

# Neurophysiology Research

## PowerLab® Systems and Dagan Amplifiers for Neuroscience



### Features & Benefits

- Complete electro/ neurophysiology research systems
- Intracellular and extracellular system configurations
- Two electrode voltage clamp systems
- Online and offline analysis of data
- Spike Histogram software module for advanced spike discrimination and data analysis
- Ideal for action and evoked potentials, voltage clamping, nerve and muscle recordings

PowerLab data acquisition systems and Dagan Corporation instruments provide complete solutions for recording and analyzing *in vitro* or *in vivo* neurophysiological signals. The complete research systems allow you to measure nerve conduction velocity, spontaneous nerve and muscle activity, action potentials and evoked potentials as well as cell or epithelial membrane transport.

ADInstruments is a world leader in the development and manufacture of computer-based data acquisition systems. PowerLab hardware, supplied with LabChart® and Scope™ software, easily integrates with Dagan preamplifiers. It provides computerized data recording, display and analysis, at the high sampling rates required for neurophysiological recordings.

Dagan Corporation has over 30 years experience in manufacturing innovative instruments for electrophysiologists and neuroscientists. Their product range includes extracellular and intracellular preamplifiers, patch clamp systems, stimulus isolators, headstages and a wide range of related accessories.

PowerLab data acquisition systems operate on both Windows® and Mac® OS platforms. Thousands of biophysical and neurophysiology researchers around the world have made PowerLab their preferred choice.



# Neurophysiology Research Systems

ADInstruments offer complete research systems that include a PowerLab data acquisition unit (with LabChart and Scope software) and a Dagan preamplifier with accessories. Use the systems with high impedance glass and metal recording electrodes for *in vitro* or *in vivo* applications. They include intracellular, extracellular or voltage clamp amplifiers with appropriate headstages.

## ML870B70 Extracellular Recording System

The ML870B70 Extracellular Recording System is suitable for use with high-impedance microelectrodes that require a high-gain, low-noise amplifier and current injection.

The system includes an 8-channel PowerLab system with a 19" Rack Adapter, Extracellular Preamplifier with Capacitance Compensation Probe and Glass Pipette Holder.

The Spike Histogram Module for LabChart software is included for the detection, discrimination and analysis of extracellular neural spike activity.



ML870B70 Extracellular Recording System

## ML870B71 Intracellular Recording System

The ML870B71 Intracellular Recording System is used for current injection and intracellular recordings from high-impedance fluid-filled glass electrodes.

The ML870B71 includes an 8-channel PowerLab data acquisition system, 19" Rack Adapter, Dual Intracellular Amplifier (designed for a wide variety of applications including recording from one or two channels), two Intracellular Headstages and two Glass Pipette Holders.



ML870B71 Intracellular Recording System

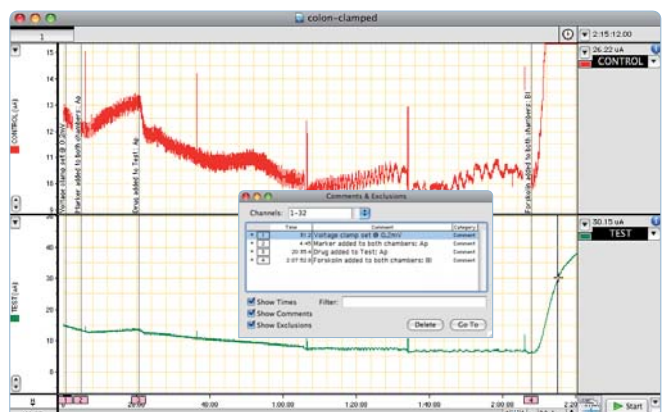
## ML870B72 Two Electrode Voltage Clamp System

The ML870B72 Two Electrode Voltage Clamp System is a general-purpose system. It has a Two Electrode Voltage Clamp Amplifier that features recording channels with bridges for passing current and capacitance compensation for maximal speed.

The system includes three Low-Noise Headstages, an 8-channel PowerLab data acquisition system, 19" Rack Adapter, two Glass Pipette Holders and a Foot Pedal Buzz (for remote control of the Buzz feature when impaling cells).



ML870B72 Two Electrode Voltage Clamp System



Recording of voltage clamp experiment using colon tissue.

# Neurophysiology Instruments

In addition to the three amplifiers featured in the Neurophysiology Research Systems, ADInstruments also supplies a wide range of Dagan intracellular and extracellular amplifiers, stimulus isolators, headstages, audio monitors, probes, glass pipette holders and accessories.

