TDT v92 Release Notes

Major Changes and Improvements

New Gizmos!

- **MRI Recording Processor** - MRI artifact rejection filters for cleaning continuous single unit and LFP signals during magnet switching or other large sources of artifacts (PDF link, What's New document for getting started)

New Hardware!

- **Support for the Subject Interface Module (SIM) –** SIM integrates new high-resolution stimulation with PZ5 analog and digital recording cards (System3 PDF link, Synapse PDF link)

- **Support for the Medusa4Z** - A new high-resolution four-channel preamp for low impedance recordings. Added support in BioSigRZ and in RPvdsEx device macros (System3 PDF link, BioSigRZ PDF link)

Gizmo Slides

- Access a user dialog in Synapse that provides an overview of what each gizmo does and the common connections they have (What's New document for getting started)

Legacy Circuits now support Gizmo Control Widgets and Storage Gizmos

- Add gizmoControl widgets and Storage Macros in Legacy circuits to control circuit parameter tags and see stored data in Synapse (What's New document for getting started)

Parameter Sequencer Custom Timer

- Added timer column to Parameter Sequencer to have explicit control and complete flexibility of when each presentation occurs (What's New document for getting started)

Save Individual Waveform Traces in BioSigRZ

- Added an option to store each individual waveform that makes up the average to a CSV file for each SGI presentation (BioSigRZ PDF link, What's New document for getting started)

Miscellaneous Improvements

- **EStim2**
  - Added API parameters for biphasic wave construction - T1, Td, T2, L2
  - EStim2 detects SIM voltage mode and changes units accordingly
- **Parameter Sequencer**
  - Faster pasting and more options in CSV table
  - Fixes to calculator and table
  - Can change sequencer headers from 'Seq-N' to custom identifier
- **Lab Rat** - Fake Brain 'Stim Sync' now working with external and gizmo strobe input
- **OpenBrowser** - Added clip min/max parameters for EDF exporting to improve resolution

- **OpenExplorer** – 'Auto Plot New Block' option in Control menu automatically selects new block when in Track mode
- **Fiber Photometry Gizmo – new defaults**:
  - Low pass changed from 3 Hz to 6 Hz
  - Clip Threshold changed from 3.5 V to 7 V
  - Light driver DC Offset changed from 80 mA to 20 mA
  - Allow user to set required sampling rate if higher sampling frequencies are needed
- **Runtime Recording Notes** – Epoc timestamps for note events now show up on Flow Plot
- **Revision Log** - User can mark experiment versions as 'stable' in revision log dialog. Useful if you are continually editing an experiment but want to revert to a known good state.
- **File Stim gizmo** – 'FileList' parameter added. This returns list of loaded file names when called through API. This list also gets saved in tin file of each recording block
- **Compiler Optimizer**
  - Now On by default in new installations
  - Increased 'Processing' slider limit when enabled
- **Keyboard shortcut** – can use F7 hot key to compile in Synapse (shift + F7 to revert)
- **Stim Gizmos** - Increased maximum values for several options in the parameter tables

Bug Fixes

- Fixed EStim2 pulse timing - there were two extra samples at the end for Td and T2
- IZ2H/IZ2MH voltage scale factor fixed
- Corpus clock inaccuracy fixed
- The extra low pass filter option 'Add DSP filter' to remove high frequency digital noise on digital banks might not have worked with mixed analog/digital PZ5 configurations or multiple logical amplifiers
- RPvdsEx components ArtReject, Counter, TSlope, and IZ2 emulator fixed in Corpus
- AudioStim/UltrasonicStim set phase to +/-180 degrees fixed
- Persistence changes in Standby mode is now saved to the database
- BioSigRP fix for reading broken awf and arf files
- Fixes for PO8e HAL integer streaming modes
- BioSigRZ crash after Advance/Repeat fixed
- Workbench TDevAcc networking protocol fixed
- Epoc Storage gizmo – fixed value change mode for integer inputs

What's New in Synapse 92?

MRI Recording Processor

What is the MRI Recording Processor?

