University of Maryland Baltimore County - UMBC
Phys650 - Special Topics in Experimental Atmospheric Physics
(Spring 2009)

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http://userpages.umbc.edu/~martins/PHYS650/

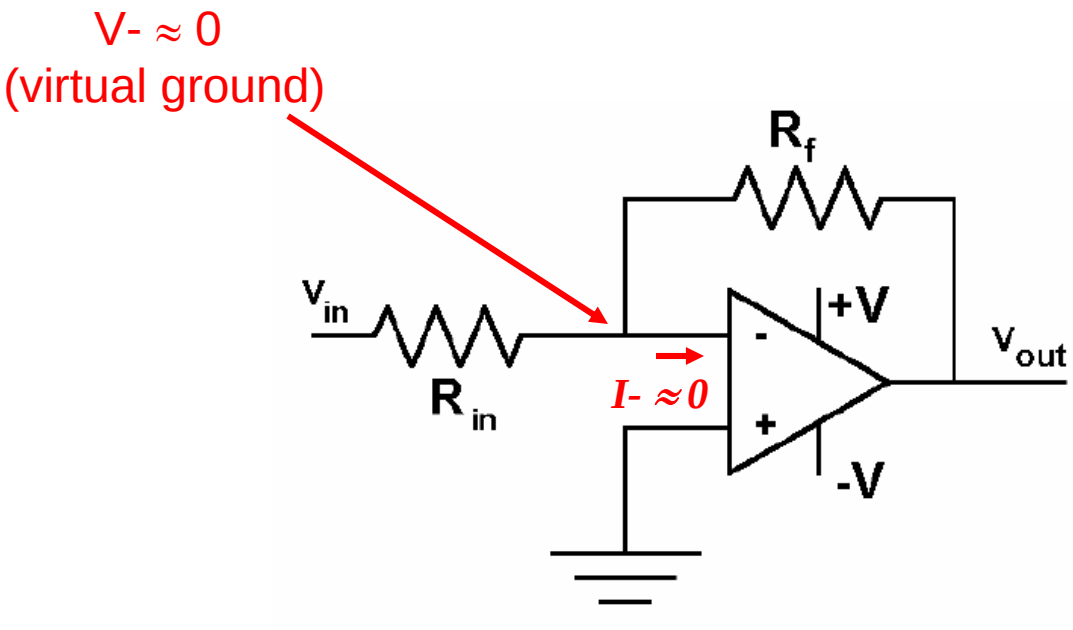
CLASS4 – 2/18/2009

Construction of a sunphotometer

The Op-Amp inverting amplifier

$I_{in} \approx$ *zero.* *Impedance is so high, the input current is negligible*

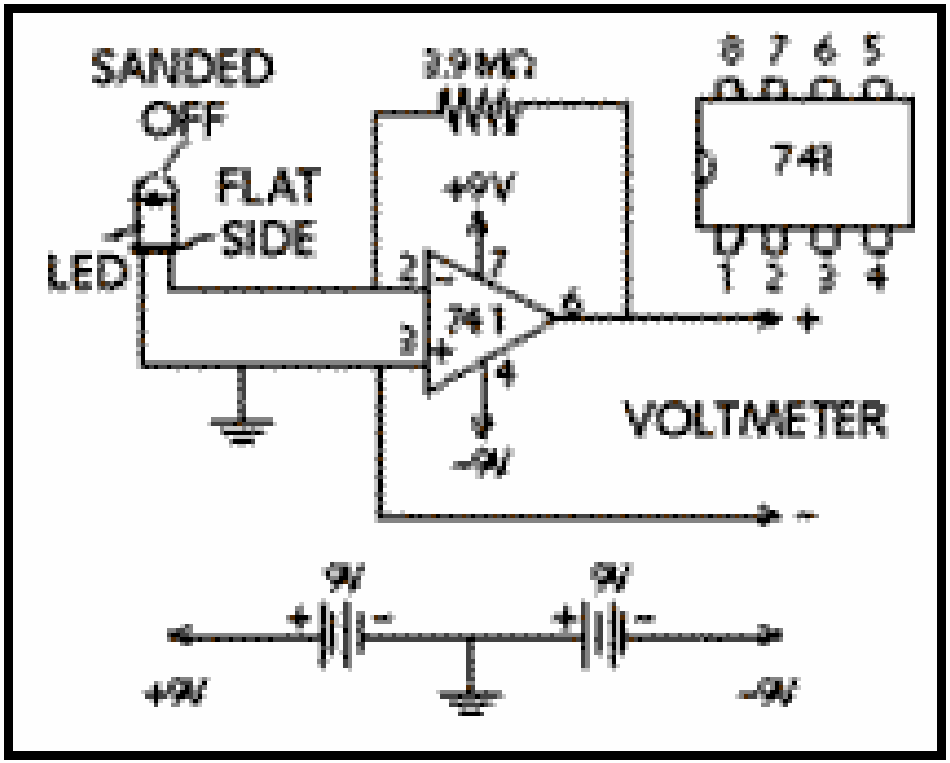
$V_2 - V_1 = 0$ *Gain is so high, the circuit attempts to zero the input voltage difference*