## IX1 Single Channel Intracellular Preamplifier

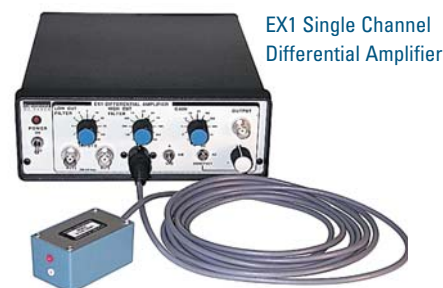
The IX1 is suitable for a wide variety of intracellular and extracellular recordings (with appropriate headstage). It features a small-box headstage with a choice of five current ranges and a buzz with independent amplitude control to make cell penetration easy. It is supplied standard with a 7001/N Intracellular Headstage.



IX1 Single Channel Intracellular Preamplifier

## EX1 Single Channel & EX4-400 Quad Channel Differential Amplifiers

These extracellular amplifiers have high-pass and low-pass filters designed for very low noise applications. They are used with the 4001 and 4002 Extracellular Differential Headstages (purchased separately). Features include DC recording with or without variable offset and single ended or differential inputs.



EX1 Single Channel Differential Amplifier

## BVC-700A Whole Cell Clamp (Bridge & Voltage Cell Amplifier)

The BVC-700A is capable of both DC and pulsed bridge current clamp and continuous voltage clamp recordings. It is supplied with a 7001/N headstage. It is also capable of extracellular recording (with the optional 8024-15 headstage).



EX4-400 Quad Channel Differential Amplifier

## PC-ONE Patch/Whole Cell Clamp

The PC-ONE has seven compatible headstages which adapt the amplifier for applications including cell attached patch clamping, bilayer recording and voltammetry. It is supplied with one headstage of your choice. Additional headstages can be purchased separately.

## Cell Clamp 2-V

Cell Clamp 2-V is a low-cost, easy-to-use solution for 2 electrode voltage clamp studies where the higher speed of active headstages is not required. It is supplied with two passive pencil probes and a virtual current monitor bath cable.

## BSI-950 Biphasic Stimulus Isolator

The BSI-950 is an economical analog input–analog output stimulus isolation unit. It is suitable for use with externally generated stimulation signals. The AC powered stages are optically isolated from the battery-powered output stage. The Biphasic Stimulus Isolator can produce biphasic current and voltage stimulation.



BSI-950 Biphasic Stimulus Isolator

## AM-2 Audio Monitor

The AM-2 is an easy-to-use audio monitor that transforms electrical signals being recorded into sound. Users can monitor recordings without needing to watch the computer screen. The monitor has two modes of operation: the amplitude mode can be used to listen to events or spikes, while the frequency mode can be used to detect changes in membrane potential when the electrode enters the cell.



AM-2 Audio Monitor

# Headstages and Accessories

## Headstages

### TEV-201 Headstage

TEV-201 is a high-impedance, low-noise headstage that ensures the fastest possible rise times in clamp experiments. It can be used with the TEV-200A Two Electrode Voltage Clamp.

### 2410A Capacitance Compensation Probe

2410A provides ultra-low noise and removes capacitive loading. High-resolution neutralization control allows you to fine tune signal rise times when microelectrode resistances are greater than a few megaohms.

### 7001/N Headstage

7001 is an intracellular headstage available in a number of current multiplier (N) modes (N = 0.001, 0.01, 0.1, 1, 10). It is suitable for use with IX2-700 and IX1 Intracellular Preamplifiers, and the BVC-700A Whole Cell Clamp.

### 4001 and 4002 Extracellular Differential Headstages

4001 is an extracellular headstage for use with EX1 and EX4-400 Differential Amplifiers. The 4001 probe features capacitance compensation. The 4002 does not incorporate capacitance compensation.

### 8024-15 Extracellular Headstage

8024-15 is a high-gain AC coupled amplifier with selectable high-pass filters. The headstage can be used with intracellular amplifiers such as IX1, IX2-700, BVC-700A or TEV-200A for extracellular recordings.

### 8024-7001 Dual Mode Extra/Intracellular Headstage

8024-7001 headstage extends the use of intracellular amplifiers to allow extracellular recordings. The headstage can be used with amplifiers such as the IX1 and IX2-700.

### PC-ONE-10 - PC-ONE-70 Headstages

These seven headstages are all for use with the PC-ONE Patch/Whole Cell Clamp. The PC-ONE-10 (large), PC-ONE-20 (standard) and PC-ONE-30 (small) are for whole cell applications. The PC-ONE-40 is for extracellular patch applications. The PC-ONE-50 is used for Planar Lipid Bilayer recording. The PC-ONE-60 is for remote control dual range and patch recordings. The PC-ONE-70 is for voltammetry.

## Accessories

### TEV-208 Series Resistance/Leakage Current Adapter Box

TEV-208 adapter box is used with the TEV-200A Two Electrode Voltage Clamp. This compensates for errors caused by resistance and leakage current.

