

# Wireless Motion Sensor (PS-3219)

## Hardware

### Included Equipment

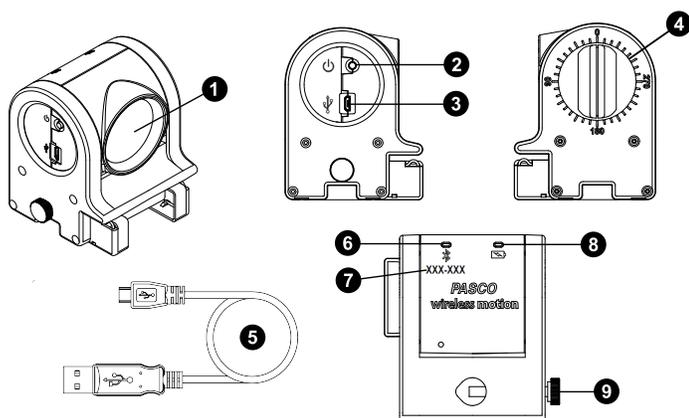
- Wireless Motion Sensor
- Micro USB Cable

### Required Item\*

- PASCO Capstone or SPARKvue

### Other Items

- PASCO Cart and Track Dynamics System
- Motion Sensor Guard
- Motion Sensor Bracket
- Cart Adapter Accessory



- 1 Sensing Element
- 2 ON/OFF button
- 3 Micro USB port
- 4 Angle Indicator
- 5 Micro USB cable
- 6 Bluetooth LED
- 7 Device ID
- 8 Battery LED
- 9 Thumb screw

## Introduction

The Wireless Motion Sensor is a combination wireless *and* USB sensor that connects to a computer or a tablet device through Bluetooth, and can also connect to a computer with a USB cable (included). The sensor measures distances to an object from 15 centimeters to 4 meters. The sensing element can be rotated 180 degrees. The sensor can be mounted on the end of any PASCO track, or on a support rod up to 12.5 millimeters in diameter. Use the Cart Adapter Accessory to mount the sensor on any PASCO Dynamics Cart. (See "Equipment Mounting".)

## How It Works

An electrostatic transducer in the face of the Wireless Motion Sensor transmits a burst of sixteen ultrasonic pulses with a frequency of about 49 kHz. This burst of pulses can be heard as a single click. The ultrasonic pulses reflect off the target and return to the face of the sensor.

Sound intensity decreases with distance; to compensate, the sensor increases the gain of the receiver amplifier as it waits for the echo. The increased gain allows the sensor to detect an object up to 4 m away. The lower gain at the beginning of the cycle reduces the circuit's sensitivity to echoes from false targets.

The sensor measures the time between the outgoing pulses and the returning echoes. It uses this time and the speed of sound to calculate the distance to the target. To determine velocity, the software uses consecutive position measurements to calculate the rate of change of position. Similarly, the software determines acceleration by using consecutive velocity measurements.

## Using the Sensor

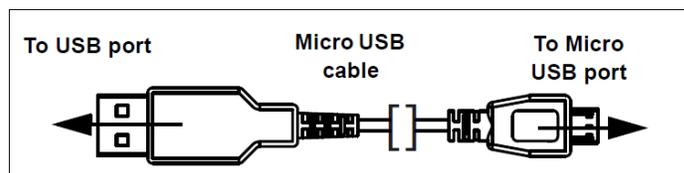
The sensor is designed to work with PASCO data collection software to measure distances to an object in front of the sensing element. The software displays position, velocity, and acceleration.

## Software Help

See the SPARKvue Help or PASCO Capstone Help for information about collecting, displaying, and analyzing data.

- In SPARKvue, select the HELP button ( ? ) in any screen, including the Home Screen.
- In PASCO Capstone, select **PASCO Capstone Help** from the **Help** menu, or press **F1**.

## Initial Step: Charge the Battery



- **Connect the Cable:** Use the Micro USB Cable to connect the micro USB port on the end of the sensor to a USB port or USB charger such as the PASCO PS-2575A Universal USB Charger. Charging begins automatically. The charger circuit inside the sensor turns itself off when the unit is fully charged. The battery status LED will shine yellow as the battery as charging, and will shine green when the battery is charged. The battery is partially charged at the factory. Initial charging time may be three hours or longer depending on the power source and the condition of the battery.

