CED
CAMBRIDGE ELECTRONIC DESIGN LIMITED
DATA ACQUISITION & ANALYSIS

Spike2 Signal
eNewsletter
#91 January 2015

Contents

New CED website

We are pleased to announce the release of the new CED website, which is now available to view at http://ced.co.uk. Here you can find information on all of our data acqusition and analysis products, as well as downloadable versions of the latest Spike2 and Signal releases, video tutorials and technical support information.

UK Training Days - 23rd & 24th April

Our next training day events will take place on April 23rd & 24th in Cambridge, UK.

For over 20 years our training days have helped thousands of researchers make the best use of CED systems for their research. Join us in Cambridge and learn how to make the best use of Spike2 and Signal to save hours of repetitive analysis.

These sessions are suitable for both existing and prospective users of our data acquisition and analysis systems.

Future meetings and events

German Physiological Society 94th Annual Meeting
Magdeburg,
Germany
March 5th - 7th 2015

Experimental Biology 2015
Boston, MA
USA
March 28th - April 1st 2015

BNA 2015 Festival of Neuroscience
Edinburgh,
UK
April 12th - 15th 2015

Latest versions of Spike2 and Signal

Spike2	Released	Signal	Released
Spike2 version 8.03a	01/15	Signal version 6.02	08/14
Spike2 version 7.15	07/14	Signal version 5.11	09/14
Spike2 version 6.18	10/12	Signal version 4.11	01/14
Spike2 demo	12/14	Signal demo	08/14

Script spotlight

Script writers can use a number of different methods to interact with a user, ranging from short message dialogs to large and complex custom built dialogs from which the user can define parameters for a whole experiment. Usually message dialogs would be used to inform the user that something has happened (or is about to happen). The standard `Message()` script command produces a dialog with the supplied text and an OK button for the user to click once the message has been recieved, but often during an experiment the user may be busy adjusting settings on external equipment or monitoring a subject, and would rather have a message that closed on its own after a specified time.

The `NewsFlash()` function, included in the `GHutils` script in your Spike2 or Signal installation `\include` folder, is a function that allows you to create a message dialog box that will appear on screen and close on it's own after a specified time period. You can include the functions from the GHutils script in your own script using `#include <GHutils.s2s>` in Spike2 or `#include <GHutils.sgs>` in Signal. The `NewsFlash()` function uses the following arguments:

```
NewsFlash(msg$, Tshow, x, y, beep%);
```

Where `msg$` is the message to display, `Tshow` is the time to display the message and `x` and `y` are the screen co-ordinates of the top left corner of the message box. The `beep%` argument can be set to 1 to play a warning tone when the message opens. Set this to 0 for no warning sound. The example Spike2 and Signal scripts in NewsFlashExample.zip, will display a pop-up message in the middle of the application window, with a warning sound when the message opens, for five seconds.

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"Is there any method available to open Spike2 files directly in Matlab for additional processing? It would be very useful if Matlab could read Spike2 data files and modify them without changing the file format each time."

The MATLAB/SON library interface is a set of files that lets users open, create and edit SON files (.smr and .smrx) in MATLAB using a MATLAB script. It is provided as a solution to the problem of importing data from MATLAB into Spike2 and also allows users to sample data in Spike2 and analyse it in MATLAB, without having to repeatedly export and import from one program's file format to the other using the built-in `MatLabxxx()` script commands.

The library contains a number of functions and *class objects* which relate to the different supported data types in Spike2. These allow the user to read and process all channel data types in MATLAB. This processed data can then be written back to the SON file for further analysis in Spike2.

Example MATLAB scripts and full documentation are included in the downloadable file to demonstrate the MATLAB/SON interface functionality.

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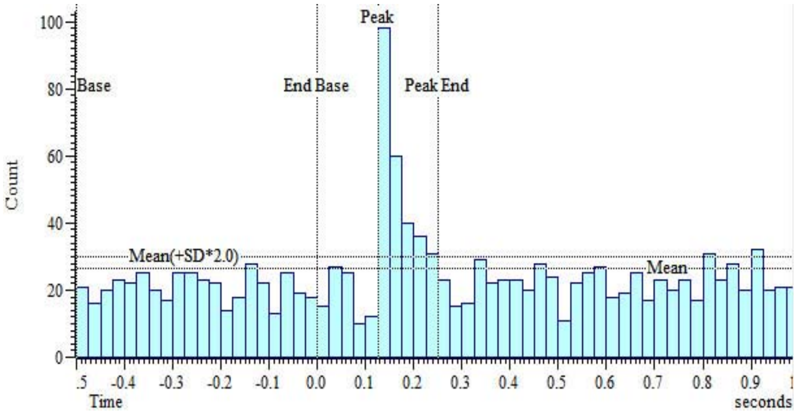
Scripts: Spike2

