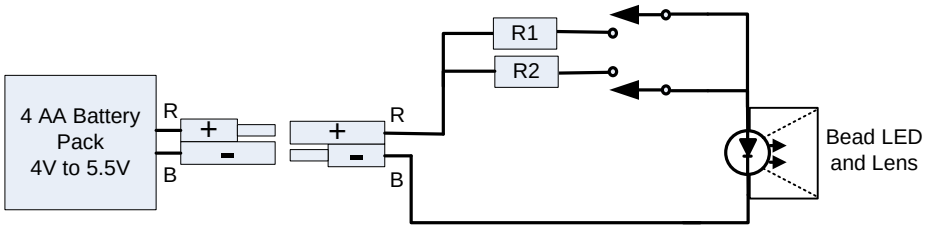
Highly Efficient Home Made LED Head-Lamp

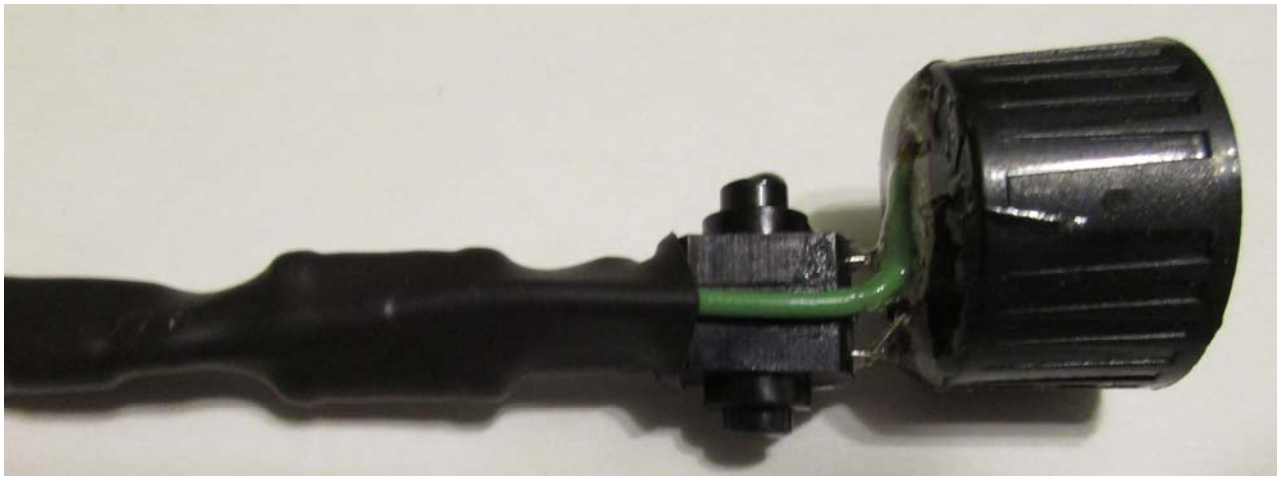
(5/13/2016)

Simple Resistor Controlled

A 4 cell NiMH battery has an average working voltage of 5.0 v. With an over all range of 4.5v to 5.4 volts. The following is a basic simple way to interface the battery pack to the LED. R1= 20 ohms (Medium), R2 = 51 ohms (low), and both on gives 14 ohms (high). A high efficiency 280LM 3W bead LED and optional 60 degree lens if needed. The white lens cover was glued to the LED. It was found that the spot size was more workable and bigger if the lens was not used. This is the way it ended up in use.



High-Low SW for LED



Using a No-12 step-down circuit

15 different Step down circuits were purchased from eBay and tested for workability and power conversion efficiency. No-12 was found to be the best. The circuit is described on eBay as “DC-DC 4.5V-28V to .8V-20V step down module power supply for arduino”. Currently sells for under a dollar. The pot was pried off with a knife blade and a 25 turn 50k ohm precision pot was put in its place.

