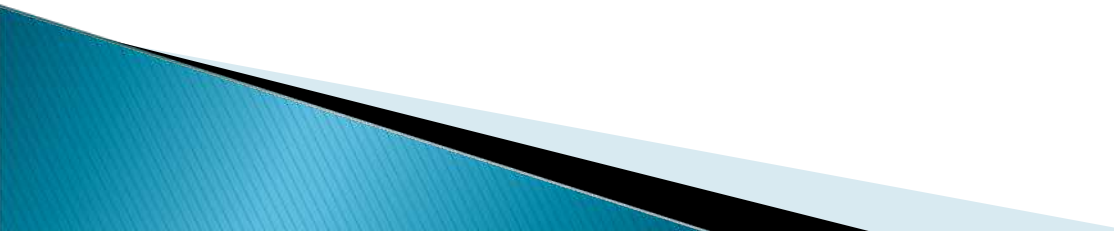


PCB Manufacture for Dummies

G4KQK

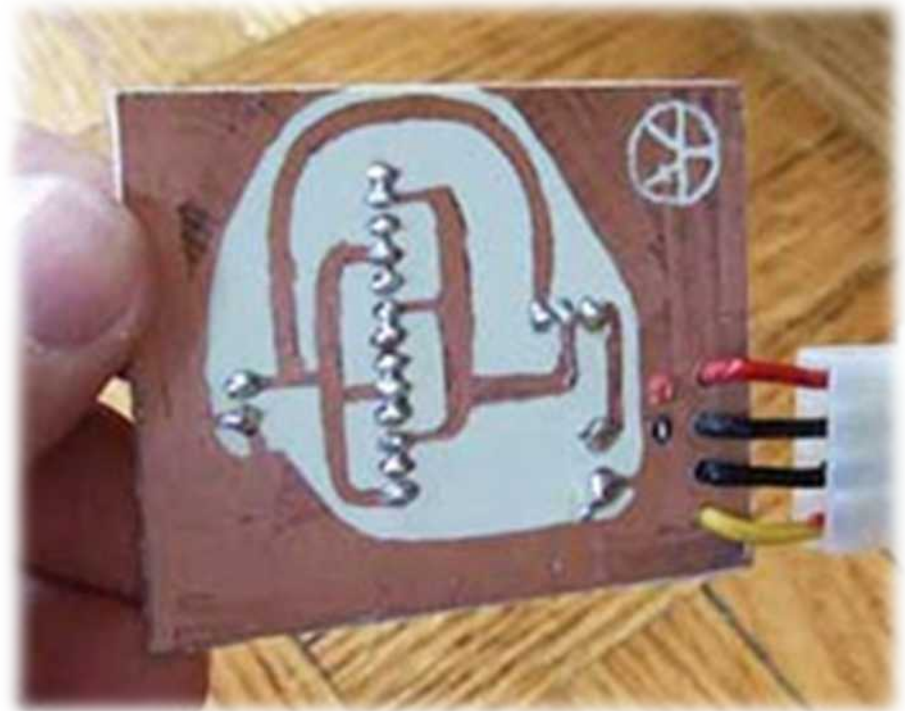


Why make your own?

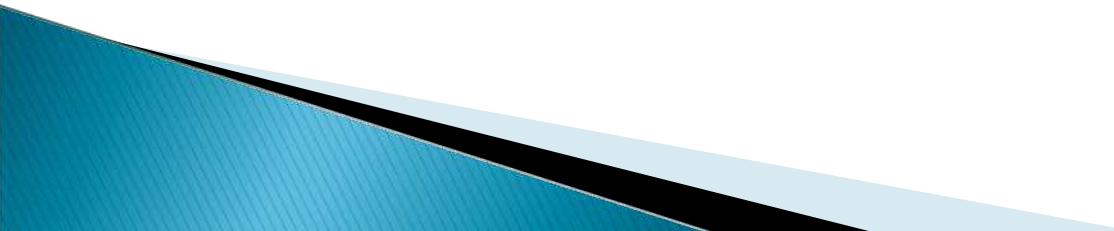
- ▶ Not commercially available
 - ▶ Outsourcing manufacture is expensive and slow
 - ▶ Satisfaction / Enjoyment / Learning new skills
 - ▶ Enables virtually any design to be produced
 - ▶ **CHEAP!**
- 

