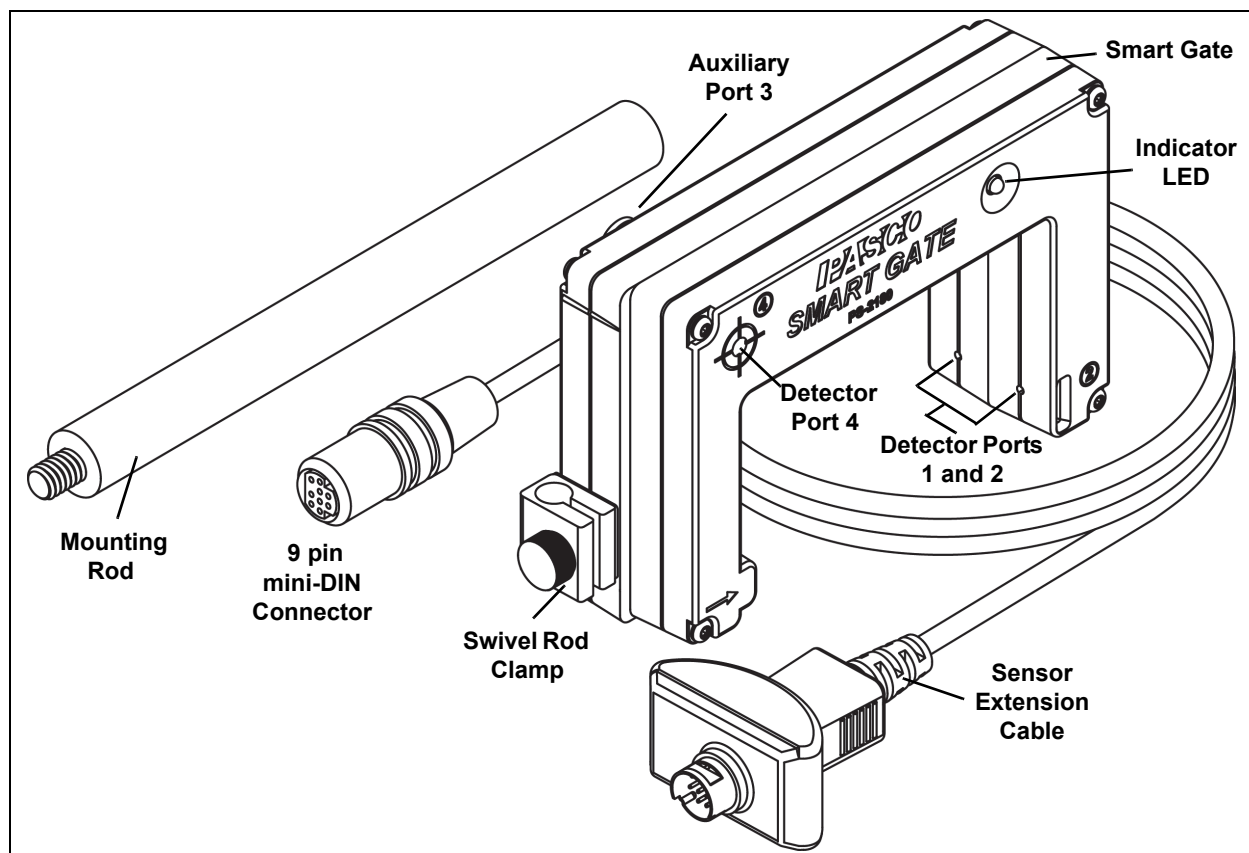


Smart Gate

PS-2180



| Included Items |
|----------------------------------|
| Smart Gate |
| Mounting Rod |
| Sensor Extension Cable (PS-2500) |

| Required Items* |
|--------------------------------|
| PASCO Interface |
| PASCO Data Collection Software |

*See the PASCO catalog or the PASCO web site at www.pasco.com for more information.

