

Centripetal Force Apparatus

ME-8088

Introduction

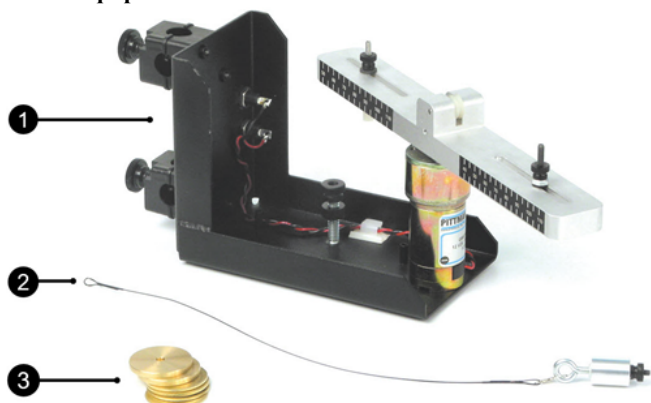
The Centripetal Force Apparatus allows students to investigate the relationships between centripetal force, radius, mass, and velocity for an object undergoing uniform circular motion. Traditional experiments in this area involve swinging masses above the experimenter's head. However, this approach is difficult to execute, and the data produced is rarely sufficient to understand the relationships. The Centripetal Force Apparatus removes these difficulties by using sensors to measure the force on the mass and the mass's velocity as it rotates.

The velocity can be varied by changing the voltage supplied to the included electric motor. Drilled masses are included to enable a range of mass trials. The radius can be changed by sliding the captured masses along the grooves in the rotating arm. A measuring scale is included on both sides of the arm.

The sturdy base includes rod clamps for connection to a standard rod stand. The apparatus can also be clamped to a table using a C-clamp.

Equipment

Included equipment:



- 1 Frame with electric motor
- 2 Ball bearing swivel with cable
- 3 Masses
 - 3 × 5 g masses
 - 3 × 10 g masses
 - 2 × 20 g masses

Required equipment:

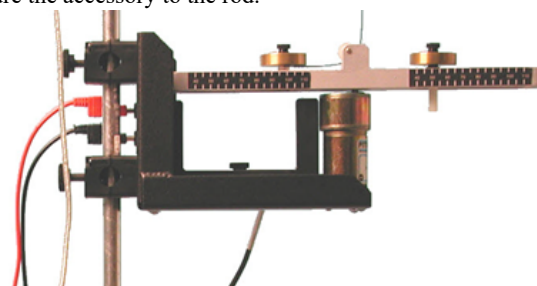
- Large Rod Base (ME-8735)
- Stainless Steel Rod, 45 cm (ME-8736)
- Stainless Steel Rod, 90 cm (ME-8738)
- Photogate Head (ME-9498A)
- Multi-Clamp (ME-9507)
- PASPORT High Resolution Force Sensor (PS-2189)
- Banana plug cords, such as the Red Banana Plug Cord 5-Pack (SE-9750)

- Power supply capable of delivering 12 VDC at 0.5 A, such as the AC/DC Power Supply (SE-9584)
- PASPORT interface, such as the 550 Universal Interface (UI-5001)
- PASCO Capstone or SPARKvue data collection software

Procedure

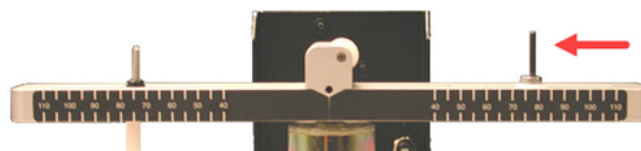
⚠ WARNING: Do NOT stand directly next to the motor or rotating arm *or* look at the rotating arm at eye level. To avoid possible injury from the rotating arm hitting the body, keep at least a one-foot distance from the motor and rotating arm when the motor is running.

1. Mount the 90 cm Stainless Steel Rod into the Large Rod Base.
2. Insert the rod through the rod clamps on the Centripetal Force Accessory, then tighten the thumbscrews on the rod clamps to secure the accessory to the rod.



3. Loosen the screw below the rotating arm and remove the free mass holder, then measure the holder's mass.

✎ NOTE: The free mass holder includes the screw, two plastic washers, a nut, and two thumbscrews.



4. Use a thumbscrew to mount the Photogate Head to the bottom base of the Centripetal Force Accessory.



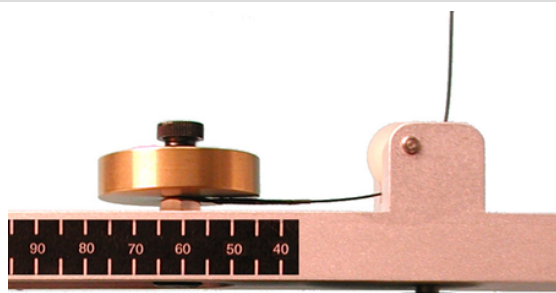
- Attach the Multi-Clamp to the upper end of the 90 cm Stainless Steel Rod.
- Insert the 45 cm Stainless Steel Rod horizontally into the Multi-Clamp.
- Slide the PASPORT High Resolution Force Sensor onto the 45 cm rod, then adjust the top screw to anchor the sensor to the rod.

 **NOTE:** Make sure the sensor's cords are kept out of the rotating arm's path.



- Attach the ball bearing swivel to the bottom of the Force Sensor.
- Thread the cable from the swivel hook through the pulley and over the free mass holder.

 **NOTE:** Always lay down the cable *before* adding the mass.



- Add a mass to the free mass holder and screw on the thumbscrew to secure the mass in place.
- Add a mass to the fixed mass holder and use a thumbscrew to secure the mass in place.
- Connect your chosen PASPORT adapter to SPARKvue or PASCO Capstone. For more information on this, see the manual for the adapter and the SPARKvue or Capstone online help.
- Plug the Force Sensor into a PASPORT port on the interface. The program should automatically detect and recognize the sensor.
- Use banana plugs to connect the Centripetal Force Accessory to the power supply.
- Turn on the power supply and begin driving the motor on the Centripetal Force Accessory.

 **CAUTION:** To avoid injury or damage to the equipment, keep all cords away from the motor and rotating arm.

Software help

The SPARKvue and PASCO Capstone Help provide information on how to use this product with the software. You can access the help from 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/ME-8088 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. Visit pasco.com/freelabs/ME-8088.

Technical support

Need more help? Our knowledgeable and friendly Technical Support staff is ready to answer your questions or walk you through any issues.

-  Web pasco.com/support
-  Chat pasco.com
-  Email support@pasco.com
-  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.