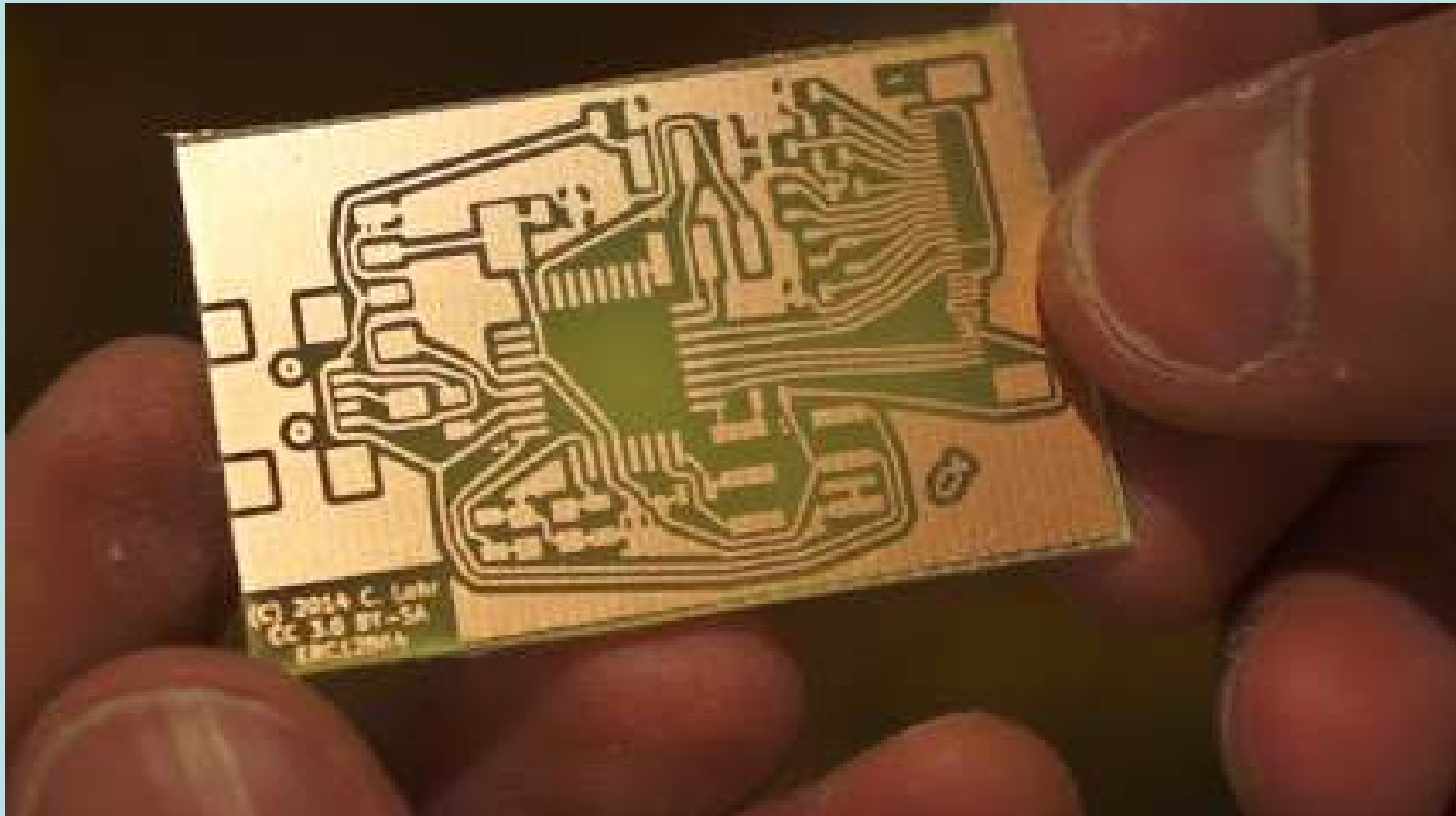# Home Brew PCBs – Steve G4FYF

……. A personal experience

Hope to Cover……

- **Wiring Options**
- **Schematic to Board design**
- **Software Options – demo**
- **PCB Preparation**
- **Transfer Options - demo**
- **Etching Methods**