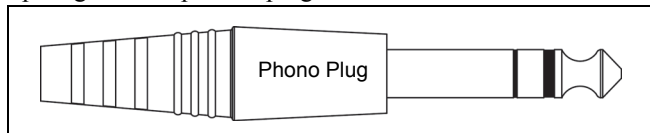
Introduction

The PS-2180 Smart Gate measures the time for the motion of a moving object, such as a PASCO Cart. The PASCO data collection software analyzes the data and calculates position, velocity, and acceleration.

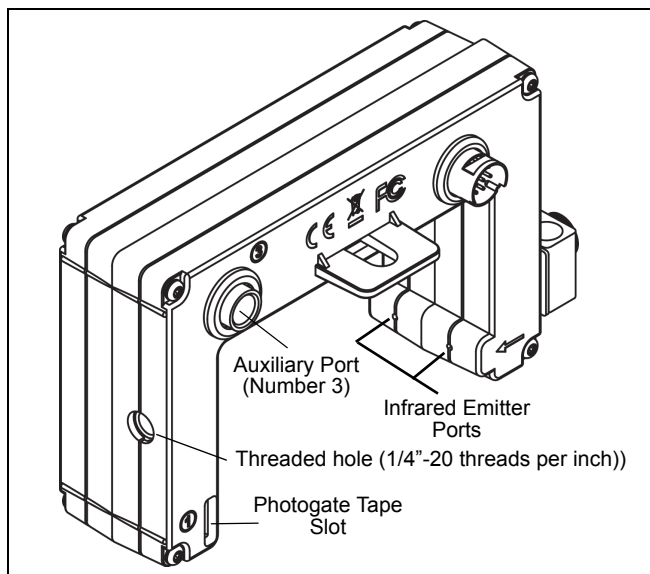
The sensor is designed to work with a PASPORT-compatible interface (such as the PS-2100 USB Link) and data collection software (such as PASCO Capstone or SPARKvue) to record, display, and analyze the motion.

The Smart Gate has three detector ports and one Auxiliary port. Detector Ports 1 and 2 are located opposite the two infrared emitter ports. The ports are 1.5 cm apart. (Please see the diagram.)

The Auxiliary Port (number 3) accepts a 1/4" (6.35 mm) tip-ring-sleeve "phono" plug similar to the illustration.



Detector Port 4 can detect a beam of laser light in the same way as the PASCO Laser Switch (ME-9259A). The fourth detector port allows the measurement of an object that is too large to pass through the Smart Gate.



The sensor includes a 2 meter long Sensor Extension Cable and a 14 centimeter long, 0.95 cm diameter Mounting Rod. The Mounting Rod fits the threaded hole on the side of the Smart Gate.

Related Products*

The Smart Gate is part of three PASCO systems:

- Smart Gate System (ME-3701)
- Smart Gate Pulley System (ME-3702)
- Projectile Launcher Smart Gate System (ME-6798)

(*See the PASCO web site at www.pasco.com for more information.)

Compatible Equipment

The Smart Gate can be used with a variety of PASCO equipment:

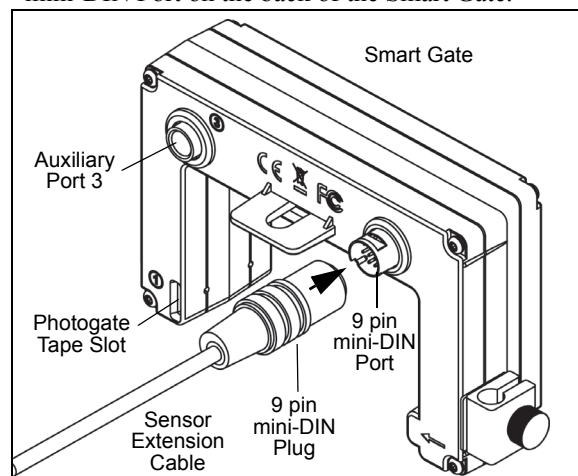
| Product Name* | Model |
|--|----------|
| Super Pulley | ME-9450A |
| Photogate Stand | ME-9805 |
| Picket Fence (Large) | ME-9377A |
| Picket Fence (Smart Timer) | ME-8933 |
| Picket Fence (Cart) | ME-9804 |
| Photogate Bracket (Track) | ME-9806 |
| Photogate Mounting Bracket (Projectile Launcher) | ME-6821A |
| Photogate Head | ME-9498A |
| Accessory Photogate | ME-9204B |
| Time-of-Flight Accessory | ME-6810 |
| Photogate Tape | ME-6663 |
| Photogate Tape, High Resolution | ME-6666 |
| Photogate Pendulum Set | ME-8752 |

