
EDR Graphical User Interface and Basic Commands


Revision History

Date	Version	Description
09/04/2021	1.4	Updated contacts
14/12/2020	1.3	Updated for EDR 3.8.8
27/05/2020	1.2	Updated for EDR 3.8.3
05/03/2020	1.1	Revised
19/01/2020	1.0	First version of document

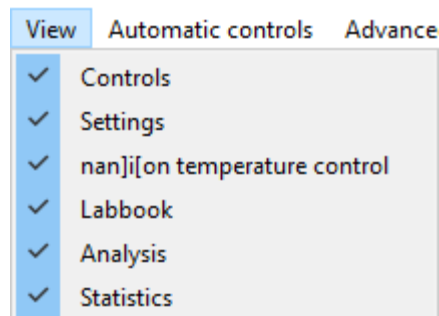


Introduction

The default GUI is organized in multiple menus all embedded in a single window; however single menus can be removed from the main window and split in different windows to be placed where preferred on the screen.

To split the selected menu click on the window restore icon  of the menu or double click on the menu bar.

Click on the “View” menu, or right click of the mouse on a menu bar enables the selection of the visualized menus. Some widgets are available from the “Automatic controls” menu, and they are described in the corresponding Quick Guide.




Current/voltage plots window

The central window of the Graphical User Interface displays the acquired input current channel (or channels for multichannel devices) and the control voltage in an oscilloscope-like fashion.

Vertical zoom and offset



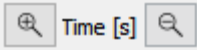
The vertical zoom  controls let you interact with the current and voltage plots in terms of scale.

The offset can be modified using the mouse scroll wheel.

The scale and offset are independent for all current channels and can be modified for each channel separately.



Horizontal zoom

The horizontal zoom  is always applied to all current and voltage channels together. The zoom buttons increase and decrease the time scale of all channels.

Rectangular zoom

It is also possible to select a rectangular area to zoom manually. To do it simply left click in one corner of the rectangular area you want to zoom, drag the mouse cursor to the opposite corner of the area and finally release the left button of the mouse.

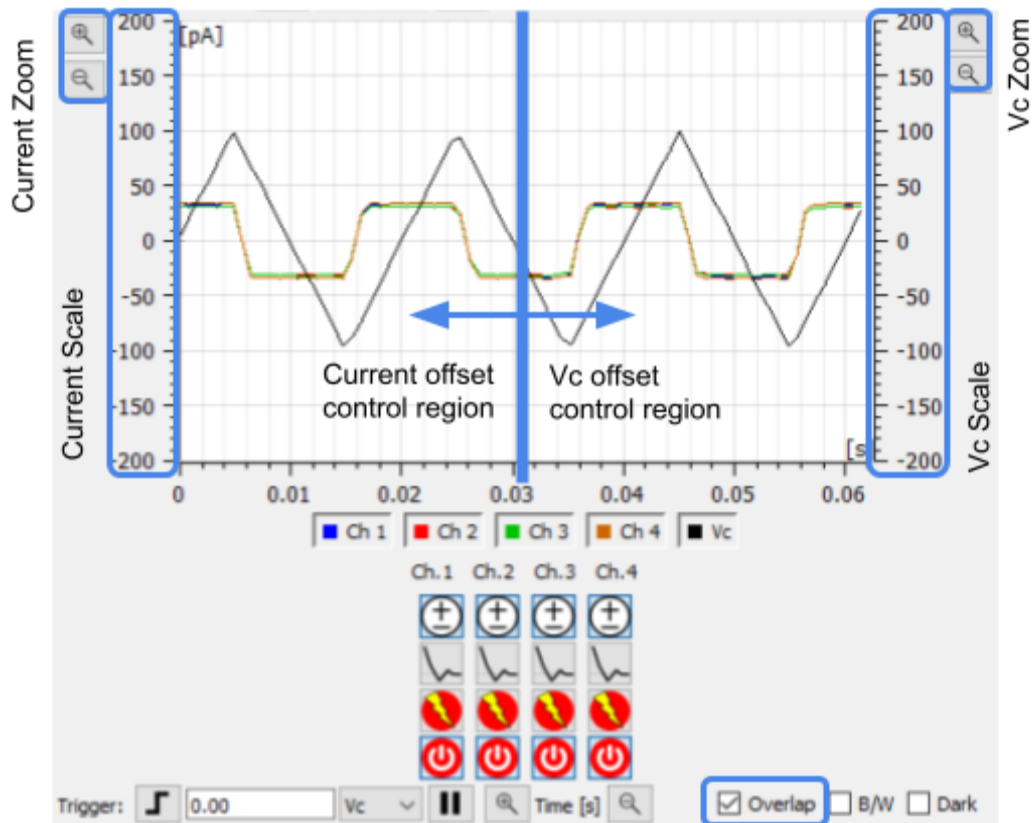
To go back to the previous zoom setting right click anywhere within the plot areas.

