How To: Printed Circuit Board (PCB) - Now with newest TriTank!!

Simon Christensen
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TL;DR version

1. Check that all necessary equipment is at the station: Gloves, lab coat, goggles, PCB plates and rubbing alcohol. Check that your PCB design on a transparent piece of paper looks good with solid black pads and wires.

2. Plug in the tank, warm up the UV-lightbox by giving it a full spin on the "egg-timer".

3. Expose the PCB plate to UV light through a transparent paper with your PCB design on it. Remember to cut the plate to size. Remember to remove the protective foil.

4. Put the UV-lit PCB plate in the "Develop-tank (the left one in the Tri-Tank). Give it a few seconds and check the PCB plate. Design should be very visible when done. Normally takes maximum 30 seconds. Rinse the plate with water in the middle tank.

5. Put the developed PCB plate in the "Etching-tank (the right one in the Tri-Tank). It should take 20-30 minutes to completely etch - but make sure to check it often (for example every 3-5 minutes). Rinse the plate in water in the middle tank, once it’s finished etching.

6. Remove the remaining photoresist from the copper paths with rubbing alcohol ("sprit"). Rinse plate again.

7. Postprocessing: Drill, cut/grind sharp edges/corners, use the "magical stone".

Step 0: Pre-Preparation

Etching PCB’s include working with acid. Remember to use gloves, put on some goggles, and wear some clothes that you can live without - and remember to wear the lab coat. Check that there is rubbing alcohol at the station. If any of the mentioned elements are missing from the station then contact Labtools at labtools@cs.au.dk, and they will stock up as soon as possible.

Step 1: Preparation

First step is to heat up the UV lighting box. Turn the "egg-timer" a full rotation and let it run until finished. In this step you should also heat up the etching tank. It takes a while to heat up as well, and the etching process is must faster when properly heated up.
The etching tank needs to be plugged in. One power cable is for the pump (creating bubbles) and the other one for the heating element. The solutions in the tanks are warm and ready when the thermometer shows 30-35+ degrees.
Step 2: UV-light exposure

First you remove the black foil from the copper plate. Some plates are double-sided, which is useful for more advanced PCB’s and circuits. The copper plates on the pictures are one-sided, which is the most commonly used. Do not use double sided PCBs for one-sided designs - you will be saturating the acid in the etching tank, if it needs to dissolve that much copper.

Consider the orientation and design of your PCB on the transparent paper you printed it on. Is it the right way around? Or is it mirrored? It is often helpful to put some text on the PCB (for example the version number of the PCB iteration). Also remember that the components will be on the OPPOSITE side of the copper. Remember to face the copper side DOWNWARDS in the UV light box (yes, it is unfortunately necessary to say this...).
On the UV-exposed copper plate you should be able to see, where your design will be placed - the wirings should be visible as slightly more yellow than the rest of the surface.

**Step 3: Develop**

Now the green laquer has to be removed - the etching tank can remove the copper more easily than the laquer.

This is done by wedging your PCB plate in the holder and dipping it in the Develop-tank, that can remove the UV-exposed green laquer. How long the copper plate has to be developed, depends on it’s dimensions.
and how saturated the solution in the tank is. Start with giving the plate a few seconds, but it might take up to a minute. You should easily be able to see if it has been properly developed. Remember to rinse the plate in the middle tank after it has been developed. If your design ends up looking like one of the pictures below, you might have to rotate your PCB plate 180 degrees during the Develop-phase - the bottom of the plate normally gets developed more than the top.

After developing your PCB plate should look like this. Remember to check if the text you put on the PCB is oriented properly. Next step is to etch the plate. To avoid saturating the solution in the etching tank please cut the plate to as small a size as possible.
Step 4: Etching

When the etching tank is heated up, and the PCB developed, you can now etch the plate. When the plate is put in the etching tank, you need to turn the "bubble-function on, if you haven’t already. You turn it on by plugging the cable in - do not change the settings on the pump. Check regularly if the PCB is done, since it varies a lot how long it will take to finish etching. It typically takes 15-30 minutes. Remember to use gloves. It might be a good idea to flip the plate 180 degrees around half-way, since the etching often happens bottom-up.
When the PCB is finished, there should be no left over copper, but the tracing (PCB-design) should still be protected by the lacquer. Rinse in water after taking it out of the etching tank.

**Step 5: "Strip"**

The lacquer that protects the copper tracing now needs to be removed. Use rubbing alcohol on a piece of paper to remove this. It should come off pretty easily.
Remember gloves! And remember to rinse afterwards!

This is how a fully developed and etched PCB looks. Yay!

**Trin 6: Final touches**

Use the drill to drill out holes for your components.
To make the PCB accept soldering a bit more easily, you can use "the magical rock" that will roughen the surface of the copper traces a bit. The rock is in the PCB box at the station, it is red and a little softer than you would think.