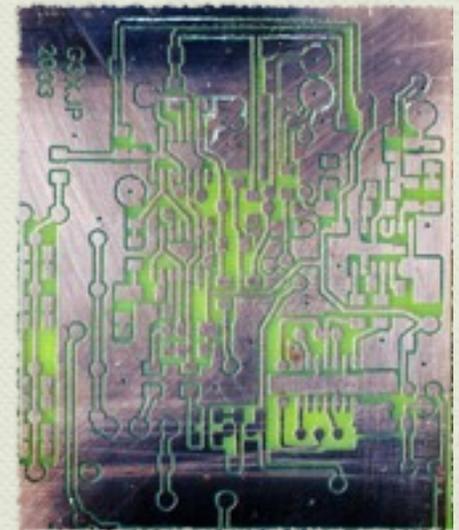
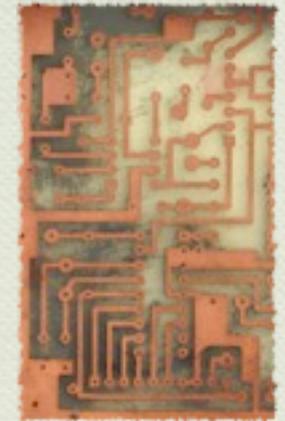
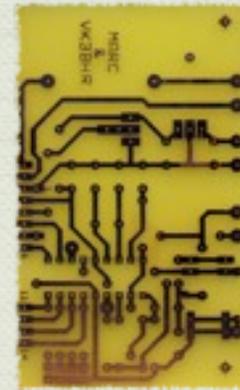


# Making circuit boards on your kitchen table

*Ross Feilen, March 2009, produced for IET Younger Members Talk*

# Why build your own?

- ◆ Speed - you can build your own board in a couple of hours  
Particularly important if you want to rapidly prototype designs
- ◆ Cost - even occasional projects work out cheaper overall (more about this later)
- ◆ You get great satisfaction in producing your own work!





The kitchen table  
(as promised)

# Things you need - checklist

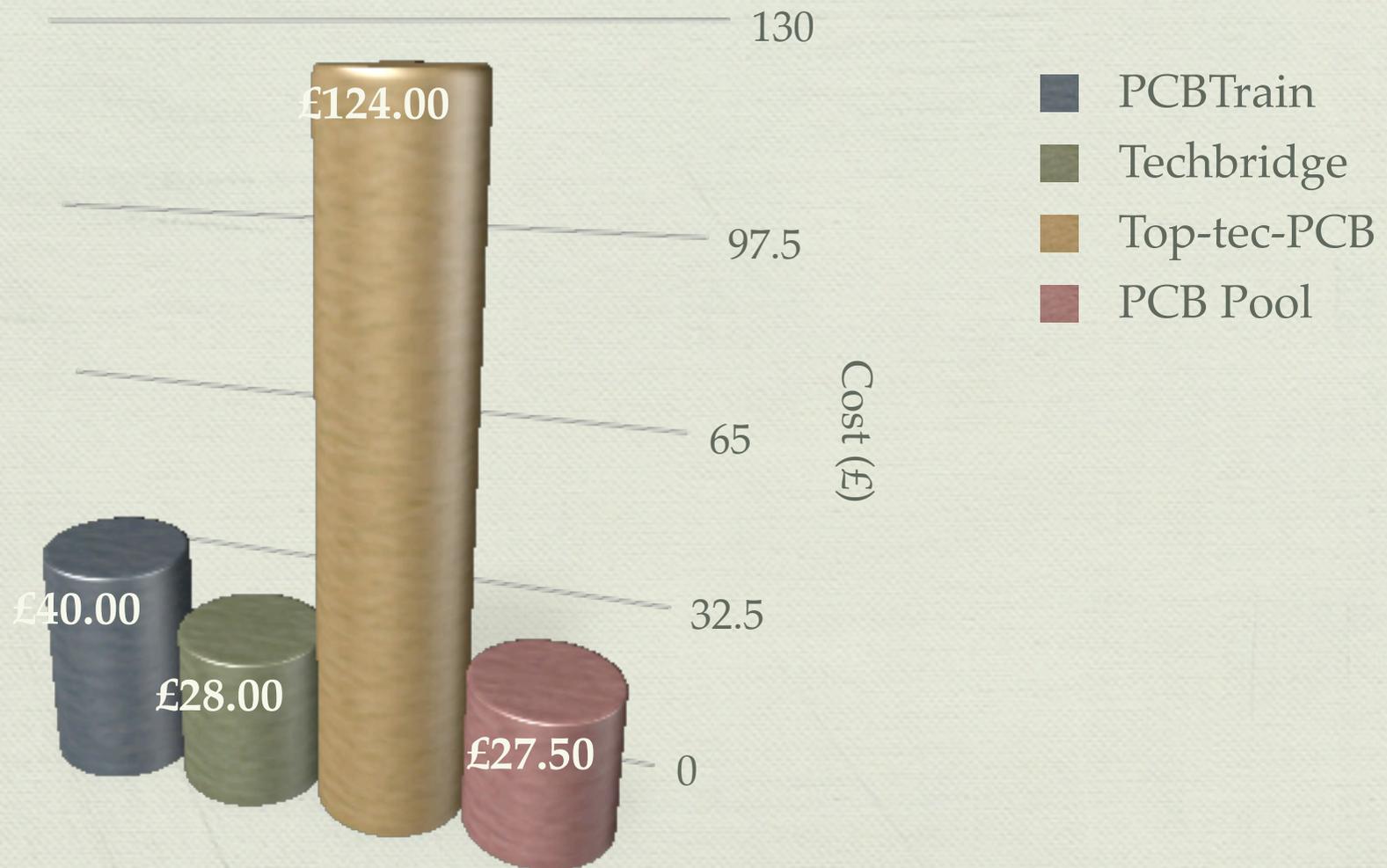
- ◆ Copper-clad board (single or double sided)
- ◆ Laser printer
- ◆ Press 'n' peel (or LaserStar film)
- ◆ Ruler and scissors
- ◆ Iron (must have flat plate)
- ◆ Paint, small brush and a touch-up pen
- ◆ Cleaning solvent - I recommend adhesive remover
- ◆ Hacksaw and file, brillo pads
- ◆ Ferric chloride for etching
- ◆ Etching tray (lunchbox)
- ◆ High-speed drill with bits (usual sizes are 0.8 & 1 mm)
- ◆ A project to build - and time!



# Commercial PCB comparison...

- ◆ 60 x 80 mm board, from suppliers listed in IET magazine  
(Board is single-sided and quote for most basic service)
- ◆ PCBtrain.co.uk: £40, ten working days
- ◆ techbridgecircuits.co.uk: £28, 11 days, min. order three boards
- ◆ top-tec-pcb: €135 (£124), 8 working days
- ◆ pcb-pool.com: €30 (£27.50), 8 working days
- ◆ To make your own boards - pays off after just a few! (£100 setup)

