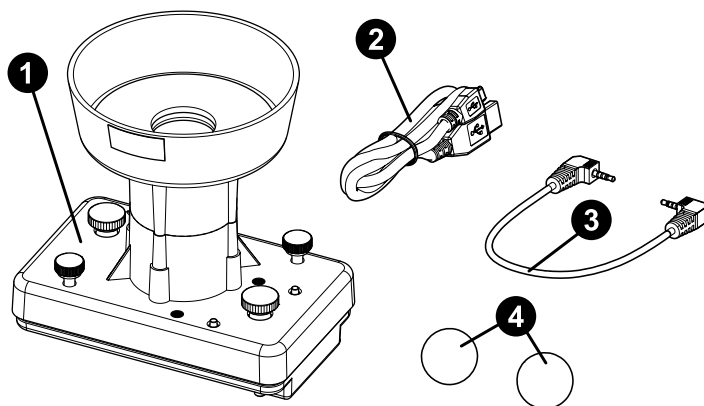# Smart Ballistic Cart Accessory
ME-1245

Introduction

The Smart Ballistic Cart Accessory is designed to be mounted in the accessory tray of any PASCO dynamics cart. The accessory can be used to launch an inserted ball while the cart is in motion and subsequently catch the ball, demonstrating the principles of projectile motion. The launch can be triggered either manually with any cart or via PASCO Capstone or SPARKvue software when used with a Smart Cart.

⚠ **CAUTION:** Always wear safety glasses while the Smart Ballistic Cart Accessory is in use. Do NOT look down the barrel, even if you believe the accessory is not loaded.

Equipment

Included equipment:

❶ Smart Ballistic Cart Accessory

❷ Micro USB cable

❸ Smart Cart accessory cable
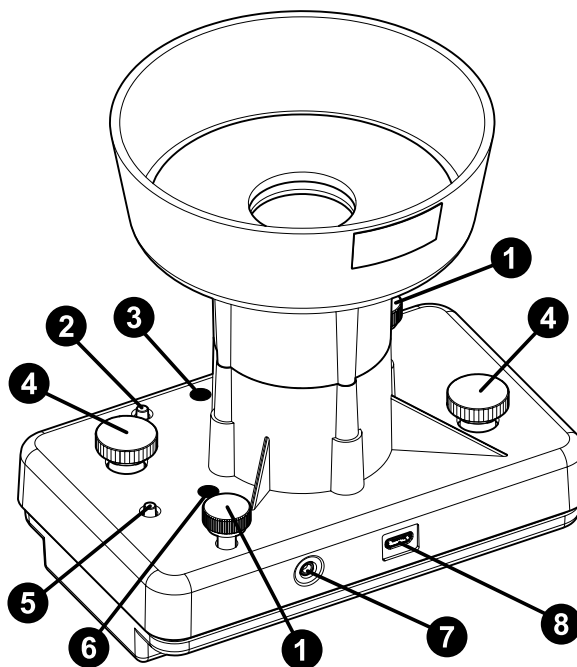
❹ 2× plastic balls

Required equipment:

- Any of the following PASCO carts:
    ◦ Smart Cart (ME-1240 or ME-1241)
    ◦ PAScar (ME-6933 or ME-6934)
    ◦ Plunger Cart (ME-9430)
    ◦ Collision Cart (ME-9454)
- Any of the following PASCO tracks:
    ◦ PAStrack (ME-6960)
    ◦ Aluminum Dynamics Track, 1.2 m (ME-9493)
    ◦ Aluminum Dynamics Track, 2.2 m (ME-9779)

Recommended software:

- PASCO Capstone or SPARKvue data collection software

Features

❶ **2× aim adjustment knobs**

Turn these knobs to adjust the aim of the projectile.

❷ **Power button**

Press and briefly hold to turn the accessory on or off.

❸ **Battery Status LED**

Indicates the charging status of the accessory's battery.

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

❹ **2× mounting thumbscrews**

Use to mount the accessory to a cart.

❺ **Timed release button**

Press and briefly hold this button to launch the projectile after a one second delay.

❻ **Ready Status LED**

Indicates whether the accessory is ready to launch a projectile.

LED	Status
Yellow blink	Ready to launch
Yellow ON	Launch mechanism is recharging

PASCO®

❼ Smart Cart port

Use to connect the accessory to a Smart Cart.

❽ Micro USB port

Use to connect the apparatus to a charging device via the included USB cable.

Initial step: Charge the battery

Charge the battery by connecting the micro USB port to any standard USB charger via the included micro USB cable. 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 accessory 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.

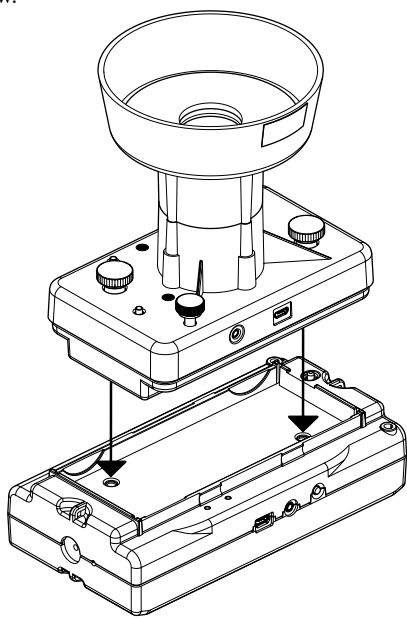If you have installed the software previously, check that you have the latest update:

⬚ **SPARKvue:** Main Menu ☰ > Check for Updates

☁ **PASCO Capstone:** Help > Check for Updates

Usage

Mount the accessory

1. Place the Smart Ballistic Cart Accessory in the accessory tray of the cart. If you are using a Smart Cart, make sure that the ports on the accessory are on the same side as the ports on the cart, as shown below.