Electronic Circuit Diagram for The LED Sunphotometer

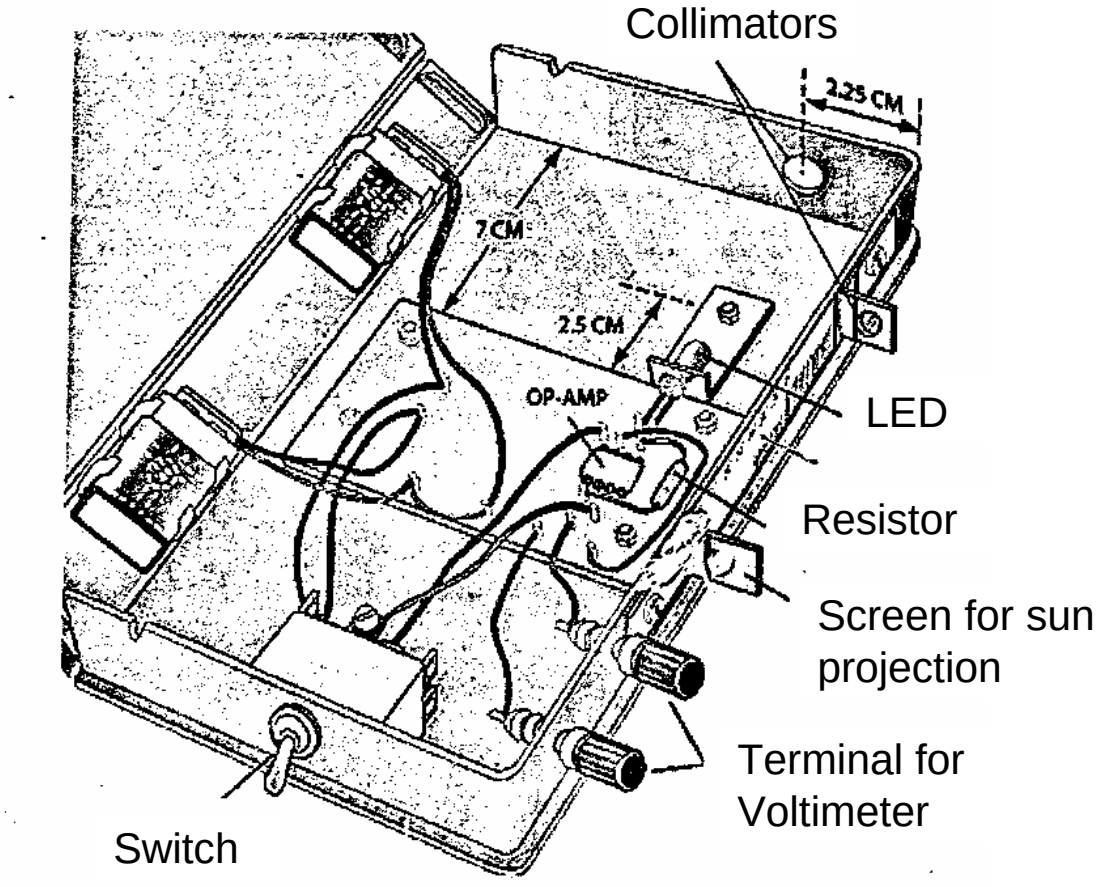
(extracted from F. Mims III, Scientific American)

Pin numbering on 741 opamp and voltmeter polarity corrected. Figure in original Scientific American article had pins 5-8 reversed and voltmeter polarity backwards.