…..plus hints and tips along the way, seldom mentioned in texts

Home Brew PCBs – Steve G4FYF

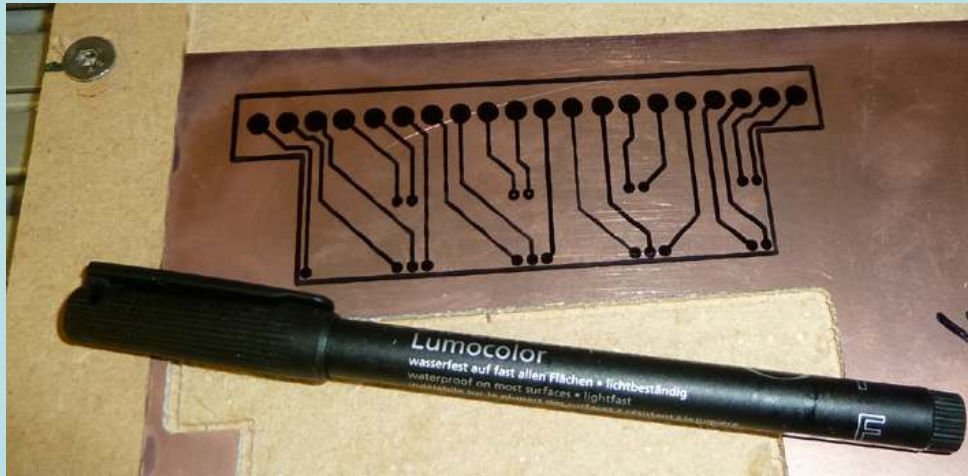## First Licensed as G8LYU Late 1977

Licensed as G4FYF – Early 1978

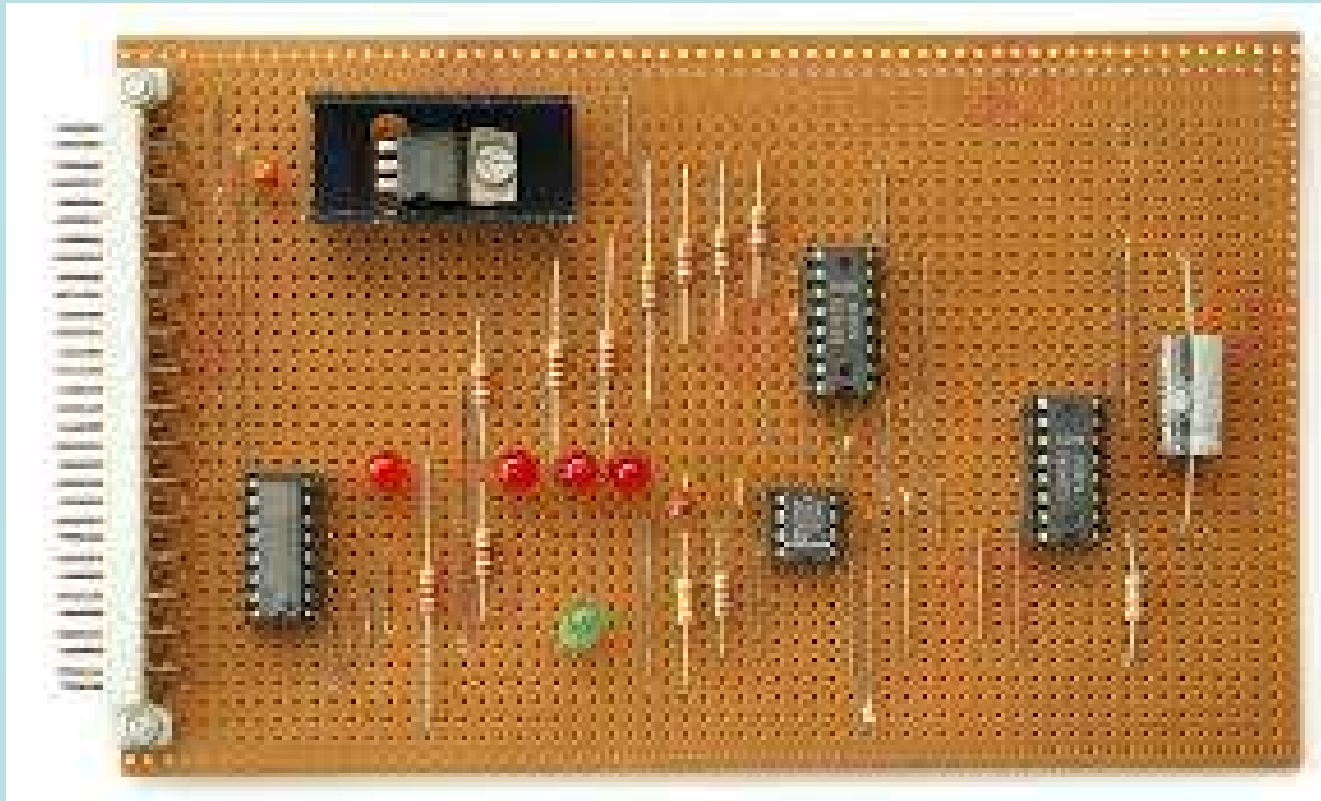# Various Wiring Techniques

Point-to-Point

Various Wiring Techniques

- 'Letraset'

