Wireless Smart Gate

PS-3225

Introduction

The Wireless Smart Gate is a versatile measuring device that connects to a computer or mobile device wirelessly through Bluetooth, or to a computer via the included micro USB cable. The Wireless Smart Gate measures the time for an object's motion, such as a PASCO cart, as the object blocks one or more beams of light. The Smart Gate has three detector ports and one auxiliary port.

Port 1 and Port 2 operate in the same way as a pair of PASCO photogates that are side-by-side. The space between the emitters for Port 1 and Port 2 is 1.5 cm. PASCO Capstone or SPARKvue software records and displays the times for a variety of timing combinations, such as the amount of time each port is blocked or the time from when one port is blocked until the second port is blocked. The software also displays the values of various calculations using these times, such as the speed or velocity between Port 1 and Port 2. These ports also include slots for High Resolution Photogate Tape (ME-6666).

Port 3, the Auxiliary Port, is the port for a photogate, or for a similar device such as a Time-of-Flight Accessory (ME-6810A). Port 3 accepts a ½ inch (6.35 mm) "tip-ring-sleeve" phono plug.

Port 4, the Laser Detector Port, works with an external laser beam to measure the movement of objects too large to pass through the Smart Gate. The software begins recording when a laser beam shining into the port is blocked by a passing object.

Equipment

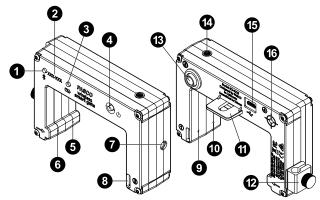
Included equipment:

- Wireless Smart Gate (PS-3225)
- Mounting Rod
- Micro USB cable

Required software:

• PASCO Capstone or SPARKvue data collection software

Features



1 Bluetooth Status LED

Indicates the status of the Wireless Smart Gate's Bluetooth connection.

Bluetooth LED	Status
Red blink	Ready to pair
Green blink	Connected



NOTE: The Bluetooth Status LED is disabled when the Smart Gate is connected to a computer via the micro USB cable.

2 Device ID

Use to identify the Wireless Smart Gate when connecting via Bluetooth.

3 Battery Status LED

Indicates the status and charge level of the battery.

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

4 ON/OFF button

Press to turn the Smart Gate on. Press and briefly hold to turn the Smart Gate off. To preserve battery, the Smart Gate automatically turns itself off after several minutes of inactivity if not connected.

6 Port 1 emitter

Emits the laser which is detected by the Port 1 detector.

6 Port 2 emitter

Emits the laser which is detected by the Port 2 detector.

7 1/4-20 Threaded Hole

Use to attach the included Mounting Rod to the Smart Gate.

8 Photogate Tape slot

Insert High Resolution Photogate Tape (ME-6666) into this slot.

Port 1 detector

Provides a signal to the software when the beam from the Port 1 emitter is blocked.

Port 2 detector

Provides a signal to the software when the beam from the Port 2 emitter is blocked.

Super Pulley tab

Mount a Super Pulley (ME-9450A) here if setting up a pulley timer or other experiment using the pulley. (See Connecting a **Super Pulley to the Smart Gate.)**

12 Swivel rod clamp

Use with the included thumbscrew to mount the Smart Gate to a 1/4 inch vertical rod, such as the Photogate Stand (ME-9805). Can be detached if desired.

Port 3 (Auxiliary Port)

Connects the Smart Gate to an external device, such as a Photogate Head (ME-9498A) or Time-of-Flight Accessory (ME-6810A).

1 Indicator LED

Lights up when one or more of the ports in use are blocked.

LED	Status
Amber	Port 1 blocked
Green	Port 2 blocked
Red	Ports 1 and 2 blocked
	Port 3 or 4 event

Micro USB port

Use with the included micro USB cable to connect the Smart Gate to a USB charger. The port and cable can also be used to directly connect the sensor to a computer without the use of Bluetooth. This connection method is not supported by iOS.

Port 4 (Laser Detector Port)

Sends a signal to the software when a beam shining into the port is blocked.

Initial step: Charge the battery

Charge the battery by connecting the micro USB port to any standard USB charger. The Battery Status LED is solid yellow while charging. When fully charged, the LED changes to solid green.

