ADINSTRUMENTS
making science easier

PowerLab® LabTutor® Systems

Interactive Data Acquisition and Courseware for Life Science Education

ADInstruments PowerLab LabTutor Systems are designed for life science student laboratories to teach scientific principles, not data acquisition skills. Comprising a PowerLab data acquisition unit and LabTutor software, the user-friendly systems deliver a complete laboratory course. The supplied experiment suites include background information, instructions, real-time data acquisition, analysis and electronic report submission — all within a single software application.

The Reliability of PowerLab Hardware

ADInstruments' PowerLab data acquisition systems have earned their reputation as being a powerful, reliable and versatile part of the world's best research laboratories. The innovative PowerLab 15T balances this quality and reliability with a set of easy-to-use education features.

The Innovation of LabTutor Software

LabTutor software was developed for educators who want their students to learn scientific principles independently through real experiments. Using the familiar Internet Explorer® interface, LabTutor guides students through each stage of an experiment, from setup through to data acquisition, analysis and reporting.

The Ease of Complete Systems at Affordable Prices

Every PowerLab LabTutor System is supplied with the software, hardware, transducers and accessories that students require to complete a wide range of experiments. Educators are also supplied with an electronic Instructor's Guide and courseware materials for each experiment, making it easy to integrate the systems into existing curricula and lesson plans. In addition, the complete PowerLab LabTutor System solution offers outstanding value for money.

Features & Benefits

- Delivers economically priced solutions for life science education
- Includes ready-to-use experiments with background information and step-by-step instructions
- Minimizes set up time and hands-on supervision
- Provides real-time data acquisition with interactive analysis and reporting
- Engages students and improves learning outcomes
- Comes with free experiment and LabTutor software upgrades
- Creation and customization of LabTutor experiments with the optional LabAuthor software

Quality & Safety

PowerLab systems are manufactured under the ISO 9001:2000 certified quality management system and have a three year warranty.

PowerLab systems meet the European EMC directive, which is equivalent to the FCC Class B standard in the United States.

All biopotential signal conditioners are approved to the IEC 60601-1 patient safety standard, making them safe for use with human subjects.

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PowerLab LabTutor Systems

PTB151 Human Physiology System I

The PTB151 includes a four-channel PowerLab 15T data acquisition unit with an integrated isolated stimulator and dual-channel bioamplifier. The revolutionary LabTutor software, in conjunction with transducers and accessories, allows a wide range of human physiology experiments to be performed. These include blood pressure, cardiovascular effects of exercise, breathing, ECG, EEG, EMG and reflexes and reaction times.

ML818 PowerLab 15T

- MLS040 LabTutor Software
- MLA2540 Shielded Bio Amp Cable
- MLA2505 Shielded Lead Wires
- MLADDF30 Stimulating Bar Electrode

MLT1010/D Pulse Transducer

MLT1132/D Respiratory Belt Transducer

MLT1100/D Sphygmomanometer

MLA92/D Push Button Switch

MLT201 Cardio Microphone

MLT003/D Hand Dynamometer

MLAYDG Dry Earth Strap

MLAWBT9 EEG Flat Electrodes

MLA700 Reusable ECG Electrodes

MLA1010 Disposable ECG Electrodes

MLA1093 Abrasive Gel

MLA1090 Electrode Cream

MLA1095 Electrode Paste

MLA1094 Alcohol Swabs

PTB152 Human Physiology System II

In addition to the equipment supplied with the PTB151, the Human Physiology System II includes the PTK10 Human Respiratory Kit. This provides the ability to carry out a number of respiratory airflow and volume exercises such as lung volumes and capacities, pulmonary function tests and the effects of airway restriction.

