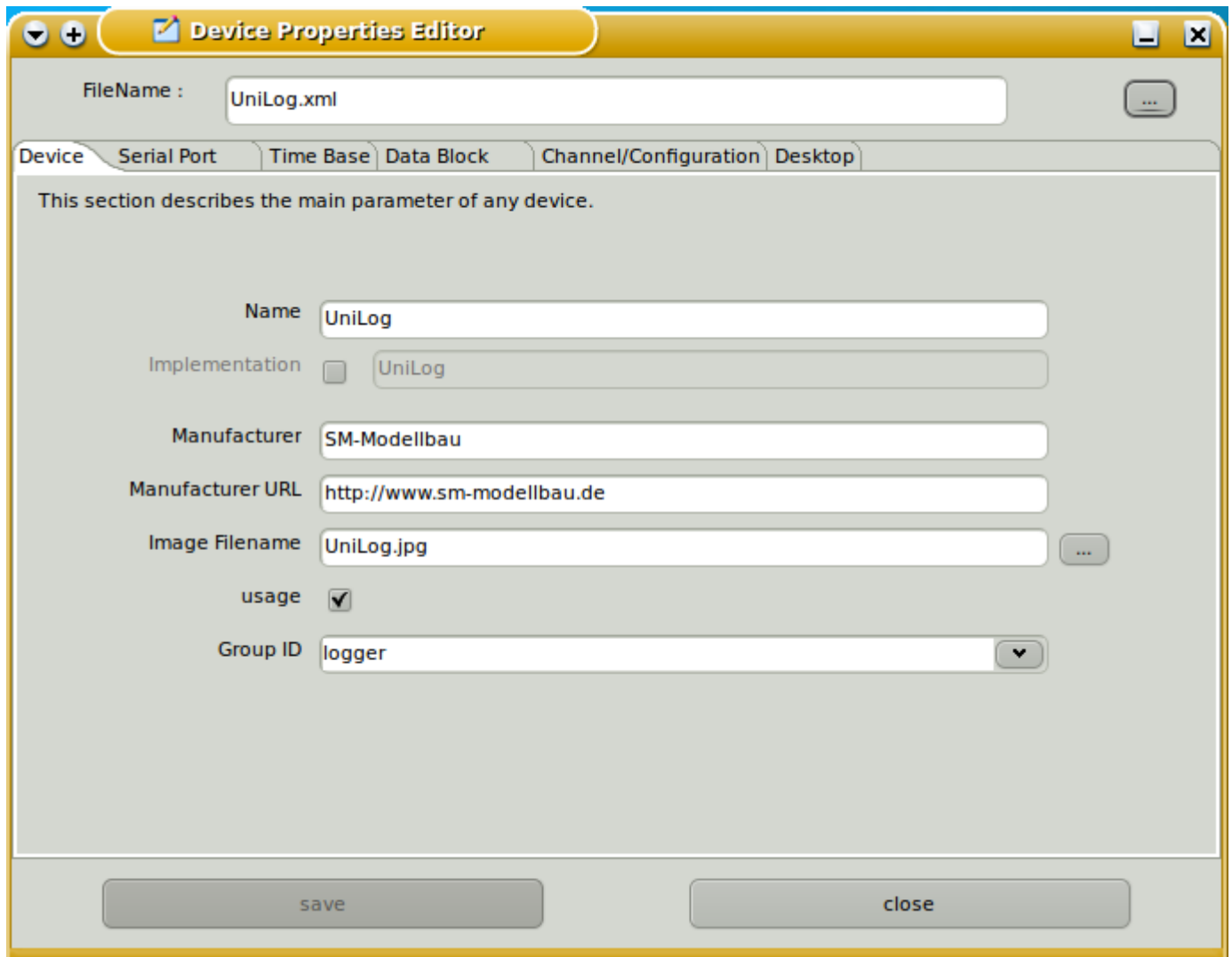
Using the menu bar the device properties file of the actual device will be opened. Is that the case, manipulating properties will not directly manipulate all properties of an already loaded and displayed data set. Will the DevicePropertiesEditor started as standalone application, it is possible to type the name of the device directly, if known. Is the name unknown to the application and can not be find in the devices directory a new device properties file might be created.



A sample files gets extracted and needs to be adapted as required. Selecting the button, right hand side, a dialog will be opened to enable selection of an existing file.

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The device tabulator shows how to specify name and manufacturer of an device.

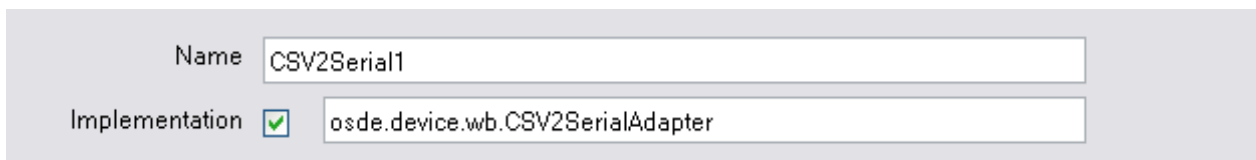


The screenshot shows the 'Device Properties Editor' window. At the top, the 'FileName' is 'UniLog.xml'. Below the tabs (Device, Serial Port, Time Base, Data Block, Channel/Configuration, Desktop), a message states: 'This section describes the main parameter of any device.' The configuration fields are as follows:

- Name: UniLog
- Implementation: ☐ UniLog
- Manufacturer: SM-Modellbau
- Manufacturer URL: <http://www.sm-modellbau.de>
- Image Filename: UniLog.jpg
- usage: ☒
- Group ID: logger

At the bottom, there are 'save' and 'close' buttons.

Switching the implementation active, the implementing device class name has to be configured, optional as full qualified including the package. The implementation can always be used if an equal device implementation class is already available, and/or if the device name does not fit. As an example the CSV2SerialAdapter has several devices using this implementation, differences exist in the data block specification. As an additional example the several copies of the Bantam charger devices can be named, where differences exist in cover design and device name. The captured data should be found under the directory followed by the device name, isn't it.



This close-up shows the 'Name' field with the value 'CSV2Serial1' and the 'Implementation' field which is checked and contains the full class name 'osde.device.wb.CSV2SerialAdapter'.

If the 'package' is not given, the 'package' gets calculated starting with "osde.device.", followed by the manufacturer name, converted in lower case and hyphen and blanks eliminated. The default class name can be calculated by removing blanks and hyphen. capital letter are kept.

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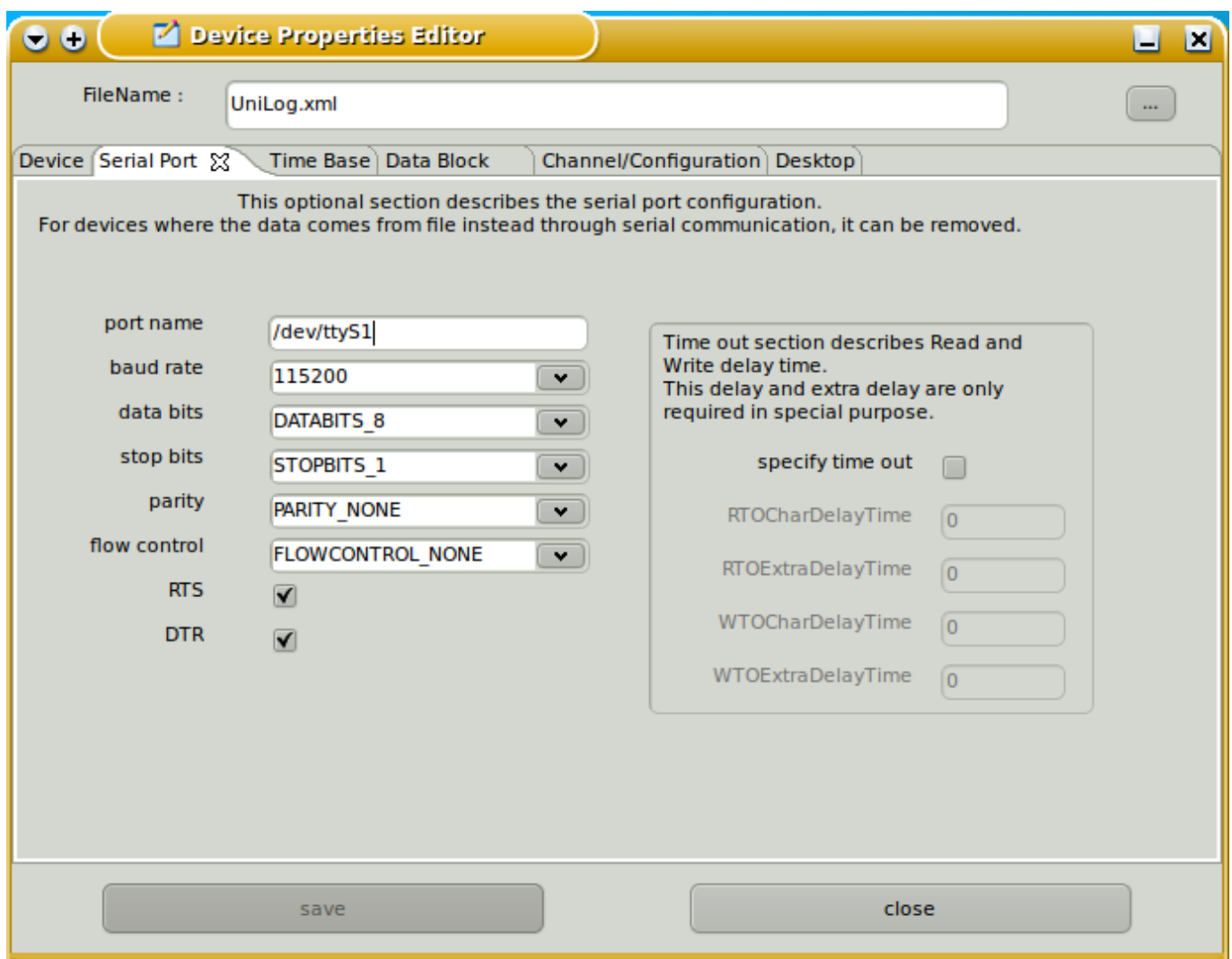
The image name can directly typed if known and it references an existing within the device plug-in. If the image gets selected by use of the right hand side button and file selection dialog the selected image guest scaled to 225x165 pixel. In addition it is possible to pack the image directly into the referenced plug-in. Modifying the plug-in could only done in the temporary folder where write rights are guaranteed. If this option is chosen the modified plug-in must be copied to the application directory, where the plug-in can be added to the class path.

A screenshot of a text input field labeled "Image Filename" containing the text "CSV2SerialAdapter.png". To the right of the input field is a small button with three dots "...".

How to do that will be advised in a message box.

Hint : This change might be get lost while updating the application. A backup might be saved somewhere else by your own.

The serial port gets configured easily by selecting appropriate values from the combo boxes.

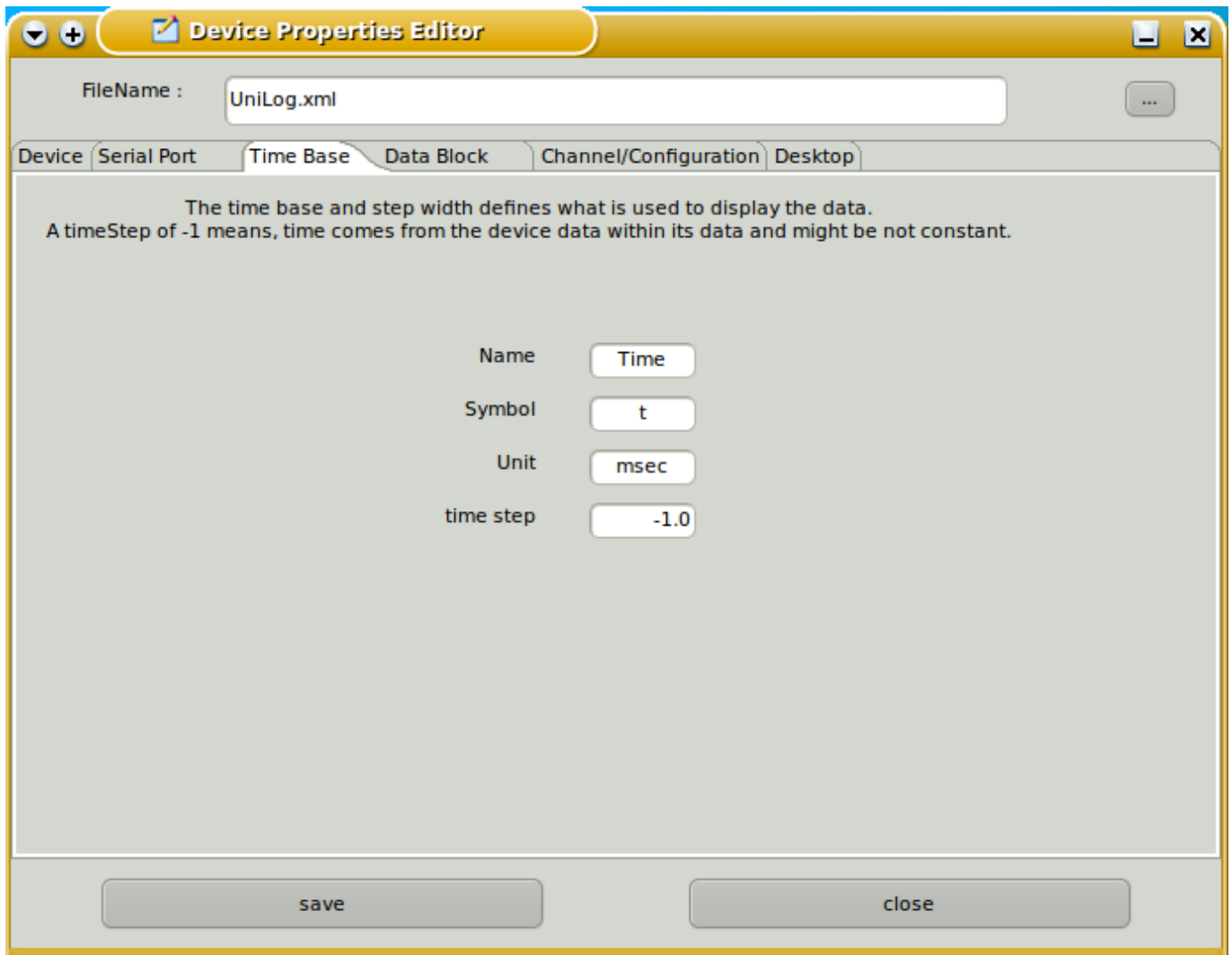
A screenshot of the "Device Properties Editor" dialog box. The "Serial Port" tab is selected. The "FileName" field contains "UniLog.xml". The "port name" field contains "/dev/ttyS1". The "baud rate" dropdown is set to "115200". The "data bits" dropdown is set to "DATABITS_8". The "stop bits" dropdown is set to "STOPBITS_1". The "parity" dropdown is set to "PARITY_NONE". The "flow control" dropdown is set to "FLOWCONTROL_NONE". The "RTS" and "DTR" checkboxes are checked. The "Time out section" contains a "specify time out" checkbox (unchecked) and four input fields: "RTOCharDelayTime" (0), "RTOExtraDelayTime" (0), "WTOCharDelayTime" (0), and "WTOExtraDelayTime" (0). At the bottom are "save" and "close" buttons.

