

# ADInstruments Product Overview

## Complete solutions for life science research



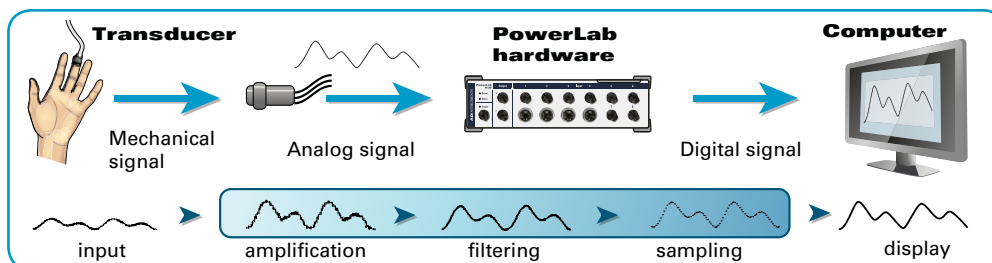
ADInstruments provides complete solutions for life science research, built around PowerLab data acquisition units and LabChart Pro software. From measurements of ventricular pressure-volume, intracellular voltage potential, working heart performance, Nitric Oxide (NO) and more, PowerLab data acquisition systems record, display and analyze data with renowned ease and accuracy.

Our LabChart Pro software provides powerful automation, data extraction and analysis features that are flexible and intuitive, saving hours of cumbersome calibration, calculations and data logging. Specialized LabChart Pro analysis modules such as ECG Analysis, Blood Pressure, Dose Response, Spike Histogram and Peak Analysis, further expedite your experimental results.

In addition to PowerLab units, ADInstruments manufactures an extensive range of signal conditioners, transducers and accessories. We also work closely with leading manufacturers to provide gold-standard, application-specific instruments that are compatible with PowerLab.

We will work with you to develop a complete solution for your studies – accelerating your research from raw data to publication. As your research progresses we will continue to provide support, adapting your existing equipment for new projects and providing the latest technology for every application.

Our industry-leading support and training programs are available through a global network of 11 offices and over 40 distributors. No matter where you are, help is always on hand.



### Typical Applications

- Cardiovascular pressures
- Ventricular pressure-volume
- Blood flow & cardiac output
- Isolated tissue & dose response
- Isolated perfused organs
- ECG & HRV
- Intracellular recording
- Extracellular recording
- Evoked potentials
- Respiration & exercise physiology
- Small animal telemetry

### Product Range

- Data acquisition systems
- Bridge & Bio amplifiers
- Programmable stimulators
- Organ and tissue baths
- Blood flow meters
- Neuro amps & headstages
- Telemetry systems
- Mikro-Tip® catheters
- Pressure transducers
- Gas analyzers & spirometers
- NIBP systems

# ADInstruments PowerLab Data Acquisition Systems for Research

When PowerLab hardware is combined with ADInstruments software, researchers have a powerful and versatile data acquisition system at their command. PowerLab systems for research provide the full utility of a multi-channel, real-time chart recorder, polygraph, XY plotter, digital voltmeter and storage oscilloscope with the benefits of easy data handling, remarkable resolution, variable sampling speeds and comprehensive analysis.

## PowerLab data acquisition units provide:

- 16 Bit resolution on all gain ranges
- Variable sampling and online computation speeds of up to 200 000 s/s per channel (400 kHz aggregate across all channels or 2 x 200 kHz on two channels)
- Fast processor for real-time data acquisition without data loss
- Integrated pod ports for wider amplifier and transducer choice
- Digital inputs and outputs for external instrument control and triggering
- AC/DC coupled inputs
- Independent stimulator outputs
- High-pass, low-pass and anti-aliasing filters
- Available in 4, 8 or 16 channels
- Supplied with LabChart software



Online computations can be performed at high sampling rates and displayed in real time. The PowerLab unit has no buttons or dials and absolutely no programming is required. It connects directly to Windows and Macintosh computers via USB port.

