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News

US Training Days: Thursday 10th and Friday 11th November

These training days will take place at the [Holiday Inn Rosslyn at Key Bridge, 1900 N Fort Myer Drive, ARLINGTON, VA](#) just prior to the Society for Neuroscience meeting in Washington, DC. The days are suitable for both existing and prospective users so join us and learn how to make the most of Spike2 and Signal for your individual data acquisition and analysis requirements.

- **Covers all the major features of Spike2 and Signal**
- **In-depth tutorials take you from recording data through to advanced analysis techniques**
- **Optional workshop sessions allow you to discuss specific questions with CED staff in a small group environment**

Attendance is limited so please [register](#) early to reserve your place on the appropriate course.

Future meetings and events

Spanish Neuroscience Society

University of Salamanca,
Salamanca, Spain
September 28th – 30th 2011

Society for Neuroscience 2011

Booth 2238 - Walter E. Washington Convention Center,
Washington, DC, USA
November 12th – 16th 2011

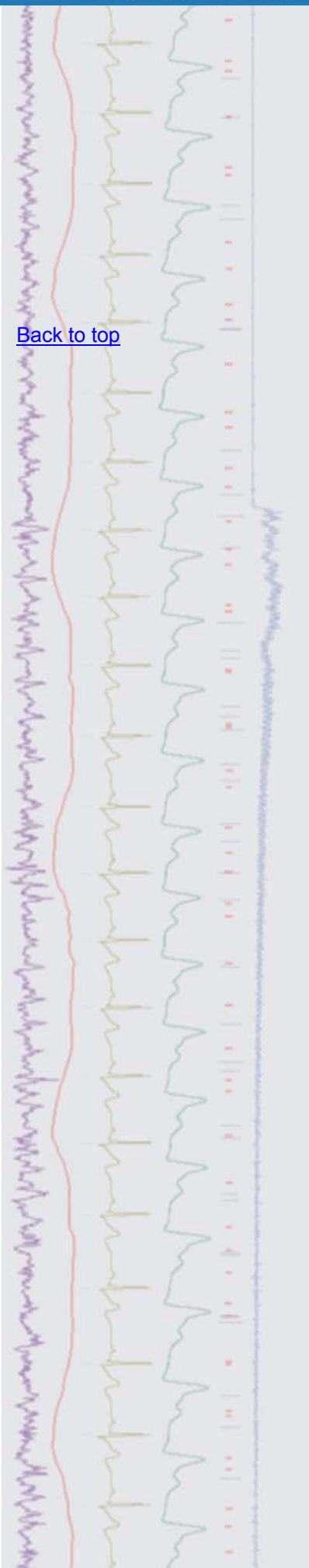
Australian Neuroscience Society 2012

Jupiters Hotel,
Gold Coast, QLD, Australia
January 29th – February 1st 2012

Latest versions of Spike2 and Signal

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	Released	Signal downloads	Released
Spike2 version 7.07	07/11	Signal version 5.03	09/11
Spike2 version 6.16	03/11	Signal version 4.09	08/11
Spike2 demo		Signal demo	



Scripts Spotlight

Gated analysis

One of the first things that you learn as a new Spike2 user is how to take measurements over a time range by bracketing it with cursors and using the `Cursor Regions` dialog. This is all well and good but can become tedious if you have multiple time ranges to analyse. There are several scripts in the Spike2 `scripts` folder that can speed things up.

`TimeRanges.s2s` allows you to mark multiple time ranges of interest as coloured bars using the `State` channel draw mode. You can then use `WMeasure.s2s` to take your chosen cursor regions type measurement (sum, mean, peak-to-peak etc.) repeatedly at fixed intervals over a selected time range or only during the marked time ranges, i.e., *gated* by the range marker channel. The results are tabulated in the log view and can be pasted to a spreadsheet. You also have the option to plot the results as an additional channel in the data file.

