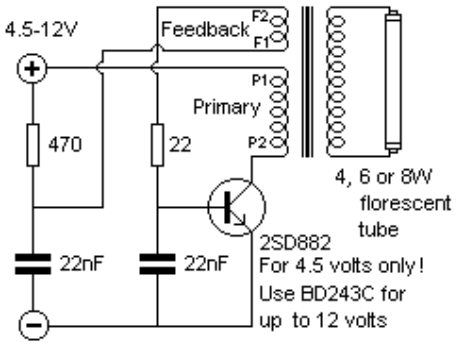
A simple inverter for florescent lamps

This inverter is very easy to construct, reliable, and even powerful enough to light up a 15W florescent tube (if you cool your transistor well). The only hard-to-find piece of this baby is the so-called yellow inverter transformer. It's a miniature high frequency transformer that has a 25mm x 20mm x 5mm ferrite core, 30 turns of primary, 15 turns of feedback, and 250 turns of secondary all concentric, wound on plastic frame than wrapped with a 'yellow' adhesive tape. If you can't find it in your local electronic shops then search for old portable rechargeble florescent lanterns since they have at least one yellow inverter. Of course you can wind a handmade transformer which would do the same but it is a very difficult task when you don't have an original to inspire and it will still need an appropriate ferrite core.



This is a single transistor oscillator circuit. Current passed through primary winding inducts a magnetic field to the core and the core gives the energy back to the feedback winding with a delay determined by the core material and windings. System then oscillates continuously on a frequency depending on this timing. You cannot use 2SD882 with voltages over 4.5 volts. It is only needed if you are going to feed the circuit with only 4.5 volts. Equivalent transistors may not work as good as 2SD882 (NEC Electronics, Japan). Characteristics are below :

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Bipolar NPN transistor  : 2SD882 (or D882 as labeled)
Casing                  : TO126
Max. collector current  : 3 Amperes
Max. total power        : 10 Watts, while case is at 25 degrees Celsius
Transition frequency    : 45 MHz
Max. collector capacity : 45 pF
hFE (current gain)      : 160 at 1 Ampere (typical value)

Bipolar NPN transistor  : BD243C
Casing                  : TO220
Max. collector current  : 6 Amperes
Max. total power        : 65 Watts, while case is at 25 degrees Celsius
Transition frequency    : 3 MHz
hFE (current gain)      : 30 at 300mA (minimum value)
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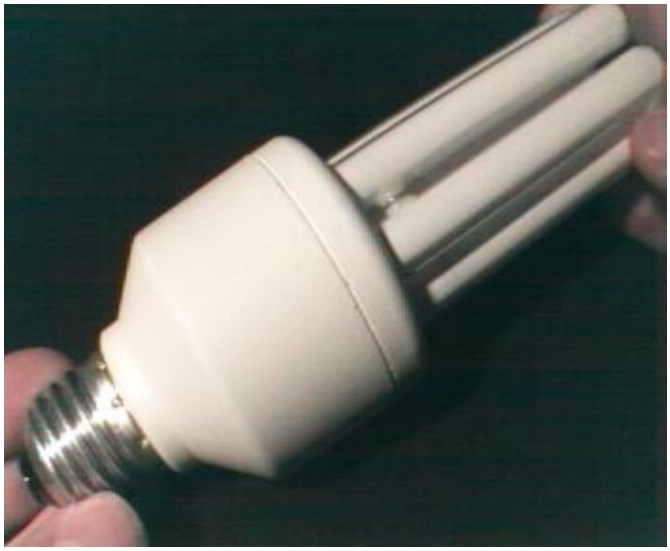
In case you decided to build your own transformer, here are the instructions to create one:

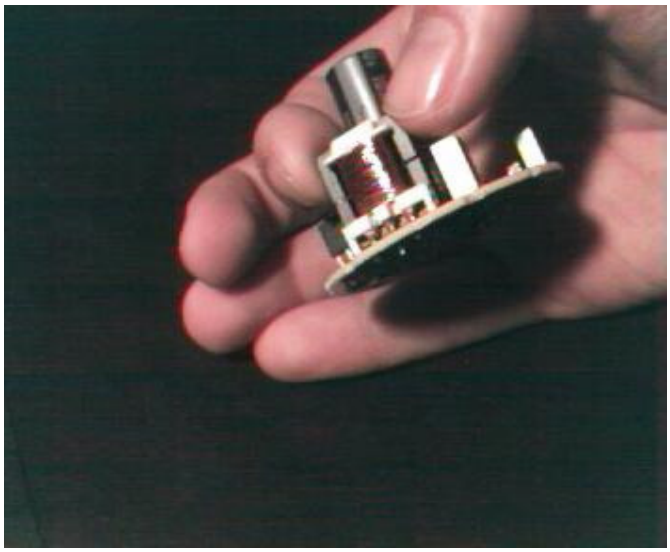
First of all, you have to find a ferrite core transformer frame. It may be found in discarded rechargeable fluorescent lanterns (in this case it will be probably ready to use), fluorescent tube lights build to use in cars, at electronics stores, and in the energy saver lamps.

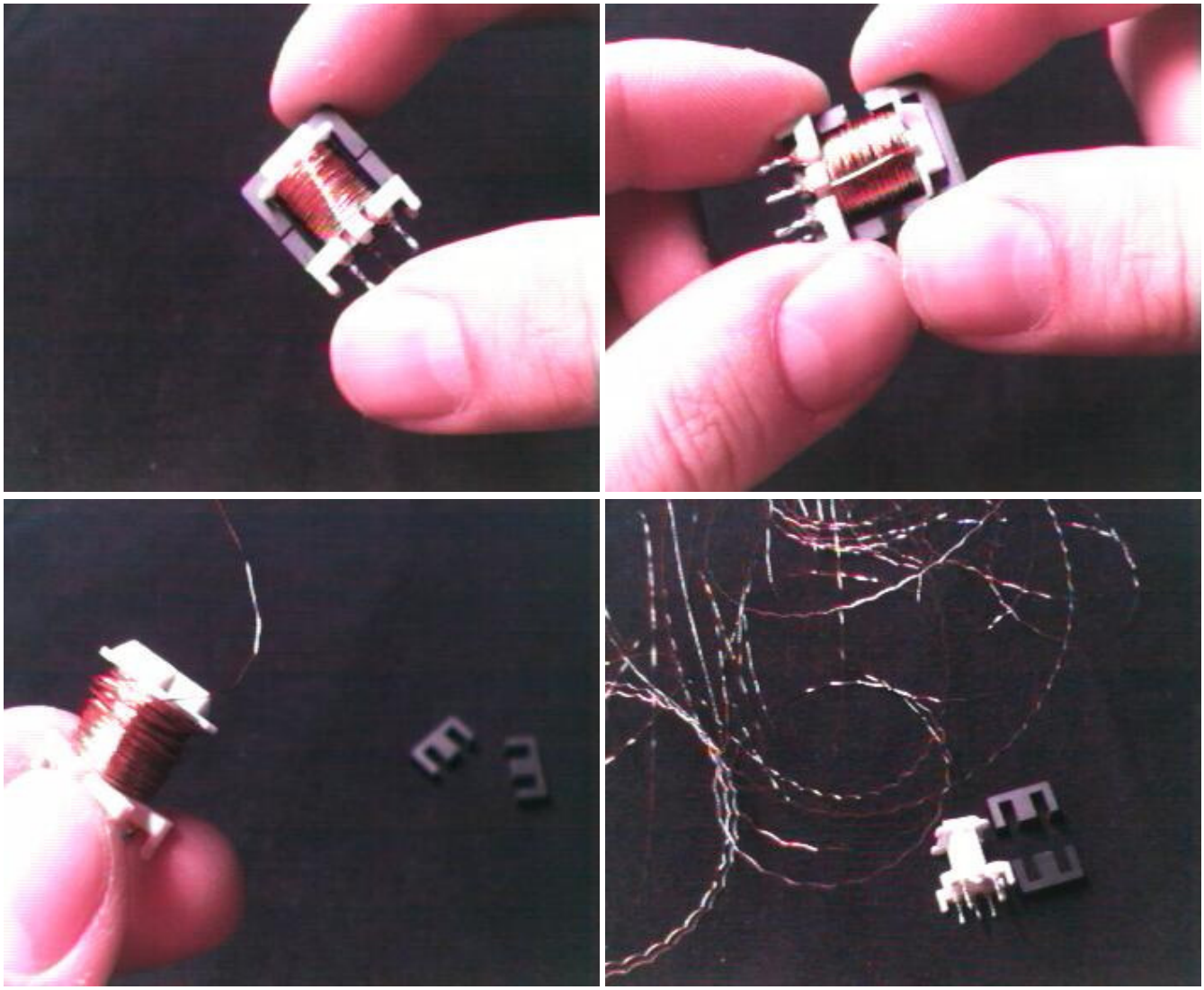
Following work describes the process to gain a ferrite core transformer from a dead energy saver lamp and give it a new life
as the heart of the inverter. Please note that these lamps are in various sizes under various brands and it's important to get a transformer which is near or equal in size given above (25mm x 20mm x 5mm). Otherwise it may be difficult to fit the windings on it and performance may noticeably degraded.

