SutterPatch® Software Release Notes

Version 3.0 (build 370); December 15, 2023

New Feature Highlights

- Data Navigator
    - Importing data is now available in both "live" and demo modes.
    - Retooled to improve performance, especially for large data sets.
    - Added filtering of the data tree using metadata values as selections.
    - Added metadata favorites to the metadata review window.
    - The signal names also contain the user specified signal labels.
    - Tree structure is preserved when hiding / unhiding the window.
    - Added action "Discard Marked Paradigms" when the selection is on the experiment node and "Enable Marks" is enabled.
    - Mark properties of paradigms, routines and signals nodes are preserved.
    - Mark properties no longer depend on the GUI state of a node.
    - Added "Set Sweeps marks by Equation" and "Set Sweep Marks by Value List".
    - Added "Copy Routine Name to Clipboard" to handle international keyboard characters that have slight differences when using "Set Signal Marks by Name Match".
    - Added arrow key icons for navigating through the data tree nodes, shift click moves by node.
    - Added importing multiple files from a folder ("batch import").
    - Added sweep selector to review windows (Routine and Paradigm).
    - Added "copy to.." control to Metadata and Image Review.
    - Added controls to invert the selected image (vertically and horizontally) in Image Review.
    - Added "Extract Sweep to Template Pool in addition to using the marquee in the scope window.
- Paradigm Editor
    - Enhanced Paradigm step "Front Window" to include options to show/hide controls of the dPatch/IPA control panels and to show/hide the dPatch
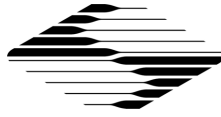
monitors.

- Added settings icon with options to write paradigm steps to the notebook and settings for writing to the Metadata.

- Added "copy to.." control.

- Analysis to Notebook step uses the data export and scope title content preferences for formatting.

- Preferences

  - Added option "Start index" (0 or 1) to auto File Naming.

  - Added option "A/C Line Frequency" to consolidate this selection from all the various windows.

  - Added option to "Pre-allocate input and output buffers" to improve load time for routine execution.

  - Added option "Title content" in Scope Window to allow showing experiment name (or HDF5 filename), paradigm name and routine name.

  - Added option "HDF5 Format" to Data Export.

  - Added new options for "File Control" to provide inter-application communication via text files for reading and writing to SutterPatch. All Paradigm Editor commands, other than flow control, are supported.

- Scope Window

  - Timer value at start of selected sweep is shown in the scope depending on "Show Timer" preference setting.

  - Added Power Spectrum (FFT) Plot.

  - Added "Scan Signal Data" tool for scanning a specified signal, wave index, time and amplitude are displayed during the scan.

  - "Show Previous / Next" series retains the active sweeps display mode.

  - Added separate button for continuous auto scale.

  - Modified continuous auto scale to update as needed to keep the signal in view, ~ 20% change from previous update.

- Single channel analysis

  - Added "skip" option to allow stepping over a stretch of data.

  - Added "Show results in graphs" option to define whether the most relevant fitting results are shown in the graph.

  - Added "Print Fit-Results to History" option to write extensive fit results to the history window.
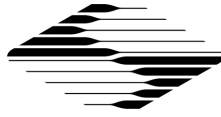
- Synaptic Event analysis
  - Added "Show Results Graph" to allow viewing results without having to open a layout.
  - Added "Show Results Table" to view analysis results without having to open a layout.
  - "Save Results" has been modified to add the results to the Analysis Editor as well creating a layout page.
  - "Threshold Analysis" has been renamed to "Distribution Analysis" as the function has been reworked to allow any combination of results to be plotted.
  - Added cursor info to "Distribution Analysis" window to scan data.
  - Selection an event in the "Distribution Analysis" graph will update the event in the event list and in the sweep preview.
- Action Potential analysis
  - Added "Show Results Graph" to allow viewing results without having to open a layout.
  - Added "Show Results Table" to view analysis results without having to open a layout.
  - "Save Results" has been modified to add the results to the Analysis Editor as well creating a layout page.
- Acquisition Control
  - Start Paradigm and Start Routine control remain active during Membrane Test and Free-run allowing paradigms and routines to be started while automatically terminating ongoing acquisition.
  - Stop Acquisition control will now terminate all active acquisition, even when Stop of End of Sweep is enabled.
- SutterPatch Notebook
  - Retooled from standard text Notebook to formatted.
  - Added graphic object support.
  - Added print and save options (TXT, HTML or RTF).
- Template Editor
  - Added controls for resizing template waves.
- Dynamic Clamp Editor
  - Improved output for Copy to.. functions.

- Command Signal to AuxOut functionality can now be handled via the live CommandIn signal, eliminating the need for external connections.

- Routine Editor
    - Start-to-Start time has been expanded to include using an equation, a value list, value + increment and routine variables, allowing flexible start-to-start times from sweep to sweep.
    - Leak Subtraction has been expanded to include both P/N and Background Subtraction.
    - Effective sampling rate / interval is shown for all input channels based on bandwidth and Nyquist settings (dPatch). For IPA same as the sampling rate specified in Routine Settings.
- dPatch
    - Dynamic Hold tau range list retooled to eliminate options that could cause oscillations.
    - Added 2D dragger control to Rs Correction - Prediction.
    - Rs Correction and Prediction controls are renamed based on Feedback mode when combined correction and prediction is enabled.
    - Added the line-frequency reduction type "subtract background" to Membrane Test for improved performance, especially for test pulse durations less than 50 ms.
    - Added the ability to acquire the "live" command signals in both Membrane test and Free-run.
    - Demo data: option to add line interference for testing LFR and background subtraction as well as to simulate "true" conditions.
    - Demo data: emulation of bridge balance correction.
    - Demo data: emulation of command signals, including the effects of Dynamic Holding.
    - Added "Configure AuxOUT" for the Aux-OUT controls in the I/O tab to provide scaling and naming when interfacing with external devices, i.e temperature controller.
    - Added Lock-in frequencies of 100 and 200 Hz in the Membrane Test.
    - Added the option to open the Power Spectrum window when RMS noise Pulse type is used.
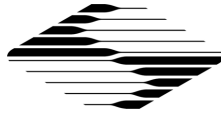
- Failure of any of the auto function is now indicated with a small red "E" in the respective controls.

- Added option to allow Membrane Test Pulse amplitudes of 0 mV and 0 pA.

- Improved performance of Membrane Test Repetition Interval with "Shortest Possible".

- Added user editable limits for amplifier auto functions (Offset, Electrode Compensation, Cell Compensation and Rs Correction).

- Added "copy to.." control to amplifier control panel.

- Added showing the Fit Trace in Membrane Test.

- Added "copy to.." control in membrane Test for writing results to either the Notebook or Clipboard.

- Firmware version 101, retooled USB packet communication for improved performance.

IPA / DIPA

- Improved performance of Membrane Test Repetition Interval with "Shortest Possible".

- Current and Voltage monitors update during long continuous (Gap free) acquisition.

- Miscellaneous

  - Synaptic Event and Action Potential Analysis windows retooled.

  - Renamed menu entries "New HDF5 File" and "Update HDF5 File" to "New SutterPatch HDF5 File" and "Update SutterPatch HDF5 File" to match the menu entry "Open SutterPatch HDF5 File". The original naming could be mistaken for an HDF5 experiment file.

  - The controls "Copy to Clipboard" and "Copy to Layout" have been replaced by a single popup control with these entries:
    To Notebook (as text)
    To Clipboard (as text)
    To Clipboard (as graph)
    To Layout (as graph)

  - Added "Sweep Time" to the special identifiers. The list now includes:
    Time (present date-time, s)
    Timer (timer time, s)
    ParadigmTime (time at start of paradigm, s)
    RoutineTime (time at start of routine, s)
    SweepTime (time relative to routine start, s)
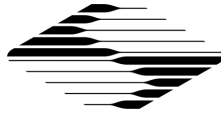
- Added SutterPatch Help Topics submenu to the Igor Pro Help menu to provide quick access to help topics.
- Added SutterPatch Online Manual entry to the Igor Pro Help menu to provide quick access to SutterPatch manuals.
- Added button to toggle between show and hide "Cursor Info", in the Scope, real-time analysis and Analysis Editor windows. This control provides easy access to the Igor Pro "cursor info" tool which can be used to place cursor(s) on any trace, get readouts of the x- and y-values and provide cursor regions for Quick Fit. The readout values are written to the notebook.
- Added USB support to SutterXOP to control Lambda 721 Wavelength Switcher.

