Tecella Lab User's Guide

For Release 0.16
September 27, 2009

www.tecella.com

Table of Contents

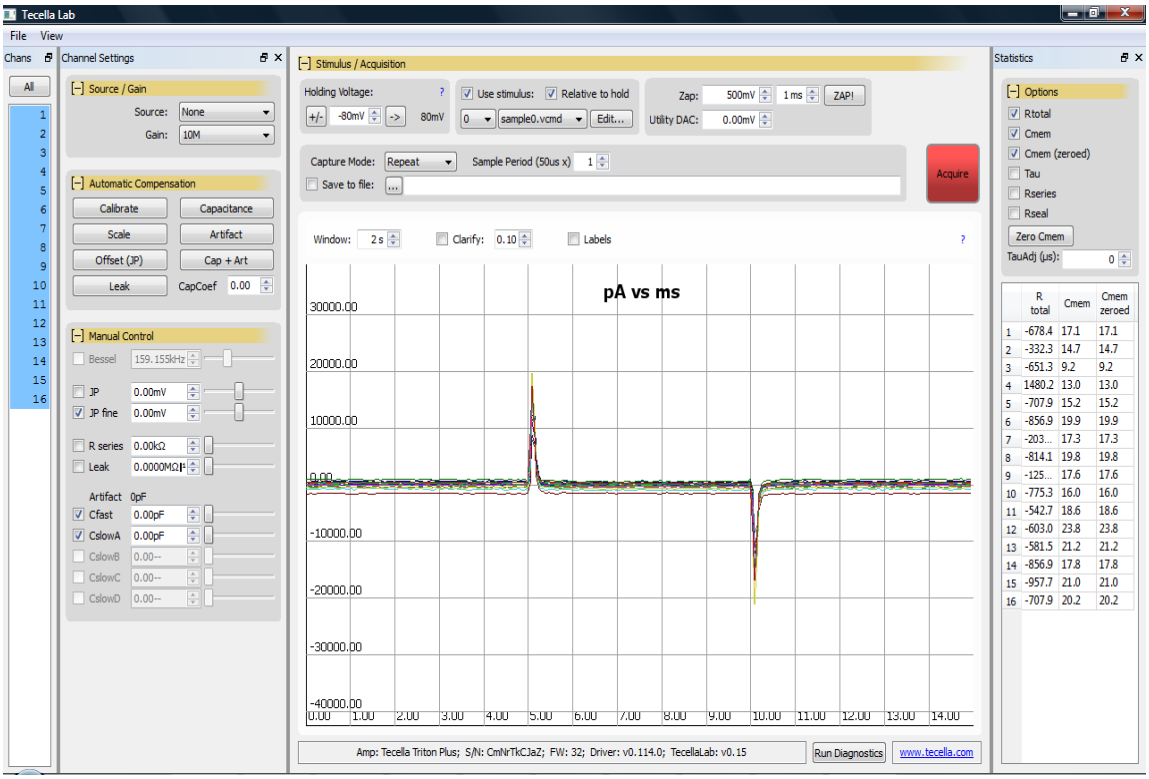

Illustration 1: The main TecellaLab window.

1 Introduction

Tecella Lab is an application used to interface with and acquire data from Tecella amplifiers. Features of Tecella Lab include:

1) An easy to use stimulus editor.
2) Automatic compensation for Offset, Leak, and Capacitance.
3) Seamlessly interface with multiple amplifiers simultaneously.
4) Capture to Tecella Lossless Compression (TLC) format, which results in file sizes about 60% smaller than raw binary.
5) OpenGL graphing support for low CPU usage.

2 Connecting the Amplifier

Connect the amplifier via USB and turn on its power switch. When you first open Tecella Lab, it will automatically detect the amplifier. If the amplifier is not detected, check the connections and restart Tecella Lab.