### BUZ-1 Universal Buzz Box & BUZZ Foot Pedal

These are used to impale cells using AC oscillation or DC current. BUZ-1 allows you to control duration, amplitude and frequency. It is activated from the front panel switch or by the optional BUZZ Foot Pedal. It is used with TEV-200A, IX2-700 and IX1 preamplifiers.

### HB120 and HB180 Glass Pipette Holders.

For use with 1 to 1.2 mm (HB120) and 1.5 to 1.8 mm (HB180) diameter glass pipettes.



# Data Acquisition & Analysis

## PowerLab Systems with LabChart and Scope Software

PowerLab data recording units, supplied with LabChart and Scope software, provide researchers with a high-speed data acquisition system. They have high signal resolution, numerous filter setting options and data compression features to reduce file size.

LabChart is ideal for long term recordings at fast sampling rates. In combination with PowerLab it allows you to sample at up to 200 kHz per channel (400 kHz aggregate) and carry out simultaneous real-time computations on incoming signals.

Scope software transforms your computer into a two channel storage oscilloscope and XYT plotter. Scope records, displays and analyzes high frequency signals time-locked to a stimulus. It is ideal for recording action potentials and evoked responses.

## Spike Histogram Module for Windows & Mac OS

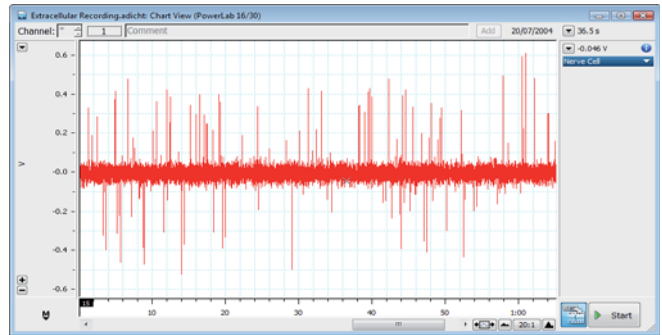
The Spike Histogram Module for LabChart is used to perform online or offline spike discrimination and analysis of extracellular recordings at high sampling rates. It features a height and width discriminator that gives you a faster method of discrimination than template matching. You can view discriminated data in real time as analysis plots of rate, amplitude, interspike interval and peristimulus time histogram.

Spike Histogram for Windows has the added feature of exporting data in .nex format. With this you can easily transfer your data into NeuroExplorer software. NeuroExplorer provides an extensive set of spike train analysis options including autocorrelograms, crosscorrelograms, burst and spectral analysis, and more.

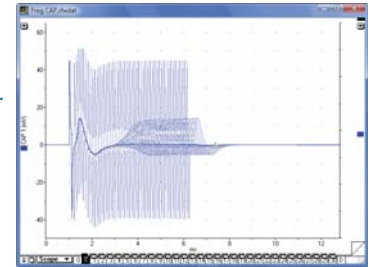
## PowerLab Flexibility

PowerLab systems can record signals from many third-party instruments. You can connect any preamplifier with a suitable connector and an analog output (maximum  $\pm 10$  V) to a PowerLab.

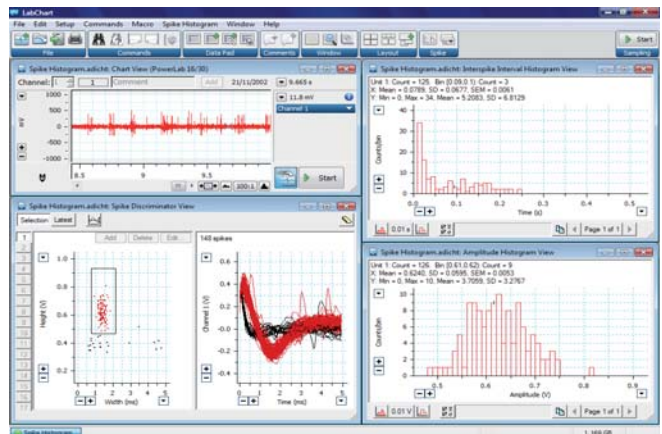
LabChart and Scope also allows fast data analysis. The software programs feature a number of 'Save as' and 'Export' options to make presenting, publishing and exporting data into specialized neurophysiology analysis formats easy.



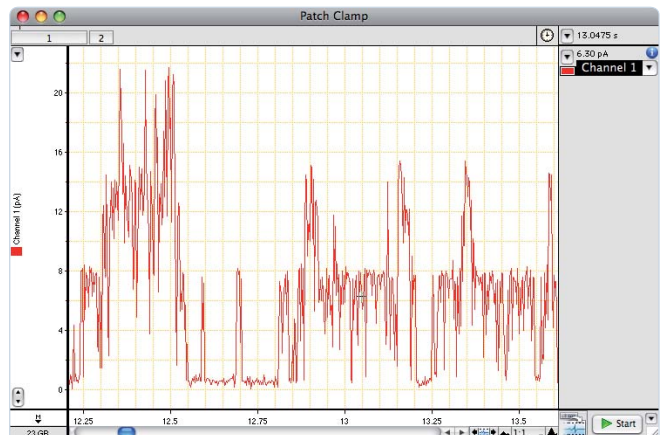
Above: Extracellular spike train recording in LabChart software.