Hint : If timeouts guest specified the implementation must be written to use this values.

The description of the serial port is optional due to the fact that some devices don't use it and read simulated serial data from text files. As example the CSV2SerialAdapter devices does not have a serial port specified.

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To configure the time base is simple.

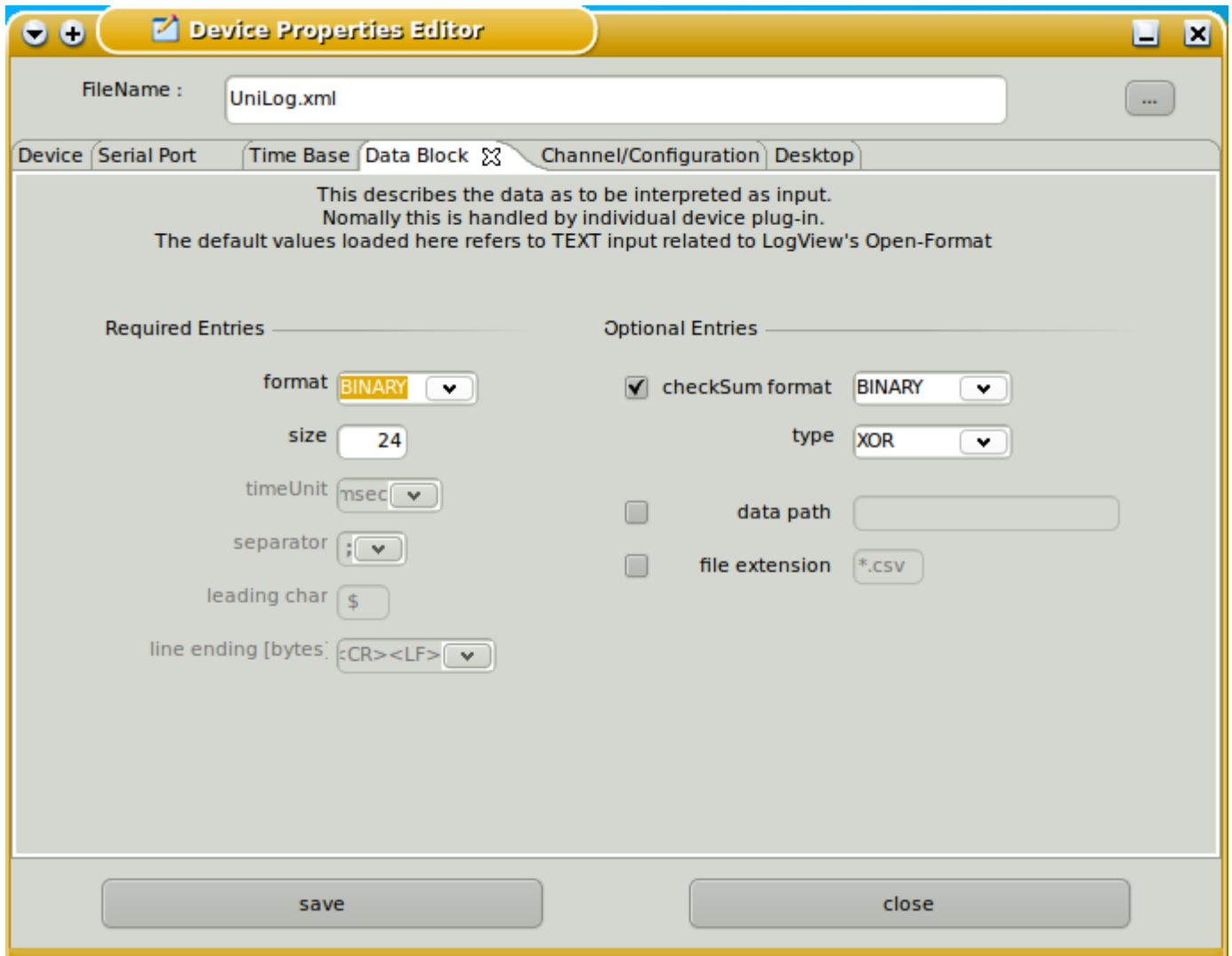


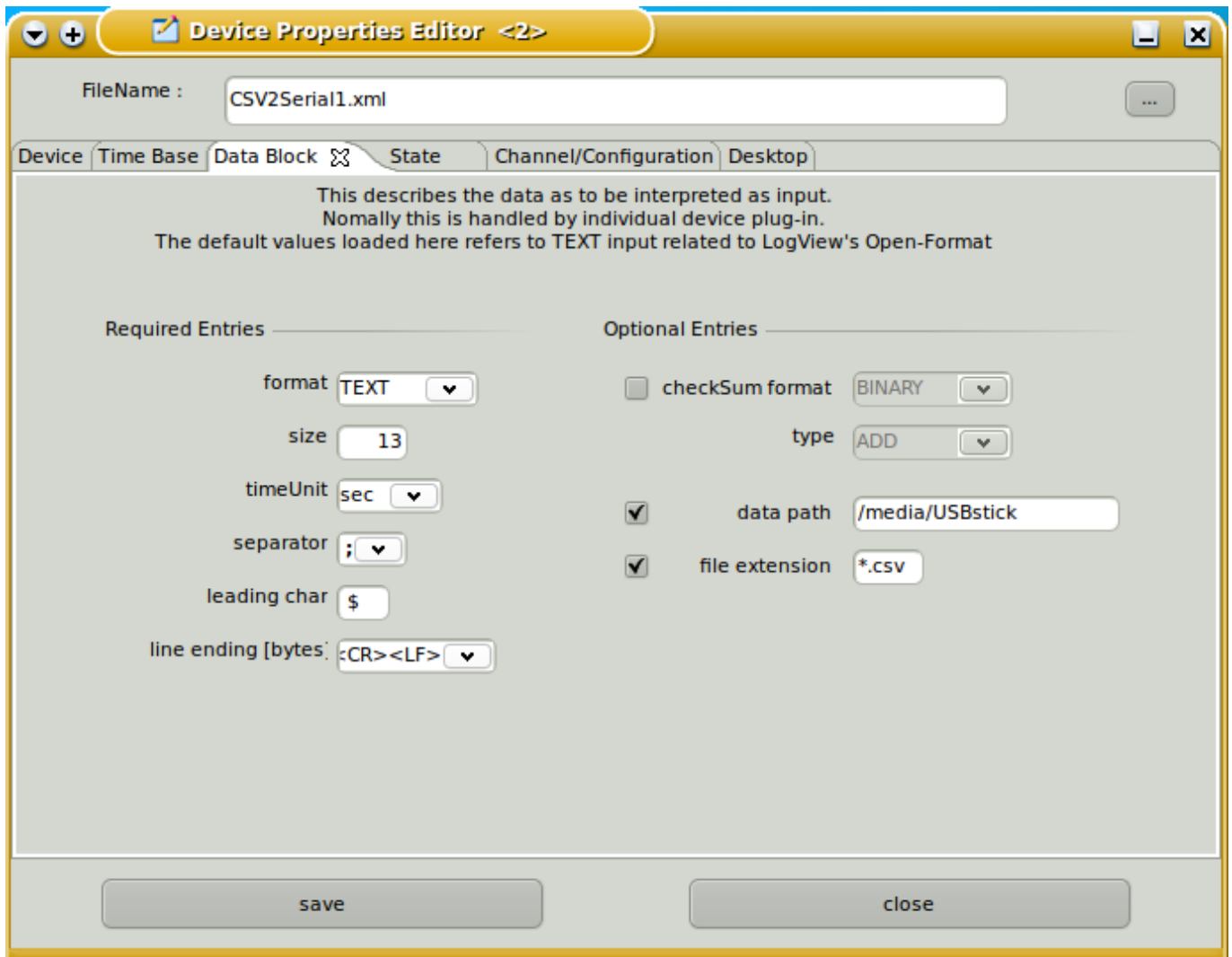
A value greater than 0 milli seconds as time step between the measurement points is voted as constant time gap. The time step value lower than 0 milli seconds signals that the device gives individual time steps. This must not mean that the time steps might not constant. The implementation for the particular device must handle this situation.

Hint : The UniLog, as example, uses an adjustable but constant time step between measurement points. Therefore the time step is -1 msec. Finally the device implementation must handle the situation and read the time step value for each sequence and use it as constant value for the data.

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The next two pictures contrast two different data block configurations. The UniLog configuration describes binary data with a constant length of 24 bytes. Is 24 bytes the maximum and a shorter length as example 20 bytes possible the configuration must point out -24 as value. The data type is BINARY and no separator sign is configurable.



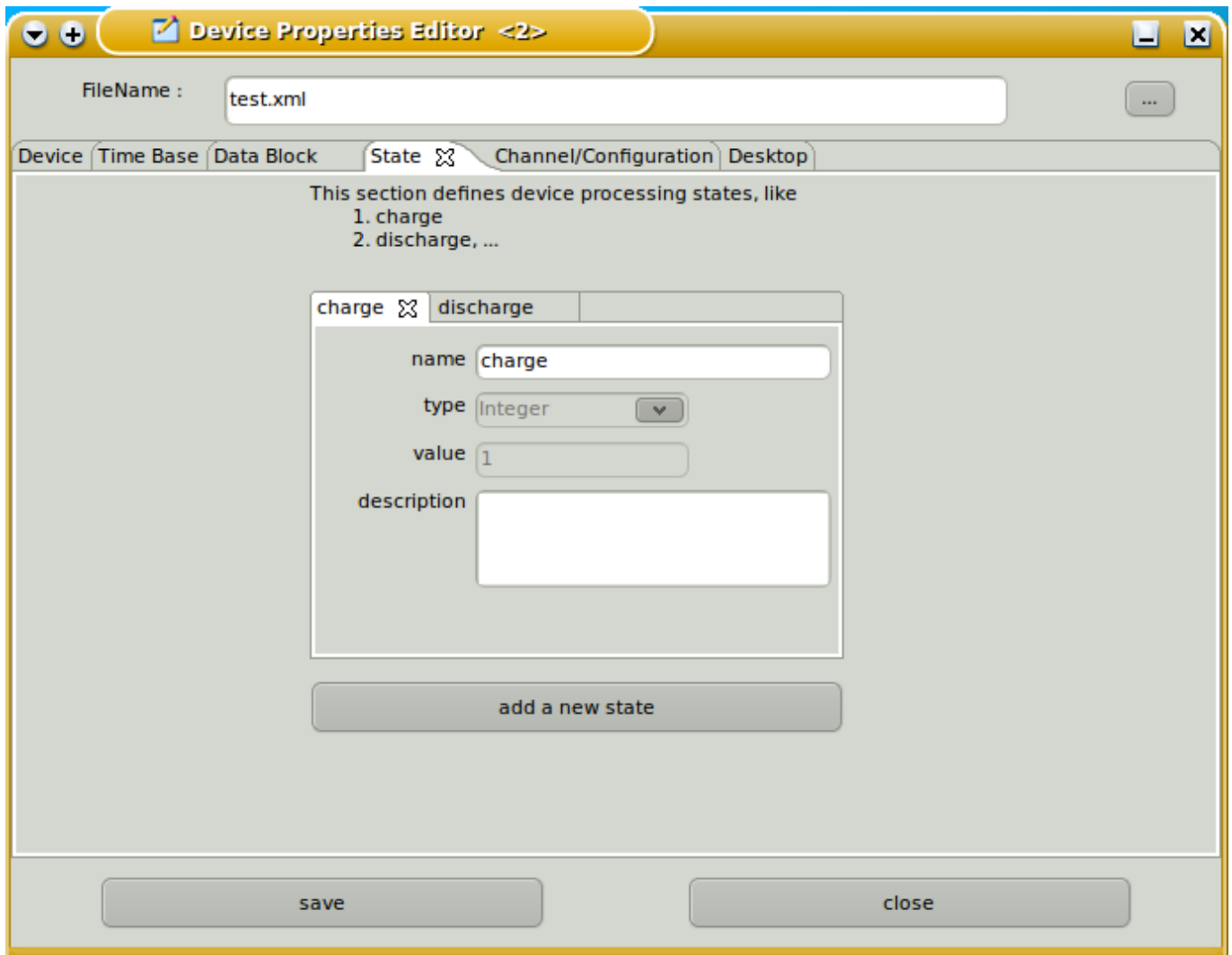


Is TEXT chosen as data type additionally configuration parameter must be specified. The file extension, what is used during file selection, as well as the standard data path, will help to select files faster. Both are optional, but help, if data files are delivered by a memory card, like the DataVario from WStech, which will appear with an dedicated path value if inserted into the computer.