(*See the PASCO web site at www.pasco.com for more information)

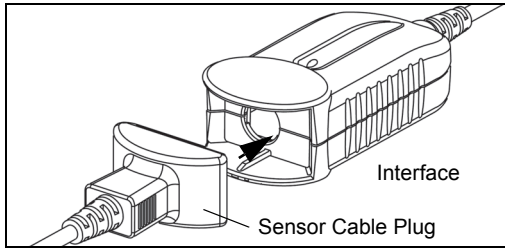
Setup the Smart Gate

Connecting the Smart Gate

- Connect the small end of the cable into the 9- pin mini-DIN Port on the back of the Smart Gate.



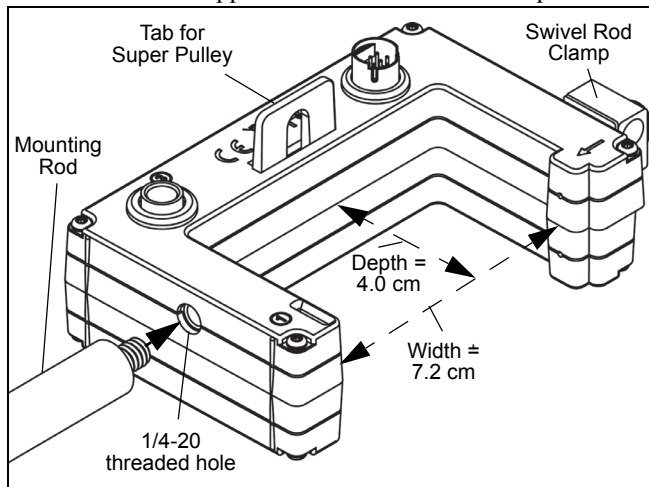
- Connect the other end of the cable to a PASPORT input port of a PASCO interface.



- Test the operation of the Smart Gate by watching the light-emitting diode (LED) on the front side of the Smart Gate as the beams are blocked.

Mounting the Smart Gate

The Mounting Rod fits the threaded hole that is on the side of the Smart Gate opposite to the swivel rod clamp.

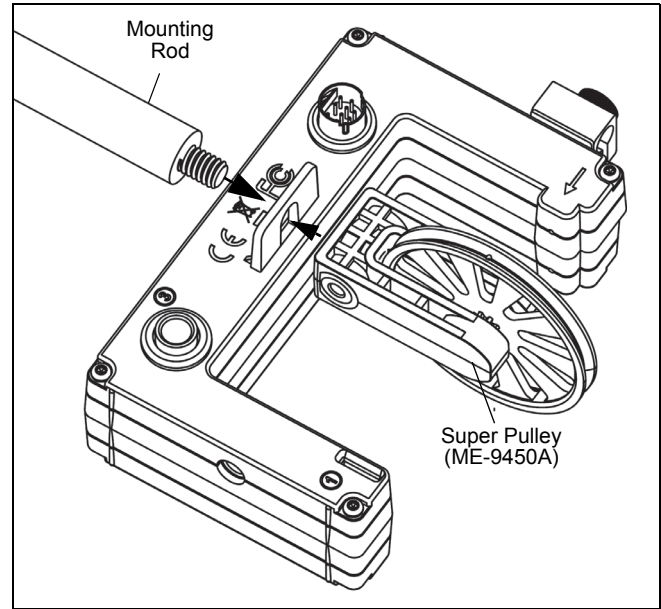


The swivel rod clamp and thumbscrew allows the Smart Gate to be mounted on a 0.63 cm (1/4 in.) diameter support rod, such as the Photogate Stand (ME-9805).

