

## An Excellent Survival Multifunction Headlamp

This CREE LED Q4 and Q5 Zoomable Headlamp sells on ebay for less than \$10.00. Found to be the most cost effective and useful for after pole shift survival. Both the Q4 works a bit more efficiently than the Q5 once one is done with modifications. It has three light settings one is bright, the next is half to 1/3 as bright and the last is blinking on and off. See the end of this write up for light intensity and run time for various configurations. If you're not going to modify but only use as sold then Q5 would use less power and is the better bet.



With no modifications: 3 AAA cells produce on high 7160 Lux and on low 3540 Lux (no resistors or light reduction)

The standard run times for the light to drop to 50% of original level.

Standard Q4 off the shelf using 3 AAA cells on high setting => 7160 Lux at 1 hours

Standard Q4 off the shelf using 3 AAA cells on low setting => 3540 Lux at 2 hours

No changes Q5 using 3 AAA 900 mAh cells on high setting => 1700 Lux at 3 hours

No changes Q5 using 3 AAA 900 mAh cells on low setting => 660 Lux at 9 hours

Run time for Q4 with modifications using AA cells:

20 ohm resistor using 3 AA cells on high setting => 680 Lux at 18 to 20 hours

20 ohm resistor using 3 AA cells on low setting => 330 Lux at 40 hours

20 ohm resistor using 3 AAA 900 mAh cells on high setting => 700 Lux at 10 hours

20 ohm resistor using 3 AAA 900 mAh cells on low setting => 350 Lux at 20 hours

X-mass tree bulb using 4 AA cells on high setting => 907 Lux at 24 to 30 hours

X-mass tree bulb using 4 AA cells on low setting => 445 Lux at 60 hours

The run times before dropping to 50% of measured starting light intensity were done with focus ring was all the way open to produce the maximum angle of light. When the focus is at minimum spot size --- the light intensity is about 15.5 time higher than the numbers shown above. Measurements were made at one foot distance from lens aluminum ring. The diameter of the spot of light at one foot is 9.5"(Q4) or 8.5"(Q5).

The modified lower Lux light levels have been found to be plenty adequate for long term use as task lighting. The result of running at lower power soothing that is designed to run at near 3 watts is one gets a much more efficient longer lasting light source.

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### CREE 3 Watt Task Light Modifications for Longer Run Times:

For those that don't like to have elastic bands around their head, this headlamp works well with a cap as shown below. In doing this one can add a 4 cell AA battery pack to significantly extend the run time. The battery pack can go in a shirt pocket or in a pants pocket. This takes the battery weight off the head. A wire is sewn into the cap with a sewing awl so as to come down the back of the neck into an outer shirt to hold it in place. A bit of hot melt glue keeps it from untying. Total length of the wire and connectors is about 6 feet. A 7/8 inch thick piece of white packing foam was used for a spacer.



Thin flexible speaker wire was used for the lead wire. PC Mouse cable or almost any flexible wire will work. A standard closed battery case with switch and a molded rubber plug Two 1.25" number 6-32 bolts with wing nuts were used to hold it in place.



Fender washers were used on the under side of the cap to help hold it in place.

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Two bolts were used to keep it from turning. The unit was placed so that it can bend down and light the ground as one walks (for out door use). With the lens in place the zoom at 12" from the lens will make a uniform white spot of 1.5 to 9.5 inches.



The lenses can be taken off to result in a wider angle. This works well when there are not a lot of others around to be too bright for them. The near and far adjustment of the lenses is useful when outside hiking or walking at night. When taken off it allows a wide angle of light or 155 degrees at 170 Lux at one foot distance (charged battery). The remaining part of the aluminum focus ring can be adjusted to narrow the angle a bit to 130 degrees at about 170 Lux.



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The lens can be taken apart at the red threaded spacer. When put back together without the focusing lens it narrows the angle of light output. The angle of light output can then be adjusted with the zoom between 60 and 80 degrees at 170 Lux. The zoom gives a spot 14 to 19 inches in diameter at 12 inches from the lens.

When working around others the angle may need to be narrowed so as to minimize glare. If outdoor a small thin plastic disk can be cut from any thin acrylic packaged store bought item. The see through hard to get into acrylic packaging of common items can become useful after the pole shift for clear protection of eyes and other light devices. In this case it works good to replace the LED its self with this thin clear acrylic plastic disk to protect it from rain and mud. A common pair of seizers will cut it out.



A 20 to 27 ohm resistor or x-mass tree bulb as show above is wired in series with the battery source. A 35 mini light set x-miss tree bulb was found to work excellently. It has a negative resistance curve in that is has less and less resistance as the battery voltage decreases due to discharging. A small stiff wire is wound around the speaker wire to keep it from going though the hole. This resistor or x-miss tree bulb limits the power usage with the extra voltage involved by using 4 – AA cells.

