Converting a Projectina Microscope to LED Lighting

Graham Matthews, Dec 2017

Projectina before conversion

The Microscope

The Projectina microscope is a venerable 1960s beast of a projection microscope. It came in a number of configurations and the instrument I possess is, I think, one of the earlier models. The light sources used on these instruments were 100W halogen filament lamps and they became extremely hot in use. So much so, that I understand it was not uncommon for the lamp lenses to crack. The heat also necessitated the use of built in infrared filters and made manual adjustments of the lighting, for example adjusting iris diaphragms, rather hazardous for the user's fingers. The power consumption was also considerable, and the high currents could make plugs, sockets and wiring run hot.

Even so, I have always enjoyed using this microscope, both in non-projection and projection modes.

I have been watching the development of ultra-bright LEDs for some time and waiting for single-die LEDs of sufficient power to become available, as one really needs a light source comparable in power and size to the filament in a halogen lamp. LEDs also run a lot cooler than filament lamps and product virtually no radiant infrared.

With the introduction of the Cree T6 LED, my wishes seemed granted, so I decided to attempt a conversion of my Projectina to cooler LEDs. The safety conscious amongst you may wish to add in UV filtering to replace the infrared filters in the Projectina, although the spectrum of these LEDs is supposedly low in UV, but may be a bit on the blue side, and there have been some safety concerns over possible eye damage with LED lighting.

The following is a brief guide to how I performed the conversion. It is now running well, and I am very happy with the results.

Parts Required

2 x Cree XML T6 White Color 10W LED Emitter Bead LED Mounted On 20mm Star PCB, or equivalent (eBay)

1x 5K linear potentiometer (eBay)

and a suitable knob

I found this one in my scrap box.

1x SPDT switch (old, also from my scrap box, but a good style match for the 1960s).

1x 18w LED Driver Transformer for MR16-MR11-G4 LED Light Bulb by Long Life Lamp Company (Amazon)

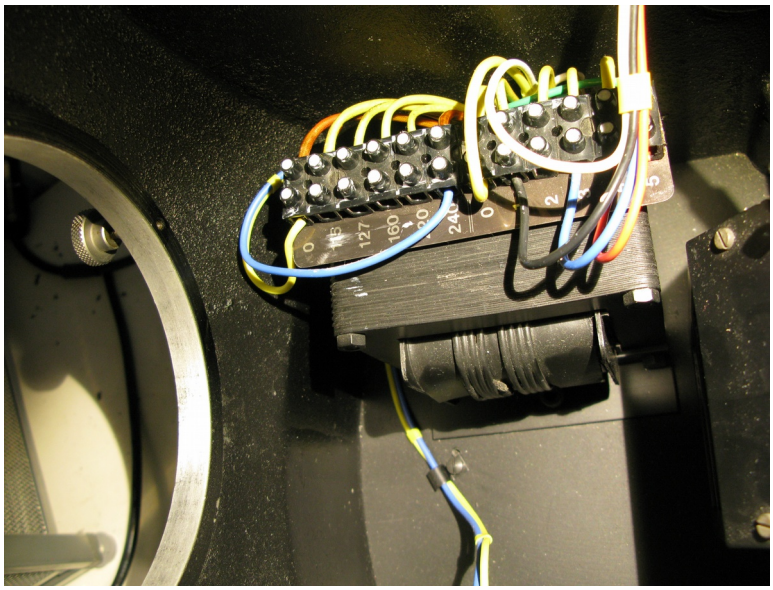
LM2596 DC-DC 4V-35V to 1.23V-30V Step Down (Buck) Power Module Voltage Regulator 3A (eBay)

2x low voltage plug and socket

Disassembly

Remove all unnecessary parts from the microscope: stage, nosepiece, large internal mirror, projection screen and store out of harm's way.

