Overview

Visible light beam
So you can see the beam being broken

Multicolour indicator
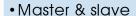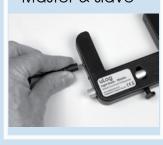Colour on Light gate corresponds to sensor channel on the computer screen and goes off when an object passes through

Mounting bar
Use with clamp stands

Locking screw
Use to grip the mounting bar, clamp stand uprights or remove and mount the gate directly onto a camera tripod

Mounting point
Can be used to mount on standard clamp stands, supplied mounting bar and other suitable mounting points

- Master & slave
- Tripod mounting
- Fit direct to stand

Easy USB sensing and datalogging

Getting started with uLog Light gates

1 Insert the CD and install SensorLab
   (see last page for more information)

2 Run SensorLab and plug your uLog sensor into a free USB port
   You should see live readings from your sensor on the screen

3 Once the software is running select 'Setup'
   Click the icon shown right

4 From the setup wizard, select 'Timing' and then follow the wizard to set your experiment details.
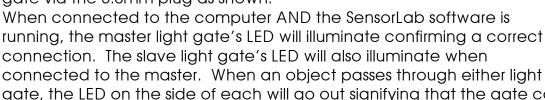   Select the required timing option

Set up timing or periodic data logging

5 Click 'Start' when prompted and begin logging data.

Congratulations, you have recorded your first set of data using uLog!

Using the Master and Slave light gates

The uLog Light gate set is supplied as a 'master' and 'slave' pair. The master light gate plugs directly into the computer using the standard USB plug and the slave light gate plugs into the master light gate via the 3.5mm plug as shown.

When connected to the computer AND the SensorLab software is running, the master light gate's LED will illuminate confirming a correct connection. The slave light gate's LED will also illuminate when connected to the master. When an object passes through either light gate, the LED on the side of each will go out signifying that the gate can 'see' the object. Once the object has passed through, the LED will illuminate again. This is designed to aid in the setup of experiments. The master and slave light gates can be mounted in a number of ways using the supplied bar and locking nut as shown below:

Multiple sensors

The uLog system allows more than one sensor or pair of light gates to be plugged into one computer at any one time*. For example, if you wanted to record the rotation frequency (to derive speed) of four wind turbines and simultaneously measure temperature and light, you could plug in 2 pairs of uLog light gates (master & slave), a temperature sensor and a light sensor. Note that the number of uLog sensors you can use is dependant on the computers processing power, number of USB ports & the USB power available (particularly limited on small computers). Use a high quality **powered** USB hub to increase both number of USB ports and power capacity. Note you can move uLog sensors further away from the computer using a USB extension cable.

*Please note that when using Light gates for timing experiments using the Sensorlab setup wizard, only a single Master or a pair of Master and Slave light gates can be used at any one time.

Ideas for experiments

Inelastic collisions
A common example of a perfectly inelastic collision is when two snowballs collide and then stick together afterwards. This is an example of conservation of momentum as illustrated by the following equation:

$$m_1v_1 + m_2v_2 = (m1 + m2)v_f$$

m_1 = mass of object 1; v_1 = velocity of object 1 through master light gate.
m_2 = mass of object 2; v_2 = velocity of object 2. V_f = Final velocity of both objects through slave.

By using a linear Air track (or suitable ramp and cars), the Physics of Inelastic collisions and the conservation of momentum can be investigated by allowing a moving object to collide with a stationary one and 'stick' together. The initial Velocity of the single object can be obtained using one light gate and the two objects then pass through a second light gate giving the combined objects Velocity.

Equipment required:
uLog Light gate set, SensorLab data logging software, computer, Air track or ramp, balance (if mass of cars not known), 2 suitable air track cars, Black card 10cm square, Modelling clay or similar, Clamp stands or similar to mount the light gates.

Hazards:
Children should be supervised at all times.
Always check your local regulations or the schools safety policies for guidance on the use of any hazardous material.

Method:
1. Fix the card onto the car which will be travelling towards the stationary car and obtain the mass of each. Attach some modelling clay or similar to enable the cars to stick together.
2. Mount the Light gates to clamp stands and position over the track as in the photo.
3. Connect the master to the slave light gate and connect to a computer.
4. Place the light gates so that one of the cars is stationary between the two as shown in the photo. (ensure the light gate which is passed through first is the master).
5. Start the data logging software and select velocity at any sensor.
6. Record the velocity v_1 and final velocity v_f
7. Repeat for a number of readings making sure to place the second car in the same location.
8. Calculate the initial momentum and final momentum for each set of experimental data using the equation shown above.

Additonal experiments
The uLog light gates allow Speed, Acceleration, Simple Harmonic Motion, Frequency of rotation, Velocity and Kinetic Energy. The setup wizard guides you through each setup.
See the SensorLab software guide for more information.

Further experiment ideas using LogIT sensors
Further experiments can be found on the CD supplied with the uLog or from www.logitworld.com