Horizontal Projectile Lab

P4-1406

CONTENTS:

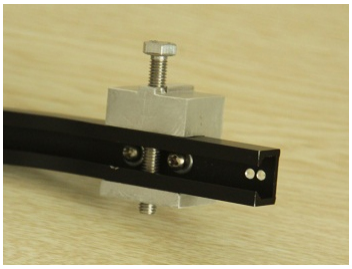
1 Curved Projectile Ramp
2 Nylon Wing Nuts (AD021d)
2 0.75” steel balls
1 Start Position Bolt
1 Medium Attachment Hex Bolt (AD021b)
1 T bubble level

ALSO UTILIZES:

Timer and Photogate (P4-1450)
Workshop Stand (P4-1901)
Meter Stick or Measuring Tape
Soup Can or other container

ASSEMBLY:

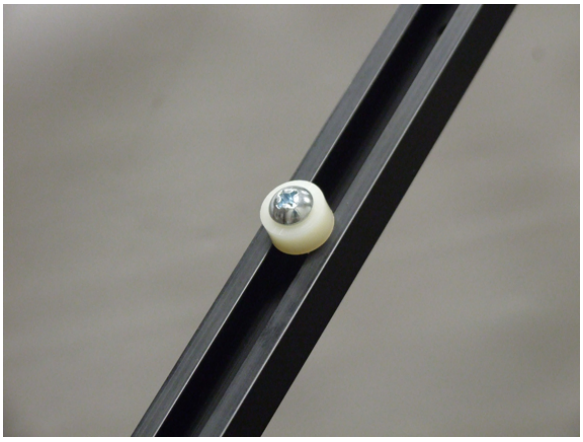
1. Attach the horizontal ramp by inserting the medium attachment hex bolt (AD021b) into the hole near the end of the projectile ramp. Make sure that the bolt is placed into the side of the projectile ramp which has its mounting hole on the raised rectangular surface (see image at the right).



2. With the bolt still in position through the mounting hole on the projectile ramp, slide the head of the medium attachment hex bolt (AD021b) down one of the double T channels in the Workshop Stand. It is helpful to pick a side of the stand that allows for the viewing of the stand's numerical scale when the ramp is mounted.

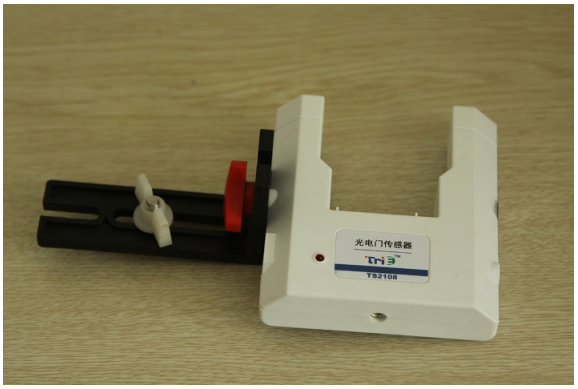
3. Attach the nylon wing nut (AD021d) to the end of the medium attachment hex bolt (AD021b) and tighten firmly. The raised rectangular surface on the side for the projectile ramp will ensure that the ramp is perpendicular to the workshop stand.

4. A consistent starting position can be indicated on the ramp using the included hardware. Decide which of the five starting holes you wish to use on the ramp and insert the Start Position Bolt into the starting hole on the horizontal ramp. This is held in place by using a metal wing nut which is threaded unto the machine screw from the underside of the ramp.



5. To measure velocity, attach a photogate to the workshop stand in a manner that allows the marble to roll off of the ramp and through the photogate. To do this, first attach a photogate mounting bracket to a photogate as shown in the picture at the right. Leave the red mounting bolt loose enough that the photogate can be easily turned on the mount.

6. Loosely attach a short attachment hex bolt (AD021a) to the photogate mount using a nylon wing nut (AD021d) (See the image at the right).

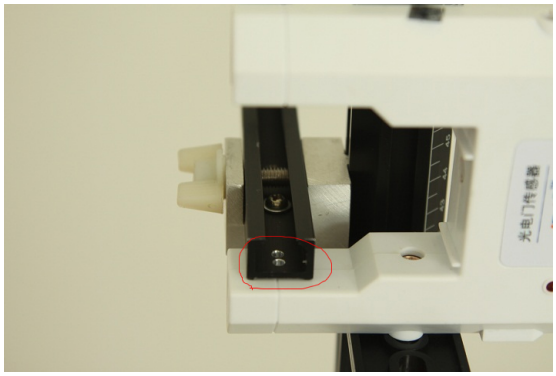


7. Slide the head of the short attachment hex bolt (AD021a) along with the photogate and mounting bracket down a channel on the opposite side of the workshop stand from which the projectile ramp is mounted. In other words, when facing the channel of the Workshop Stand which currently holds the horizontal projectile ramp, mount the photogate one channel to the right.

8. Lower the photogate until the bottom half of its "U" shape is just lower than the bottom of the projectile ramp (see the image at the right). It may be necessary to rotate the photogate counter-clockwise so that it can clear the projectile ramp.

9. Tighten the photogate mounting bracket securely by firmly tightening the nylon wing nut (AD021d) on the photogate mounting bracket.

10. Rotate the photogate back towards the Workshop Stand aligning it so that the photogate beam is able to pass through the small hole located at the end of the projectile ramp (see the image at the right).



11. Tighten the photogate red mounting bolt firmly to hold the photogate in this position.

12. The horizontal projectile ramp can now be leveled by placing a bubble level at the end of the projectile ramp just after where it is attached to the Workshop Stand and adjusting the feet of the Workshop Stand in order to achieve levelness in all directions of the bubble level.

13. To find velocity with a photogate, measure the time the gate is blocked. Divide the marble's diameter by that time to find its instantaneous velocity.