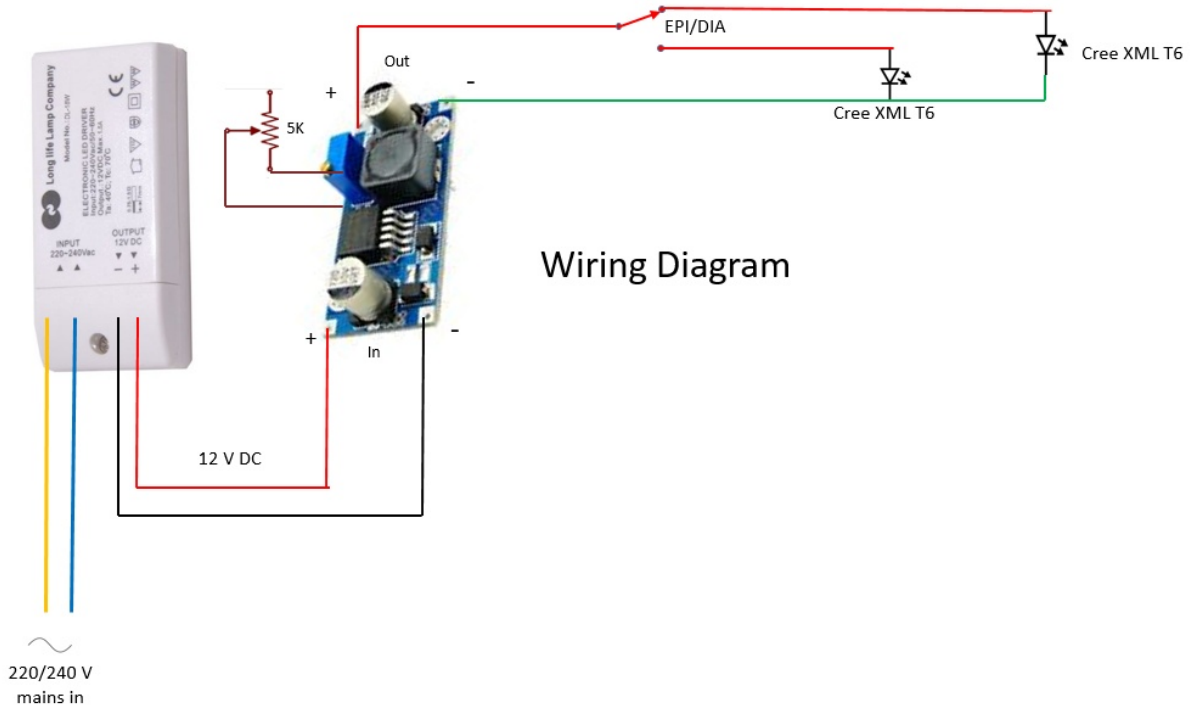
Remove all the attached incoming and outgoing wiring from the transformer:



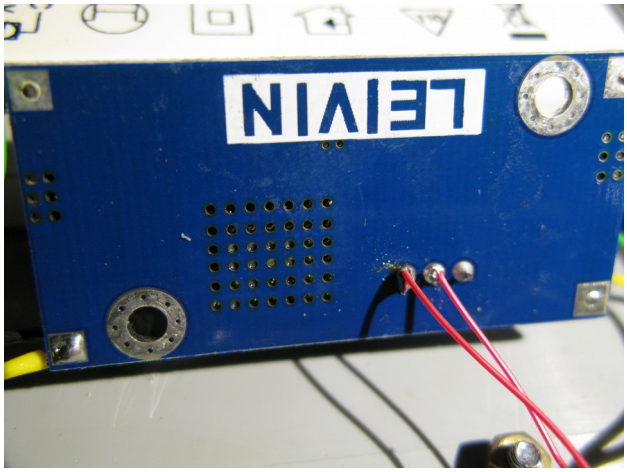
Note the incoming mains wires in the illustration are the yellow and blue wires connected to the terminal block marked 0 and 240.

Unbolt and remove the transformer. This will make the instrument rather lighter – although still not exactly light!