- Or, good old

  permanent pen

Various Wiring Techniques

- **Veroboard**

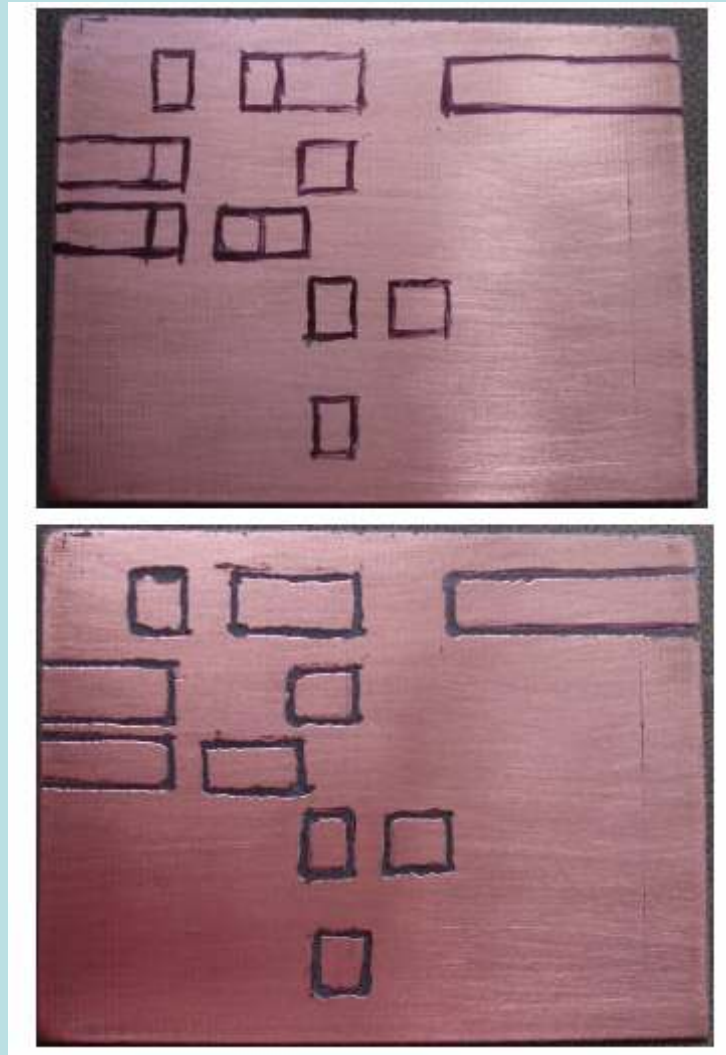# Various Wiring Techniques

- 'Ugly' Construction