Bug Fix Highlights

- Stored Free-run acquisition would not create an acquisition routine copy if acquisition was terminated by closing the Scope Window.
- Dynamic Clamp setting copy was not properly stored in the HDF5 file.
- Notebook properly stored when using PXP experiment files.
- Virtual signals with math type Bessel Filter and Integrate did not properly handle P/N leak subtracted traces, main and leak pulses are now filtered individually.
- Removed Nan data points at the end of dPatch CommandIn and Auxiliary channels sweeps.
- Export type "Copy Data Waves to Igor Folder" exporting both 2D and 1D waves, and not user selection.
- G-Holding controls in the dPatch control panel were not disabling for active Hodgkin-Huxley and Markov conductance models.
- Updating the configuration pool for shortcuts, templates, solutions, camera, and dynamic clamp settings.
- IPA control panel I/O tab controls properly resized and updated.
- Improved IPA display compression.
- Partial sweeps selection with IPA amplifiers was not properly saving the partial sweep.
- Pause / resume for routine acquisition would fail, both demo and live mode.
- Certain conditions would cause the middle slider on the Triple slider controls, used in both IPA and dPatch control panels, to not update correctly.

- dPatch free-run acquisition the "Acquired: XX" value was not updated for the last acquired sweep.

- Certain continuous (gap-free) conditions with the dPatch could cause the last sweep to not fully complete.

- Export to Layout for membrane-test and free-run graphs were updating with the last acquired data trace. All graphs display the data set that was active during the export.

- Single channel analysis: incorrect levels would occur when the transition amplitude could not be estimated due to a short event duration.

- Reading metadata parameters (via identifiers in equations) during reanalysis was limited to the last change before the routine was acquired. Now the appropriate tag is retrieved.

- Metadata prompt window will no longer block the controls when a routine or paradigm metadata step is called from a planned paradigm.

- Metadata prompt will now terminate properly when canceled.

- HDF5 file write errors would occur when saving an acquired routine copy that included templates that were larger than 1 million points.

- ABF and PatchMaster data import would create acquired routine copies that required additional information. Additional prompts have been added for user interaction.

- Certain IPA routines created with SutterPatch version 2.2 and earlier would use the default input sampling interval when converted to a newer Routine structure.

- Single Channel Analysis Amplitude Distribution Plot CurveFit error.

Known Limitations

- This release requires Igor Pro 9.0 and above.

- Internal routine structure has changed which requires that routines be converted. Once converted they cannot be opened by older SutterPatch versions. You will be prompted to make a duplicate copy before the routine file is converted.

- For Windows 10 / 11: setting a display scaling factor greater than 100 % may cause strange "creeping" window behavior when the Set Preference option "Automatic window repositing" is enabled. A single click on the windows title bar will stop the creeping.

- Windows 10/11: windows updates tend to enable power management settings to go to "sleep" to save power. For USB internal Hubs this can lead to USB communication errors. To check this setting: start Windows Device Manager,

expand Universal Serial Bus controllers, select each USB Hub device, right click Properties, Power management tab, uncheck Allow the computer to turn off this device to save power. Here is a link that shows how to disable selective USB suspend: https://www.top-password.com/blog/set-windows-to-power-on-off-usb-devices-in-sleep-mode/ in greater detail.

- MacOS: when the system is idle (no keyboard or mouse activity) for an extended period SutterPatch may become unresponsive (spinning beach ball), SutterPatch / Igor has NOT crashed, the system will recover. The time for recovery is somehow related to the idle time, the longer the idle time, the longer it takes to recover. Hiding Igor during these idle times will minimize this issue.

- The time required to save data for PXP experiment files increases based on the file size since the entire data set is rewritten. For large data sets using the option "Save separate HDF5 file" will drastically improve the saving performance since only the updated data is written.

Version 2.3.1 (build 320); February 28, 2023

Bug Fix Highlights

- Fixed IPA control panel resizing errors.
- Fixed dPatch control panel non-functional Dynamic Hold control
- Fixed missing icons

Version 2.3 (build 309); October 25, 2022

New Feature Highlights

- Analysis Editor
  - Added math options:
    - Compute average of respective sweeps in a cycle.
    - Compute average of all sweeps in a cycle.
    - Compute average of selected table entries.
    - Compute sum of selected table entries.
  - Table formatting now uses the preference - Use Scientific/Engineering format.

- Data Navigator
    - Added link and right click action to open Paradigm review window.
    - Added ABF import (version 1.85 and 2).
    - Added importing images, previewing images and adding / modifying notes associated with these images.
    - The data navigator window now preserves its last state.
    - Speed improvements for importing PatchMaster data files. Added progress bar to show status.
    - Added user editable paradigm description.
    - Added additional "Mark" options, including Set Sweep Mark by Equation, i.e., mark odd / even sweeps.
- Dashboard
    - "Small" size now uses a floating window, with configurable icon selections.
- Metadata
    - Solution and chemical stimulus parameter now written.
- Paradigm Editor
    - Planned paradigm steps are now stored in the data file in the same manner as routine copies.
    - Added planned paradigm step copy review window for viewing and copying.
    - Added paradigm steps: "Wait for Trigger", "Write to Notebook", "Dynamic Clamp Model" and "Start New Paradigm Data".
    - Paradigm step editor: added "select all" button.
    - Added the "IF[..]" special identifier to the virtual trace equations.
    - Added Execute Routine options "Membrane Test" and "Free-Run" with their respective parameter settings.
    - Added several new settings to "Amplifier" step command for both IPA and dPatch amplifier series.
- Preferences
    - Added option "Use Scientific/Engineering format" to define the data formatting for data export, the notebook, analysis editor tables and copy to clipboard.
    - Added option "Show time in Acquisition Control window".
    - Added option to show preferences settings on startup.
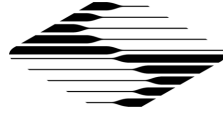   - Added option "Copy to Igor folder".

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- Added option "Write tags to notebook".

- Added options to enable "_" separator in file names.

- Added options to save data waves as either single or double precision.

- Added Compact HDF5 file during shutdown process.

- Added Copy Data Waves to Igor Folder to Data Export for exporting to a user specified folder for use by custom procedures and functions.

- Scope Window

  - Added Color Plot to visualize data.

  - Retooled slider controls for improved performance.

- Single channel analysis

  - Added control "Channels open upwards/ downwards" to set proper amplitude limits.

  - Added cityscape mode to amplitude histograms.

- Acquisition Control

  - Non-continuous routine acquisition can be "Paused" and "Resumed".

  - Stop at end of sweep" option state is preserved.

  - Added Select Routine options "Membrane Test" and "Free-Run"

- SutterPatch Notebook

  - Dedicated notebook that is part of SutterPatch data set.

  - Variety of entries can be automatically added to the notebook including:

    - Real time measurements and graph values.

    - Cursor coordinates from acquisition-, reanalysis-, review-scope, analysis window, analysis editor, template editor.

    - Graphs, tables, and any other object pasted from the clipboard.

    - User notes and paradigm results.

- Routine Editor

  - Expanded the maximal number of characters in the equations for segment amplitude and duration from 80 to 400 characters.

  - Value Lists have been reworked to have the same round-robin behavior as templates, to minimize the need to specify individual values for each sweep.

  - All comma separated equations are now checked for syntax errors.

