Simple Light Sensor

by simplecomponents

This article shows you how to make a simple light sensor that can be connected to a multimeter, DC analogue amplifier (operation amplifier, instrumentation amplifier, transistor amplifier) or digital to analogue converter (DAC). Most microcontrollers and probably even some microprocessors have a DAC input.

I came up with the idea when noticed a very bad mistake in the following Instructable:

https://www.instructables.com/id/DARKLIGHT-SENSOR-...

The article in the link showing an op-amp without a feedback resistor. I believe that a 560 kohm resistor should be connected from output to op-amp negative input to reduce the effect of bias and offset current that will saturate this IC (integrated circuit).

Supplies:

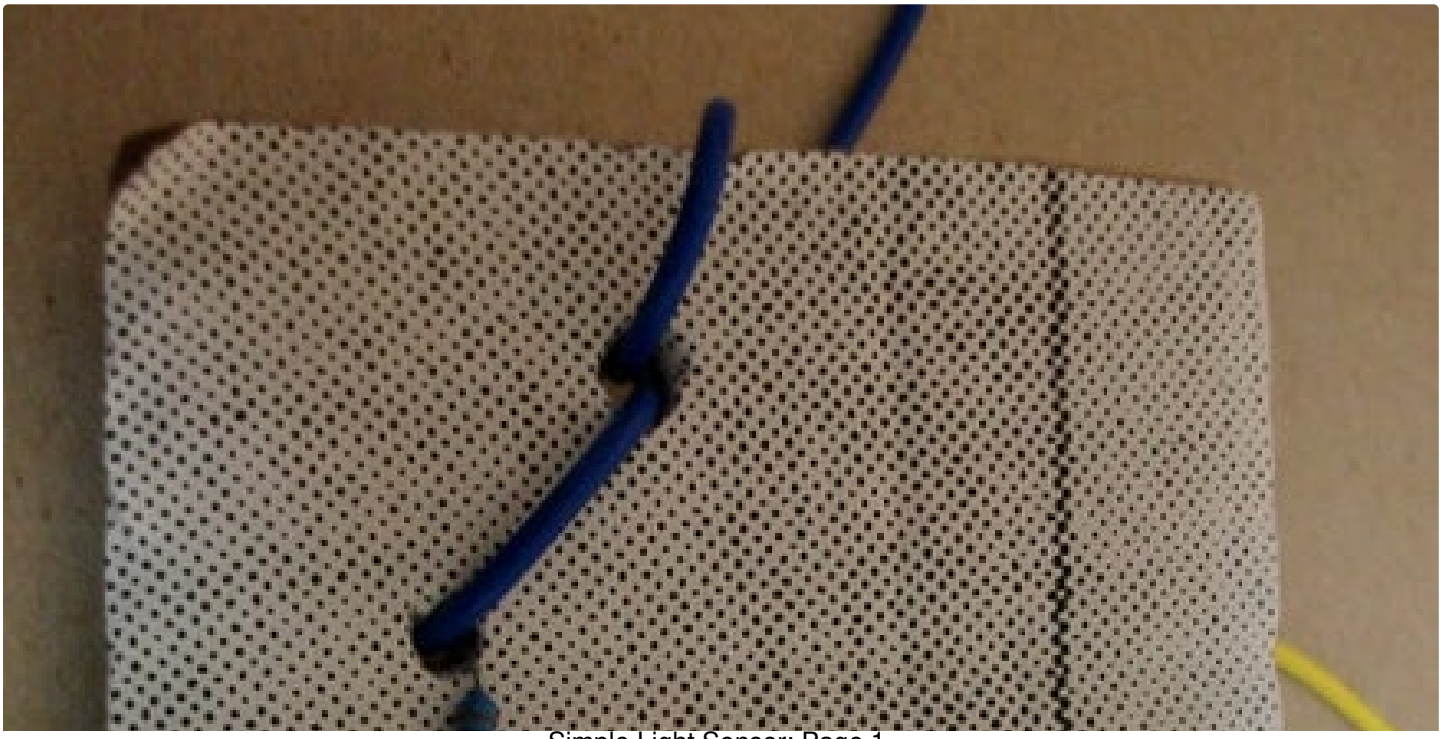
Parts: small cardboard piece, photodiode, phototransistor or LDR, 1 Megohm or 100 kohm resistor, 27 kohm or 10 kohm resistor, 1 mm metal wire, Any battery or power source under 9 volts with harness.

