CED eNews
The eNewsletter from Cambridge Electronic Design
#19 ~ June 2006
Established 1970

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Meetings and events

CED representatives will be attending the following meetings and events over the coming months.

5th Polish Electrophysiology Forum
Lodz
Poland
June 8th - 9th

Includes a Spike2 and Signal tutorial session to be held on Friday 9th June

Ontario Exercise Neuroscience Gathering
Brock University
St. Catharines, Ontario
Canada
June 16th - 17th

Including a Spike2 tutorial session to be held on Saturday 17th June

The Physiological Society AGM
University College London
London
July 5th - 7th

5th Forum of European Neuroscience (FENS)
Austria Centre
Vienna
July 8th - 12th

We will also be present at the annual Woods Hole Marine Biological Laboratory Summer Courses, where students will use Spike2 and our 1401's as part of the songbird and electric fish practical sessions on the Neural Systems and Behaviour course.

Latest versions of Spike2 and Signal

The latest updates for Spike2 and Signal are available from the CED downloads page, or by clicking on the links in the table below. Demonstration versions of the latest software are also available.

Spike2 downloads	Signal downloads
Spike2 version 5.15	Signal version 3.07
Spike2 version 4.24	Signal version 2.16
Spike2 demo	Signal demo

A full list of the new features and changes in the latest software versions is available from the website.

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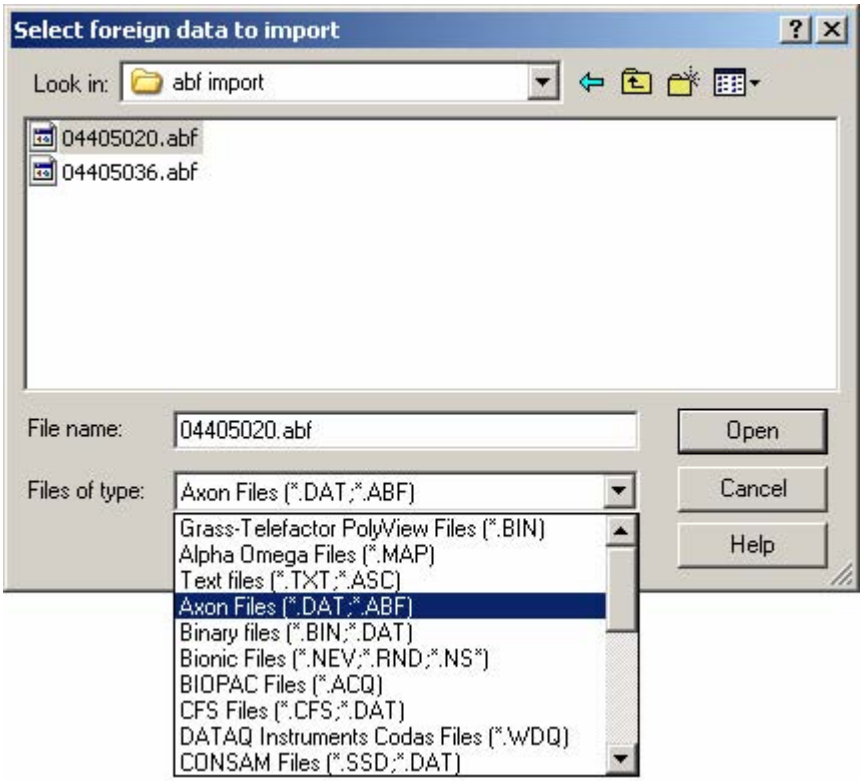
Q. A number of my colleagues have asked me to use Spike2 to analyse data recorded in other file formats. How do I import these foreign files?

A. Spike2 has a number of file import filters which can translate data files from many other formats into Spike2 data files. Common file types such as Axon Instruments, BIOPAC, Plexon and Neuralynx are supported, as well as Windows Wave, Text files and the option to import Binary files in both big-endian and little-endian format, depending on the information supplied.

The Import command from the Spike2 file menu leads to a standard file open dialog in which you select the file to convert. You then set the file name for the result. The exact details of the conversion will depend on the file type.



File import dialog displaying some of the file types available

New additions to the file importers include:

- The extension of the EDF importer to include support for the EDF+ format for both continuous and episodic data
- A preliminary version of a Grass-Telefactor Polyview binary format importer

If you need to translate a file format that is not covered, please contact us with your requirements.