  - New analysis functions:

- Amplitude at absolute peak
- Amplitude at max
- Amplitude at min
- Amplitude at threshold
- AP duration 20% - 100%
- Added options "time relative to sweep" and "time relative to region" to:
  - Time to absolute peak
  - Time to max
  - Time to min
  - Time to threshold
- Added sorting of routine pool in either ascending or descending order.
- Added option to store / not store the acquired series.
- Added option to "Save partial sweep".
- For dPatch added option to acquire the "Live" command signal.
- For dPatch added Bandwidth settings for command signals, both live and template copies, and for AuxIN channels.
- For the dPatch added controls for the new "In Sweep Actions" and for "Preloading the stimulus".
- For dPatch added segment waveform option "Constant" which will repeat the specified amplitude value without having to download x number of output points to the dPatch.
- Added options to select Input channel Recording Mode for situations when the parent channel is not physically connected to an amplifier channel.
- Added "To Notebook" options to Real-time measurement for writing individual results to the SutterPatch Notebook.
- Added and reordered acquisition information in the Preview section.
- Added option to scale a template within a routine.
- Added option to update an existing template in the routine from the Template Editor without having to first delete it.
- dPatch
  - Firmware version 93:
    - Command waveform signals can now be acquired.
    - Gap junction dynamic clamp mode for Hodgkin Huxley models.

- Command IN and Auxiliary input channels are digitally filtered based on Bandwidth and Nyquist factor settings.
- In Sweep actions for changing Recording Mode, Dynamic Holding and Holding within a sweep based on threshold or fixed time.
- Added command waveform preloading to minimize delays in starting Routine acquisition.
- Voltage and Current monitors on the control panel are now both acquired, which consider Dynamic Holding changes performed by the dPatch firmware.
- Timeout and maximum iterations used by the various auto functions can now be defined by the user.
- Added visual warning and automatic disabling of CC recording mode when an overload condition exists for more than 10 minutes when the amplifier is idle.
- IPA / DIPA
    - Added Liquid Junction Potential setting in IPA Control Panel.
    - Added Auto Bridge function.
- Miscellaneous
    - Added minimum slope to Action Potential Analysis.
    - Added multiple ADP level options (20 – 100%) in Action Potential Analysis.
    - SutterPatch functions are now tolerant with external functions that set a different home folder.
    - Camera control – adding notes to images.
    - Analysis, Dynamic Clamp, Equation, Paradigm and Template Editors now have the same Pool and Files options as the Routine Editor.

Bug Fix Highlights

- Tags within a Series are now correctly handled when Virtual Signals are added, deleted, or updated.
- Metadata
    - Recording holding values (potential, current, AuxOUTs)
        - All holding values are written on Routine start, even if they are not defined or acquired in the Routine.
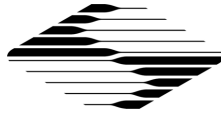   - Editing of holding values disabled.

- Entries for the holding potential or current now assigned to the correct headstage.
  - Paradigm or Routine sequence numbers could be reset if a Metadata prompt was canceled.
  - Metadata tags in the reanalysis scope were not properly displayed in concatenated view.
- Storing to HDF5 data displayed an error, however data were properly stored, when the routine had more than one sweep which was stopped during the acquisition of the first sweep with the option "Stop at end of sweep" enabled.
- Properly displaying all sweeps when reenabling persistence display during routine acquisition.
- X-axis range is now properly calculated when sweep time is displayed as minutes and hours.
- Membrane Test amplitude in CC-mode was incorrect when changing feedback range in the dPatch control panel.
- Eliminated border effects when filtering data of virtual traces.
- Resizing the lowest pane in the Analysis window could cause an Igor crash.
- PatchMaster import for signals that had variable sweep lengths would fail. P/N pulses are now added to main trace to match SutterPatch behavior.
- Setting dPatch Digital Outputs 11 to 16 would fail in some functions.
- Y-scaling was not properly defined for signals at scope pane 3 or higher when y-scaling preference was set to "Use Last Y Scale".
- Slider controls failed to work properly due to a bug in macOS Monterey.
- dPatch Routine acquisition using filter bandwidths of 100, 300 and 500 Hz failed.
- Analysis Editor tables had empty columns which resulted in export errors.

Known Limitations

- Internal routine structure has changed which requires that routines be converted. Once converted they cannot be opened by older SutterPatch versions. You will be prompted to make a duplicate copy before the routine file is converted.
- For Windows 10 / 11: setting a display scaling factor greater than 100 % may cause strange "creeping" window behavior when the Set Preference option "Automatic window repositing" is enabled. A single click on the windows title bar will stop the creeping.
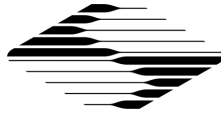
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Version 2.2 (build 284); December 21, 2021

New Feature Highlights

- Igor Pro 9 compatibility
  - Installers for both version 8 and 9 available.
  - Igor Pro 9 is more responsive when large data sets are acquired.
- Analysis Editor
  - Added new functions Import and Export Table as text.
  - Added column labels to analysis waves.
  - The Analysis editor table will show the column labels if the analysis wave was created with column labels.
  - The "Overlay" button is now active also when only one analysis wave is selected. All graphs related to that wave are overlaid.
- Data Navigator
  - Added Copy to Clipboard button to Metadata Review.
  - Added the routine actions "Concatenate Sweeps" and "Restore concatenated Sweeps".
  - ATF export uses the text formatting as defined by Preferences > Data Export.

- Added Import options
  - HDF5 files
  - HEKA Patchmaster data files (connection to a Sutter amplifier system required)
- HDF5 Files
  - Added file menu option "Open SutterPatch HDF5 File" to open a new HDF5 data file without performing a "New Experiment" operation.
  - The file menu option "New HDF5 File" stores data in a separate HDF5 file without creating an additional pxp file.
- Metadata
  - Stimulus holding values for all connected headstages are now written, irrespectively of whether or not a signal is acquired. That also applies to storing data from Free Run (available on dPatch only).
  - Auxiliary Out holding values are written for all physically existing channels.
- Paradigm Editor
  - Paradigms can now be edited while acquisition is running.
  - Added button "Edit paradigm..." to the paradigm step editor of the "Chain" step.
  - "Amplifier" Step: Added the option "AutoBridgeAmpl".
- Preferences
  - Scope Window: "Include zero when autoscaling" now applies globally.
  - Data Export > Copy to Clipboard: Added option "Use zero" as substitute for invalid values.
  - Files & Naming: Added file size warning.
- Scope Window
  - Simplified Continuous Autoscale behavior: Now remembers On/Off.
  - Context / Right-click Menu: Added marquee options, depending on which graphs are visible:
    - "Set Time Range of Analysis"
    - "Set Time Range of Amplitude Histogram"
    - "Set Time Range of Parametric Plot"
    - "Set Y-Scale..."
- Single channel analysis

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- Marquee is now accessible when holding the shift-key down.
- Marquee contains the option "Set Analysis Time Range"
- Routine Editor
  - Added amplitude preference for Waveform type MembraneTest instead of using fixed amplitude of -5 mV.
  - Added Realtime analysis function AP Duration
  - Added Ramp Increment to Sine Wave Segments, including Lock-In
  - Added controls for Fast Mode Switching Option (dPatch only) including setting control to enable / disable this option
- Virtual Signals
  - Added sweep start and end range to Math Type "Sweep Average"
  - Added Limit to Marked Sweeps setting for processing during reanalysis to Math Types Baseline Subtract, Cycle Average, Equation, Sweep Average and Sweep Subtract
- dPatch
  - Added Fast Recording Mode Switching during a sweep triggered by either a fixed time (location) or based on a threshold crossing
  - Added Stop at End of Sweep setting to Free Run acquisition
  - Added option to synchronously stimulate both headstages when performing an auto routine.
  - Recording mode can now be switched while acquiring by holding the shift key when clicking on the VC or CC button.
  - Settings menu of control panel:
    - Added option "Show Auto Bridge Balance Amplitude".
    - Added option "Show Control StimBoth".
- IPA / dIPA
  - Added automatic bridge balance to the IPA control panel.
- Miscellaneous
  - Added blocking Igor from quitting when an acquisition or a paradigm is running.
  - Added the "X" argument in Equation Pool and Paradigm equations.

Bug Fix Highlights

- Fixed issue with unexpected acquisition errors when holding was changed during routine acquisition. This issue only affected IPA series amplifier systems.

- Fixed issue with routine acquisition not stopping when Stop at End of Sweep was enabled

- Fixed auxiliary output channel scaling in Routine Editor when the Unit was not V or A

- Fixed issue with Dendrite recording mode settings when editing a headstage configuration

- Fixed Paradigm settings for executing a Membrane Test

- Fixed Metadata parameters associated with Virtual Signals > Sweep Average

- Fixed showing the tags in the review scope.