Get the software

You can use the sensor with SPARKvue or PASCO Capstone software. If you're not sure which to use, visit pasco.com/products/guides/ software-comparison.

SPARKvue is available as a free app for Chromebook, iOS, and Android devices. We offer a free trial of SPARKvue and Capstone for Windows and Mac. To get the software, go to pasco.com/downloads or search for SPARKvue in your device's app store.

If you have installed the software previously, check that you have the latest update:

SPARKvue: Main Menu => Check for Updates

PASCO Capstone: Help > Check for Updates

Check for a firmware update

SPARKvue

- 1. Press the power button until the LEDs turn on.
- 2. Open SPARKvue, then select **Sensor Data** won the Welcome Screen.
- 3. From the list of available devices, select the sensor that matches your sensor's device ID.
- 4. A notification will appear if a firmware update is available. Click Yes to update the firmware.
- 5. Close SPARKvue once the update is complete.

PASCO Capstone

- 1. Press the power button until the LEDs turn on.
- 2. Open PASCO Capstone and click Hardware Setup M from the Tools palette.
- 3. From the list of available wireless devices, select the sensor that matches your sensor's device ID.
- 4. A notification will appear if a firmware update is available. Click Yes to update the firmware.
- 5. Close Capstone once the update is complete.

Hardware setup



NOTE: The open space for the Wireless Smart Gate is 7.2 cm (width) by 4.0 cm (depth). Use Port 4 to measure the motion of objects larger than this.

Mounting the Smart Gate to a rod

The included Mounting Rod fits into the 1/4-20 threaded hole on the side of the Wireless Smart Gate opposite the swivel rod clamp, as shown in Figure 1. The swivel rod clamp and thumbscrew also allow the Smart Gate to be mounted on a 1/4-inch diameter rod, such as the Photogate Stand (ME-9805).

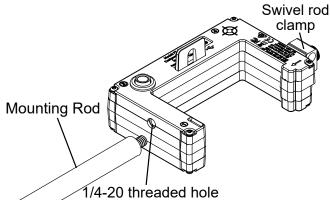


Figure 1. Mounting the Smart Gate to a rod.

Adding a Super Pulley to the Smart Gate

The tab on the Wireless Smart Gate housing provides a seat to attach a Super Pulley (ME-9450) using the Mounting Rod. Slide the 1/4-20 threaded end of the rod through the gap in the tab, as shown in Figure 2, then screw the Super Pulley onto the rod.

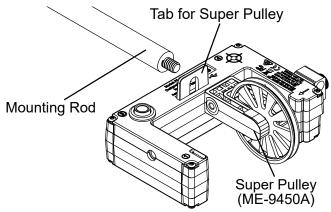


Figure 2. Adding a Super Pulley to the Smart Gate.



NOTE: When using the Super Pulley with the Wireless Smart Gate, only Port 1 will record state changes caused by the rotating pulley.

This setup should be used with the Smart Pulley (Linear) or Smart Pulley (Rotational) timers in SPARKvue or the Photogate with Pulley timer in Capstone. (See Timers.)

Mounting the Smart Gate on a track

The Wireless Smart Gate can be attached to the side of a PASCO track using a Photogate Bracket (ME-9806), as shown in Figure 3. To do so:

- 1. Slide the Photogate Bracket's square nut into the T-slot on the side of the track.
- 2. Secure the Photogate Bracket in place using the included large thumbscrew.
- 3. Remove the swivel rod clamp from the Wireless Smart Gate. Set it aside to be reattached at a later time.
- 4. Use the short thumbscrew from the Photogate Bracket assembly to attach the Wireless Smart Gate to the Photogate Bracket. (See Figure 3.)

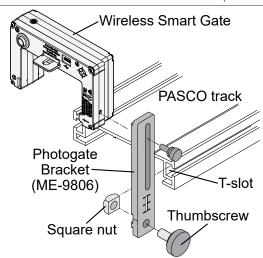


Figure 3. Mounting the Wireless Smart Gate to a PASCO track.