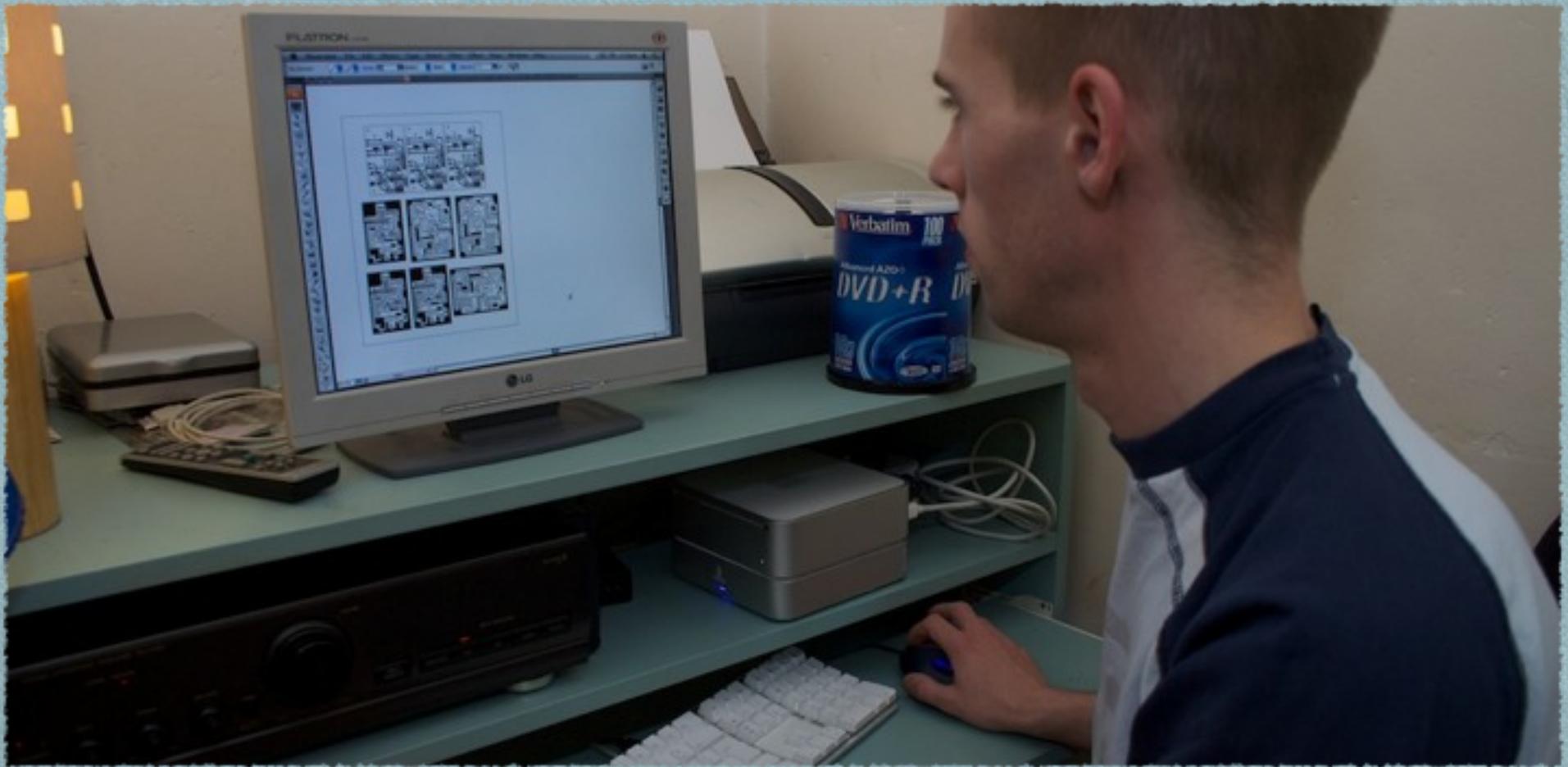
# Graph of cost comparison



The process

# Process for creating PCBs

- ◆ Produce (or acquire) the artwork, then print onto film
- ◆ Prepare the board to correct size, and file down the edges
- ◆ Iron on the film to the board to transfer the artwork
- ◆ Allow to cool, lift off and touch up spots as necessary
- ◆ Etch the board, remove resist, clean up and inspect
- ◆ Drill holes to appropriate sizes, final inspection

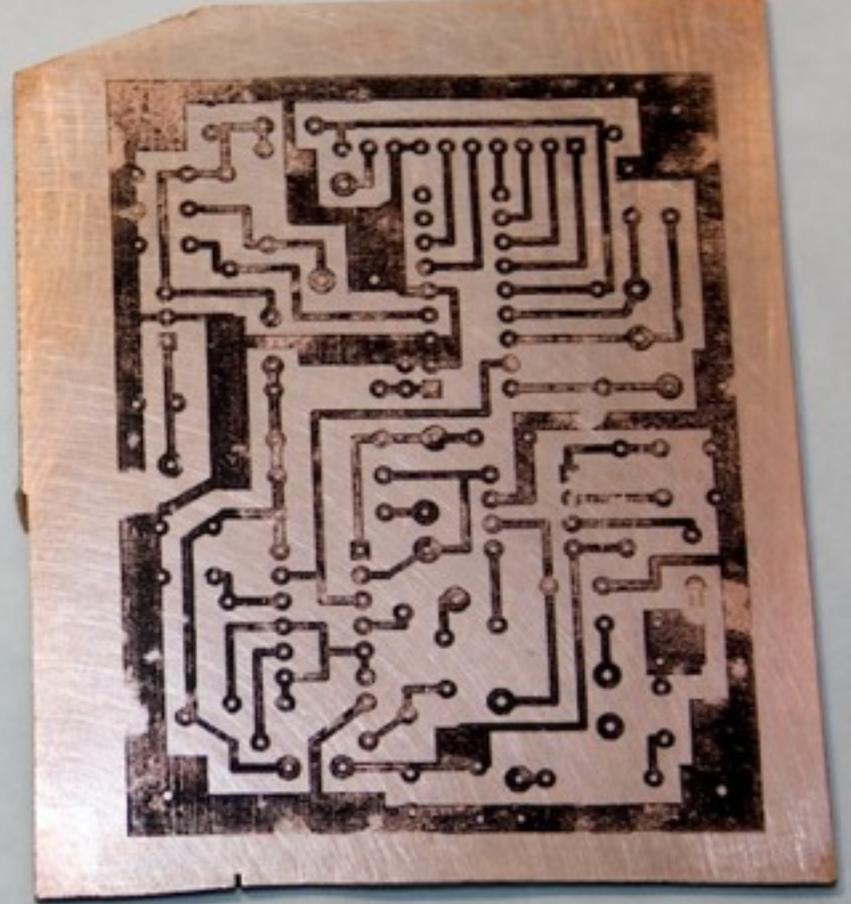


Producing the artwork

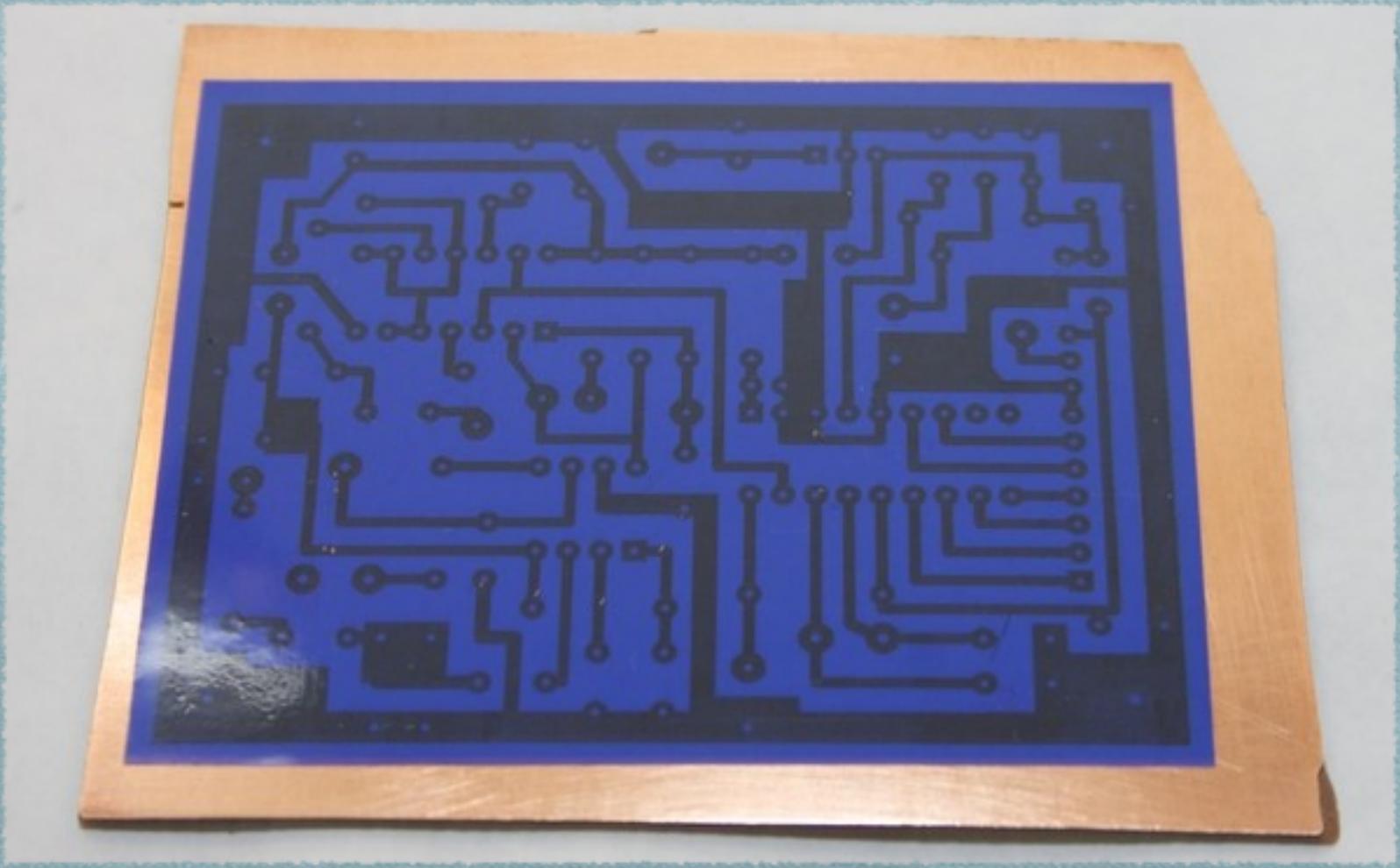
# Ironing artwork to the board

- *Medium high temperature setting*
- *Press down flat & hold for several seconds*
- *Move iron and repeat.*
- ***Never** move the iron whilst on the board - or smudging occurs!*