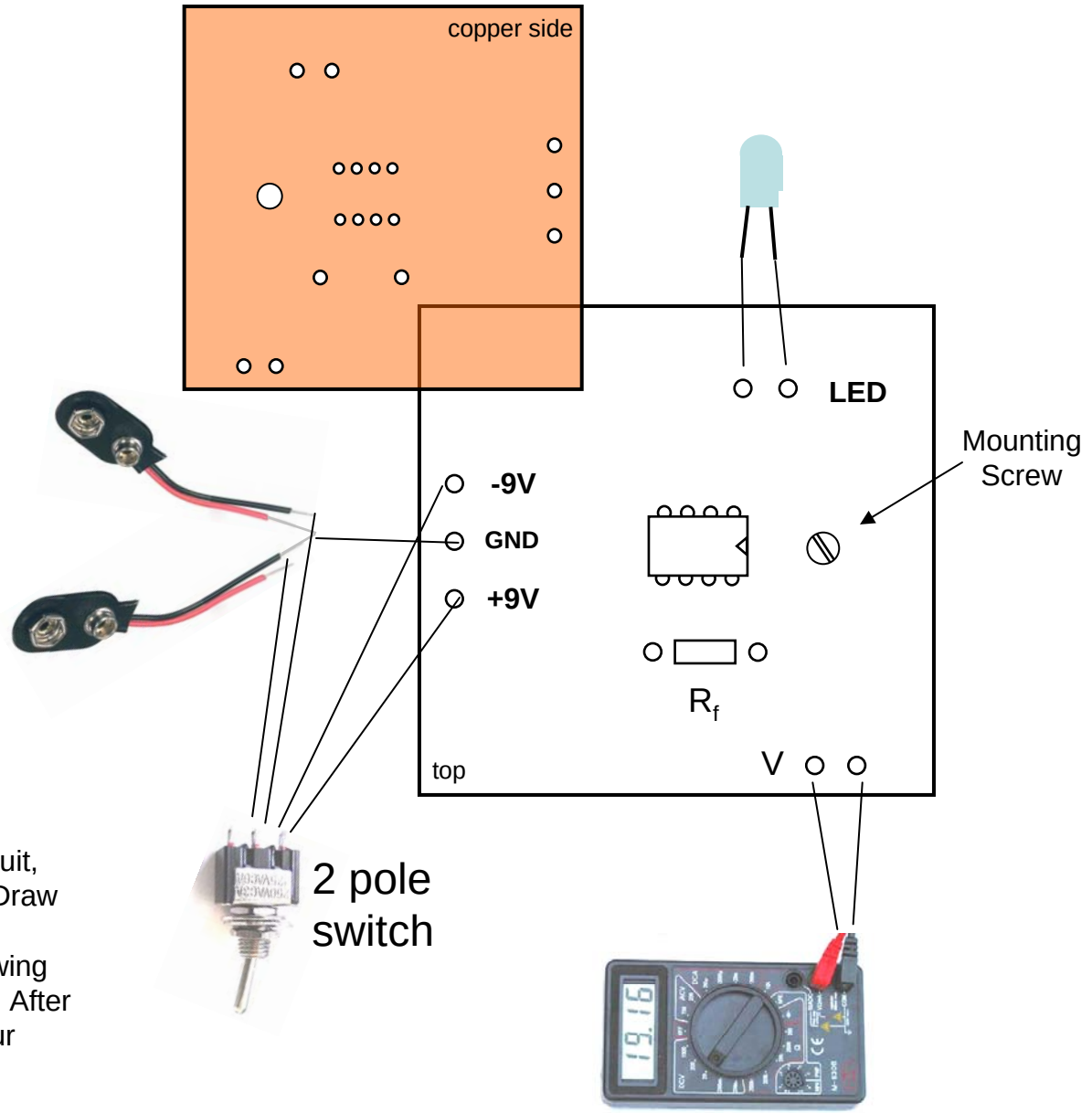
Example of Mechanical Assembly:

(extracted from F. Mims III, Scientific American)