- Fixed loading the HDF5 file when the pxp file is not in the default path.

- Metadata associated with output signals are now also written if no waveform is applied during acquisition.

Version 2.1.1 (build 260); Apr 30, 2021

New Feature Highlights

- Analysis Editor
    - Row dimension labels of an analysis wave now reflect source Routine and Sweep number, e.g. "R1_IV_Swp5".
    - Displayed tables show row dim labels.
- Data Navigator
    - "Full" preview
    - Info pane shows Paradigm Description where applicable
    - Added mark/unmark all paradigms, routines and signals to right-click menu
    - Added action "Average Marked Sweeps" on paradigm level when marks are enabled.
    - Added "Analyze all Routines" to right-click menu
    - Metadata review
        - New option: "absolute / relative" event time
        - Selection of grouping (by event / by parameter), time base (absolute / relative) and expanded / compressed state are now persistent.
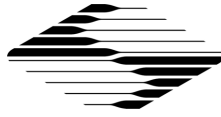
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- Paradigm Editor
  - Added paradigm step "Start New Paradigm Data"
  - Implemented multi-selection in paradigm step listbox.
  - Implemented copy and paste of paradigm steps.
- Preferences
  - Added Feedback notice display duration
  - Combined definition of table export format from Analysis Editor and Single-channel Module in Set Preferences > Data Export
  - Added options for Data Export > Igor Binary
- Scope Window
  - Added "copy to clipboard" and "add to layout" to analysis sub-window
  - Signal amplitude histogram in real-time or reanalysis
  - Acquisition Scope
    - Turning on persistence during acquisition now also shows past sweeps.
  - Reanalysis Scope
    - Single / multiple review scope windows
    - Previous / Next Routine button
    - Added "Show all sweeps" and "Show marked sweeps" to marks settings pop-down menu.
- Virtual Signals
  - Added new Math Type "Cycle Average"
  - Added Sampling Rate selection to Math Type "Stimulus" for dPatch acquired signals to reduce signal data points
- Analysis Modules
  - Added ability to plot individual events in Synaptic Event and Action Potential modules
- dPatch
  - Added Configure AuxIO monitor ("slow reads"), optionally stored to Metadata
  - "Synchronous" stimulation (i.e. simultaneous stimulation of both probes) in auto-compensation functions (electrode, whole-cell and R-series).
  - Improved the auto electrode compensation, making it less sensitive to pipette offset setting

- Added Auto Bridge Compensation
- Dynamic Clamp
  - Added capability to monitor Dynamic Clamp generated stimulus on an Auxiliary Output channel
  - Added Conductance Streams to Hodgkin-Huxley models
  - Added Conductance "Holding" for conductance streams
- dPatch control panel: Implemented transforming AuxIN to user specifications
- Dendrite
  - Added Gain, Bandwidth, Recording Mode and Capacitance telegraphing
  - For non-telegraphing operation added Gain and Bandwidth selection based on connected amplifier type (AxoPatch-1D, Multiclamp 700, AxoPatch 200A/200B, Dagan 3900, Heka EPC800, Warner PC-505 and OC-725)
  - Added Aux I/O parameter monitoring with storing to Metadata
  - Additional metadata parameters stored.
- Miscellaneous
  - Documentation: Ongoing updates to all operation manuals and the online help
  - Preparation for Igor Pro 9 compatibility

Bug Fix Highlights

- Sweep Marks:
  - Analysis now correctly limited to only the marked sweeps
  - Only results from marked sweeps included in Analysis Wave
- Unmarking sweeps in the Reanalysis Scope could lead to unexpected behavior. Fixed.
- Paradigm step Amplifier > VGain no longer causes an error.
- Sweep cycle selection for Continuous Sweeps mode now correctly behaves with IPA family amplifier systems
- Measurement / Graph editing during reanalysis properly stores changes
- Dynamic Clamp channel parameters are now properly updated in the Edit Model Parameters window when switching Conductance Pool entries
- Adding / deleting output channels to routines now properly preserves any active templates stored in the routine

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- Data waves are now properly truncated after aborting an acquisition with the dPatch storing to an HDF5 file.
- Improved multithreading code to address time shifts reported by some users during long stimulus outputs for the IPA family of amplifier systems

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Version 2.1.0 (build 247); Jan 8, 2021

New Feature Highlights

- Acquisition
    - Event-triggered acquisition mode
    - Marking of sweeps
- Acquisition Control Panel
    - New window representing the experimental workflow
    - Presents all controls for Paradigm and Routine execution
    - Allows starting a new Auto-triggered Paradigm
- Analysis
    - Added fixed scaling for analysis graphs
    - Marking of sweeps
    - Implemented showing (and analyzing) only the marked sweeps
    - New Marquee menu option in the Reanalysis Scope: "Extract to Graph"
    - Parametric plots
- Application Modules
    - Action Potential Analysis, Single-channel Analysis and Synaptic Event Analysis are now accessible via:
        - Measurements popup in the Reanalysis Scope
        - Action list in the Data Navigator
    - Action Potential Analysis
        - Added ability to analyze only selected (marked) sweeps
        - Added absolute time and inter-event interval to the results
    - Synaptic Event Analysis
        - Added ability to add undetected events
        - Added ability to remove clusters of events from Threshold Analysis plot
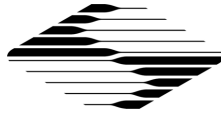
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- Added ability to analyze only selected (marked) sweeps
- Dashboard
  - The "New Experiment" button changes to "New HDF5 File" when the HDF5 file option is active.
- Data Navigator
  - Converting between Packed Experiment (.pxp) and HDF5 files
  - Startup process (open experiment) is now much faster until the progress bar shows
  - Startup process (open experiment) is now much faster when "single sweep" is active
  - Storing to and loading from HDF5 file now shows a progress bar
  - Checkboxes for multi-selection and marking
  - Expanded list of actions for the different node levels
  - Supports the sweep marks
  - Selecting the top-level entry (Experiment node) shows Experiment Info
- Dendrite
  - Added more metadata parameters for better instrument support
- dPatch
  - Subtraction of integrator reset transients
  - Support for firmware version 64
- Dynamic Clamp
  - Added ability to enter either alpha/beta or tau/infinity equations for Hodgkin-Huxley style models
  - Added ability to copy parameters from any headstage in the Dynamic Clamp Model pool
  - Added progress bar when downloading model parameters
- Paradigm Editor
  - Added "Set Mark" to paradigm steps.
- Preferences
  - Removed the preferences "Signals Display" and "Sweeps Display". These functions are replaced by the sweep marks
- Real Time Measurements
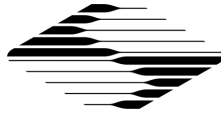 - Updated to match Routine Editor changes

- Added additional menu selection to Measurement control for selecting real time measurement settings without the need to load the Measurement Window
- Measurement menu selections are now stored in preferences
- Added selection to overwrite analysis measurement settings from either the acquisition copy or from settings stored in a file

- Routine Editor
  - Added support for Event-triggered acquisition
  - Added virtual signal Downsample for reducing the sampling rate in a signal
  - Modified virtual signal Stimulus to allow the selection of any output signal
  - Added control to display Sampling Interval for Input signals
  - For dPatch added control for keeping filter setting at series end
  - Added MembraneTest waveform type to generate a membrane test pulse segment used by the real time analysis functions
  - Added segment selection button in Waveform Editor to improve the selection process
  - Added individual settings for handling the Sweep End output settings during Inter-Sweep and Routine End
  - Added Unit popup menu for Input and Output channels with common units
  - Added MT Series Resistance, MT Membrane Resistance and MT Membrane Capacitance measurements to compute Membrane Test parameters during sweep acquisition
  - Added X and Y axis ranges to Real Time Measurement Graphs
  - Added signal selection for displaying cursor regions for segment-based measurements
  - Removed Cursors Relative to Full trace and added Reset Times Button to emulate the same behavior with Cursors Relative to Sweep Time
  - For dPatch added saving Dynamic Clamp parameters with Routine copy if Dynamic Clamp is active during a routine execution
  - Routine copies stored with the data have two entries, the original acquisition copy, which is never modified, and a last used analysis copy modified by changes to real time measurements or creation / deletion of virtual signals
  - Added date code to Routine structure

- Automatic Routine parameter checking has been enhanced to handle all routine parameters including cleanup / removal of unneeded values

- Added checking and warnings for output signals that are out of range

- Improved support of changing Routine variables from a Paradigm during a For Each Sweep event – all remaining output waves are automatically updated, Routine copy is updated and tagged when the change occurred

- Added Right click menu to Routine Preview for consistency, and to allow access to Export Graphics function

- Sample Data

  - Recreated sample PXP files from scratch to avoid errors caused by legacy data structures; sample data now be opened rather than imported

  - Added Current Clamp Ramp dataset to illustrate the use of Virtual Signals and Equations in Realtime Graphs

- Scope Window

  - Replaced the "Select Sweeps" panel by the sweep marks and the respective functions in the Data Navigator

  - Context menu: Removed options "3D View", "Zero baselines" and "Show Sweep_N only". They are implemented by the 3D view icon, "Center" and "Persistence" icons, respectively, on the bottom of the scope.