Hint : This configuration are optional. Other implementation might use this parameters in a different way.

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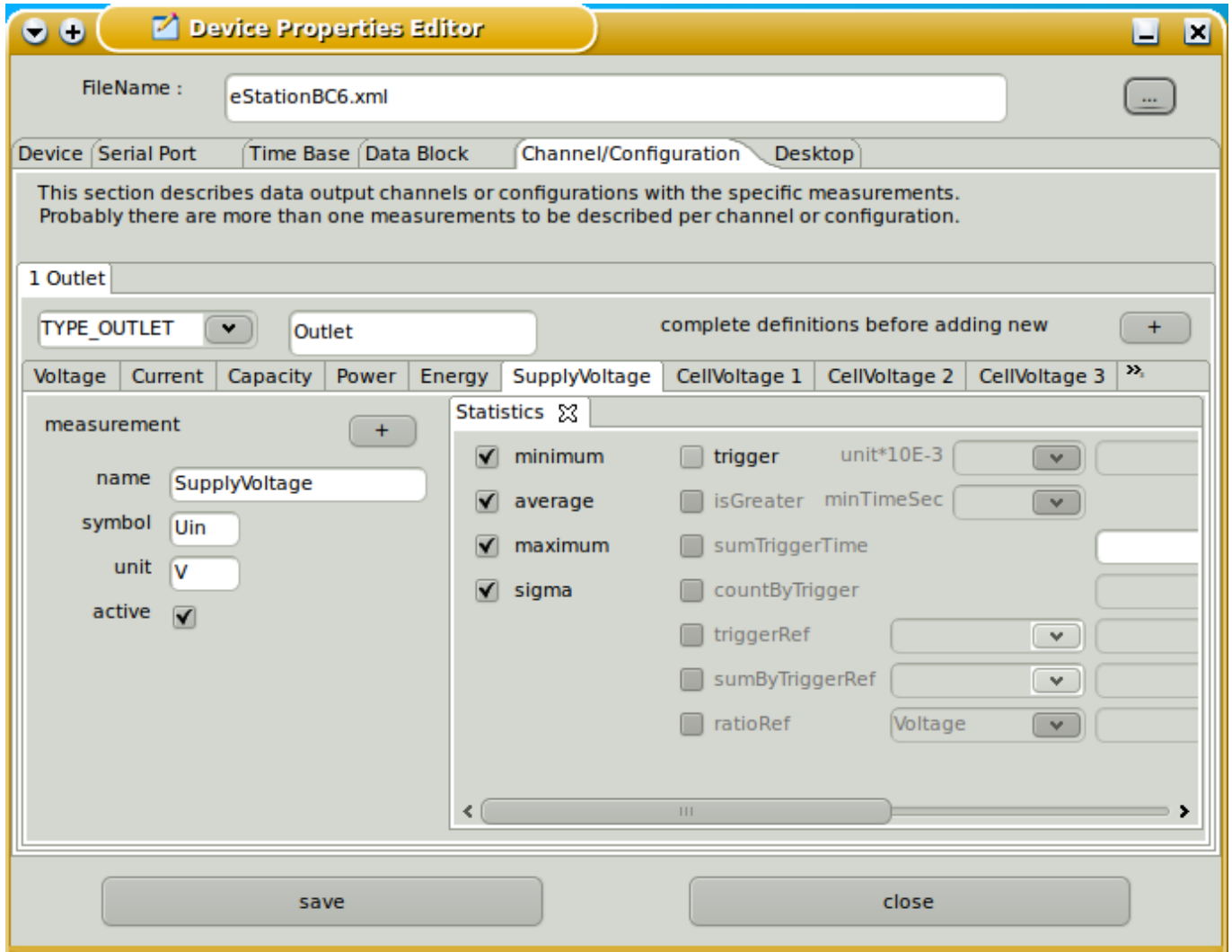
The state tabulator will describe a sequence number to device states. This description makes sense if a device can use more than one state and data are imported by a text file using the CSV2SerialDataAdapter. Finally the device implementation use the states and match it somehow with the data.



Hint : If text data are imported using the CSV2SerialDataAdapter the state 1 would be charge (\$1;1;time;data;..), and state 2 discharge (\$1;2;time;data;..) compared to the sample.

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The tabulator with the name channel/configuration is the most complex and the biggest one. Here, as required or desired, the device outlet as a data channel or different configurations gets described. As described two different types of channel/configurations are available. A charger device with only one outlet to connect one battery at a time has only needs to configure only one channel/configuration from type outlet. The sample on right hand side just showing this.



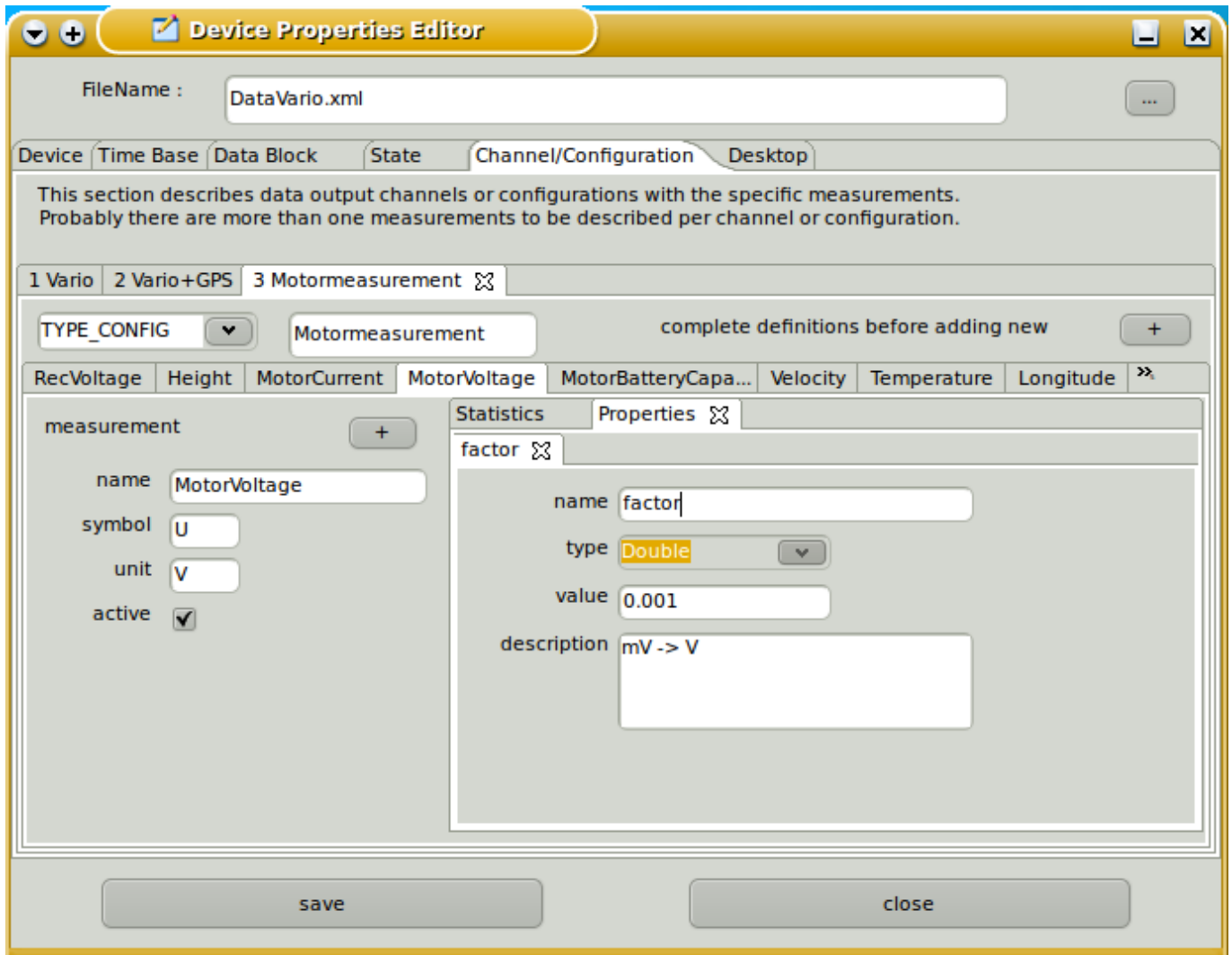
Underneath the area where the type and the name has to be configured another tabulator describes the individual measurements. The measurement configuration is responsible how the data are finally displayed in the various windows including the unit and the statistic mathematics.

Hint : Is the channel/configuration type is chosen as configuration (TYPE_CONFIG) different configurations could be combined with identical data set.

If a copy of an channel/configuration is necessary it is sense full to complete the measurement configuration which belongs together before do the copy.

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Measurements get described with the name, its unit, its symbol and if the measurement is active captured from the device. Non active measurements are calculated (current * voltage). In addition there are optional properties like factor, offset and reduction which influence the view of the (raw) data.

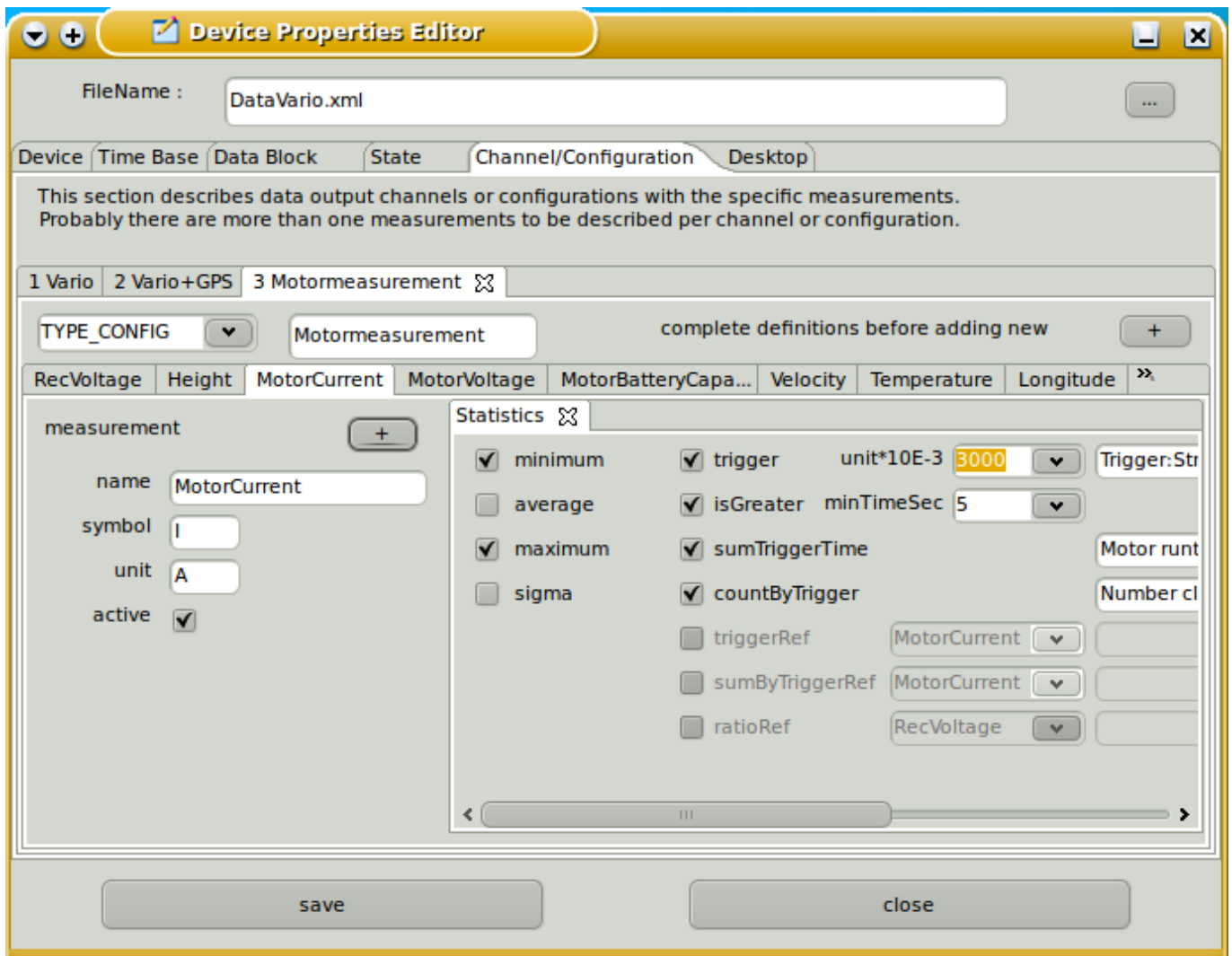


Hint : Are additional properties and/or statistics configuration required, use the context menu to create. After a measurement is completely described by properties and statistics it is possible to copy the complete set into a new one using the + button.

Adding a property is simple since there are a lot of prepared once available and only the value needs to be specified.