Various Wiring Techniques

- 'Manhatton' Style
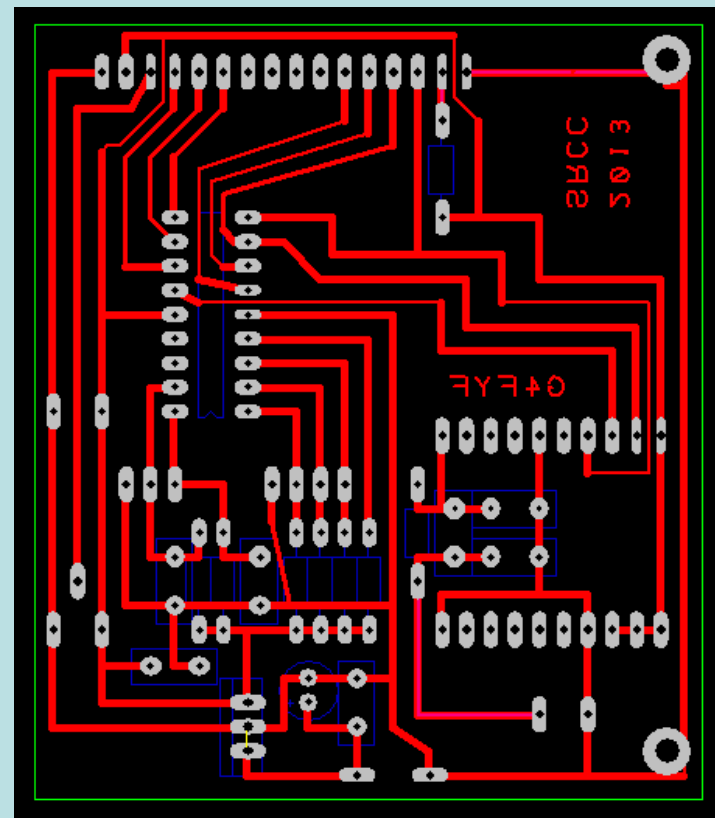
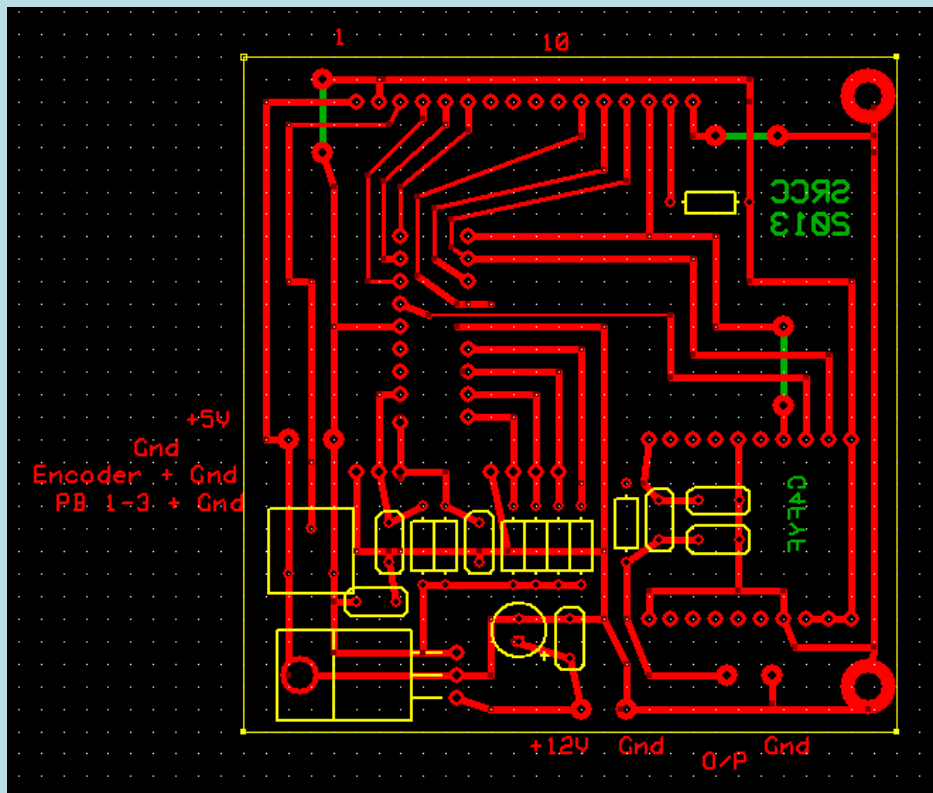# 'Dremel' Quick and Dirty!