Methods – By Hand

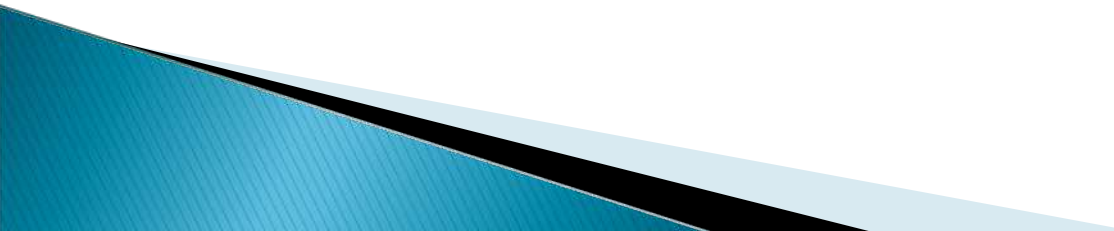
- ▶ Dalo Marker / Sharpie / Transfers
- ▶ Inelegant but cheap



Methods – Photo etching

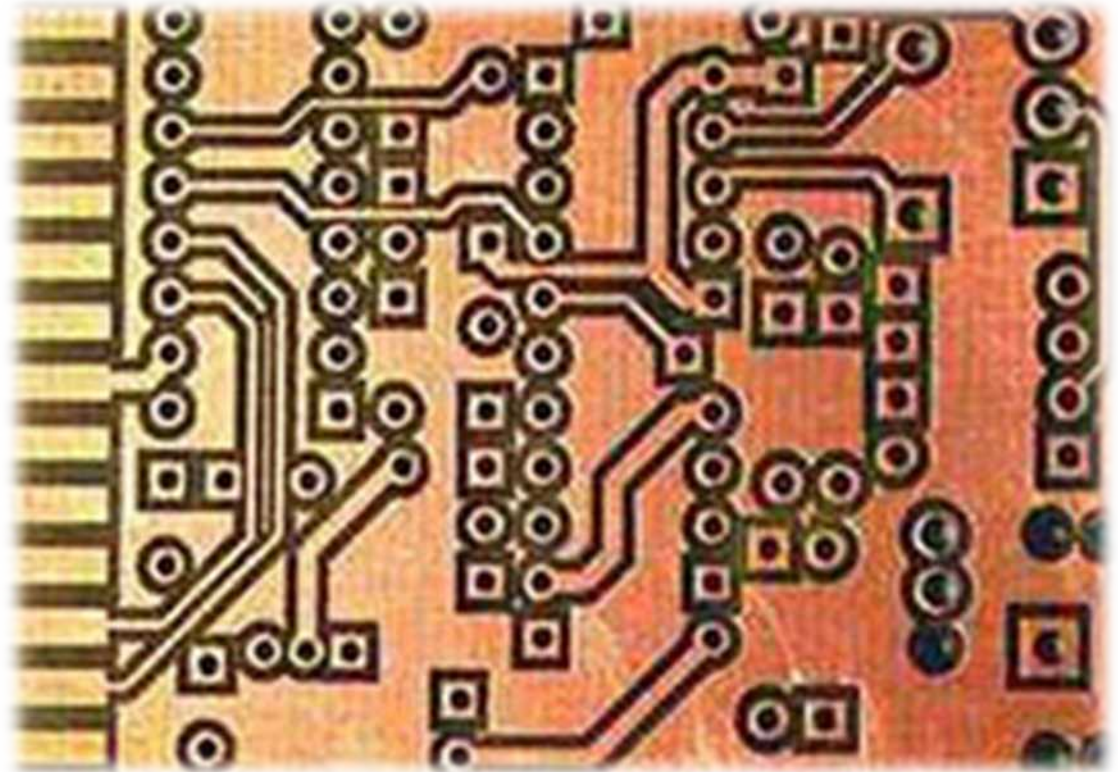
- ▶ Elegant + Precise
 - ▶ Expensive-Needs Developers, Lightbox, expensive photosensitive PCB, etc.
- 