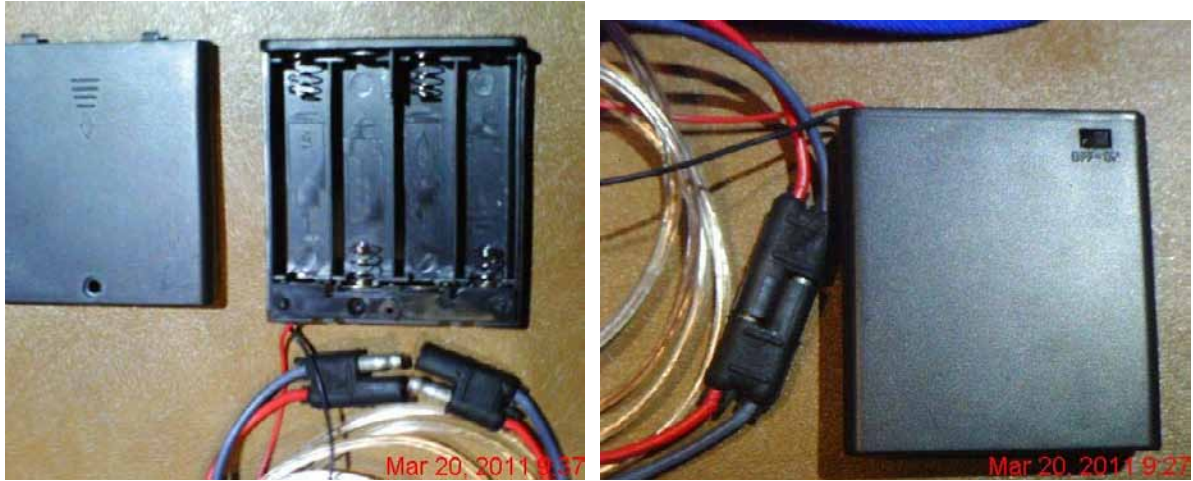
Using a X-mass tree bulb as power limiting resistor one typically gets 907 Lux (82 ma) on high and 445 Lux (41 ma) on low for charged cells. The run time is such that after a day the batteries are about half charged. One can put it on charge over night while one rests. This way the rechargables will last much longer. Use NiMH LSD (low self discharge) cells like EMB, Tenergy, enloop or equivalent.

A 20 ohm resistor in series with LED SMD gives 680/330 Lux for high/low. Four fillips head screws are removed to take the battery holder out and the resistor is put in series with the two wires running to the LED SMD. The blue or red or positive one is the one to cut and solder in the resistor.

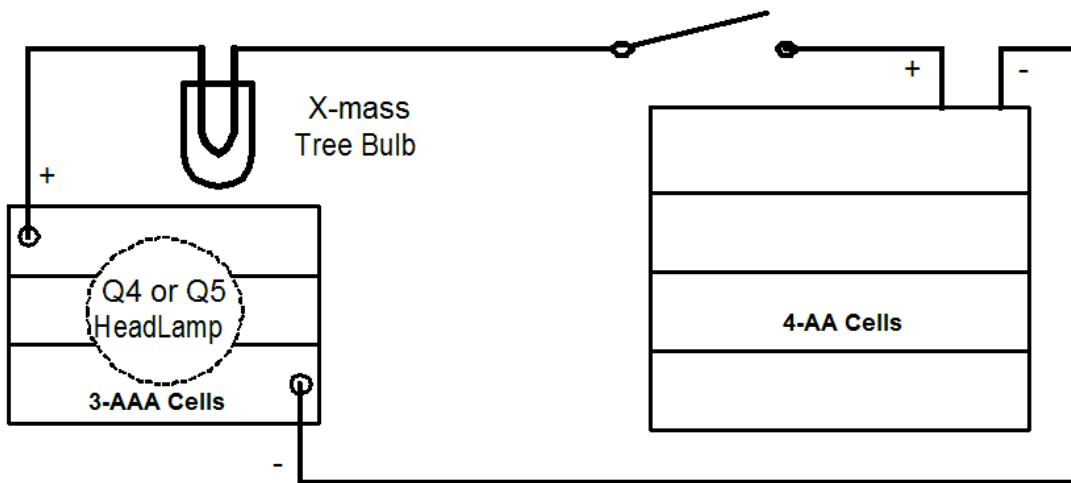
The input wires are soldered to the positive and negative terminals as show above. The X-mass tree bulb will fit in one battery slot with the spring holding it in place. The unit is sold as a 5 Watt light source. However if throttled back to using .25 watts running at about 3

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volts and .08 amp it will run much longer time producing plenty of light as detailed above. The LED runs more efficient in this region and will last very much longer.