Software Options

- Many freebie downloads
- ***ExpressPCB***
- Easy to use; lacks some component footprints; limited adjustment of certain elements.
- ***DesignSpark (RS)***
- Bit more getting used to; more flexible.
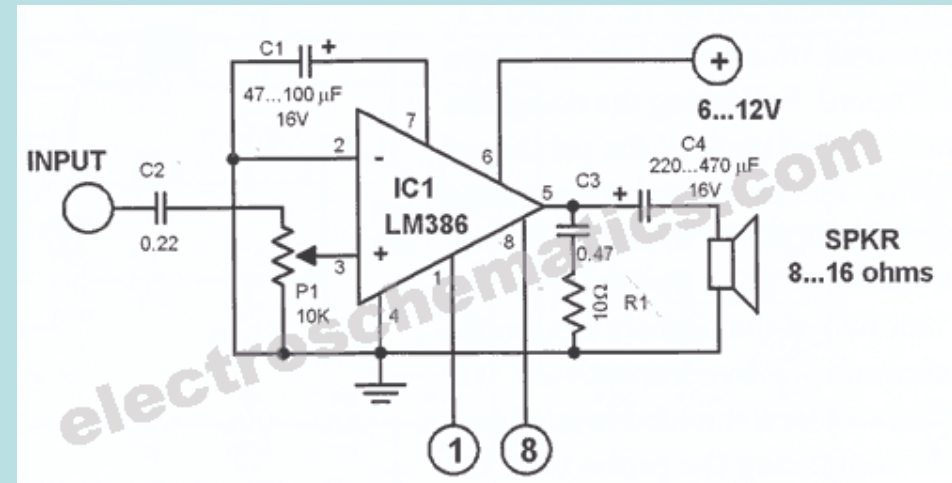
Software Options

Express PCB

Design Spark

Schematic to Board Design

- **Considerations**

- **Size – 'blank canvas'?**

- **Inputs, Outputs, Power rails**

- **Interferences – topography; physical size of components**

- **Access for soldering iron to make connections**

- **Minimise, preferably eliminate, wire links**

Quick Demo

ExpressPCB

From PC to Transfer

- 'Draw' on computer – check

- Print on to paper – check

- Have coffee – check again.

- Have another coffee – check yet again!

- Happy? Print onto glossy photo paper
  Must use laser printer, photocopier, or laminator

PCB Preparation

- You will need…..

- Copper clad PCB board
- Stanley knife & scalpel
- Steel Ruler
- File
- Abrasive (e.g. wire wool)
- Etching solution + plastic container
- Water
- Drills (e.g. 1, 2, 3 mm)

PCB Preparation

- Score & snap PCB to size

- Wash well with detergent; dry well

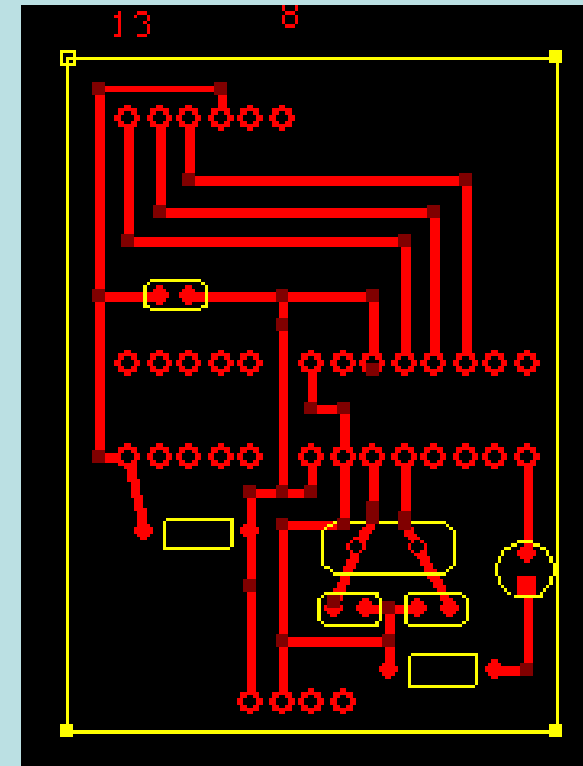- Abrade copper; wipe clean

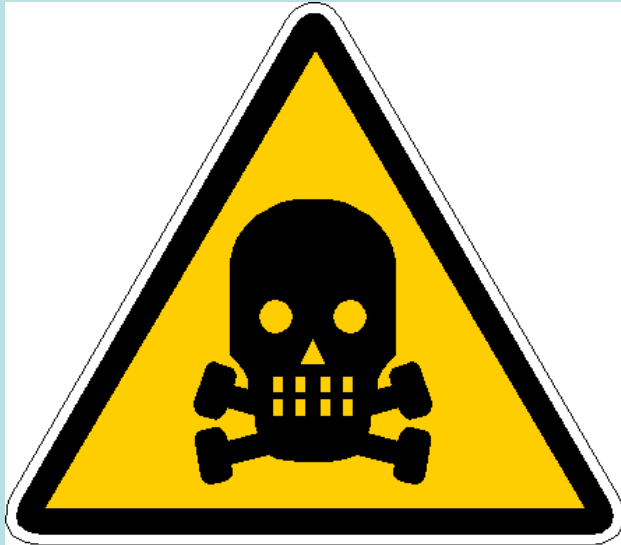# Transfer - Methods

Photo Transfer

Toner (Iron) Transfer

Now to Resume……

* **Iron Transfer Demo**

ISP Shell for Arduino Uno

But First …………..

