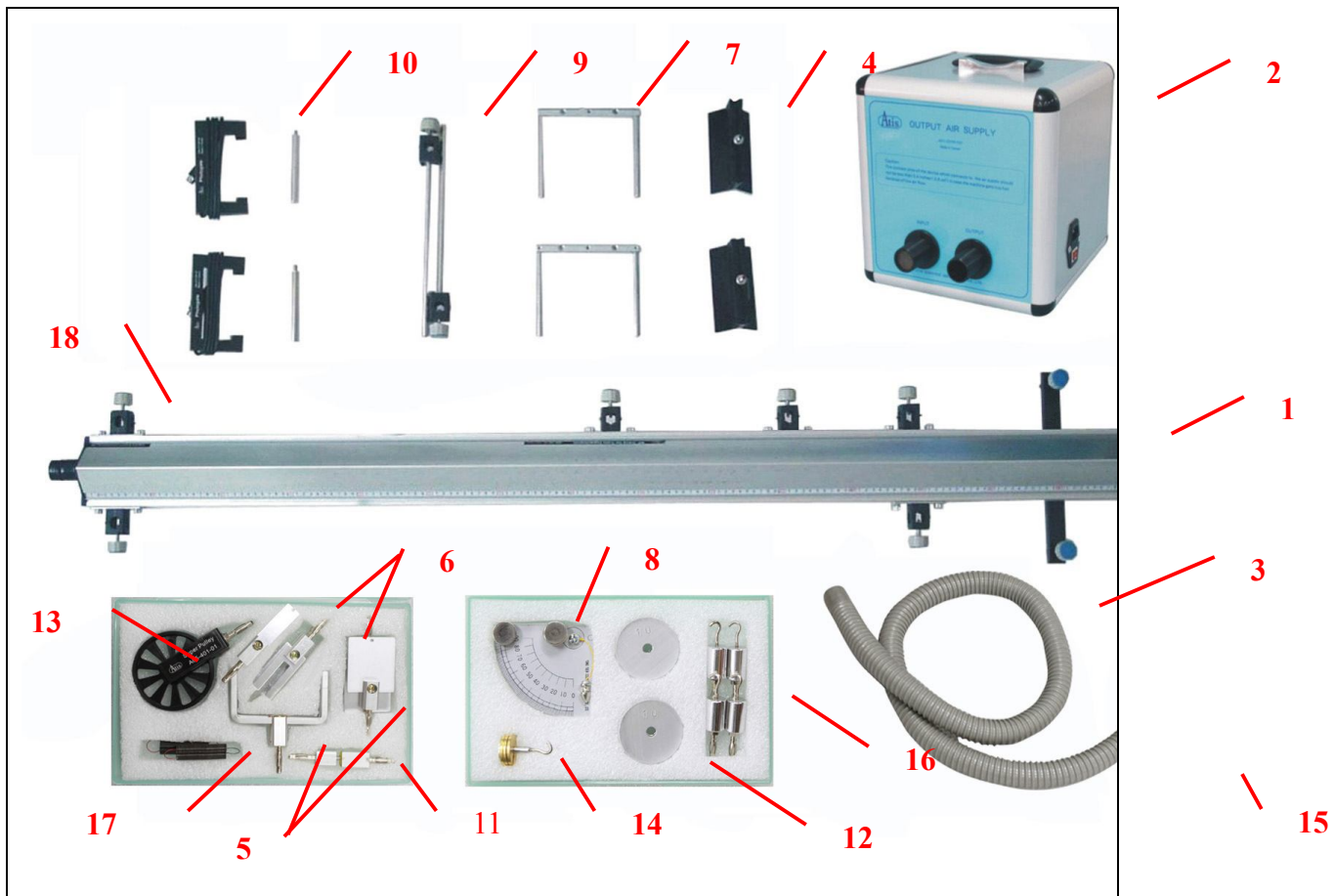


Experiment: Air Track

No	Accessories	Qty	No	Accessories	Qty
1.	Air Track (adjustable foot)	1	2.	Low Noise Pump	1
3.	Pump Air Pipe	1	4.	Cart	2
5.	Slotting Set	3	6.	Fence (time and speed)	2
7.	Block	2	8.	Movable Protractor	1
9.	Fixed Bracket	2	10.	Photogate (iron bar)	2
11.	Slotting Set(Inelastic collision)	1	12.	Weight 10g	6