Similarly, `GatedPower.s2s` allows you to generate a power spectrum based only on the data within marked time ranges. This script also has an option to overlap FFT blocks so that all of the raw data is included in the spectrum. This option is given because power spectra are performed on successive time slices or epochs with a duration determined by the sample rate and the chosen FFT size (i.e. 256, 512, 1024 etc... samples). Partial epochs cannot be analysed. So, if the duration of a range is not an exact multiple of the epoch duration, then we have to make a choice between ignoring the data in the partial epoch at the end of the time range or, overlapping the epochs for a perfect fit. In practice we aim not for minimum overlap but an overlap of close to fifty percent.

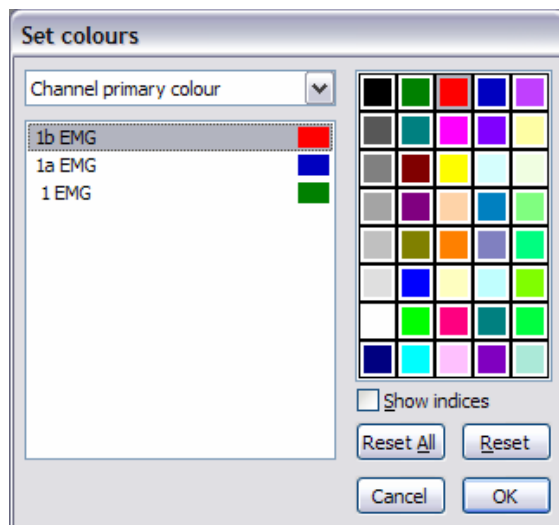
Each of these scripts generates a hotkey on the `Script Bar` when you run them for the first time. These buttons allow you to quickly flip from one script to the other. You will find user guides in the comments section at the top of the script file. Users of Spike2 v7 will find these scripts in the `scripts` folder.

If you have any questions please contact geoff@ced.co.uk



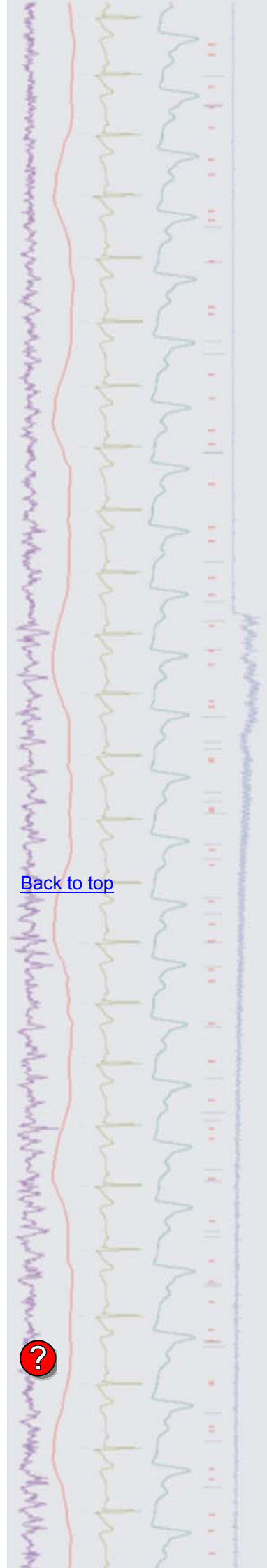
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- Q. I'd like to set-up my data-file so that different channels are displayed in different colours for easy identification.
- A. You can set individual colours for almost all types of data, channel and view in Spike2. Click on the colour palette icon in the main Spike2 toolbar or select `Change colours...` from the `View` menu to access the `Set colours` dialog.