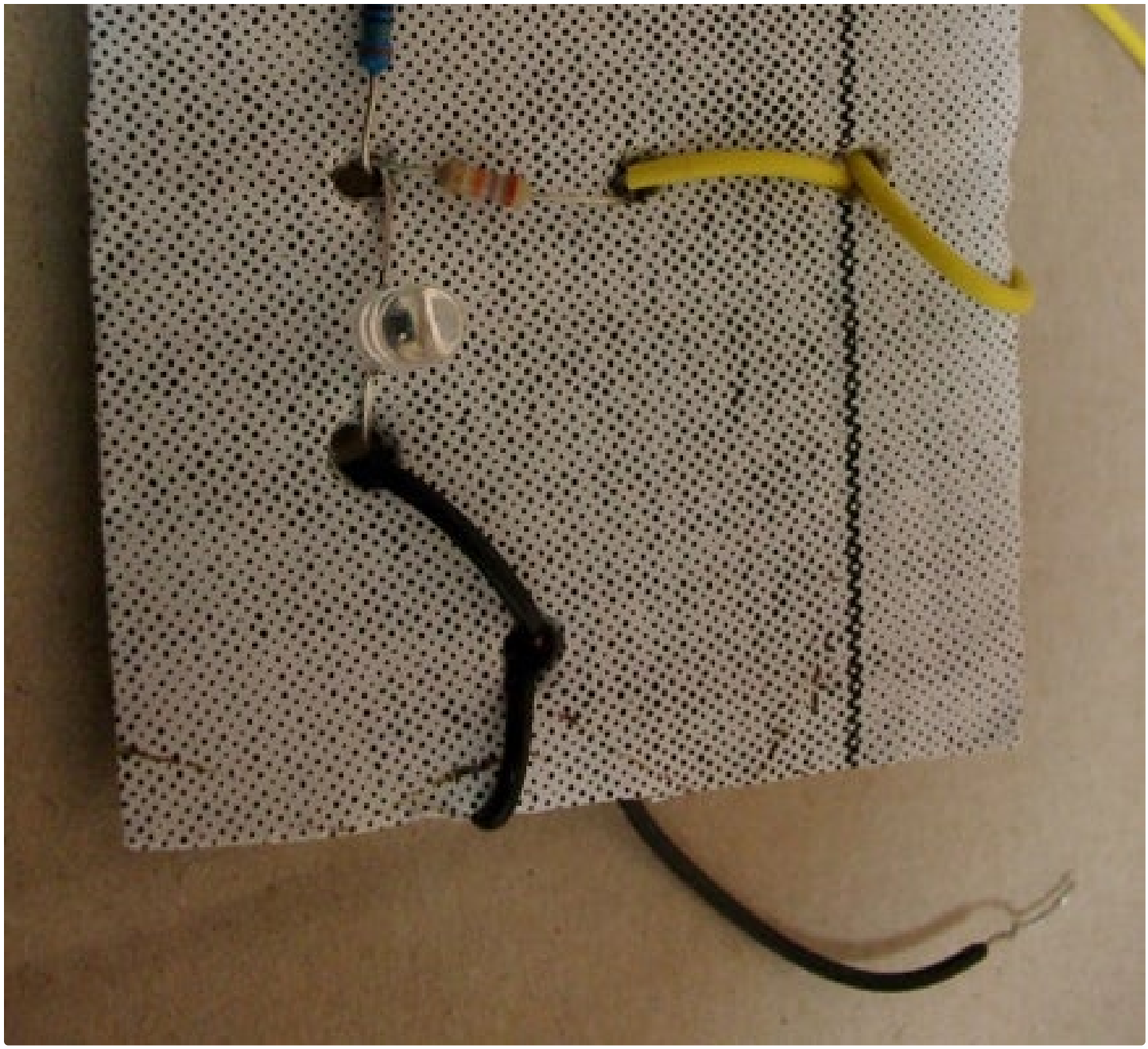
Tools: scissors.

Optional parts: wires.

Optional tools: wire stripper (there is not much work to do), pliers.

https://www.youtube.com/watch?v=ngeWpPeVRHc





Step 1: Build the Circuit

Note how I twisted the wires with pliers. You can use your fingers.