Left: Scope recordings of an amphibian compound action potential.



Analysis of extracellular spike data (recorded in LabChart) using the Spike Histogram Module.



A patch clamp recording using pancreatic beta-cell membrane from primary cultivated NMRI mouse.

# Ordering Information

## Neurophysiology Research Systems

Note: The equipment from Dagan Corporation in this brochure is not intended for connection to human subjects.

ML870B70 Extracellular Recording System	ML870B71 Intracellular Recording System	ML870B72 Two Electrode Voltage Clamp System
1 x ML870/P PowerLab 8/30 includes LabChart Pro software	1 x ML870/P PowerLab 8/30 includes LabChart Pro software	1 x ML870/P PowerLab 8/30 includes LabChart Pro software
1 x MLA190 19" Rack Adapter	1 x MLA190 19" Rack Adapter	1 x MLA190 19" Rack Adapter
1 x 2400A Extracellular Preamplifier (Supplied with 2410A Capacitance Compensation Probe)	1 x IX2-700 Dual Intracellular Amplifier (Supplied with two 7001 Intracellular Headstages)	1 x TEV-200A Two Electrode Voltage Clamp (Supplied with TEV-201, TEV-202, VCM/BC-203 Headstages)
1 x HB180 Glass Pipette Holder (1.5 to 1.8 mm)	2 x HB180 Glass Pipette Holder (1.5 to 1.8 mm)	2 x HB180 Glass Pipette Holder (1.5 to 1.8 mm)
*LabChart Pro includes all LabChart Modules, including the Spike Histogram Module		1 x BUZZ Foot Pedal Buzz

## Individual Items

Instruments	Headstages and Accessories
TEV-200A Two Electrode Voltage Clamp (Supplied with TEV-201, TEV-202, VCM/BC-203 Headstages)	TEV-201 Headstage for TEV-200A
2400A Extracellular Preamplifier (Supplied with 2410A Capacitance Compensation Probe)	7001 Headstage for IX2-700, BVC-700A & IX1
IX2-700 Dual Intracellular Preamplifier (Supplied with two 7001 Intracellular Headstages)	4001 Extracellular Differential Headstage WITH capacitance compensation
IX1 Single Channel Intracellular Preamplifier (Supplied with one 7001 Intracellular Headstage)	4002 Extracellular Differential Headstage WITHOUT capacitance compensation
EX1 Single Channel Differential Amplifier	8024-15 Extracellular Headstage for IX1, IX2-700 & TEV-200A
EX4-400 Quad Channel Differential Amplifier	8024-7001 Dual Mode Extra/Intracellular Headstage for IX1 & IX2-700
BVC-700A Whole Cell Clamp (Bridge & Voltage Clamp Amplifier, supplied with one 7001 Headstage)	2410A Capacitance Compensation Probe for 2400A
PC-ONE Patch/Whole Cell Clamp (Supplied with one PC-ONE Headstage of your choice)	PC-ONE-10 Large Whole Cell Headstage for PC-ONE
CELL CLAMP 2 Two Electrode Voltage Clamp (Supplied with two passive pencil probes)	PC-ONE-20 Standard Whole Cell Headstage for PC-ONE
BSI-950 Biphasic Stimulus Isolator	PC-ONE-30 Small Whole Cell Headstage for PC-ONE
AM-2 Audio Monitor	PC-ONE-40 Extracellular Patch Headstage for PC-ONE
	PC-ONE-50 Bilayer Headstage for PC-ONE
	PC-ONE-60 Whole Cell and Patch Headstage for PC-ONE
	PC-ONE-70 Voltammetry Headstage for PC-ONE
	TEV-208 Series Resistance/Leakage Current Adapter Box for TEV-200A
	BUZ-1 Universal Buzz Box for IX1, IX2-700 & TEV-200A
	BUZZ Foot Pedal Buzz
	HB120 Glass Pipette Holder (1.0 to 1.2 mm)
	HB180 Glass Pipette Holder (1.5 to 1.8 mm)

 Share your data with colleagues. Free LabChart Reader – download to view and analyze LabChart data.

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PowerLab systems and signal conditioners meet the European EMC directive. ADInstruments signal conditioners for human use are approved to the IEC60601-1 patient safety standard and meet the CSA C22.2 No. 601.1-M90 and UL Std No. 2601-1 safety of medical electrical equipment standards.



**GLP**  
21CFR Part 11  
Compliance



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ISO 9001:2000 Certified Quality Management System

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