## Signal conditioners and instruments

ADInstruments manufactures a wide range of software-controlled preamplifiers for use with PowerLab data acquisition systems. Once connected, the signal conditioners are automatically identified and configured by the PowerLab system with all settings stored when the data file is saved on your computer.



## Transducers and accessories

An extensive selection of instruments, transducers and accessories is also available to cover numerous life science applications. Third-party products sourced from leading manufacturers are fully compatible with PowerLab recorders and signal conditioners.



## Complete research systems

ADInstruments extends the use of its core product, the PowerLab data acquisition unit, with a range of complete solutions for specific research applications such as isolated tissue, isolated heart, biopotentials, telemetric data acquisition, electrophysiology, microneurography, psychophysiology and many more. The preconfigured systems include PowerLab data acquisition systems, signal conditioners, specialized instruments, transducers and accessories.



# LabChart software

LabChart software (supplied with all PowerLab systems for research) transforms your Windows or Macintosh computer into a digital chart recorder and oscilloscope that records and displays data in real time. You benefit from easy acquisition, graphical presentation and numerous analysis features.

## LabChart can:

- Automatically recognize and control PowerLab hardware, ADInstruments amplifiers and smart transducers
- Record, display and analyze up to 32 channels of raw data
- Display data in specialized windows including Scope View, Spectrum View, Zoom View and XY View
- Analyze data online or offline

## Use LabChart to:

- Record from multiple PowerLabs and devices
- Preview & optimize recording
- Import and export data easily
- Annotate data with comments
- Convert raw data into useful units
- Automate recording & analysis tasks
- Change recording settings in seconds
- Recall data and experimental settings
- Generate customized stimulus outputs
- Speed up analysis with LabChart Modules



## Showcase your data using free LabChart Reader

LabChart Reader is a free downloadable software that lets you share your LabChart data files with colleagues, publishers and students. It enables anyone to open and view LabChart files and includes a number of LabChart analysis and display features.

## Ensure GLP & 21 CFR Part 11 Compliance

The GLP Client and GLP Server provide a data acquisition solution for GLP and 21 CFR Part 11 compliant environments. They provide a non-editable audit trail of all file operations, and a centralized user and signature authorization system that verifies user validity each time a LabChart file is opened or saved.

## Specialized analysis modules

Additional software modules are available separately or as a complete software package in LabChart Pro\*. The LabChart Pro Upgrade is an economical way of purchasing the entire suite of ADInstruments research software including:

**Dose Response** – generates dose response curves, EC<sub>50</sub> values and additional parameters

**Blood Pressure** – automatically detects, analyzes and reports parameters from arterial or ventricular pressure recordings

**ECG Analysis** – detects and reports the onset, amplitude and interval times of PQRST from human and animal ECG signals

**Heart Rate Variability** – displays and analyzes variation in the interval between heartbeats in human and animal ECG

**Peak Analysis** – automatic detection and analysis of multiple, but not overlapping, signal waveforms from recordings

**Circadian Analysis** – analyzes and generates graphical and tabular views for daily and averaged circadian data

\*LabChart Pro does not include GLP Client and GLP Server software.

**Metabolic** – provides real-time measurements of parameters such as:  $\dot{V}_{CO_2}$ ,  $\dot{V}_{O_2}$ ,  $\dot{V}_E$  and RER

**Spike Histogram** – detects, discriminates and analyzes extracellular spike activity generating a range of plots and statistics

**Cardiac Output** – calculates cardiac output from a LabChart recording of a thermodilution curve measured in animals

**Video Capture** – allows the synchronized recording and playback of a QuickTime movie and LabChart data file

**DMT Normalization** – calculates and standardizes optimal vessel pretension conditions using the wire myograph

**PV Loop** – analyzes left ventricular pressure and volume data, calculates loop area and a wide range of hemodynamic parameters