The circuit is very simple. I used a 1 Megohm resistor to bias the photodiode. You might try 100 kohm resistor because the photodiode might saturate when exposed to sunlight.

The colours on the 1 Megohm resistor are:

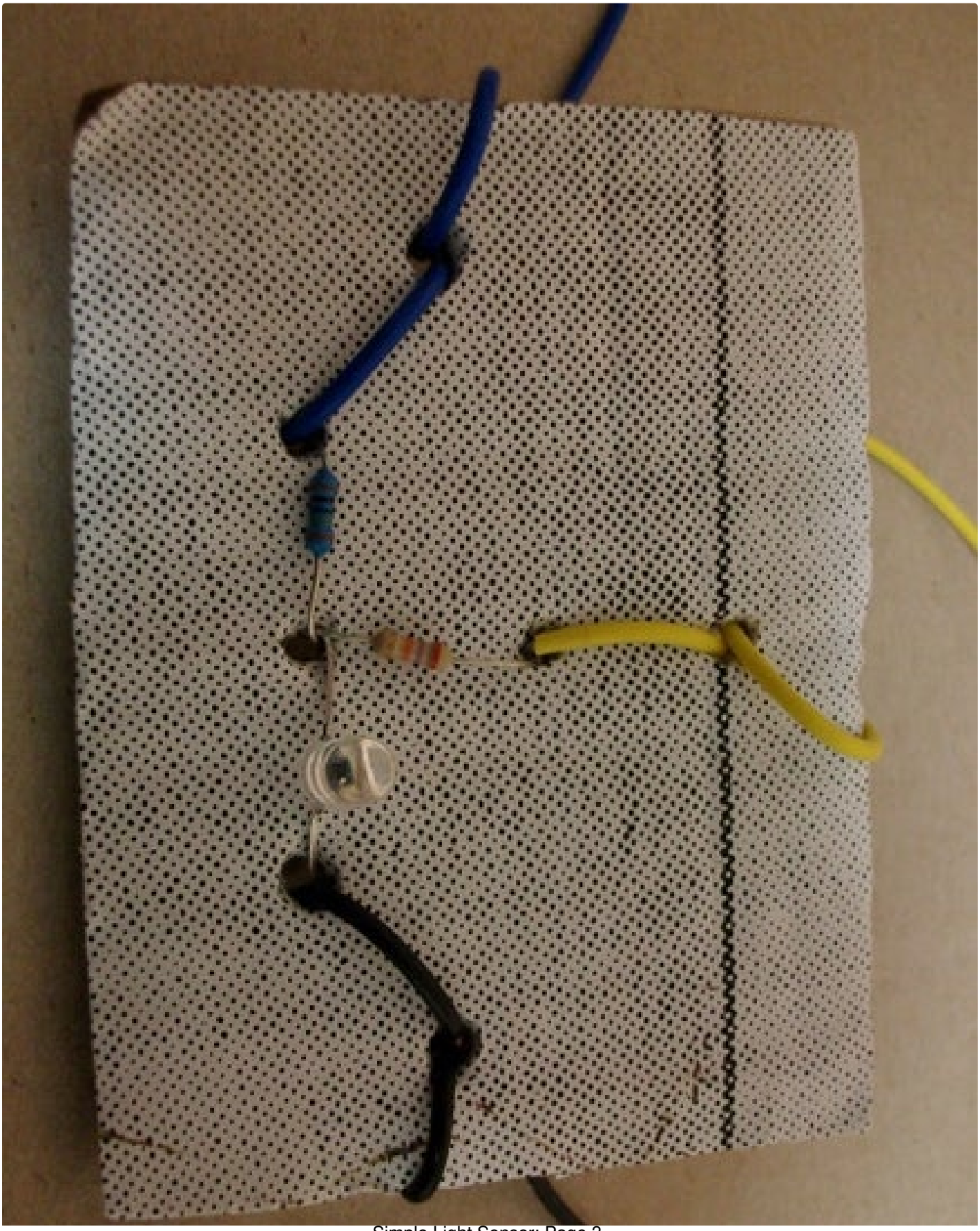
Brown, Black, Black, Green. This means "1", "0", "0" and "4" as the multiplier. This is equivalent to "100" "0000" or 1,000,000 ohms. Thus 1 Megohms.