ML818 PowerLab 15T

- MLS040 LabTutor Software
- MLA2540 Shielded Bio Amp Cable
- MLA2505 Shielded Lead Wires
- MLADDF30 Stimulating Bar Electrode

MLT1010/D Pulse Transducer

MLT1132/D Respiratory Belt Transducer

MLT1100/D Sphygmomanometer

MLA92/D Push Button Switch

MLT201 Cardio Microphone

MLT003/D Hand Dynamometer

MLAYDG Dry Earth Strap

MLAWBT9 EEG Flat Electrodes

MLA700 Reusable ECG Electrodes

MLA1010 Disposable ECG Electrodes

MLA1093 Abrasive Gel

MLA1090 Electrode Cream

MLA1095 Electrode Paste

MLA1094 Alcohol Swabs

PTK10 Human Respiratory Kit

ML311 Spirometer Pod

MLT1000L Respiratory Flow Head

MLA1011A Clean Bore Tubing & Adapter

MLA145 Student Respiratory Kit

Complete Solutions for Life Science Education

PTB153 Human and Animal Physiology System

The PTB153 Human and Animal Physiology System includes the PTK11 Nerve and Muscle Kit that allows students to carry out the human physiology experiments featured in the PTB152 Human Physiology System II, as well as a number of animal physiology experiments. These include earthworm action potentials, frog heart, frog nerve and frog skeletal muscle experiments.

ML818 PowerLab 15T

- MLS040 LabTutor Software
- MLA2540 Shielded Bio Amp Cable
- MLA2505 Shielded Lead Wires
- MLADDF30 Stimulating Bar Electrode

MLT1010/D Pulse Transducer

MLT1132/D Respiratory Belt Transducer

MLT1100/D Sphygmomanometer

MLA92/D Push Button Switch

MLT201 Cardio Microphone

MLT003/D Hand Dynamometer

MLAYDG Dry Earth Strap

MLA1605 Shielded Lead Wires (5 alligator clips, 25 cm)

MLAWBT9 EEG Flat Electrodes

MLA700 Reusable ECG Electrodes

MLA1010 Disposable ECG Electrodes

MLA1093 Abrasive Gel

MLA1090 Electrode Cream

MLA1095 Electrode Paste

MLA1094 Alcohol Swabs

PTK10 Human Respiratory Kit

ML311 Spirometer Pod

MLT1000L Respiratory Flow Head

MLA1011A Clean Bore Tubing & Adapter

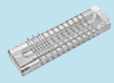
MLA145 Student Respiratory Kit

PTK11 Nerve and Muscle Kit

ML301 Bridge Pod

MLT500/A Force Transducer

MLA0320 Animal Nerve Stimulating Electrode



MLT012/B Nerve Chamber with Cables

MLA285 Differential Pod Input Cables (2)

MLA270 Stimulator Cable

Students acquiring EMG signals during one of the LabTutor exercises featured in the Muscle experiment.

Students performing spirometry flow and volume experiments using the PowerLab 15T, LabTutor and the Human Respiratory Kit.

PowerLab LabTutor Systems

PTB154 Animal Physiology System

This system is used for isolated nerve and muscle preparations from animals. These include earthworm action potentials, frog heart, frog nerve and frog skeletal muscle experiments. The Bridge Pod and Force Transducer allow muscle contraction measurements, while the PowerLab unit's Output connector and Bio Amp provide the means to stimulate and record action potentials.

ML818 PowerLab 15T

- MLS040 LabTutor Software
- MLA2540 Shielded Bio Amp Cable
- MLA2505 Shielded Lead Wires
- MLADDF30 Stimulating Bar Electrode

MLT1010/D Pulse Transducer

ML301 Bridge Pod

MLT500/A Force Transducer

MLA0320 Animal Nerve Stimulating Electrode

MLT012/B Nerve Chamber with Cables:

MLA285 Differential Pod Input Cables (2)

MLA270 Stimulator Cable

MLA1605 Shielded Lead Wires (5 alligator clips, 25 cm)

MLA013 Muscle Holder

MLA40 Manipulator & Stand

LabTutor Experiments*

* Please Note: Some experiments may require additional equipment. Contact your ADInstruments representative for further assistance.