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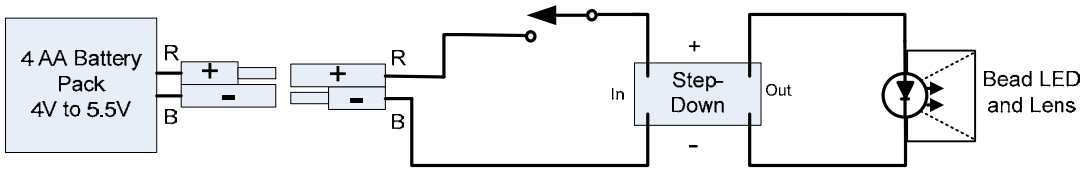
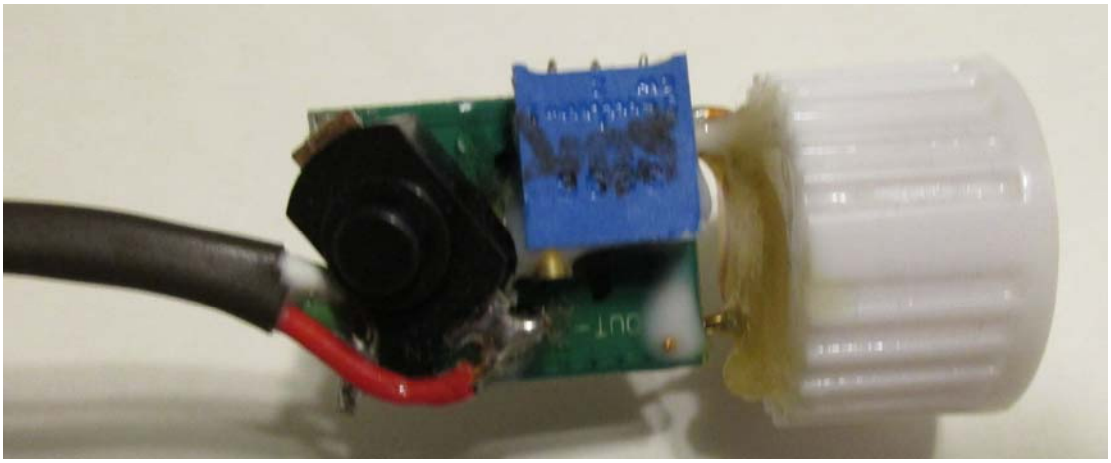
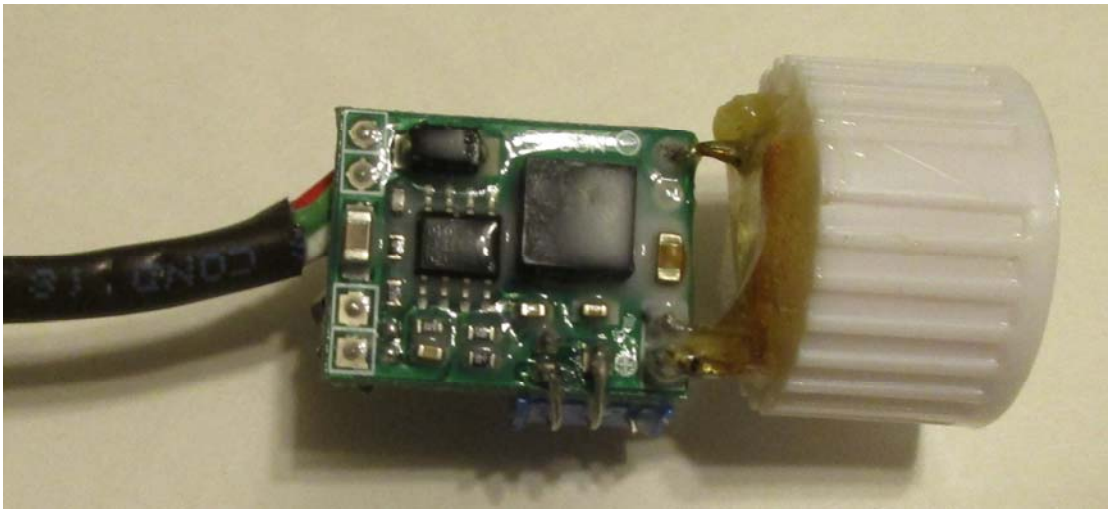
A 4 cell NiMH battery has an average working voltage of 5.0 v. With a over all range of 4.5v to 5.4 volts. An efficient steps down was found that would work with the input range of 5.4v to 4.5v volt of the battery pack and drive one 3 Watt LED at 2.6-2.9V.