Visualization options

Overlap B/W Dark

Check the Overlap checkbox in order to overlap all the current and voltage channels in a single plot.

Notice that the voltage vertical scale is on the right side. To change zoom use the vertical zoom controls placed on the right side and to change Vc offset use the mouse scroll wheel once the mouse position is in the right side of the window:



Check the Black and White (B/W) checkbox in order to visualize all the traces in black (not with different colors for each current channel as by default); check the Dark to invert plot colors (dark background and lighter traces).

Single channel buttons

On the right side of current plots a list of buttons is available, depending on the particular Elements device (not all of these buttons are available for all devices).



If one of these buttons is not available it means that the device being used does not implement the corresponding feature.

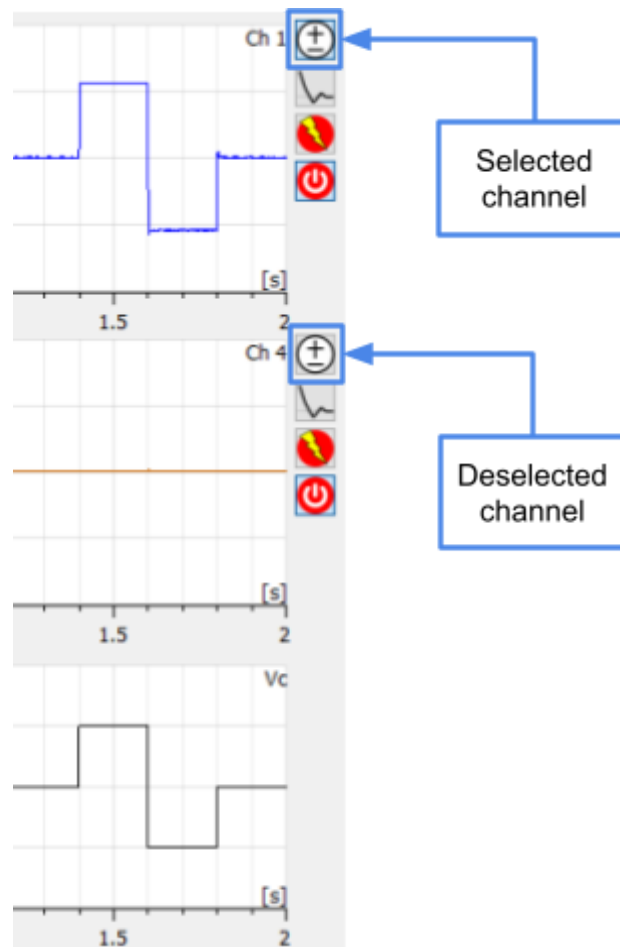
These buttons affect only the current channel they refer to, and they can be used to:



Select channel for voltage protocol



Pressing this button will select/deselect a channel for voltage protocols application (all channels are selected by default: button pressed). This feature allows the application of a voltage protocol on a subset of the available channels while leaving the other channels alone.