Human Physiology

1. **Blood Pressure:** Auscultation, Cardio Microphone, Blood Pressure & Pulse, Hydrostatic Effects.
2. **Breathing:** Normal Respiration, Hyperventilation, Rebreathing, Breathing & Heart Rate.
3. **Cardiovascular Effects of Exercise:** ECG & Pulse at Rest, Pulse After Hand Exercises.
4. **The Diving Response:** Dive Simulation & Resting Heart Rate, Breath-Hold & Resting Heart Rate, Dive Simulation & Peripheral Circulation.
5. **ECG & Heart Sounds:** ECG at Rest, ECG Variation, ECG & Heart Sounds, ECG & Phonocardiography.
6. **ECG & Peripheral Circulation:** ECG & Pulse, The Pulse, Palpation of Arterial Pulses, Arterial Anastomoses.
7. **Electromyography (EMG):** Voluntary Contraction, Alternating Activity & Coactivation, Evoked EMG, Nerve Conduction Velocity.
8. **Electroencephalography (EEG):** EEG Artifacts, Alpha Waves, Mental Activity, Auditory Stimulation, Hyperventilation.
9. **Electro-Oculography (EOG):** Recognizing Artifacts, Angular Displacement, Saccades, Smooth Tracking, Gaze-Holding.
10. **Muscle:** Nerve Stimulation, Twitch Response & Recruitment, Summation, Tetanus, Force Grip – Muscle Fatigue.
11. **Reflexes & Reaction Times:** The Myotatic Reflex, The Pupillary Light Reflex, Contraction of the Palmaris Brevis, Reaction Time, Prewarning & Reaction Time, Predictable Clues & Reaction Time, Distraction & Reaction Time, Auditory Clues & Reaction Time.
12. **Respiratory Air Flow & Volume:** Lung Volumes & Capacities, Pulmonary Function Tests, Simulating Airway Restriction, Individual Variability.
13. **Sensory Physiology:** Convergence of Gaze, Accommodation (Focusing), Saccadic Masking, The Blind Spot, Mechanical Stimulation of the Retina, The Positive After-Image, The Negative After-Image, Retinal Blood Vessels, Visual Information, Optical Illusions, Color-Blindness, Two-Point Discrimination, A Tactile Illusion, A Thermal Illusion, Taste & Smell, Distribution of Taste Buds, The "Joint Position" Sense, The Semicircular Canals.
14. **Water Balance:** Kidney Performance.
15. **Gut Absorption**

Exercise Physiology

16. **Introduction to Fitness Testing:** Body Composition & Skinfolds, Measuring Blood Pressure & Heart Rate, Musculoskeletal Fitness.
17. **Cardiorespiratory Effects of Exercise:** Cardiorespiratory Effects of Exercise.
18. **Cardiovascular Effects of Exercise:** ECG & Pulse at Rest, Pulse After Hand Exercises.
19. **Aerobic Fitness Testing:** VO2 Max
20. **Anaerobic Fitness Testing:** MAOD test.
21. **Energy Metabolism:** Resting Values, Incremental Test.
22. **Energy Expenditure & Exercise:** Resting Values, Steady State Exercise.

Animal Physiology

23. **Earthworm Action Potentials:** Evoked Action Potentials, Lateral Axon Recruitment, Conduction Velocity, Refractory Period, Action Potential Bidirectionality.
24. **Earthworm Smooth Muscle:** Baseline Movements, ,Temperature Effects, Neurotransmitter Effects, Effects of Extracellular Ions.
25. **Frog Heart:** Baseline Data, Temperature Effects, Starling's Law of the Heart, Drug Effects.
26. **Frog Nerve:** Nerve Threshold, Nerve Refractory Period, Conduction Velocity.
27. **Frog Skeletal Muscle:** Twitch Recruitment, Effects of Stretch, Summation, Tetanus, Fatigue.
28. **Frog Nerve & Skeletal Muscle:** Twitch Recruitment, Effects of Stretch, Summation, Tetanus, Fatigue, Action of Tubocurare.

