

Gravitational Torsion Balance

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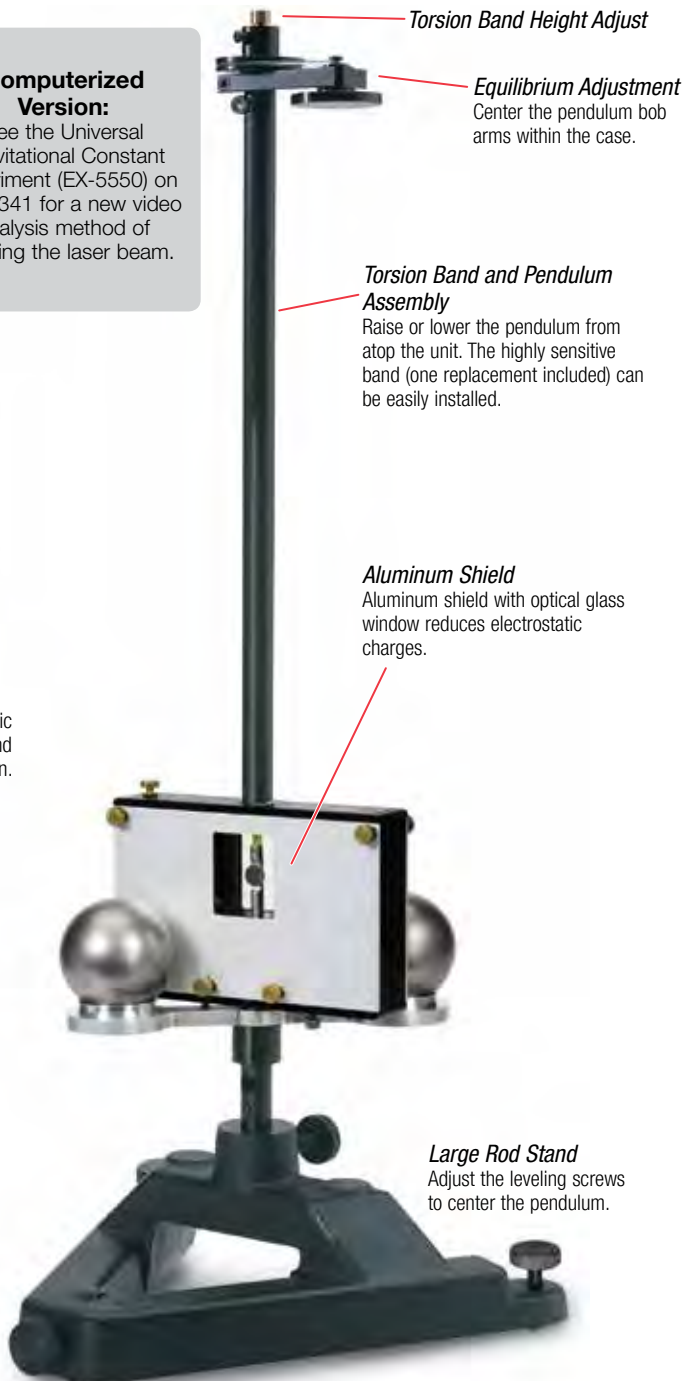
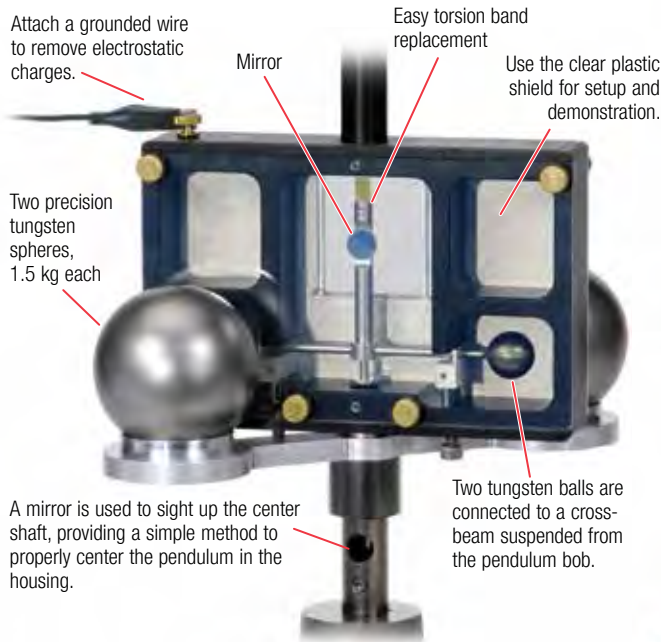
AP-8215A

- ▶ Measure the universal gravitational constant in a single lab period
- ▶ Adjustment and locking mechanisms decrease lab setup time
- ▶ Torsion band easily replaced

Features

- ▶ View the pendulum bob's position through a mirror in the unit's central shaft. Use the leveling screws in the cast-iron base to accurately center the bob.
- ▶ A special "U"-shaped groove in the locking mechanism is used to dampen the oscillation of the small tungsten balls.
- ▶ Easily adjust pendulum height with a single screw.
- ▶ The smooth action of the rotating large tungsten ball support ensures that the balls can be moved easily without disturbing the motion of the small tungsten balls.

