



Edu-logger Photo Gate Logger Sensor Guide 900-209



**Edu-logger photo gate logger sensor
900-209**

The Edu-logger photo gate sensor can be used for any science experiment or activity which involves taking accurate velocity and/or acceleration measurements especially in the field of Physics.

The sensor comes pre-calibrated so you can start experimentation right out of the box using this guide.

Hundreds of possible experimental subjects that can be done with the 900-209 sensors are: velocity/acceleration/distance relationships, impulse, collisions, conservation of energy, force, momentum, and many more.

The photo gate sensor uses an infrared beam which detects if an object is passing through it. Therefore the sensor actively reads out as “open” or “blocked”. While collecting data however there are several parameters to truly customize your experiment:

- Velocity with a single gate
- Velocity with two gates
- Acceleration with a single gate
- Acceleration with two gates
- Change in time between two gates
- Velocities with timing cards.

Experiment customization is explained after the following quick start guide.

Notes:

The photo gate sensor cannot work together with any of the other Edu-logger sensors. A special message

appears when other sensor is connected with the photo gate sensor.

The photo gate sensor cannot work at off-line mode because the computer is mandatory for its operation options. The off-line option is eliminated when the software finds that the photo gate sensor is connected.

The photo gate sensor cannot work with the monitor display unit 900-272.

Quick start procedure:

PC or Mac Computer

Materials needed:

- 900-209 Photo Gate Sensor
- 900-213 USB Module
- A USB to mini USB cable (which comes with the 900-213)

Your photo gate sensor needs to be connected to a 900-213 module. The 900-213 module then connects to a computer via a USB to mini-USB cable. Please note that you cannot plug the photo gate sensor directly into the computer.

Resident PC software and browser based application can be downloaded for free at

www.edulab.com as well as a full software user guide.

Note: Make sure not to download and install both types of software they will conflict on the computer.

Procedure:

1. Install the Edu-logger software
2. Connect the 900-213 module to the PC or Mac
3. Connect the photo gate sensor to the 900-213 module (they directly plug together). Please note there is no calibration required for this sensor.
4. Open the Edu-logger software.
5. Once a photo gate sensor logo appears on the left side of the screen the probe has been automatically identified and you can begin experimentation.
6. If the photo gate sensor is not automatically identified then click the “Search for sensors” icon to find the sensor.
7. Select the “On-line experiment” button; this will open a graph below.

8. Click on the “Module setup” button located on the photo gate sensor icon in the module window to change the sensor settings if need be.
9. Click on the "experiment set up" button to change the experiment settings if need be (experiment duration for example).
10. The photo gate sensor will give a live reading in the box to the left of the screen while plugged in.
11. To run an experiment and collect data click “Run experiment”.
12. To end data collection early, click “Stop experiment”.

Tablet, smart phone device

Materials needed:

- 900-209 Photo Gate Sensor
- 900-268 WiFi module
- 900-215 Battery

Your photo gate sensor needs to be connected to a 900-268 module. The 900-268 module will create a closed Edu-logger WiFi network which will stream the Edu-logger data to a device of your choosing. Once your device is wirelessly connected to the Edu-logger network you can run experiments and collect data through a browser of your choosing.

Procedure:

1. Connect the photo gate sensor directly to the left side 900-268 (no wires required).
2. Connect a 900-215 module to the right side of the 900-268 module.
3. Although not required, we recommend plugging the 900-215 to an outlet using a USB to mini USB charger (such as a typical cell phone charger). The 900-268 module will run for 15-75 minutes (depending on the sensor) without being plugged in.
4. The 900-268 can be powered directly using a mini to USB cord and plugging it into your computer or a wall charger. Please note this function is only available on 900-268 units with the USB icon on the cover.
5. For further 900-268 instructions or the 900-268 quick start guide please visit:www.edulab.com
6. The 900-268 indicator lights will flash; take no action until the LED to the far left turns blue; this can take up to one minute.