Using Multiple Amplifiers Simultaneously

Note: This feature is only supported if the amplifiers being used are identical. Tecella Lab will automatically detect all connected amplifiers on startup and display them as if they are a single amplifier. To determine which amplifier is first, check the serial number (S/N) in the bottom status bar.

3 Selecting the Amplifier Configuration

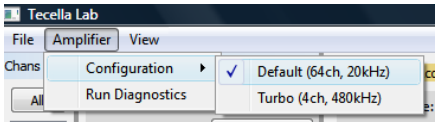

Illustration 2: Configuration Selection

Some amplifiers support multiple configurations. For example, an amplifier may support a higher sampling rate mode with fewer channels or be able to switch between current clamping, voltage clamping, and/or voltage following.

To select the amplifier configuration, go to the top menu and select *"Amplifier->Configuration->"*. The available configurations will be listed, with a check mark next to the current configuration. Clicking on any other configuration will change the amplifier configuration immediately.

Note: You must not be acquiring when changing the configuration.

4 Channel Selector

Illustration 3: Channel Selector

Any settings changed in other sections of the GUI will apply to all the channels selected here.

Note: Only the first channel selected will have it's current settings/statistics displayed.

"All" is a shortcut to select all the channels.

In the list of channels, selected channels are highlighted. Hold down <ctrl> to add/remove channels individually from the selection. Hold down <shift> to add/remove a range of channels to the selection.

5 Statistics

This section displays various calculated values of the stimulus response.

Note: These values are calculated assuming the first 2 stimulus segments form a step function.

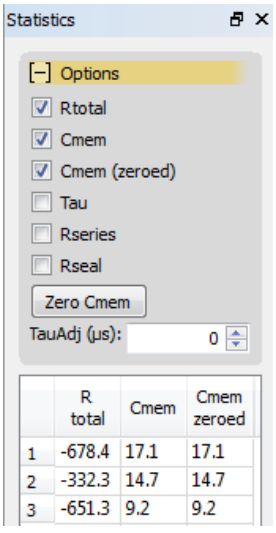

Illustration 4: Statistics

1. Rtotal – Displays total resistance. The difference between the initial and settled value of the step response is used to calculate total resistance.
2. Cmem – Displays membrane capacitance. The area under the step response is used to calculate capacitance.
3. Cmem (zeroed) – Displays membrane capacitance subtracting values from the last time the "Zero Cmem" button was pressed.
4. Tau – Displays the tau (adjusted by TauAdj). The fall time of the step response is used to calculate tau.
5. Rseries – Displays series resistance – This is the smaller of the two solutions to the quadratic equation incorporating Rtotal, Cmem, and Tau.
6. Rseal – Displays seal resistance – This is the larger of the two solutions to the quadratic equation incorporating Rtotal, Cmem, and Tau.

The "Zero Cmem" button resets the values used to adjust "Cmem (zeroed)".

TauAdj – The user can adjust the calculated tau to subtract any unwanted contributions, such as from different Bessel or gain settings.

6 Selected Channel Settings

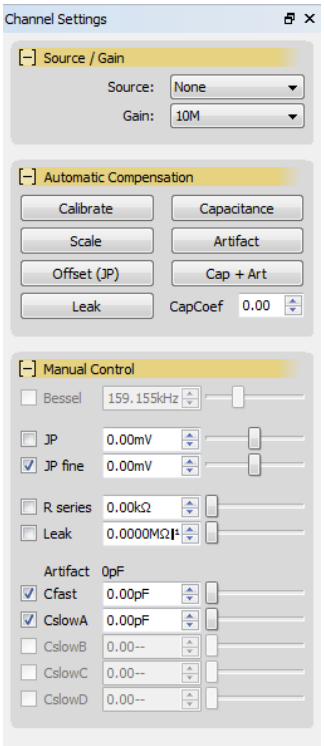

Illustration 5: Channel Settings

Source/Gain

The following sources are available: "None" selects nothing, "Normal/Head" selects the external connectors, and "Model 1" selects the internal model cell made of resistors and capacitors.