Digital offset compensation



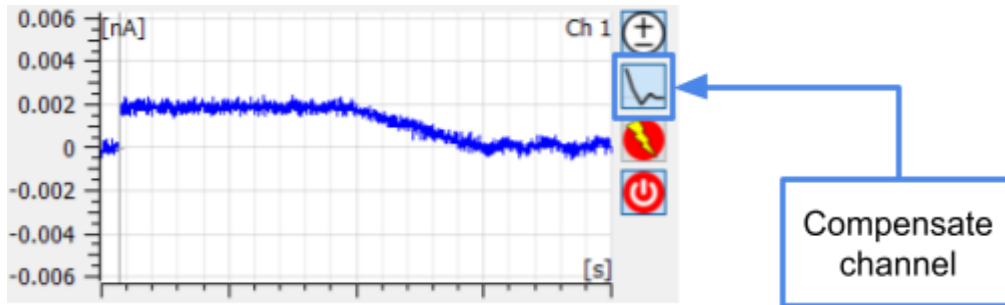
Pressing this button will activate/deactivate the digital offset compensation procedure on a channel (by default digital offset compensation procedures are deactivated: button released).

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The digital offset compensation modifies the voltage applied to the device under test in order to compensate for electrode voltage offset. This way, when the user applies 0 V the actual potential applied on the DUT is slightly different so that the net current flowing is as close as possible to 0.



Zap



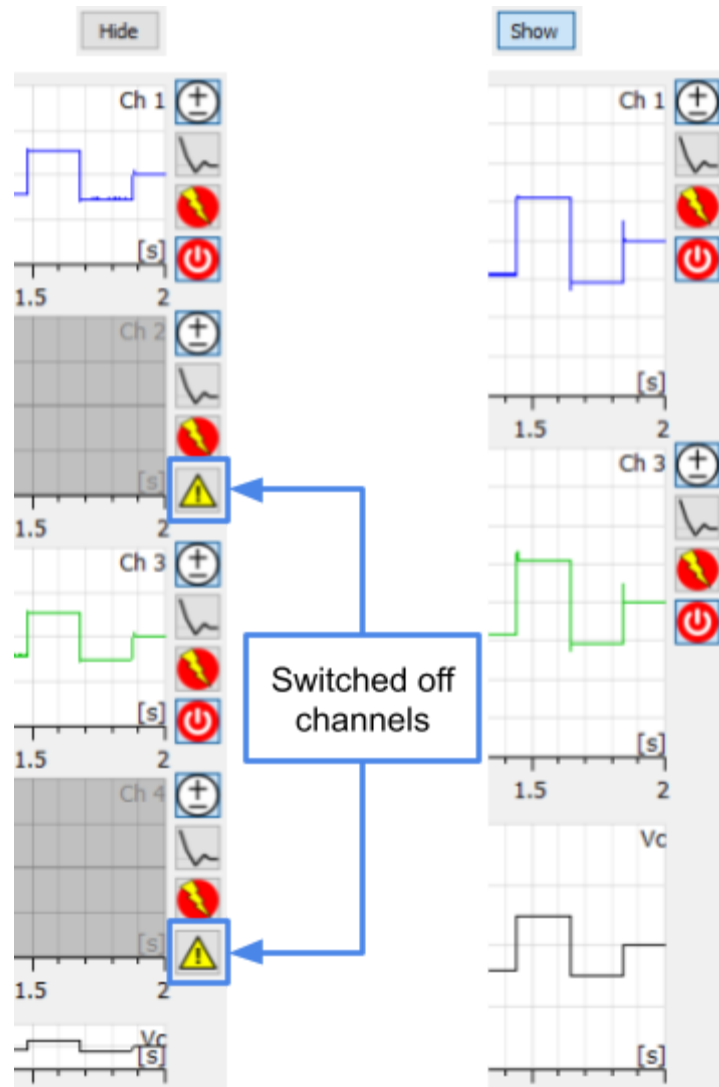
This button applies a zap to a channel. The zap applies -1V for 100ms and is typically used to break the lipid bilayer when it is badly formed, e.g. because of a clog.



Switch off channel



Pressing this button will switch on/off a channel (all channels are switched on by default: button pressed). Switching off a channel is useful to neglect irrelevant data, such as data coming from a broken bilayer, and concentrate on more meaningful data. Switched off channels are easily recognizable since their plots are grayed out and their trace is identically 0. They can also be removed using the button “Hide” or brought back using the button “Show” located on top of the plots.