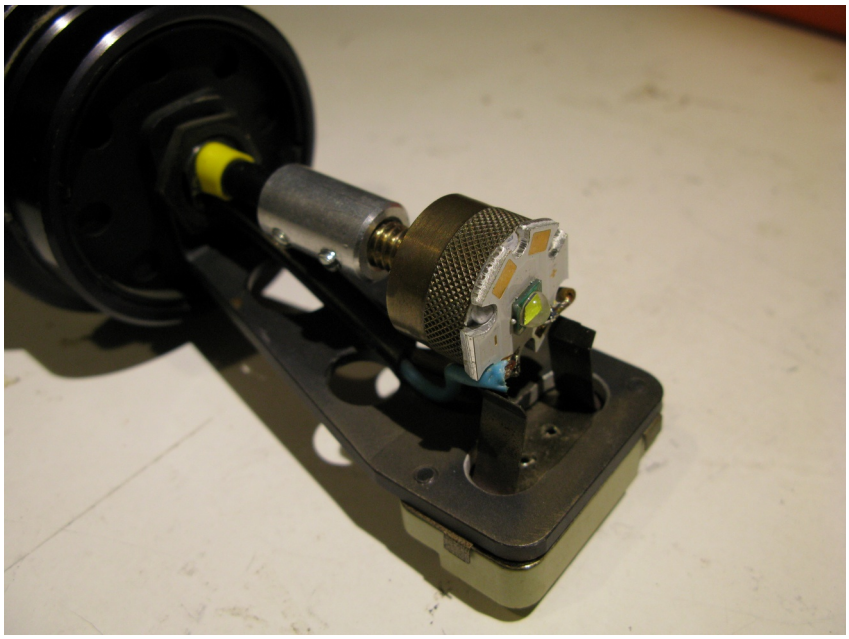
The electrics



The LED brightness is controlled by the 5K potentiometer which is wired across the blue trimmer on the underside of the LM2596 regulator board thus (red wires):

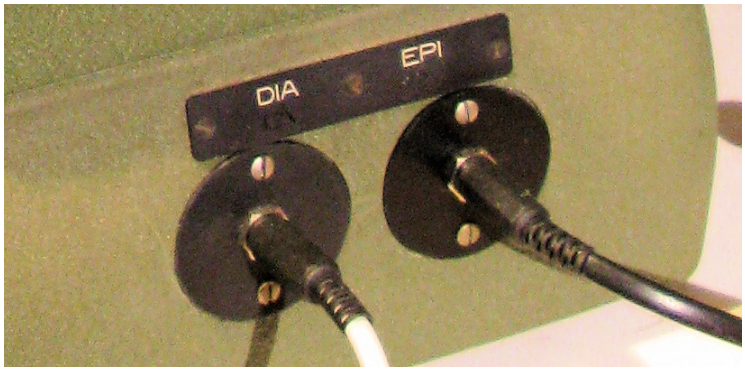


The LEDs are mounted on suitable heat sinks (I used some metal scrap) with heat conducting compound (electronics thermal heatsink compounds/adhesives can be found, e.g. on eBay). The LED element should be in the same position as the filament of the lamp that is being replaced, i.e. central and between the metal clips previously used to retain the lamp:



Each lamp has its own plug and the Projectina sockets may be replaced with modern low voltage sockets compatible with the plugs. I chose this type of plug:

available from suppliers such as Farnell. I made new mounting plates from sheet plastic cut to size with a compass cutter (old CD cases, etc., are good sources of sheet plastic, or modeller's plastic card). It is, of course, important to observe polarity. I used centre positive.



I replaced the Projectina multiposition switch with the potentiometer to control the brightness.

You may need to do some butchery to mount the potentiometer and adjust the shaft length.