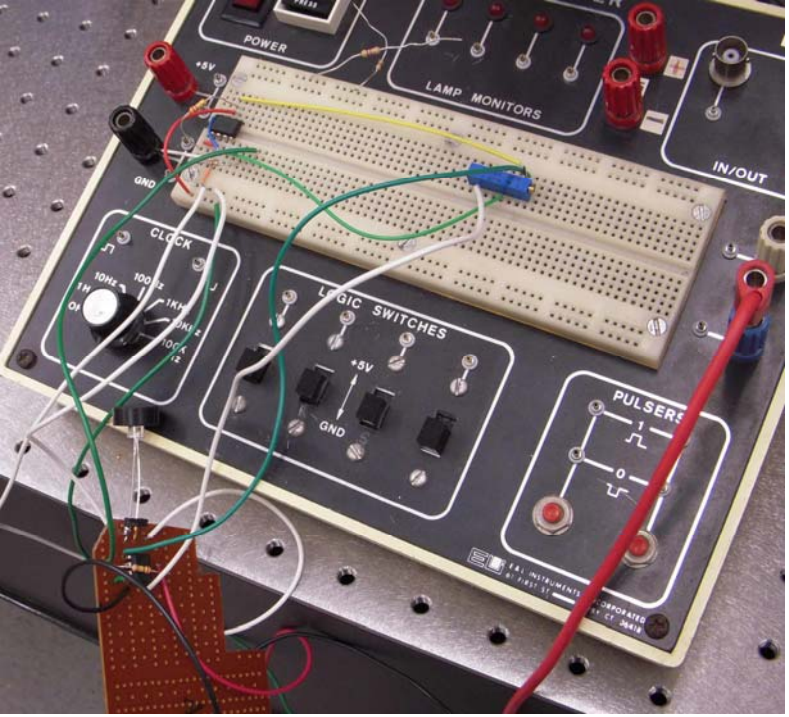


Homework Problem: Draw your PCB

The PCB is an insulated board covered with a thin copper layer. The top side is the component side. The copper film is on the other side. On the copper side you draw the circuit connecting the holes following the diagram in the previous page. The circuit is drawn using a pen with a special ink that resists the corrosion bath in which the pcb is put to remove the unwanted copper. After removing the ink with a solvent, the copper connections between and around the holes are exposed. The components are inserted from the top side and the leads soldered on the copper connections.

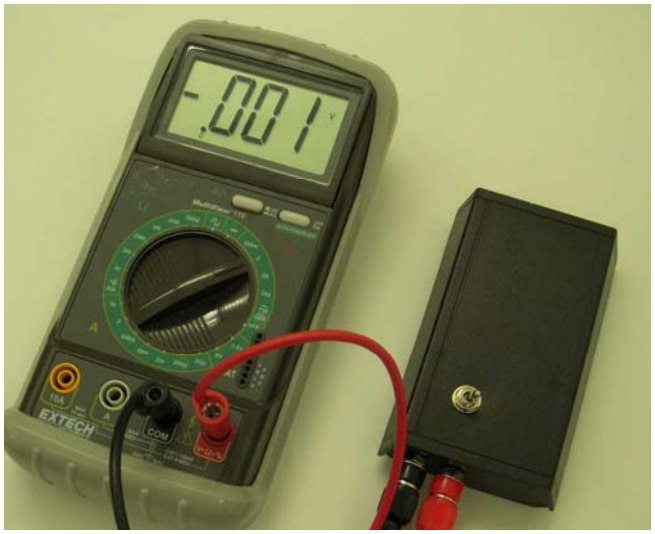


For the next class, draw your own pcb circuit, using a pencil and a printout of this slide. Draw the circuit on the copper side of the pcb. During next class you will transfer the drawing to your pcb using a corrosion resistant ink. After removing the unwanted copper, solder your components and wires on the pcb.