  - Added function for sweep marks (acquisition scope).

  - Fixed the scope preference "Auto-set" for the time axis

  - X-axis Lock retains scaling of the time axis

  - Y-center and Y-auto-range are now extended to all panes by holding the shift key down when clicking on the respective icons

  - Added "Toggle Cursor Info" to context (right-click) menu

- Shortcuts

  - Added shortcuts to "Mark" function in scope

  - Shortcut for "Start Routine", "Stop Acquisition", " Start Acquisition"

- Show Routine Data Window

  - Reworked GUI controls and functionality to preview section to match Routine Editor

  - Added viewing Dynamic Clamp parameters

  - Added routine selection to either display original routine or modified routine parameters

- Added Copy to Clipboard and Copy to Layout buttons
- Virtual Signals Window
  - Updated to match Routine Editor changes
  - Added support for relocating / hiding signals in the scope window
  - Added separate listbox to allow source signal selection for relocating / hiding these signals as well
  - Added selection to overwrite virtual signal settings from the original acquisition copy, including regenerating any modified virtual signals

Bug Fix Highlights

- Metadata are no longer written when the user selects not to write in a prompt.
- Fixed timing issue with dPatch Free run acquisition
- Fixed issues with HDF5 saving and deleting virtual signals
- Fixed issues with importing HDF5 files
- Fixed issues with dPatch acquisition halting when Filter was changed on dPatch panel during ongoing acquisition
- Fixed issue with selecting multiple waveform segments for copying and deleting
- Fixed issue with Routine Editor controls remaining disabled when equation editor window was closed
- Fixed Export Graphics behavior for a number of SutterPatch graph windows
- Fixed inconsistent behavior when discarding Routine or Paradigm Data
- Many minor fixes and improvements

Version 2.0.4 (build 230); January 8, 2020

New Feature Highlights

- Dynamic Clamp support for the dPatch® Amplifier System
- Added support for Dendrite™ Data Acquisition System
- Routine Editor
  - Added Conductance Stream output channels for the Dynamic Clamp Variable Conductance model
  - Added Triangle waveform type

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- Added additional controls to show scaled output values when a scaling factor is applied to Auxiliary Output channels
- Added controls to minimize measurements and\or graph parameter settings to properly fit controls on low resolution displays
- Display compression for waveform review for faster updates
- Real Time Measurements
  - Added saving of last used measurement and graph settings to simplify loading and using these settings with other experiment files
- Improved functionality for user gain and offsets for the IPA/dIPA amplifiers
- Improvements to Event Detection Analysis Module, including baseline drift reduction
- Improvements in usability and flexibility of the Single-channel Analysis Module
- Context-sensitive Help buttons in many dialogs
- Template Editor: Browse for and load any Igor wave as a Template
- File format: Implemented HDF5 file support for performance improvement
- Scope Window:
  - Implemented display compression of routine data during acquisition and reanalysis
  - Added "Concatenate" checkbox to Analysis window enabling concatenating analysis results across routines
  - Added "Clear" button to Analysis window when "Concatenate" is active to clear the analysis results in the analysis window.
  - Added "Copy to Clipboard" button
  - Added "Autoscale Y-axis of active signal" button
  - Added "Autoscale X-axis" button
  - Scope Preferences:
    - New y-range scaling option "Use last y-scale"
    - Implemented "Maximal Sweeps in Persistence Display" to improve performance with large data sets
- Shortcuts: Added Scope options "Center" and "Auto scale"
- Equation parser:
  - Added special identifiers "DynHold" and "DynHoldOn"
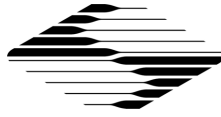 - Added left and right shift ("<<" and ">>")

- Paradigm Editor:
    - Usability improvements
    - Added Scope options "Center" and "Auto scale"
- dPatch only:
    - LockIn now supports "on-cell" mode
    - Saving data in Free Run
    - Implemented Stimulus DAC calibration of headstages
    - Added emulation of electrode compensation in cc-mode

Bug Fix Highlights

- Measurements > Edit Virtual Signals now correctly updates Metadata.
- dPatch capacitive resets are now processed correctly when Mask or Blank are selected.
- Routine Editor – fixed bug with output scaling factors not properly computed
- Fixed threshold measurement for Action Potential Analysis Module
- Metadata > Auxiliary Outputs: Signal units and several other parameters are now stored and correctly formatted in Metadata Review.
- Data Export to ABF: Usability improvements
- dPatch® Demo Mode: Pipette offset now correctly subtracted

Version 2.0.3 (build 216); August 7, 2019

New Feature Highlights

- Routine Editor
    Redesigned Real Time and Measurements window
    Segment based measurements can specify the segment definition of any output channel, not just the parent
    Redesigned Sweep Cycles for the dPatch Amplifier to improve continuous acquisition performance
    Improvements to Virtual channel equations to handle series to series math functions
- Single-channel Analysis Application Module
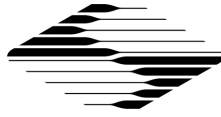- Added Dynamic Holding for the dPatch

- Optional 50 kHz bandwidth limiter for dPatch to accommodate slower computer systems
- Support for Cell Compensation in Lock-in amplifier mode
- Improved analysis in Event Detection Application Module.   Amplitude measurement now uses a peak finder algorithm
- Redesigned Log Window

Bug Fix Highlights

- Fixed bug when Zap was used on Headstage #2 of the double IPA
- Fixed bug when using 2-D sliders to set Rs compensation on the IPA/ double IPA
- Fixed bug involving scaling of current clamp stimulus on the double IPA
- Fixed bug with Lock-in virtual signals settings not properly stored in Routine
- Fixed bug with amplitude values not appended to segment templates
- Fixed bug with Auxiliary output channel units not properly saved

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Version 2.0.2 (build 205); April 30, 2019

New Feature Highlights

- The Full Installer includes Igor Pro version 8.0.3
- Added export data in ABF format (version 1.8; Episodic Stimulation)
- Data Navigator
    - Added "Display" in right-click menu
    - Selection of sweeps, routines or paradigms to export
- Improved Template handling in Waveform Editor
- dPatch Amplifier:
    - Added Dynamic Holding for Current Clamp mode
    - Added Blanking / Masking controls for capacitive transients to Free run and Routine acquisition
    - Removed indefinite cycles and added data wave size limit checking since the high bandwidth capabilities of the dPatch can easily exceed the maximum wave limits, memory and storage capacities.
- Added inter-event intervals to event detection analysis

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- Added "About SutterPatch" to Help menu

- Recording long, continuous data segments using a dPatch® Amplifier could massively slow down the computer system. This has been addressed for most conditions.
    - Inability to stop Routine Acquisition
    - Memory allocation could take very long
- Routine Editor:
    - Fixed creating output waveforms for digital bits greater than four
    - Fixed display of Value + Increment values for Routine copies
    - Fixed multi-amplifier routine acquisition
    - Fixed bug for routines that had only Auxiliary input / output channels enabled
    - Fixed scaling error when changing output channel "Restrict to" mode
- Fixed bug related to data acquisition when using multiple amplifiers
- Paradigm > Insert > Set Metadata
    - An empty list of meta parameters was shown in certain situations.
    - All user changes in the Prompt (if selected) are now properly applied.
- Multiple minor bug fixes.

