PASCO
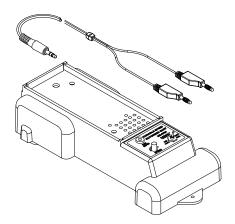# Variable Speed Motorized Cart

ME-9781

What's included

- Variable Speed Motorized Cart

- Power cable

Introduction

The Variable Speed Motorized Cart incorporates many features of other PASCO carts, including precision bearing wheels and an accessory tray. In addition, the cart has motorized rear wheels geared to operate at a constant speed. The speed control knob adjusts the speed from 8 cm/s to 25 cm/s. The cart's speed can also be varied automatically and remotely using a DC power supply or a PASCO Universal Interface. An external voltage source connects to the external input port on the cart.

Battery operation

Battery installation

Install four C cell batteries in the battery clip compartment on the bottom of the cart. The estimated battery life is six hours or 5 km of travel.

Manual ON/OFF

Start and stop the cart manually using the **ON/OFF** switch.

Speed Adjustments

Adjust the speed manually by turning the **SPEED** control knob. Turning the knob clockwise increases the speed. Turning the knob counterclockwise decreases the speed.

External power operation

> ⚠ CAUTION
>
> Never supply the Variable Speed Motorized Cart with external source voltages greater than ± 6 volts.

Power supply

Switch the **ON/OFF** switch to **OFF**. The cart can now receive power from the external voltage source instead of the batteries. Use the included cable to connect the external input port **EXT. INPUT** on the cart to an external voltage source. Control the speed by varying the voltage on the power supply.

PASCO Universal Interface

1. Switch the voltage input to external by moving the **ON/OFF** switch to **OFF**. The cart can now receive power from the external source instead of the batteries.

2. Connect the Variable Speed Motorized Cart to the PASCO Universal Interface. Use the included cable to connect the external input port **EXT. INPUT** on the cart to the power output ports of the interface.

3. Start the PASCO PASCO Capstone or SPARKvue and open the Signal Generator.

4. Choose and adjust the signal you want the interface to output.

5. Click ON in the Signal Generator to start outputting the signal.

6. Click OFF in the signal control window to stop outputting the signal.

Suggested activities

Relative motion

Use a piece of paper on the floor to simulate the motion of a river. Simulate the relative motion of a boat crossing the river by moving the piece of paper while the cart is traveling over it.

Vectors with relative motion

Explore vectors by mounting a Motion Sensor at an angle on the Variable Speed Motorized Cart. Place the track at an angle to the wall and point the Motion Sensor towards the wall. The Motion Sensor will record the relative velocity of the Motion Sensor with respect to the wall.

Next, orient the track so that it is perpendicular to the wall. Repeat the data collection process. The velocity measured by the Motion Sensor the second time is the velocity of the Motorized Cart.

Use PASCO Capstone or SPARKvue to plot velocity versus time for both data runs.

Independence of vertical and horizontal Motion

Mount a Smart Ballistic Cart Accessory (ME-1245) onto the Variable Speed Motorized Cart. Arrange the equipment so that the Ballistic Cart Accessory will launch the ball while the cart is moving forward.

Constant Acceleration versus Constant Velocity

Compare the cart's motion to a Super Fan Cart (ME-6977) to compare constant velocity motion with constant acceleration. Track position versus time of the Variable Speed Motorized Cart and the Fan Cart.

Independence of kinetic friction and speed

Determine the effect of speed on kinetic friction with a Force Sensor mounted on the Variable Speed Motorized Cart. Place a friction block on a track with masses placed on top of the block. Use the Force Sensor to measure the kinetic friction.

Angle of incline versus efficiency (constant force)

Explore the effect of the angle of incline of a track on the efficiency of the Variable Speed Motorized Cart. Measure the cart's speed at various incline angles using a Motion Sensor.

Plot the percent efficiency versus the angle of incline, where percent efficiency is

$$\frac{\text{mechanical power}}{\text{electrical power}} \times 100$$

Variable force versus efficiency (constant angle)

Explore the relationship between varying force and efficiency when a Variable Speed Motorized Cart climbs a track inclined at 30°. Measure the position of the cart as it climbs the incline track. Vary the voltage supplied to the Variable Speed Motorized Cart with a **negative ramp** signal from the Universal Interface.
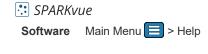
Different waveforms

Explore the effect of controlling the Variable Speed Motorized Cart with different voltage waveforms (such as sine, square, and triangle) from a PASCO Universal Interface. Plot the voltage and the position of the cart versus time.

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/ME-9781**.

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	**pasco.com/help/sparkvue**

PASCO Capstone

Software	Help > PASCO Capstone Help
Online	**pasco.com/help/capstone**

Specifications and accessories

Visit the product page at **pasco.com/product/ME-9781** to view the specifications and explore accessories. You can also download experiment files and support documents from the product page.

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**

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