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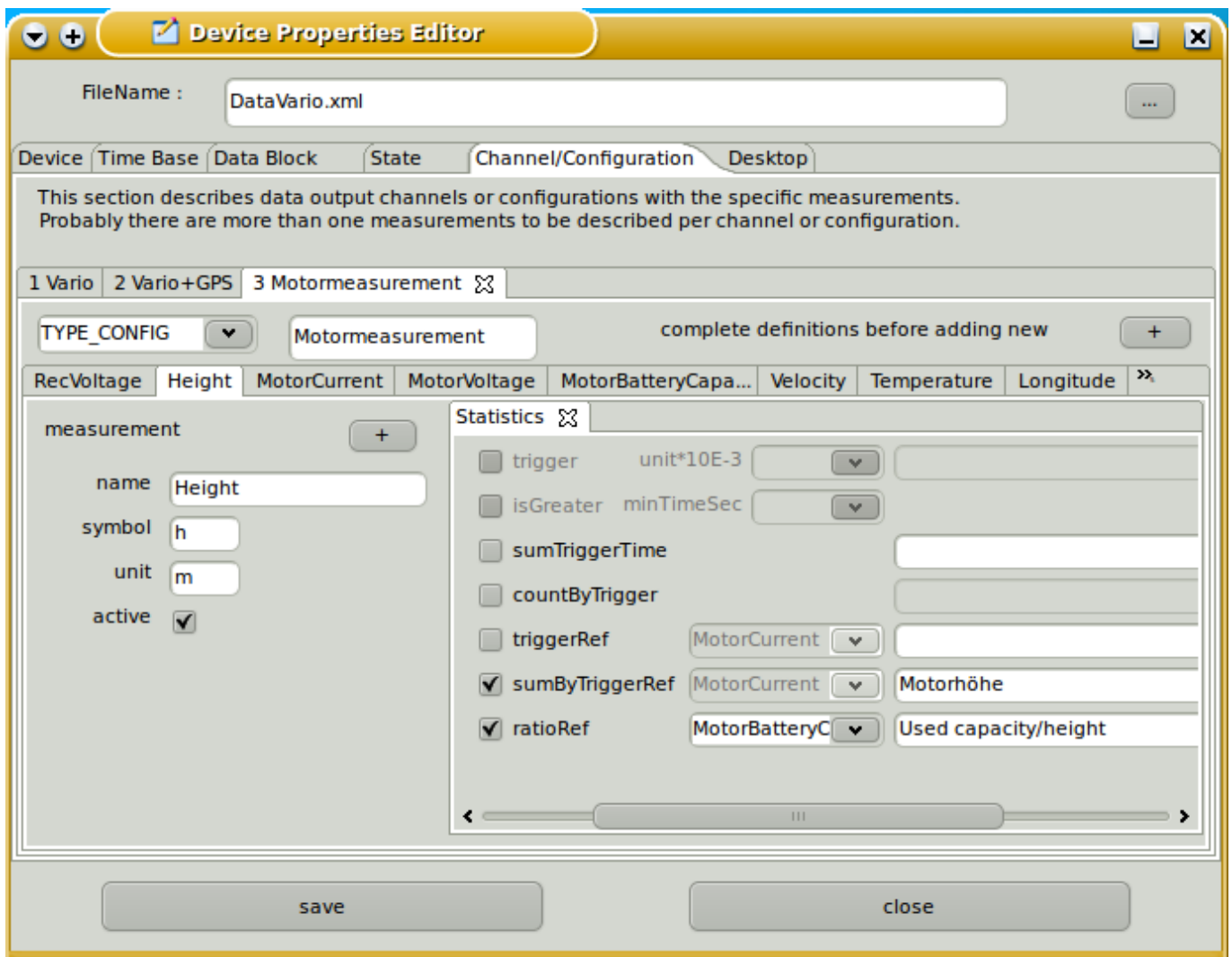
This statistics sample showing how to select average minimum and maximum as well as how to configure an trigger. A trigger is described by a value and a time to be specified as a limit. All average, minimum, maximum and deviation are related to this trigger now. In addition it is shown how to configure that the time where the trigger is active gets summarized. This might calculate the real motor runtime. It is also possible to count the trigger events.



Hint : It is possible to add comments to the most of trigger or trigger related statistics. This helps to identify which statistic value relates to an adjusted trigger and which not ([Statistics Window](#)).

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The next sample is showing how a already defined trigger can be used to calculate related statistics data. In the sample, while "sumByTriggerRef" is selected, the height gets summarized over the trigger period only to count the total height by motor runtime. This will help to identify the best propeller to motor adaption in comparison to other combinations.

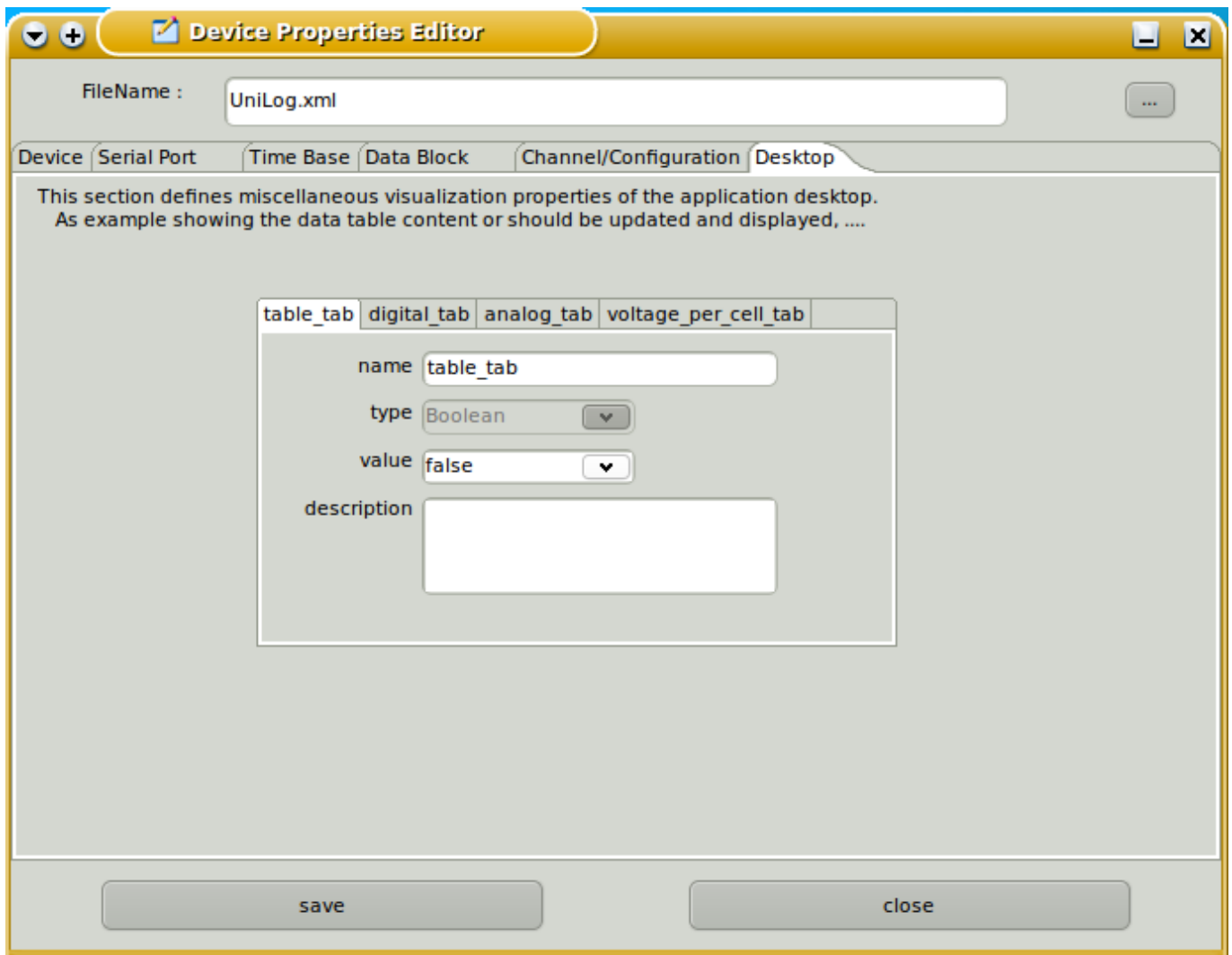


In addition a proportionality gets calculated to show the used battery capacity versus the height during motor runtime. This allows judgments how effective the available power is used up.

Hint : Additional configuration samples can be found in UniLog or DataVario device property files.

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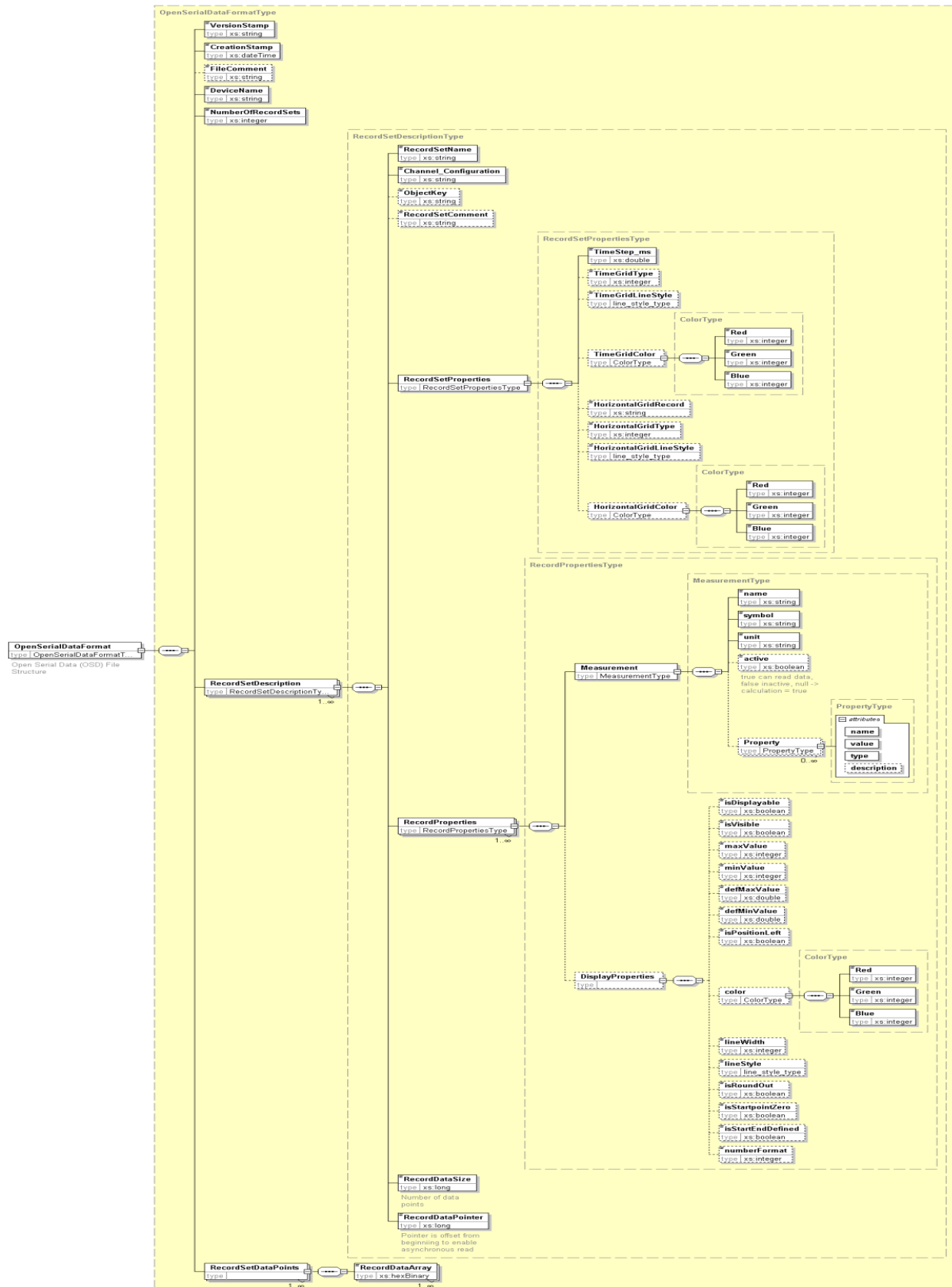
At least the description follows about the application visualization. At this point it is initially configured which tabulator is active and visible. Active relates to visibility and calculation time for the content to be displayed within the window behind.



Hint : Initial means that the application device selection dialog itself allows to modify this, refer to [Device selection dialog](#).

Data File Format

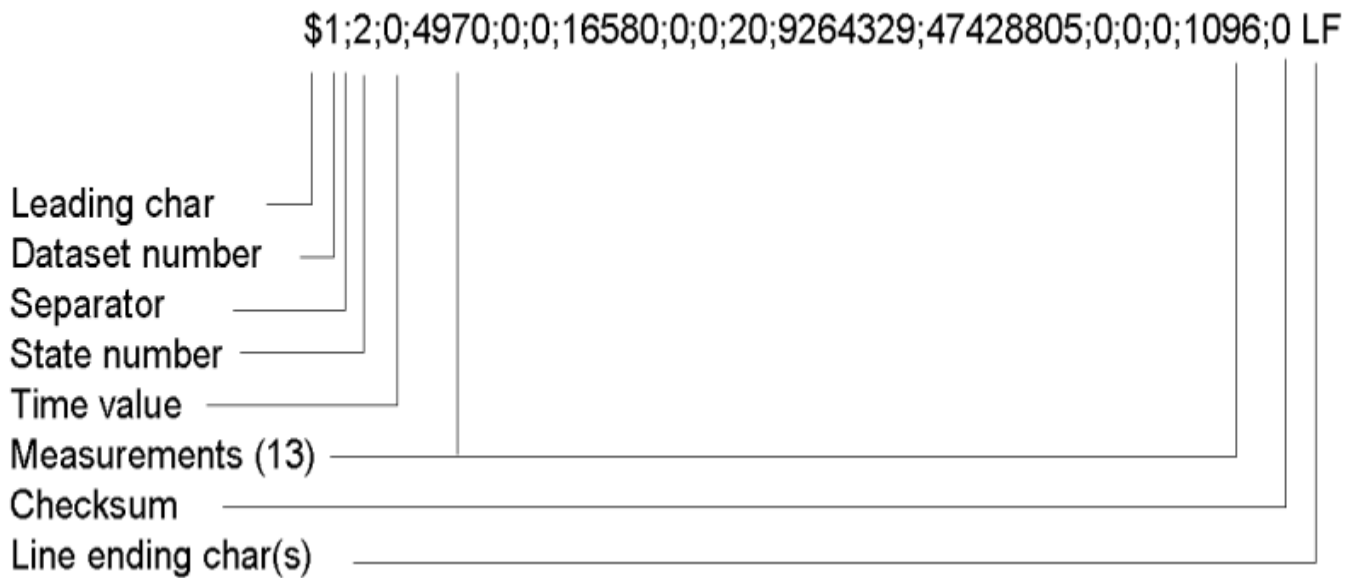
The file format OpenSerialData (OSD) is implemented in version 1 as clean binary format. To enable extensibility for a long time period the configuration data are key value pairs. This enables the capability to keep some configuration data optional similar to optional XML elements. The read functions will construct at first a HashMap of the key/values and apply only the values of existing keys. All other are default. The binary format seems for me simpler for the first shot to enable asynchronous read capability.



