

**NEW!**



FULLY INTEGRATED PATCH CLAMP AMPLIFIER AND DATA ACQUISITION SYSTEM ENSURES QUICK AND EASY SETUP  
OPTIMIZED FOR WHOLE-CELL PATCH CLAMP RECORDINGS IN TISSUE SLICES, ADHERENT OR DISSOCIATED CELLS  
FULL COMPUTER CONTROL PROVIDES AUTOMATED COMPENSATION OF ELECTRODE AND WHOLE-CELL CAPACITANCE  
VOLTAGE AND CURRENT CLAMP CAPABILITY FOR COMPLETE CHARACTERIZATION OF CELLS' ELECTRICAL ACTIVITY  
BUNDLED SUTTERPATCH™ SOFTWARE EXCELS IN COMPREHENSIVE DATA MANAGEMENT, INTUITIVE NAVIGATION AND  
STREAMLINED DATA ANALYSIS

## IPA™: INTEGRATED PATCH CLAMP AMPLIFIER AND DATA ACQUISITION SYSTEM

Sutter Instrument proudly announces the introduction of our first major new product line in 20 years: a full suite of electrophysiology recording hardware and software. The first product in this new line is the **IPA™** Integrated Patch Amplifier, which enables efficient, low-noise whole-cell recordings. The **IPA** system combines state-of-the-art amplifier technology with fully integrated D/A and A/D conversion and a high speed USB interface. Acquisition, data management, and streamlined analysis are performed using the bundled **SutterPatch™** Data Acquisition and Analysis Software, built on the foundation of Igor Pro 7 (WaveMetrics, Inc.).

### *External Inputs & Outputs*

External signals, such as environmental parameters or stimulus information, can be recorded using 4 auxiliary analog input channels. The **IPA** system also supports the control of peripheral hardware, such as wavelength or solution switchers, with 2 analog and 8 digital (TTL) output channels. Alternatively to the standard breakout cable, the available Patch Panel provides a tidy way of connecting auxiliary signals on the front of your rack."

### **SutterPatch** Software

The **IPA** system, in combination with **SutterPatch** software, has been engineered to automatically capture and store all amplifier settings, stimulus information and external experiment parameters and associate them in time with the raw data traces. This

includes all amplifier and acquisition settings, as well as timing and progress of the experiment. Fully integrated computer control of the amplifier means that the acquisition software is aware of the internal state of the amplifier and digitizer at all times and can track any changes that may occur. This is independent of whether a change is triggered automatically or initiated by the user.

### *Tracking of Other External Data*

In addition to status changes in connected hardware that are automatically tracked, the experimenter can manually trigger tags to document events like stimulus application in instruments not connected to the **IPA** system.

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**SUTTER INSTRUMENT**

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Information about environmental parameters and a more detailed specification of sample properties, can be recorded and stored with the raw data. A total of over 500 metadata attributes are supported. Examples include: animal species, strain, date/ time when a cell sample was prepared, recording solutions, pipette resistance, hardware properties, and detailed information about stimuli applied.

*Data Visualization and Analysis*

**SutterPatch™** software has been designed to simplify the navigation and analysis of complex datasets. The scope window supports multiple view modes in both two-dimensional and an innovative three-dimensional display. The 3D view is particularly useful during assay development. Built on top of the latest version of the proven Igor Pro platform, the **SutterPatch** program combines native Igor Pro functionality with a wealth of features that are tailored to electrophysiology applications. Both the newcomer and the experienced user of patch clamp programs will feel comfortable using **SutterPatch** software.

Application modules provide focused functionality for particular applications. Currently available:

- Event Detection Module: A deconvolution algorithm that excels at detecting miniature synaptic events even on a noisy background.
- Camera Module: An easy way to document the identity and condition of the recorded cell.

Whole-cell recordings in both voltage and current clamp experiments can easily be performed on the **IPA** system. Typical applications include, but are not limited to:

- Tissue slice recordings
- Cultured cell experiments
- Cell line studies from adherent or dispersed cells
- *In-vivo* patch clamp
- Network studies
- Optogenetics

The **IPA** Integrated Patch Clamp Amplifier is a computer-controlled single-headstage amplifier optimized for whole-cell recording applications.

**Amplifier**

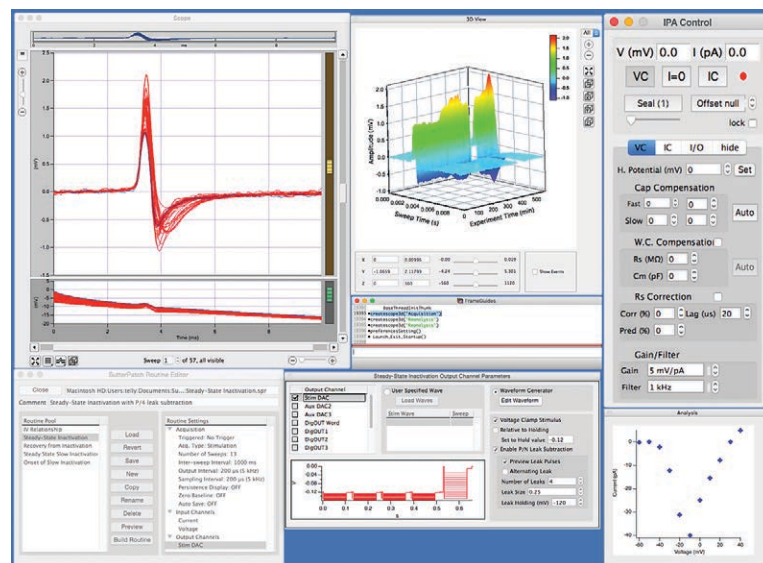
- Voltage clamp and true current clamp modes with smart switching between modes to avoid current artifacts
- Open-Circuit (RMS) noise of 1.4 pA in a 0.1-10 kHz bandwidth
- 500 MΩ headstage feedback resistor provides a maximal range of ±20 nA
- Fast pipette capacitance compensation and whole-cell compensation
  - Fast compensation up to 25 pF
  - Whole-cell compensation: Cm from 1-100 pF; Rs from 1-100 MΩ
- Onboard automatic compensation routines
- Series resistance prediction and correction (0-100 MΩ)
- Four-pole Bessel low-pass filter (cutoff = 0.5-20 kHz)
- Output gain: 1, 2, 5, 10, 20, 50, 100
- Holding potential ±1000 mV
- Current clamp bridge compensation and capacitance neutralization
- Slow holding potential tracking compensates for drift during current clamp recordings

**Data Acquisition**

- Embedded data acquisition system eliminates the need for an external data acquisition board
- Single high-speed USB connection controls data acquisition and amplifier
- Up to 6 input channels (1-50 kHz sampling rate per channel)
- Up to 300 kHz aggregate sampling rate
- Complex command waveforms (1-10 kHz sampling rate per channel)
- Auxiliary input / output for control of other instrumentation
  - 4 analog input channels (±10V)
  - 2 analog output channels (±10V)
  - 8 digital output channels (TTL)
- Data acquisition can be initiated by an onboard microsecond clock or external (TTL) trigger

**SutterPatch Software**

- Built on the foundation of Igor Pro 7 (WaveMetrics, Inc.)
- Comprehensive data analysis routines and publication quality graphics
- Paradigms and Routines provide complete experimental control
- Associated metadata stores all relevant information regarding your experiment
- Runs on Windows 7 or later (64-bit), or Macintosh OS X 10.11 (El Capitan)



Screen shot of SutterPatch software