The MRI Recording Processor is a new gizmo designed to clean up recorded neural signals in an MRI or anywhere else with well-defined stimulation artifacts.

The gizmo uses special filtering schemes to mitigate large artifacts that occur during magnet switching.

The filter can be triggered automatically when an artifact is detected or by an external logic signal that syncs to the MRI magnet switching.

This can be useful for fMRI studies, electrical stimulation experiments, and startle response suppression.

Configuring the Gizmo

The MRI Recording Processor has several configuration options for managing how the artifact is detects and gated, and for which type of filtered waveform is output for other downstream processes.

Options for triggering the artifact gate, filter centering, artifact detection timestamps, and working filter window are in **General**.

Configuration of filtered output signals are in **Single Units** or **LFP**. Each respective menu has filtering options commonly used for that signal type. Enabling Plotting does not save the data – signals must be output into a storage gizmo for saving.
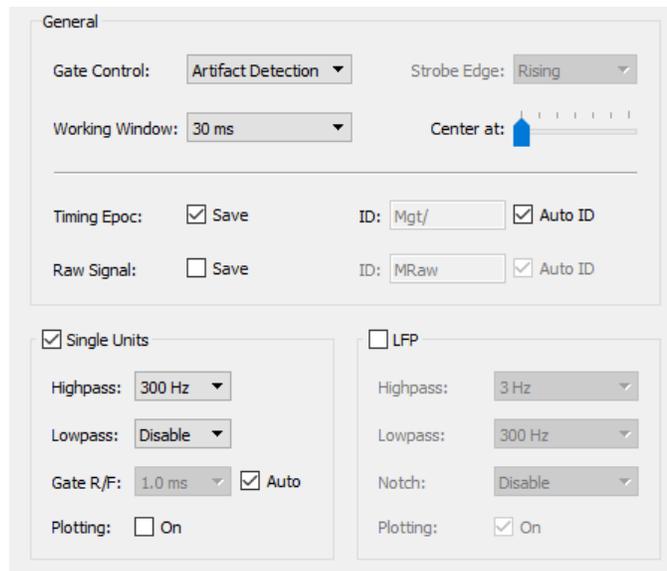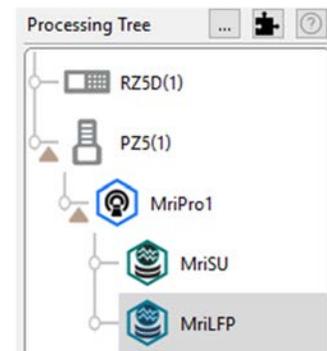

Example Run-Time Output

Setup

A typical MRI recording setup would look like this.

The PZ5 amplifier routes raw recording signals to the MRI gizmo for processing and filtering.
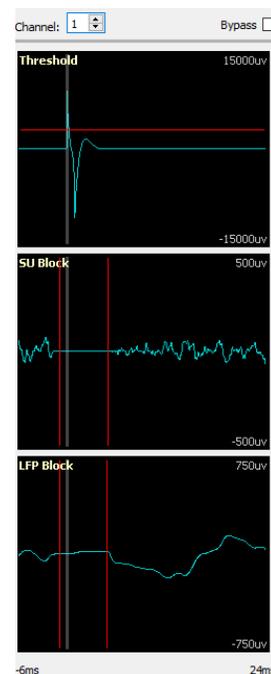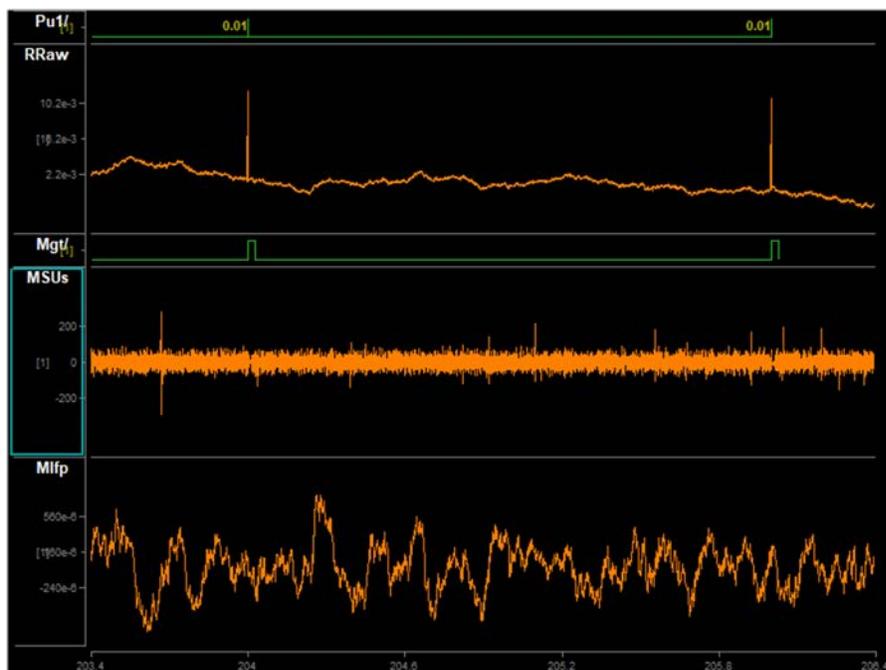
The outputs for Single Unit and LFP filter signals are saved in Stream Store Processors at the appropriate sampling rates.