CSV2SerialAdapter Data Format

The text data format is a standard "Comma Separated Values" CSV-file as it is used by spread sheet applications as well. The alignment of data (values) is common for a lot of battery charger devices. The LogView application also can import this type of data and is named as "OpenFormat". Due to the platform comprehensive approach of the OpenSerialDataExplorer, it is required to make the specification more complete. As example different execution platforms used different new line characters, p.e. Windows <CR><LF> while creating a file. On the other hand it must be secured that files created on different platforms, with specific new line characters, can be interpreted, p.e. Linux <LF> or Mac <CR>. Refer to the DevicePropertiesEditor [data block](#) description.

The sample showing the assignment of the values in relation to the text data and how they gets interpreted.



Actual Supported Devices

The following will list the actual supported devices with its dialogs and give some hints for usage.

AkkuMaster

The AkkuMaster C4 device dialog is to be used to view, adjust and gather data from AkkuMaster discharge and charge processes. It is possible to configure each outlet independent from the others. A configuration which overloads the charger is impossible, since the individual loads are accumulated and the resulting total current will be displayed.

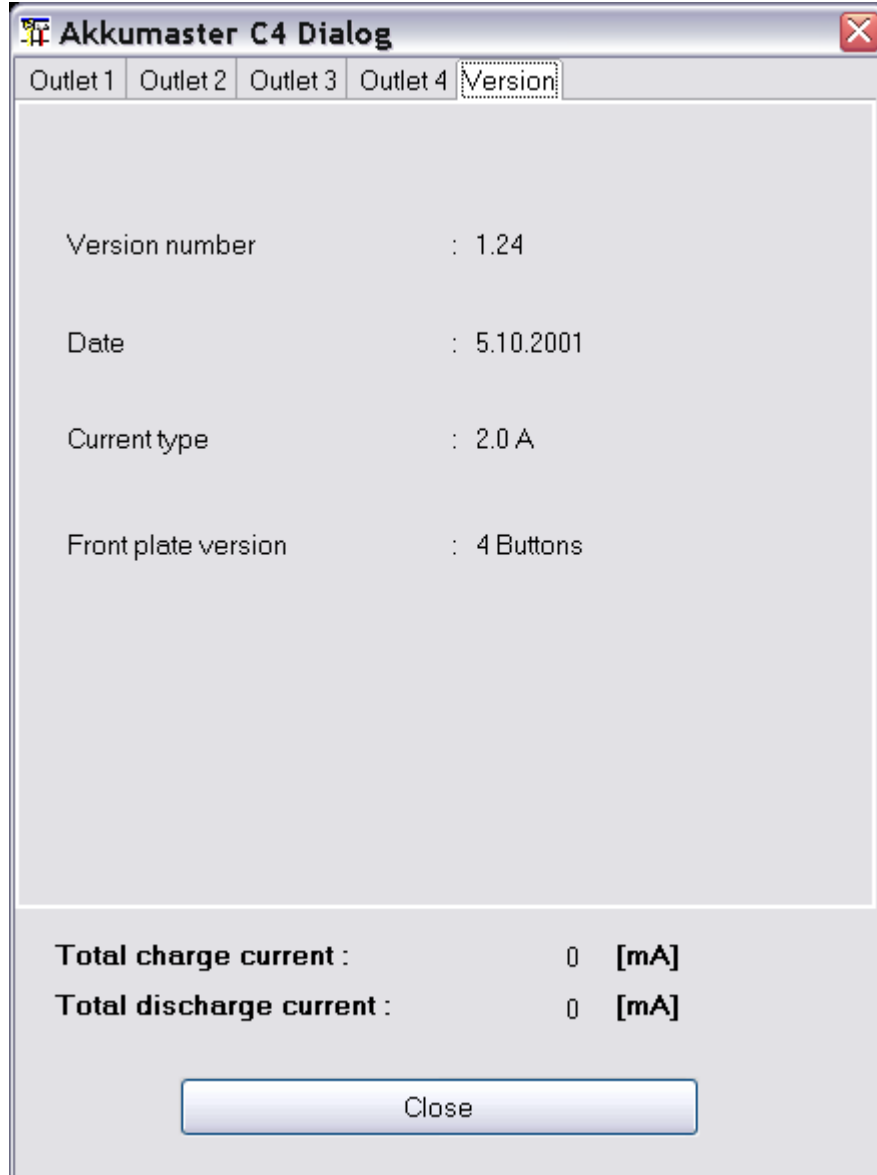


Note : If a data gathering process is active, it is not possible to close the dialog. Each outlet channel may gather data in parallel and can be displayed individual. To switch between outlets will not be possible if device dialog is modal adjusted in application preferences.

A lot of hints are available by tool tips of the dialog itself and make this help nearly obsolete. The tool tips are visible by hovering the mouse over the fields of interest.

Version information

Afterwards the serial communication is configured using the device selection dialog the device version information is gathered in background while opening the dialog. This may lead into serial communication error, if the configured port can't be opened. The device dialog with the actual EPROM version from manufacturer is shown in picture 1 displaying version information.



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After selecting an outlet tab only the two radio buttons are active. Other senseless buttons are disabled for the moment.

- Gather data only
- Configured process

Such a condition is shown in picture 2.

The screenshot shows the 'Akkumaster C4 Dialog' window. At the top, there are tabs for 'Outlet 1', 'Outlet 2', 'Outlet 3', 'Outlet 4', and 'Version'. The 'Outlet 1' tab is selected. Below the tabs, there are two radio buttons: 'Gather data only' and 'Configured process'. The 'Configured process' radio button is selected. Under 'Configured process', there are two sections: 'Battery' and 'Program type'. The 'Battery' section has three dropdown menus: 'capacity [mAh]' (0), 'number cells' (1 Cell), and 'battery type' (0 NiCa). The 'Program type' section has a 'Program name' dropdown menu (1 charge only) and three more dropdown menus: 'charge [mA]' (0), 'discharge [mA]' (0), and 'memory #' (1). Below these sections are two buttons: 'Start' and 'Stop'. At the bottom, there are two labels: 'Total charge current : 0 [mA]' and 'Total discharge current : 0 [mA]'. A 'Close' button is at the very bottom.

Akkumaster C4 Dialog

Outlet 1 | Outlet 2 | Outlet 3 | Outlet 4 | Version

☐ **Gather data only**
Function to gather data of a process started at charger device

☒ **Configured process**

Battery

capacity [mAh] number cells battery type
0 1 Cell 0 NiCa

Program type

Program name
1 charge only

charge [mA] discharge [mA] memory #
0 0 1

Start **Stop**

Total charge current : 0 **[mA]**
Total discharge current : 0 **[mA]**

Close

Gather data only

If, as usual, the charge/discharge process is started at the device, the selection of “Gather data only” the displayed process parameters are updated. Additionally the “Start” button gets activated to enable the start of the gathering process (picture 3).

The screenshot shows the 'Akkumaster C4 Dialog' window. At the top, there are tabs for 'Outlet 1', 'Outlet 2', 'Outlet 3', 'Outlet 4', and 'Version'. The 'Gather data only' option is selected with a radio button. Below it, a description reads: 'Function to gather data of a process started at charger device'. The 'Configured process' section is also visible, containing settings for 'Battery' (capacity [mAh]: 2200, number cells: 4 Cells, battery type: 0 NiCa) and 'Program type' (Program name: 3 discharge-charge, charge [mA]: 500, discharge [mA]: 500, memory #: 1). At the bottom, there are 'Start' and 'Stop' buttons, and a 'Close' button. The status area shows 'Total charge current : 0 [mA]' and 'Total discharge current : 0 [mA]'.

After the start button is pushed all the graphics displays are updated by the gathering cycle. The stop button gets activated to enable stopping of the process for some cases. New data sets get created while the device switch between charge and discharge. The gathering process stops automatically if the device signals no activity anymore.

Note : Stopping the data gathering process will also stop the running process of the connected device for safety reasons!

Configured process

While using “Configured process” the data configuring the future process are updated with the actual values depending the the current adjusted values of the selected outlet. Afterwards you can modify the values according your choice. Since the program must be loaded into the devices EPROM before it can be executed the adjusted values are written into the selected memory.

Note : Since it is not possible to query data for the selected memory, I prefer to do all program configuration direct at the device and use “Data gather only” for data gathering.

If a memory index will be modified from which is red from the device the background of the combo box is colored the make this change more visible. Such a situation is shown in picture below.

Akkumaster C4 Dialog

Outlet 1 | Outlet 2 | Outlet 3 | Outlet 4 | Version

☐ **Gather data only**
Function to gather data of a process started at charger device

☒ **Configured process**

Battery

capacity [mAh]	number cells	battery type
2200	4 Cells	0 NiCa

Program type

Program name		
4 charge-discharge-charge		
charge [mA]	discharge [mA]	memory #
500	500	4

Start **Stop**

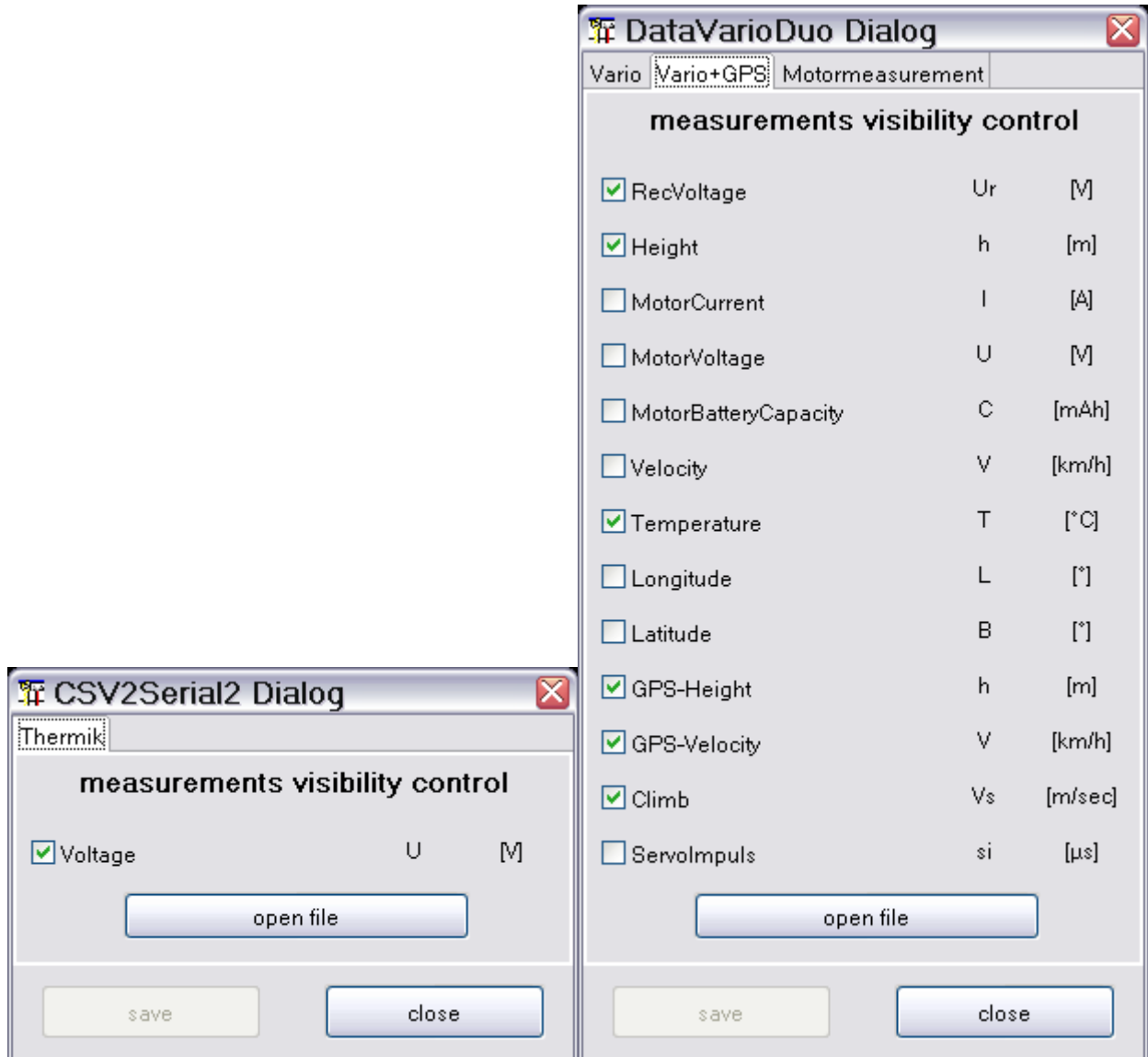
Total charge current : 0 [mA]
Total discharge current : 0 [mA]

Close

To close the device dialog is only possible while no gathering processes are active. While closing the dialog the serial port is closed as well.