Note also that in order to minimize cross-talk with the switched off channels (recall that a common use case is for broken bilayer, which means very low resistances and thus very high currents), voltage protocols are not applied on switched off channels and their current offset is continuously digitally compensated.

Moreover, data from switched off channels is not recorded during data saving.

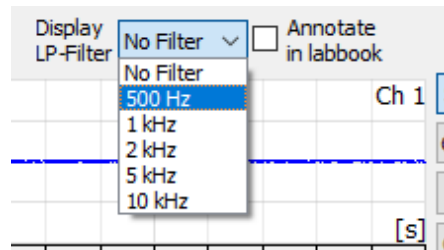
All channels buttons





Multichannel devices provide the option to apply the controls described above to all of the channels at once. This can be done by using the buttons that can be found on top of the plots.

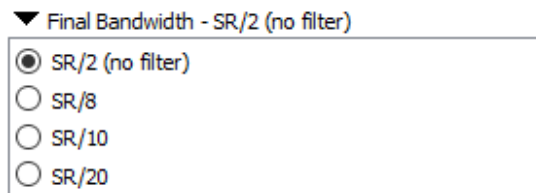
Low pass filtering of displayed data



It is possible to filter displayed data in order to remove some high frequency noise and enhance low frequency activity.

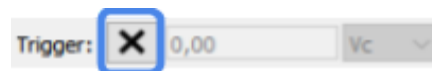
Notice that these filters only affect current data visualization: analyses and data recording are applied to raw data even if one of these filters is selected. Checking the “Annotating to labbook” checkbox allows you to automatically take note of all filters selections on the lab book.

Notice that these filters are fundamentally different from the “Final Bandwidth” control:

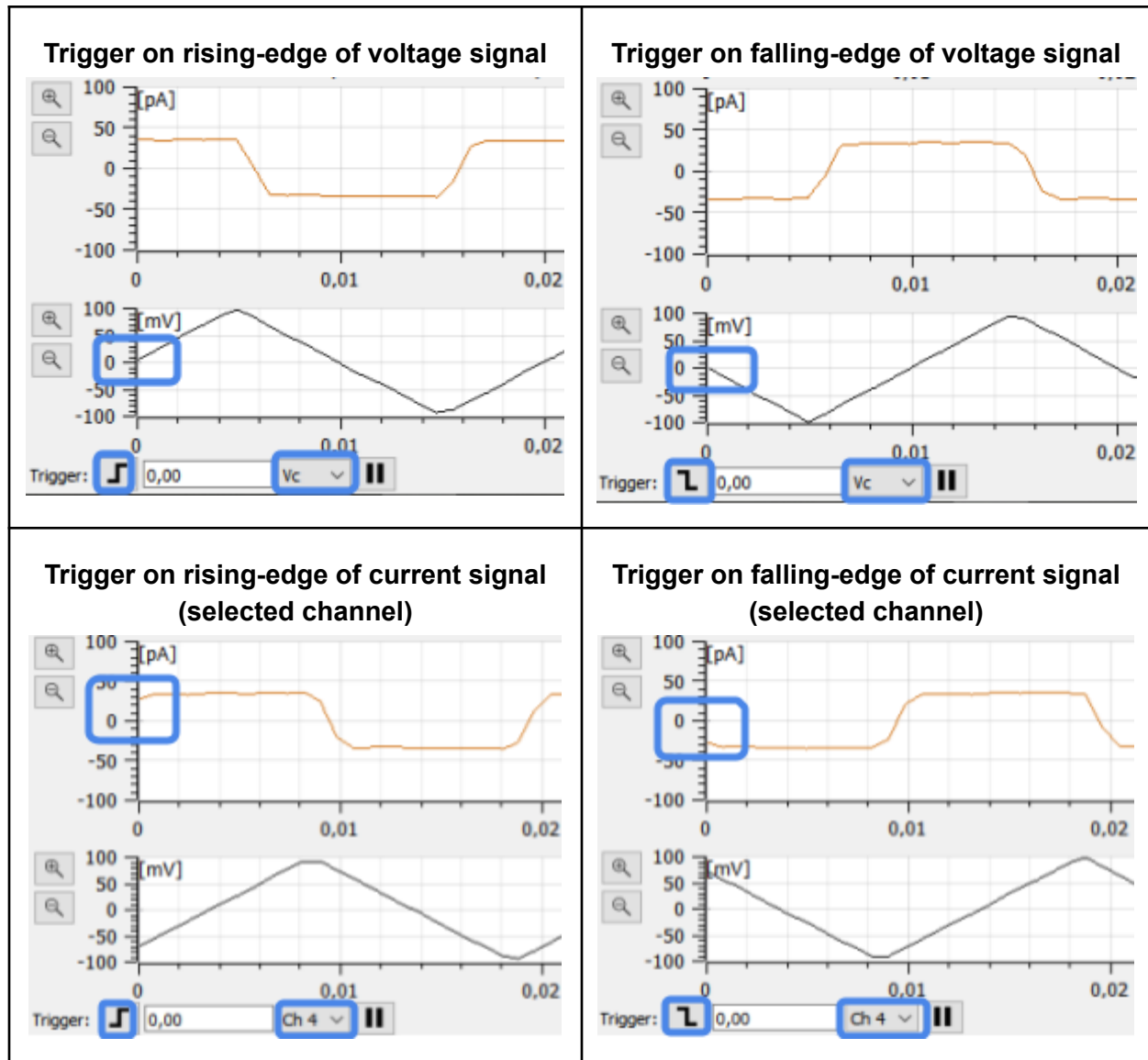


“Final Bandwidth” can be used to apply a low pass filter too, but in this case the filtering is applied on the digitized data, so it affects data visualization, but also analyses and data recording.

Displayed data trigger and pause function



Pressing this button will activate/deactivate the trigger function, using the selectable value as threshold. It is also possible to select the rising- or falling- edge of the selected (current or voltage) signal, as shown in images below:



Press the pause button  to interrupt data display (e.g. to better check for a particular event while experiment is running); click on play button  to restart visualization again. Notice that only data display is paused, but data recording continues without interruption.

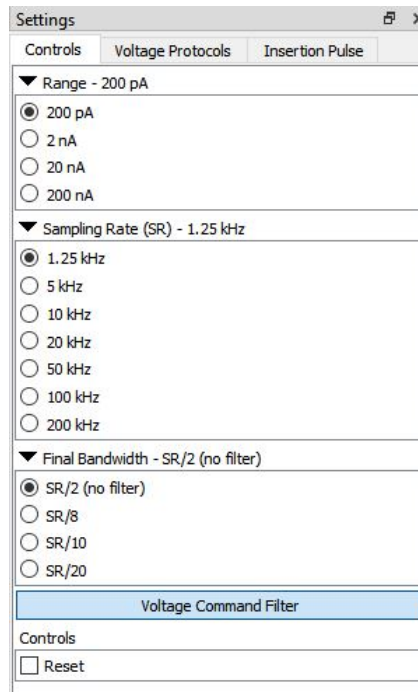
Device controls

The Settings menu contains all the device controls in a modular fashion with some features enabled depending on the particular Elements device connected. In any case this section allows



users to set current Range, Sampling Rate and Final Bandwidth of the measurement, as well as to set the voltage command applied by the device.

For example, the following image shows a device reading data in the ± 200 pA range, sampling data at 1.25 kHz and filtering them with a final bandwidth of 625 Hz.



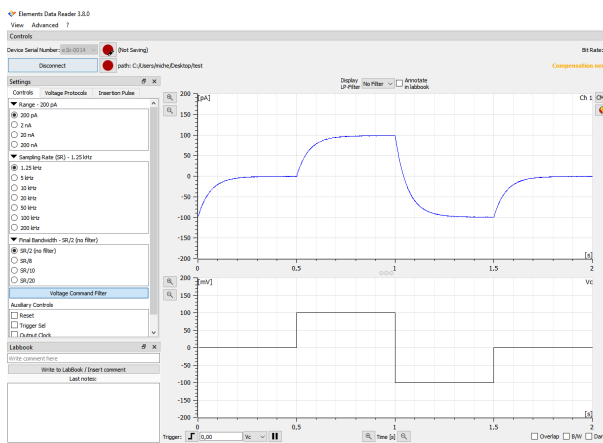
The Voltage command filter button (when present, depending on the particular Elements device) controls the filter at the output of the Vc circuitry generator. The filter is active by default, so the bandwidth of the voltage stimuli is limited to few tens of Hz depending on the particular device (see the Voltage command filter section below for other details).