# Research applications

## Introvascular Blood pressure

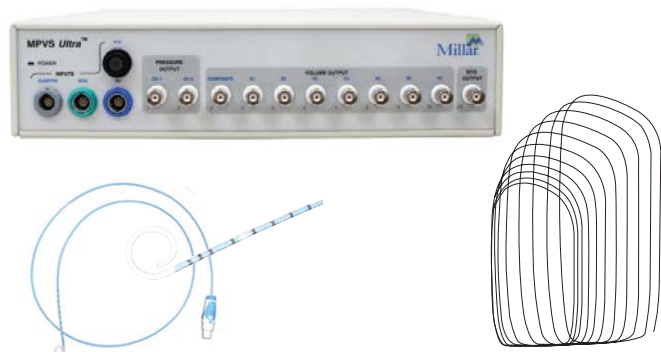
### Mikro-Tip BP Foundation System

Provides the essential tools for measuring blood pressure in small and large animals. Includes the low-drift, high impedance input Bridge Amp, compatible with a wide range of high-fidelity Mikro-Tip® BP catheters in a variety of sizes and configurations for diverse research needs (available separately). The catheters operate seamlessly with LabChart's Blood Pressure Module to determine systolic and diastolic pressures, dichrotic notch, dP/dt and more.



### Mikro-Tip pressure-volume

Simultaneously measure pressure and volume in large and small animals with the MPV5 Ultra Foundation System and Millar Mikro-Tip® PV catheters (selected separately). Supplied with LabChart's PV Loop Module for automated calculation of systolic and diastolic pressures, stroke volume, CO and more. Single and multi-segment Mikro-Tip PV catheters suitable for use in animals 16 g and larger (i.e. mice, dogs, sheep) are supplied in a range of sensor sizes and electrode configurations. Also suitable for use in the digestive and reproductive systems (i.e. bladder, uterus).



### Fluid-filled blood pressure transducers

Determine arterial and venous blood pressure using the range of fluid-filled polyethylene, pressure transducers for use with small and large animals. The transducers are ideal for use with ADInstruments Bridge Amps or the electrically isolated BP Amp that provides BP readings in mmHg. The BP Amp is suitable for use with human subjects.



## Non-Invasive Blood Pressure (NIBP)

### Human NIBP System

Features the Finometer MIDI, which reconstructs human arterial pulse waveform to produce beat-to-beat arterial blood pressure changes. Supplied with various sized finger cuffs.



### Animal NIBP System

The NIBP Controller Unit featured in this system detects intermittent pressure/pulse for calculation of systolic pressure in mice and rats. Interchangeable automated tail and cuff transducers are supplied.



# Research applications

## Blood flow and cardiac output

### Invasive measurements

Measure arterial or venous flow with Transonic Flow Systems and Transonic Flowprobes (purchased separately). With minimal signal drift and attenuation, flowprobes are appropriate for acute and chronic studies. A range of sizes suitable for mice and larger animals are available, as well as inline/clamp-on sensors for tubing applications.



### Blood flow perfusion

Continuously monitor blood flow and perfusion of microvascular beds and rapidly calculate Cardiac Output (mL/min) with Laser Doppler Flowmetry (LDF) probes and the BloodFlow Meter (second analog output correcting for BSC). Suitable for monitoring circulation during surgery and drug or cardiovascular studies, LDF probes for use with skin, muscle and organs are available.



## Biopotentials

Electrically isolated Bio Amps are optimized for recording human and animal ECG, EMG, EEG, ERG, EOG, visual evoked cortical response and more. In conjunction with LabChart's Spectrum View, HRV and ECG Analysis Modules, the Bio Amps make extraction and analysis of power frequencies, R-R interval quick and easy.