The script, PSTHResponseDetect.s2s, generates a PSTH and then automatically detects the first response after the trigger time larger or smaller than baseline mean plus a number of standard deviations. It then measures response amplitude and latency and prints these values to the Log window. You can set the type of response (peak or trough) to detect and set how many consecutive bins must be above or below the threshold to define a response in the settings dialog generated by the script.



Signal “How do I set-up Signal for voltage clamp sampling?”

When the Signal installation is run, it will give you the option of enabling or disabling clamp support. This includes the `Clamp` sampling support tab in the sampling configuration along with the leak subtraction analysis and single-channel idealized trace functions.

Clamp setup

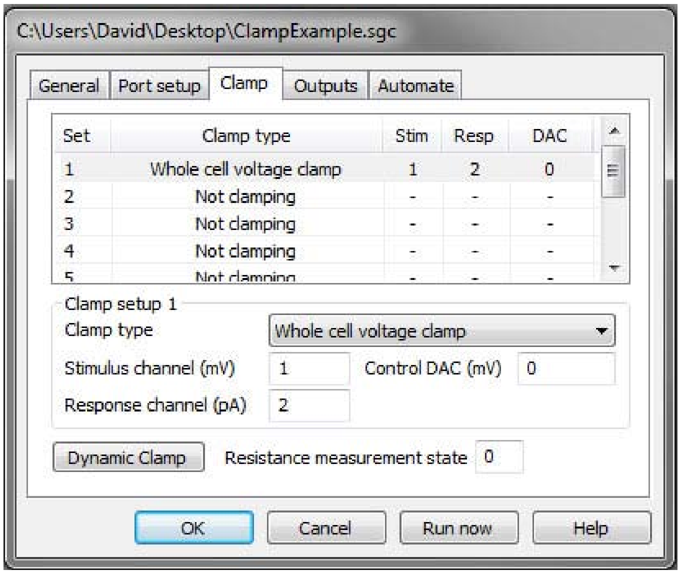
The following guidelines assume a sampling configuration which uses ADC inputs 0 and 1 of the 1401 to record one stimulus and one response channel, with a one second sweep length and a sample rate of 10kHz. The control stimulus will be supplied by DAC output 0 on the 1401.

The downloadable configuration ClampExample.sgc includes all of the settings detailed here and can be used as a starting point for carrying out clamping experiments using Signal. This configuration has been tested with Signal version 5 and 6.

Clamp tab

The `Clamp` tab includes eight clamp ‘sets’, which can be used simultaneously. Each set allows you to specify which channels to use for recording the stimulus and response from the cell or patch and which DAC output should be used to control the stimulus for the selected experiment type. When Signal has this information it can automatically scale the data during sampling and perform further clamp specific analysis, such as membrane resistance measurements.

The `Resistance measurement state` field can be used to nominate a particular state (set of pulse outputs) which will be used to monitor the membrane resistance on-line. In this example we are only going to specify a single set of outputs, so will leave this field set to 0.



C:\Users\David\Desktop\ClampExample.sgc

Set	Clamp type	Stim	Resp	DAC
1	Whole cell voltage clamp	1	2	0
2	Not clamping	-	-	-
3	Not clamping	-	-	-
4	Not clamping	-	-	-
5	Not clamping	-	-	-