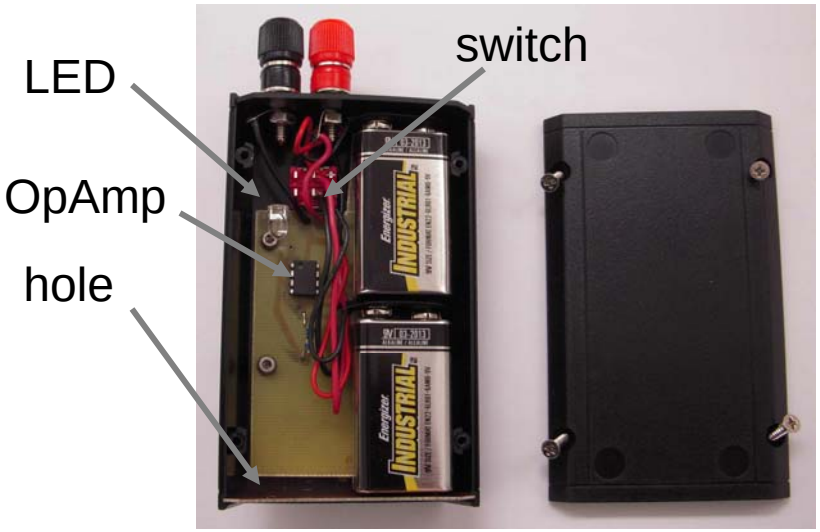


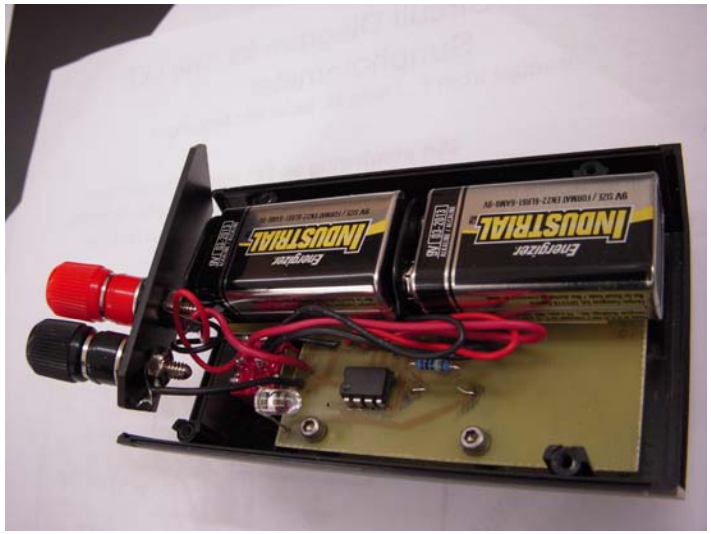
Sunphotometer: It all starts here

Done

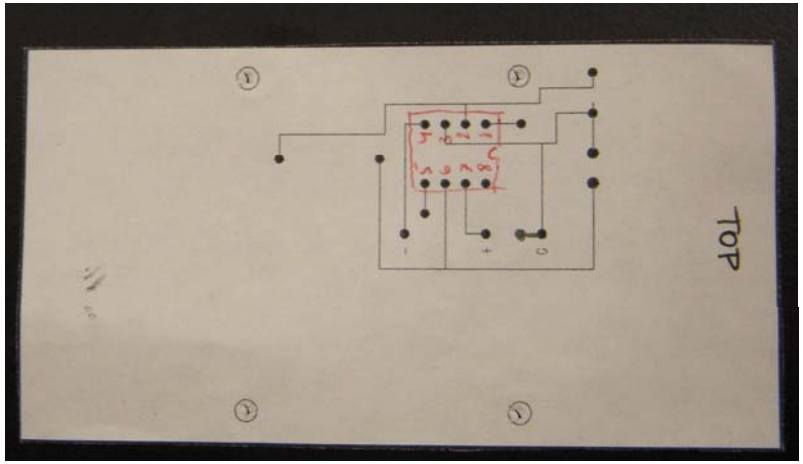


A peek inside

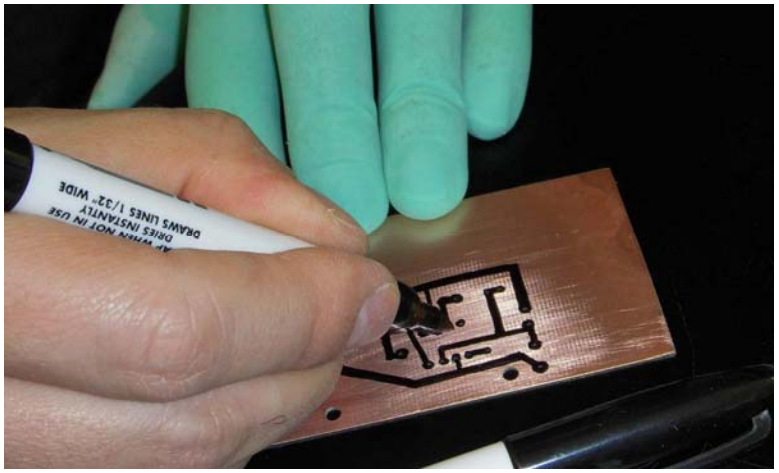




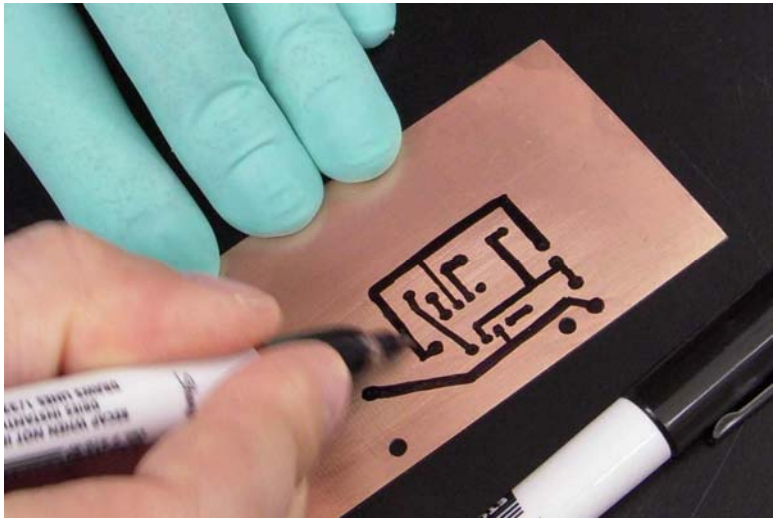