### Dual Bio Amp/Stim

The Dual Bio Amp/Stimulator is an integrated unit supplied with shielded flat electrodes. With two fully isolated differential amplifiers and an isolated stimulator safe for human connection, it offers compatibility with a wide range of electrodes and sensors (available separately).

### Multi-channel Bio Amps

8 and 16 channel Bio Amps are supplied with both chest and reusable electrodes for differential EEG or multiple biopotential measurement in a single subject. Also compatible with EEG caps (available separately).



### Animal Bio Amp

The low-noise, high-gain differential Bio Amp is supplied with micro-hook electrodes. Compatible needle or spring clip electrodes are available separately.



### ECG switch box

For mechanical selection of standard lead configurations (10 standard lead wires). Ideal for vector cardiography, it gives direct measurement of leads I, II, III, aVF, aVL, aVR and V1 to V6.



# Research applications

## Isolated perfused hearts

### Working heart (Radnoti)

Measure hemodynamic parameters in small animal hearts with the Radnoti working heart system (suitable for mice to rabbits). Capped and water-jacketed to ensure constant perfusate temperature, with ports for insertion of cannulae and commonly-used pacing and ECG electrodes. With additional instruments you can measure atrial volume and cardiac output, left-ventricular pressure, pH, temperature, surface ECG and more.



### Langendorff heart (PanLab)

Monitor cardiac function including left ventricular developed pressure, HR and more. Easily switch between constant-pressure and constant-flow modes with the convenient pump controller (included with system).



## Isolated tissue

### Traditional organ baths (Radnoti)

Radnoti modular organ bath systems allow easy substitution of parts, enabling an extensive choice of tissue types and chamber sizes (5 to 300 mL). The water-jacketed glassware and tubing with heating coils in the organ/tissue baths ensure constant temperature maintenance throughout the system for accurate study of muscle contraction, dose responses and more (LabChart Modules supplied).



isometric force transducers

### All-in-one compact organ baths (PanLab)

Systems available in 4, 8 and 16 chambers ideal for striated, smooth and cardiac muscle studies. Featuring electrovalves for automated filling and emptying of tissue chambers, a constant system temperature is ensured by enclosure of tissue vessels, reservoir coils and tubing in a single temperature-controlled water chamber. Systems are provided with isometric transducers, however isotonic transducers and stimulating electrodes are also available.



Isotonic force transducers

## Myographs

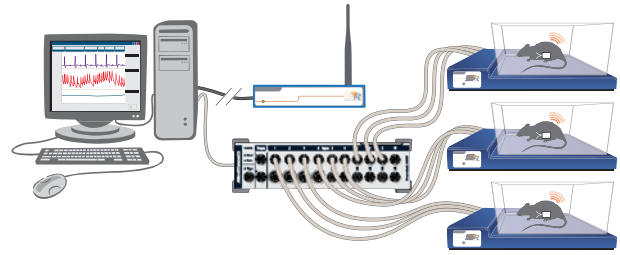
Ideal for *in vitro* studies of muscle function, these systems feature DMT Wire Myographs. Investigate small tubular tissues <60  $\mu\text{m}$  in diameter, or larger muscle strip preparations. They are Supplied with the DMT Normalization Module for speedy experimental set-up, and the Dose Response Module for pharmacological assessment of muscle contraction, enzyme activity and more. Single, dual and four chamber systems are available, as well as a confocal system for use with LSCM.



# Research applications

## Small animal telemetry

Wireless systems are suitable for acute and chronic studies in untethered animals weighing >200 g. Fully implantable telemeters (available separately) feature wirelessly rechargeable batteries, reducing the need for repeated animal surgery and expensive telemetry refurbishment.



## Biopotential and pressure

Record pressure, biopotentials, and temperature with the Small Animal Foundation System and high-fidelity TR5\* series telemeters (available separately), 3 of which feature Millar Mikro-Tip® solid-state catheter technology, eliminating signal drift and movement artifact.