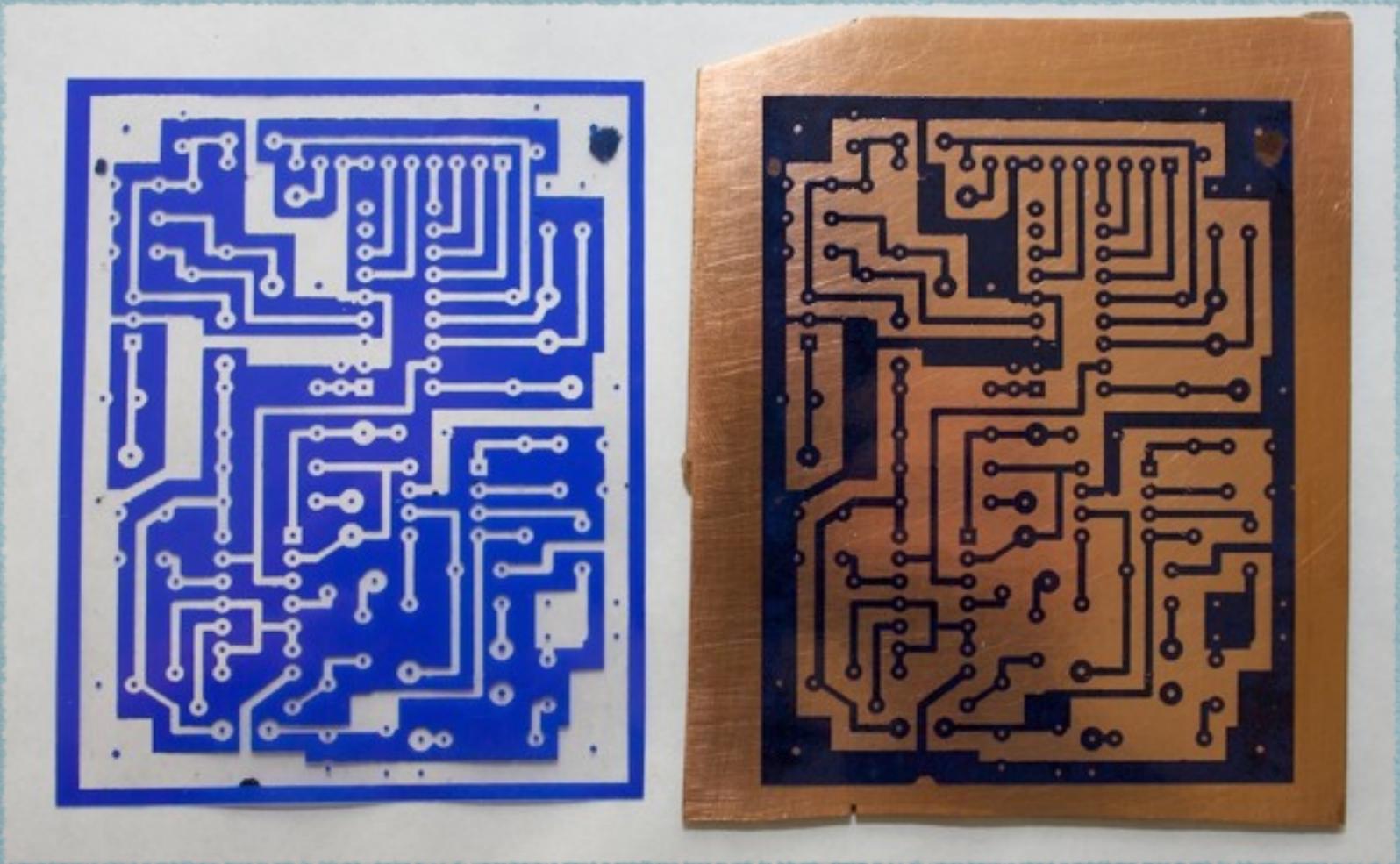




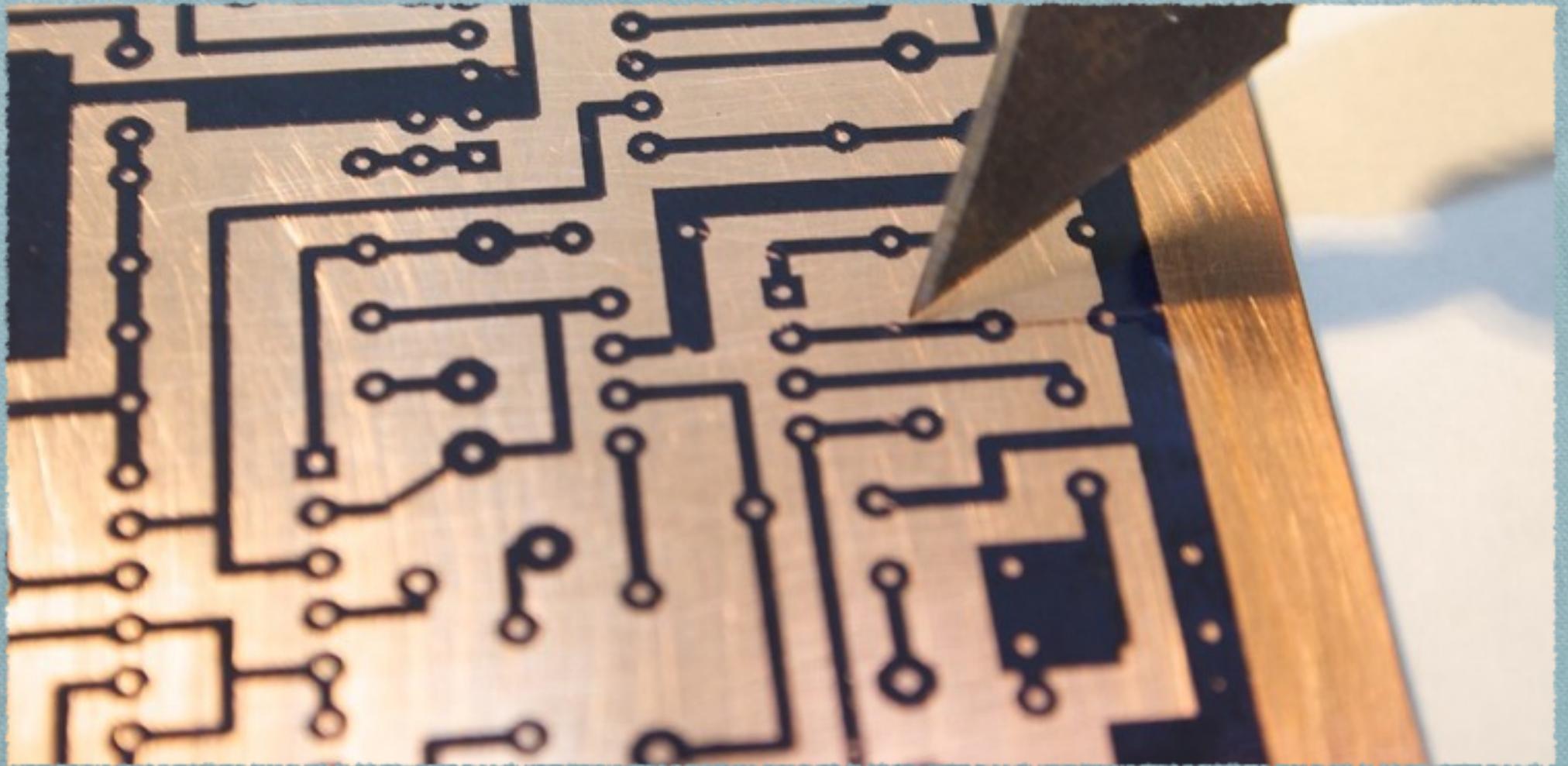
Acetate film doesn't transfer well for me