2. Turn each mounting thumbscrew until finger-tight to secure the accessory to the cart.

Set up the software

Once you have mounted the accessory to a Smart Cart, you can connect the device to PASCO Capstone or SPARKvue. This allows you to launch a ball from the accessory either at a specific time or position or when a button in the program is pressed.

⬚ **SPARKvue:**

1. Connect the Smart Cart to SPARKvue. For more information on this, see the Smart Cart manual and the SPARKvue online help.

2. Using the Smart Cart accessory cable, connect the Smart Cart port on the accessory to the accessory port on the Smart Cart. SPARKvue will automatically detect and recognize the accessory.

3. Select **Ballistic Cart** from the list of Quick Start Experiments.

4. Set a position-based or time-based trigger condition for the accessory. A time-based condition will cause the ball to launch a specified number of seconds after data collection begins. A position-based condition will cause the ball to launch when the cart travels a specified number of centimeters away from its starting position. (If you will be using the Trigger Now button or manual triggering, skip this step.)

5. Place a ball into the barrel and push down until it locks in place.

6. Begin data collection, then move the cart as desired. If you have set a trigger condition, the ball will automatically launch when this condition is met. Otherwise, you can press the **Trigger Now** button in the program to immediately launch the ball.

☁ **PASCO Capstone:**

1. Connect the Smart Cart to Capstone. For more information on this, see the Smart Cart manual and the PASCO Capstone online help.

2. Using the Smart Cart accessory cable, connect the Smart Cart port on the accessory to the accessory port on the Smart Cart. Capstone will automatically detect and recognize the accessory.

3. Select **Ballistic Cart** in the **Tools** palette on the left.

4. Set a position-based or time-based trigger condition for the accessory. A time-based condition will cause the ball to launch a specified number of seconds after data collection begins. A position-based condition will cause the ball to launch when the cart travels a specified number of centimeters away from its starting position. (If you will be using the Trigger Now button or manual triggering, skip this step.)

5. Select **Ballistic Cart** again to close the tool, then create a graph display to track a measurement relevant to your experiment.

6. Place a ball into the barrel and push down until it locks in place.

7. Begin data collection, then move the cart as desired. If you have set a trigger condition, the ball will automatically launch when this condition is met. Otherwise, you can reopen the Ballistic Cart tool and click **Trigger Now** to immediately launch the ball.

PASCO®

Trigger at zero

If the Smart Ballistic Cart Accessory is set up with a position-based trigger with a value of 0 cm, the procedure for triggering the device is slightly different. In this case, when data recording begins, the Battery Status LED on the Smart Cart will rapidly begin flashing red. Roll the cart away from this position until the LED begins to flash green, indicating that the accessory will now activate upon returning to the starting point. Until recording stops, the ball launch will be triggered every time the cart passes the zero mark.

Manual triggering

In addition to triggering a launch within the software, you can also manually trigger the Smart Ballistic Cart Accessory using a button on the accessory's surface. This allows you to launch the ball even if you are using a cart other than the Smart Cart. Once you have mounted the accessory on the cart, following these steps to manually launch a ball:

1. Press and briefly hold the power button to turn on the device.

2. Place a ball into the barrel and push down until it locks in place.

3. Once the Ready Status LED begins blinking, press the **TIMED RELEASE** button. After one second, the ball will launch.

Adjust the aim

Projectiles fired from the Smart Ballistic Cart Accessory should land back in the cup after being launched. If the projectile consistently misses the cup, perform the following adjustments to improve the aim:

- Level the track. If the track is tilted, the cart may accelerate in one direction or another while not in contact with the ball.

- Turn the aim adjustment knobs to adjust the direction the projectile is launched. One knob tilts the barrel parallel to the track, while the other tilts the barrel perpendicular to the track. Markings on the apparatus indicate which knob tilts the barrel on which axis. To test the aim, use the manual trigger to launch the ball while the cart is at rest.

Turn off the accessory

The Smart Ballistic Cart Accessory automatically turns off if it is unplugged from the Smart Cart. If the accessory remains plugged into the Smart Cart but is not connected to data collection software, or if it is turned on without being connected to a Smart Cart, it will automatically turn off after five minutes of inactivity. In both cases, the Battery Status LED will flash red before the accessory turns off. You can also turn the accessory off manually by pressing and briefly holding the power button.

Specifications and accessories

Visit the product page at pasco.com/product/ME-1245 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 student handouts and teacher notes. Visit pasco.com/freelabs/ME-1245.

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

Limited warranty

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

Copyright

This document is copyrighted with all rights reserved. Permission is granted to non-profit educational institutions for reproduction of any part of this manual, providing the reproductions are used only in their laboratories and classrooms, and are not sold for profit. Reproduction under any other circumstances, without the written consent of PASCO scientific, is prohibited.

Trademarks

PASCO and PASCO scientific are trademarks or registered trademarks of PASCO scientific, in the United States and in other countries. All other brands, products, or service names are or may be trademarks or service marks of, and are used to identify, products or services of, their respective owners. For more information visit www.pasco.com/legal.

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.