If the MRI has a digital Sync line to mark magnet switching, then a bit input would also be configured in the RZ.

A common processing tree for an MRI experiment.

Run-Time Results

Example runtime output. The raw data trace RRaw has a large artifact that needs to be filtered. Detected artifacts are timestamped with an epoc event Mgt/. The processed and filtered output signals are the bottom traces MSUs and Mlfp.

Thresholding and filter widths for each signal type can be adjusted during runtime.

This release document is a supplement. For more information about MRI Recording Processor and Synapse see: Web Link here

What's New in Synapse 92?

Gizmo Slides

What are Gizmo Slides?

Gizmo Slides are a new user help tool in Synapse.

Gizmo Slides can be access directly within Synapse.

Each Gizmo Slide has specific information about a gizmo's function, inputs and outputs, and provides examples on how to use it and access important gizmo parameters in Run-Time or via the API.

How Can I Access Gizmo Slides?

Gizmo Slides can be accessed in two simple steps

1. Click on the '?' icon above the processing tree.

   This will generate a pop-up window for the gizmo slides.

2. Select a gizmo whose slides you wish to view.

   The Gizmo Slides pop-up will automatically update for the selected gizmo.

   This function can be accessed with Gizmos already in the Processing Tree. Available Gimzos to highlight are pruned based on connection compatibility with the selected item in the Processing Tree.

What's New in Synapse 92?

Custom Sequence Timing: Parameter Sequencer

What is the Custom Timer Feature?

Parameter Sequencer has a new *Custom* feature for strobing Sequence indices.

When using a Sequence to control stimulation, the *Timer* option in *Strobe Source* allows users to play out the parameters in a sequence at set intervals.

The new *Custom* option for the timer allows users to input desired time intervals between subsequent stimuli in milliseconds.

This can be useful for playing out stimuli at different durations or electrical stimuli at varying pulse frequencies + total pulse counts.
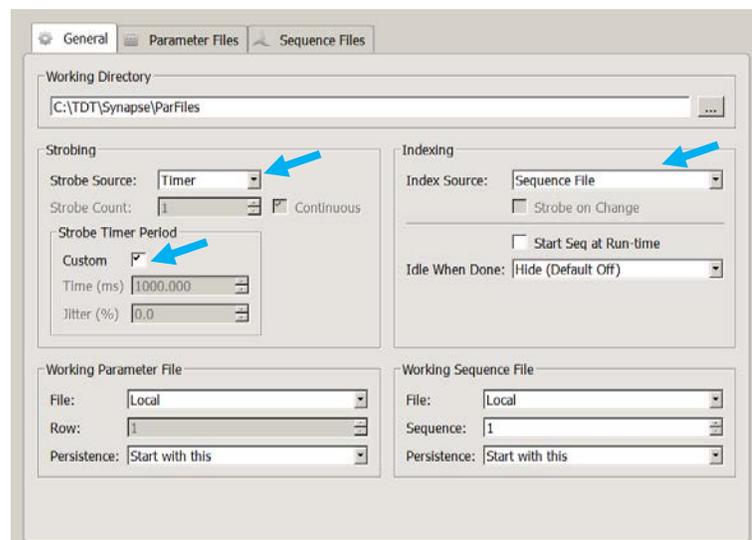
Enabling the Custom Timer

Setup of the custom timer is straightforward. It can be enabled with three settings in the **General** tab of the Parameter sequencer.