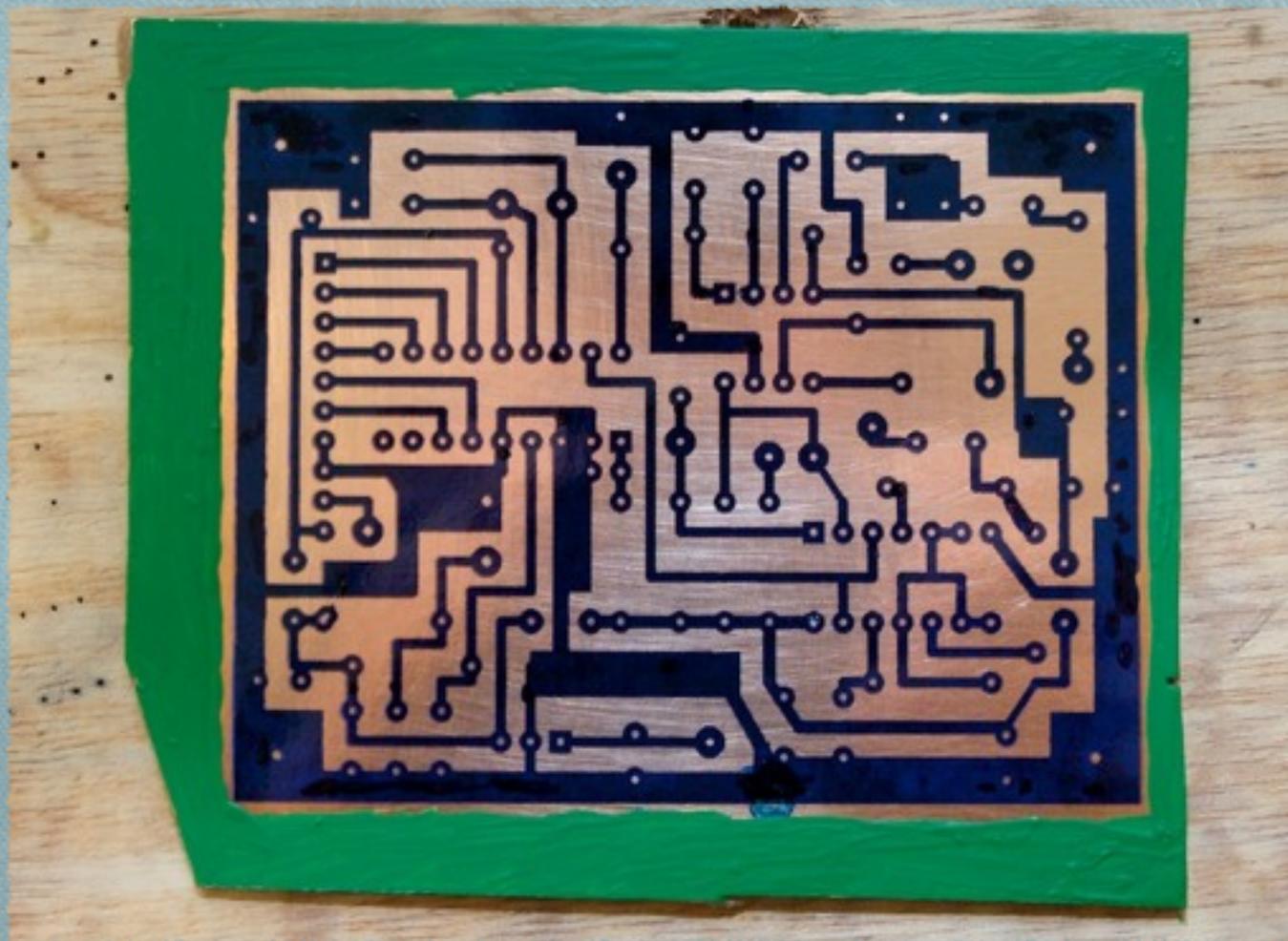
Press 'n' peel ironed to board



After cooling and lift-off



Touch up needed



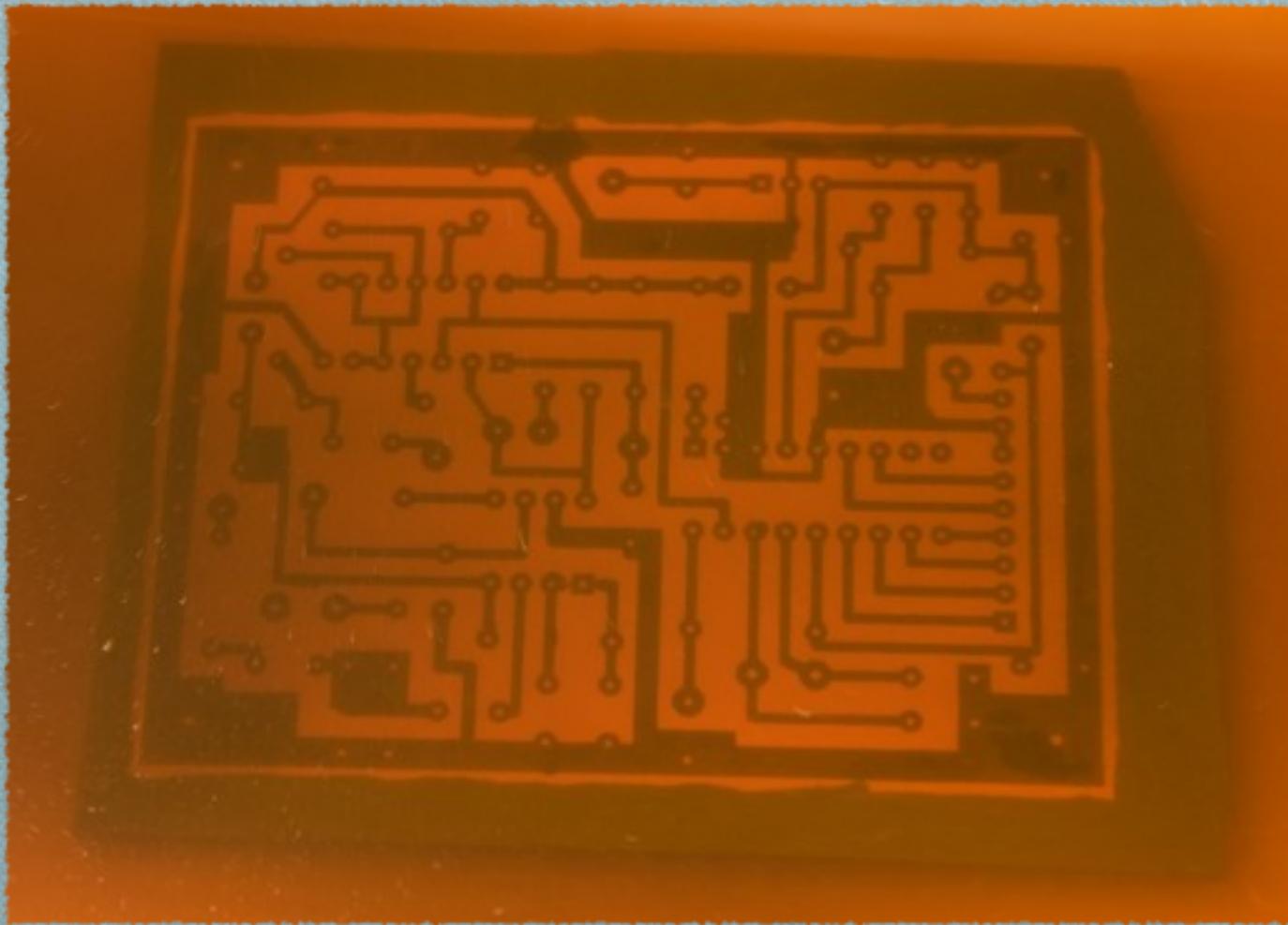
Ready to etch...