Open the lamp and take out the PCB. Locate the ferrite core transformer and unsolder it. Detach the core parts and unwind
the wires on the frame. Now you have an empty frame and two E shaped core parts.





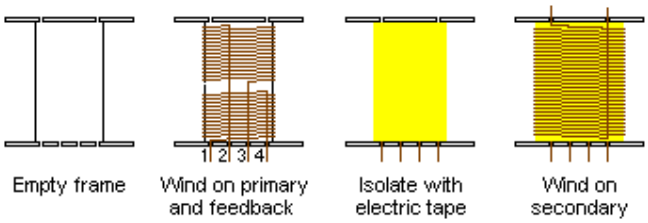


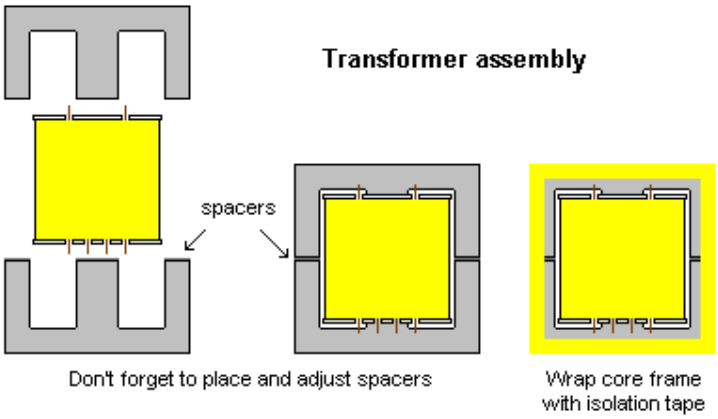



Steps to salvage a mini ferrite core transformer from a dead energy saver lamp

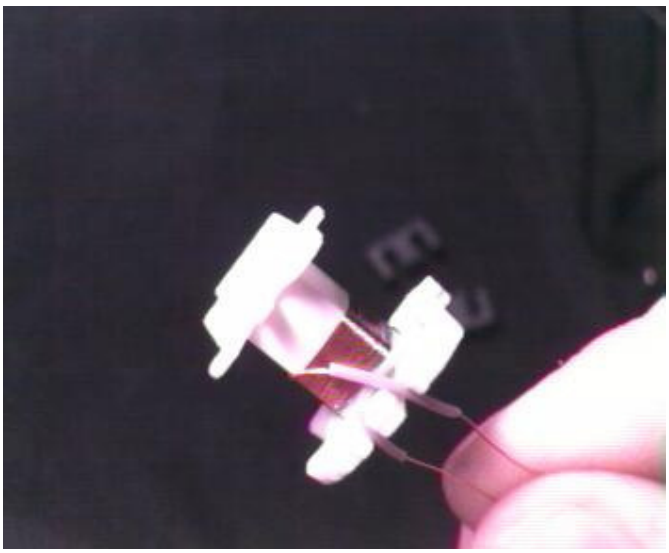
Use AWG28 (~0.3mm) wire to form primary and feedback windings and AWG32 (0.2mm) wire to form secondary. Make out a smooth winding for maximum performance and easy fitting. Place primary and feedback windings on opposite sides of the frame. Primary winding will run over on feedback in this case but it is not so important. It also isn't important in which direction the windings are made, you just have to change two wires' places to make circuit work, But for a problemless first run and make the transformer to fit on the PCB right, follow these instructions:

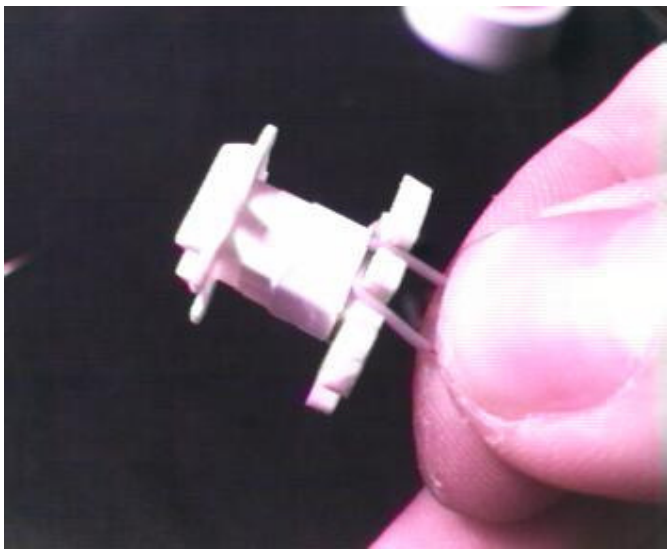
Number the four slot as 1-2-3-4. Now take the care: start with winding the feedback, put wire at slot 2 then wind on clockwise. When 18 cycles completed, stop winding and put the end of the wire in slot 3. Start on slot 4 for primary, wind 25-30 cycles clockwise and end in slot 1. Now the polarity of the leads are correct for the layout of the printed circuit board design. If you make a mistake at this point or just confused, it does not matter at all. Allow wires came out 2cm or more long from the frame, then you will be able to swap feedback (or primary) connections in case of wrong phase polarity. There should be thin spacers made out of adhesive tapes, between the contact points of core parts. If you got your ferrite core with this spacers on it, do not remove them. If there isn't any spacers, you can use very thin adhesive tape to make them. If you don't use any, performance of the transformer will be degraded. You should manually move two core parts relative to each other in order to find the best operating point which can be determined from the brightness of the lamp.

