# Lab #6: Carts on a Track

## Lab due Thursday, October 12, 2006!

**Theory:**

1. Consider two carts on a track with a compressed spring between them. Let the potential energy of the stored in the spring be $U_o$. The spring is released. Use momentum conservation to show that

$$v_2 = -\frac{m_1}{m_2}\, v_2 \tag{1}$$

2. Next use energy conservation to show that the velocity of cart #B is

$$v_1 = \sqrt{\frac{2U_o}{m_1}\frac{1}{1 + m_1/m_2}} \tag{2}$$

**Experiment:** The goal of this is to verify this relation.

(a) Start with equal mass carts (500g) and a compressed spring. Decompress the spring (using a weight) and measure the velocity of the outgoing cart using the ultrasonic motion detector.

(b) Next make the cart #2 "infinitely" massive by placing a stop on the air track as shown by your instructor. Decompress the spring and measure the velocity of cart in this case.

(c) Use the velocity in part (a) to make a theoretical prediction for the results of part (b). Call this $v_{\text{theory}}$.

(d) Compare the velocity measured in part (b) with this theoretical expectation. Compute the percent error

$$\%\text{Error} = \frac{|v_{\text{exp}} - v_{\text{theory}}|}{v_{\text{theory}}}. \tag{3}$$