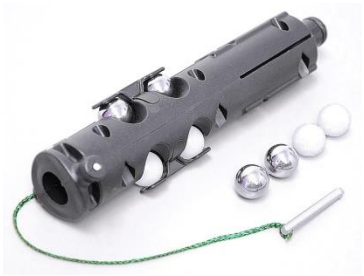
Independence of Motion Accessory

(Order Code: IOM-VPL)



The Independence of Motion Accessory is for use only with the Vernier Projectile Launcher (VPL). It cannot be used alone or with any other device. These instructions assume that you are familiar with the operation of the Projectile Launcher.

The Independence of Motion Accessory (hereafter called IOM) enables the Projectile Launcher to perform the classic experiment where one ball is dropped as another is projected horizontally. The balls strike the floor simultaneously.

A built-in level makes leveling the accessory fast and easy. One ball is placed in the barrel, which causes a pin to extend. A second, drilled ball is placed on the extended pin. When the first ball is ejected from the Projectile Launcher, the pin retracts and the second ball falls. Both metal and plastic balls are provided.

What is Included with the Independence of Motion Accessory

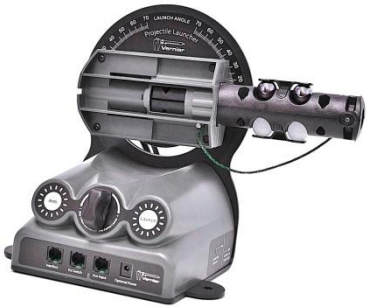
- Four steel balls, with two drilled
- Four white plastic balls, with two drilled

NOTE: Vernier products are designed for educational use. Our products are not designed nor recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

Configure the Independence of Motion Accessory

The IOM uses the air pressure from the Projectile Launcher to fire projectiles a short distance horizontally, while also releasing a second ball to fall vertically.

Set up the IOM using these steps:



- Configure the Projectile Launcher so that the barrel is approximately horizontal. Insert the IOM into the barrel of the Projectile Launcher. The bubble level on the IOM must be on top.
- Push the IOM firmly into the Projectile Launcher so that the aluminum barrel is not visible.
- Inset the cotter pin below the Projectile Launcher barrel to remove all possibility of the IOM from being ejected from the Projectile Launcher.
- Position the Projectile Launcher so that the IOM extends over the edge of the table, and so that the IOM is horizontal as judged by the bubble level.

- Prepare the Launcher for firing by providing power, pressurizing the air chamber per its standard operating instructions.
- First insert a non-drilled ball into the axial chamber as shown here. Note that the pin extends to the side.
- Place a drilled ball on the pin.

The accessory is now ready for use. The Launcher will fire the axial ball horizontally out of the device. As the ball leaves the chamber, the pin will retract and allow the drilled ball to fall vertically.

Listen for the impact of the balls, and note that they strike the floor simultaneously.

Although the IOM precludes the use of photogate timing, note that the Projectile Launcher still requires power. As a result you must either connect a powered interface to the Interface port, or supply power via the Optional Power input. The Launcher uses the same power supply as the original LabQuest® and the LabQuest 2.

Suggested Experiments

Independence of Motion

Configure as described above. Do the two balls strike the floor simultaneously, even for different horizontal velocities, or for differing horizontal distances travelled? Change the horizontal velocity by changing the air pressure.

Independence of Motion and Mass

Configure as described above. Does the simultaneity depend on the mass of the balls? Try the experiment with the plastic balls.

Independence of Motion: Vertical Fall Variation

Configure as described above. Do the two balls strike the floor simultaneously, even if the drop height is much larger?

Independence of Motion: Vertical Velocity Variation

Configure as described above, but set the Launcher barrel to an upward angle of about 20 degrees. Do the two balls now strike the floor simultaneously? Why or why not?

Related Products

Projectile Launcher (order code: VPL)

Use the Vernier Projectile Launcher to investigate important concepts in two-dimensional kinematics. Launch steel balls at angles between 0 and 70 degrees and over distances up to 2.5 m.

Projectile Stop (order code: PS-VPL)

The Projectile Stop has one job–to keep the projectiles from the Vernier Projectile Launcher from rolling out of sight. Place the Projectile Stop in the launch line, beyond the landing site, and the projectile will be caught.

The Projectile Stop is heavy foam-coated steel that stays where you put it.

Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use.

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Revised 1/8/2013

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