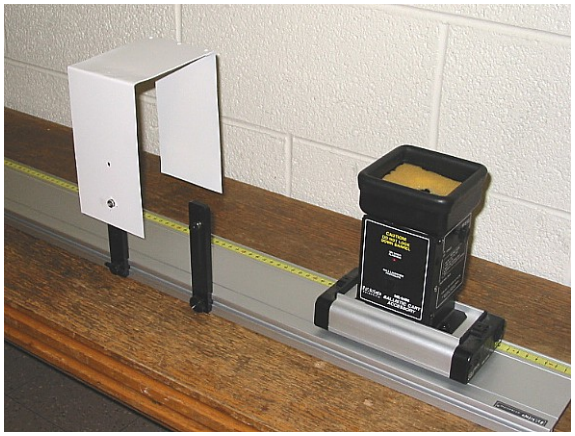
Ballistic Cart (High Tech)

Purpose: Demonstrates the independence of motion in the horizontal and vertical directions.

NOTE: The cart now has a wireless video camera on board, so the class can see from the cart's frame of reference. See the Video Addenda link.

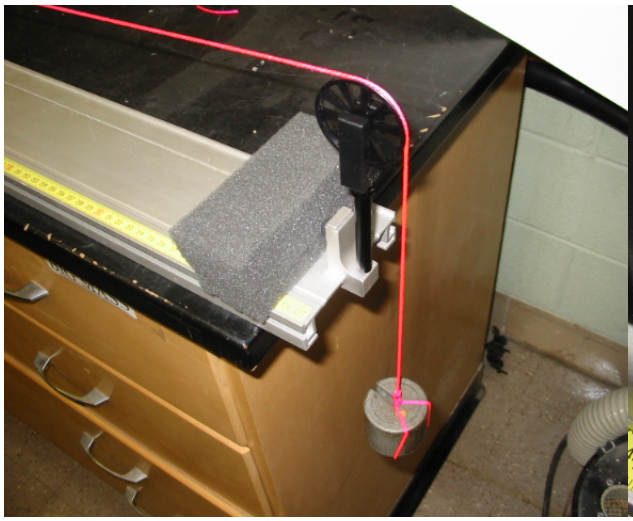
This demo shows how linear motion in the horizontal direction is independent of what's happening in the vertical direction: The cart launches a steel ball upward, and subsequently catches it down the road.

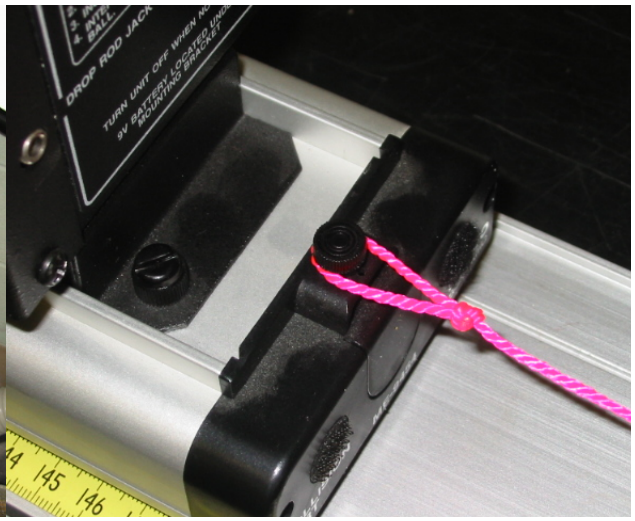
This version uses a low-friction cart and a photogate/electronic tripping mechanism. You can arrange the tunnel so that the cart passes through it while the ball is in the air.



NOTE: Make sure the cart has something soft to crash into. A permanent magnet holds the ball and spring launcher down (push it down with your finger to cock it). When the photogate on the cart is interrupted by the flag (attached to the track), it fires the launcher by energizing an electromagnet to counter the permanent magnet's field. The flag is a filed-down screw which should pass freely through the photogate without any adjustment, once the assembly is mounted on the track.

As an additional exercise, it is interesting to rig up a pulley and weight to accelerate the cart. The pulley supplied screws into the track stop (see photo). The trick is to make sure acceleration occurs during the launch phase: the string on the supplied 200 mg weight is about the right length (using the long track) to ensure that the cart will accelerate from rest and still work. Locate the photogate flag about 20 cm down from the (end) starting position. The ball will miss the cart and land on the track behind the cart.





Extra Equipment: Pasco cart track (on the back table, the short one will work, but the long one is needed for acceleration).

Location: Shelf A2.

See Manual