1. Set *Index Source: Indexing* to *Sequence File*.

    This will enable the *Strobe Timer Period* options in *Strober* when S*trobe Source: Timer* is selected.

2. Set *Strobe Source: Timer.*

3. Enable the *Custom* option in *Strobe Timer Period*.

Configuration for using Custom timing feature

With these settings enabled, a new column will appear in the **Sequence Files** tab.

Configuring the Customer Timer

Example Experiment

With the Custom timer feature enabled, we can configure a real experiment and observe the results.

This experiment will use the eStim Driver to present stimulation pulses of different periods + pulse counts at increasing time intervals.
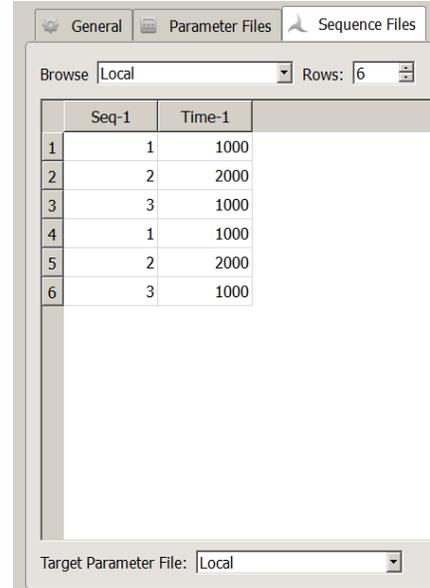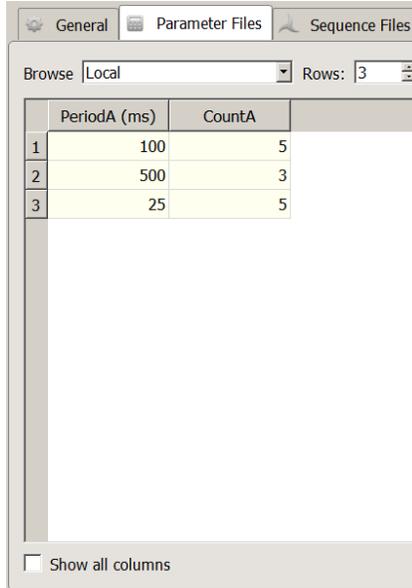
For a more in depth understanding of the Parameter Sequencer and how it is setup, please see the Signals & Parameters video on our Synapse video tutorials or see the Synapse Manual.

Setup

Processing Tree
RZ2(1)
ParSeq1
eStim1
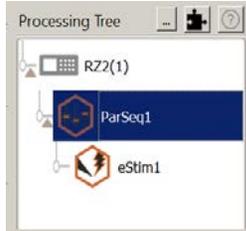
Electrical Stim Parameters:

	Name	Mode	Value
1	PeriodA (ms)	Param In	100.0
2	CountA	Param In	1
3	AmpA (uA)	Constant	10.0
4	DurA (ms)	Constant	10.00
5	DelayA (ms)	Constant	0.00