7. Take your tablet or smart phone, go to the WiFi settings and select the Edu-logger network which matches the 900-268 Module ID found on the back of the 900-268 device. (Edu-loggerXXXX for example).
8. Give your device about 20 seconds to connect to the 900-268.
9. Once the device is connected, go to your browser and type the website **wifi201.com** into the URL bar, then wait for 30-60 seconds.
10. You will see a “Control mode” icon in the browser, click on this icon.
11. The browser will then load a new screen and begin to auto detect the sensor(s); this can take a minute. (You can stop the search when the sensor is found.)
12. If the browser does not auto detect the sensor(s), select “Search for sensors”.
13. Once the sensor is found you will see an icon on the left side of the screen for the photo gate sensor. The icon will display real time data.
14. Click on the “Module setup” button located on the photo gate sensor icon in the module window to change the photo gate probe settings if need be.
15. Click on the experiment set up button to change the experiment settings if need be (Experiment duration for example).
16. To run an experiment and collect data, select “On-Line” experiment, then select "Run".
17. If you have a newer generation 900-268 (with the USB icon on the cover) this can be used as a 900-213, meaning you can tether the probes directly to the computer using the 900-268. To engage operation in this fashion, press 3 times on the panel key. Repeating this operation will return the unit to WiFi mode.

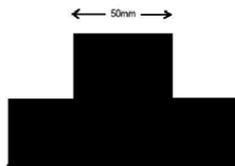
Experiment customization:

The Edu-logger photo gate sensor offers several different experimental customization options. To access them; click on the “Experiment Setup” button after your photo gate sensor has been detected.

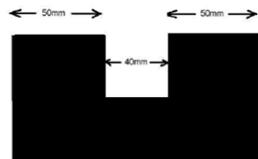
Timing cards:

Making timing cards is a unique option to further customize any experiment with the Edu-logger photo gate sensor. To make timing cards we recommend cutting your desired shapes out of black plastic for the most accurate readings though even plain paper will work just fine.

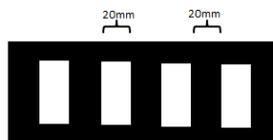
For example:



Single 'flag' timing card



Double 'flag' timing card



Multi 'flag' timing card

Velocity with a single gate:

Velocity with a single gate is the very basic velocity measurement using only one photo gate sensor and any object with a known width.

1. Click the “Experiment Setup” button in the Edu-logger software and select “Velocity with a single gate”.
2. The graphic demonstrates the basic idea of what your experimental setup should look like.
3. Measure and input the object width (in millimeters) into the text field labeled “X[mm]”
4. Click “Save” and then you are ready to begin data collection.

Velocity with two gates:

The velocity with two gates option is ideal for experiments which examine collisions between two objects of known width and mass.

1. Click the “Experiment Setup” button in the Edu-logger software and select “Velocity with two gates”.
2. The graphic demonstrates the basic idea of what your experimental setup should look like.
3. Measure and input the width and mass for both of the objects passing through the photo gate.
4. Assign each of your photo gate sensors to both the “Sensor A” and “Sensor B” position.
5. Be sure to space the photo gates far enough apart to allow for a collision between the two objects before they rebound back through the photo gates.
6. Click “Save” and then you are ready to begin data collection

Acceleration with a single gate:

Acceleration with a single gate requires an object (or timing card) with two flags (example shown above) with known widths.

1. Click the “Experiment Setup” button in the Edu-logger software and select “Acceleration with a single”.
2. The graphic demonstrates the basic idea of what your experimental setup and timing card/object should look like.
3. Measure and input the width for both flags.
4. Click “Save” and then you are ready to begin data collection.

Acceleration with two gates:

Acceleration with two photo gates requires two Edu-logger photo gate sensors and an object or timing card with a known width.

1. Click the “Experiment Setup” button in the Edu-logger software and select “Acceleration with two gates”.
2. The graphic demonstrates the basic idea of what your experimental setup should look like.
3. Measure and input the width of your object (in millimeters) into the text field labeled “X[mm]”.
4. Assign each of your photo gate sensors to both the “Sensor A” and “Sensor B” position.
5. Click “Save” and then you are ready to begin data collection.