Half of the Wireless Smart Gate's casing fits between the "rails" on the ribbed side of the Photogate Bracket, allowing the Smart Gate to be adjusted up or down. To adjust the Photogate Bracket to an angle relative to the track, mount the bracket on the track with the smooth side against the edge of the track. The small thumbscrew will hold the Wireless Smart Gate in place against the smooth side of the bracket. Both the bracket and the Smart Gate can then be set at any angle.

Mounting the Smart Gate on a projectile launcher

You may use a Photogate Mounting Bracket (ME-6821A) to attach the Wireless Smart Gate to a Projectile Launcher (ME-6800) or Mini Launcher (ME-6825B), as shown in Figure 4. To do so:

- 1. Clamp the Projectile Launcher in place on the included base. See the Projectile Launcher manual for setup instructions.
- 2. Mount the Photogate Mounting Bracket in the T-slot of the Projectile Launcher. Adjust the bracket so that the second position of the bracket is aligned with the end of the launcher.
- 3. Remove the swivel rod clamp from the side of the Wireless Smart Gate. Set it aside to be reattached at a later time.
- 4. Use one of the smaller thumbscrews from the Photogate Mounting Bracket to attach the Smart Gate to the bracket. (See Figure 4.)

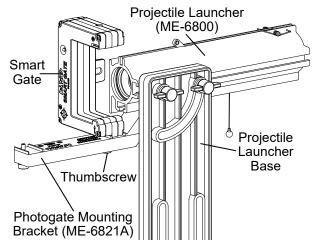


Figure 4. Mounting the Smart Gate to the Projectile Launcher.



Using the Smart Gate with the Time-of-Flight Accessory

The Time-of-Flight Accessory (ME-6810A) is designed for projectile motion experiments. The accessory can be used with a Wireless Smart Gate mounted on a Projectile Launcher (ME-6800) or Mini Launcher (ME-6825B) to measure the time of a projectile's motion from launch to landing. To do so, follow the setup instructions from **Mounting the Smart Gate on a Projectile Launcher**, then connect the plug from the Time-of-Flight Accessory into Port 3 on the back of the Wireless Smart Gate, as shown in Figure 5. The Smart Gate will measure the initial speed of the projectile, and the Time-of-Flight Accessory will measure total travel time.

This setup should be used with the **Time Of Flight** timer in SPARKvue or the **Time of Flight (Smart Gate)** timer in Capstone. (See **Timers**.)

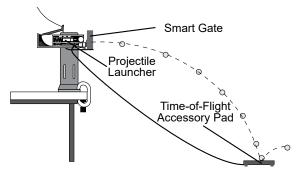


Figure 5. Connecting the Time-of-Flight Accessory to the Smart Gate.

Using the Smart Gate with Photogate Tape

High Resolution Photogate Tape (ME-6666) fits through the Photogate Tape Slot on the detector side of the Wireless Smart Gate. The Photogate Tape is reusable and is made of a flexible Mylar material that can be cut to any length. The tape is 30 m long in total, with 1 cm spacing between bands (edge-to-edge). When the tape is threaded through the slot, the student can measure position, velocity, and acceleration with high accuracy.

Using the Smart Gate with a cart and picket fence

Mount a Picket Fence (ME-9804) or a Smart Timer Picket Fence (ME-8933) to the accessory tray of a PASCO cart, such as the PAScar (ME-6950). Use a Photogate Mounting Bracket (ME-9806) to mount the Smart Gate on the side of a PASCO track, such as the PAStrack (ME-6960), as shown in Figure 6. Adjust the height of the Smart Gate to match the level of the desired flag pattern on the picket fence.

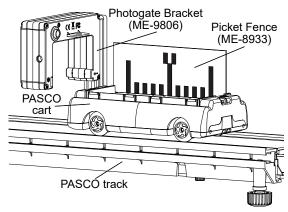


Figure 6. Using the Wireless Smart Gate with a cart-mounted picket fence.

The picket fence setup should be used with the **Photogate and Picket Fence** timer in SPARKvue or the **Picket Fence** timer in Capstone. (See **Timers**.)