## LED Information

The Bluetooth and the Battery Status LEDs operate as follows:

### Bluetooth LED:

LED	Status
Red blink	Ready to pair
Green blink	Connected
Yellow blink	Logging*



**NOTE:** The Bluetooth LED will not display a red or green blink when connected via micro USB cable to a USB port.

### Battery LED:

LED	Status
Red blink	Low power
Yellow ON	Charging
Green ON	Fully charged

\***Logging:** PASCO wireless sensors can either stream live data to a compatible device or log data (save it to the sensor's memory). The data can then be uploaded to the device for display and analysis at a later time. Logging capability supports long-term or remote data collection while not connected to the device.

## ON/OFF Information

To turn the sensor on, press the ON button. The status LEDs will blink. To turn the sensor off, press and **hold** the ON button for a moment until the status LEDs stop blinking. The sensor puts itself to sleep after 1 hour of inactivity if connected, and after several minutes if not connected.

## Set Up the Software

### SPARKvue

#### Connecting the Sensor to a Tablet or a Computer via Bluetooth

- For SPARKvue, select the Bluetooth icon in the **Wireless Devices** list. The sensors are ordered by proximity to the device. Select the correct address that matches the Device ID number (XXX-XXX) found on the sensor. Select **Done**.

#### Connecting the Sensor to a Computer with the Micro USB Cable

- Connect the micro end of the included Micro USB Cable into the micro USB port on the end of the sensor. Connect the other end of the Micro USB Cable to a USB port on the computer, or into a powered USB hub connected to the computer.
- In the SPARKvue Home Screen, select a measurement from the list under the sensor's name. A graph of the

measurement versus time opens.

### Collecting Data

- Select the Start button to begin collecting data.

## PASCO Capstone

### Connecting the Sensor to a Tablet or a Computer via Bluetooth

- For PASCO Capstone, select **Hardware Setup** in the Tools palette. In **Hardware Setup**, the sensors are ordered by proximity to the device. Select the correct address that matches the Device ID number (XXX-XXX) found on the sensor.
- Select a display in the main window or from the **Display** palette. In the display, use the **<Select Measurement>** menu to pick a measurement to be shown.

### Connecting the Sensor to a Computer with the Micro USB Cable

- Connect the micro end of the included Micro USB Cable into the micro USB port on the end of the sensor. Connect the other end of the Micro USB Cable to a USB port on the computer, or into a powered USB hub connected to the computer.
- In PASCO Capstone, select a display in the main window or from the **Displays** palette. In the display, use the **<Select Measurement>** menu to pick the measurement to be shown.

### Collecting Data

- Select **Record** to begin collecting data.



**NOTE:** The Wireless Motion Sensor has options for tracking motion at either long range or short range; these can be toggled through the sensor settings in PASCO Capstone or SPARKvue. (See the online help guide for more detailed instructions.) It is recommended that the short range setting be selected when using the sensor with carts and tracks.

## Troubleshooting the Sensor

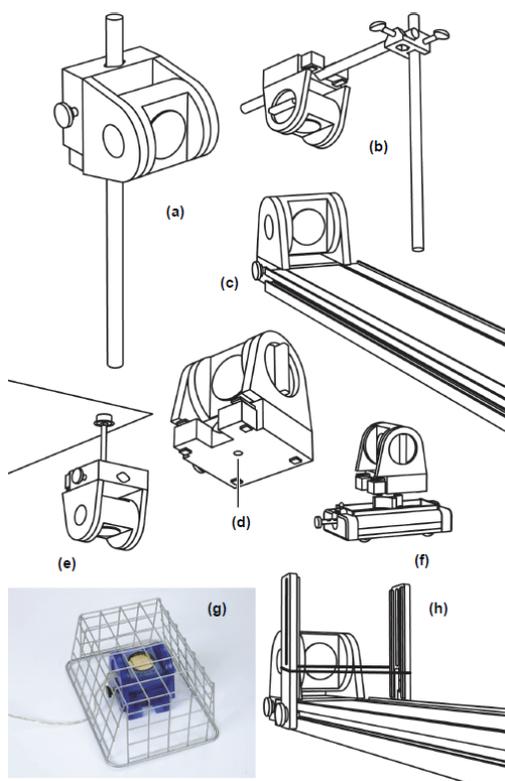
- If the sensor loses Bluetooth connection and will not reconnect, try cycling the ON button. Press and briefly **hold** the button until the status LEDs blink in sequence, then release the button. Start the sensor in the usual way.
- If the sensor stops communicating with the computer software or tablet application, try restarting the software or application. If the problem persists, press and **hold** the ON button for 10 seconds and then release. Start the sensor in the usual way.
- Turn Bluetooth off and then back on. Retry.