Version 2.0.1 (build 204); February 20, 2019

New Feature Highlights

- Free update for all existing users.
- Welcome Screen now lets you open an existing Experiment
- Hardware control:
    - Added "Lock-in Adjustments" window to allow easy calibration of LockIn computation.
    - Added "cap. Reset" LED to indicate capacitor resets in capacitive feedback mode during data acquisition (dPatch System only)
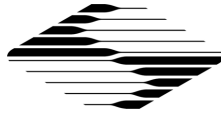- Scope Window:
    - Added Marquee menu

- The status of Autoscale button in Membrane test Scope Window and Free run Scope Window is retained now.
- Membrane Test:
  - Lock-in algorithms available for dPatch System
- Paradigms and Paradigm Editor:
  - "Write to Log" step now accepts a comma-separated list of equations.
  - Added Paradigm Step type: "Set Metadata"
  - Added paradigm step "Pause"
  - Paradigm editor window can be resized.
  - Added multi-selection in list of paradigms for "New Pool..." and "Delete"
  - Added routine pool and paradigm pool performing "semi-automatic" LockIn calibration
- Routines and Routine Editor:
  - Routine Pool Listbox now allows selection of multiple Routines using the Shift key:
    - Single-button action to create a new Routine Pool from selected Routines
    - Delete multiple Routines at the same time
  - New commands in the Files and Pools menu
  - Variety of control changes, including hiding controls and improvements to tooltips to simplify operation
  - Added individual cell help tooltips to listbox controls
  - Added selection to display all output channels in the Preview
  - Changes to Input Channels:
    - Added Nyquist factor selection (2,5, or 10) for dPatch, previously fixed at 10
    - Channel information is now available as a tooltip
    - Enabled capacitive integrator reset to Smooth and BesselFilter virtual signals for Routine acquisition
    - Auto naming of Virtual signals
    - Parent Out channel selection locked for input channels that are hardwired
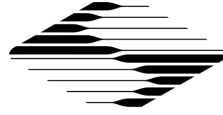   - Improvements to Virtual Signals, including:

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- Lock-in: Improvements to algorithm
- SweepAverage: Provides cumulative or running average of the input sweep
- BaselineSubtract: Subtracts a baseline value from the input sweep

- Changes to Measurements and Graphs:
  - Auto naming of measurements and analysis graphs
  - Auto unit selection for analysis graphs
  - Sorted Analysis types in alphabetical order
  - Added new Analysis type "max slope"
  - Start / End Ratio for segment based measurements can extend the segment boundaries

- Changes to Output Channels & Waveforms:
  - Expand window and P/N leak controls only when P/N is enabled
  - Added selection to use holding as start value in Value+Increment
  - Added Sweep Number selection to Value+Increment and Value List
  - Added scrolling value control to Value List entries
  - Changed waveform editor scroll bar for improved performance

- Data Navigator:
  - Improved export to .atf and .ibw files.

- Preferences:
  - Added gentle switch and file saving preferences.
  - Added option for faster data saving at end of Routine acquisition

- Shortcuts:
  - The "Write to Log" step accepts a comma-separated list of equations.

- Event detection analysis: Now saves event integral, rise time and decay tau for each found event.

Bug Fix Highlights

- Improved cleanup on closing an Experiment

- Certain amplifier settings were not written to Metadata

- Paradigm or Routine sequence numbers now correctly increment when acquiring new data in an existing Experiment

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- Improved functionality of virtual signal Bessel filter.
- Many minor bug fixes

Version 2.0.0 (build 200); September 1, 2018

New Feature Highlights

- Free upgrade for all existing users.
- SutterPatch 2 comes with Igor Pro version 8. All existing users receive a free upgrade. Support for Igor Pro 7 will be terminated in the future.
- Added support of the new dPatch® Ultra-fast Low-noise Digital Patch Clamp Amplifier System
    - Membrane Test
        - Two simultaneous channels, from either two headstages or one headstage and one auxiliary input channel
        - Separate Line Frequency Reduction options for each channel
            - Displayed in separate scope pane or as replacement of acquired signal
        - Test Pulse stimulus types (Single Pulse, Double Pulse, Triangle, Sine or RMS Noise)
        - Selectable 1, 2, 5 or 10 running average sweeps used in measurements calculations
        - Scope display of either acquired, running average or both
        - Real-time updates to settings made on Amplifier Control Panel
        - Audio monitor
        - Display Compression for optimal performance
    - Free run
        - Two simultaneous channels from any combination of headstages and/or Auxiliary input channels
        - Real-time updates to settings made on control panel
        - Display Compression for optimal performance
    - Routine acquisition
        - Fixed output sampling interval – nothing to configure

- Input sampling interval for amplifier channels automatically set by dPatch filter settings

- Auxiliary input channel sampling interval automatically set by specified bandwidth

- Additional parameter settings for "Smooth" and "Bessel Filter" virtual channels for handling integrator reset

- Gap-free / precise sweep timing automatically set for all routines

- Open-ended acquisition can be enabled to acquire indefinitely after a defined stimulus cycle, within the same series

- Redesigned Membrane Test
  - Allows immediate changes to stimulus
  - Separate Start / Stop buttons

- Improvements to Virtual Signals, including:
  - 4- or 8-pole Bessel high- and low pass filter
  - Subtract reference sweep
  - Explicit source channel for trace equation

- Scope Window:
  - Now continuous autoscale using right-click on Autoscale All button. Left click for momentary autoscale.
  - Added PVCam support to Camera Module
  - Improved responsiveness of the scope when drawing traces, clicking and dragging
  - Improved 3D view
  - Measurement regions can now be hidden, locked or edited
  - Separate Start / Stop buttons
  - Countdown for ISI > 5 s.

- Improved Amplifier Control Panel:
  - 2D dragging to adjust two connected parameters
  - Triple-mode sliders for dPatch

- Paradigms and Paradigm Editor:
  - Separate Start / Stop buttons
  - Step Set Paradigm Variable now supports "All Variables" option for both Paradigm and Routine variables

- Equations:
    - Implemented IF operator
    - New variable "Stimulant" returns the last applied stimulant concentration.
    - New special identifier to trace equations:
      "s[SeriesNo,SweepNo,SignalNo,RoutineName]"
- Improved data handling
- Improved Solution Editor
- Template editor:
    - Added function "Define Template Properties" to set X-start, X-increment, and Y-unit to values usable by SutterPatch.
- Stimulus waveform updated during Routine runtime
- Added more options to the icons display of Dashboard. Now Dashboard can be configured to have small size icons or large size icons, expand vertically or horizontally.
- Data Navigator:
    - Now allows exporting single signal to ATF file
    - Improved Metadata Review
- Preferences:
    - File to be automatically saved as Unpacked Experiment (*.uxp file) for large experiments
    - Color coding of headstages in Amplifier Control Panel background
- Display
    - Added support for dual-monitor mode and high-resolution screens under Windows
- Shortcuts: All Shortcut actions are now listed as sub-menu items.
- Minor errors and warnings are now reported in the new FeedbackNotice alert

Bug Fix Highlights

- Axis rescaling with a marquee now keeps the times axes for all signals in sync.
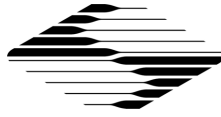- Many minor bug fixes

Version 1.1.4 (build 180); February 13, 2018

Bug Fix Highlights

- Improved functionality of Continuous Sweeps mode.
- Addressed freezes that could occur in combination with certain power save settings on Windows computers.
- Fixed a bug where switching off Persistence Display in Continuous Sweeps mode could lead to data loss.
- Fixed scaling issue of Scope Window time axis for long sweeps in time course mode.
- Several minor bug fixes.

Version 1.1.3 (build 165); October 21, 2017

Bug Fix Highlights

- Fixed acquisition-timing issue when acquiring from multiple IPA amplifiers in Continuous Triggered mode.
- Fixed "Null String error" when performing a reanalysis for the first time.
- Multiple minor bug fixes.