General | Parameter Files | Sequence Files

Browse Local ▾ Rows: 3

	PeriodA (ms)	CountA
1	100	5
2	500	3
3	25	5

☐ Show all columns

General | Parameter Files | Sequence Files

Browse Local ▾ Rows: 6

	Seq-1	Time-1
1	1	1000
2	2	2000
3	3	1000
4	1	1000
5	2	2000
6	3	1000

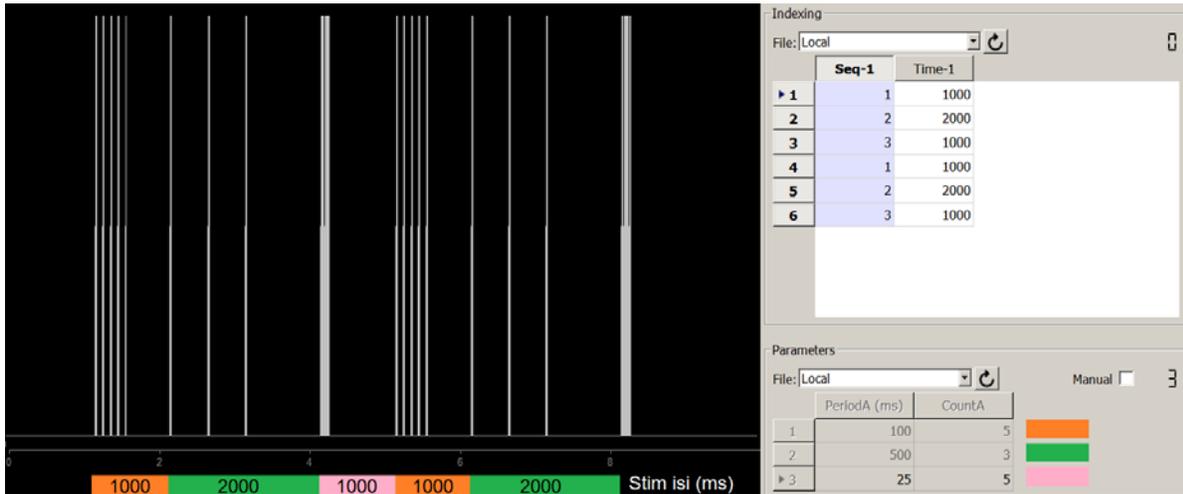Target Parameter File: Local ▾

Experiment tree + eStim Driver parameters	Parameter values to programmatically control with Sequencer	Sequence of parameters to play and specification of time intervals for successive stimuli

Run-Time Results

Indexing
File: Local ↻

	Seq-1	Time-1
▶ 1	1	1000
2	2	2000
3	3	1000
4	1	1000
5	2	2000
6	3	1000

Parameters
File: Local ↻   Manual ☐

	PeriodA (ms)	CountA	
1	100	5	🟧
2	500	3	🟩
▶ 3	25	5	🟪

Stim isi (ms): 1000 2000 1000 1000 2000

The Custom Timer controls the onset-to-onset time for stimuli.

This release document is a supplement. For more information about Parameter Sequencer and Synapse see: Web Link here

---

What's New in Synapse 92?

Legacy Mode: Widget Controls and Run-Time Plotting

What is Legacy Mode?

Legacy mode is a feature in Synapse that lets users load and run RPvdsEx circuits directly on a device. This is typically done when users have complex circuits they want to transfer into Synapse.

Legacy mode is like programming in OpenEx or ActiveX in that everything is done in the .rcx – there are no gizmos.

Before v92 Legacy circuits had no runtime controls other than through API access.

Legacy circuits now can include runtime widgets for dynamic user control.

Legacy stream stores can now be arranged on the flow plot setup.

Configuring Legacy Mode

Legacy Mode is configured for a select device in the Rig Editor.

Once a device is in Legacy Mode, it will appear in the Processing Tree with no connections.

The user can load a .rcx file in the 'File Name' field of the User Circuit dialog.
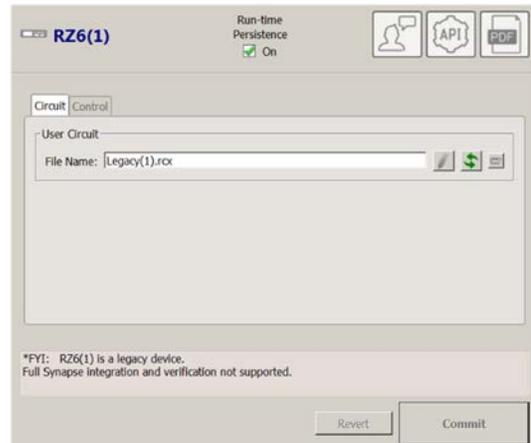
Setting Up RunTime Widgets

Widgets for runtime user control are setup in the user circuit that is loaded onto the Legacy device.