Signal

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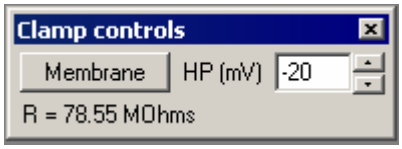
Clamp sampling part 2: On-line control and analysis

Q. I am now ready to run clamping experiments and would like more information on the on-line control and analysis capabilities of Signal.

A. Once a clamping setup has been specified in the sampling configuration, as in our attached `ClampExample.sgc` file, you are ready to start sampling. When you create a new data file ready to sample, an additional clamp control toolbar is created along with the standard sampling control toolbar. This console contains specific options and information for each clamping setup in use.



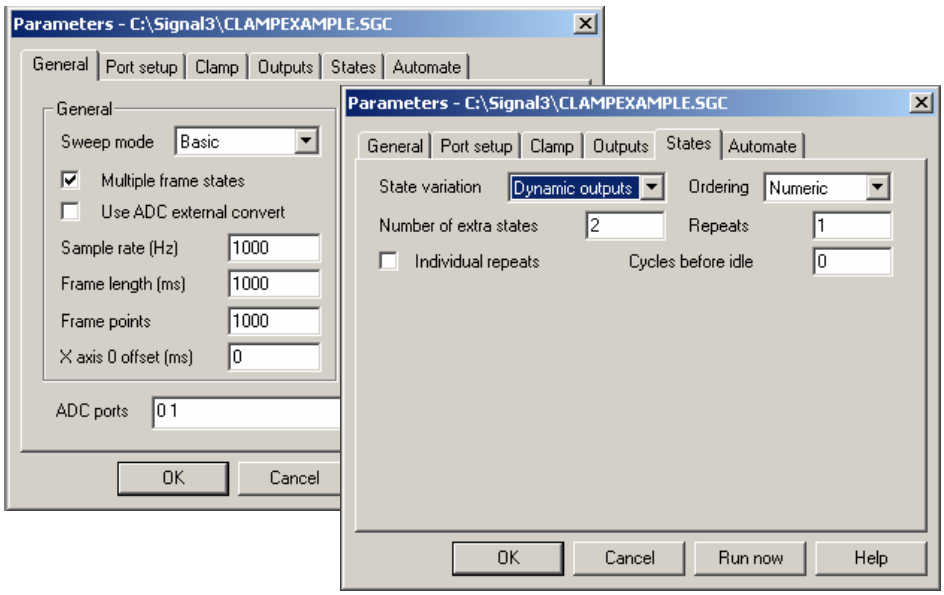
Clamp control toolbar

The holding potential (HP) control allows easy adjustment of the baseline level of the stimulus DAC output using the spinners or by entering a value.

The bottom of the toolbar contains a text field displaying the total (electrode and membrane) resistance measurements. This is updated whenever the specified sampling state for resistance measurements is used. In our example configuration we have only one set of outputs available, which are always used for the membrane resistance measurements. However in a real experiment you would often want to specify a number of different pulse outputs and nominate a specific one for resistance measurements. This can be done by using multiple states in Signal.

Sampling with multiple states

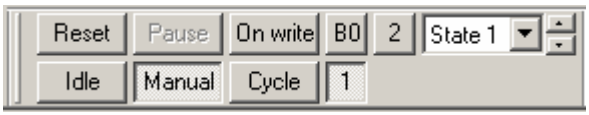
Multiple states sampling in Signal is used to flag different conditions in an experiment so that subsequent analysis can distinguish between data frames recorded under the various conditions (or *states*). Multiple states are selected by setting the Multiple frame states checkbox in the General page of the sampling configuration. This enables a States tab where the user can define the mode and settings for the experiment, as below.



Sampling configuration showing the enabled States tab

Dynamic outputs mode is the obvious choice for clamping experiments as it allows you to setup different pulse outputs for each stimulus type to be used during the experiment. Signal then records which output is being used for each sampled frame. If the state set for resistance measurements is used, then the values displayed in the clamp control toolbar are updated. The number of states (output types) to use and how they are controlled is set-up in the configuration as

above. Output states can be controlled manually, sequenced numerically, randomly or controlled by setting up protocols specifying the order and repetition of outputs. During sampling the states toolbar gives access to the available sequencing options, which can be selected at any time.



States toolbar

The pulse outputs to use for each state are set in the pulses tab of the sampling configuration (see Part 1 of this article in the previous eNewsletter for details). It is also possible to change and edit pulse output parameters such as amplitude and duration for any state by accessing the pulses dialog during sampling. Any changes made take effect at the start of the next sampled frame.

Note: There are a further two additional state modes available. In external digital mode, different stimulus types are flagged by external equipment (for example, stimulus generators) using digital patterns which Signal records using the digital inputs of the 1401.