Circuit: component side



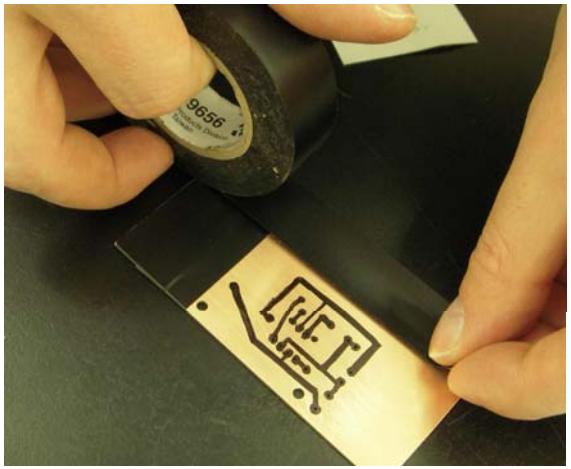
Clean the copper side with acetone
Use gloves and draw your circuit



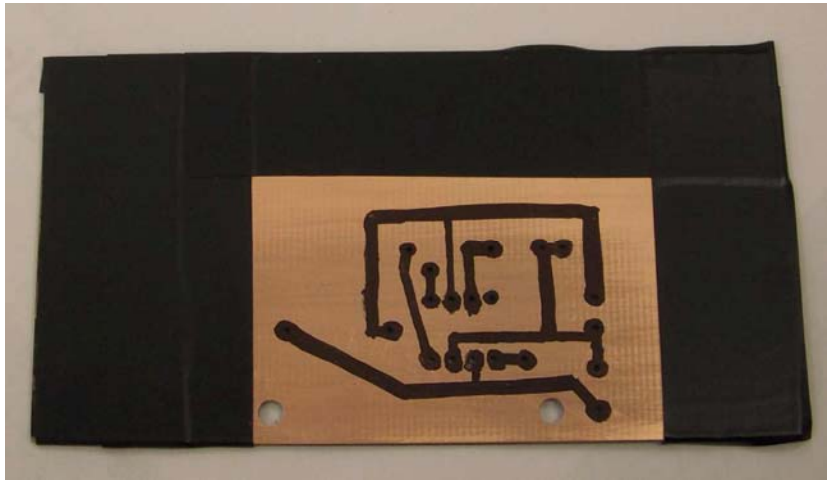
Overpass and draw sharply.
Don’t let lines touch each other