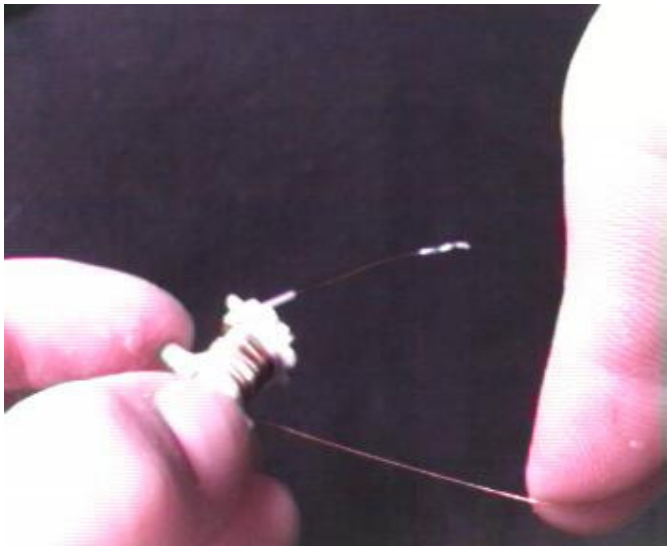


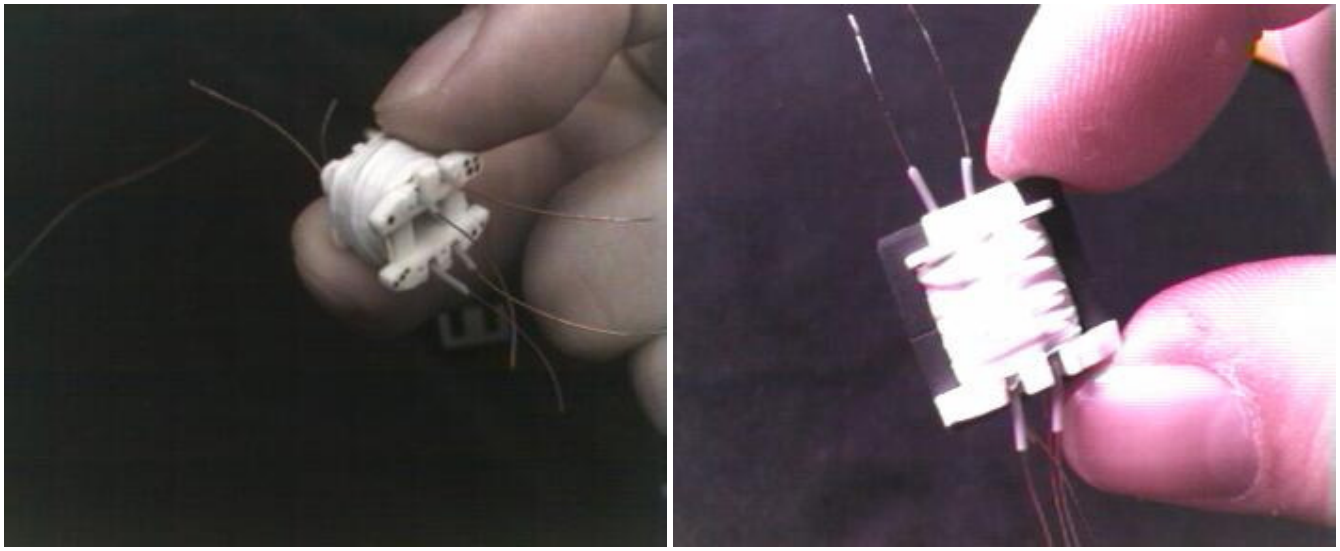


Steps on winding the transformer



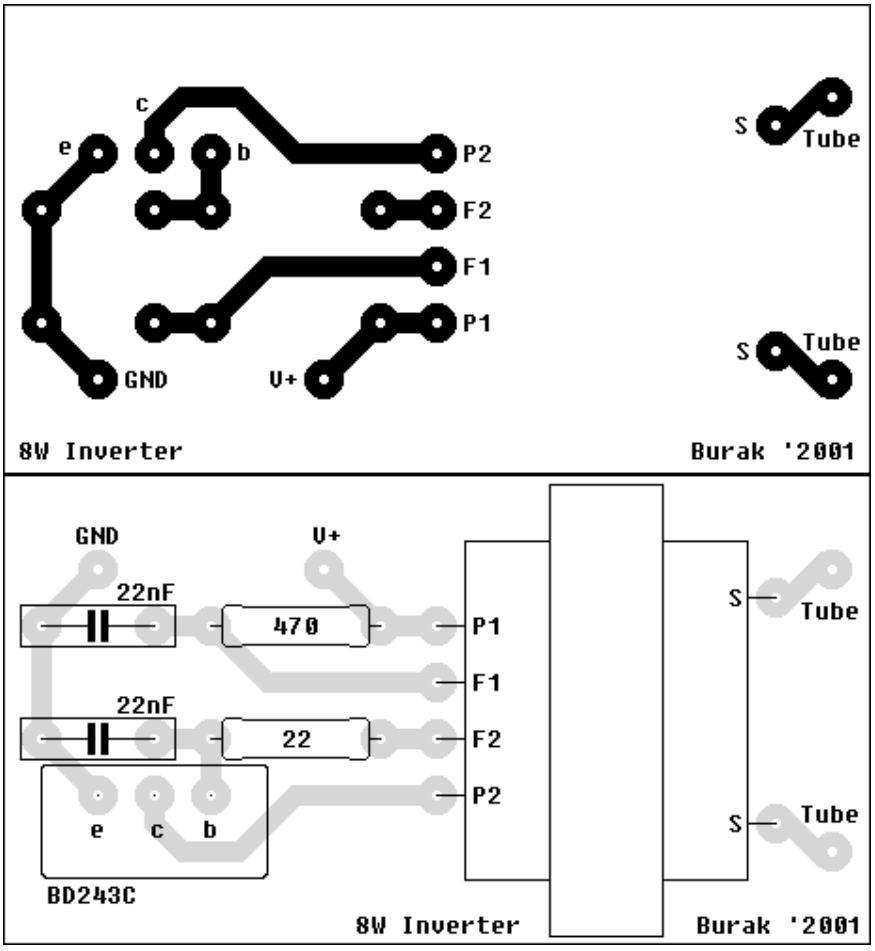






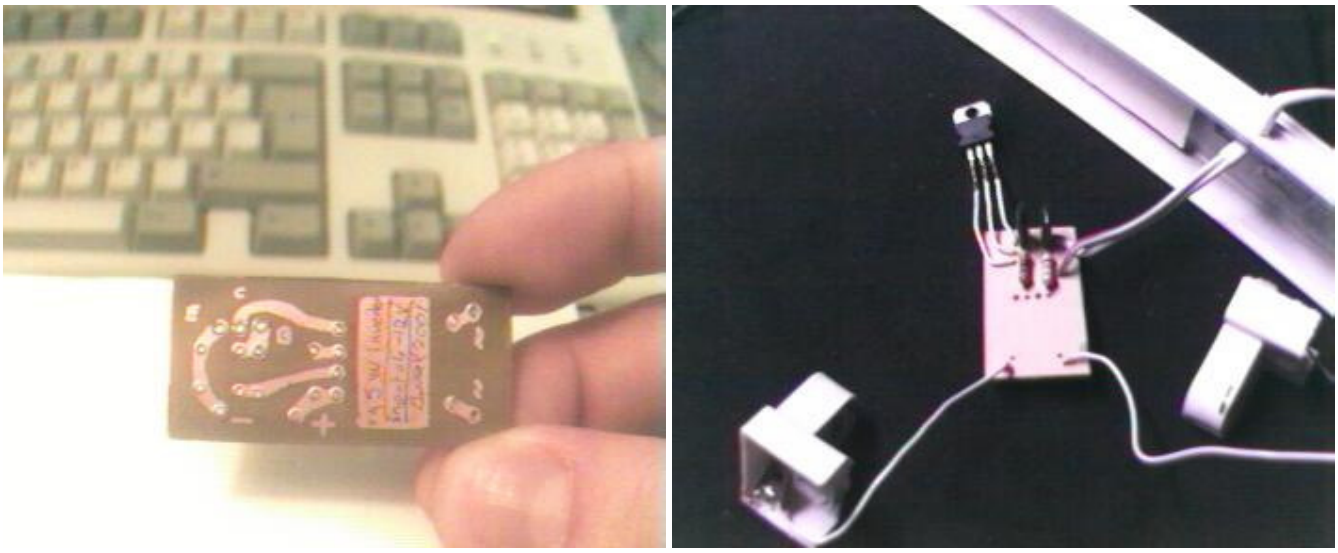
Winding primary, feedback, and secondary

Although the circuit has got a few parts, you may want to create a PCB to fit components on, after a successful test run. Here is a PCB suggested, easy to create and small enough to place almost anywhere. You may refer to my PCB design page to get info on how to create your own PCBs. Print this PCB design at 300DPI to match the actual scale. Here is a TIFF file already set to 300DPI and ready to print.



