



# Mini Drop Shoot Accessory

Model No. ME-6827

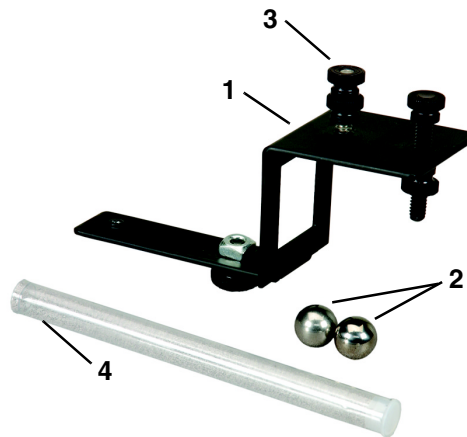




# Mini Drop Shoot Accessory

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## Equipment List



Included Equipment	Replacement Part Number*
1. Drop Shoot Bracket	648-08601
2. 1.6 cm Steel Balls (2)	042-030
3. Photogate Mounting Hardware	
4. Loading Rod	003-0567

\*Use Replacement Model Numbers to expedite replacement orders.

Additional Equipment Required	
Mini Launcher	ME-6825
C Clamp	SE-7285
Photogate Head	ME-9498A
Time of Flight Accessory	ME-6810
Smart Timer or Computer Interface	ME-9830

## Introduction

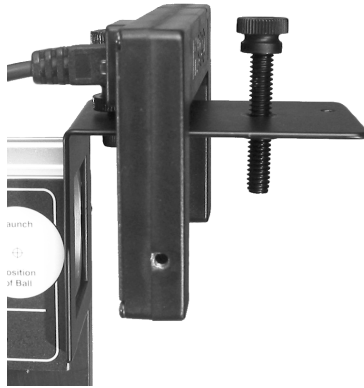
PASCO's Drop Shoot Accessory is designed to demonstrate the independence of motion in the x and y directions for a projectile. The included bracket easily mounts on a Mini Launcher (ME-6825). Add a Photogate to the bracket to determine the muzzle velocity of the ball as it leaves the launcher. In addition, a Time of Flight Accessory can be used to measure the time of flight for the ball.

## Independence of X and Y Motion

1. Mount the Mini Launcher to a tabletop with a C clamp or other table clamp.
2. Using the attached plumb bob, set the launch angle to  $0^\circ$ .



3. Slide the Drop Shoot Bracket into the groove on the bottom of the Projectile Launcher.
4. Tighten the thumbscrew on the bottom to secure the bracket.



5. Connect a photogate as shown to measure the initial speed of the fired ball (optional). Since the photogate beam passes through the center of the ball's path, the velocity of the ball is calculated by the following equation:

$$velocity = \frac{\text{diameter of ball}}{\text{"blocked time"}}$$

6. Place the Time of Flight Accessory directly below the Drop Shoot Bracket.
7. Hang a steel ball from the magnetic screw.
8. Adjust the magnetic screw until the "hanging ball" is centered on the launcher piston.
9. Remove the "hanging ball."
10. Place a steel ball into the barrel and use the included loading rod to depress the plunger to the first click.
11. Replace the "hanging ball".
12. Pull the launch cord to release the balls.
13. Mark the position the "hanging ball" when it strikes the ground.
14. Click Stop in DataStudio to end data collection.
15. Position the Time of Flight Accessory such that the hanging ball will strike it and repeat the launch procedure.
16. Describe the motion of the balls in the x direction.

17. Describe the motion of the balls in the y direction.
18. How does the time of free fall compare for the two balls? Explain.

## Changing Launch Velocity

1. Repeat the above experiment, depressing the plunger of the launcher to the "second click" instead of the "first click."
2. Draw a force diagram for each ball as it flies through the air.
3. Ask students to predict the horizontal range and time of free fall for this new launch setting.
4. How does the horizontal range compare to the "first click" setting? Explain.
5. How does the time of free fall compare to the "first click" setting? Explain.
6. What must be changed to affect the time of free fall?
7. If desired, repeat the experiment for the "third click."