All available gains are listed in the gain drop down menu. Smaller gains have a larger dynamic range but bigger gains are less noisy.

Automatic Compensation

Note: only the enabled settings (via the check boxes in Manual Control) will be used by Automatic Compensation.

"Calibrate" calibrates each channel's internal offset using the assumption that a flat 0V stimulus should result in a response of 0A. Pressing the button again will remove any offsets.

"Scale" uses the internal model cell to calibrate the scale of each channel to within 1% tolerance. Pressing the button again will remove the effects of auto scale.

"Offset (JP)" finds the best JP to calibrate for any external offsets due to battery effects or junction potentials.

"Leak" finds the best leak to compensate for leaky seals. After auto leak, the offset is automatically adjusted to zero.

"Capacitance" performs analog capacitance compensation that calculates the optimal values for Cfast and the available Cslows. Automatically turns off "Artifact."

"Artifact" performs digital capacitance compensation that records any capacitance not compensated by Cfast and Cslows. Pressing "Artifact" again will turn off digital capacitance compensation.

"Cap+Art" is a shortcut for Capacitance followed by Artifact.

"CapCoef" is how much you prefer over/under compensation of "Capacitance". 0 is no preference. Positive indicates a preference for under compensation. Negative indicates a preference for over compensation.

Manual Controls

Most of the settings can be set using automatic compensation. However, manual edits and sliders may be used to adjust each setting.

The check box next to each settings serves two purposes:

1) If a settings can be disabled it will be disabled when the box is unchecked.

2) Only checked settings will be used by the automatic controls above.

7 Stimulus and Acquisition Settings

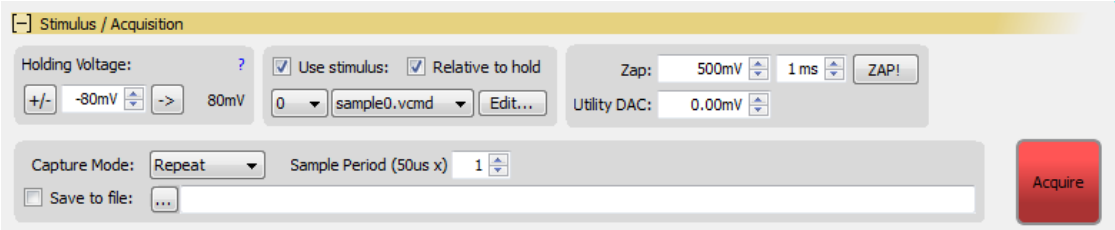

Illustration 6: Stimulus/Acquisition Settings

Holding Voltage

Specifies what the default applied voltage should be when not acquiring or a stimulus is not playing. The value on the right is the current value being used. The value on the left is used to enter a new value.

To apply the new value, press the "->" button or hit enter.

The "+/-" provides a quick shortcut to invert the current holding voltage.

Stimulus

The "Use stimulus" check box indicates whether the stimulus should start playing at the start of acquisition.

The "Relative to hold" check box indicates if the holding voltage should be added to all segments of the current stimulus.

The number at the bottom left is the stimulus index to use/edit. Most amplifiers only have a single stimulus.

To the right of the stimulus index is the currently selected stimulus for the given index.

The "Edit..." button on the bottom right allows you to edit and create stimuli.

Zap

Here you can specify the voltage and duration of a quick but large voltage pulse. The zap only occurs when the "ZAP!" button is pressed.

Utility DAC

If the amplifier has a utility DAC, you may specify the voltage here. The voltage changes when you press enter or click outside the box.

Acquisition

There are three modes of capture:

1. "Single" plays the stimulus once and stops.
2. "Repeat" plays the stimulus over and over until the user presses stop.
3. "Continuous" plays the stimulus once, but continues to record the response until the user presses stop.