The Reset checkbox keeps the device in reset mode. This function can be useful to reset the digital offset compensation value to the initial value or, in some cases, to restore the device functionality if the front end gets stuck in saturation.

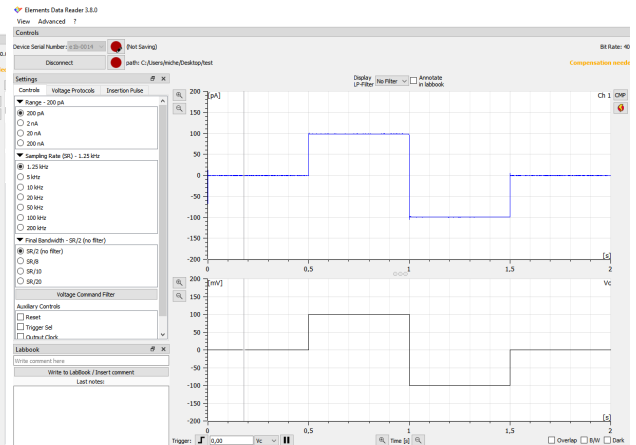
Voltage command filter

It is recommended to use the filter (filter enabled, button pressed) when a constant or slow changing voltage is applied, in order to reduce the RMS noise on the current measurement.

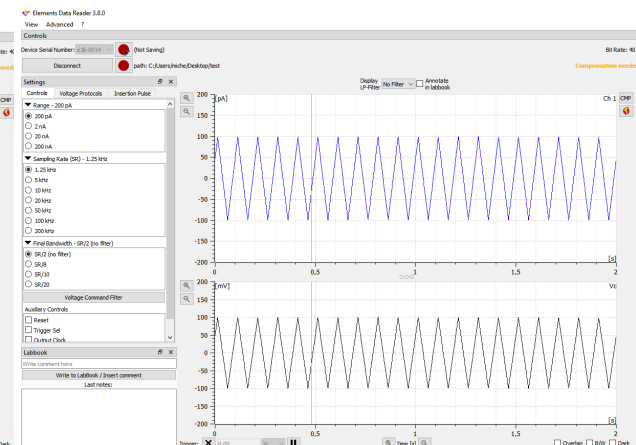
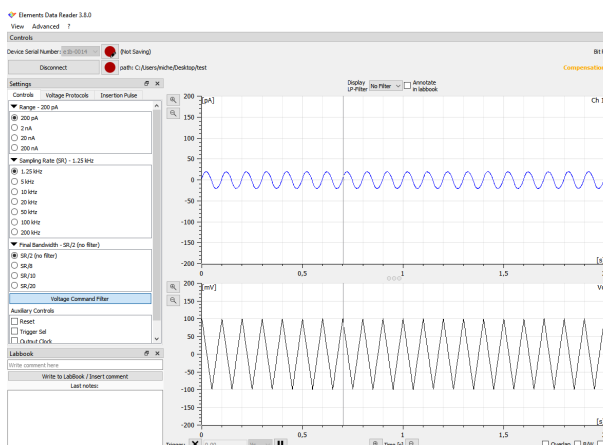
On the other hand, it is better to disable the Voltage Command Filter when a voltage protocol with high bandwidth components (such as the seal test or a steep triangular wave) is applied, as shown in the images below:



Vc filter enabled



Vc filter disabled



Voltage protocols

The Voltage Protocols tab contains a complete set of parametric voltage stimulus protocols. For each automatic voltage protocol the different parameters represented in figure can be set (see device specific guide for the complete list of voltage protocols available for every device, e.g. [e1b voltage protocols](#) and the “Voltage Protocols” guide for other details).