Pharmacology

29. **Drugs Affecting the Chick Biventer Cervicis:** Nerve Stimulation, Acetylcholine, Potassium Solution, Suxamethonium
30. **Drugs Affecting the Guinea Pig Atria:** Isoprealine, Isoprenaline after Propranolol, Acetylcholine, Acetylcholine After Atropine, Acetylcholine potentiation, Atrial Stimulation.
31. **Drugs Affecting the Mammalian Uterus:** Oxytocin Tissue Preparation, Epinephrine, Salbutamol
32. **Drugs Affecting the Stimulated Ileum:** Codeine, Naloxone and Codeine, Norepinephrine, Acetylcholine and Codeine.
33. **Drugs Affecting the Unstimulated Ileum:** Acetylcholine, Histamine, Nifedipine, Antagonists.

General Biology

34. **Introduction to Spectrophotometry:** Absorbance.
35. **Acid-Base Titration:** Acid Base Titration, Household Vinegar Titration, The Bicarbonate Buffer System, Amino Acid Titration.
36. **Biological Membranes:** Spectrophotometer.
37. **Cellular Respiration:** Glucose Metabolism, Substrate Specificity, pH Effects.
38. **Photosynthesis - Carbon Dioxide Fixation:** Photosynthesis, Light Intensity, Respiration
39. **Photosynthesis -Oxygen Production:** Photosynthesis, Light Intensity, Respiration
40. **Temperature Effects on Enzyme Performance:** Effects of Temperature

Guided and Pure PBL Experiments

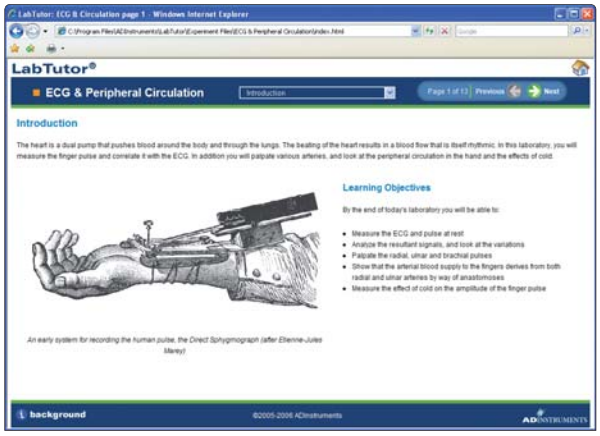
41. **Blood Pressure**
42. **ECG and Pulse**
43. **EMG**
44. **Respiration and Airflow**

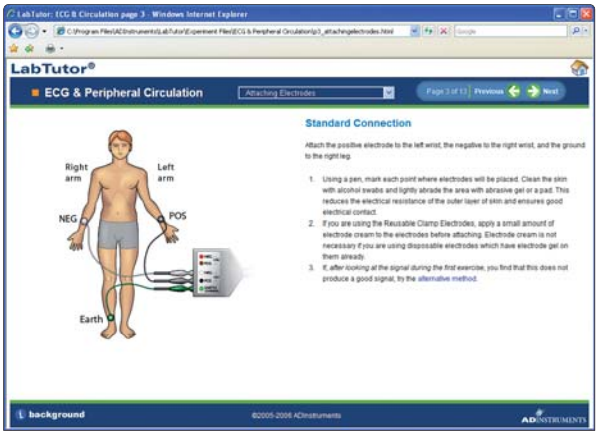
Free additional experiments are added on a regular basis to: www.adinstruments.com/LTexperiments

LabTutor Software

LabTutor not only provides all the background information students require for each experiment, it also features step-by-step instructions, real-time data acquisition, interactive analysis, measurement and graphing tools, as well as electronic reporting and submission. Using a simple HTML editor, educators are able to customize content, such as report questions. In summary, LabTutor provides a complete practical-laboratory course in one revolutionary software application. Benefits include minimized preparation time, increased independent learning, and best of all, more captivated students. The sample experiment pages below illustrate the LabTutor experiment structure.