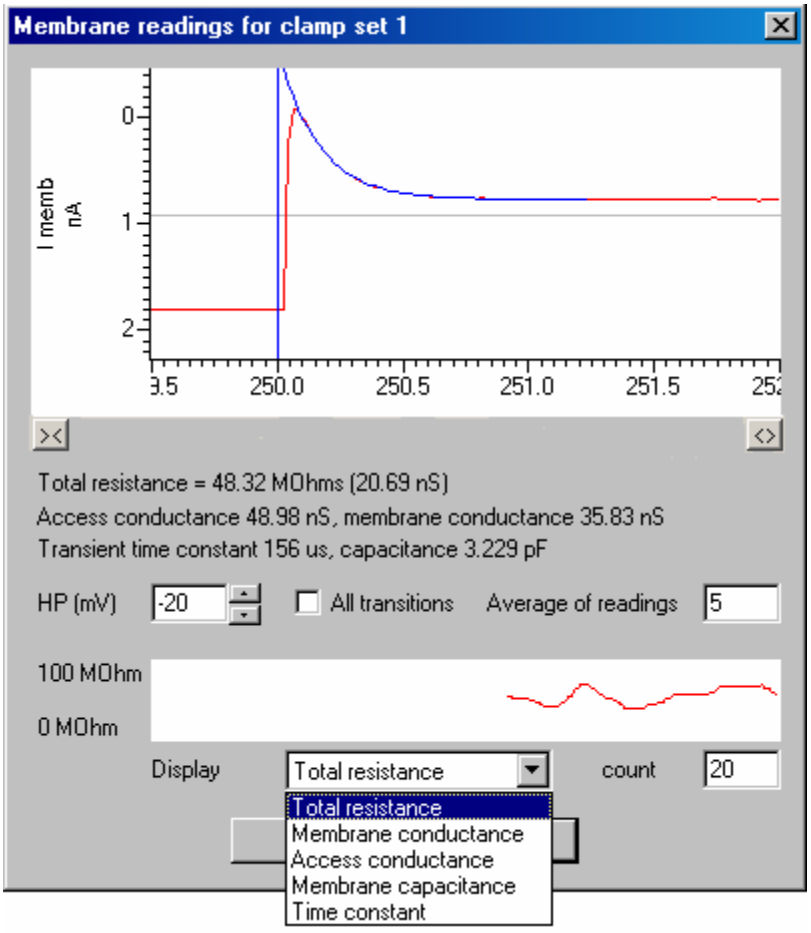
In static outputs mode, Signal generates digital patterns from the 1401 to communicate with external equipment and records the pattern used in the sampled frame.

As these states do not give us any control over pulse outputs, they would not be used for clamp experiments.

Membrane analysis

The Membrane button in the clamp control toolbar opens a dialog and switches sampling to the specified state for resistance measurements in order to monitor membrane properties. The dialog displays a section of waveform data from the response channel taken at the start time of the stimulus pulse. The time range displayed can be adjusted using the buttons labeled '><' and '<>'.

The measurements taken during membrane analysis depend on the type of clamp experiment. For a voltage clamp experiment a curve representing the capacitance decay is fitted to the waveform trace and the following values are displayed in the text area below the waveform area: total resistance (and conductance), access and membrane conductance, the capacitance transient decay time constant and the membrane capacitance value. For current clamp experiments, only the overall resistance is measured.



Membrane analysis dialog

Further options are available in the dialog to take measurements based on both edges of the stimulus pulse and to display the average results of the last *n* sweeps.

The area at the bottom of the dialog is used to display one of the selected membrane measurements as a plot over time. Select measurement type from the 'Display' drop-down list and use the 'Count' control to set the number of points to display. The 'Clear' button deletes all points in the current display.

For full details of how the membrane measurement values are calculated see the Signal on-line help chapter entitled Online clamping support.

The on-line control and analysis features have been designed to fulfill the main requirements of researchers performing clamp experiments. If you have any comments or feedback from using the new clamping features in Signal, then please let us know.

Scripts: Spike2

Q. In eNewsletter 9 you included a script to output a series of pre-recorded spike events on-line as a stimulus from the digital outputs. What I would like to do is play out the same data through the sound card. Is there a script available to do this?

A. The attached script `PlayEventsToWM.s2s` creates a new WaveMark channel based on event times in a data file. This new WaveMark channel can then be played via the sound card or 1401 DAC's using the standard output waveform functions. There is also the option of creating a waveform channel from the events for conversion to a .WAV file using the `SmrtoWav.s2s` script, which is available to download from our website, or by clicking here.

