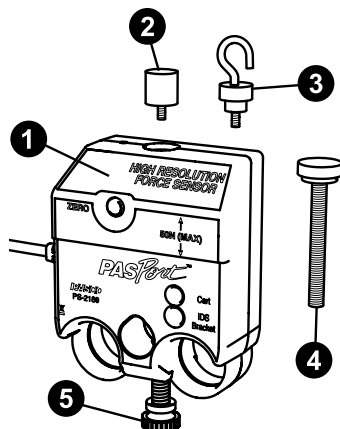# High Resolution Force Sensor (PS-2189)

Introduction

The High Resolution Force Sensor connects to a PASPORT interface and records force in the range of -50 N to +50 N at a rate of up to 1000 samples per second. High resolution, dynamic over-sampling, and low drift rate make this sensor well-suited for measuring very small changes in force.

Equipment

Included equipment:

1 **High Resolution Force Sensor**

2 **Bumper attachment**

3 **Hook attachment**

4 **Cart thumbscrew** (M5 × 45 mm)
Use to secure the sensor to a PASCO cart.

5 **Rod clamp thumbscrew** (1/4-20 × 0.75 in.)
Use to secure the sensor to a rod, such as the 120 cm Stainless Steel Rod (ME-8741).

Additional items required:

- PASPORT interface
- PASCO Capstone or SPARKvue data collection software

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

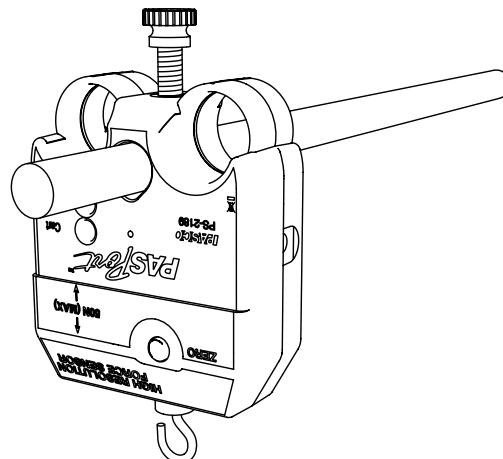Go to Main Menu > **Check for Updates**

PASCO Capstone

Go to **Help** > **Check for Updates**.

## Set up the hardware

Sensor mounting

To mount the sensor on a rod:

1. Slide the sensor onto a rod, as shown below.
2. Tighten the thumbscrew to secure the sensor in place.

To mount the sensor on a PASCO cart:

1. Align the hole labeled **Cart** on the sensor with one of the threaded holes in the accessory tray of the PASCO cart.
2. Insert the included cart thumbscrew through the **Cart** hole so that it extends into the threaded hole, as shown below.
3. Tighten the thumbscrew to secure the sensor in place.

PASCO
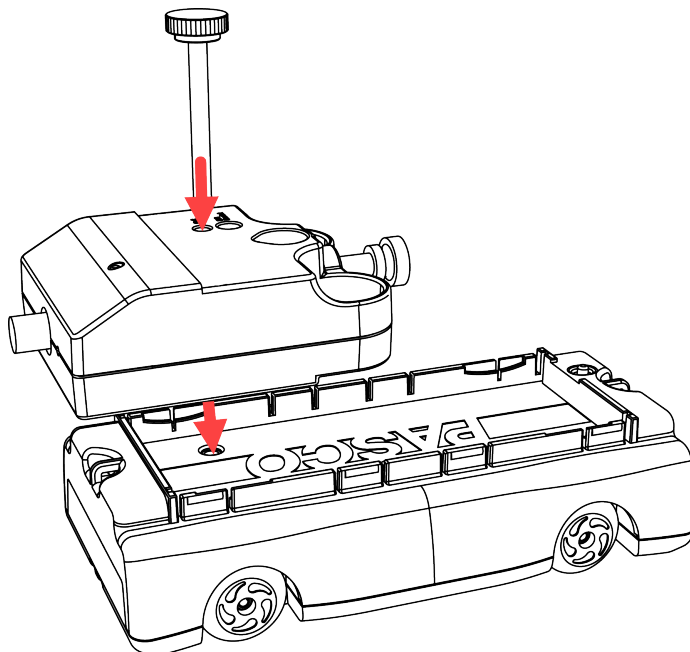
Connect bumper and hook attachments