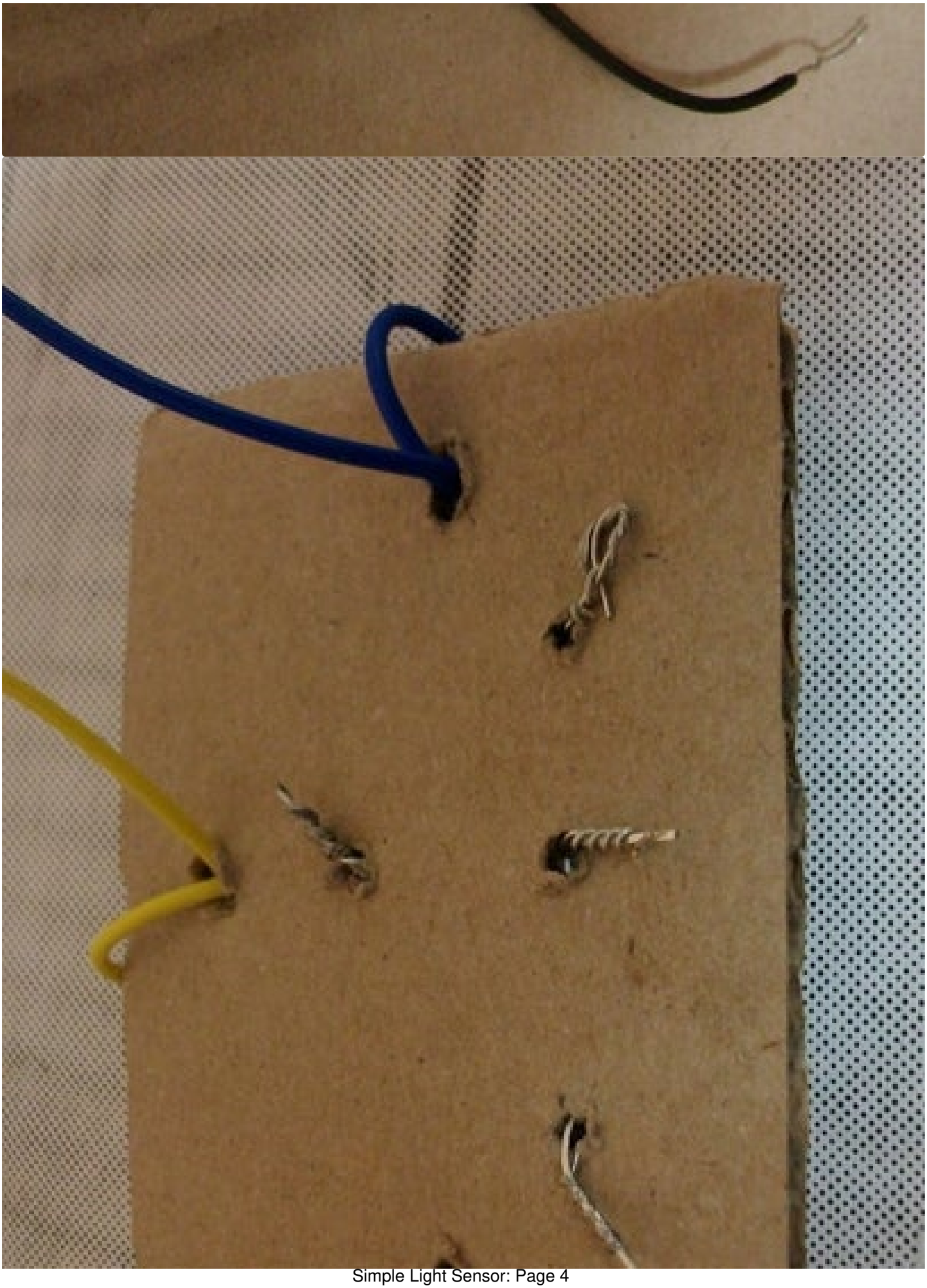
The colours on the yellow resistor are:

Red, Violet, Orange. This means "2", "7" and "3" as the multiplier. This is equivalent to "27" "000" ohms 27 kohms.

I used a 27 kohm resistor to protect the diode from short circuit loads or reverse voltages. However, the resistor does not

provide optimum protection for reverse current sources. You can connect a Zener diode across the circuit output for complete reverse current protection. You can also connect a capacitor across the input for noise filtering because room fluorescent lights and light bulbs emit a low-frequency photonic noise. However, it is not likely that you need such extreme measures.