CSV2SerialAdapter

The device dialog is used to configure the visualization of the displayed data. Using the "open file" button a file selection dialog enable to open new files while applying the current visible visualization configuration. The dialog is build up dynamically and might be different for each device. As example two different dialogs are shown:



Hint: The configured visualization profile is also used if a channel/configuration is selected using the tools bar combo box and the data are imported with the "import file" button.

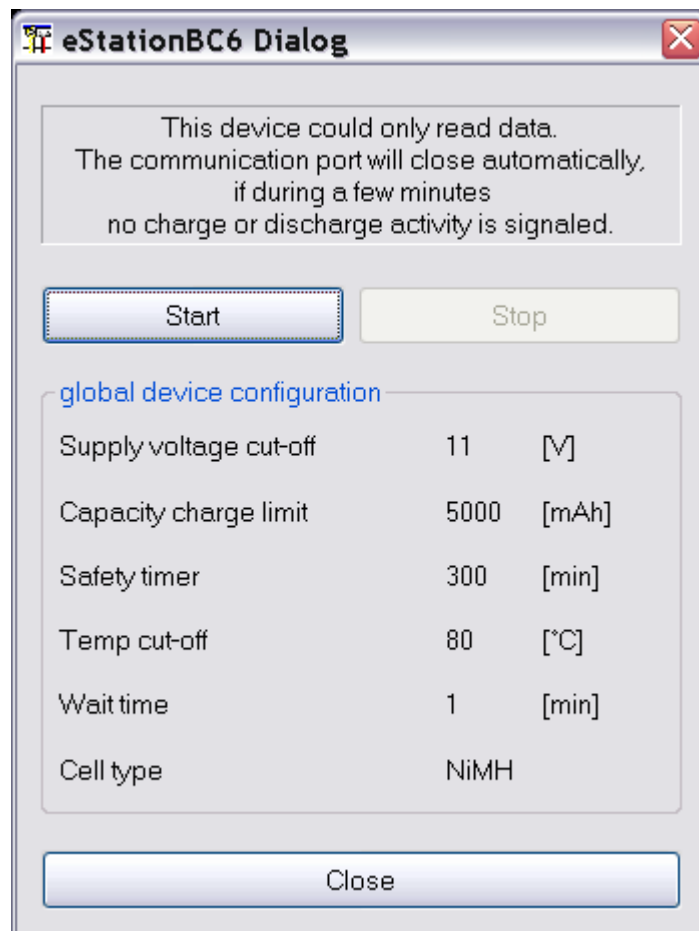
eStation Bantam

The eStation device dialog is only used to start and stop data collection of charge and discharge processes.



Usage

Afterwards the serial communication port adjustments are done using the device selection dialog the start button can be used to initiate data collection.



For NiMh and NiCd batteries the switch from discharge to charge will be done automatically. If the serial communication port signals no data the port will be closed after waiting a few minutes.

LiPoWatch

The LiPoWatch device dialog is to be used to visualize and adjust of the LiPoWatch "Settings". Using the last tabulator "Data I/O" the data stored in the device can be read and visualized.

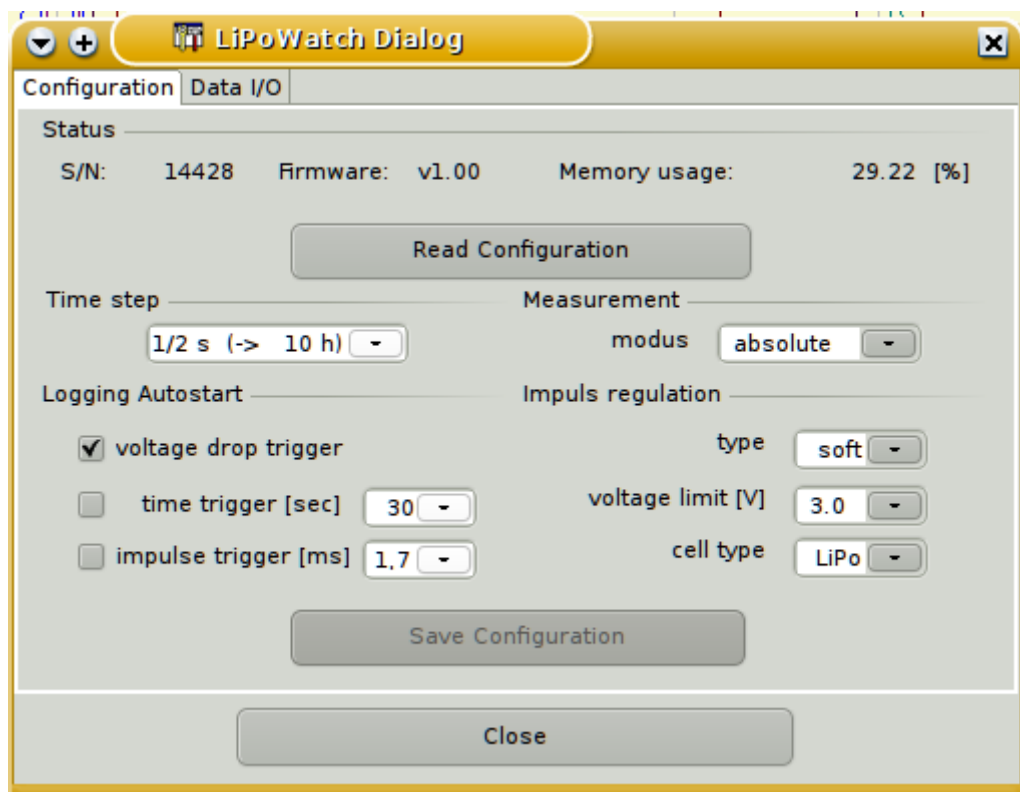


A lot of hints are available by tool tips of the dialog itself and make this help nearly obsolete. The tool tips are visible by hovering the mouse over the fields of interest.

The actual implementation fits the firmware version 1.0.

The „Configuration“ Tabulator

Afterwards the serial communication is configured using the device selection dialog and the device dialog is opened it is possible to query the LiPoWatch internal setting by pushing the button “Read Configuration”. Such a view with queried settings is shown in picture 1.

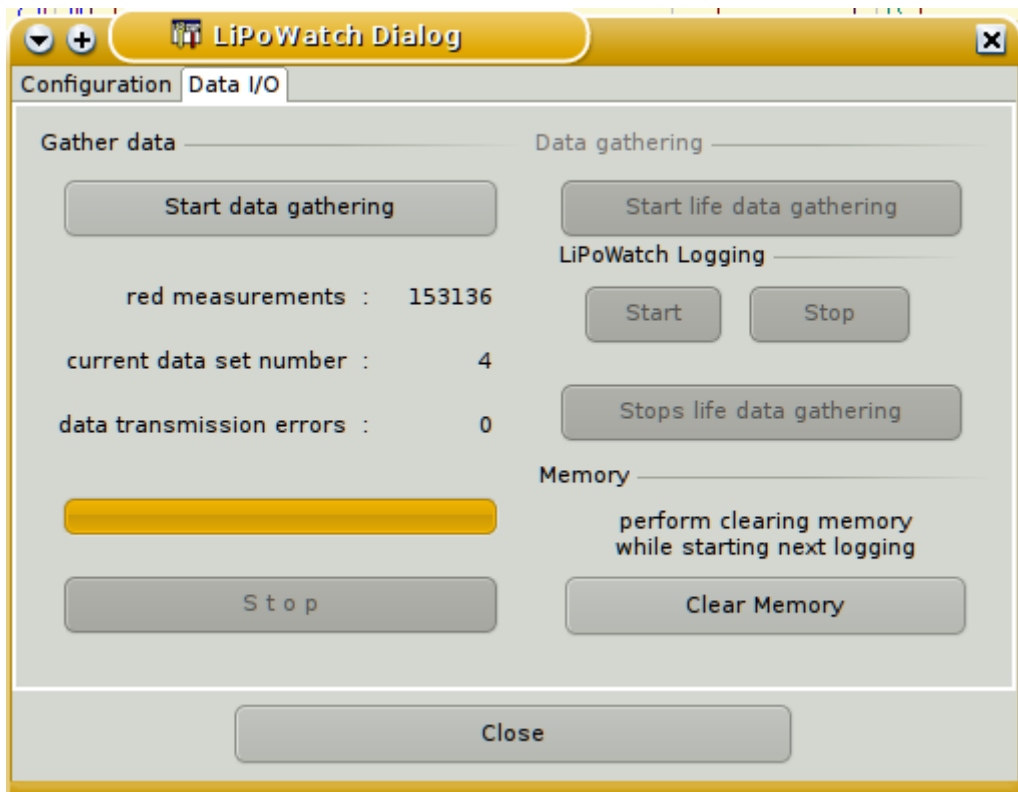


If configuration settings are modified the button “Save Configuration” gets activated. Pushing this buttons will write the modified settings data into the LiPoWatch device.

Hint : It is meaningful to read at first LiPoWatch configuration before modifying, otherwise some dialog defaults will be written into the device.

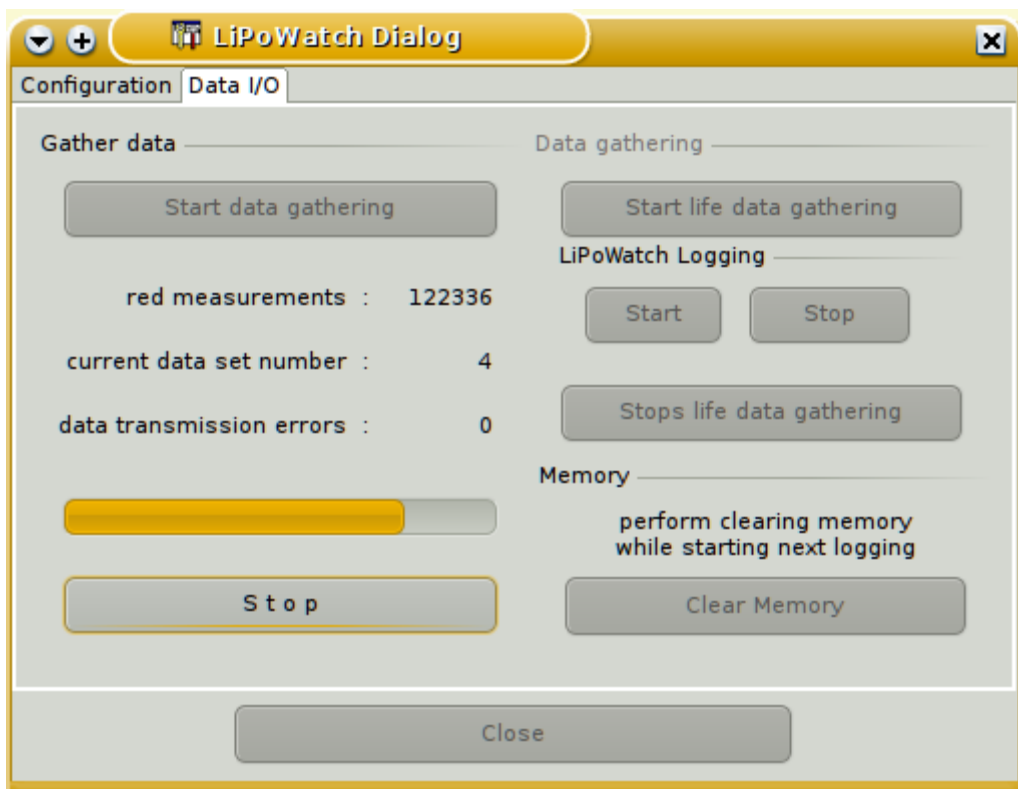
The „Data I/O“ Tabulator

Initially all buttons are active to read log data from the LiPoWatch.



After pushing “Start data gathering” all the data within the device gets red. The live data visualization is not yet implemented!

By pushing start* buttons as reaction the stop* buttons are getting activated.



At the end of the read operation the data are displayed. The dialog gets back to its initial state. Only the progress bar is filled and the number of red measurements are displayed.

Picolario

The Picolario device dialog is used to read logged data out of the device. For later data visualization adaption the two inner tabulators enables data configuration according your needs. Depending of the available data the configuration requires more or less adaption. For adjustment the following options can be used :

- Leave height values untouched
- Subtract first height value from subsequent (it's the normal case)
- Subtract last height value from preceding (late start of data logging)
- Height offset
- Slope calculation type



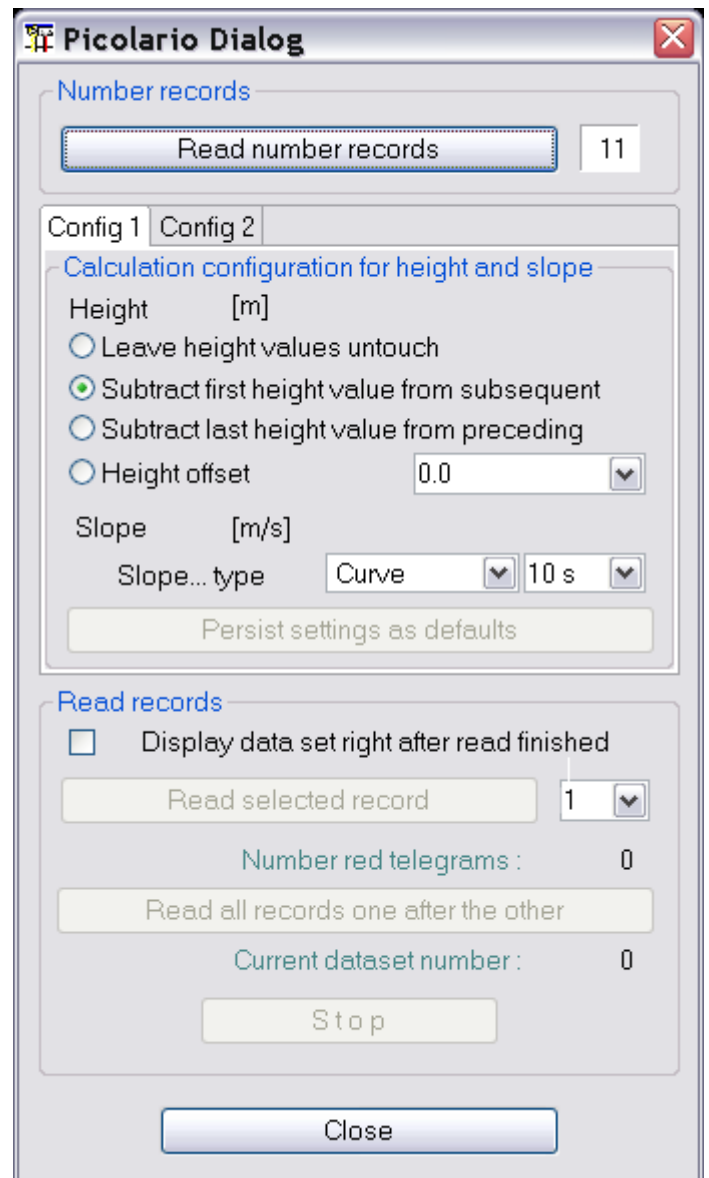
A lot of hints are available by tool tips of the dialog itself and make this help nearly obsolete. The tool tips are visible by hovering the mouse over the fields of interest.