The open space for the Smart Gate is 7.2 cm (width) by 4.0 cm (depth). Remember, the Smart Gate Detector Port 4 allows the measurement of larger objects when used with a laser.

The tab on the Smart Gate housing provides a seat for attaching a PASCO Super Pulley (ME-9450A) using the included Mounting Rod. When using a Super Pulley with the Smart

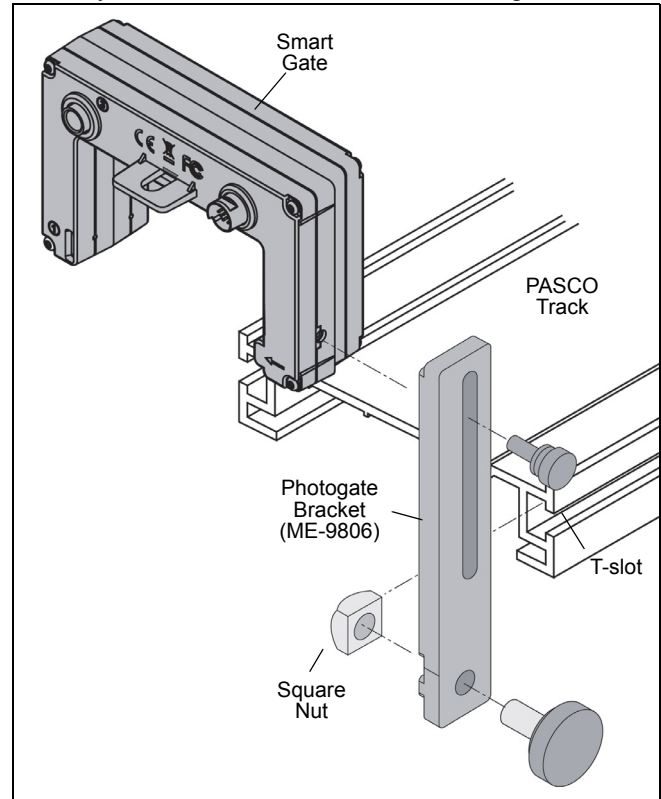
Gate, only Detector Port 1 (“gate 1”) will record state changes caused by the rotating pulley.



Mounting the Smart Gate on a PASCO Track

The Smart Gate can be attached to the side of a PASCO Track with a Photogate Bracket (ME-9806). Slide the square nut on the Photogate Bracket into the T-slot of the side of the PASCO track. Remove the swivel rod clamp from the side of the Smart Gate (but save the swivel rod clamp for later use).

Use the short thumbscrew from the Photogate Bracket assembly to attach the Smart Gate to the Photogate Bracket.



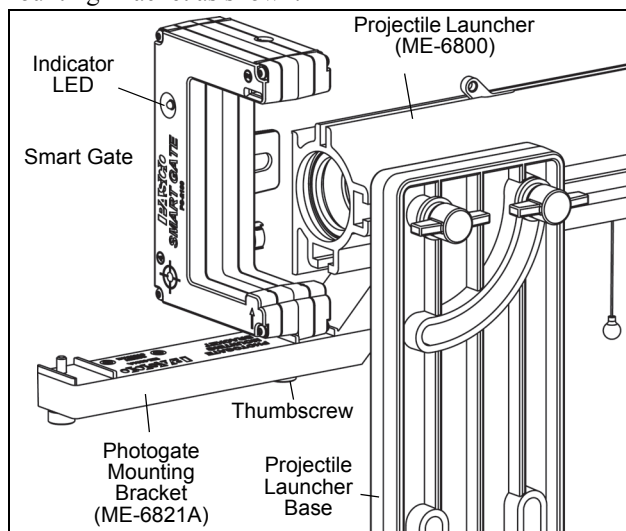
Note that part of the Smart Gate housing fits between the “rails” on each edge of one side of the Photogate Bracket,

and the Smart Gate can be adjusted up or down. If you wish to adjust the Smart Gate to an angle relative to the Photogate Bracket, mount the bracket on the track with the smooth side of the bracket against the edge of the track. The small thumbscrew will hold the Smart Gate in place against the smooth side of the bracket so the Smart Gate can be set on any angle.