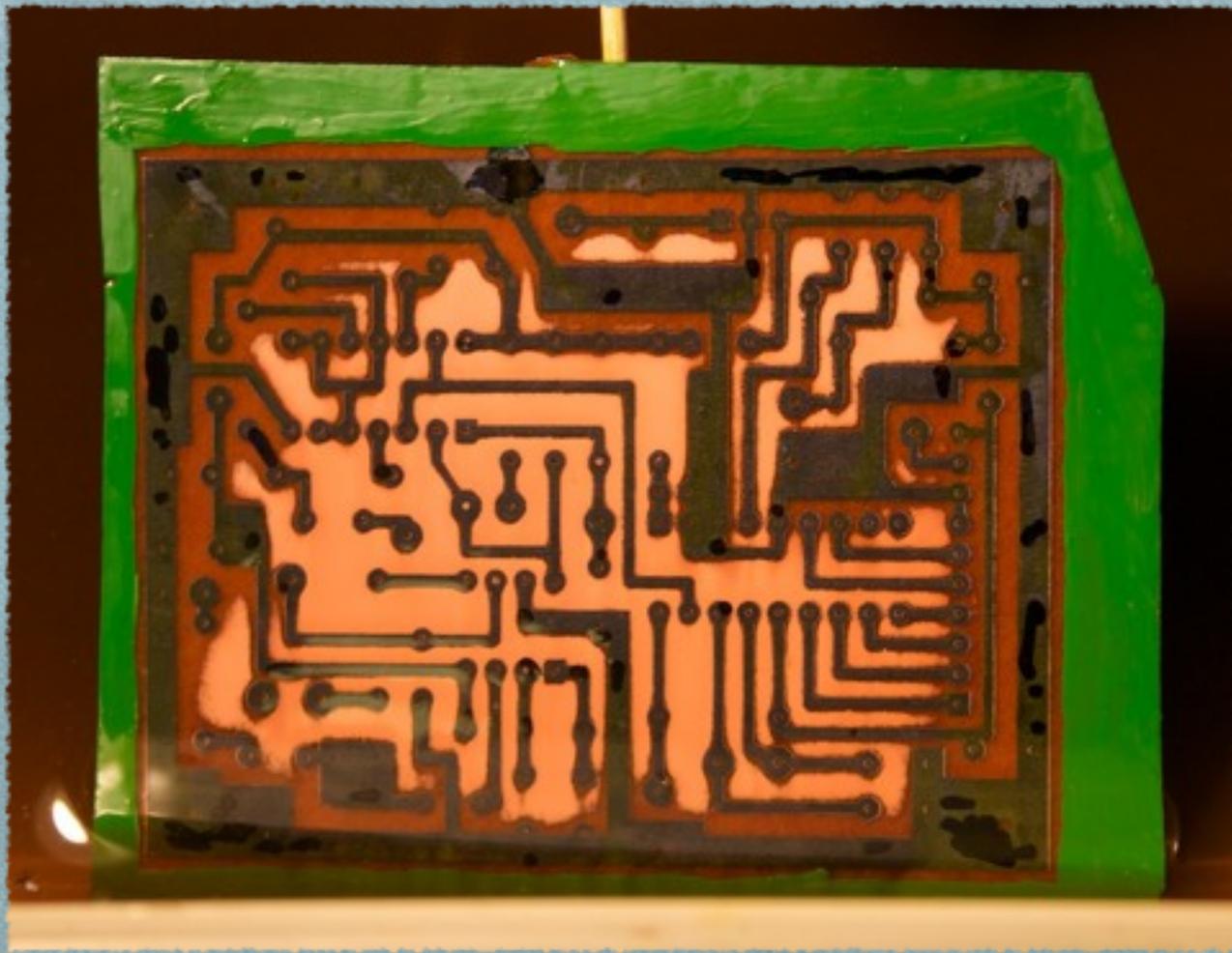
Etchant ( $\text{FeCl}$ ) as supplied



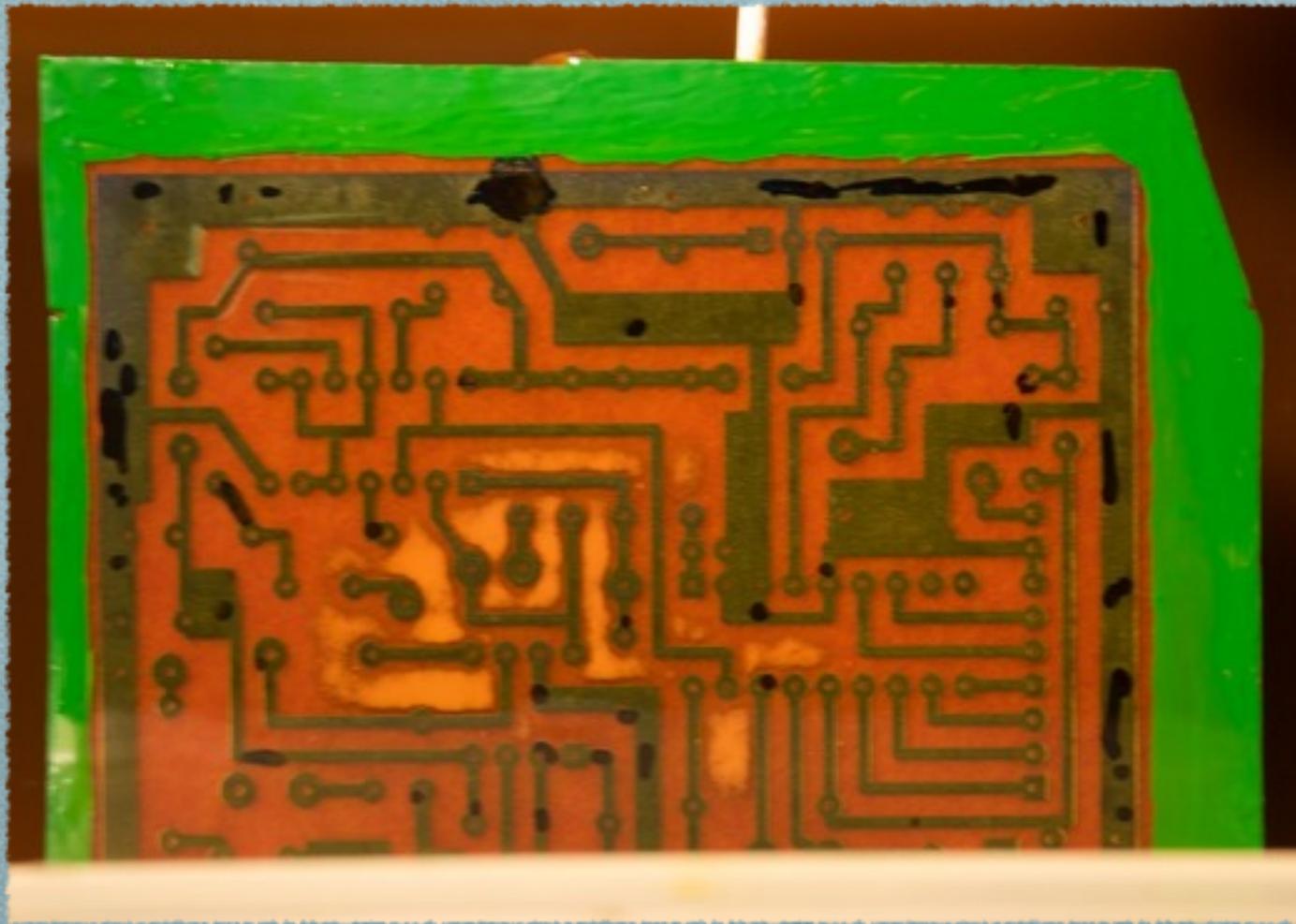
Ready to go!



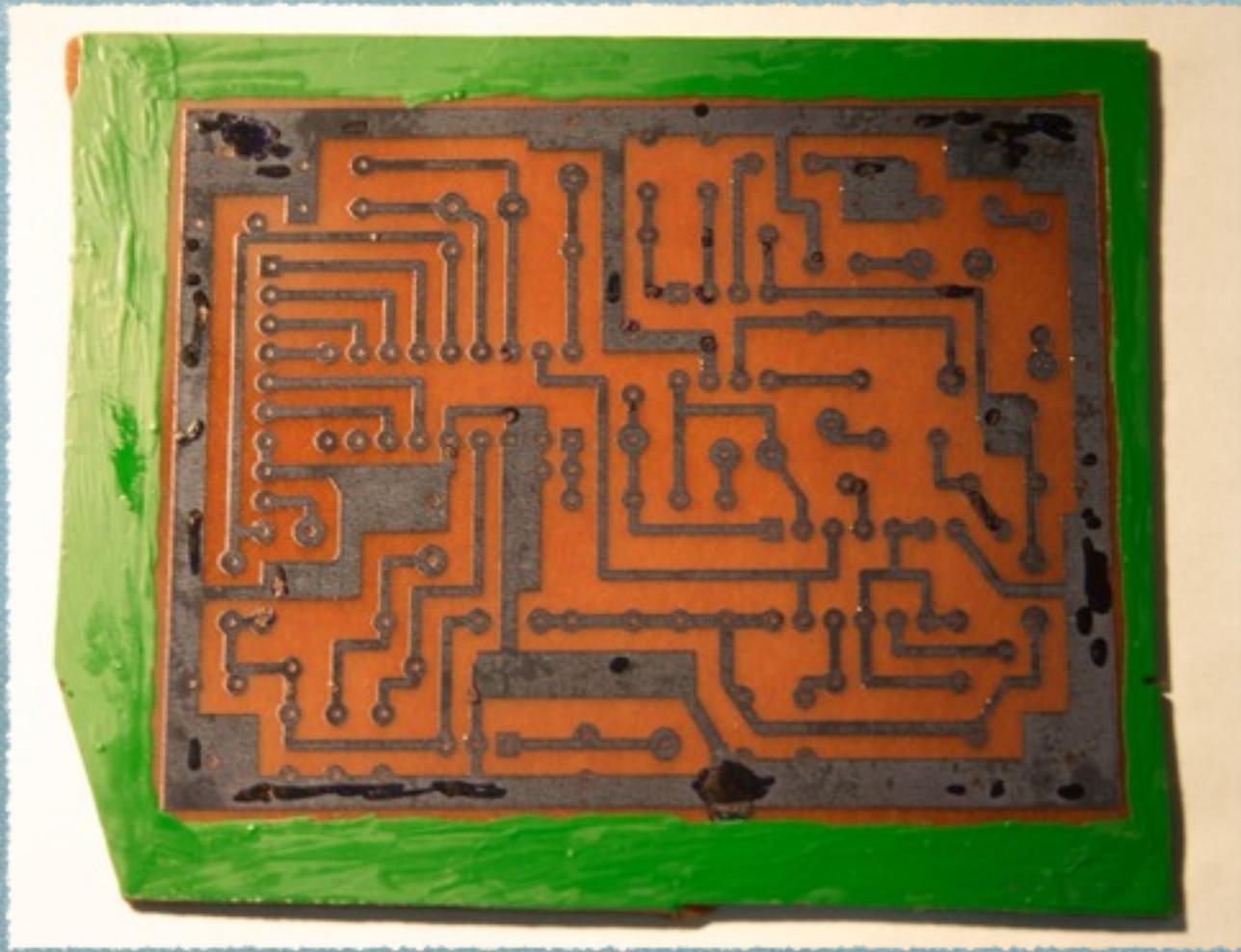
Etching in progress...