Settings

Controls Voltage Protocols

Protocol: H

Apply Clear

Vhold 0 mV

Vfp 10 mV

Vstep 10 mV

Tpu 20 ms

Tpe 50 ms

N 1 N

Ne 0 N

Load Save Default

Click to enlarge

LabBook

When this feature is enabled, users can add any comment to a lab book .txt file while the experiment is running, such as experimental details or when any important event occurs during the recording.

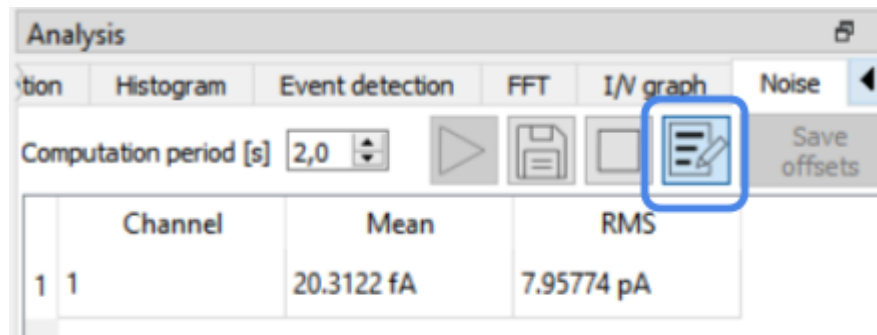
To add a note just write it in the field and click on the “Write to LabBook/Insert comment” button

Labbook

Write comment here


Write to LabBook / Insert comment

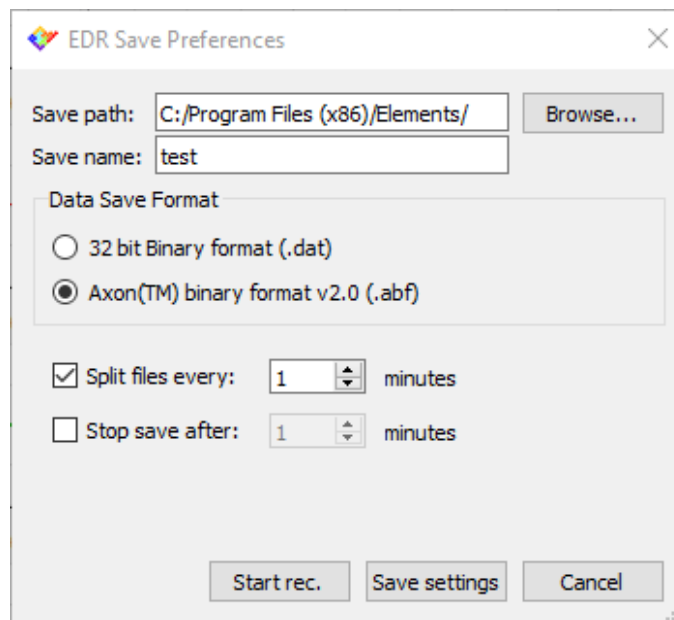
Online Analysis results can be also noted to the lab book clicking on the proper button




The labbook .txt file will be saved in the default path: “C:\Users\

Save settings

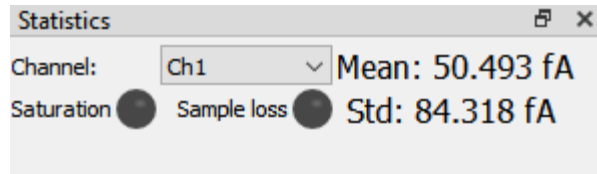
Click the save settings and start recording button  to enter into the Save Preferences menu (see the “Record, display and read data” guide for details)



The configuration can be saved clicking “Save settings”, in order to quickly start a recording with the same settings by clicking the Quick Save button . Ctrl + ‘G’ keyboard shortcut can also be used to quickly start and stop data recording (see shortcuts list at the end of this guide). Multiple records will be saved with the set name followed by the progressive number (e.g. C:/Program Files (x86)/Elements/test_01, ...test_02, ...test_03.... and so on) .