Change in time between two gates:

Change in time between two photo gates requires two Edu-logger photo gate sensors and an object or timing card with a known width.

1. Click the “Experiment Setup” button in the Edu-logger software and select “Change in time between two gates”.
2. The graphic demonstrates the basic idea of what your experimental setup should look like.
3. Measure and input the width of your object (in millimeters) into the text field labeled “X[mm]”.
4. Assign each of your photo gate sensors to both the “Sensor A” and “Sensor B” position.
5. Click “Save” and then you are ready to begin data collection.

Velocities with timing card:

Velocities with timing card experiment requires one Edu-logger photo gate sensor and an object or timing card (a multi 'flag' is recommended). A known width is not required for the time measurements, it is however required for velocity calculations.

1. Click the “Experiment Setup” button in the Edu-logger software and select “Velocities with timing card”.
2. The graphic demonstrates the basic idea of what your experimental setup should look like.
3. Choose the expected experiment. A longer duration will include less samples. Click “Save” and then you are ready to begin data collection (scroll the menu down to see the save button).
4. You will get the time difference in which every black flag went through the photo gate. Velocities can be calculated by dividing the flag width by the time difference.

Restoring sensor's factory default settings:

Procedure:

1. Connect the 900-213 to a PC, Mac, tablet, or smart device.
2. Connect the photo gate sensor to a 900-213 module (they directly plug together). Please note there is no calibration required for this sensor.
3. Open the Edu-logger software.
4. Click the "Tools" icon.
5. Click the "Restore sensor's factory defaults" on the menu.
6. If prompted to clear the graph, click either the "Off-line experiment" or "On-line experiment" (whichever you are using).
7. Click "Clear experiment results".
8. Resume from step 4.

Included with sensor:

- Edu-logger 900-209 Photo Gate Sensor Guide (this document).
- Infrared transmitter and receptor housed in the photo gate unit.
- Threaded rod for easy connection to retort stands or other labware.

Sensor specifications

ADC resolution	16 bit
Accuracy	100 μ s
Resolution	100 μ s
Max sample rate (S/sec)	10,000

Sensor features:

- Fully digital data.
 - Rugged plastic ergonomic case.
 - Internally housed infrared transmitter and detector.
 - Photo gate handle with three threaded holes to customize your experimental setup.
 - Push button switch for Start/Stop experiments in off line mode.
 - LED indicator of experiment status (blinks while collecting data).
 - Pre-calibrated sensing equipment.
- Note:** Edu-logger products are intended for educational use.

Videos and experiment examples:

- Videos, literature and other probes can be found at www.edulab.com

Technical background:

The philosophy behind Edu-logger's plug and play technology is based on each sensor's ability to store its own data due to an internal flash memory chip and micro-controller in each plastic Edu-logger body. This technology allows the sensor to collect and then store the digital data in the correct scientific units (°C, °F, Lux, %, ppm, for example).

The sensor is pre-calibrated at the factory. The built-in software in the logger can be upgraded at any time using software.

The Edu-logger photo gate sensor uses an infrared beam to determine when an object has passed through the photo gate. Every point that there is a break in the infrared beam, a 1 is registered in the program.

The Edu-logger sensor firmware calculates velocities and accelerations based on the record of 1's and 0's as well as the experimental inputs. The computer program gets processed data from the sensor.

Maintenance and storage:

- Never submerge the Edu-logger plastic body in any liquid.
- Do not allow liquid into the photo gate sensor's body.
- After use, gently wipe away any foreign material from the photo gate sensor.
- Store in a box at room temperature out of direct sunlight.

Warranty:

We promise to deliver our sensor free of defects in materials and workmanship for a period of 3 years from the date of purchase. Our warranty does not cover damage of the product caused by improper use, abuse, or incorrect storage. Sensors with a shelf life such as ion selective probes have a warranty of 1 year. Should you need to act upon the warranty please contact your distributor. Your sensor will be repaired or replaced.

Thank you for using Edu-logger!



Flexible, simple, fast, forward thinking.

W: www.edulab.com

E: info@edulab.com

V10012013