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Right-click the script icon and save to disk.

If you have any problems opening the embedded scripts in this newsletter please let us know.

Scripts: Signal 

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Right-click the script icon and save to disk.

If you have any problems opening the embedded scripts in this newsletter please let us know.

Q. I am using active cursors in Signal to take measurements from LTP responses. The problem I have is that I need to set the cursors up each time for every file that I analyse. It would be nice to have a script that would automatically set-up the cursors and take measurements without the need to set them up for each file.

A. The attached script, `CursorSetup.sgs`, is an example script that sets up active cursors to find the maximum response and 10% and 90% slope positions of the response. These values are then plotted to XY views and displayed. The script asks the user to select the response channel and position cursors to mark the pre-stimulus baseline and the response before setting up the active cursors. This script could easily be modified to include different measurements if required.

Did you know…?

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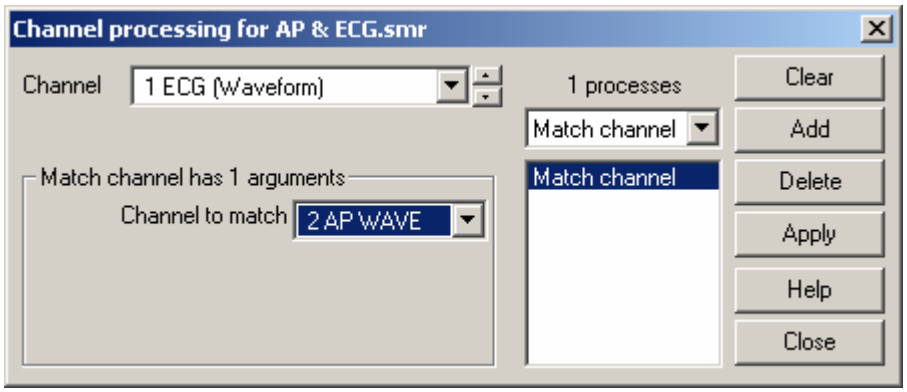
In Spike2 you can resample waveforms to user-defined sample rates with the interpolate process, or match the sampling rate of another channel in Spike2 using the Match to channel function. One example of the use of these functions would be waveform correlation analysis between two channels initially sampled at different rates.



Channel process dialog

Recent questions

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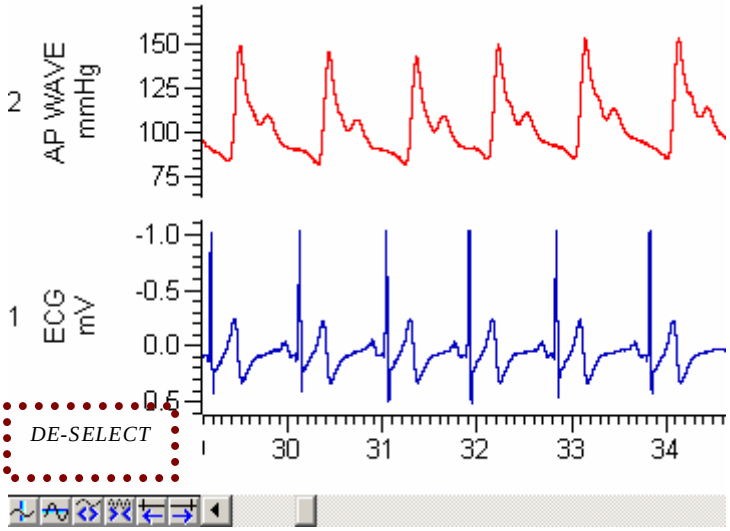
Q. Is there a way to display the analysis results of more than one channel in a result view in Spike2?

A. Result views can hold the results of multiple selected channels or a list of channels. You select channels in a Spike2 data file by clicking on the channel number to the left of the Y-axis (the number will turn grey). To select multiple channels use Shift+Click for a contiguous selection or Ctrl+Click to choose separated channels. The process settings dialog of the new result view analysis options should now include an option in the drop-down list for Selected: *n..n*. Analysis types that require waveform channel data will process and display all selected channels with a matching sample rate. See the Did you know..? section above if you need to match sample rates between channels for multi-channel result views.

There is also a ‘de-select button’ which is concealed in the white space at the bottom left of the data file display, see below for details! Click in this area to de-select all currently selected channels. This ‘button’ is coloured the same as the background to preserve print quality.



The de-select 'button' area in a Spike2 file

User Group

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