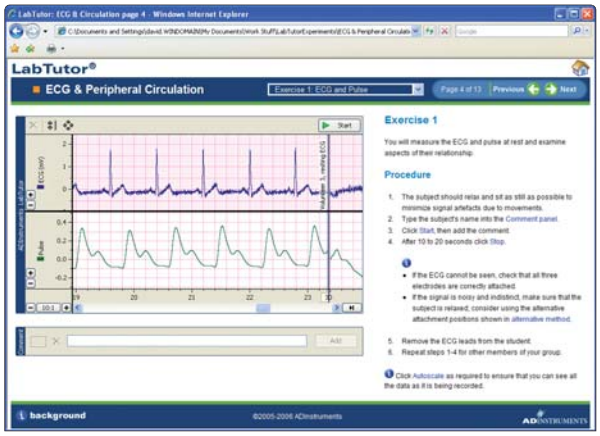
Introduction & Setup

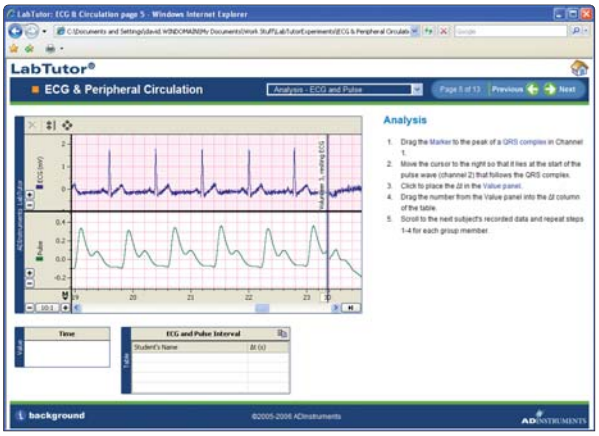


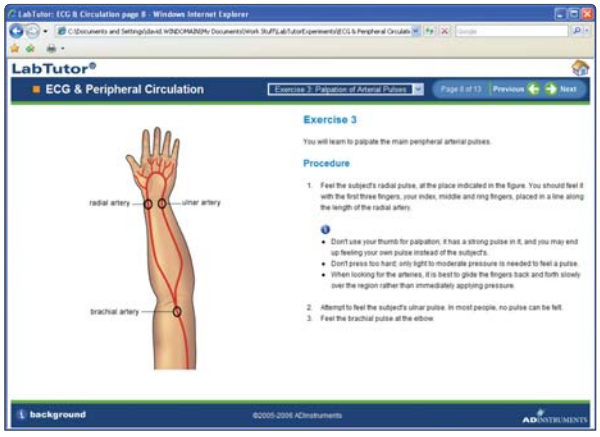


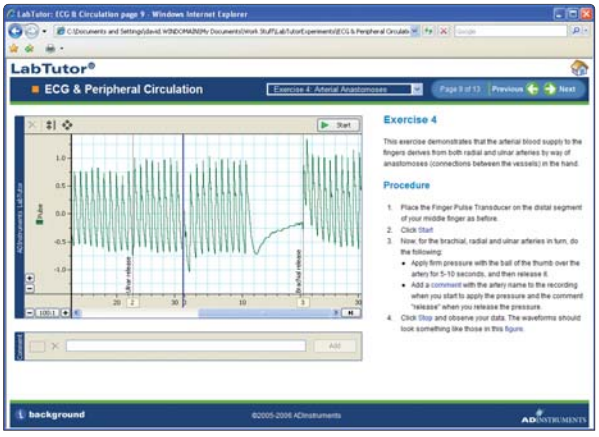
The Introduction section provides an explanation of the experiment and Learning Objectives. A Background information button provides additional scientific details about the experiment. This is followed with experiment setup instructions.