13.	Fixed Pulley	1	14.	Weight Bracket and Weight (5g)	1
15.	String	1	16.	Hook	4
17.	Harmonic Spring	2	18.	Connector Movable Seat	6
19.	Photogate Electronic Timer (E01-631B-Y01)	Not included	20.		



Procedures

(A) collision experiment

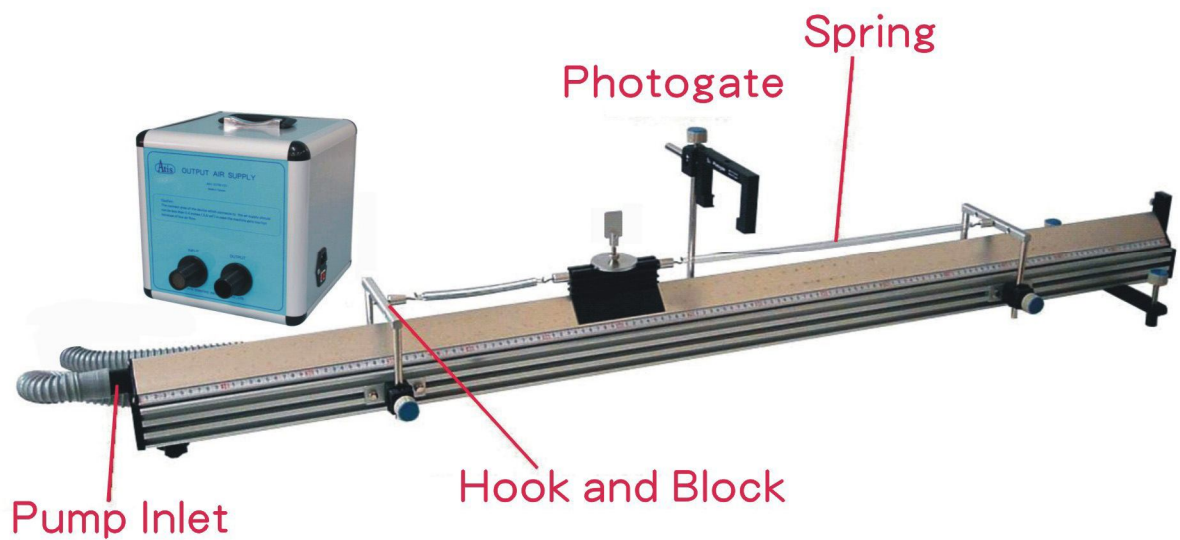
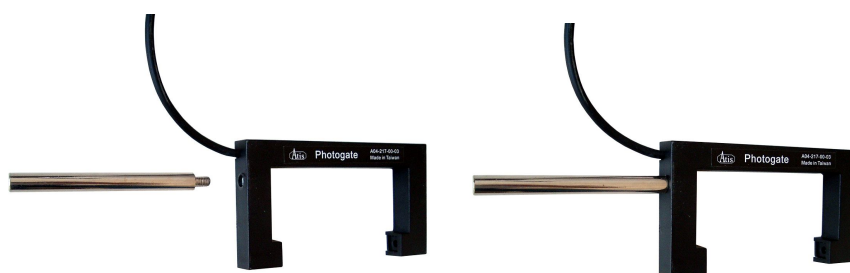
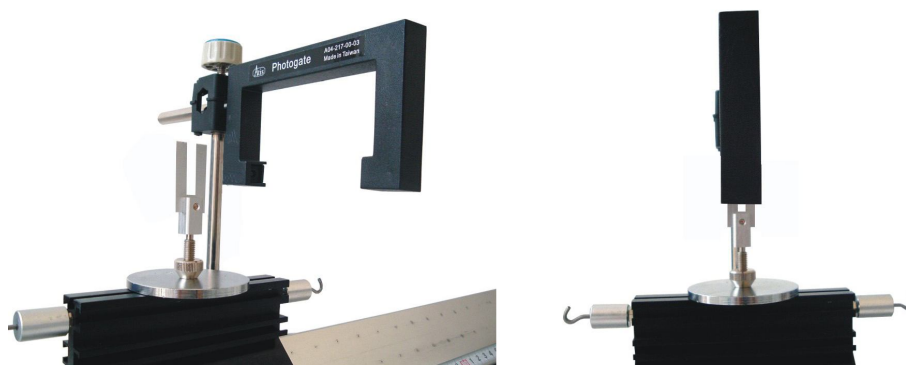