Usage

Afterwards the serial communication is configured using the device selection dialog and this dialog is opened, the only active button „Read number records“ must be pushed to read the actual available record number from the device (prerequisite is the Picolario is ready to transfer data). A sample result is shown in picture 1.

In the second step it is possible to adjust the data configuration using one of the inner tabs. The visible tab will be used to manipulate data for visualization of the current red data. Normally a good choice is what is stored as default. If any further adjustment is required it can be done after reading the data.

As third step each single data set can read one after the other by select the record number and push the „Read selected record“. A better method is to read all the data in series. Depending the amount of data this can take a time. It is possible to display each data set in the display right after finishing read operation. To achieve this behavior the check box „Display data set right after read finished“ must be checked. To view and manipulate red data sets it is good to set the device dialogs not in application modal mode (application preferences).



An active device dialog is shown in next picture.

The Configuration Tabulators

As mentioned in the introduction section the visualization of the data can be adapted as required. Do the height values require an offset of an amount what is not offered be combo selection a manual overwriting of the entry is possible.

The slope calculation might be performed using different algorithm and time intervals. A linear regression results in better smoothed curve, but as drawback a phase shift against the height curve can be recognized. This drawback is eliminated by using the none linear variant of the regression calculation, to simplify it's called „curve“.

To get the slope value at a point of interest it is possible to measure it by context menu selection Curve Selector -> Height -> Context menu -> Point difference.

Mainly two variants of curve adaption takes place in the daily usage. This is the reason to have the two inner tabulators to adjust the two configuration types independent.

To permanent use the other adjusted configuration tab values it is possible to shift the data set to use the other configuration tab.

Therefor simply select the different tab according the channel configuration selector (the different one which is displayed in front after opening the dialog). The application ask if you really want to do this and shows the following message box.

If the answer is yes, the data set uses the new configuration values of the selected tabs.

Note : After each display configuration change the visual data are adapted to be displayed using the new values. If new values should be used as defaults for the next data gathering operation the configuration adjustment can be made persistent by pushing the „Persist settings as defaults“.

The height can be displayed in feet by adapting the following in the Picoario.xml device configuration file from

```
<Property description="Height calculation Feet to Meter (1852 / 6076)" type="Double" value="0.304806" name="factor"/> to
```


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<Property description="Height calculation Feet to Meter (1852 / 6076)" type="Double" value="1.0" name="factor"/>

and the section where the unit is given from

<unit>**m**</unit> to <unit>**feet**</unit>.

The file can be found in application configurations directory under ../Devices/Picolario.xml.

The main sense of the configuration tabs will focus on the statistic data. This is the reason the tabs are re-named to "Thermal" and "Motor". Using the motor configuration it is tried to filter the parts where a running motor can be assumed. The statistic values focus on the filtered areas (refer to the screen shots as example).

Graphic Statistics **Table** Digital Analog Cell voltage Curvecompare File comment

Description
p5-12-2006 NiMh battery not charged prior to flight

2) flight record : received: 05-12-2006, 08:44:43

Measurement	Unit	Minimum	Average	Maximum	Standarddeviation	Miscellaneous
Time	[HH:mm:ss:SSS]	0	---	46:27:950	---	Interval = 50.0 ms
Voltage	[V]	4.3	5.2	5.3	0.171	
Height	[m]	-8.2	39.4	164.3	---	
Slope	[m/s]	-3.4	0.0	6.1	---	

Graphic Statistics **Table** Digital Analog Cell voltage Curvecompare File comment

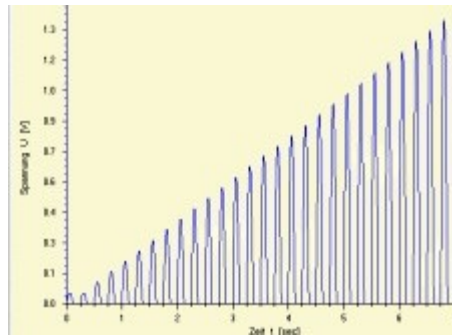
Description
p5-12-2006 NiMh battery not charged prior to flight

2) flight record : received: 05-12-2006, 08:44:43



Measurement	Unit	Minimum	Average	Maximum	Standarddeviation	Miscellaneous
Time	[HH:mm:ss:SSS]	0	---	46:27:950	---	Interval = 50.0 ms, ~ motor run time = 02:06:450 [mm:ss:SSS]
Voltage	[V]	4.3	5.2	5.3	0.171	
Height	[m]	-8.2	---	164.3	---	Sum motor climb height = 492.6 [m]
Slope	[m/s]	---	3.7	6.1	1.187	Number voted climbs = 5 (Trigger: Slope > 1 m/sec > 15 sec)

Later it is planned, to enable modification of the values needed for the statistic calculation by the dialog.

Simulator





The Simulator device dialog is used to create synthetic data for several test cases. There is no effort spend to make this nice, it is only function required. The functionality can adapter according needs.

 Simulator Dialog 


Data generator

Pushing START a new dataset will be created,
generating data until STOP is pushed


Time...sec] * Data points = Tim... cycle

5  50 

Voltage

cCombo1 

Current

cCombo1 

Start

Stop

UniLog

The UniLog device dialog is to be used to visualize and adjust of the UniLog "Settings". Using the last tabulator "Data I/O" the data stored in the device can be read and visualized. To manipulate the visualization the four configuration tabs might be used. At this place everybody can create there own configuration with meaningful names. In initial, as recommendation, there are

- Height, simple height measurement with low additional weight for the model plane
- Receiver, additional to the height the receiver supply power can be measured to get reasonable values to estimate required power consumption for the voltage regulator
- Motor, to measure the motor power and efficiency to dimension the motor controller or propeller
- Velocity, influence of the prop to the flight velocity or simple get a feeling for the planes speed



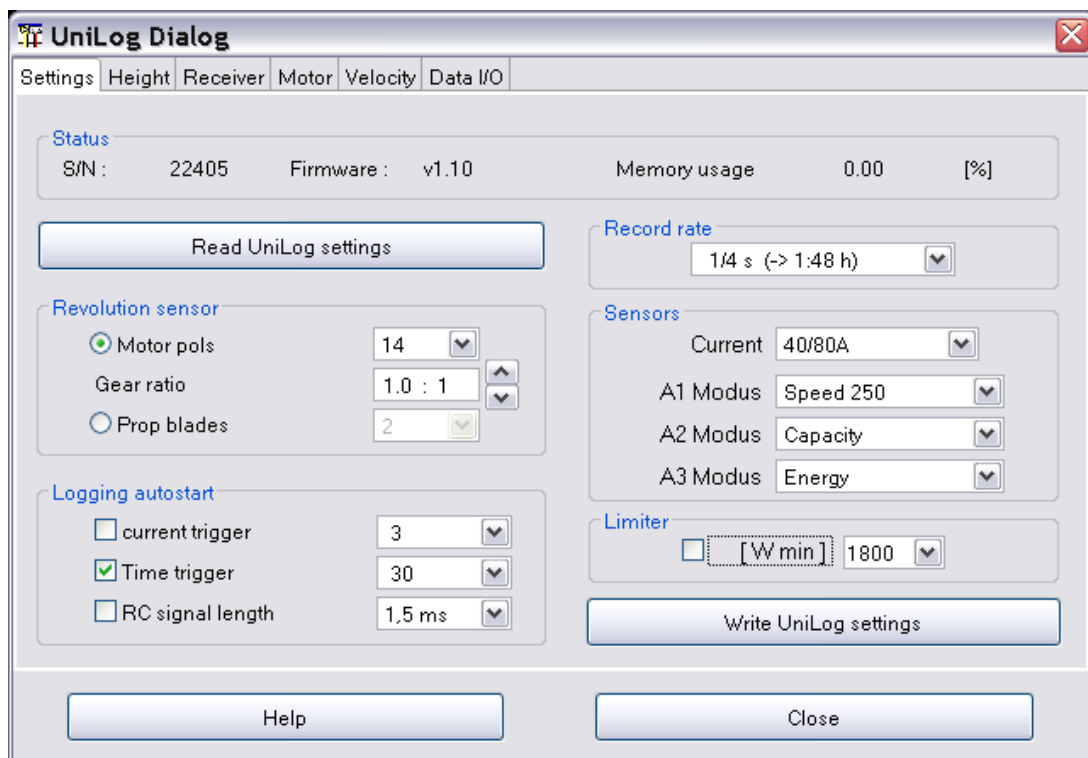
Alternative the configurations can be adjusted to fit personal requirements or simply model names like Model_1 to Model_4.

A lot of hints are available by tool tips of the dialog itself and make this help nearly obsolete. The tool tips are visible by hovering the mouse over the fields of interest.

The actual implementation fits the firmware version 1.10.

The „Settings“ Tabulator

Afterwards the serial communication is configured using the device selection dialog and the device dialog is opened it is possible to query the UniLog internal setting by pushing the button “Read UniLog settings”. Such a view with queried settings is shown in picture 1.



All analog outlets are to be pre-configured starting with firmware 1.10. By activating the limiter function the signal to the motor controller are reduced reaching the adjusted consumed energy. To enable this functionality the controller signal must go through the UniLog. An activated limiter will also set the time

step to 1/16 Second and only one data collection is possible.

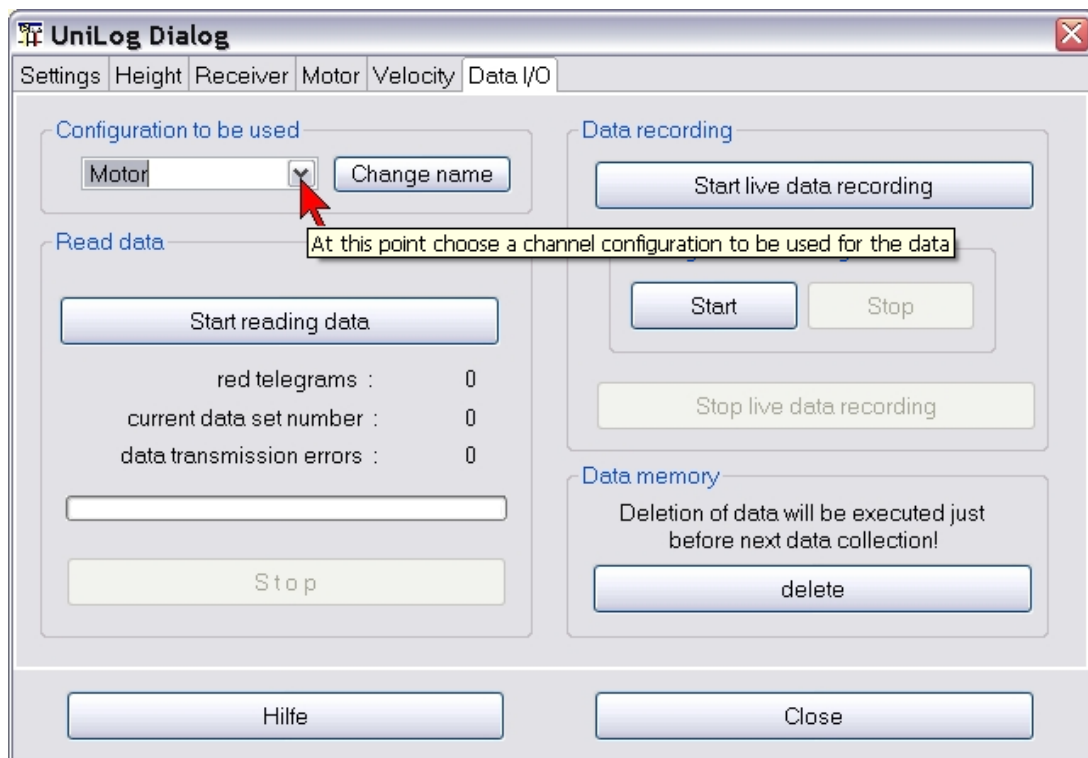
If settings are modified the button “Write UniLog settings” gets activated. Pushing this buttons will write the modified settings data into the UniLog device.

Hint : It is meaningful to read at first UniLog setting before modifying, otherwise some dialog defaults will be written into the device.

The „Data I/O“ Tabulator

Initially all buttons are active to read log data from the UniLog. With selecting a specific configuration, tabs 2 to 5 will be explained next section, this selected configuration will be applied to the red data. But it is possible to switch data configurations later for each data set individual.