Methods – Silkscreening

- ▶ Involves silkscreening an etch resist onto PCB
 - ▶ Elaborate
 - ▶ Expensive
 - ▶ Not suited to DIY
- 

Methods – Milling Machine

- ▶ Potentially suited to DIY
- ▶ Needs expensive equipment and expertise

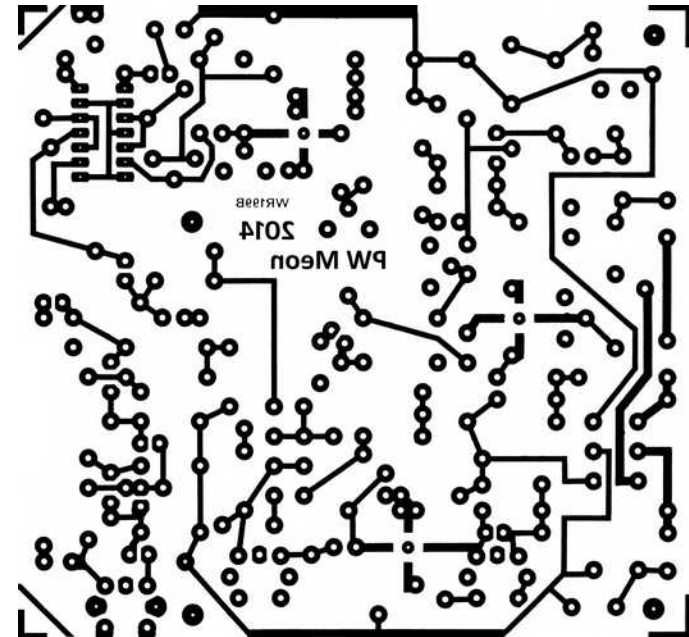
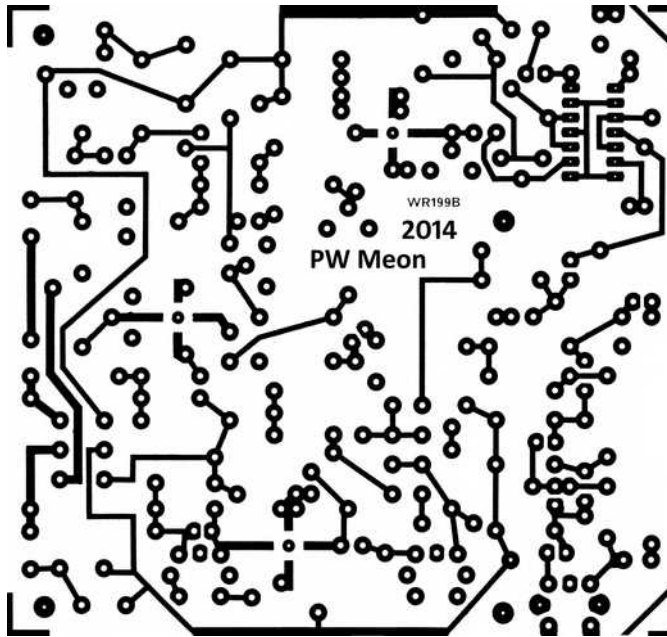


Methods – Outsourcing

- ▶ ‘Nuff said

Methods – Toner Transfer

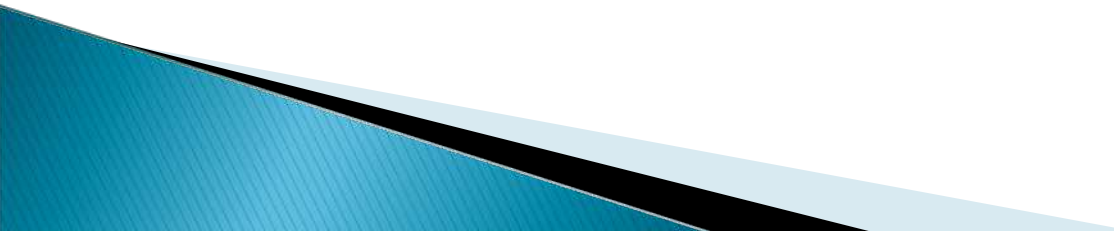
- ▶ What's toner?
- ▶ What's toner transfer?
- ▶ How?