Using the Smart Gate with a Photogate Pendulum

Use a Pendulum Clamp (ME-9506), a support rod, and string (such as the Braided Physics String (SE-8050)) to hang a Photogate Pendulum (ME-8752) with the string attached at two points on the Pendulum Clamp, as shown in Figure 7. Using the included Mounting Rod and a Multi-Clamp (ME-9507), mount the Wireless Smart Gate so that the pendulum interrupts the infrared beam as it swings through the Smart Gate. For more accurate results, arrange the pendulum so that it swings close to the emitter side of the Smart Gate, as shown in Figure 7.

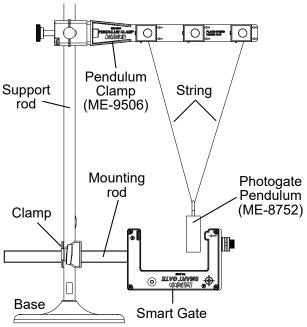


Figure 7. A Photogate Pendulum apparatus with Smart Gate.

This setup should be used with the **Photogate and Pendulum** timer in SPARKvue or the **Pendulum Timer** in Capstone. (See **Timers**.)

Software setup

SPARKvue

Connect the Smart Gate via Bluetooth:

- 1. Start SPARKvue, then select Sensor Data.
- 2. Turn on the Wireless Smart Gate. The Bluetooth Status LED should blink red to show that the device is ready to pair.
- 3. From the list of available wireless devices, select the Smart Gate with the device ID matching the ID printed on your Smart Gate.

Connect the Smart Gate via USB:

- 1. Start SPARKvue, then select Sensor Data.
- Using the included USB cable, connect the micro USB port on the Smart Gate to a USB port or powered USB hub on your computing device. The device will automatically connect to SPARKvue.

Create a display:

- 1. In the Select measurements for templates column, click the **Properties** Dutton next to the Wireless Smart Gate's name. Select a timer option from the list and click OK. (See Timers for a description of the various timer options.)
- 2. Click the box next to the measurement you wish to display, then select a display from the **Displays** column to open the Experiment Screen. The corresponding type of display will be created and configured to display the selected measurement.
- 3. Click **Start** to begin recording data.

PASCO Capstone

Connect the Smart Gate via Bluetooth:

- 1. Start Capstone, then select Hardware Setup from the Tools palette on the left.
- 2. Turn on the Wireless Smart Gate. The Bluetooth Status LED should blink red to show that the device is ready to pair.
- 3. From the list of available wireless devices, select the Smart Gate with the device ID matching the ID printed on your Smart Gate.

Connect the Smart Gate via USB:

- 1. Start Capstone, then select Hardware Setup from the Tools palette on the left.
- 2. Using the included USB cable, connect the micro USB port on the Smart Gate to a USB port or powered USB hub on your computer. The device will automatically connect to Capstone.

Create a display:

- 1. By default, the Smart Gate (Single Flag) timer is enabled. If you wish to change this timer, select the Timer Setup tool, click the red X next to the timer's name to delete it, and create a new timer. (See **Timers** for more information.)
- 2. Double-click the icon for the desired display from the **Displays** palette on the right of the screen. The selected type of display will automatically be created in the main experiment window.
- 3. Click each < Select Measurement > box and choose an appropriate measurement from the list of options.
- 4. Click **Record** to begin recording data.

Timers

The Wireless Smart Gate can be configured in the software to act as one of several timers. Different timers require different experimental setups; see Hardware setup for information on the setups for various pre-programmed timers. For details on how to set up the Smart Gate as each type of timer, see the PASCO Capstone or SPARKvue online help.

Options for pre-configured timers offered by the software include:

- Smart Gate Timer 🛅 / Smart Gate (Single Flag) 🥌 A timer which uses Ports 1 and 2 to measure the speed of an object as it passes between the ports.
- Photogate and Pendulum 📴 / Pendulum Timer 🥧

A timer which uses Port 1 to measure the period and velocity of a pendulum as it passes through the Wireless Smart Gate. Enter the width of the pendulum during setup.

• Photogate and Picket Fence 🕒 / Picket Fence 🍛

A timer which uses Port 1 to measure the position, velocity, and acceleration of a cart that has a picket fence attached. Enter the flag spacing (the length between two adjacent leading edges) during setup.