Mounting the Smart Gate on a PASCO Projectile Launcher

Use a Photogate Mounting Bracket (ME-6821A) to attach the Smart Gate to a PASCO Projectile Launcher (see the PASCO web site for more information about launchers).

Clamp the PASCO Projectile Launcher in place. Mount the Photogate Mounting Bracket to the T-slot of the Projectile Launcher. Adjust the bracket so that the second position on the bracket is aligned with the end of the launcher. Remove the swivel rod clamp from the side of the Smart Gate (but save the swivel rod clamp for later use). Use one of the smaller thumbscrews from the Photogate Mounting Bracket (ME-6821A) to attach the Smart Gate to the Photogate Mounting Bracket as shown.

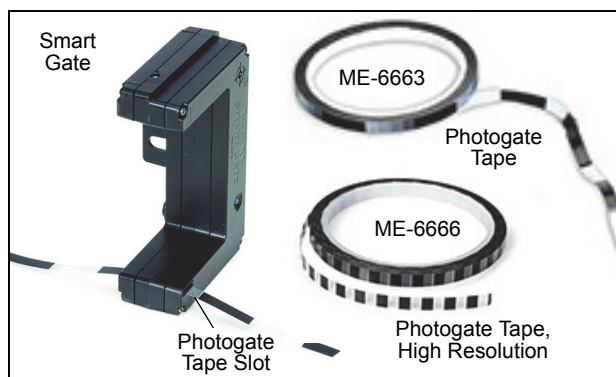


Using the Smart Gate with the Time-of-Flight Accessory

The PASCO Time-of-Flight Accessory (ME-6810) is designed for projectile motion experiments. The Time-of-Flight Accessory can be used with a Smart Gate mounted on a Projectile Launcher to measure the time of a projectile's motion from launch to landing. Connect the plug from the Time-of-Flight Accessory into the Auxiliary Port on the back of the Smart Gate. The Smart Gate measures the initial speed of the projectile and the Time-of-Flight Accessory measures total travel time.

Using the Smart Gate with Photogate Tape

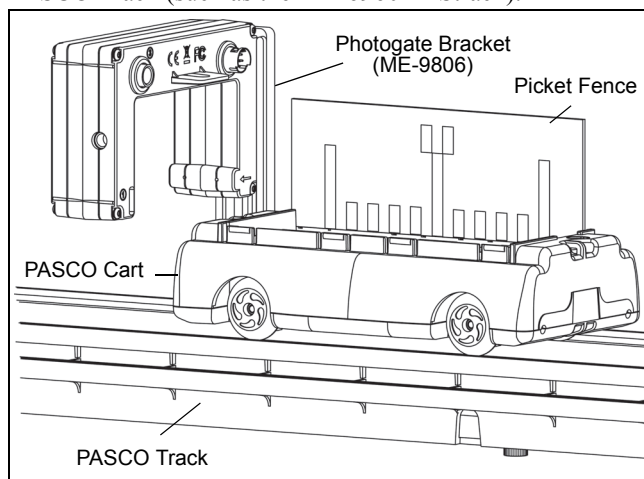
Photogate Tape (ME-6663) or High Resolution Photogate Tape (ME-6666) fits through the Photogate Tape Slot on the detector side of the Smart Gate.