Clamp setup 1

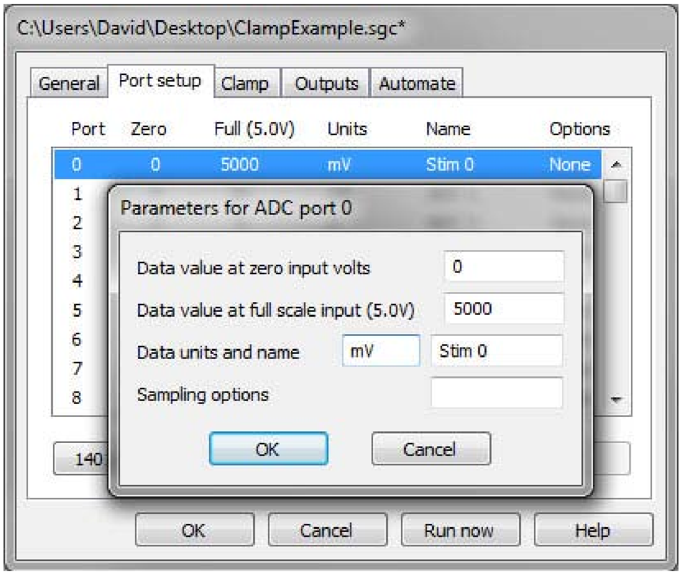
Clamp type: Whole cell voltage clamp

Stimulus channel (mV): 1 Control DAC (mV): 0

Response channel (pA): 2

Resistance measurement state: 0

Clamp tab with parameters



C:\Users\David\Desktop\ClampExample.sgc*

Port	Zero	Full (5.0V)	Units	Name	Options
0	0	5000	mV	Stim 0	None
1					
2					
3					
4					
5					
6					
7					
8					

Parameters for ADC port 0

Data value at zero input volts: 0

Data value at full scale input (5.0V): 5000

Data units and name: mV Stim 0

Sampling options:

ADC port setup

Channel setup

For voltage-clamp experiments the applied stimulus is voltage and the response is current and vice versa for current-clamp setups. The ADC inputs used to record the stimulus and response data must be set to use valid units in the `Port setup` tab of the sampling configuration. Doublie-click on a port in the list to open the Parameters dialog. The units for a voltage channel must include the character ‘V’ and the units for a current channel must include the character ‘A’, so that on-line measurements give correct values. Incorrect units will cause the channel or control DAC settings in the `Clamp setup` section to be displayed in red in the `Clamp` tab and Signal will generate an error message when ready to sample.

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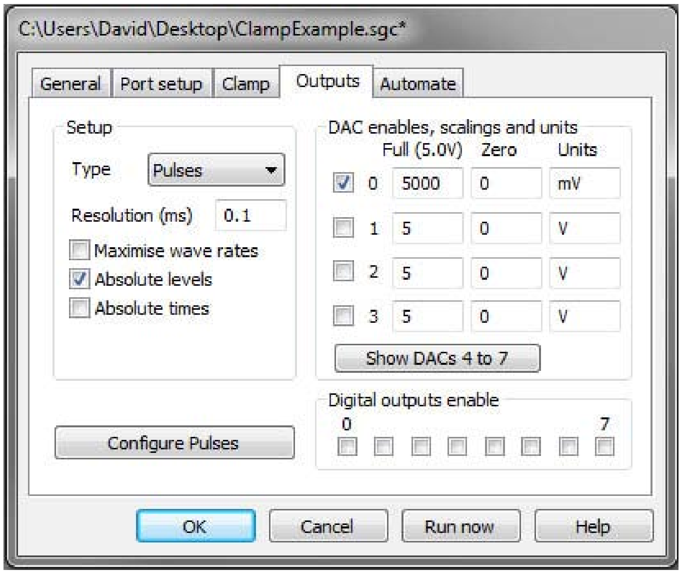
Stimulus setup

The control DAC output must also be set to match the units of the stimulus channel for the selected experiment type. The `Outputs` tab of the sampling configuration holds settings for the DAC units and scaling. The stimulus pulses to output from the DAC are configured by selecting `Pulses` in the `Type` drop-down and then clicking the `Configure Pulses` button.