Tag names are formatted as ID_* and must have corresponding gizmoControls of the same name.

Widgets of various types (I/O boxes, sliders, knobs, buttons, switches) are declared in the gizmoControl alongside information about the control Tag.
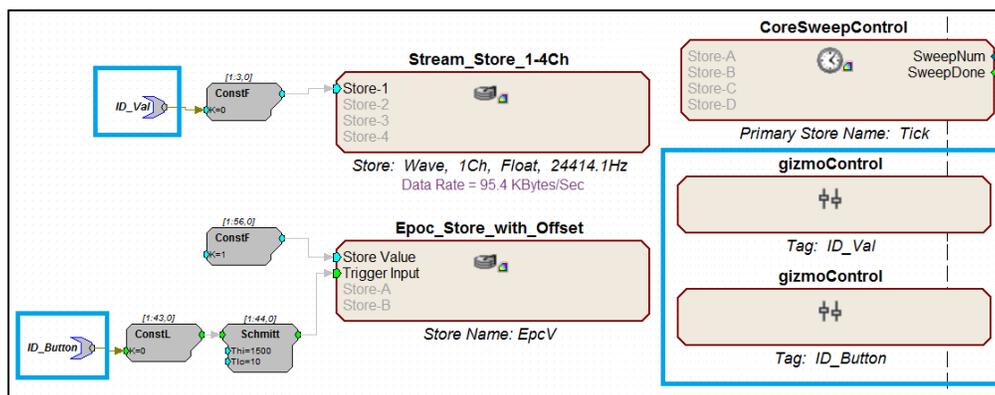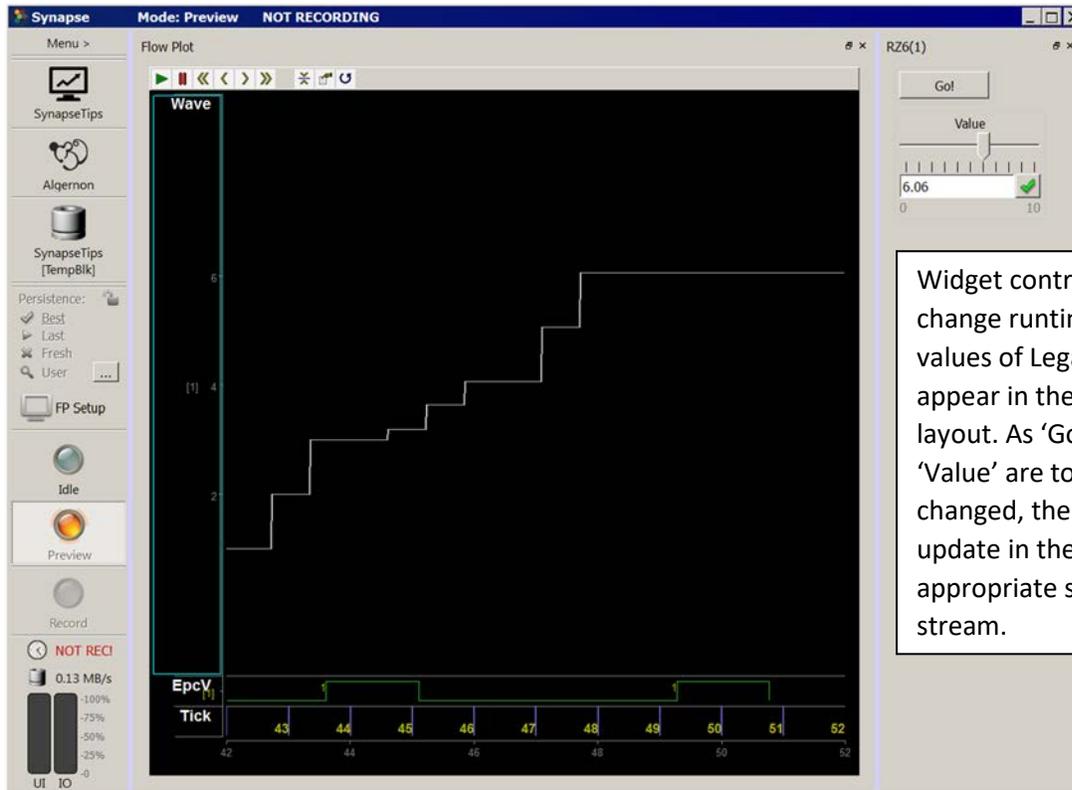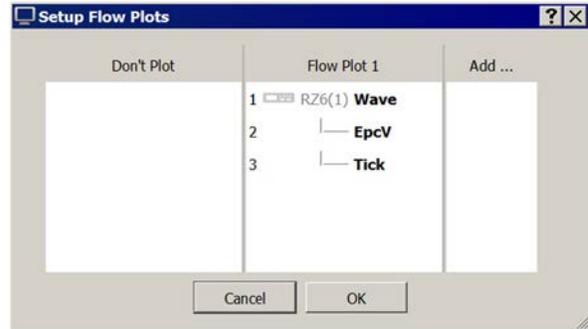
Run-Time View and Controls