You may specify the sample period as a multiple of the base sample period, usually 50us.

If capturing to a file, TecellaLab uses the Tecella Lossless Compression (TLC) format. Pressing the "..." button will open the file creation dialog box.

8 Navigating the Graph

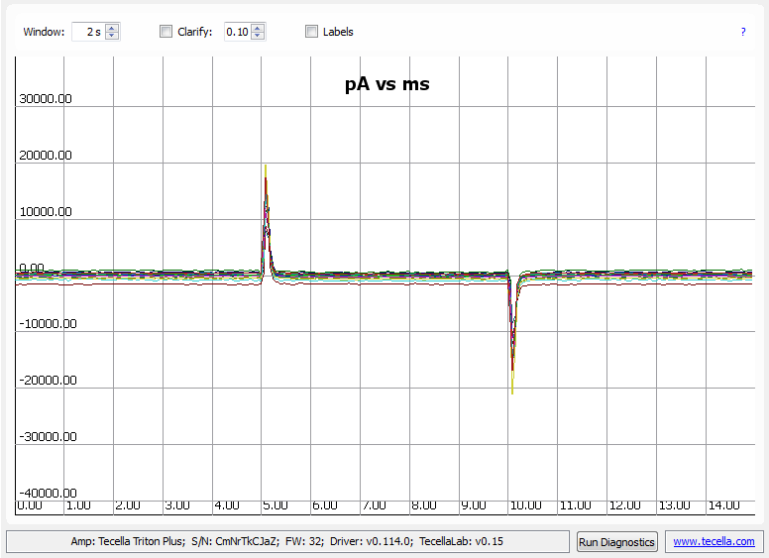

Illustration 7: Graph displays and identifies capture data.

The graph displays the acquired data for each of the selected channels in the channel selector. In Single and Repeat capture modes, only the most recent response is displayed. In continuous capture mode, the last N seconds are displayed (as specified by the window.)

Clarify averages the current graph with the previous graph, using the specified weight (W) for the current graph and (1-W) for the previous graph.

Labels can be checked to easily identify channels on the graph. Moving the mouse around will move the labels to the desired position.

The graph can be navigated using the keyboard/mouse as follows:

- To pan, left click and drag the mouse.
- To zoom, right click and drag the mouse.
- To zoom in 2x, hold alt and left click or use the scroll wheel.
- To zoom out 2x, hold alt and right click or use the scroll wheel.
- In all cases, holding shift will limit changes the X-axis and holding ctrl will limit changes to Y-axis.