Toner Transfer – Board

- ▶ Blank Copper-clad board
 - SRBP FR4 Thickness?
- ▶ Preparation:
 - Smooth– no surface damage / scratches
 - No rough edges. Remove all burrs
 - CLEAN– No grease, tarnish, dust.
 - Sandpaper
 - Scotchbrite pad
 - Steel wool
 - Metal polish– Brasso
 - Pre-etch
 - Abrasive cleaner – Ajax, Bar Keeper's Friend
 - Degrease with no residue solvent– Acetone, Thinners, Alcohol.

Toner Transfer – Printer

- ▶ Laser Printer or Photocopier
 - ▶ Must be B+W
 - ▶ Doubts re Brother and some HP printers
 - ▶ Set Hi Resolution
 - Hi Density
 - Edge smoothing – if available
- 

Toner Transfer – Medium

- ▶ Commercial – Press ‘n Peel



Effective

Expensive- £20 for 5 A4 sheets

Toner Transfer – Medium

▶ Commercial – Pulsar Toner Transfer Paper



Effective

American but available in UK

Much cheaper - £12 for 10 A4 sheets

Toner Transfer – Medium

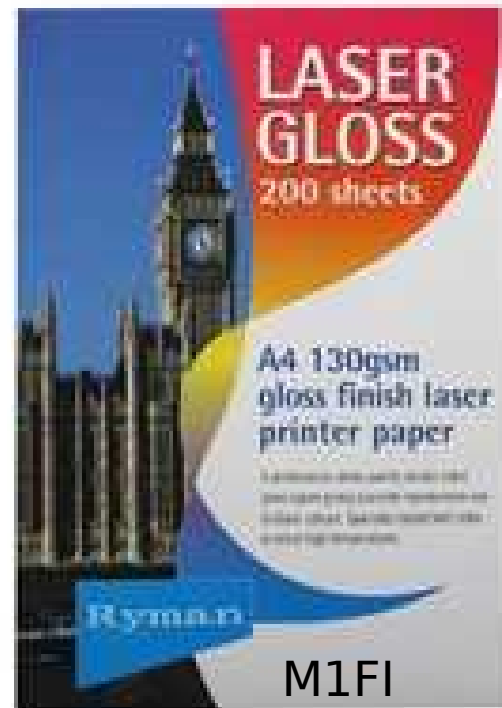
- ▶ Experimental Alternatives:-
 - Glossy photo paper
 - Matte photo paper
 - Drafting paper
 - Label backing paper
 - Tracing paper
 - Cheap shiny magazine paper
 - OHP acetate
 - Rice paper
 - Greaseproof paper
 - Oven roasting bag!

Toner Transfer – Medium

- ▶ Successful Experimental Alternatives:-
 - Sticky-Backed book covering backing paper
 - Laser copy paper