The above is a 4 cell AA enclosed holder with on-off switch on the other side. We found after testing and some use that the thin wires will break coming out of the battery pack thus our latter versions have the heavier wire that is on the molded rubber plug going directly into the pack. Note the molded rubber plug. These can be bought from <http://www.allelectronics.com/> or found in most cars and some auto parts places. A mating plug is used to charge the unit from a 12 volt source. A 160 ohm resistor is place in series with this charging plug to limit the flow. The charging rate is 45 ma or about half the usage rate. So one would charge for twice as long as it is used. A 80 ohm resistor would give a charging rate such that one hr of charge would equal one hour of use. The most efficient way to charge this is to charge two in series.



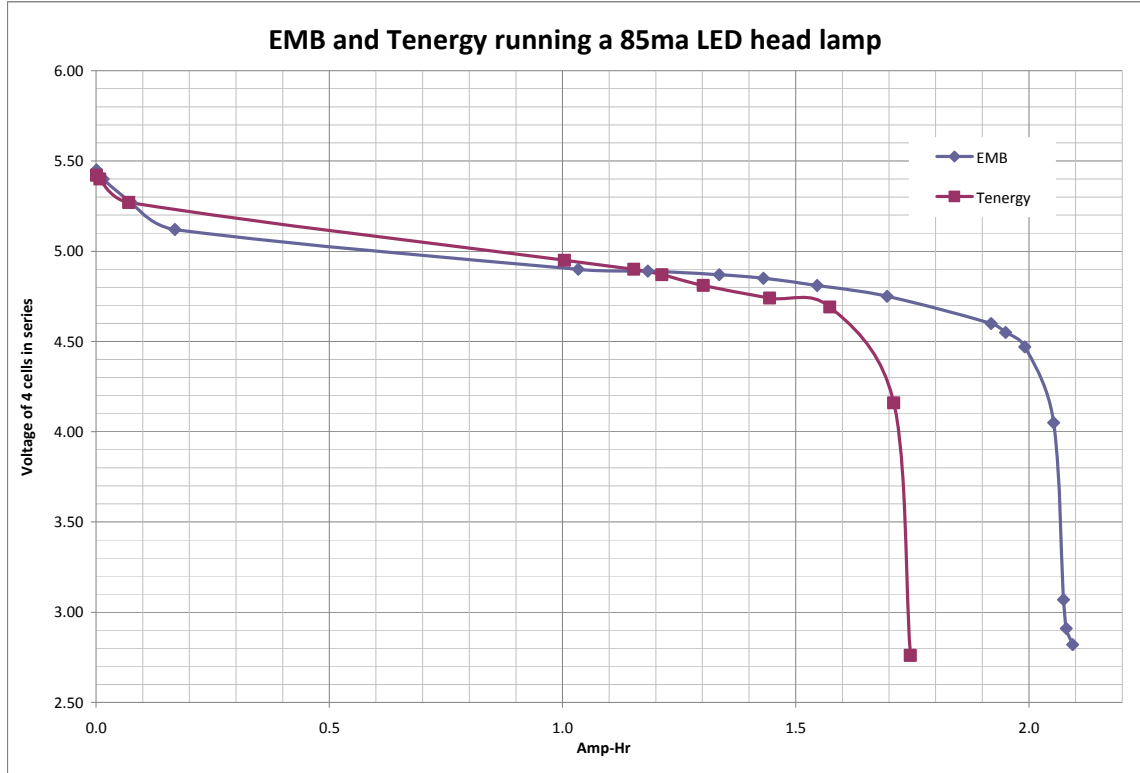
Q4 or Q5 HeadLamp and 4 cell battery box

The above circuit shows how it is wired up with the X-mass tree bulb (or a 27 ohm resistor) to limit flow and produce a usable but efficient long lasting light.