Screw the bumper or hook into the sensor as shown below.
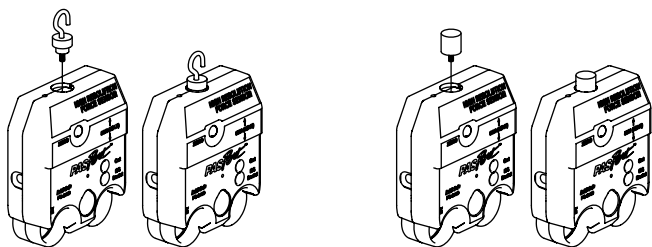
IMPORTANT: When performing experiments that involve a collision, **do NOT** use the rubber bumper with the Force Sensor, as this may damage the internal components. Instead, any of the following components can be used as a bumper for collision experiments:

- Light Spring Bumper (ME-9275)
- Bumper Accessory Set (ME-9884)
- Magnetic Bumper Set (ME-9885A)

Set up the software

SPARKvue

Connecting the sensor to SPARKvue:

1. Turn on SPARKvue, then click **Sensor Data**.

2. Turn on the PASPORT interface if needed, then connect your interface to SPARKvue. For more specific details, see the manual for your chosen interface and the SPARKvue online help.

3. Plug the High Resolution Force Sensor into one of the PASPORT ports on the interface. SPARKvue will automatically detect and identify the sensor.

Collecting data:

1. From the **Select Measurements for Templates** column, select the appropriate measurement for your experiment.

2. From the **Templates** column, click **Graph** to enter the experiment screen. The display will automatically plot your selected measurement on the y-axis and time on the x-axis.

3. When you are ready, click **Start** 🟢 to begin recording data.

PASCO Capstone

Connecting the sensor to Capstone:

1. Turn on PASCO Capstone, then click **Hardware Setup** in the **Tools** palette.

2. Turn on the PASPORT interface if needed, then connect your interface to Capstone. For more specific details, see the manual for your chosen interface and the Capstone online help.

3. Plug the High Resolution Force Sensor into one of the PASPORT ports on the interface. Capstone will automatically detect and identify the sensor.

Collecting data:

1. Double-click the **Graph** icon in the **Displays** palette to create a Graph display.

2. Click each **<Select Measurement>** box and select an appropriate measurement for your experiment to assign that measurement to the associated axis.

3. When you are ready, click **Record** 🔴 to begin recording data.

About the force measurement

Zeroing the sensor

Press the **ZERO** button on the sensor to adjust the sensor's output to zero. The sensor should always be zeroed before an experiment to ensure accurate values are collected.

Sample rate

By default, the sensor collects 20 samples per second. The sensor can collect data as fast as 1000 samples per second (or 2000 samples per second if using an 850 or 550 Universal Interface) and as slowly as one sample every 24 hours. The sample rate can be changed in the data collection software.

Dynamic over-sampling

Over-sampling reduces noise, produces slower data, and improves the measurement resolution. This effect is especially noticeable when very small force changes are measured. The degree of over-sampling depends on the sample rate. To increase the degree of dynamic over-sampling, lower the sample rate. Maximum over-sampling occurs at sample rates of 20 Hz and slower.

Software help

The SPARKvue and PASCO Capstone Help provide additional information on how to use this product with the software. You can access the help within the software or online.

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 pasco.com/product/PS-2189 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-2189.

PASCO

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
📞	Phone	1-800-772-8700 x1004 (USA) +1 916 462 8384 (outside USA)
✉	Email	support@pasco.com

Regulatory information

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

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PASCO