The Photogate Tape is made of a flexible Mylar material that can be cut to any length, and is reusable. The tape is 30 m long with 5 cm band spacing (edge-to-edge). When the tape is threaded through the Photogate Tape Slot of the Smart Gate, the student can measure position, velocity, and acceleration with a high degree of accuracy. The high-resolution 1 cm version is ME-6666.

Using the Smart Gate with a Picket Fence on a Cart

Mount a Five Pattern Picket Fence (ME-9804) or a Smart Timer Picket Fence (ME-8933) to the accessory tray of a PASCO Cart (such as the ME-6950 PAScar). Use a Photogate Bracket to mount the Smart Gate on the side of a PASCO Track (such as the ME-6960 PAStrack).

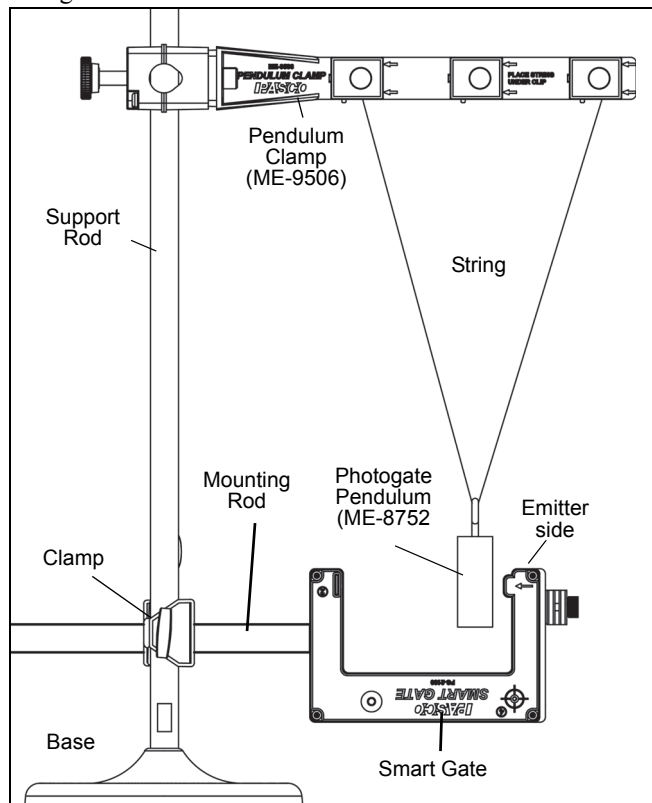


Using the Smart Gate with a Photogate Pendulum

Use a clamp (such as the ME-9506 Pendulum Clamp), support rod, and string (such as the SE-8050 Braided Physics String) to hang a Photogate Pendulum as shown (biflar suspension).

Mount the Smart Gate so that the Photogate 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.



Recording Data

Setup the Data Collection Software

NOTE: Refer to the User’s Guide and On-Line Help for the data collection software.

Suggested Activities

- Refer to the experiment guide that comes with your PASCO equipment.
- Also, check the PASCO web site. Find the web page for the PASCO equipment you are using and check the “User Resources” tab. There may be a download able (PDF) file of experiments.

More Information

For the latest information about the Smart Gate, visit the PASCO web site at www.pasco.com and enter “PS-2180” in the Search window.

Specifications

| Item | Value |
|---|-----------------------------|
| Rise and Fall Time: | Symmetrical, all four ports |
| Infrared Source: | 940 nm |
| Minimum Block Time, Detector Ports 1 and 2: | 1.5 ms |

Technical Support

Before calling PASCO Technical Support, please have the apparatus, this user's guide, and the following information available:

- Product name, model number, and serial number;
- Approximate age of the product;
- Detailed description of how to duplicate the problem.

For assistance with any PASCO product, contact PASCO at:

Address: PASCO scientific
10101 Foothills Blvd.
Roseville, CA 95747-7100

Phone: +1 916 462 8384 (worldwide)
877-373-0300 (U.S.)

E-mail: support@pasco.com

Web www.pasco.com

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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/disposal service, or the place where you purchased the product.

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

