PHYSICS
2020 LAB-READY SOLUTIONS

Wireless Technology
Discover wireless sensors with powerful data capabilities for the modern learner.

Get Started Today
Time-saving software for data collection and analysis

Sensors & Lab Manuals
Just the tools you need to get started collecting data in your Physics lab!
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Smart Cart (pages 2 & 5)
Wireless Smart Cart

It's easier and more affordable than ever before to get started with PASCO!

The Smart Cart is an all-in-one physics device that includes sensors for position, velocity, acceleration, rotation, and force. Visualize motion in real time with live data displays, then analyze it with built-in statistics tools and curve fits.

- Add calculated columns and plots
- Use on or off a dynamics track
- Free SPARKvue app
- Patent number 10,481,173

Start with PASCO's amazing Smart Cart, or outfit your science lab with a low-cost sensor bundle.

Get Started Today
From sensors and software to storage and labs, PASCO products are easy to use, so you and your students can focus on doing science.
SPARKvue® 4
This award-winning data collection and analysis software works on any platform!

SPARKvue’s intuitive design has made it an award-winning tool for collecting and analyzing experimental data. The user-friendly platform optimizes data collection and provides tools for in-depth analysis within a compact, yet powerful workspace. With the recent release of SPARKvue 4, we’ve added new features, including a new Welcome screen and Blockly coding. Now, students can use block-based code to sense and control PASCO devices, including any of our wireless sensors.

Data Collection:
- Live Data Bar: View sensor readings before recording
- Periodic Sampling: Automatic sampling at a fixed rate
- Manual Sampling: Saves data only when a user specifies
- Blockly: Adds coding plus sense and control functions
- Collaborate: Start a shared session and stream results in real-time

Data Displays:
- Graph displays with multiple plot areas and axes
- Digits
- Meter
- Data Tables
- FFT
- Map Display
- Weather Dashboard
- Oscilloscope

Tools for Data Analysis:
- Scale-to-Fit: Adjust axes for optimal data view
- Data Selection: Easily select a portion of data for analysis
- Prediction Tool: Visualize a prediction alongside the data
- Smart Tool: Find data coordinates and calculate delta values
- Calculation Tools for Statistics: Easily obtain statistics such as minimum, maximum, mean values and more
- Slope Tool: Find the slope of a curve at a specific point
- Curve Fits: Various curve fits with goodness of fit values
- User Annotation: Easily add text notes to runs or points
- Axes: Add another y-axis or a new plot with one button

SPARK LXi Datalogger
The SPARK LXi Datalogger is a Bluetooth® handheld datalogger that enables students to connect wired and wireless sensors, collect data, generate graphs, and analyze results. It is durable, splash-proof, and works seamlessly with PASCO sensors. The SPARK LXi can simultaneously accommodate up to five wireless sensors. It includes two ports for PASPORT sensors, as well as two ports for the included Fast Response Temperature Probe and Voltage Probe. It can be used with PASCO wireless sensors and PASPORT sensors with an AirLink, SPARKlink®, Air, or 550 Universal Interface.

Features:
- 8” Color Capacitive Touchscreen (1280 x 800 pixels)
- 2 GHz Quad Core Processor, 1.5 GB RAM, 16 GB Memory
- Speakers, microphone, GPS, accelerometer, and two cameras
- Simultaneously connects up to 5 PASCO wireless sensors
- WiFi-enabled
- Easily send and collect files between devices

Software:
- SPARKvue® for data collection and analysis, MatchGraph, and Spectroscopy
- Microsoft Word, Excel, and PowerPoint,
- Scientific Calculator, Periodic Table, and Google Science Journal

PASCO wireless sensors are Bluetooth accessories and require Bluetooth Low Energy wireless technology or our USB Bluetooth adapter. Bluetooth is a registered trademark of Bluetooth SIG. Apple, the Apple logo, iPad, iPhone, and Mac are trademarks of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc. Android, Chromebook, and Google Play are trademarks of Google Inc. Windows is a registered trademark of Microsoft Corporation in the United States and/or other countries. www.pasco.com © 2020 PASCO Scientific. All rights reserved.
Physics Solutions
Reimagine science learning for today’s students with physics solutions from PASCO. Our hands-on investigations sync real-time data with experimental events to help students form topical connections that are supported by data literacy.