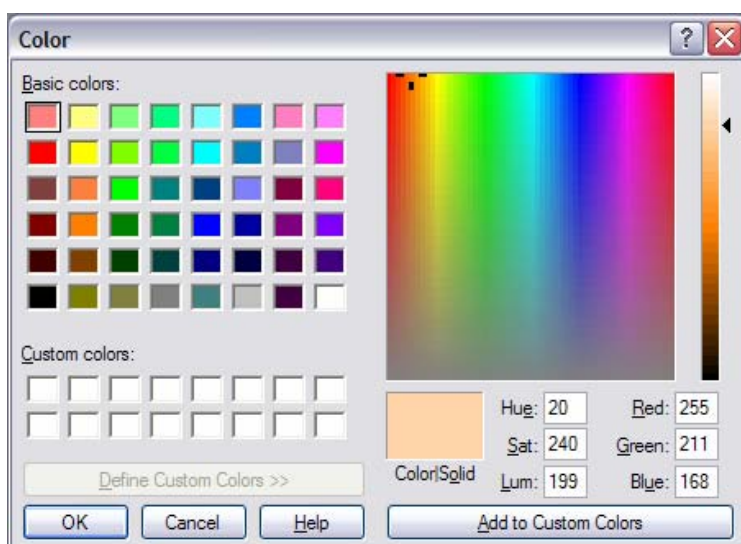


Set colours dialog

With a data file open, the `Set colours` dialog will display a list of the channels in the file. The drop-down menu can then be used to select the different channel elements such as primary, secondary and background colour for the listed

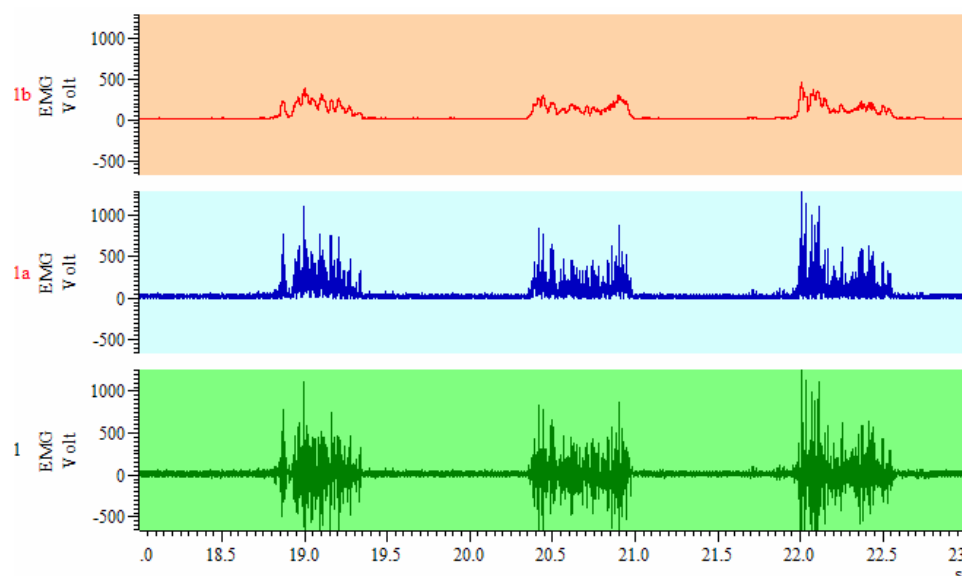


channels. Click on the name of the channel you want to change and then click a colour in the palette to apply it to the selected channel element.



Set custom colours

The available colours in the palette can be changed by double clicking on a colour. This opens a new dialog where you can select Basic colours to add to the palette or define your own Custom colours with user-definable settings for Hue Saturation, Luminescence or RGB ratio.



Processed EMG data duplicated with primary and background colours changed

Channel colour settings are stored in the resource file that is associated with the data file. Resource files have the same name as the data file and are stored in the same location with the extension .S2R. You can apply colour settings from one file to other data files using the File menu Resource Files > Apply Resource Files... option.