Figure 4-1

1. Set up as shown in Figure 4-1. Use a cart or a protractor (installed on the rail side) to adjust the air track to a horizontal position.
2. Insert the iron bar into the photogate as shown in Figure 4-2. Adjust the height of the photogate using the fixed bracket, so the fence can be sensed by the photogate when the cart goes through as shown in Figure 4-3.

**Figure 4-2 Insert the iron bar****Figure 4-3 Adjust the height of the photogate**

3. The accessories set up as shown in Figure 4-4, using 1cm U-type fence. Start the collision experiment and measure the weights of the cart.

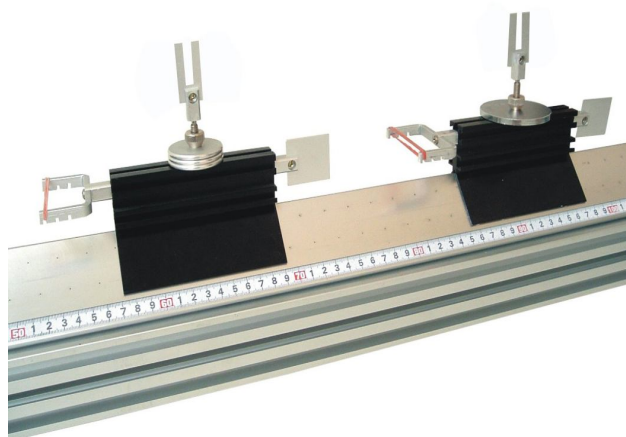


Figure 4-4 How to set up accessories

4. The distance between photogate A and B should be more than the distance between the fences to make sure that photogate A senses cart A before colliding.
5. Connect the timer with the photogate- photogate A to Ch1, photogate B to Ch2.
6. Connect the photogate to the timer, and press 'function' to select 'collision' function.
7. Turn on the power supply and set up the instruments as shown in Figure 4-1.
8. When the cart goes through, the timer will show the data. Press Data Select "+", "-" to change the unit of time and speed.

t_0 = The time difference of photogate Ch1 by the 1st time

t_1 = the time difference of photogate Ch1 by the 2nd time

t_2 = the time difference of photogate Ch2 by the 1st time

t_3 = the time difference of photogate Ch2 by the 2nd time

d_1 = the instantaneous velocity of photogate Ch1 by the 1st time

d_2 = the instantaneous velocity of photogate Ch1 by the 2nd time

d_3 = the instantaneous velocity of photogate Ch2 by the 1st time

d_4 = the instantaneous velocity of photogate Ch2 by the 2nd time

t_1, d_1 represents Ch1 photothyristor second is U-shaped piece shading shading of the time difference, speed,

9. Record the data to calculate the momentum and kinetic energy.
10. As shown in Figure 4-5, change the mass to obtain different data.