WARNING – trust me!

DO NOT USE THE DOMESTIC IRON

DO NOT USE DIRECT ON KITCHEN WORKTOP

I won't be held responsible for the consequences!!

So ......

- Have iron as hot as it will go
- Plenty pressure
- Plenty time
- Use water to remove paper and rub/brush off paper fibre debris
- 'Repair' with permanent pen if necessary

Etching

- Hydrochloric acid/hydrogen peroxide
- Ferric chloride
- Warm container of $FeCl_3$ to 50 - 60ºC [1.5 mins, med high in my microwave]
- Place PCB in copper side up
- Keep solution moving
- Keep your eye on it
- Remove, wash under running water; dry
- Rub off toner; wipe
- Check for residual copper; scrape off if necessary,
- Check for track gaps, hairline breaks; ?check with meter
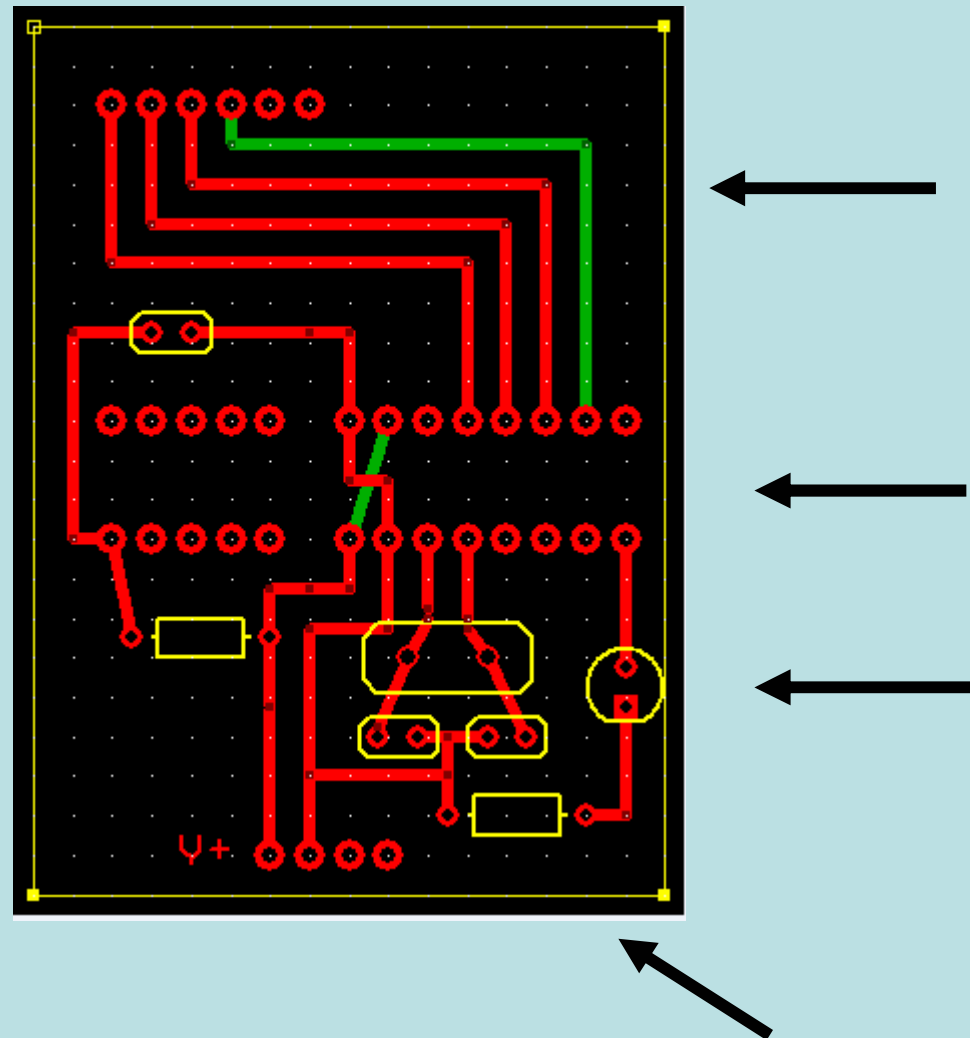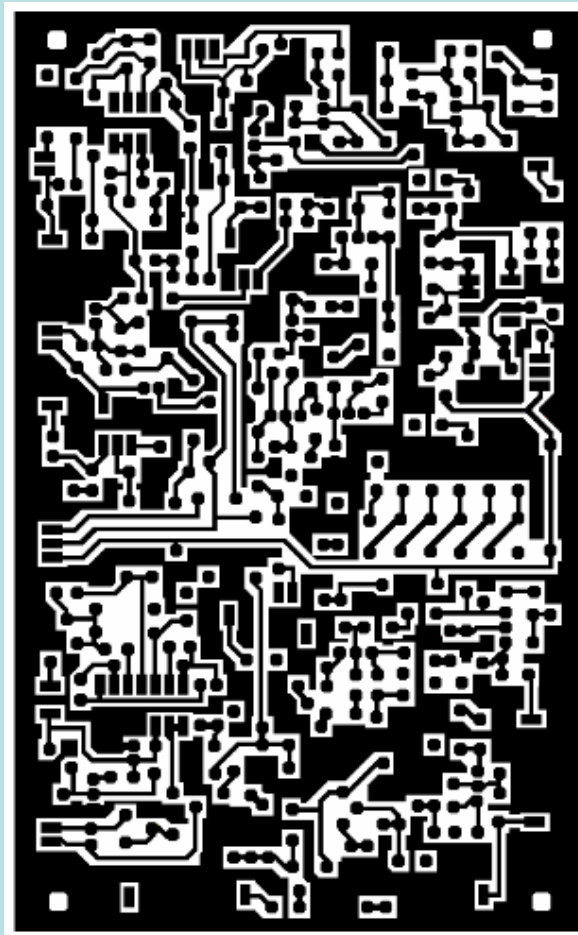- Drill and mount components