Scripts: Spike2

- Q. I would like to export a channel of waveform data to Matlab for external analysis. The problem I'm having is that my original recording took place over a long period, making the data file, and associated Matlab file, rather large. Is there any way to export just sections of the waveform, perhaps based on a stimulus trigger recorded as an event channel?
- A. The script, `TrigDataExport.s2s`, will automate the export of sections of a waveform channel, based around a trigger channel, to individual Matlab files. The script allows the user to set the trigger channel and source waveform along with a time range of data to export. The exported sections of data are saved to the same folder location with the same filename as the original file and a suffix indicating the count of the sections exported. The files also include a TextMark channel with a marker holding the trigger time from the original file.



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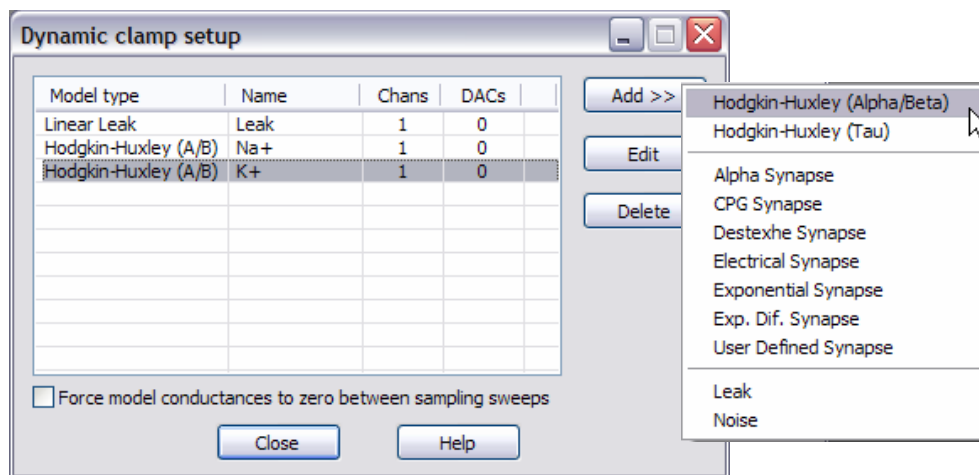
Right-click the script icon and save to disk.

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

The script requires Spike2 version 6 or higher. It could also be modified to export triggered data to other file formats if required.