C:\Users\David\Desktop\ClampExample.sgc*

General | Port setup | Clamp | Outputs | Automate

Setup

Type: Pulses

Resolution (ms): 0.1

□ Maximise wave rates
☑ Absolute levels
□ Absolute times

DAC enables, scalings and units

		Full (5.0V)	Zero	Units
☑	0	5000	0	mV
□	1	5	0	V
□	2	5	0	V
□	3	5	0	V

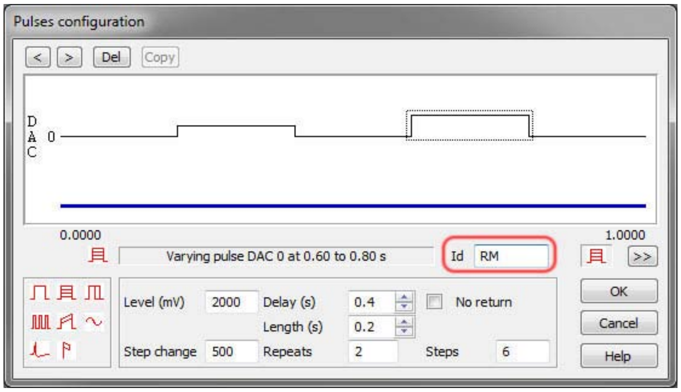
Show DACs 4 to 7

Digital outputs enable: 0 □ □ □ □ □ □ □ □ 7

Configure Pulses

OK | Cancel | Run now | Help

Outputs tab



Pulses configuration

< | > | Del | Copy

Varying pulse DAC 0 at 0.60 to 0.80 s

Id: RM

Level (mV): 2000 Delay (s): 0.4 □ No return

Length (s): 0.2

Step change: 500 Repeats: 2 Steps: 6

OK | Cancel | Help

Pulses configuration dialog

Output types generally used for clamp experiments are constant or varying amplitude/duration square pulses and square pulse trains. If more than one pulse is used for a given state you can define the one to use for resistance measurements by setting the pulse ID in the dialog to RM, as shown in the dialog.

Ready to sample

Following the setup above you should now be ready to sample. The sampling configuration is checked for the correct settings for clamp experiments when a new data file is opened. Signal will generate an error message to alert the user if any incompatibilities are found.

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Scripts: Signal

"I use Signal for TMS experiments and would like to be able to start a timer, like a stopwatch, between stimuli and display this on the screen."

The script, Stopwatch.sgs, creates a 'stopwatch' timer displayed in the Log window. The user can Start, Stop and Reset the stopwatch as required using the buttons supplied by the script toolbar.

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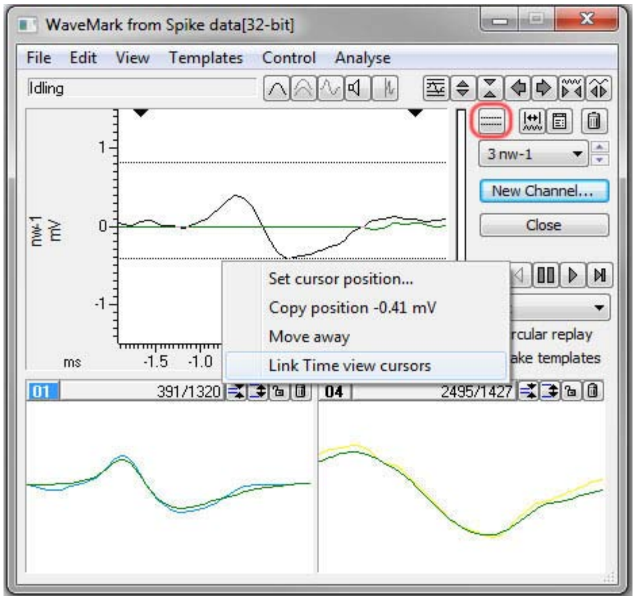
Did you know...?

You can now copy the position of horizontal cursors, and the differences in Y-axis units between multiple horizontal cursors to the clipboard. To do this, right-click a horizontal cursor and select `Copy position` from the context menu.

When spike sorting, the trigger level cursors in the spike shape window can also be linked to horizontal cursors in the data file. The `Link Time view cursors` option, available when right-clicking on a cursor in the spike shape window, links Horizontal cursor 1 to the lower trigger level, horizontal cursor 2 to the upper trigger level and horizontal cursors 3 and 4 to the lower and upper amplitude limits, if these have been made visible (see the button highlighted in the dialog). This allows the threshold levels to be adjusted in the data file as well as in the spike shape window.



Recent Questions

"Can Horizontal cursors be set to use active modes? I'd like to be able to set a horizontal cursor to track the intersection of data with a vertical cursor."

There are new cursor context menu commands which will set a horizontal cursor to track the intersection of a vertical cursor with a channel. right-click on a horizontal cursor and select `Lock to Cursor` to pair the horizontal cursor with a vertical cursor. The horizontal cursor is then set to an active mode which will track the intersection of the vertical cursor with the horizontal cursor channel data. The horizontal cursor position updates as you move the vertical cursor in Spike2, and updates frame-by-frame in Signal.

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CED User forums

Try the CED Forums bulletin board for software and hardware support

If you have any comments about the newsletter format and content, or wish to unsubscribe from the mailing list for this newsletter, please notify sales@ced.co.uk.

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