Data Acquisition & Analysis





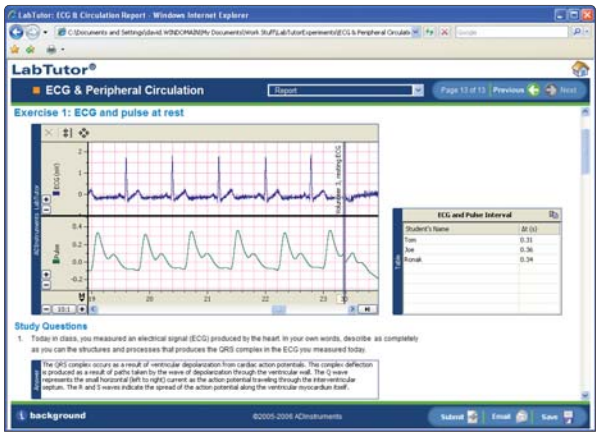


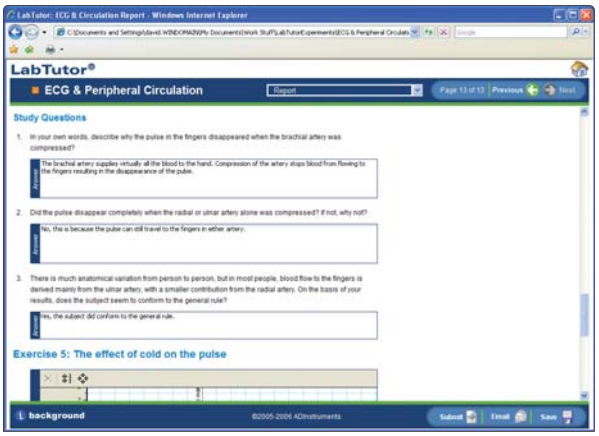


Following the setup stage, LabTutor takes students through a set of exercises with step-by-step instructions, real-time data acquisition and a series of interactive analysis tasks at the end of each exercise.

LabTutor Software

Reports & Submission





Following the completion of all exercises students move to the report section where they answer questions based on the analyzed data and their observations. As shown above, recorded and analyzed data is transferred to the report section. The reports can be submitted to a pre-specified email address, emailed to a user-selected address, or saved to the computer's hard-disk or a network location.

LabTutor requires Internet Explorer® 7.0 or later for Windows® XP with SP2, or Internet Explorer® 7.0 or later for Windows® Vista™. Connection to the Internet is not required.

Tailor LabTutor Experiments with LabAuthor

LabAuthor provides easy-to-use software tools for creating and editing LabTutor experiments. You can make changes to any preconfigured LabTutor experiment, or create a new experiment to suit your students' abilities, your laboratory classroom's facilities and your curriculum's learning outcomes. LabAuthor licenses may be purchased with or without onsite educator training and support packages.

PowerLab 15T

PowerLab 15T Specifications

- Two general recording channels
- Built-in two-channel bioamplifier
- Built-in isolated stimulator
- Analog bandwidth: 25 kHz
- Two analog outputs (–10 to +10 V)
- 16-bit signal resolution
- Continuous sampling rates: 100 kHz per channel (4 channels)
- Human Safety Certification: IEC 60601-1 (Patient Safety) IEC 60601-1-2 (EMC)
- Communication: USB 1.1 and 2.0

The PowerLab 15T provides high-quality, easy-to-use and affordable data acquisition. The built-in amplifier and stimulator are certified safe for human use, so you can feel at ease when students connect themselves to the PowerLab. Students can be ready to begin recording in seconds by simply starting LabTutor software and plugging in the transducer or electrode.

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