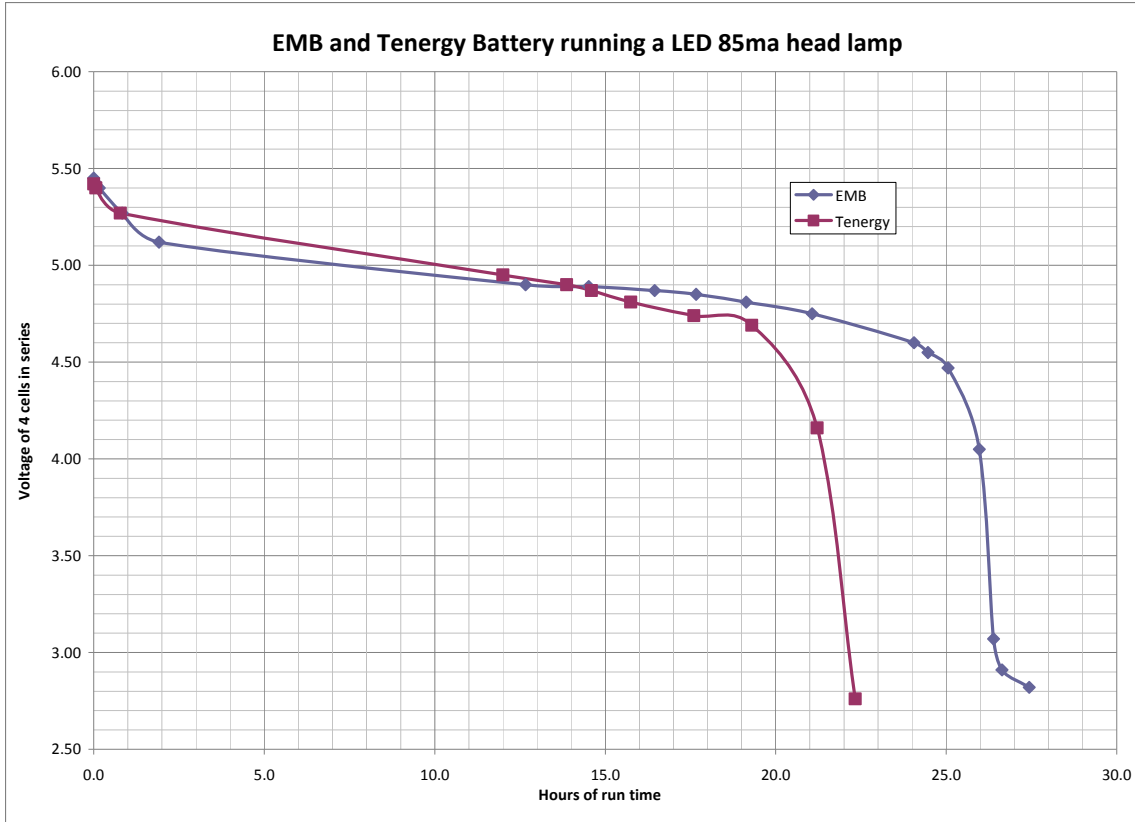
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Another configuration: A 20 ohm resistor in series with LED SMD gives 700/350 Lux for high/low. Four fillips head screws are removed to take the battery holder out and the resistor is put in series with the two wires running to the LED SMD. The blue or red or positive one is the one to cut and solder in the resistor. No other modifications were made. Standard 3-AAA batteries and the head band was used.

Typical Battery data follows:



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EMB	weight is	28.85 gm	measured 2.0 amp-hr runs light for 25hr
Tenergy	weight is	27.33 gm	measured 1.65 amp-hr runs light for 20hr

EMB can be float charged to at least 11.22 volt or a bit higher.  
 Not true with Tenergy it is less than 11.22.

Fully charged:

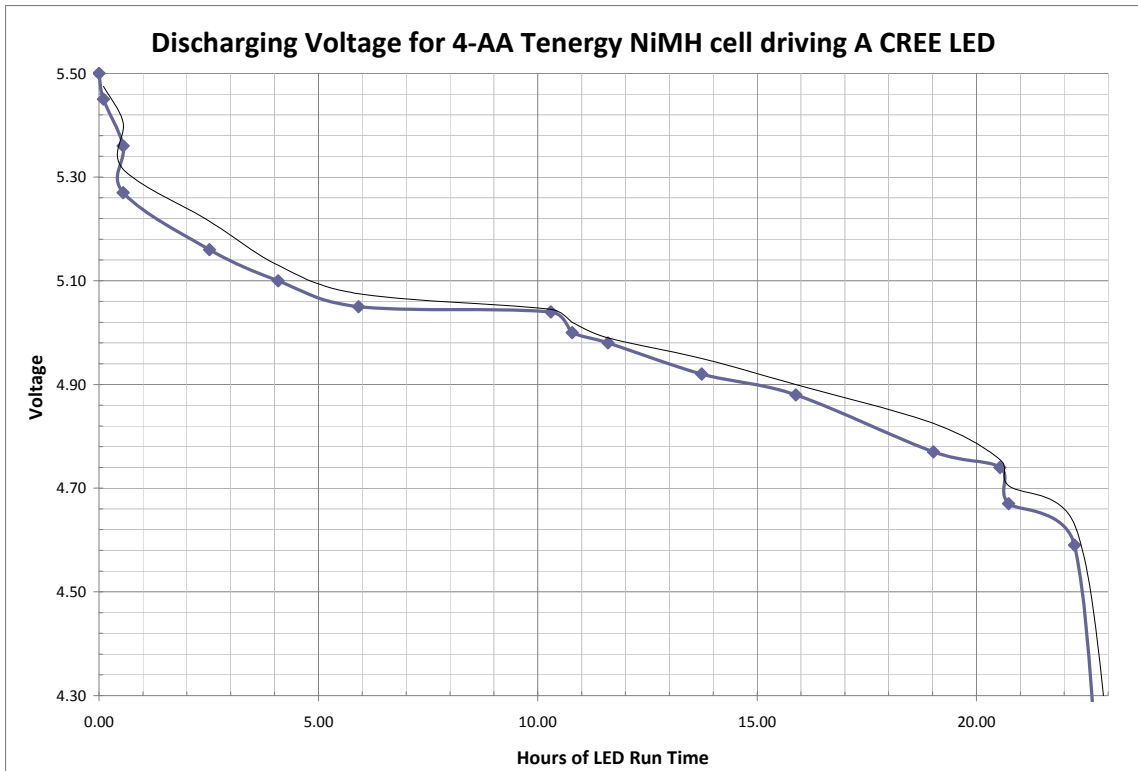
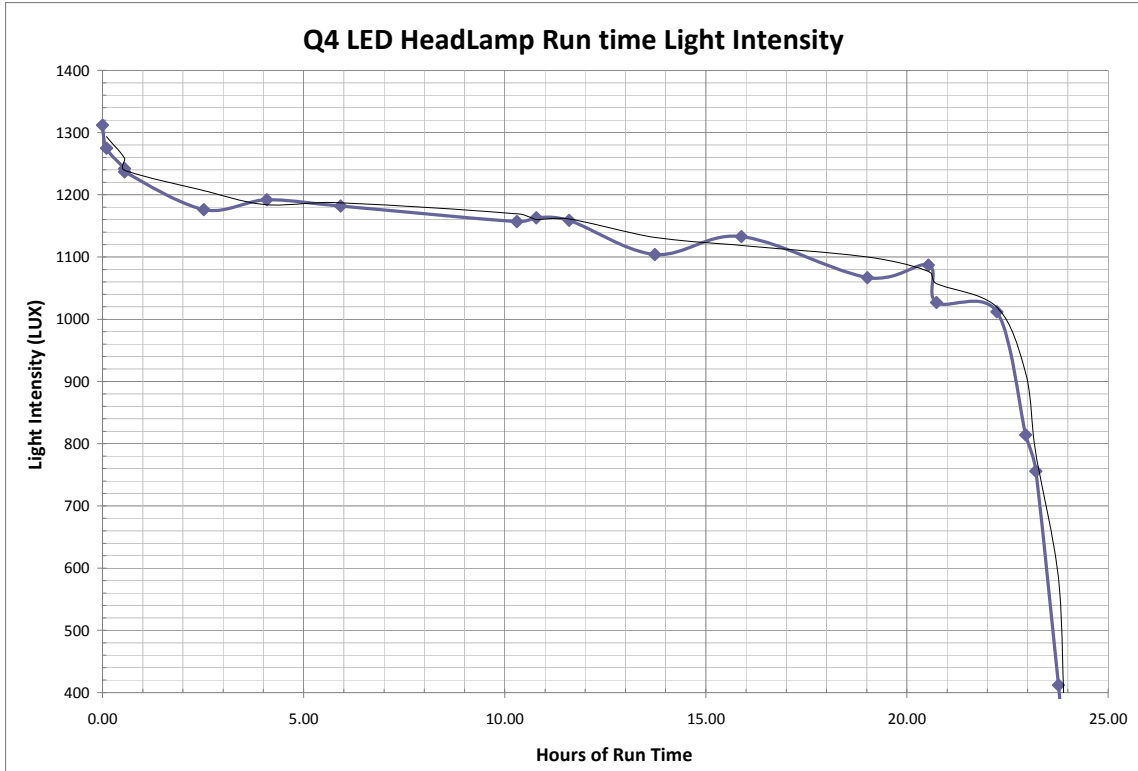
EMB open circuit volt 5.58 (HobbyPartz.com is source)

Tenergy open circuit volt 5.50 (all-battery.com is source)

Recommend .02 to .1 volt added to float charge depending on if equalization is needed or not.

For Q4 after modification see the following results using X-mass tree bulb as resistor.

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