Phone: 417.374.7431
Fax: 417.374.7442
service@gosciencecrazy.com
1747 North Deffer Drive
Nixa, Missouri 65714

Intelligent Timer for Photogates and Solenoids #TMRSOL

Warning:

- Not a toy; use only in a laboratory or educational setting.
- California Proposition 65 Warning: This product can expose you to chemicals including styrene and lead, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Introduction

Accurate timers are essential in the lab. Operating instructions for the timer below are on the following page.

Parts and Buttons

1. Port for Photogate 1
2. Port for Solenoid
3. Display
4. Mode Dial

5. Port for Photogate 2
6. Start Button
7. Mode Button
8. Set Distance Button

9. Store Memory Button
10. Result Button
11. Reset Button
12. Power Cord

Working of "Intelligent Timer with Solenoid" With "Inclined Plane" and "Loop The Loop Apparatus"

1. Connect the photo gates with the apparatus by using connecting lead (EPST male – EPST male).
   Photo gate of "Inclined Plane" or "Loop The Loop Apparatus" which is connected on Gate 1 EPST Female Socket on apparatus will act as IN Gate for passing object and the photo gate of "Inclined Plane" or "Loop The Loop Apparatus" which is connected on Gate 2 EPST Female Socket on apparatus will act as OUT Gate for passing object.

2. Select the working mode "Inclined Plane" or "Loop The Loop Apparatus" whichever is required at present.

3. Plug-in the power cord with an input of 90-240V AC.

4. Press the switch "MODE" once to select the mode of distance on the device.

5. Now press the "SET DISTANCE" key to set the distance as equal to the distance between photo gates, actually. Resolution of the set distance is 100mm.

6. Now press the "MODE" switch again, to enter this device in "TIME" mode, as the object will enter from gate1, the timer will start and as the object will exit through gate2, the timer will stop.

7. The result on LCD will be the time taken by an object to enter from gate1 and exit from gate2 within a distance.
   *The unit will be "SECOND" for this "TIME" result.

8. As again you will press the "MODE" key the device will enter in the "SPEED" mode and it will show you the auto calculated result for the speed of that object which entered from gate1 and exit from gate2. This calculation is done by the device through microcontroller programming.

9. Press the "MODE" key again, the device will enter in the "ACCELERATION" mode and it will show you the auto calculated result for the acceleration of that object which entered from gate1 and exit from gate2. This calculation is done by the device through microcontroller programming.

10. To store these results of "TIME, SPEED & ACCELERATION" you can press the "STORE MEMORY" key. This device can store up to 10 results only.

11. Repeat all of above steps to obtain the more observations for your experiment.

12. Now you can press the "RESULT" key to see the "TIME, SPEED & ACCELERATION" together for all your previous observations. Even after the power cut, your results will remain store.

13. To delete all the previous stored results, press the "STORE MEMORY" key continuous for 3 seconds, a message for "DELETING..." then "MEMORY DELETED!!" will show up.

14. Press the "RESET" key to initialize the device again for new experiments.

(Press the "RESET" key, if any unexpected result shown during experiment.)

Working of "Intelligent Timer with Solenoid" With "g By Free Fall Apparatus":

1. Connect the photo gates with the apparatus by using connecting lead (EPST male – EPST male). Connect the Upper Gate of "g By Free Fall Apparatus" on Gate 1 EPST Female Socket on apparatus and connect the "Lower Gate" of "g By Free Fall Apparatus" on Gate 2 EPST Female Socket on apparatus.

2. Connect the Solenoid to the Solenoid EPST socket on the apparatus.

3. Select the working mode "g By Free Fall" on the apparatus.

4. Plug-in the power cord with an input of 90-240V AC.

5. Touch the Steel Ball to the core of Solenoid.
   *The steel ball will remain in touch with the solenoid core. Because the solenoid core is magnetize during the power ON of apparatus.

6. Press the switch "MODE" once to select the mode of distance on the device.

7. Now press the "SET DISTANCE" key to set the distance as equal to the distance between photo gates, actually. Resolution of the set distance is 100mm.

8. Now press the "MODE" switch again, to enter this device in "TIME" mode.

9. Press the "Start" button provided on the apparatus to release the steel ball from the solenoid.

10. As the object will enter from gate1, the timer will start and as the object will exit through gate2, the timer will stop.

11. The result on LCD will be the time taken by an object to enter from gate1 and exit from gate2 within a distance.
    *The unit will be "SECOND" for this "TIME" result.

12. As again you will press the "MODE" key the device will enter in the "SPEED" mode and it will show you the auto calculated result for the speed of that object which entered from gate1 and exit from gate2. This calculation is done by the device through microcontroller programming.

13. Press the "MODE" key again, the device will enter in the "ACCELERATION" mode and it will show you the auto calculated result for the acceleration of that object which entered from gate1 and exit from gate2. This calculation is done by the device through microcontroller programming.

14. Repeat all of above steps to obtain the more observations with different distance set between two gates.

(more on next page)

Observation Table:

Sr No.	Distance Between Gates	Time	$g=2S/t^2$

Formula Used:

S = ut + ½ at

- Where s = Distance between metallic sphere and sensor plate
- t = time taken by the ball to reach at the sensor plate
- u = initial speed of the ball
- a = acceleration of the metallic sphere, Now a = g in vertical direction
- As the initial speed of the metallic sphere is zero
- Therefore
- 2 2 S = ½ gt => g = 2s/t
- Put all the value in the formula and calculate the acceleration due to gravity.