Version 1.1.2 (build 164); Aug. 3, 2017

New Feature Highlights

- Support for multi-amplifier mode:
  - A combination of any two IPA® or Double IPA® Amplifiers can be connected.
  - Up to 16 input channels are supported.
- The full installers come with the latest Igor Pro version (7.0.5). If you updated Igor when you were prompted, you should now run the SutterPatch Updater.
- Preferences:
  - Added options for automatic window positioning in multi-monitor operation or on small displays.
  - Added graphic format options for copying Analysis Editor and Template Editor to the clipboard.
- Added shortcuts:
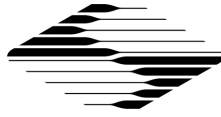 - Start and Stop Acquisition.

- Paradigm Pause and Resume.
- Copying to Layout now supported from:
    - Analysis Editor (graphs and tables)
    - Template Editor
- Measurement algorithms: The threshold values for "Time to threshold" and "Frequency" analyses can now be defined by equations.
- Data Navigator:
    - Added Series "Export as ATF File" function in Data Navigator.
    - Added preview to routines and paradigms.
- Improvements to Event Detection module, including a bug fix to the algorithm that calculates the amplitude when the event is riding on the decay phase of the previous event. Template values and detection settings are now remembered.
- Shorter inter-stimulus interval during membrane test.
- Right-click zero baseline option for displaying sweeps in reanalysis scope window.
- New virtual trace options include differentiation and integration of input sweeps.

Bug Fix Highlights

- Driver installation now supports more Chinese language versions. This could cause an error with certain language settings (Windows only). Contact Sutter Tech Support if you encounter language compatibility issues.
- Metadata: Addressed several issues in incrementing behavior.
- Multiple minor bug fixes.

Version 1.1.1 (build 160); Apr. 13, 2017

New Feature Highlights

- Added Solution Editor and Solution Pools:
    - Definition of solutions used during an experiment.
    - Assigning solutions to reservoirs in a solution switcher.
    - Direct control of a solution switcher through the Solution Editor with automated tagging in Metadata.
- Added Stimulant Concentration as a special identifier for equations.
- Improved IPA control panel functionality, including increased resolution for electrode compensation, and cleaner switching between current clamp and

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voltage clamp modes.

- Metadata: Added several new parameters based on user requests.

- Standard dialogs with "Ok" or "Yes/Cancel" buttons can now be dismissed using the "Return" key for "Ok" and "Yes", and the Esc key for "Cancel".

- Added the identifiers "gx[n]" and "gy[n]" to the equation parser. They return the analysis graph 'X' and 'Y' values of the specified equation "n".

- Routine Editor: Usability improvements in several areas
    - Streamlined scaling factor assignment for Auxiliary In- and Outputs, as well as Virtual Signals.
    - Definition mode of Digital Outputs moved to Outputs section.
    - Measurements and Graphs can now be disabled for the Routine.
    - Easier use of sweep-based measurement regions.
    - Automatically convert an entire routine pool to the active amplifier type.

- Paradigm Editor
    - Paradigm window can be kept in front while running Routines.
    - Paradigm step "Make Picture":
        - Renamed to "Camera".
        - Supports control of live viewing and taking snapshots.
    - Paradigm step Export to layout with enhanced functionality:
        - Create and append graphs from Scope and Analysis windows.
        - Define which graphs are to be placed into the layouts.
        - Control number of graphs per page.
    - Added option to mark a step to be skipped during Paradigm execution.

- Shortcuts and Shortcut Editor
    - Added "Stop Paradigm" as one of the choices for the "Paradigm" action.
    - Added "Stop Acquisition" as one of the choices for the "Routine" action.
    - Added "Save" button".

- Refinements to the demo data emulator.

- Dashboard
    - Removed Preferences button. Preferences are now accessible through the SutterPatch menu.
    - Moved Set Metadata button to upper level.
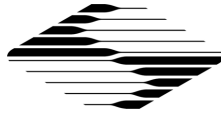   - Added Control Panel button and Free Run button to Acquire Data section.

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- Improved Camera module. Images captured by camera module are now linked with electrophysiology data.
- Data Navigator
    - Updated Info panel. Images captured by camera module are now listed.
    - Added Action Menu button as a visual analog to the right-click menu.
- Improved Window Handling
    - Automatic Window Repositioning as an option in Preferences.
    - Support for multi-screen setups in Mac OS. All windows are now entirely positioned in the visible region of their respective monitors.
- Moved Preferences Defaults button into General tab in Preferences setting.

Bug Fix Highlights

- Improved functionality for initialization of Double IPA Amplifier.
- Certain amplifier parameters, such as the compensation settings, were not written to the metadata in v1.1.0. Fixed.
- Under certain conditions, Routine acquisition controlled by a Paradigm step did not execute. Fixed.
- With P/N enabled, the holding level during the "leak delay" period BEFORE the main pulse is now the holding level from the IPA Control Panel. Previously, the holding level was the Routine Editor 'Leak Hold' amplitude, which is still used for AFTER the main pulse.
- Streamlined opening of SutterPatch Experiments in native Igor Pro.
- Fixed building stimulus as input trace, when output and input sampling rates were different.
- The SutterPatch full installer for Windows now installs the IPA driver before Igor Pro 7. This allows launching Igor Pro 7 straight from the last screen of the installer.
- Multiple minor bug fixes.

Version 1.1.0 (build 154); Feb 9, 2017

Notes and Warnings (Windows only)

- The last screen of the Igor Installer has a checkbox to launch the applications. If you check it, Igor launches while the IPA driver is being installed. This may cause the driver installation to fail. Make sure this checkbox remains unchecked. We are working on a solution.
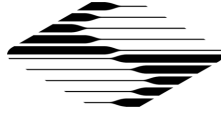
New Feature Highlights

- SutterPatch version 1.1.0 supports the newly released Double IPA® Dual-Channel Integrated Patch Amplifier.

- The full installers come with the latest Igor Pro version (7.02). If you updated Igor when you were prompted, you should now run the SutterPatch Updater.

- Shortcut Editor for assigning Keyboard shortcuts to quickly access windows or perform more involved tasks.

- Analysis Editor for reviewing and handling of analysis results, either as a graph or table.

- Add "Average Signal", "Show Data in Data Browser", "Event Detection" and "Action Potential Analysis" to right-click menu of Data Navigator.

- Enable access to analysis results through Data Navigator info panel.

- Added Routine conversion functions to easily migrate from a single to a double IPA amplifier, or vice-versa.

- Added Routine conversion options to Preferences.

- Routine copies now store real time measurements and graphs used when the Series was acquired and the last used during reanalysis.

- Paradigm Review scope window shows tags between Series.

- Autoscale on Y axis now autoscales to the subset of the data defined by the current X axis range.

- Added support for retrieving timer time during re-analysis

- Added measurement types SegmentDuration and SegmentAmplitude

- Template editor: Added "To Clipboard" function

- Routine

  - Added analysis-name, x- and y-labels to the measurements

  - Added virtual signal "stimulus"

- Paradigm Editor

  - Added the paradigm steps "View Last", "Analysis", "Front Window", and "Hide Window"

  - Added argument "format" to the write-to-log step, allowing to specify the format of the equation result written to the log

Bug Fix Highlights

- Performance issues in combination with high-resolution displays on Mac.

- Fixed bugs related to file auto naming.
- Killing the Layout Window no longer kills individual graphs.
- Fixed bugs related to Set Axis step in Paradigm Editor.
- The Scope Window no longer opens outside the Igor application frame on Windows.
- Many minor bug fixes.

Version 1.0.9 (build 146); Nov 01, 2016

Notes and Warnings
- Igor 7.01
  - Cryptic characters may appear in certain text entry fields (Igor SetVar controls). If you observe this on a Windows machine (where it seems more frequent), download the latest nightly Igor build (Help > Igor Pro Nightly Builds). On a Mac, run the SutterPatch full installer, which will install an Igor build that has this bug fixed.
- Mac OS X
  - Sierra compatibility (OS X 10.12)
    - Apple introduced a new safety feature in Sierra, which may cause issues with older SutterPatch installers. If you want to install an older SutterPatch version on Sierra, please contact Sutter Tech Support for a workaround. SutterPatch 1.0.9 is not affected.
    - Limited testing suggests that SutterPatch is fully compatible with OS X Sierra. An existing installation is not affected by the new safety feature when OS X is updated to Sierra.