G4KQK

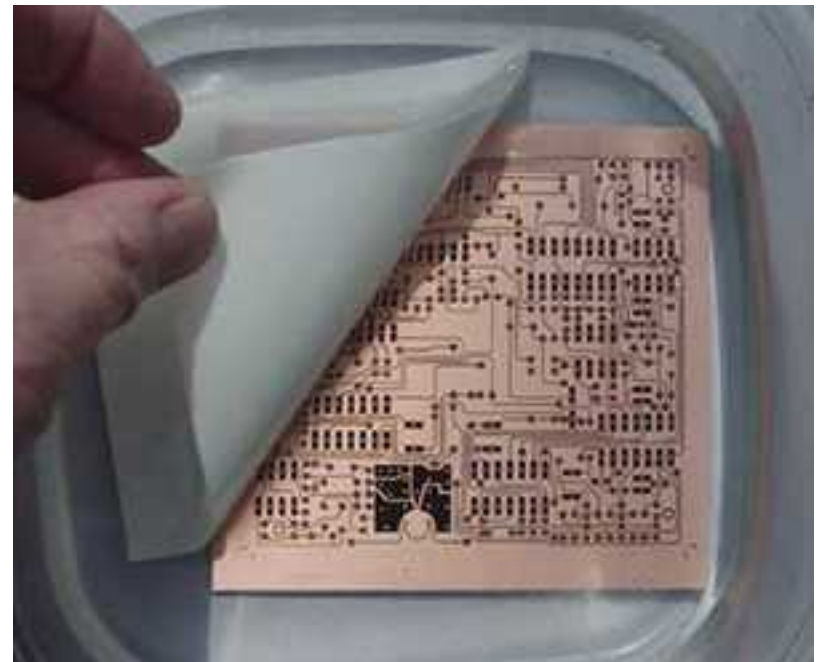


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Toner Transfer – Method

- ▶ Tape leading edge of medium to A4 sheet
- ▶ Print flipped PCB pattern
- ▶ Position and fix board face down on image
- ▶ Apply heat and pressure
 - Electric iron
 - Laminator
 - Heat press
- ▶ Remove medium
- ▶ by soaking or peeling.



Laminator

- ▶ Few will work!!
- ▶ Pulsar recommended laminator



Available in US and Canada

Laminator

- ▶ Look what I found on eBay!



Finishing Touches

KIT REPLACEMENT ITEM

PCB FAB
-IN-A-
BOX



GreenTRF Foil

DIRECTIONS FOR USE:
Because toner is very porous etchant can easily work its way through the toner particles and attack the copper that is supposed to be protected. This green film will encapsulate the toner image with plastic making it impossible for any etchant to penetrate.

Width: 8"
Length: 15'

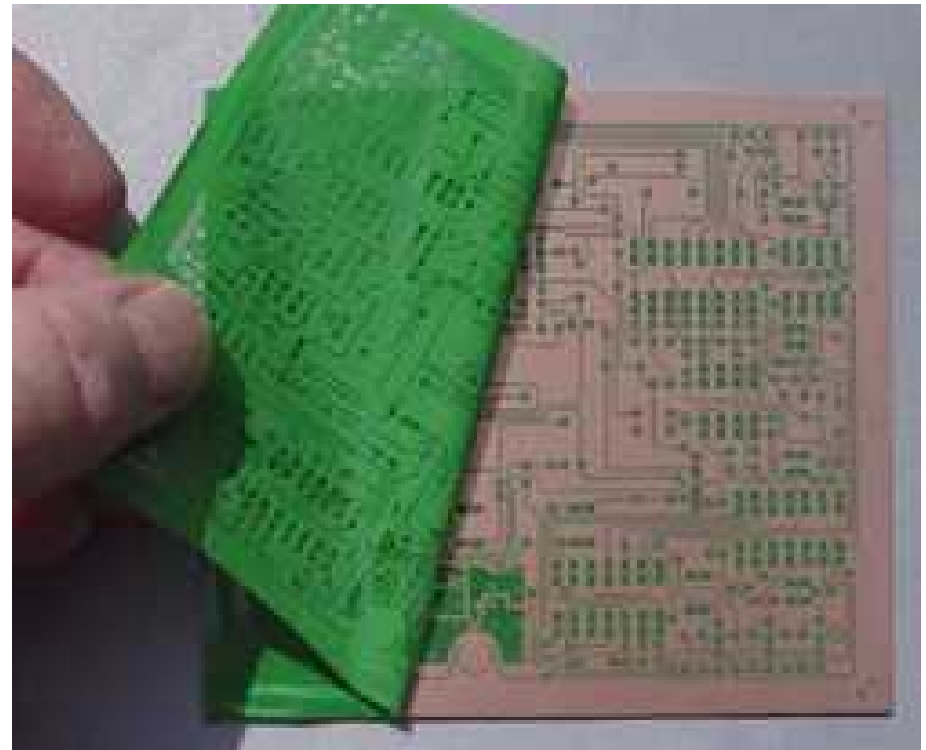
*This "GreenTRF" film is for **SEALING** the black toner circuit image to prevent pitting of the copper when used as an "etch resist".*

Pulsar
PROFESSIONAL *fx*

21 Carriage Drive • Crawfordville, FL 32927-2496
PHONE: (850) 925-2029 FAX: (888) 280-7570
www.PCBfx.com / mail@pulsarfx.com



Made in U.S.A. / Tech Support in U.S.A.