Sample Lab Activities
• Motion Graphs
• Static Equilibrium
• Work and Energy
• Gear Ratios
• Resonance and Sound
• Electricity and Circuits
• Voltage and Batteries
• Pulleys
• Waves
• Interference

Essential Physics Student and Teacher Lab Manuals
These lab manuals contain 46 labs that cover a full year of instruction. The Student Lab Manual is a print-only version. The Teacher Lab Manual comes in both an all-digital version and a print version. Also available is the Essential Physics Teacher Lab Manual Resources. This rich, all-digital resource includes editable documents, PowerPoint presentations, answer keys, video lab assistance, and more.

Essential Physics Comprehensive Equipment Kit
Use the Comprehensive Kit to perform 43 activities in the Lab Manual. Or buy the individual kits to study these specific topics in your curriculum:
• Forces & Motion
• Modular Circuits
• Simple Machines
• Light, Color & Optics
• Oscillations, Waves & Sound

See PASCO’s complete Essential Physics curriculum at pasco.com/essentialphysics

For details, call your PASCO Education Specialist at 800-772-8700.
PASCO Wireless Smart Cart

The Wireless Smart Cart has been a game-changer for physics labs around the world. The patented device collects live data for position, velocity, acceleration, force, and rotation, which eliminates the need for multiple sensors.

Help students understand physics concepts with revolutionary Smart Cart accessories, such as the Smart Cart Vector Display.

SMART CART

Charge up to five Smart Carts and store accessories.

SMART FAN ACCESSORY

Apply a constant or variable force to your Smart Cart.

SMART BALLISTIC CART ACCESSORY

Demonstrate the independence of horizontal and vertical projectile motion.

SMART CART VECTOR DISPLAY

See force, acceleration, or velocity vectors directly on your Smart Cart.

NEW

SMART CART VECTOR DISPLAY

Patent No. 10,482,789

For more information and specifications on these products, go to pasco.com/physics
Wireless Sensors and Equipment

Wireless Motion Sensor
The Wireless Motion Sensor connects via Bluetooth® or USB to your device. It uses ultrasound to measure the position, velocity, and acceleration of objects.

Features:
- Clips to PASCO Dynamics Tracks
- Rod clamp for mounting
- 180° pivoting head
- Rechargeable lithium-ion battery
- Bluetooth® or USB connectivity
- False Target Rejection Technology produces clean data

Wireless Motion Sensor ........................................PS-3219 $99

Wireless Force Acceleration Sensor
Capable of simultaneously measuring force, acceleration, and rotation, this sensor is ideal for experiments involving rotating platforms, moving carts, spring oscillations, collisions, and impulse.

Applications:
- Impulse and momentum
- Determine static and kinetic friction coefficients
- Measure centripetal acceleration and centripetal force
- Newton’s Second Law
- Newton’s Third Law

Wireless Force Acceleration Sensor ..........................PS-3202 $99

Wireless Smart Gate
The Wireless Smart Gate has dual photogate beams spaced at 1.5 cm to accurately measure speed. When used with any laser, the built-in laser switch allows you to time objects too large to fit through the standard photogate.

Features:
- 180° pivoting head
- Accepts additional photogate head
- Log data directly on the sensor
- Auxiliary port for Time-of-Flight Accessory

Wireless Smart Gate ............................................PS-3225 $85

Wireless Rotary Motion Sensor
The Wireless Rotary Motion Sensor measures angle, angular velocity, and angular acceleration, as well as their linear equivalents.

Applications:
- Rotational kinetic energy
- Static equilibrium of a rigid body
- Rotational inertia

Wireless Rotary Motion Sensor .................................PS-3220 $179

Wireless 3-Axis Acceleration/Altimeter Sensor
This 3-Axis Magnetic Field Sensor can sense the Earth’s magnetic field and fields from coils and bar magnets. There are two ranges: ±50 gauss and ±1300 gauss. This sensor is primarily for static fields.

Applications:
- Determine magnetic field strength
- Electromagnetic induction
- Magnetic field in a current-carrying coil

Wireless 3-Axis Magnetic Field Sensor .....................PS-3221 $69

Wireless 3-Axis Acceleration/Altimeter Sensor
The Wireless 3-Axis Acceleration/Altimeter can remotely log acceleration in three dimensions and altitude, making it ideal for recording roller coaster rides.