Computerized Version:
See the Universal Gravitational Constant experiment (EX-5550) on page 341 for a new video analysis method of tracking the laser beam.



Specifications

Torsion Band: Beryllium copper ribbon, 36 cm long with a cross section of 0.0178 x 0.15 mm

Small Masses: Two tungsten balls of 38 g each

Large Masses: Two tungsten balls of 1.5 kg each

Period of Oscillation: Eight minutes (approx.)

Accuracy: 5% (approx.)

Includes

- Torsion Balance Assembly
- Extra Torsion Band (1)
- Large Rod Base ME-8735
- Manual

Order Information

Gravitational Torsion Balance	AP-8215A	
<i>Required:</i>		
X-Y Adjustable Diode Laser	OS-8526A	
45 cm Steel Rod	ME-8736	p. 190
Large Table Clamp	ME-9472	p. 193
<i>Replacement Supplies:</i>		
Torsion Bands (2 pack) –		
Gravitational Torsion Balance	AP-8218	
Gravitational Balls Replacement Set	AP-8219	

Universal Gravitational Constant

EX-5550

Concepts:

- ▶ Measure the Universal Gravitational Constant in less than three hours!
- ▶ Recreate Cavendish's historical experiment
- ▶ Uses PASCO Capstone Video Analysis

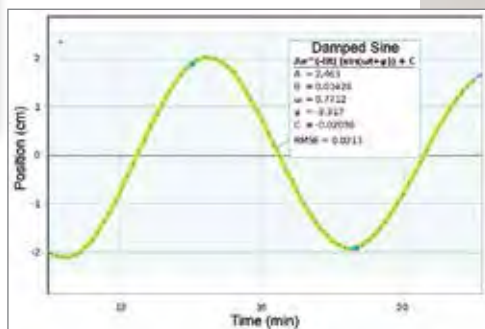
The attraction between a pair of small tungsten spheres and a pair of larger tungsten spheres is measured by the torsion of a beryllium ribbon. The large spheres are placed close to the small spheres and allowed to equilibrate. A laser is reflected from a mirror on the beryllium ribbon and shown on a screen or wall. The large spheres are then rotated through an angle to produce torque on the ribbon. The mirror rotates with the ribbon, so the laser reflection on the screen or wall is displaced. The displacement of the laser reflection is measured to find "G".

PASCO Advantage

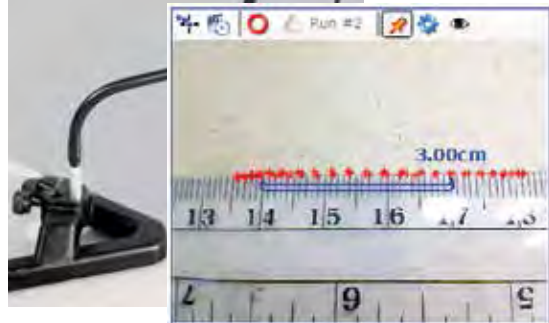
For the first time, the measurement of G using the Cavendish Balance can actually be performed in a three-hour lower division physics laboratory! Data collection is done using a webcam to video two periods of the oscillation for both ball positions in less than 45 minutes. The video data may then be transferred to the lab groups for analysis using the video analysis capability of PASCO Capstone. Fitting a damped sine curve to the video data allows an extremely precise determination of period of oscillation and where the final equilibrium positions would be. When analysis of small effects inherent in the method is included, an accuracy of better than 2% is possible.



At left, the USB Camera Microscope records the oscillation of the laser beam.



In PASCO Capstone, a damped sine fit is applied to the data to determine the equilibrium point.



This is a screenshot of the video analysis points (red plus signs) in PASCO Capstone.

Experiment Includes

- Gravitational Torsion Balance AP-8215A
- X-Y Adjustable Diode Laser OS-8526A
- Large Rod Base ME-9735
- USB Camera Microscope PS-2343
- Polarizer Set OS-8473
- Rods and Clamps

NOTE: No interface is required.

Order Information

- Universal Gravitational ConstantEX-5550
- Required:
- PASCO Capstone Software.....pp. 72-75
- Transparent Ruler and Meter Stick

To Download This Experiment

Search for EX-5550 at www.pasco.com