Electric Eye

Overview: Photoresistors are very inexpensive light detectors, and you'll find them in cameras, street lights, clock radios, robotics, and more. We're going to play with one and find out how to detect light using a simple series circuit.

What to Learn: This is the first of many different burglar alarms we're going to make with our simple circuits and switches knowledge. Pay special attention to how this gets inserted in your circuit. Notice any similarities to the switch circuit? We're going to use the idea of wiring up components in *series* over the next couple of Burglar Alarm lessons.

Materials

- AA battery case with batteries
- one CdS cell
- three alligator wires
- LED
- Optional: Laser pointer or flashlight (or both)
- Optional: DMM (Digital Multimeter)

Experiment

1. Separate the wires of your CdS cell.
2. Light up your LED in a simple circuit. Don't put in the CdS cell yet – we want to be sure everything works before introducing a new electronic element.
3. Remove one of the alligator clips from an LED wire and replace it with a third alligator clip lead.
4. Attach each one of the two free ends of alligator wires to either end of the CdS cell. You should now have a complete circuit that looks a lot like a circle when you stretch it out.
5. Put your hand over the CdS light detector and the LED should go dark.
6. Shine a flashlight or laser pointer on the CdS cell (or just go outside in the sun) and the LED will light up. If you used the sun for a light source, you'll need to cup your hands around the LED because it's going to look dark or dim outdoors.
7. Optional: Using your DMM set to DC volts and "20," measure the voltage of the LED. How many volts does the LED receive? (Don't forget to write "V" after the number you read.)

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8. Set your DMM to "ohms" or the "Ω" symbol. Touch one probe to each side of the CdS cell. If this is too difficult, then attach an alligator wire to a probe and the other end to one of the wires on the CdS cell. Do this for both sides. Make sure your dial is set to measure resistance. What do you read? (Don't forget to write "Ω" or "ohms" after the number you write down.)

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9. Fill in the data table. Note that your values will not be the same as mine, since you have different lighting, different batteries, and a different size cell than I do. Feel free to go outside, hide it under the table, close the cell in a book, put it next to the window, etc… when taking your data. Be creative!

CdS Photocell Data Table

Lighting Condition	**CdS Cell Resistance**	**LED Voltage**
CdS Cell completely covered up	*7.1 MΩ (or 7,100,000 Ω)*	*0.5 volts*
Laser pointer beam dead center on the cell	*3.8 kΩ (or 3,800 Ω)*	*2.9 volts*

Reading

This is the first of many different burglar alarms we're going to make with our simple circuits and switches knowledge. This particular one is a good one to start with, since it's relatively simple to make and you probably have experience with the *buzz* you hear when you enter a store that's armed with one of these.

A *photoresistor* or *light dependent resistor* limits the amount of current that flows through it in proportion to the light it receives. This effect is called *photoconductivity*. The more light that falls on the resistor, the more electricity flows through the wire. Photoresistors are also called *photocells*.

Exercises

1. How is a CdS cell like a switch? How is it *not* like a switch?
2. When is the LED the brightest?
3. How could you use this as a burglar alarm?

Answers to Exercises: Electric Eye

1. How is a CdS cell like a switch? How is it *not* like a switch? (The flow of current is controlled by the amount of light that falls on the detector. It's unlike a switch in that it never really stops the current completely.)
2. When is the LED the brightest? (in full sun)
3. How could you use this as a burglar alarm?