So there you have it!

But Wait……….

Practice what you preach, Steve!

What it should be……..
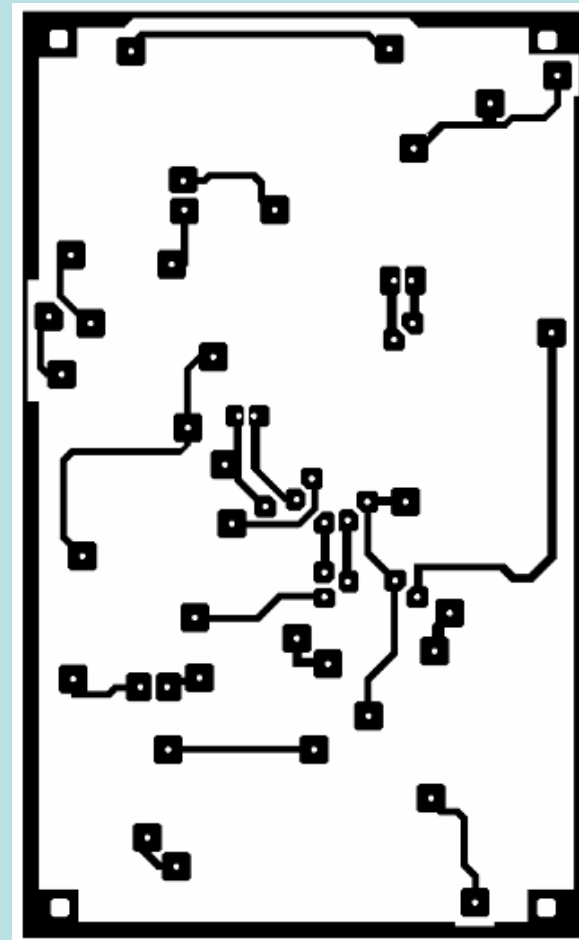
Double Sided PCB

Top Surface   Bottom Surface

Double Sided PCB

- Transfer top surface
- Cover bottom surface with several layers of overlapping gaffa tape
- Etch, wash, clean
- Drill at least 3 'navigation' holes; using pin, locate corresponding pads on bottom transfer
- Cover top surface with several layers of overlapping gaffa tape
- Etch, wash, clean

73's and Happy Etching!

Steve, G4FYF