Features:
- Measures acceleration, altitude, and angular velocity
- Adjustable strap for stability
- Ranges of ±16 g, ±100 g, ±200 g, and ±400 g

Wireless 3-Axis Acceleration/Altimeter Sensor ..........PS-3223 $95

For details, call your PASCO Education Specialist at 800-772-8700.
Wireless Sensors and Equipment

Wireless Voltage Sensor
The Wireless Voltage Sensor is ideal for exploring the fundamental concepts of electricity, voltage, and basic circuits.

Applications:
- Measure the voltage across components in a simple circuit
- Measure the induced voltage in a wire coil as a magnet passes through
- Kirchhoff’s Voltage Law
- Ohm’s Law
- RC and LRC circuit analysis
- Faraday’s Law of Induction

Features:
- Ranges of ±1.0 A and ±0.1 A
- Resolution of 0.2 mA at ±1 A range and 0.02 mA at ±0.1 A range
- Bluetooth® sampling rate of 1.0 kHz
- High-speed sampling via USB
- Remote logging
- Variable sampling rate

Wireless Light Sensor
The Wireless Light Sensor includes apertures for ambient light measurements and directional light measurements.

Features:
- Ambient sensor measures illuminance and UV Index
- Spot aperture measures light level and color intensity
- Displays the relative intensities of RGB light, then sums them to determine the level of white light
- PAR and irradiance calculations available
- Onboard memory for datalogging

Wireless Current Sensor
The Wireless Current Sensor’s wide current range enables introductory and advanced explorations of the fundamental concepts of electricity and basic circuits.

Features:
- Ranges of ±1.0 A and ±0.1 A
- Resolution of 0.2 mA at ±1 A range and 0.02 mA at ±0.1 A range
- Bluetooth® sampling rate of 1.0 kHz
- High-speed sampling via USB
- Remote logging
- Variable sampling rate

Wireless Sound Sensor
The Wireless Sound Sensor contains Sound Level and Sound Wave functions that measure true sound level (intensity) and relative changes in sound pressure level as sound waves incident on the sensor.

Applications:
- Measure sound level and frequency
- Measure the speed of sound in air
- Study sound waves
- Investigate resonance and standing waves

Wireless Pressure Sensor
The Wireless Pressure Sensor allows students to easily collect accurate gas pressure data for a wide range of applications.

Applications:
- Study Boyle’s Law and Charles’ Law
- Hydrostatic pressure
- Determine absolute zero
- Ideal Gas Law

Wireless Temperature Sensor
The Wireless Temperature Sensor measures small but significant temperature changes produced by chemical reactions, convection currents, and even skin temperatures.

Features:
- Onboard memory for datalogging
- Records and displays live temperature data
- Water-resistant
- Includes Bluetooth® connectivity and long-lasting coin cell battery

Wireless Voltage Sensor .................................................. PS-3211 $65
Wireless Current Sensor .................................................. PS-3212 $74
Wireless Light Sensor ...................................................... PS-3213 $72
Wireless Sound Sensor .................................................... PS-3227 $89
Wireless Pressure Sensor .................................................. PS-3203 $89
Wireless Temperature Sensor ............................................. PS-3201 $49

For more information and specifications on these products, go to pasco.com/physics
Basic Modular Circuits Kit

These circuit modules are designed specifically for introductory circuits investigations. For students who have never wired a circuit, this modular system makes it easy for them to see their circuit physically laid out exactly as it appears in their circuit diagram.

Each module connects mechanically to another by sliding the tabs into each other. It works on any tabletop. To electrically connect two modules, students insert a jumper clip, which emphasizes that an electrical connection has been made. The large size of the modules (8 cm x 8 cm) enables all the students around the table to see and understand completed circuits.

Applications:
- Kirchhoff’s Laws
- Batteries and Bulbs Circuits
- Switches/Open/Closed Circuits
- Resistance and Ohm’s Law
- Series/Parallel Circuits
- Circuits and Electricity

Basic Modular Circuits Kit.........................................EM-3535  $180