New Feature Highlights
- The full installers come with the latest Igor Pro version (7.01). If you updated Igor when you were prompted, you should now run the SutterPatch Updater.
- Data Navigator:
  - Performance improvement with large data sets
  - Import allows combining multiple Experiments into one.
  - Data hierarchy tree now displays data down to sweep level. Extract / Average Sweeps are allowed.
  - Preview panel shows information about selected Paradigm or Routine.
- Scope Window

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- o Measurement cursor dragging has been improved, and resizing by dragging the edges is now supported.
  - o Added Y axis center button brings the signal into the axis range without changing the scale.
- • Virtual signals:
  - o Apply a transformation i.e. Leak Subtraction, Digital Filter (Gaussian or Boxcar), Line Frequency Reduction or custom equation to an acquired or Virtual Signal.
  - o Can be created in a Routine, for execution during data acquisition or as part of an analysis.
- • Routines:
  - o Template wave(s) used in a routine are now compressed and embedded in the routine structure.
  - o Each output channel can have up to16 different template waves.
  - o Different or similar Template waves can be assigned to individual segments.
  - o Measurement cursor dragging and resizing is now supported in the Routine preview cartoon.
  - o Virtual signals can now be defined as input channels.
- • Templates:
  - o New Template Editor for creating / managing pools of multi-use waves.
  - o Import Igor Binary files or use the marquee tool to grab data from a graph on the Scope, Data Navigator, Routine Editor or Template Editor.
  - o Transform waves by applying a Digital Filter or a linear interpolation
- • Metadata:
  - o New Summary panel to review all user-defined Metadata parameters and manage prompts.
  - o Improved Metadata display during analysis
  - o Added default values where applicable
- • Preferences Settings:
  - o Automatic naming for Experiment has been added to preferences
  - o Added separate Scope Window preferences for Acquisition/ Reanalysis/Membrane Test Scope Window
  - o Hardware calibration added
- • Additional sample Paradigms and Routines

Bug Fix Highlights
- • Window positions and certain other preferences are now preserved, even if an Experiment is not saved when starting a new experiment.
- • The Waveform Editor no longer hides behind other windows.

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- Opening existing experiments could cause undesired behavior under certain conditions. Several issues have been addressed in this area.
- Waveform Preview Y axis unit display has been made more intuitive.
- Debug Mode was left enabled in Version 1.0.8, which could cause excessive logging.
- IPA offset correction algorithm improved for large offsets.
- Stopping data acquisition could be unreliable on Mac computers, particularly in demo mode. Improved dramatically, and we hope it is fixed.
- Many minor bugs addressed

Known Bugs and Limitations
- On some Windows systems, 3D Display can cause Igor to crash. This will be addressed in the next Igor Pro 7 release. Contact Sutter Tech Support for a workaround if you do not want to wait.

Version 1.0.8 (build 135); Aug 18, 2016

New Features
- The SutterPatch Welcome Panel now has a progress bar. Previously the panel was hidden after clicking Start, which could give the false impression of a freeze or crash on slow computers.
- Data Navigator > Right-click > Show Metadata
    - o Timestamps and several other parameters are now formatted to be more easily readable by humans.
    - o Routine Start and End now indicated in By Parameter view.
- Right-click menu for multiple selections is enabled in Data Navigator.
- Improved the concatenated view of the Paradigm Scope Window.
- Membrane Test pulse amplitude now supports both positive and negative polarity.
- Several improvements to make behavior in Demo Mode more similar to real acquisition.

Bug Fixes
- The installer and updater now reliably update SutterDAQ-64.xop.
- Waveform Editor: Amplitude > Value settings were not saved. Fixed
- Acquire > Set Metadata: Increment now behaves correctly. This could cause unexpected results in certain conditions.
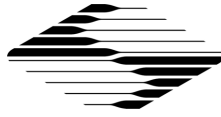- Log Window now resizes correctly.

- Corrected display of Stimulus Preview Cartoon. Display of the holding value could be misleading.
- Transferring an experiment to a different computer could cause confusing error messages. Fixed.
- Opening the Log Window from the SutterPatch menu caused an error. Fixed.
- Several minor bugs addressed

Known Bugs and Limitations
- Metadata display: Readability improvements still in progress

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Version 1.0.7 (build 134); Aug 1, 2016

Notes and Warnings
- Windows only: On some computers, the file {ProgamFiles}\SutterPatch\SP_Code\SP_Extensions\SutterDAQ-64.xop is not updated. Please rename or delete this file before running the SutterPatch Installer or Updater
- Existing Routines that cause errors related to redimensioning a wave need to be re-created.
  - You can create a new Routine within the existing Routine Pool.
  - Do not use the Duplicate feature on a Routine that causes errors, but re-create the Routine from scratch

New Features
- Data Navigator > Right-click > Show Metadata: Timestamps and several other parameters are now formatted to be more easily readable by humans.

Bug Fixes
- When creating a new Routine or enabling signals in an existing one, errors redimensioning a wave that underlies the Waveform Preview could occur. Fixed.
- Fixed polarity error in the command Waveform if Relative to Holding was used in an Equation.
- Prompt for MetaData now correctly executes before an Auto-triggered Paradigm.
- Several minor bugs addressed

Known Bugs and Limitations
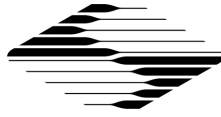- Metadata display: Readability improvements still in progress

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Version 1.0.6 (build 133); Jul 27, 2016

Notes and Warnings

- Existing Routines are not compatible and have to be re-created.
  - Take note of your settings before installing the update.
  - Make a copy of the folder SutterPatch in your Documents folder.
- Requires Igor Pro 7.00 (the initial public release version)
  - Use the SutterPatch Full Installer if possible. Do not use the SutterPatch Updater, unless you have already installed Igor 7.00.
  - Avoid using Igor's native Update feature.
- You may see warnings in the History Window during the first launch after the update. Unless the warnings persist, there is no need to contact Sutter Instrument Tech Support.

New Features

- The Full Installer includes Igor Pro 7.00
- The Full Installer installs Windows driver support files in {ProgamFiles}\SutterPatch. These should only be needed for Windows 7.
- Paradigm Data and Series (=Routine Data) can now be discarded from an Experiment.
- Added 'Zap' button to Membrane Test window.
- Membrane Test window size and position are now independent of Acquisition and Analysis Scope windows.
- Line Frequency Reduction option available for Membrane Test
- Added special identifier 'lastsweep' to Equations and Paradigms
- Added 'Input' function to Paradigm Editor
- Added new Routine 'Amplitude Equations' to sample Routine Pool
- Demo mode now simulates clipping when the amplifier range is exceeded.
- Demo mode Acquisition Scope window now has "DEMO" watermark.
- Analysis Scope Window title includes the name of the Series (=Routine Data) currently displayed.
- Routine special waves (Sine, Squarewave, Chirp and Template) no longer share one set of parameters for the entire routine. They are now defined on a segment basis to match Step and Ramp.
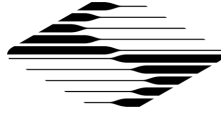- Added Real Time preview when entering special wave parameters.

Bug Fixes

- Rewrite of Paradigm and Routine structure addresses multiple bugs and shortcomings
- Continuous Sweeps acquisition mode could cause issues. Fixed.
- Waveform segment durations of '0' are now allowed.
- Fixed the issue with measurement cursors caused by changing x axes scaling.
- Added a separator in bottom signal panel x-axis. A click on the x-axis no longer activates the signal.
- More consistent behavior of X axis scaling by click-and-drag
- Metadata Review now only displays metadata for the selected Routine
- Prompt for User Metadata
    - Could skip lines if changes in multiple parameters were made. Fixed.
    - Values could inadvertently be dragged between lines. Fixed.
- The Log Window now remembers whether it is visible between sessions.
- Multiple minor bugs addressed

Known Bugs and Limitations

- Prompt for User Metadata is not shown before Auto-triggered Paradigms.
- Resizing of the Log Window can create blank space in the window and other unexpected effects.
- Metadata are displayed in raw, sometimes cryptic form. Formatting and grouping is needed to make Metadata Review more readable and useful.