## Maximum Distance

When set to a high sampling rate, the Wireless Motion Sensor's maximum distance will be reduced. Attempting to measure past this distance will result in inaccurate or broken data. This maximum distance reduces further as the sampling rate is increased, and will also be halved if you have two connected motion sensors facing each other. To measure data at a greater distance, try reducing the sampling frequency.

- The maximum distance for this sensor at 100 Hz will be 1.72 m (or 0.86 m for two motion sensors).
- The maximum distance for this sensor at 200 Hz will be 0.86 m (or 0.43 m for two motion sensors).
- The maximum distance for this sensor at 250 Hz will be 0.69 m (or 0.34 m for two motion sensors).

## Equipment Mounting



Mount the Wireless Motion Sensor as illustrated on a vertical rod (a) or a horizontal rod (b).

Integrated clips on the lower front end of the sensor allow it to be attached to the end of a PASCO track (c).

A threaded hole in the bottom of the unit (d) is provided for attachment to the Motion Sensor Bracket (e), the Cart Adapter Accessory (f), and other 1/4-20 threaded mounting devices such as a camera tripod.

To protect the Wireless Motion Sensor from being hit by an object, use a device such as the Motion Sensor Guard (g) or Photogate Brackets with a rubber band (h).

The sensor can "see through" a wire screen or rubber band placed close to the transducer.

## About the Battery

The sensor's battery is partially charged at the factory. If the battery status LED blinks red, use the micro USB cable to connect the sensor to a USB port or a USB charger.

### Battery Usage

Battery life is very important to making the sensor simple and always ready to use, so all of the PASCO wireless products are designed for long battery life. For example, the sensor turns itself off after a few minutes of inactivity.

The battery life between charges for the sensor varies depending on the sampling rate. The battery life ranges between 11 hours for high sample rates to more than 70 hours for low sample rates.

In typical classroom/lab use, this would translate to a battery life between charges ranging from one to four weeks or more, because full-day continuous sampling would be unusual. Even in the most extreme case with a high sample rate, the sensor battery would support a full day of use before needing to recharge.

### Maximizing Battery Life

One factor that affects battery life is the storage temperature and the number of charge cycles. Therefore, avoid storing the sensor in very cold or very hot environments.

## Specifications and accessories

Visit the product page at [pasco.com/product/PS-3219](http://pasco.com/product/PS-3219) to view the specifications and explore accessories. You can also download experiment files and support documents from the product page.

## Experiment files

Download one of several student-ready activities from the PASCO Experiment Library. Experiments include editable student handouts and teacher notes. Visit [pasco.com/freelabs/PS-3219](http://pasco.com/freelabs/PS-3219).

## Technical Support

Need more help? Our knowledgeable and friendly Technical Support staff is ready to answer your questions or walk you through any issues.

- ☐ Chat [pasco.com](http://pasco.com)
- ☎ Phone 1-800-772-8700 x1004 (USA)  
+1 916 462 8384 (outside USA)
- ✉ Email [support@pasco.com](mailto:support@pasco.com)

The Reference Guide will be updated periodically. For the latest revision of this Reference Guide, visit the PASCO website at [www.pasco.com/manuals](http://www.pasco.com/manuals) and enter the product number, PS-3219, in the text window.

## Replacement Parts

For information about possible replacement parts, contact Technical Support.

### Limited Warranty

For a description of the product warranty, see the Warranty and Returns page at [www.pasco.com/legal](http://www.pasco.com/legal).

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### FCC statement

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### CE statement

This device has been tested and found to comply with the essential requirements and other relevant provisions of the applicable EU Directives.

### Product end-of-life disposal



This electronic product is subject to disposal and recycling regulations that vary by country and region.

It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment.

To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle or disposal service, or the place where you purchased the product.

The European Union WEEE (Waste Electronic and Electrical Equipment) symbol on the product or its packaging indicates that this product must not be disposed of in a standard waste container.

### Battery disposal

Batteries contain chemicals that, if released, may affect the environment and human health.

Batteries should be collected separately for recycling and recycled at a local hazardous material disposal location adhering to your country and local government regulations.

To find out where you can drop off your waste battery for recycling, please contact your local waste disposal service, or the product representative.

The battery used in this product is marked with the European Union symbol for waste batteries to indicate the need for the separate collection and recycling of batteries.