

A LED Microscope Illuminator

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A last column reviewed my construction of a SOLUX incandescent lamp based microscope illuminator. Although this lamp continues to be my preferred light source, it does get very hot and it does lack the positioning flexibility of a commercial fiber optic illuminator.

Recently, very bright white LED, (Light Emitting Diode), light sources have become available. Flashlights and Christmas tree lights using white LEDs are now widely marketed. These light sources typically generate a Watt, or less, of heat. With this obvious advantage, I decided to give a try at making a dual illuminator using bright white LEDs. Searching the web, I found, what appeared to be, a suitable LED lamp manufactured under the trade name LUXON. The part number on my LED lamp is 3805LXHLNWE8, (Figure 1) I think I paid about \$14 each for them...(search as I may, I cannot now find these... perhaps they are no longer made, but there are hundreds of other similar ones to chose from. Look for ones with extreme high brightness and a built in rear reflector.)

A critical feature of the fiber optic illuminator that I wanted to duplicate was the flexible metal tubing to position the light source. Searching the web, I was unable, (then), to locate a vendor of metal flexible tubing for a price and minimum length, (about 3 feet), that I wanted to buy. However, fortune shown upon me. On a trip to the town dump, (a.k.a. "transfer station"), I spotted the remains of an "art deco" five bulb floor lamp that had just the flexible metal pipe I was looking for. I retrieved it from the scrap metal "mountain" and brought it home. One of the original five lamp assemblies that was unused in my project is shown in Figure 2. The flexible pipes were only 10 inches long, but with threaded ends, two lengths were easily fastened together with an extra deep nut to make a twenty- inch length.



Figure 1. LUXON LED



Figure 2. Salvaged "art deco" lamp with flex pipe.

The intensity of a Light Emitting Diode is controlled by the electrical current through it. More current equals more light, (as long as one does not exceed the maximum rated current for the device). LEDs also require a direct current power source, like the ubiquitous black, plug-in, blocks that power most electronic gadgets these days. I selected a 5 Volt, 1 Amp power module from a collection I had saved, (as I said in the last issue, "I save way too much stuff"). These power modules are also available at Radio Shack.

I decided to go with two different light intensities, (i.e. HIGH and LOW), rather than a continuously variable intensity, (electrically simpler to construct). A note here: I am happy to assist readers with the details of the electrical connections. Those wishing to ignore these details should skip to the next paragraph. My LUXON LEDs have a forward voltage of about 3.2 volts at the recommended 400 milliamp operating current. This determines my HIGH brightness LED series resistor as: $(5 - 3.2)\text{Volts}/0.4\text{ Amps} = 4.5\text{ ohms}$, (I used a 5 ohm, 1 watt, resistor). A second series resistor, for LOW brightness is selected by a double throw toggle switch, I used 10 ohms here. A schematic for my lamp is shown in Figure 3, (one lamp only shown).

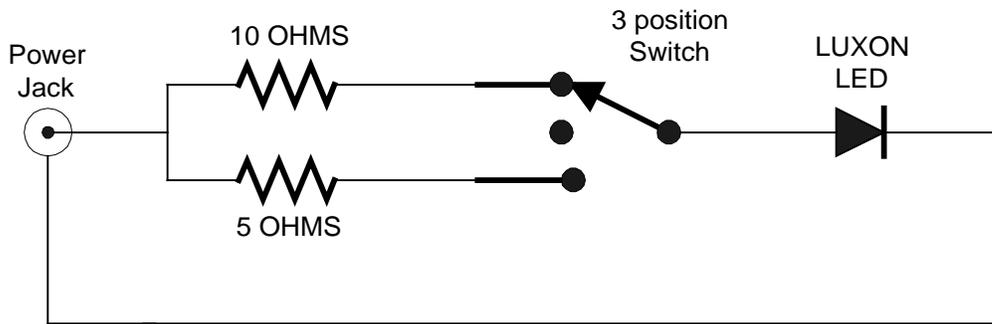


Figure 3. Wiring schematic, one LED side only is shown

Small “shades” for my LEDs were made from cut off eye dropper bottles. A foam grommet, (actually a small slice of hose), holds the shade in place in the end of the flexible pipe, Figure 4. A pair of 4:40 screws and nuts attach the LED module to the eyedropper shade.

The resistors, toggle switches, and power jack were assembled on a length of 1 ½ inch aluminum angle stock. Electricians outlet box wire clamp nuts were used to attach the flexible pipes to the angle stock. Finally the completed assembly was screwed to a block of 1 ¼ inch thick oak, (a left over piece of a stair tread). The finished illuminator is shown in Figure 5. I find this illuminator particularly useful in mineral photography, where multiple light sources, accurately positioned, are helpful. I do find that the light color of my LEDs is a bit on the “blue” side.



Figure 4. Lamp attachment to flex pipe with shade



Figure 5. Completed LED Illuminator