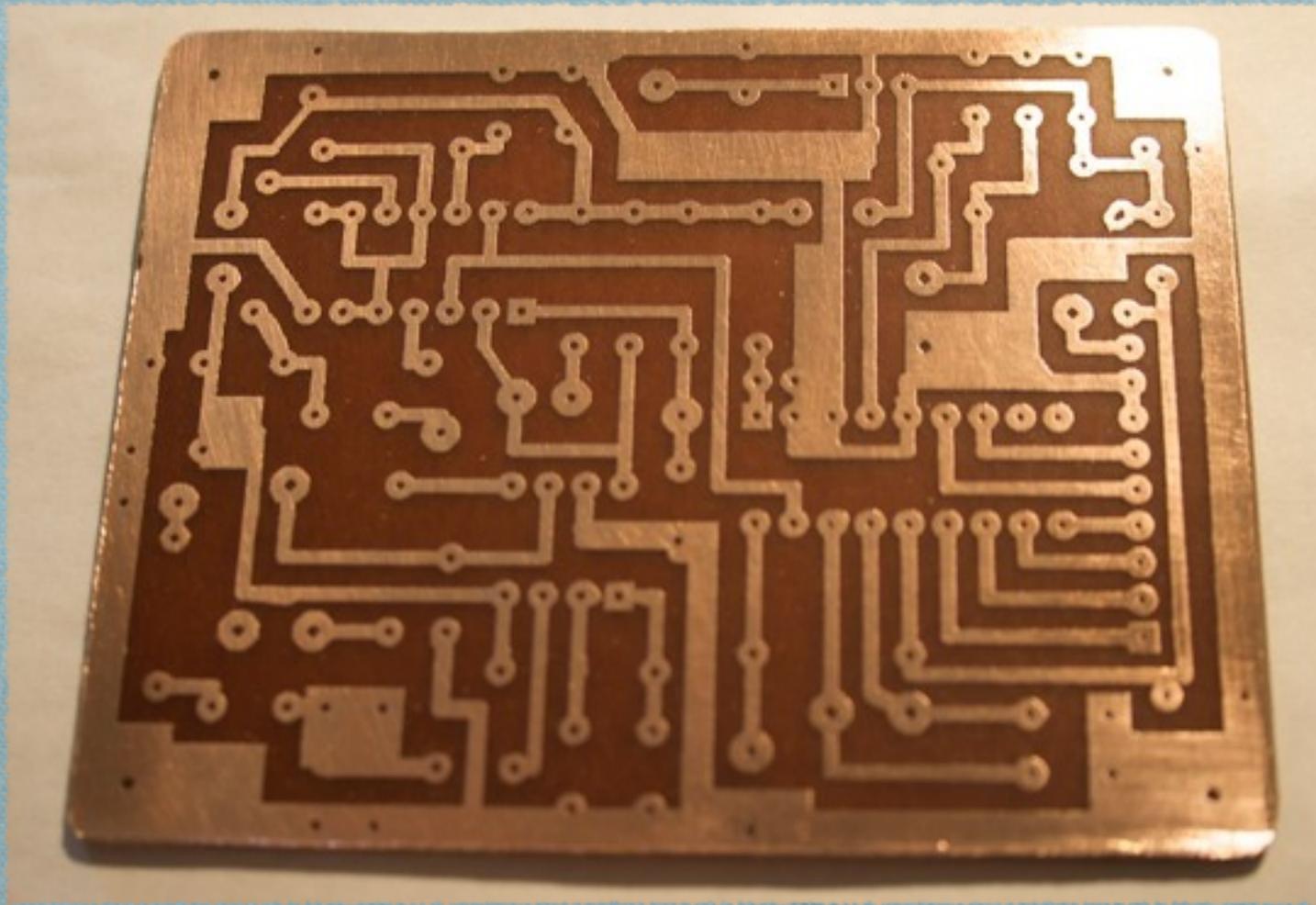
Half way through



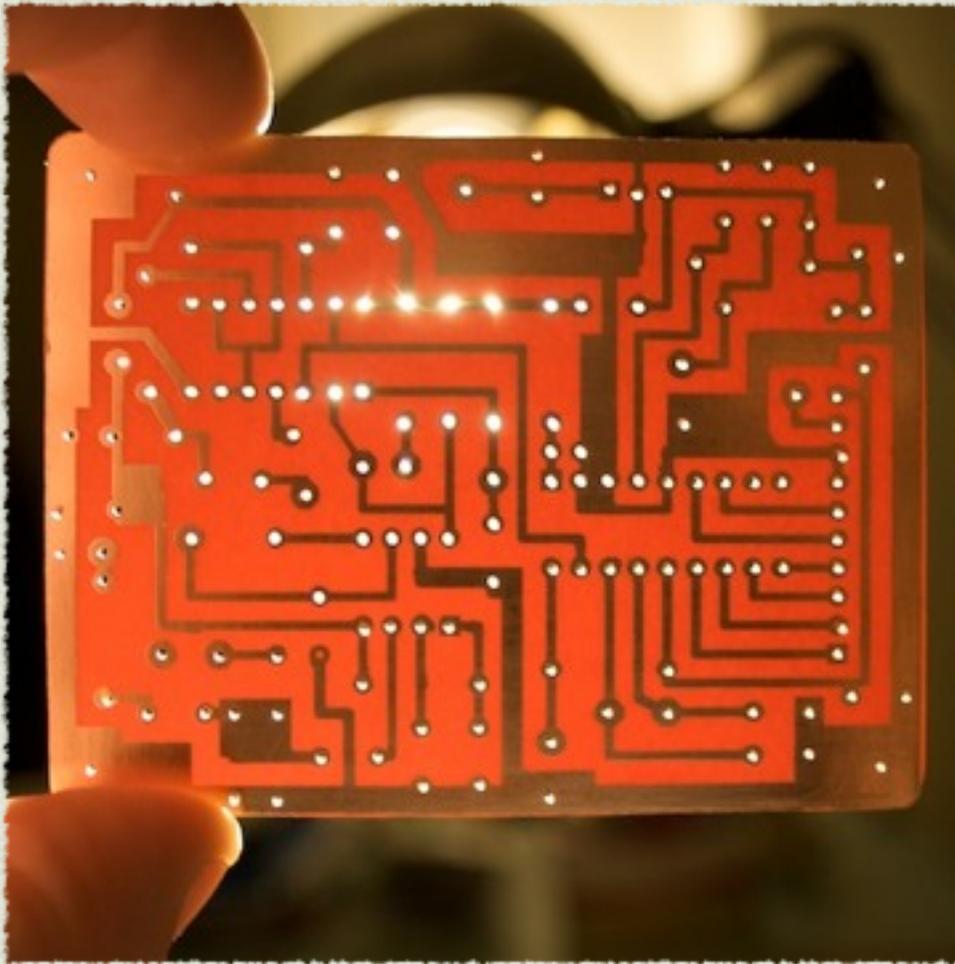
Nearly done!