Streams from storage macros can be arranged by the user in the FP Setup during runtime or the RT Layout during design time.

Any storage macro streams in the Legacy circuit appear in the Flow Plot.

Widgets for dynamic runtime tag control appear under the Legacy device's name in the runtime layout.

Widget controls to change runtime tag values of Legacy circuits appear in the runtime layout. As 'Go!' and 'Value' are toggled or changed, the values update in the appropriate storage stream.

'Wave' and 'EpcV' are storage streams setup in the Legacy circuit. These appear in the Flow Plot and can be spatially arranged like all other Synapse plots.

What's New in BioSigRZ 92?

Saving Individual Traces

What is the Save Individual Traces Feature?

BioSigRZ now allows users to save individual response traces for each stimulus presentation during a recording.

Individual traces are saved in addition to the averaged response waveform from an SGI.

Enabling Save Individual Traces

Setting up the saving of individual presentation responses is straightforward.

1. In Setup → Acquisition enable the 'Save Individual Traces' option in the Response Record File field.

2. The response files will get saved in the same folder as the arf files. Set this up during recording if 'Prompt for File Name' is enabled, or in the 'Name' files in Acquisition Setup.
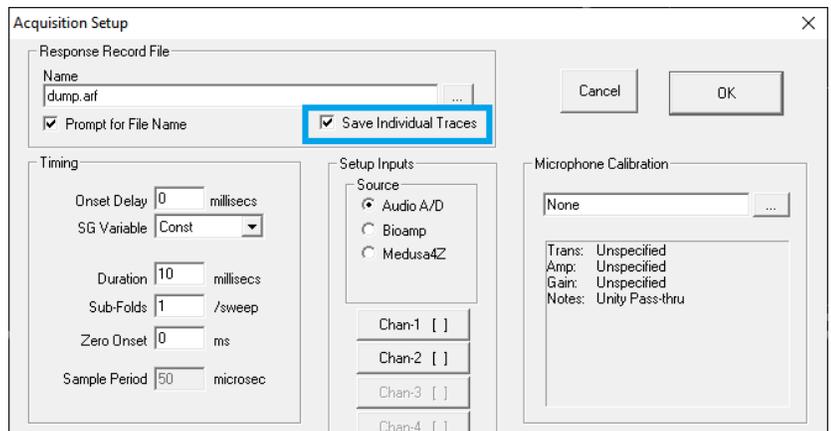
How is the Data Saved?

Individual traces are saved to csv files that can be accessed in Microsoft Excel, Matlab, or other programs.

The csv files are saved in the same folder as the .arf response file. There is one csv file per SGI.

The file format for each csv file is: {ARFNAME}-{GROUP}-{SGI}-{CHANNEL}-{NREPEAT}.csv

This release document is a supplement. For more information about BioSigRZ and saving individual traces see: Web Link here