Adjustment of the 50k ohm 25 turn light intensity pot (pot on pc board as purchased was replaced) was done at 4.95 Volts to get an input current of about 60 to 66 ma.

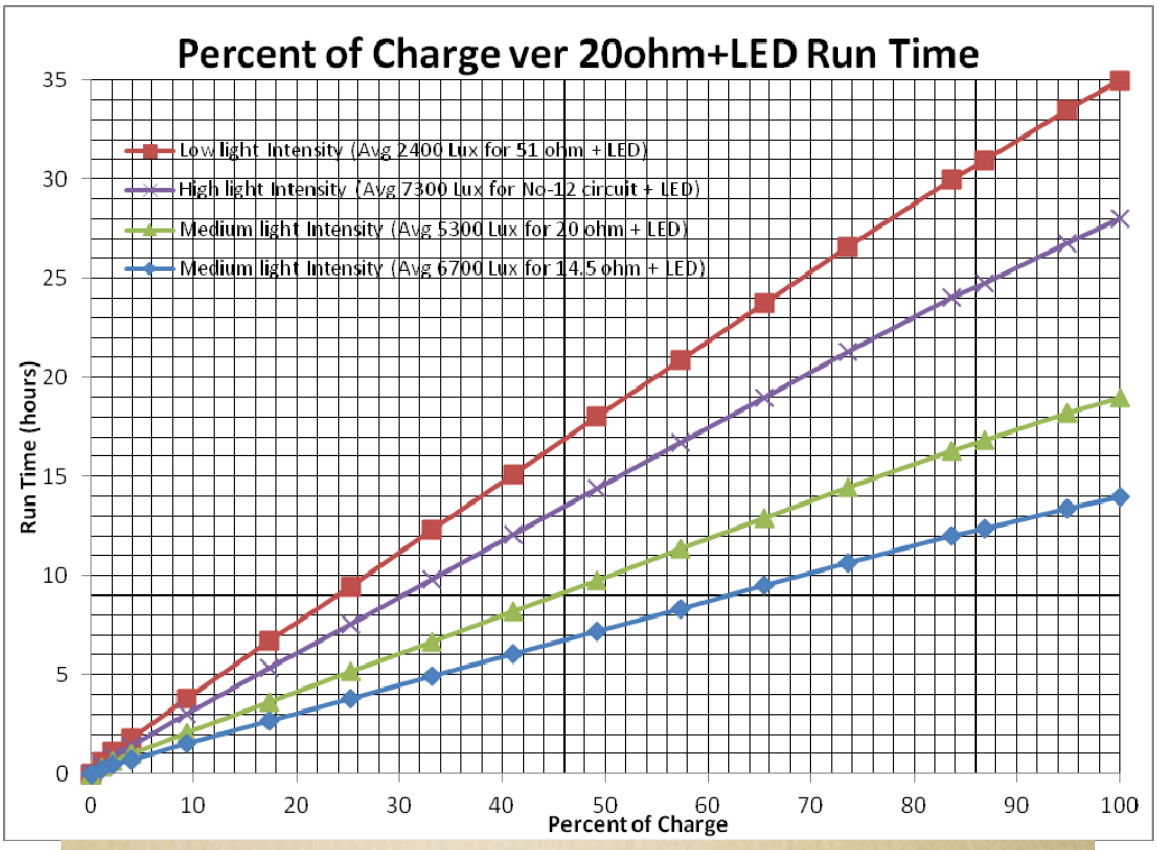


Step Down of Battery Pack Voltage to 2.7-2.9 V for LED





Silicone rubber type I that comes in a caulking tube can be used to seal this and has a high resistance so as to not affect the circuit.



Standard small paper clips were used to hold the headlamp onto a simple hat or cap. The butterfly wings on the clips will be removed before the cap is put in use.

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V	I	Lux no Lens	Power	Lux/w	Comments
4.98	0.0652	7670	0.325	23622	No-12 circuit
5.00	0.0464	2380	0.232	10259	Low R=51
4.92	0.1091	5420	0.537	10097	Medium R=20
4.87	0.1443	7050	0.703	10032	High Both on R=14

At an average battery voltage of 5.0volts the efficiency for the resistor configuration is 31 times that of an incandescent bulb. Efficiency for the No-12 circuit configuration is 73 times that of an incandescent bulb.