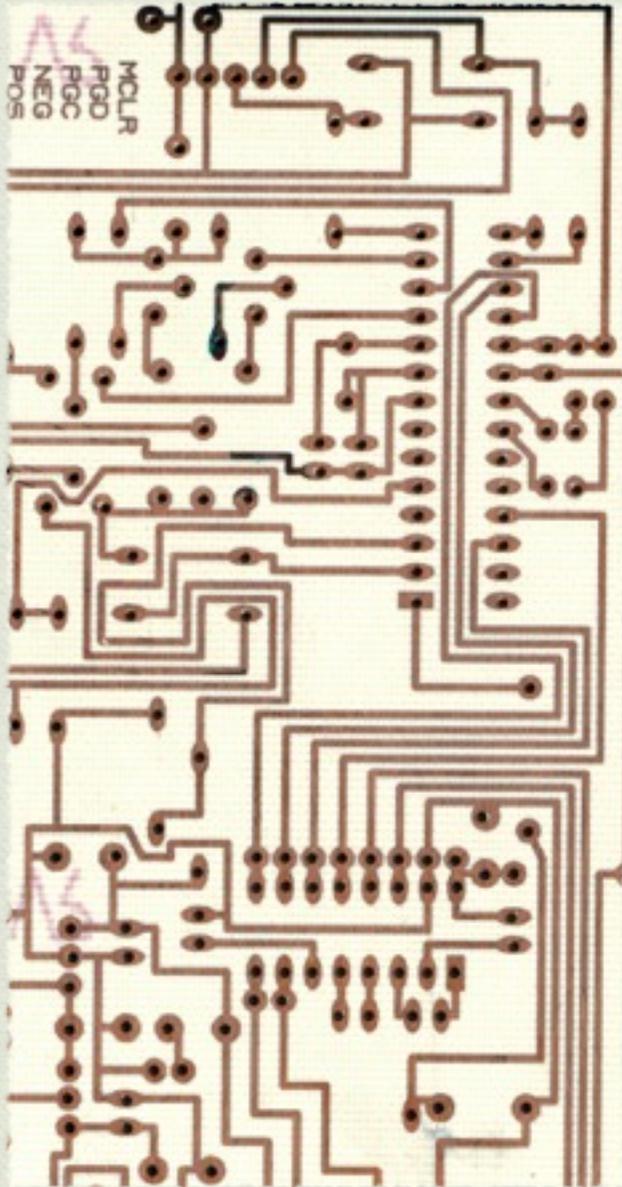
Washed and dried



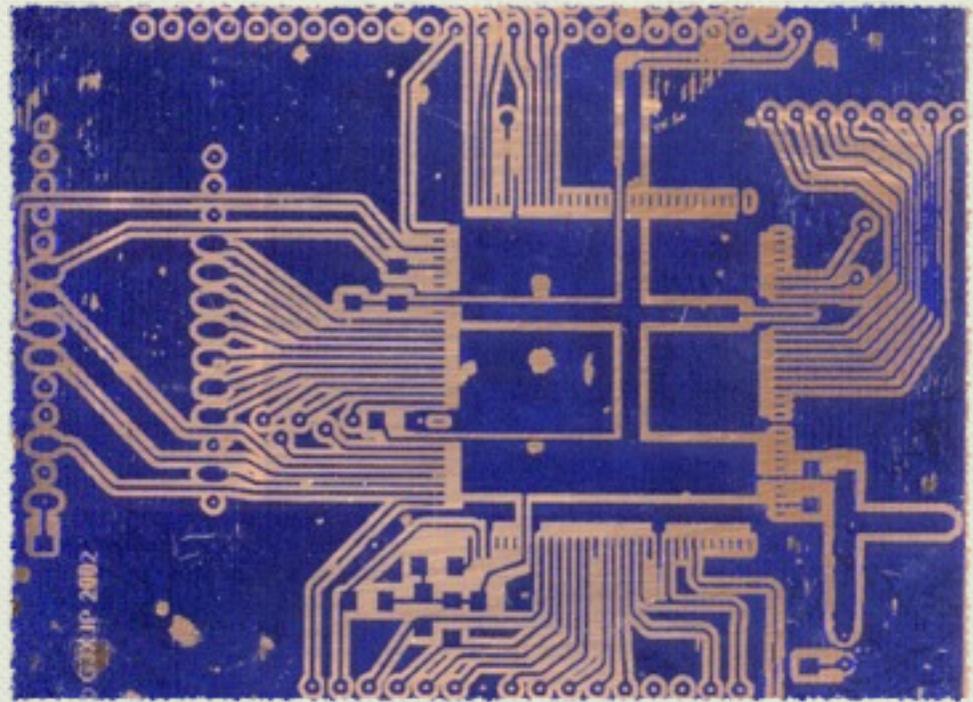
Resist scrubbed away



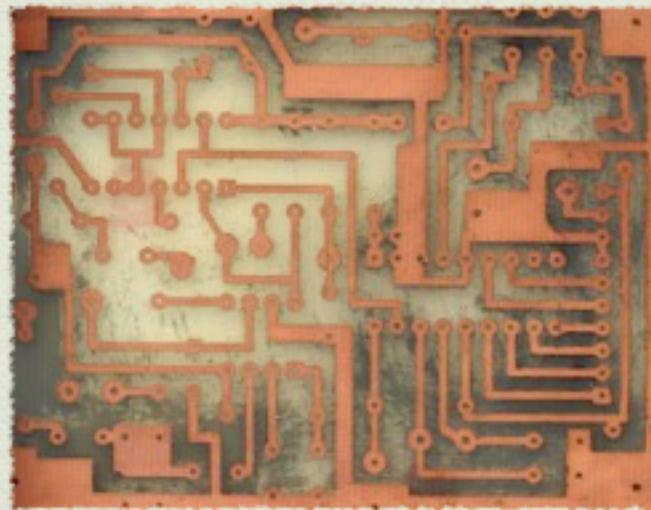
Drilling the holes



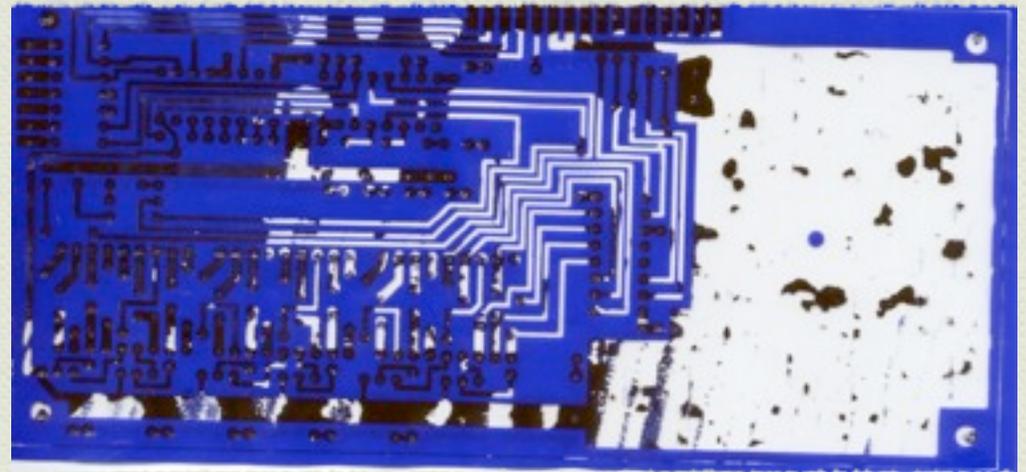
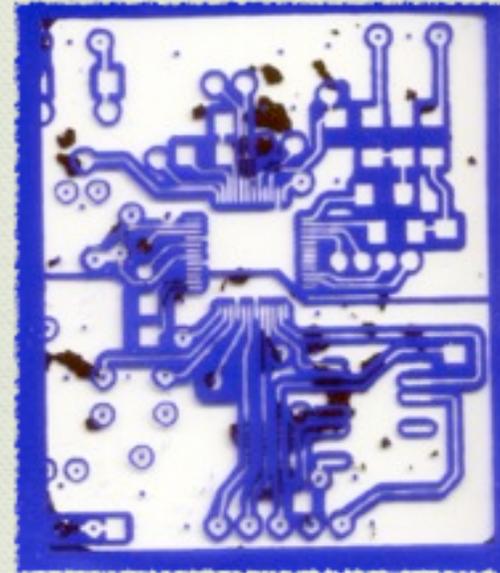
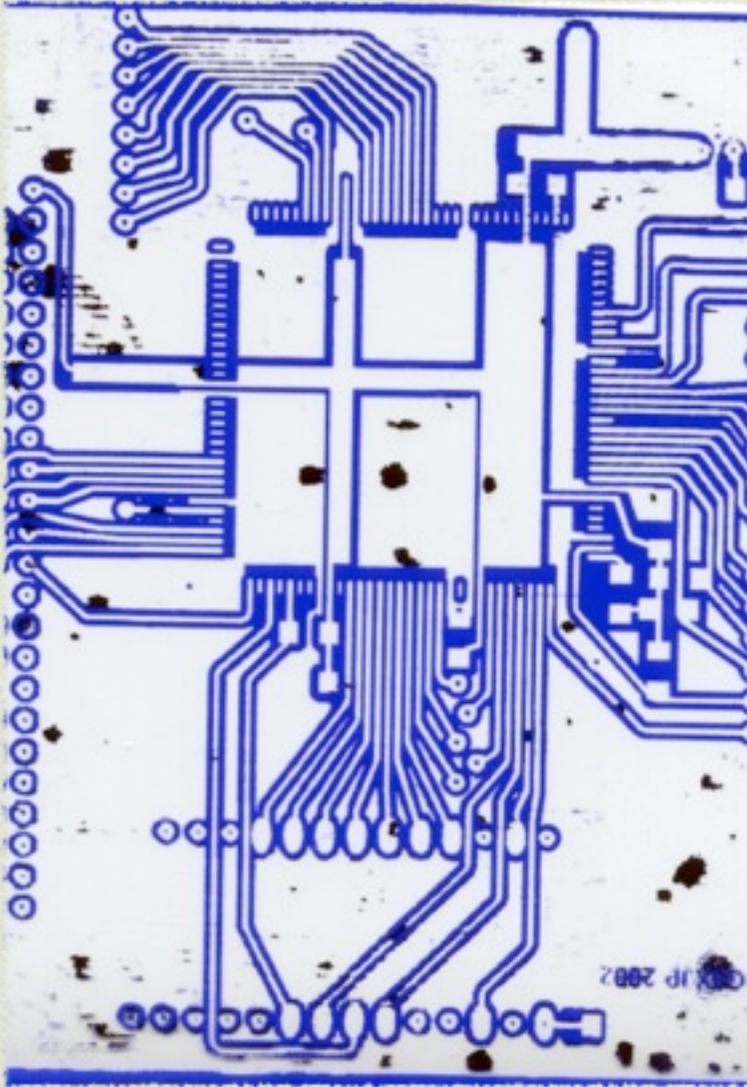
Board produced  
in my Department