Figure 4-5 How to change the mass of the cart

11. Inelastic collision set up as shown in Figure 4-6. Repeat steps 3 to 10, record and verify the conservation of momentum.

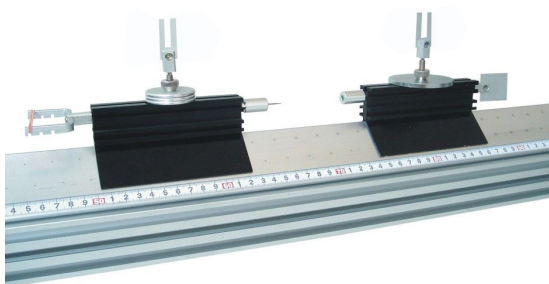


Figure 4-6 Inelastic collision set up

(B) Newton's second law of motion

1. Instruments set up as shown in Figure 4-7.
2. Record the weight of the cart. Connect the cart and the weight bracket by a string. Assume the weight as an applied force F .

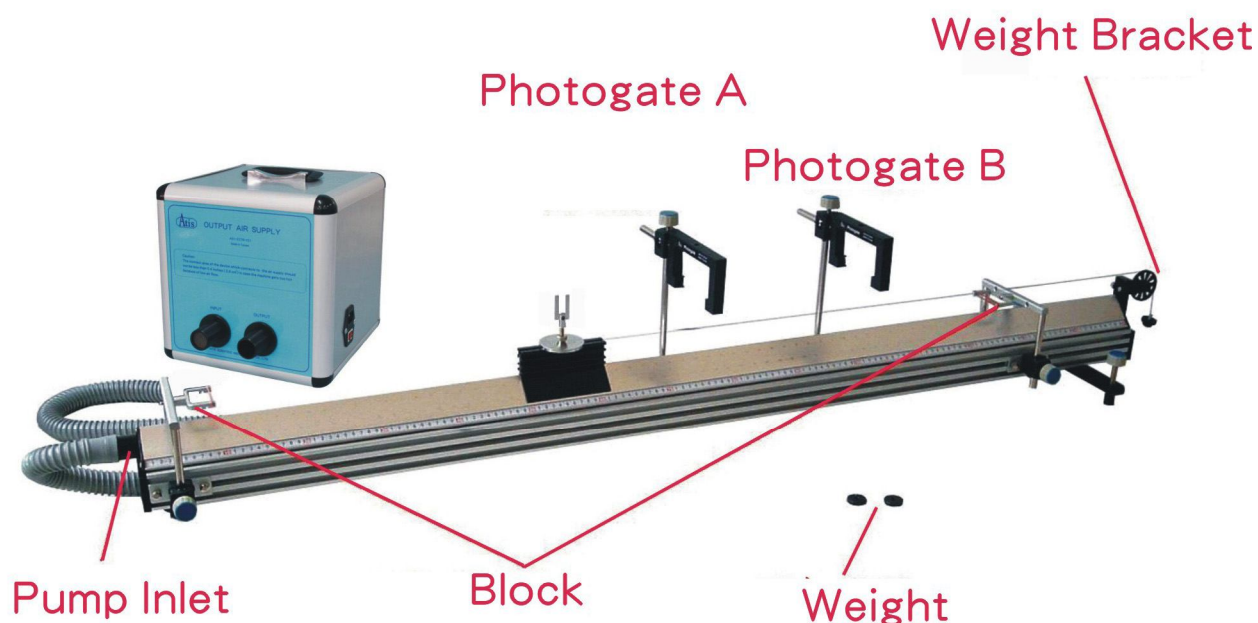


Figure 4-7 Newton's Second Law of Motion Experiment

3. Connect the timer to the photogate: photogate A to Ch1, photogate B to Ch2.
4. Turn on the power and press function 'Acceleration'
5. Turn on the pump and start the experiment. When the cart goes through the photogate, the data will be displayed on the timer. Press Data Select "+" "-" to switch the unit of measurement for time (t), velocity (d) or acceleration (A).
6. Change the mass to obtain different data.

