Position vs time graphs, and velocity vs time graphs. (A data logger based "ticker timer".)

Aim:

To investigate motion by producing and analysisng position vs time graphs, and velocity vs time graphs.

Theory:

A falling object will accelerate at a constant rate - its velocity will change by a constant amount every second. A velocity vs time graph of this motion will be a straight line an the acceleration is equal to the slope of this line. The position vs time graph is a parabola.

Equipment: Photo gate sensor connected to an interface or data logger and a computer.

Data Logger Setup:

- Input 1: Photo Gate
- Samples: 60,000
- Rate: 20,000 samples / Sec

Method: The equipment should be set up as shown below. The picket fence can be held above the photo gate with a string.



- 1) Connect the data logger or interface to the computer and start the software.
- 2) Hold the picket fence above the photo gate.
- 3) If you are using the Ezilog USB set the sample rate to 20,000 samples/s and sample time to 3 s. Click the Run button and release the picket fence. After the graph appears, click the View Posn vs Time button to display graphs of position vs time and velocity vs time. Use the value for acceleration at the top left of the graph (see below).



a) Graph produced from dropping a picket fence through a photo gate using the Ezilog USB.



b) Position vs time and velocity vs time graphs generated from graph a using the Ezilog USB.

Discussion:

- 1. Is the velocity vs time graph a straight line?
- 2. Calculate the area under the velocity vs time graph and compare this value with the change in position over this time (see below).



3. Discuss any sources of error that may have affected your results.

This experiment was conducted using the Ezilog USB data logger - http://www.logint.com.au/ezilog.html