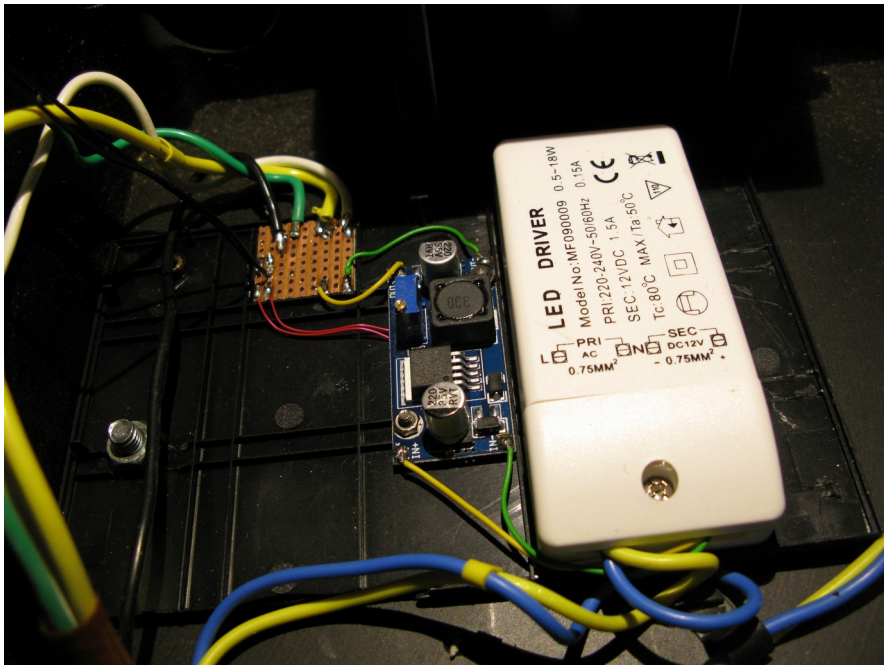
The EPI/DIA selection switch is mounted in what was a blanked off hole conveniently placed on the side of my Projectina next to the light control switch/potentiometer. This may vary with the model of Projectina.

Setting up

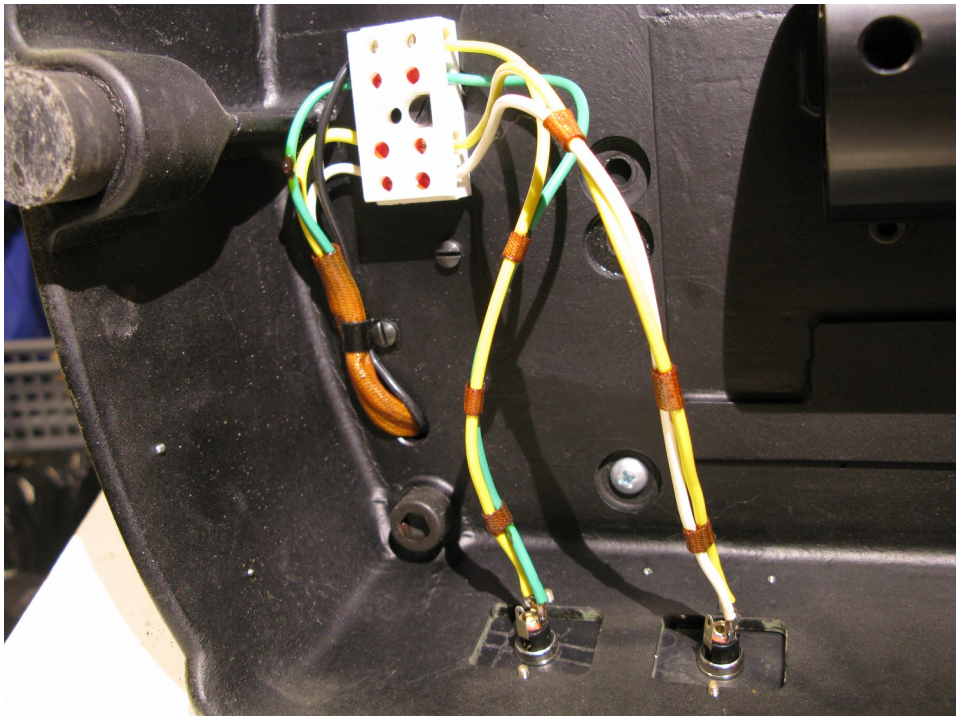
Without the LEDs plugged in, the output voltage from the LM2596 regulator board should be adjusted to maximum using the potentiometer. The voltage should then be adjusted using the screw on the top of the blue trimmer on the board to give a maximum of a shade under 3.3 v (e.g. ~3.29 V).

You can now re-assemble everything and try out the lighting…

More views



The electronics were mounted on a spare flat plastic tray which was then bolted down using the transformer fixing holes. The veroboard is just used as a convenient anchoring and connection point for wiring.



This is the underside, showing the connections to the power sockets for the LEDs

If you have any comments or questions, I can be contacted via email:

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