## Sympathetic Nerve Activity and Pressure

For scheduled or sequential acquisition of pressure, biopotentials, SNA, and temperature, the Telemetry SNA and Pressure Foundation System is supplied with the TR Scheduler Pod. Compatible SNA Pressure Telemeter with gel-tipped catheter is available separately.



## Electrophysiology

Ready-to-use neurophysiology research systems, featuring Warner Instruments' equipment, are ideal for *in vitro* and *in vivo* applications.

The [Extracellular Recording System](#) is provided with low noise differential amplifier and the [Intracellular Recording System](#) features an Intracellular Electrometer Amplifier for simultaneous current injection stimulation and recording using a single microelectrode. [Epithelial Voltage Clamp Systems](#) are available in single and dual channel configurations for investigations of tissue transepithelial voltage, short circuit current, and membrane resistance. Ussing Chambers are available separately with inserts that can be easily changed between experiments. Two systems are available for two-electrode, whole-cell voltage clamping of large cells and cell structures. They feature the [Oocyte Clamp Amplifier](#), with unique bath clamp circuitry, two clamp speeds and fast stable voltage clamping with extended current measuring range.



## Microneurography

The Neuro Amp Ex is a low-noise, high-gain differential amplifier purpose-built for amplification of extracellular single cell/tissue potentials and single nerve fiber potentials (split-nerve preparation or human microneurography). Electrically isolated for human connection it is supplied with a headstage and microelectrode adapters.

## Spirometry and exercise physiology

The Exercise Physiology System incorporates a variety of specialized instruments, transducers and accessories safe for human connection during exercise and at rest. Hardware includes Spirometer, Respiratory Flow Heads, Gas Analyzer, Gas Mixing Chamber, Thermistor Pod, temperature sensor and single-channel bioamplifier.

Monitor and calculate human cardiorespiratory and metabolic parameters such as RR, volume and flow rates,  $\dot{V}_{CO_2}$ ,  $\dot{V}_{O_2}$ ,  $\dot{V}_E$ , RER, intrathoracic pressure and lung sounds with the BP, HRV, Metabolic and ECG Analysis modules supplied with the system.



## Psychophysiology

Measure evoked responses to visual and auditory stimuli (VEP, ERP etc.) with a complete system that incorporates SuperLab® Software, StimTracker® and accessories such as the Response Pad and Smart Voice Key (one computer is required for stimulus presentation and another for data acquisition).

With transducers available separately, you can also record skin conductance/temperature, respiratory, cardiac, and neurophysiological responses, as well as analyze reaction time and reflexes.



## The ADInstruments Advantage:

**Industry leaders** – Installations in thousands of research institutes, universities, hospital and commercial laboratories around the world, including every top 100 life science and biomedical university (QS, 2010).

**Quality and reliability** – All our systems and products are manufactured under a quality system certified by an accredited body as complying with ISO 9001:2008.

**Proven track record** – With nearly 25 years of design and manufacturing experience, we have installed more than 28,000 PowerLab data acquisition systems worldwide.

**Power and flexibility** – Adaptable to a variety of life science applications. Start with a PowerLab system and simply add an appropriate amplifier, instrument or transducer. Whether animal or human, organ, tissue or cell, *in vivo*, *in vitro* or *ex vivo*, our systems record and analyze data seamlessly.

**Environmentally friendly** – Our manufacturing processes, RoHS compliant parts, lead-free soldering, and use of recycled and recyclable materials, ensures we meet our environmental responsibility as a corporate citizen.

**Data integrity** – Our PowerLab data acquisition systems with LabChart software are calibrated and tested to deliver indisputable data of the highest quality.

**Intuitive use** – With no programming required, our software is mastered quickly and provides comprehensive recording, display and analysis features.

**Excellence in customer training & support** – Our staff includes scientists, educators, programmers and biomedical engineers who understand your research needs. With eleven ADInstruments offices and over forty distributors, we provide a truly global support network.

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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.



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