

## **Long burning (emergency, or camping) combination flashlight and headlamp**

Change your 2-D cell flash light for a rechargeable long lasting 1.1 amp-hr set of 4 Ni-Cad cells. Change the filament bulb to LED.

Benefits over Alkaline batteries and Filament type bulbs:

- No reoccurring battery or bulb costs.
- Rechargeable about 300 times.
- Result weights 4 oz less than 2-D Alkaline batteries
- White light LED Bulb lasts over 11.2 years of continuous use on low. About 6 years on high.
- LED bulb will not burn out with rough use (no delicate filament).
- 5 times more efficient at converting battery power to light than a comparable Xenon flash light bulb.
- Headlamp provides wide 20 degree beam of unfocussed light. Works well for close up tasks.
- Minimizes leakage for long-term storage. Less corrosive if it does leak.
- Puts out white light at all battery voltages instead of yellow light as the battery runs low. Color of light does not change with voltage.

Test results of this resistor LED combination:

- It takes over 60 hours of continuous running for the light output to drop below  $\frac{1}{4}$  that of a fully charged battery.
- At 25,000 LUX (tested near the source of light) White LEDs are 8 times more efficient at producing light than a xenon filament bulb drawing .47 amps. This is when both are adjusted to produce the same light output.
- White LED's are 20 times more efficient at 10,000 LUX
- White LED's are 30 times more efficient at 7,000 LUX
- Filament light bubs become more inefficient at reduced battery voltages. LED's become more efficient at producing light from the electrical power that is available. This is because a colder filaments produces less visible light and more heat at lower than designed for voltages. LED's do not change their color spectrum at reduced voltages.
- The PR-2 at \$12.95 (not worth the cost)
  - 1.7 times more efficient at 19,000 LUX
  - 4.2 times more efficient at 10,000 LUX
  - 6 times more efficient at 7,000 LUX

Parts and notes for PVC pipe flash light:

- 1 – T1 ¾-20W white, 5 mm, 6400 mcd 20 degree clear = \$ 2.80
- 1 - Reflectors = \$ .20
- 2 - ¾ inch PVC end caps - .22 \* 2 = \$.44
- 1 - 6.4” of ¾ inch PVC 200 psi pipe .59/18 = \$.033
- 4 – 2-56 by about 3/8” long machine screws = \$.06
- 1 – Slide Switch SPDT with center position off Radio shack 275-409A 1.99/2 = .995
- 1 – Power Jack Radio shack 274-1565A 1.99/2 = \$.995
- 2 – 47 Ohm Resistors ½ watt 271-1105 99\*2/5 = \$.396

Notes:

- 15/32” hole in center of end-cap for LED
- 9/16” hole for switch
- 3/32” holes for 2-56 machine screws about ½ long a little shorter would be better.
- 21/64” hole for DC Power Jack – cut and file the square side.

Parts and notes for conversion of standard flashlight: (Lumilite as a sample)

- 1 – T1 ¾-20W white, 5 mm, 6400 mcd 20 degree clear = \$2.80
- 1 - Reflectors .20\*2 = \$.40
- 2 – 2-56 by about 3/8” long machine screws
- 1 – Power Jack Radio shack 274-1565A 1.99/2 = \$.995
- 1 – 47 Ohm Resistors ½ watt 271-1105 99\*1/5 = \$.20
- 1 – 8-32 nut used as a spacer between batteries and LED holder.

Parts and notes for headlamp: (task light)

- 1 – T1 ¾-20W white, 5 mm, 6400 mcd 20 degree clear = \$2.80
- 1 - Reflectors = \$ .20
- 1 – Coaxial DC Power Plug 274-1569A 1.99/2 = \$.995
- 1 – 47 Ohm Resistors ½ watt 271-1105 99\*1/5 = \$.20
- 1 – Approximately 24” 12 gage insulated wire \$.08
- 3 – Safety pins – brass plated \$.06

Battery charger from 12 DC source: Trickle charge all the time by leaving it plugged into your car. Will take a week to charge it if discharged.

- 1 Car charger adaptor (from 99 cent store) \$.99
- 1 – Coaxial DC Power Plug 274-1569A 1.99/2 = \$.995
- 2 – 1200 Ohm Resistors ½ watt 99\*1/5 = \$.20

Note: cut the end off and use radio shack plug

The following is needed to assemble all of the above:

- 5 min epoxy
- Heat shrink tubing
- Solder