Etching

- ▶ Ferric Chloride
 - Toxic, Corrosive, Stains+++.
 - Limited life
 - Useless when expired

Etching

- ▶ Cupric Chloride Solution

- Hydrochloric acid
- Hydrogen Peroxide



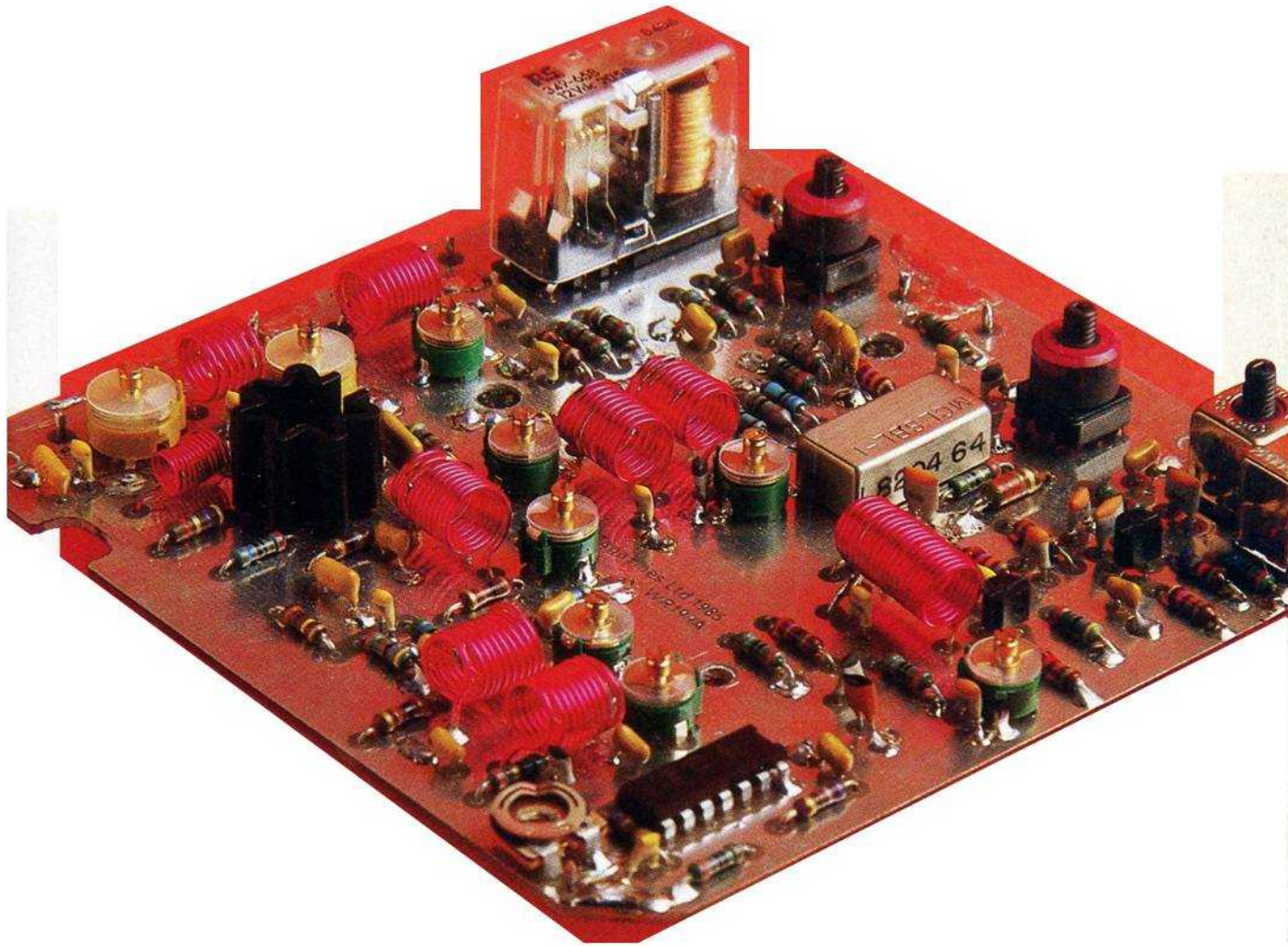
- ▶ Regeneration

- O₂
- H₂O₂



After etching:-

- ▶ Remove etch resist
- ▶ Test track continuity
- ▶ Drill board
- ▶ Protect exposed copper
 - Lacquer
 - Liquid Tin
- ▶ Populate + Solder



Thank you