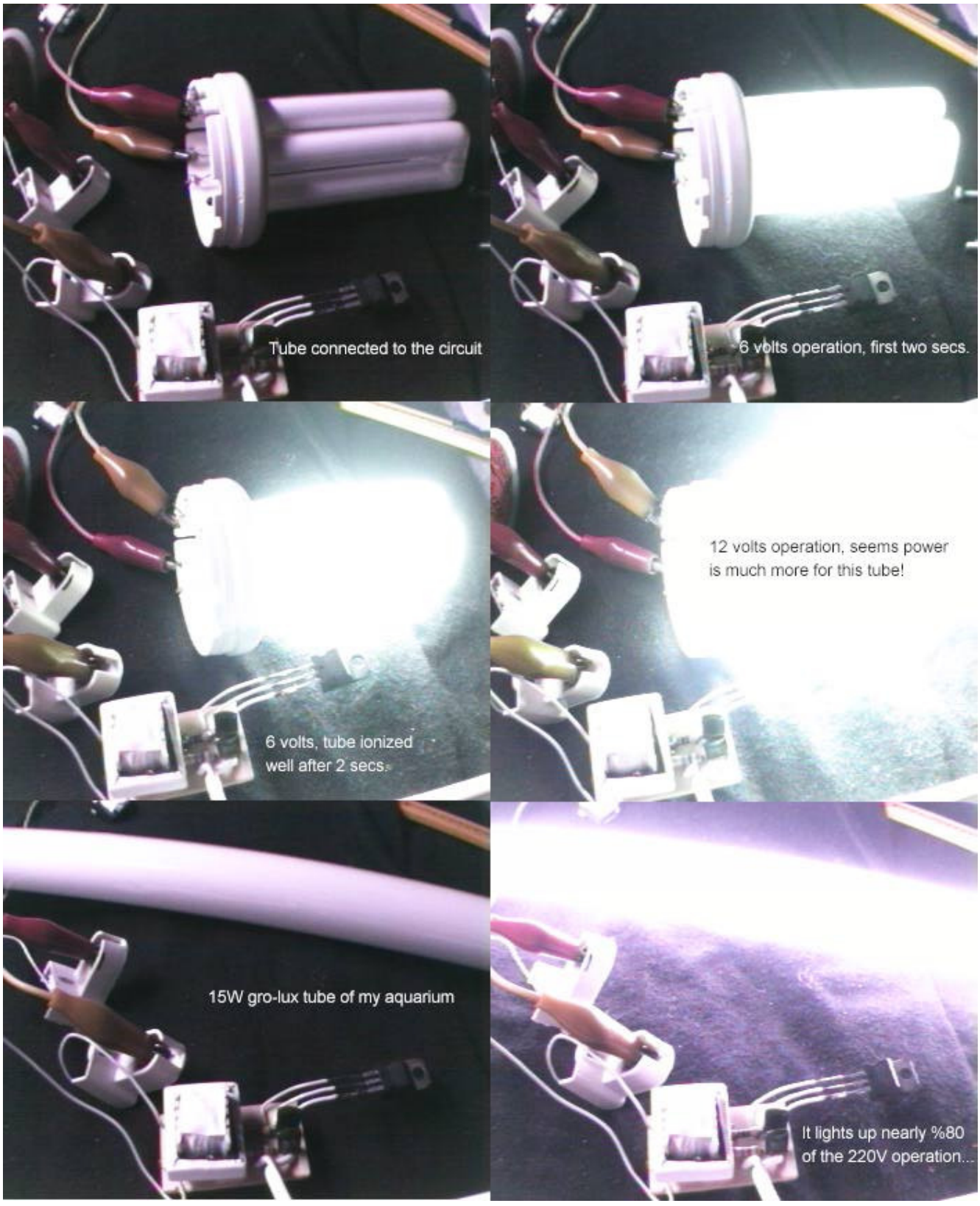
PCB design for the inverter

After the PCB has created and components are soldered on, carefully check your work for possible short circuits before applying power. As a drawback of simplicity, circuit doesn't have any current limiters to survive any. Be aware that there will be more than a few hundreds of open circuit voltage on the secondary outputs, thus take care of the solder points.