(C) Simple harmonic motion:

1. Instruments set up as shown in Figure 4-8.
2. Record the weight of the cart and connect the hook and the block by using the

spring as shown in Figure 4-9.

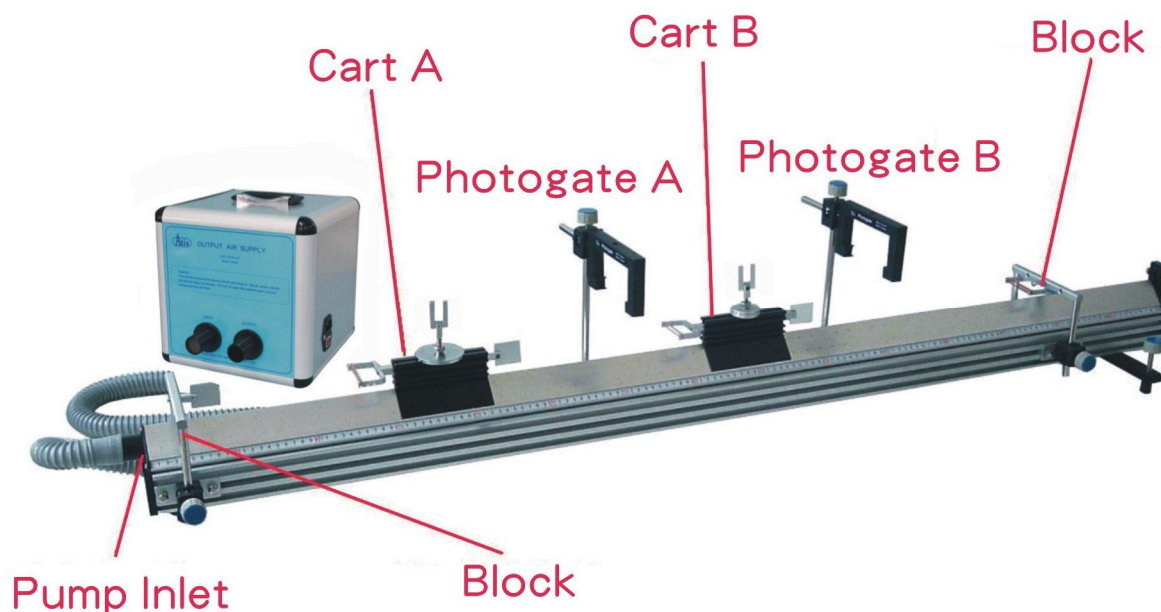


Figure 4-8 Simple harmonic motion set up

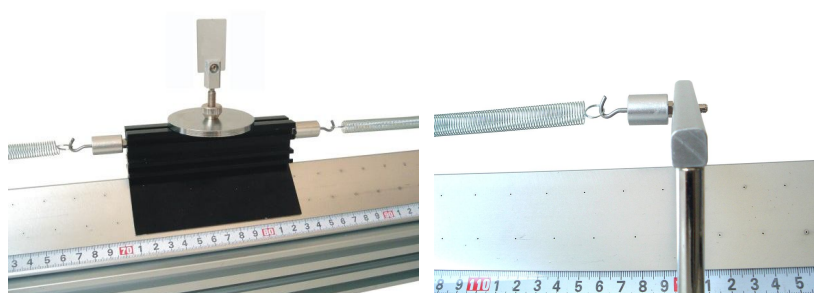


Figure 4-9

3. Connect the timer to the photogate: photogate A to Ch1.
4. Turn on the power and press function 'Pendulum'
5. Turn on the pump, and pull the spring then let go the cart to do simple harmonic motion. The timer will display the data when the cart finishes one period. Calculate the average value of 10 periods.
6. Change the mass to obtain different data.