Use tape to protect excess area from corroding

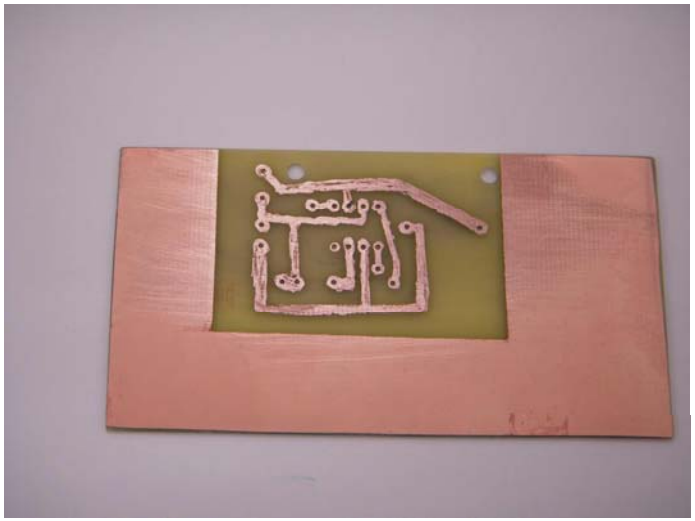


Ready for corrosion

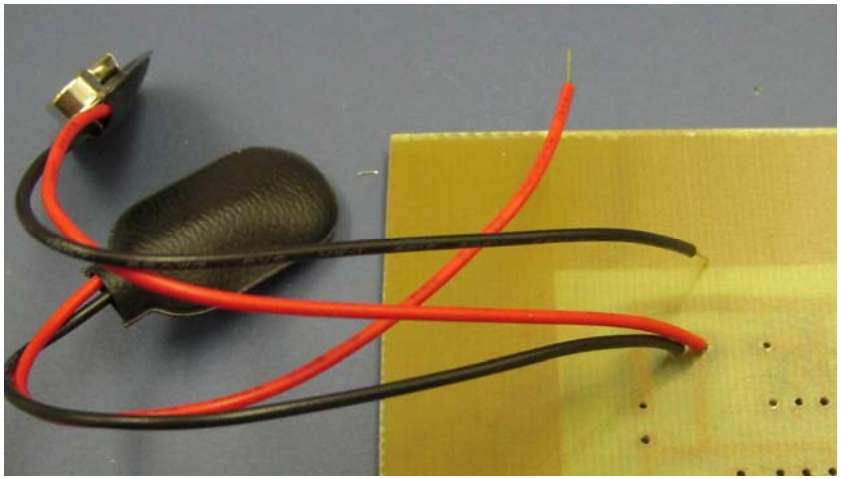


Corrosion

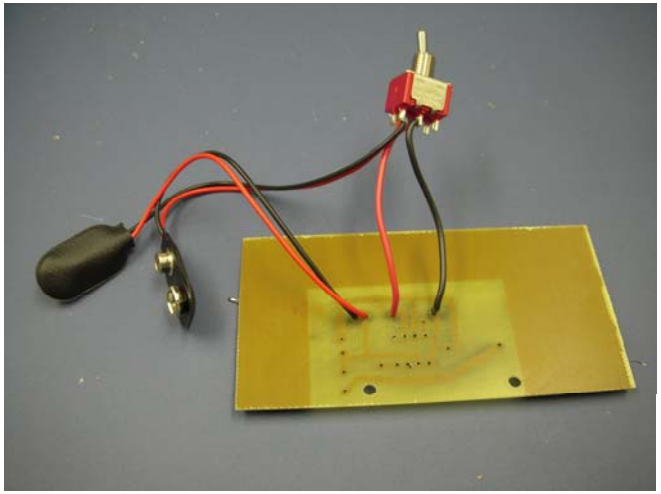
Ready: remove ink with acetone and sand paper



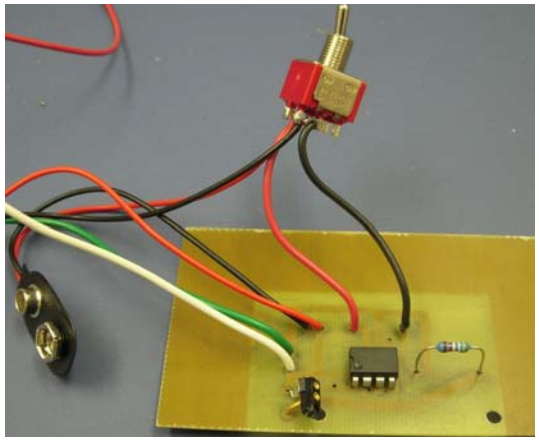
Start soldering the wires: The ground uses one + and one – battery wire



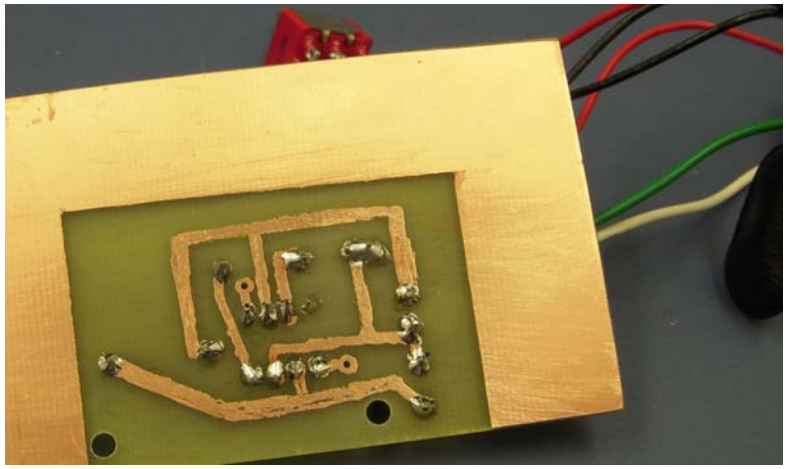
Test the switch with an ohmmeter to learn how it works