Etched PCB and PCB with components mounted on, without transformer

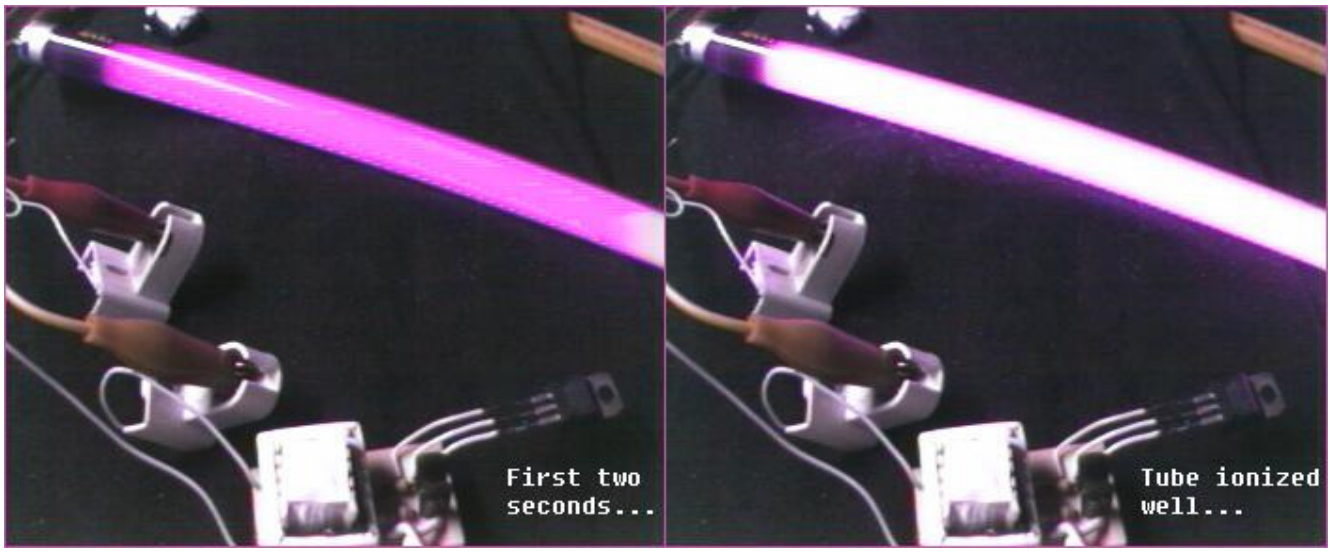
If you have done it right, it should function surprisingly good than you think of. Here you can see it's lighting up the fluorescent tube which the transformer was detached from, and even a 15W tube which is not intended to use with this circuit but possible as you see. You may noticed that the transistor is not mounted on a heatsink, indicating it's not get hot much. Of course, for continuous operations, there should be at least a small plate of aluminum heatsink.



Inverter in operation

Since the current passed through tube determined by the input voltage of the inverter, do not overlight tubes that you don't want to destroy. For example, the energy saver lamp's tube lighted with 12Volts above becomes much brighter than it's original 220Volts operation. Although looks great, it becomes hot and starts to blacken inside. So adjust the input voltage to light up your tubes at a usable brightness to extend lifetime.

It's certainly possible to light up ultraviolet (blacklight) tubes for fancy experiments and decorations. F8T5 tubes can be easily lighted up with the inverter. Just take this advice: as the tubes get old, they draw more current from the inverter. So always use a tube that lights up well and consumpts less current.



Lighting up a blacklight tube

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