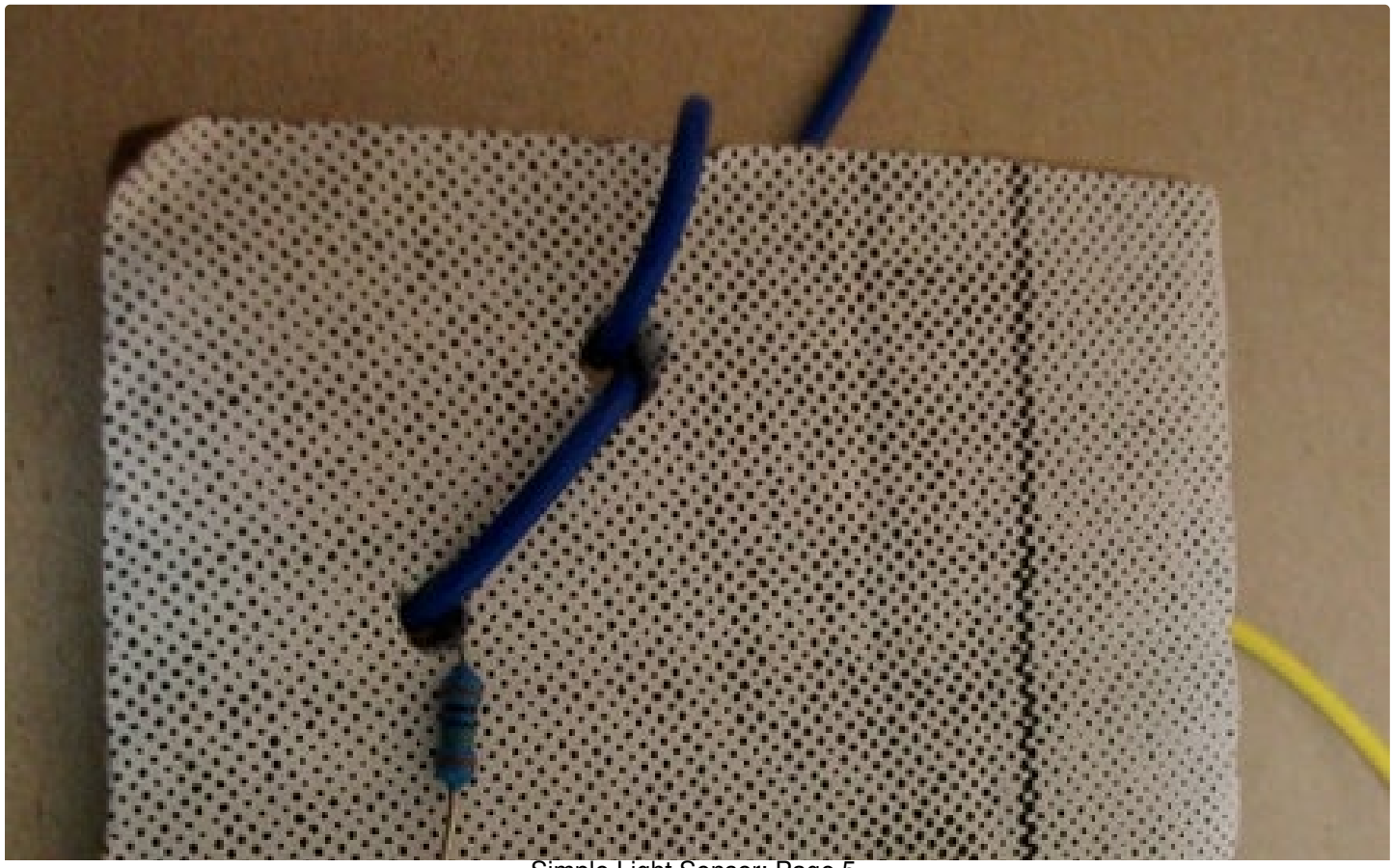
Step 2: Test the Circuit

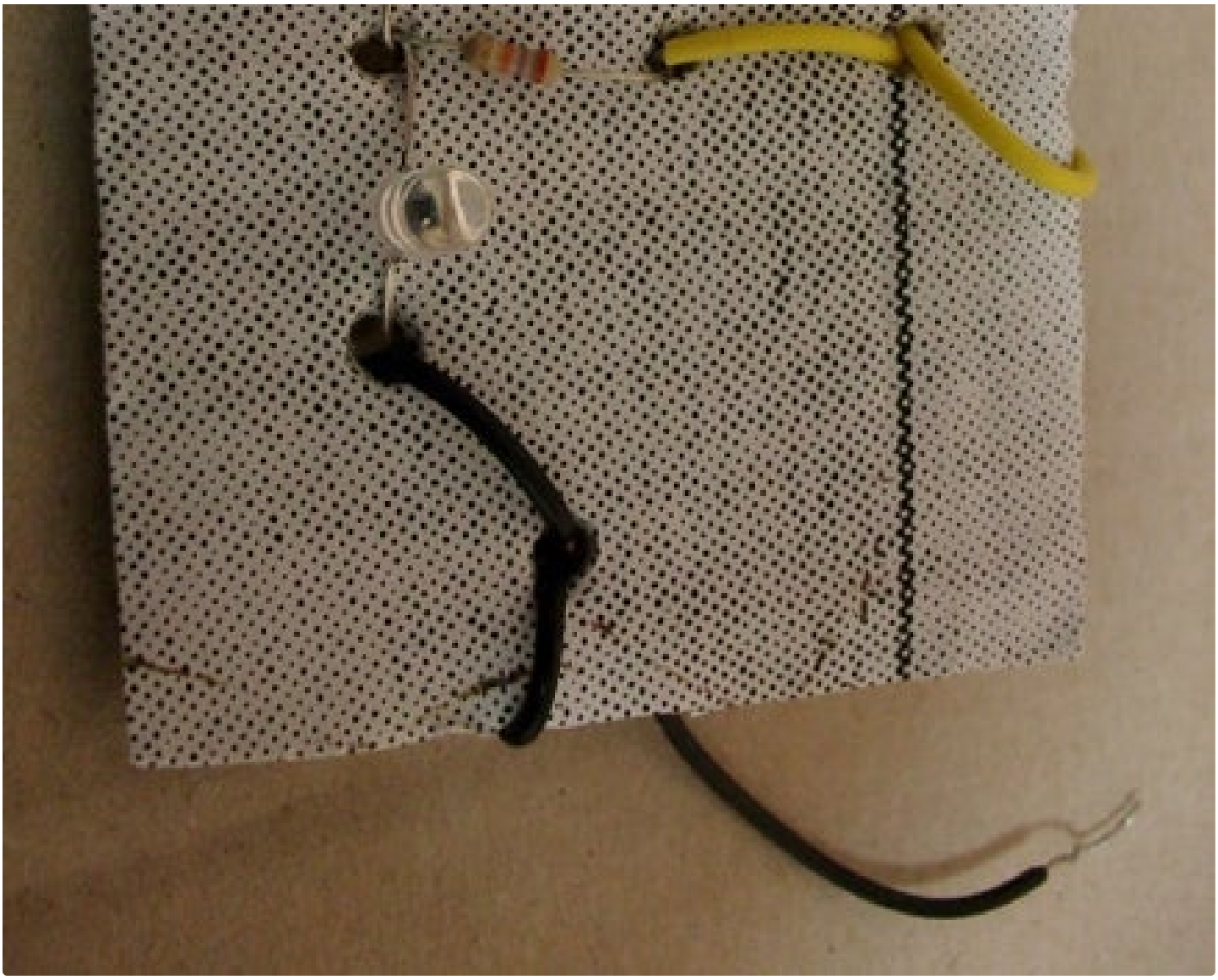
The circuit was working without any capacitors. I connected the output to an op-amp voltage follower and the output of op-amp voltage follower to a multimeter. I only used the op-amp circuit because my multimeter input resistance is only 3 kohms. The op-amp voltage follower has a very high input resistance and low output resistance.

Connecting the op-amp as a voltage follower rather than a direct to the photodiode sensor with feedback allows the use of op-amps for other purposes.

The power supply was set to 4.5 V, which I believe is the absolute minimum voltage for the op-amp. The bright LED is not turning OFF due to the op-amp saturation voltage. Thus you can try implementing the following light sensor circuit with one transistor:

https://www.instructables.com/id/Darkness-Light-Sw...





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