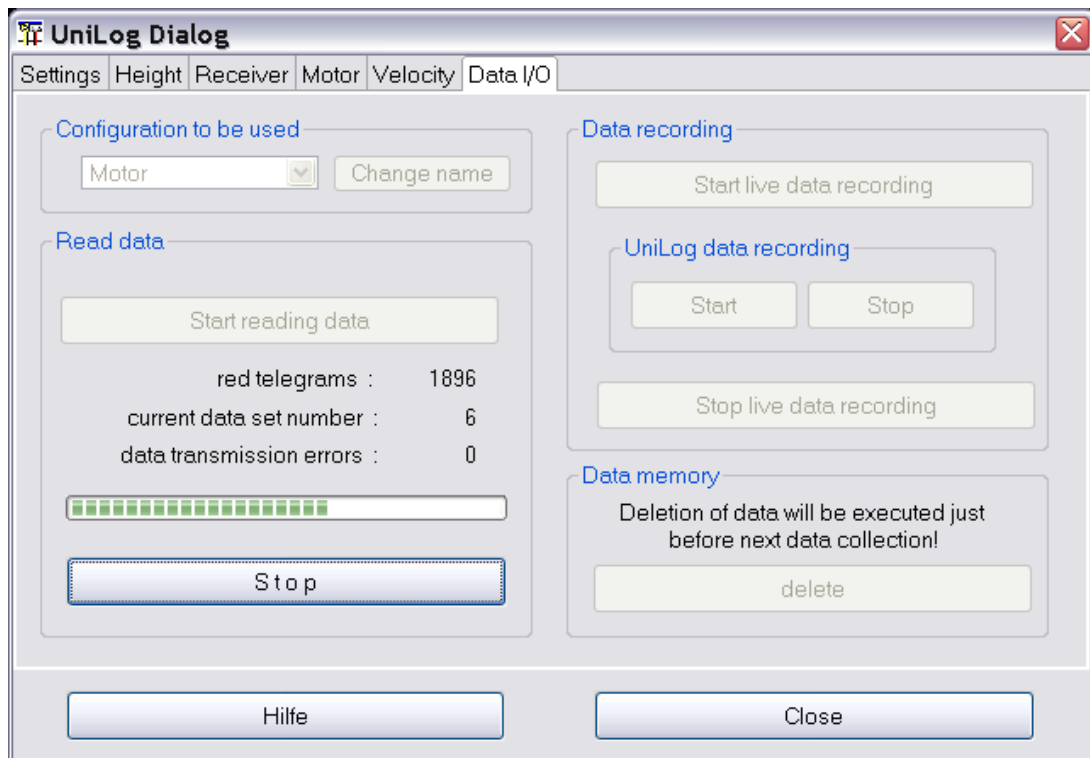
Only the “delete” button is extra. Pushing this button the data are marked for deletion. The deletion gets active next time a log operation is started. The data stored within can still be read.



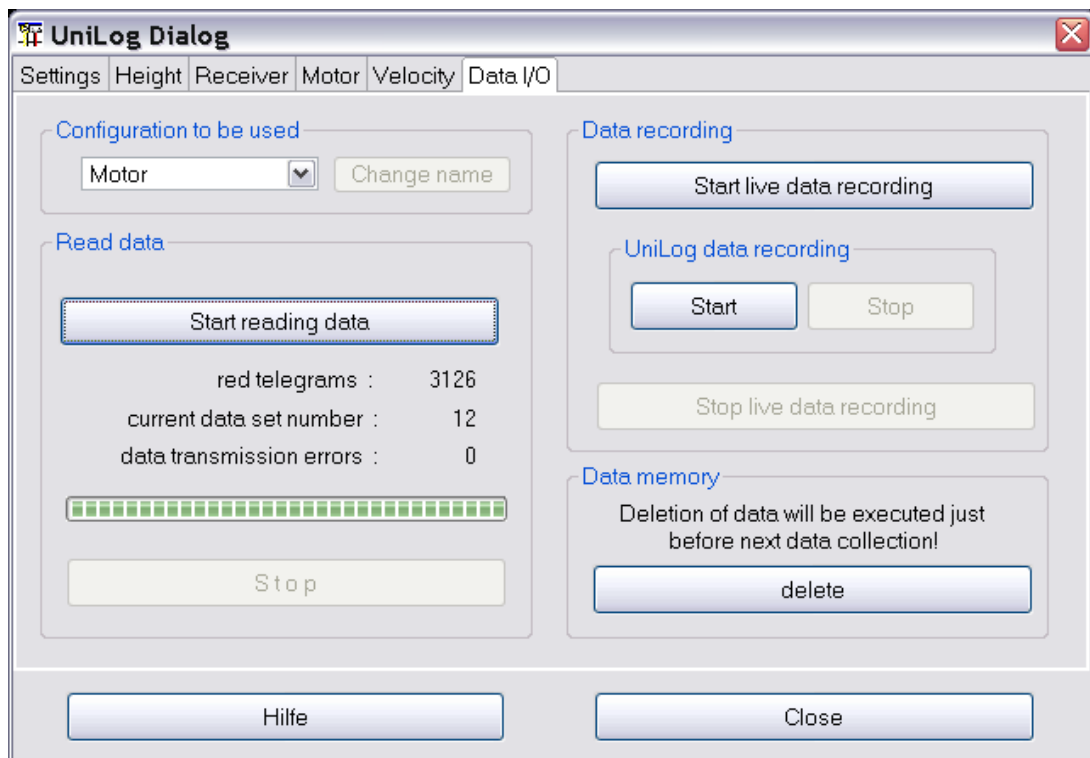
After pushing “Start reading data” all the data within the device are going to be red and the read operation starts immediately and the selected configuration is applied.

Using the button “Start live data recording” a query cycle is initiated which reads according the device settings and connected sensors and the data are displayed in graphics, as digital and as analog displays. If the button “Start” within the UniLog data recording group is pushed the UniLog itself will log the data internal.

By pushing start* buttons as reaction the stop* buttons are getting activated.



At the end of the read operation the data are displayed. The dialog gets back to its initial state. Only the progress bar is filled and the number of red data telegrams are displayed.



The Data I/O Tabulator enables to modify the configuration names. To change a configuration name it is required to push at first the button “Change name” to activate the change mode. After editing the name the operation is committed by the enter button. The new name will be displayed in the tabulator changed and will be made persistent in the device configuration file.

The Configuration Tabulators

This complex tabulator is showing all device possible measurements. Only the real measurements representing a device sensor connection has a check box to enable activation. If a measurement gets activated the depended measurements are getting activated too. As sample the receiver configuration tab will be explained.

UniLog Dialog

Settings | **Height** | Receiver | Motor | Velocity | Data I/O

Supply/Drive/Height

<input checked="" type="checkbox"/> VoltageRec	Ur	[M]	
<input checked="" type="checkbox"/> Voltage	U	[M]	Offset
<input checked="" type="checkbox"/> Current	I	[A]	inv 0.000
Capacity	C	[mAh]	
Power	P	[W]	
Energy	E	[Wh]	
Voltage/Cell	U*	[M]	
Number cells			2
<input type="checkbox"/> Revolution	n	[1/min]	
Prop n100W			3400 100W * 1/min
Efficiency	eta	[%]	
<input checked="" type="checkbox"/> Height	h	[m]	
Slope	Vs	[m/s]	
Calculation	Curve		10 s

Analog outlet configuration

	Description	Unit	Offset	Factor
<input type="checkbox"/> A1	Velocity	[km/h]	0.000	1.000
<input checked="" type="checkbox"/> A2	ServoImpuls	[µs]	0.000	1.000
<input checked="" type="checkbox"/> A3	TemplIntern	[°C]	0.000	1.000

Persist adjustments as default

Help Close

If the measurement “Height” will be selected the dependent measurement slope calculation with its two combo boxes gets activated.

For the slope calculation one of two regression types has to be selected as well a regression interval time between 1 and 20 seconds.

Each change will be immediate change the data set visualization. A change will also activate the “Persist adjustments as default” button to make the configuration composition persistent and will be used next time data are gets applied to this configuration.

Special are the 3 analog connectors (A1 to A3). All analog outlets are pre-configured using the device settings (Settings tab). This will adjust UniLog internal measurement adjustment. While reading data this UniLog internal settings are used to adjust name and unit for each analog measurement. If required for the connected sensor an offset as well as a factor can be used for adaption. A change will activate the “Persist adjustments as default” button to enable to persist the change for later repeated usage.

If a data set is just displayed while opening the dialog the dialog tab with the matching configuration is displayed on top. Does the data set displayed not match the configuration the configuration might be adapted or a better matching configuration selecting another tab can be selected. By doing this a message box pops up to commit or de-commit this operation.

Different configurations enable different statistics data calculation. As sample the next screen shot displays a receiver configuration statistics view.

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Graphic Statistics **Table** Digital Analog Cell voltage Curvecompare File comment

Description
2008-06-10 "VoltageRec." displays the voltage of the receiver, the "Voltage" displays the voltage of the battery (both sides of voltage regulator)

3) flight record : received: 2008-06-10, 10:18:32;
S/N : 22405; Firmware : v1.06;

Measurement	Unit	Minimum	Average	Maximum	Standarddeviation	Miscellaneous
Time	[HH:mm:ss:SSS]	0	---	42:25:250	---	Interval = 250.0 ms
VoltageRec	[V]	5.0	5.0	5.0	0.001	
Voltage	[V]	8.0	8.1	8.2	0.022	
Current	[A]	0.000	0.044	0.480	0.049	
Capacity	[mAh]	0.0	---	31.6	---	
Power	[W]	0.0	---	3.9	---	
Energy	[Wh]	0.0	---	0.3	---	
Voltage/Cell	[V]	4.0	4.1	4.1	0.011	
Height	[m]	-6.1	66.8	159.0	---	
Slope	[m/s]	-6.7	---	5.7	1.558	

Below a motor measurement statistics view is displayed. All important calculation data and differences are red circled.

Graphic Statistics **Table** Digital Analog Cell voltage Curvecompare File comment

Description
2008-05-23

2) flight record : 2008-05-23 11:30 o'clock, Maurener Tal, wind from east 0-15 Km/h, cloudy sky

Measurement	Unit	Minimum	Average	Maximum	Standarddeviation	Miscellaneous
Time	[HH:mm:ss:SSS]	0	---	23:42:500	---	Interval = 250.0 ms, Motor run time = 05:06:250 [mm:ss:SSS]
Voltage	[V]	12.8	13.9	16.5	---	(Values refer to current trigger range)
Current	[A]	---	32.7	44.8	---	Number of climb flights = 10 (Trigger: current > 2 A + > 5 sec.)
Capacity	[mAh]	0.0	---	2793.9	---	
Power	[W]	---	455.9	670.7	102.325	(Values refer to current trigger range)
Energy	[Wh]	0.0	---	39.0	---	
Voltage/Cell	[V]	1.1	1.2	1.4	0.050	(Values refer to current trigger range)
Revolution	[1/min]	---	5881	6686	---	(Values refer to current trigger range)
Efficiency	[%]	---	2	---	11.849	(Values refer to current trigger range)
Height	[m]	-0.8	---	196.0	---	Sum motor driven height = 1086.3 [m] Energy/Motoheight = 35.89 [mWh/m]
Slope	[m/s]	-1.0	3.3	6.3	1.426	(Values refer to current trigger range)
Templntern	[°C]	21.2	22.3	23.0	0.489	(Values refer to current trigger range)

For later it is planned to enable the adaption of the statistic configuration by a dialog.

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Hint : If four configurations are too much it can be reduced. This requires to comment out channel configuration in UniLog.xml (<!-- XML comment -->). More than four configurations are possible but the current implementation does not support.

Of course it is possible to activate all measurements in the configuration tab and filter using the curve selector.

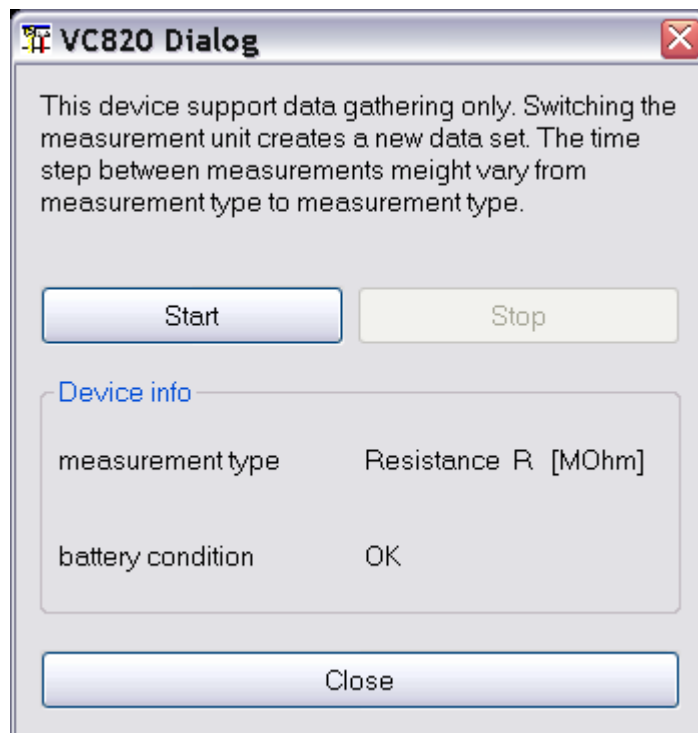
VC800

The VC8x0 device dialog might be used to start and stop data collection. It is showing information about the adjusted measurement type and battery condition.



Usage

Afterwards the serial communication port adjustments are done using the device selection dialog the start button can be used to initiate data collection. Nevertheless the "start gathering" button can be used instead without opening this dialog.



Switching the measurement type at the multimeter itself will create a new data set.

Pushing the "stop" button will stop gathering data.