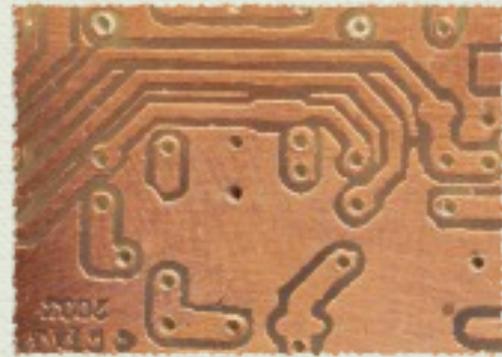
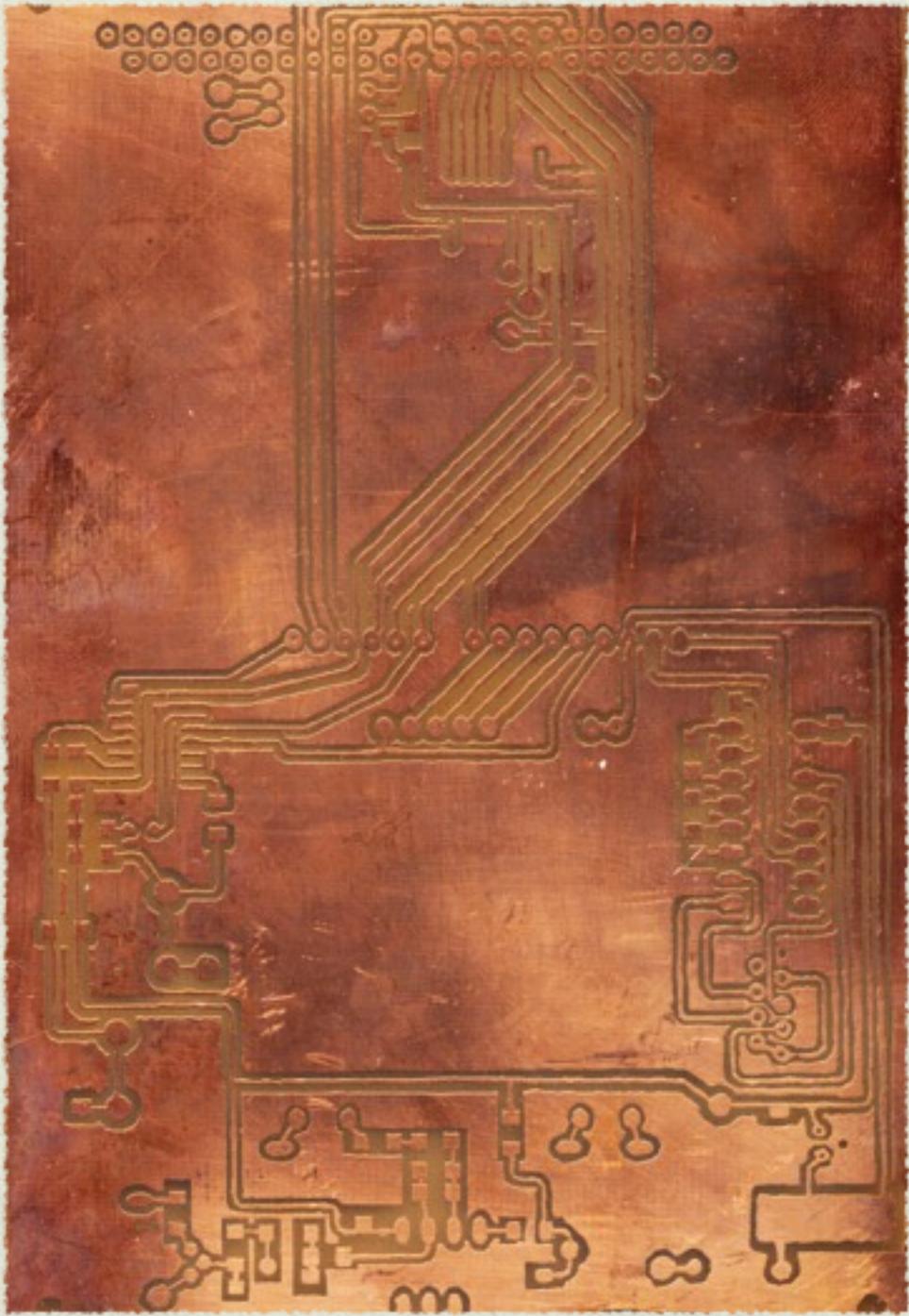
Press 'n' peel touch up required



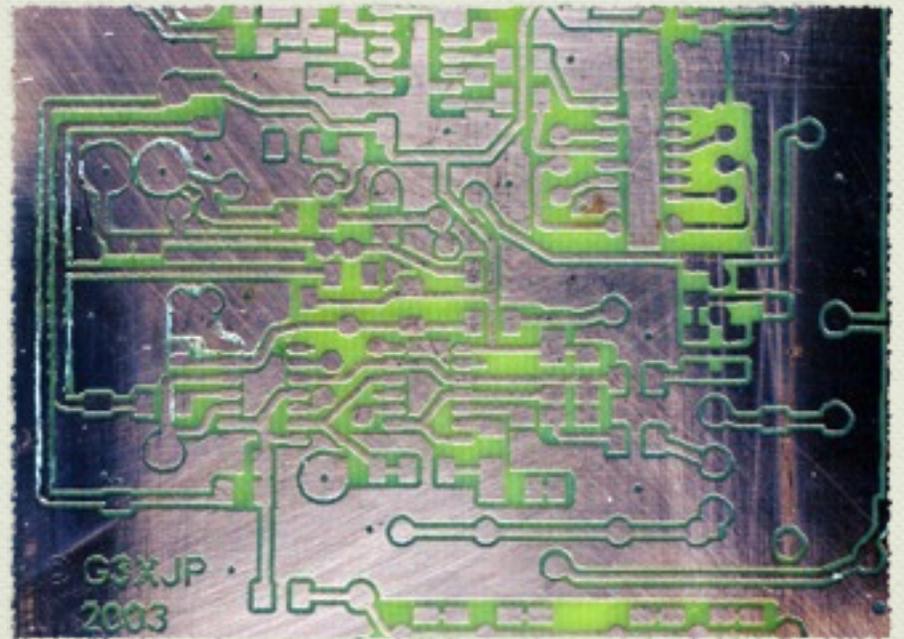
An early board  
made using  
Press 'n' Peel



The transfer process doesn't always work first time



Hand painted boards:  
time consuming!



Thanks for watching!  
Any questions?