PHYSICS 125 EXPERIMENT NO. 7
CONSERVATION OF MOMENTUM

Purpose:

Conservation laws are very powerful tools in understanding physical phenomena. We have already examined some aspects of energy conservation laws in the laboratory. This week's work is devoted to observing momentum conservation

What happens in collisions of objects is governed by momentum conservation. We use the air track to study collisions in one dimension. The goal is to see that momentum really is conserved in these relatively simple processes [Simple because no external forces act in the horizontal direction since there is no friction].

Two photogate connected to the computer are available for determining the velocities of the air track carts before and after collisions. Be sure to obtain the initial and final velocities of both carts.

You should obtain results which verify momentum conservation to better than 10%, with reasonably careful measurement technique.

Procedure:

1.Weigh air track carts having different masses m_1 and m_2.

2.The “photogates" in this experiment are connected to the grey box with the computer set to "gate timing mode”. The computer determines the time that the light falling on the photocell is interrupted by the opaque "flag" which is attached to the cart. The lab instructor will show you how to use the timing equipment. The velocity of a cart that passes through the photogate is found by dividing the width of the "flag" (ω) by the time determined by the computer.

For good results it is important to accurately measure ω.

so that the front edge of the flag just begins to interrupt the light beam. Record the position of the front edge of the cart, then move it until the back edge of the flag begins to move out of the light beam. Again record the position of the front edge of the cart. The difference of these position readings gives the flag width ω.

Go through the same procedure for the other photogate with the other cart. Now you are ready to take some data!

3. Level the track.

4. Study *elastic* collisions where: cart 1 collides with the stationary cart 2; cart 2 collides with the stationary cart 1. From your data, compute the initial and final momenta in each case. Also compute the initial and final kinetic energies.

5.Study an *inelastic* collision. Install the "Velcro” strips at the ends of the carts so they stick together. Do the same computations you did in step 4 above.

Question:

The air track reduces friction, but does not entirely eliminate it. Air resistance also affects the motion. What effect do these forces have on your results?