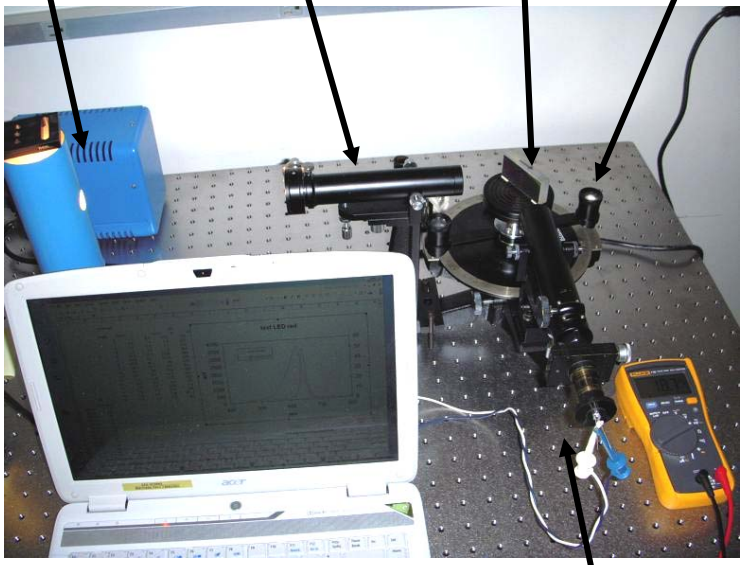
Almost done. Before soldering the LED use the monochromator and get the LED's light absorption spectrum

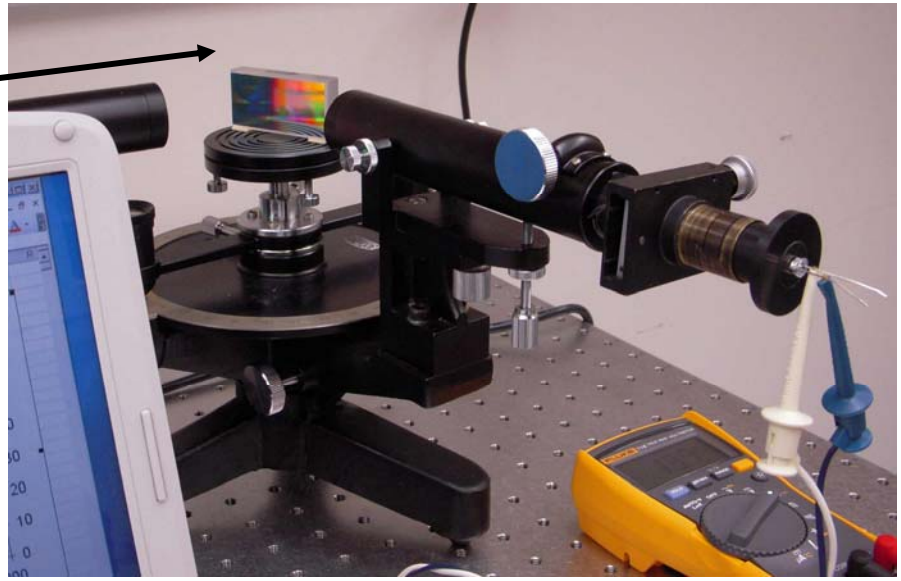


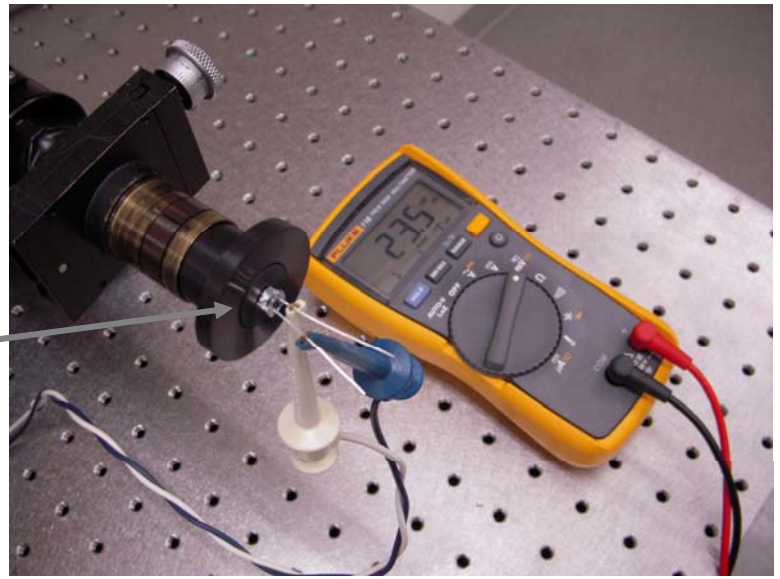
the back side



The monochromator







Do not forget to calibrate your monochromator with the NA and Hg Lamps or against the Ocean optics spectrometer!!!