• Smart Pulley (Linear) or Smart Pulley (Rotational) 🔄 / Photogate with Pulley

Timers which use Port 1 to measure the linear or angular position, velocity, and acceleration of an object connected to a Super Pulley (ME-9433). Enter the arc length, angle spacing, or both (as needed) of the pulley's spokes during setup.

• Photogate Timing (One Photogate) ! / One Photogate (Single Flag)

A timer which uses Port 1 or 2 to measure the speed of a flag or other object of known length passing through the gate. Enter the length of the flag or object during setup.

• Photogate Timing (Two Photogates) 🖸 / Two Photogates (Single Flag)

A timer which uses Port 1 and a separate Photogate Head (ME-9498A) connected via Port 3 to measure the speed and acceleration of an object passing through the gates. Enter the object's length and the distance between the photogate beams during setup.

• Collision Timer 🖸 / Collision (Single Flag) 🥌

A timer which uses Port 1 and a separate Photogate Head (ME-9498A) connected via Port 3 to study the movement of two objects as they move towards each other, collide, and move away from each other. Use to measure the speed of each object before and after the collision. Enter the length of the objects during setup.

• Time Of Flight 🔡 / Time of Flight (Smart Gate) 🥌 A timer which uses Ports 1 and 2 and a Time-of-Flight Accessory (ME-6810A) connected via Port 3 to measure the initial velocity and time of flight of a projectile.



NOTE: In addition to the default timers, PASCO Capstone and SPARKvue offer a set of UK Timing Modes. For information on accessing and using these, see the SPARKvue and PASCO Capstone online help.

Set up the Laser Detector Port

The Laser Detector Port (Port 4) can be used to measure the motion of objects too large to fit through the Smart Gate. After connecting the Smart Gate to the software, follow the steps below to set up the Laser Detector Port for use in one of the single photogate timers.

- SPARKvue:
 - 1. In the Select measurements for templates column, click the **Properties** Dutton next to the Wireless Smart Gate's name.
 - 2. In the Properties window, open the Laser Switch Only submenu, select your desired timer from the list, and select OK. If needed, enter any necessary values into the subsequent text boxes.



NOTE: Timers requiring two photogates or an external accessory cannot be used with Port 4 in SPARKvue.



- 3. Set up a laser so that the beam shines into the Laser Detector Port and can be interrupted by the object you will be measuring.
- 4. Create a display for your experiment and begin recording data.

PASCO Capstone:

- In the Hardware Setup tool, locate the image of the Wireless Smart Gate and click inside the yellow circle connected to the Laser Detector Port. A symbol of a laser will appear.
- 2. Select the **Timer Setup** tool and click the red **X** next to the Smart Timer's name to delete the default timer.
- 3. Select Pre-Configured Timer, then click Next.
- In the list of available timing devices, check the box next to the Laser Switch, as well as an additional photogate or external accessory if required.
- Finish setting up your desired timer as usual. (For more advice on timer setup, see the SPARKvue or PASCO Capstone online help.)
- 6. Set up a laser so that the beam shines into the Laser Detector Port and can be interrupted by the object you will be measuring.
- 7. Create a display for your experiment and begin recording data.

Troubleshooting

- If the sensor loses Bluetooth connection and will not reconnect, try cycling the ON button. Press and briefly *hold* the button until the LEDs blink in sequence, then release the button.
- 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, then release the button and start the sensor in the usual way.
- If the previous steps do not fix a connection problem, turn Bluetooth off and back on for your computer or tablet, then retry.

Software help

The SPARKvue and PASCO Capstone Help provide information on how to use this product with the software.

SPARKvue

Software: Main Menu > Help **Online:** help.pasco.com/sparkvue

PASCO Capstone

Software: Help > PASCO Capstone Help

Online: help.pasco.com/capstone

Specifications and accessories

Visit the product page at <u>pasco.com/product/ps-3225</u> 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-3225.

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 <u>pasco.com</u>

% Phone 1-800-772-8700 x1004 (USA)

+1 916 462 8384 (outside USA)

Limited warranty

For a description of the product warranty, see the Warranty and Returns page at www.pasco.com/legal.

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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.

CE statement

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

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.

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.