9 Stimulus Editor

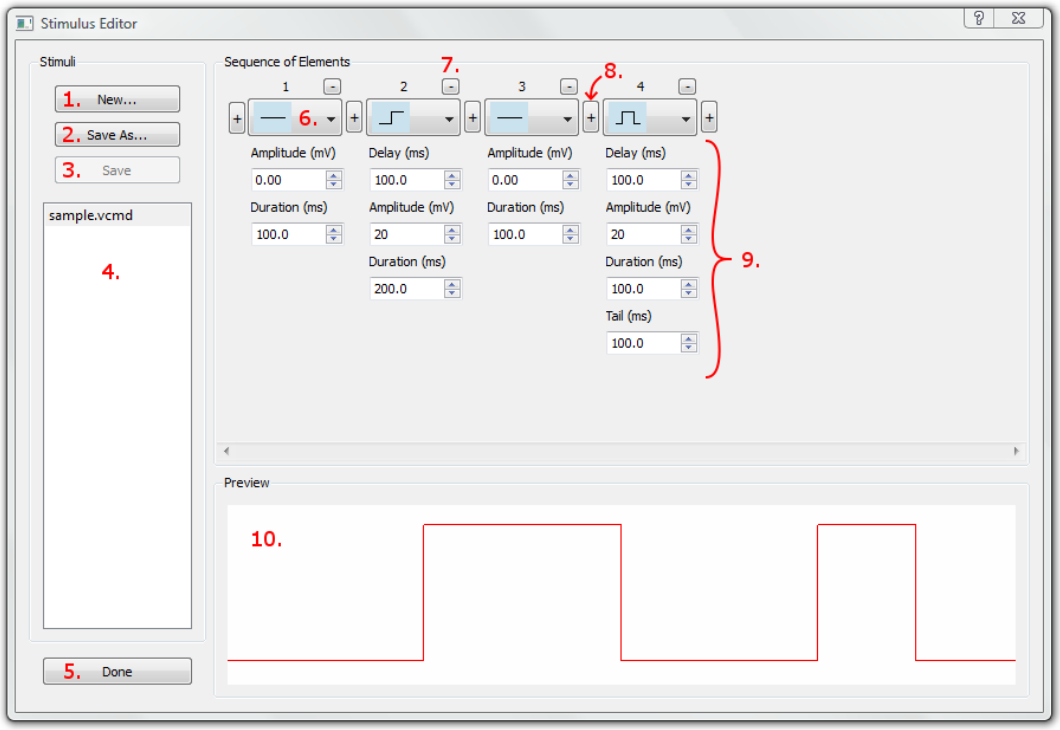

Illustration 8: Stimulus Editor

The stimulus editor provides an interface to create and edit stimuli. A stimulus is made up of a sequence of elements, which are shortcuts for commonly used patterns. Currently supported elements include segment, step, and pulse.

1. "New" creates a blank stimulus file with no elements.
2. "Save As..." saves the edited stimulus to a different filename.
3. "Save" saves changes to the current stimulus.
4. A list of available stimuli. Click here to select and edit a stimulus.
5. "Done" closes the stimulus editor and goes back to the main window.
6. Click here to change the stimulus element type. Select from Segment, Step, or Pulse.
7. The "-" button deletes the stimulus element below it from the sequence.
8. The "+" button inserts a new stimulus element into the sequence.
9. Below each element are the parameters available for a given element.
10. The preview displays what the expanded stimulus will look like.

10 TLC2ATF Command Line Utility

Accompanying TecellaLab is a small utility program tlc2atf.exe. This program will convert files captured by TecellaLab in TLC format to the text + tab delimited ATF format. For reference, the tlc2atf help message is reproduced here:

To convert an entire TLC file, you can drag and drop it onto the tlc2atf.exe. For more control, you can use the command line.

Examples:

```
  tlc2atf capture.tlc
         : Converts all samples from all channels to capture.atf
  tlc2atf -i capture.tlc -o test.atf -c 1 -c 2
         : Converts all samples from channels 1 and 2 to test.atf.
  tlc2atf -i capture.tlc -s 0 -e 999
         : Converts the first 1000 samples of all channels into
capture.atf.
  tlc2atf -i capture.tlc -s 10000 -x 4
         : Converts every 4th sample from all channels to a series of
files captureXXX.atf.  Each file in the series will have no more than
10000 samples per channel.
```

Allowed options:

Note: You man use either the full --<option> format or the shorthand -<o> format.:

```
  -h [ --help ]             Display this help message.
  -c [ --channel ] arg      Specify a channel to extract.  Absense of
                            this option implies all channels will be
                            extracted.  To extract multiple channels
                            use "-c # ... -c #".
  -o [ --outfile ] arg      Output ATF file.  Defaults to same
                            filename with atf extension.
  -i [ --infile ] arg       Input TLC filename.
  -s [ --start_index ] arg  First sample to extract, inclusive.
                            Samples indexed starting from 0.
  -e [ --end_index ] arg    Last sample to extract, inclusive.
                            Samples indexed starting from 0.
  -v [ --split ] arg        How many samples per channel to put into
                            an ATF
                            before automatically spliting the file.
  -x [ --eat_samples ] arg  Reduces the original sample rate by this
                            multiple. (must be >= 1)
```