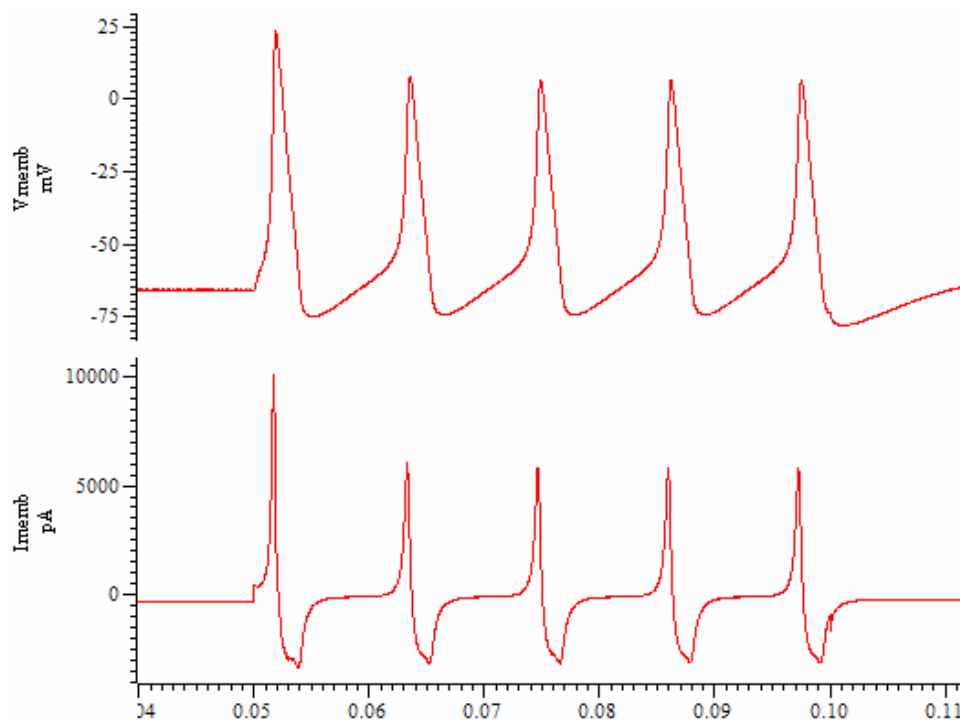
Signal

- Q. I'd be interested to know which models are supported by the dynamic clamp system in Signal. In the past I have used a "home grown" system but the programmer from our group has now left and so we no longer have any support for our existing set-up.
- A. The Dynamic Clamp system in Signal is configured from the **Clamp** tab of the sampling configuration dialog. The clamp section of the sampling configuration can be enabled or disabled from the **Clamp** tab of the **Edit** menu **Preferences** dialog and provides the main setup dialog which is used to define the models to use during an experiment. This dialog can be accessed on-line to enable or disable models and to view, edit and update model parameters while sampling. Up to 15 models of any type can be defined for use on-line in a single sampling configuration. The number of models that are able to run simultaneously during sampling is dependent on the sample rate and model complexity.



Adding models to the Dynamic clamp setup

Below is a data file showing action potentials simulated using the combination of models in the setup dialog above.



Simulated action potentials

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Hodgkin-Huxley

These models are used to simulate the membrane conductance generated by a population of voltage-dependent ion channels that obey the standard Hodgkin-Huxley equations:

- **Hodgkin-Huxley (Alpha/Beta)**- uses a formulation based upon multiple rate equations
- **Hodgkin-Huxley (Tau)**- uses a formulation based on thresholds and threshold sensitivities

Synapse

These are used to simulate synaptic current flow between two cells:

- **Alpha synapse**- uses the Alpha function to generate the post-synaptic conductance profile
- **CPG synapse**- the pre-synaptic potential mediates the release of a transmitter which causes a post-synaptic current to flow. This particular model mimics the behaviour of synapses in the central pattern generation region of the lobster central nervous system
- **Destexhe synapse**- uses the Destexhe model to generate the post-synaptic conductance profile. The synapse can be activated by the pre-synaptic potential being above or below a defined threshold
- **Electrical synapse**- simulates a simple electrical connection (a gap junction) between two cells
- **Exponential synapse**- simulates the presence of a synapse using an instantaneous rise time and a single exponential to mimic the post-trigger decay of the conductance
- **Exponential difference synapse**- generates the post-synaptic conductance profile based on the difference between two exponentials, one used to model the rising phase and the other to model the decay
- **User-defined synapse**- generates a post-synaptic conductance based on a user-defined waveform read from a text file

Leak models

These provide simpler dynamic clamp behaviours where the simulated conductance is not time-dependent:

- **Linear leak**- represents current leakage through a cell membrane with constant conductance
- **Goldmann-Hodgkin-Katz (GHK) leak**- simulates the behaviour caused by diffusion of an ion through a membrane via always-open ion channels, driven by the differing ionic concentrations either side of the membrane and the voltage difference across it
- **Boltzmann leak**- resembles a linear leak with an additional factor in the equation that represents a voltage-dependent blockage of the leak