Channel Statistics

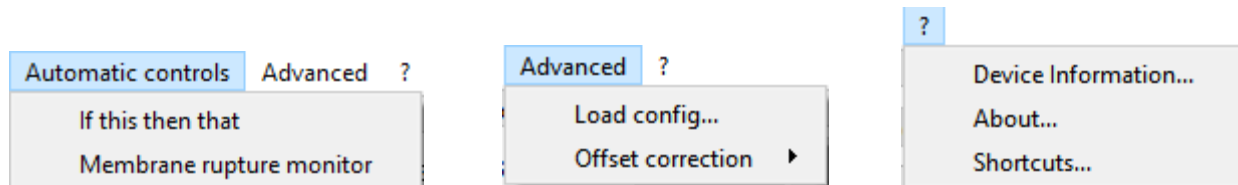


The Statistics menu reports the current mean and standard deviation (Std) values of the selected channel in real-time. The Saturation indicator flickers when the amplifier exceeds the maximum or minimum current values. The Sample Loss indicator flickers on if some samples are lost during data acquisition: this can happen if the device is acquiring at a high sampling rate while the computer is low on CPU resources, or when a command is sent to the device, briefly interrupting the data stream from the device to the computer.

Online Analyses

The Online analyses menu contains all the real time analyses available in the software.

Menus



Automatic controls

This menu grants access to some features described in a separate Guide: Automatic Controls

Load config

Users with specific needs can load a custom config file (that contains information for the configuration of the GUI) if needed in some custom experimental setup or device. Since EDR automatically loads the proper config file for each device, this feature should be used only after a specific indication by the Elements team.

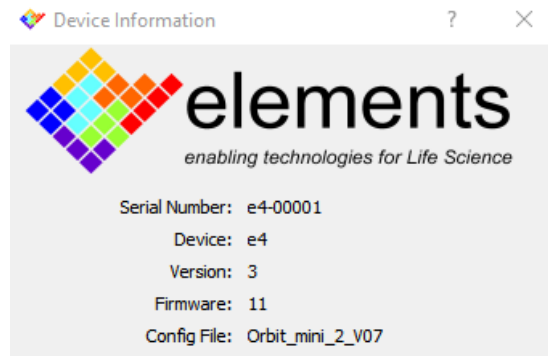


Offset correction

This feature can be used to correct the open input current offset of the amplifier via software, for instance if after a long period after purchase the device presents a current offset with no load connected at the input and/or if offsets calibrations, for some reason, are not perfect (after the proper warm up time of the device of at least 15-20 minutes, see the “Current offsets compensations” guide for other details). Using this feature when the device is connected to any load can impair the device functionality, so be sure to carefully read the instructions embedded in the software before using this feature.

Device Information

Serial Number, type and version of the Elements device, as well as firmware version and the loaded config file, are reported here:



Providing this information to the Elements team when asking for support can reduce the issue investigation time.

Shortcuts

EDR software has keyboard shortcuts to easily control the amplifier while experiments are running. Here is the list of the shortcuts that can be found clicking on “?->shortcuts” menu:



Elements Data Reader



Shortcuts:

'+'	Increase current scale
'-'	Decrease current scale
Ctrl + '+'	Increase time scale
Ctrl + '-'	Decrease time scale
Ctrl + Page up	Increase current offset
Ctrl + Page down	Decrease current offset
Shift + '+'	Increase voltage scale
Shift + '-'	Decrease voltage scale
Shift + Page up	Increase voltage offset
Shift + Page down	Decrease voltage offset
Ctrl + 'R'	Reset scales
Ctrl + Arrow up	Increase Vhold by 10 mV
Ctrl + Arrow down	Decrease Vhold by 10 mV
Ctrl + Arrow left	Increase input current range
Ctrl + Arrow right	Decrease input current range
Ctrl + '0'	Start protocol 0
...	...
Ctrl + '9'	Start protocol 9
Ctrl + 'G'	Start/Stop recording
Ctrl + 'P'	Insertion pulse
Ctrl + 'T'	Set trigger value to Vhold
Ctrl + 'H'	Hide/Show switched off channels
Alt + 'Z'	Activate ZAP
Alt + 'S'	Save voltage protocol
Alt + 'L'	Load voltage protocol

OK