Noise

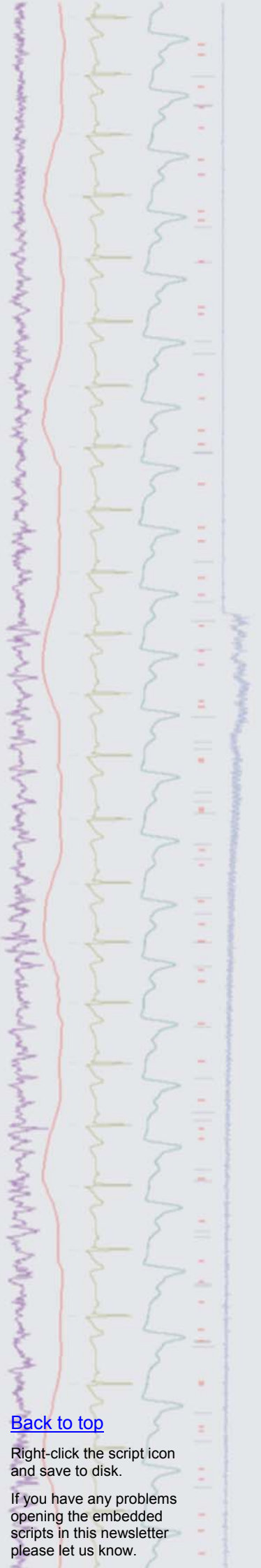
This model can be used to study the effect of simulated noisy conductances on neuronal behaviour:

- **Ornstein-Uhlenbeck noise**- generates a noise model using the mean reverting stochastic process

Full details of the available models, and the mathematics used to generate them, is available in the Signal on-line help.

Scripts: Signal 

Q. I have been using the script, `IntraSpikeAnalysis.sgs`, which was included in [eNewsletter 58](#), to take automated measurements from action potentials. This works fine, but would it be possible to extend the script to give the half-height of each spike as well?



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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.

- A. The script, `IntraSpikeAnalysis v2.sgs`, has been extended from the original version to include a measurement of the spike half-height alongside the standard measurements, which are then printed to a text file. This script requires Signal version 4 or higher.

Did you know...?

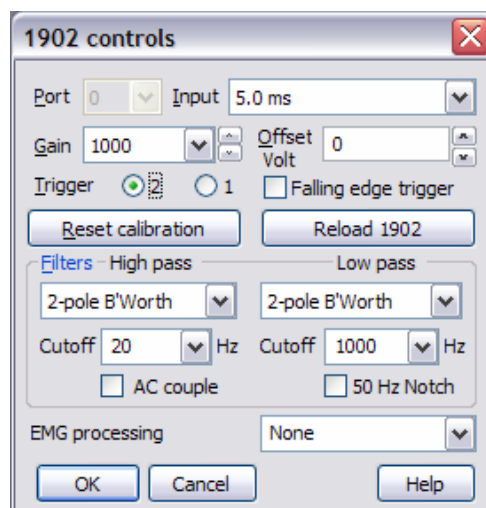
You can display channels in any order in a data or result file by clicking on the channel number to the left of the Y-axis and dragging it to a new position.

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Recent questions

- Q. I am currently using Signal, a Micro1401 and a 1902 along with a Magstim 200² stimulator for experiments investigating cortical processing of speech sounds. I'm recording EMG from a lip electrode but find that the TMS pulse introduces a large artefact which makes measurement of the responses difficult. I am intending to use the 1902 input clamp option to counter the artefact but would like to know if it is possible to trigger the input clamp slightly before the TMS pulse occurs?
- A. The input clamp option of the 1902 should always be activated before the stimulator for optimal results. It can be triggered by either the rising or falling edge of a TTL pulse delivered to the Trigger 2 input socket on the front panel. You can set which edge of a pulse to use in the 1902 controls dialog. By default the input clamp is set to use the rising edge of a pulse.

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1902 control dialog with input clamp setting of 5ms

The Magstim² range can also be set to trigger on either the rising or falling edge of a pulse by wiring the trigger signal to the appropriate pin on the 26-way connector on the rear of the unit (pin 5 = rising edge, pin 6= falling edge). In this way you could use a single 1401 digital output wired to both Trigger 2 on the 1902 and pin 6 of the Magstim unit to trigger the input clamp on the rising edge of the pulse and the stimulator on the falling edge, giving a suitable delay between clamp and stimulus.

User group

You can now find our [eNewsletters](#) archived on the CED website.

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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