

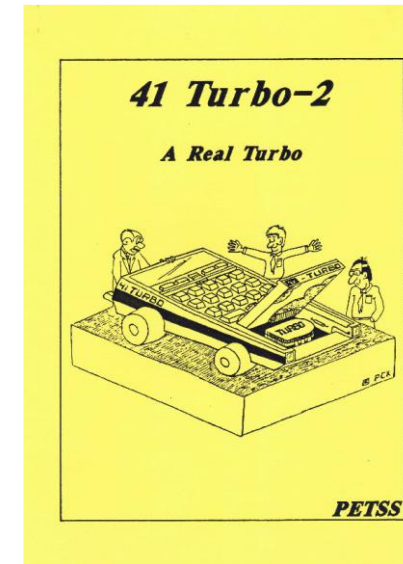
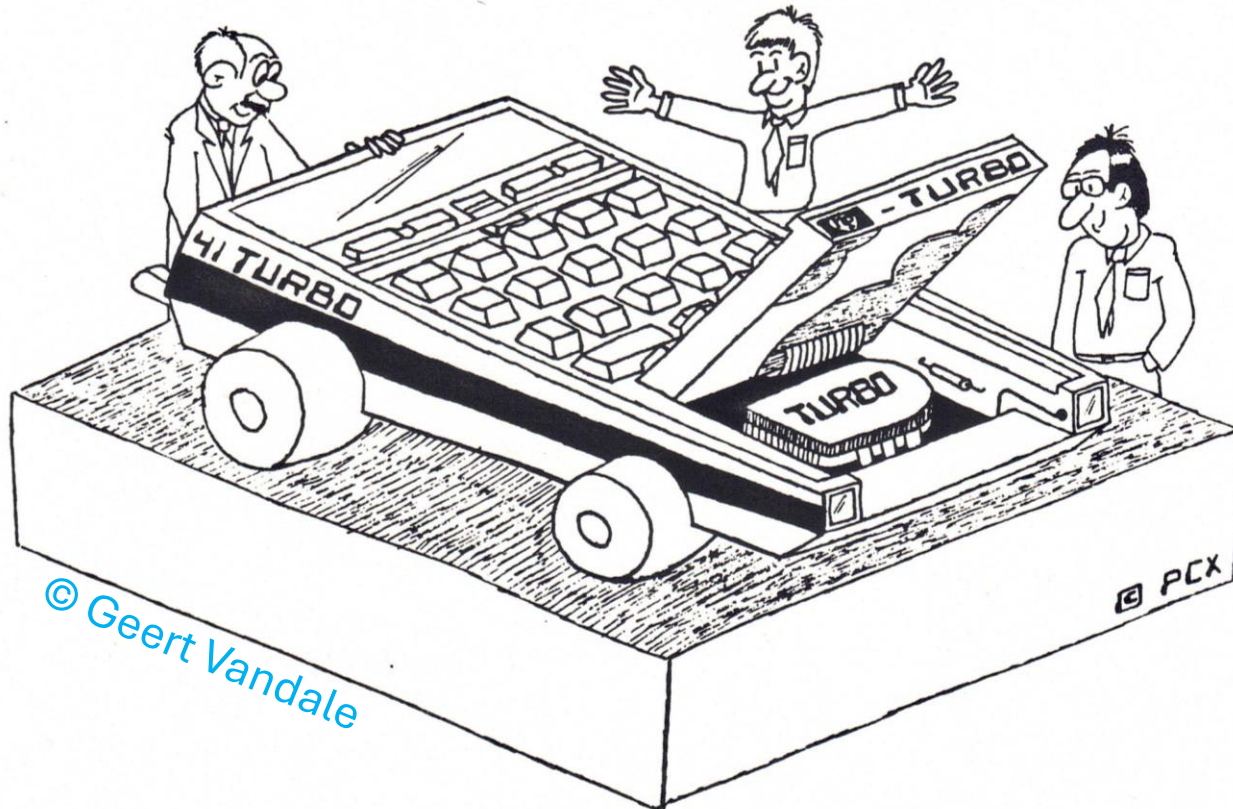


PCX - Belgium

41 Turbo & Turbo 2

A keyboard-controlled speedup
for the HP-41C, CV, CX, ...

Full story & details





The '41 Turbo-2' is an extension PCB for the HP-41 calculator, enabling to change the execution speed of the calculator with simple key presses. It is a small and thin PC-Board with some SMD Electronics on it.

Specifications:

- NO mechanical modification needed, no damage to the 41.
- Always a power-up with the high speed selected (most efficient use)
- Switches to low-speed, the normal HP-41 speed, by pressing the “-” and “x” keys together. On some calculators the “-” and the “/” ... don't ask me why 🤔
- Switches back to high speed by pressing “any key” and the “ON” key together.
- Switched from high to low (or vice versa) while running a program, displaying a catalogue or anything else without triggering a HP-41 lockup.
- Easily to remove if your HP-41 must be shipped to HP for repair ... no longer important 👍
- The '41 Turbo-2' electronics doesn't consume any power if the HP-41 is off (sleep mode).
- It needs a current of less than 1µA if the HP-41 is on or running a program. The current is 15µA while pressing a key, which can be ignored compared to the 7 a 9mA running current of HP-41.



After installing the 41 Turbo-2, the speed increase will be around 2.0 times.

You can achieve higher or lower speeds by replacing C*.

Below a list of the possible C* values in relation to the expected high speed :

C* = 22pF > High speed = 1.8 normal speed.

C* = 15pF > High speed = 2.0 normal speed.

C* = 10pF > High speed = 2.2 normal speed.

C* = 8.2pF > High speed = 2.4 normal speed.

C* not mounted > High speed = 3.0 normal speed.

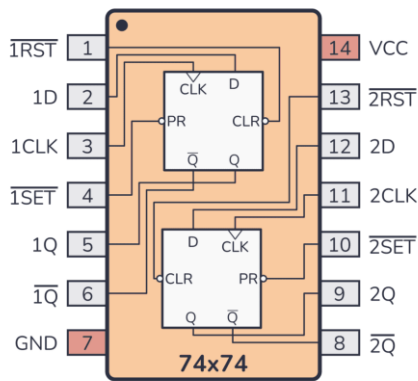
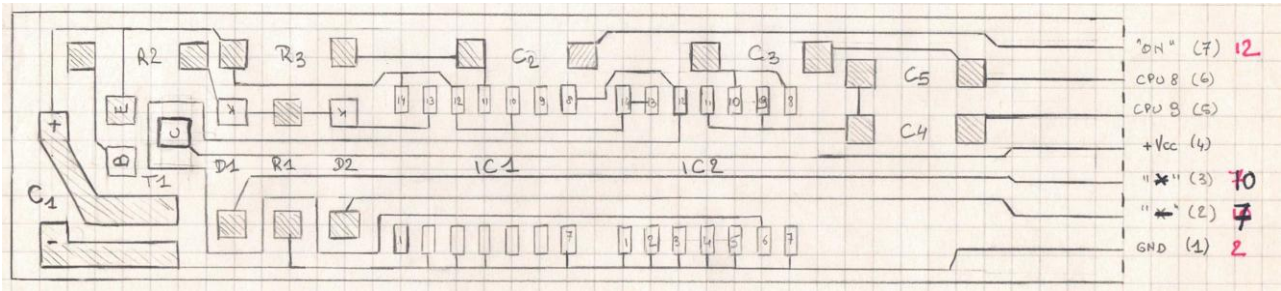
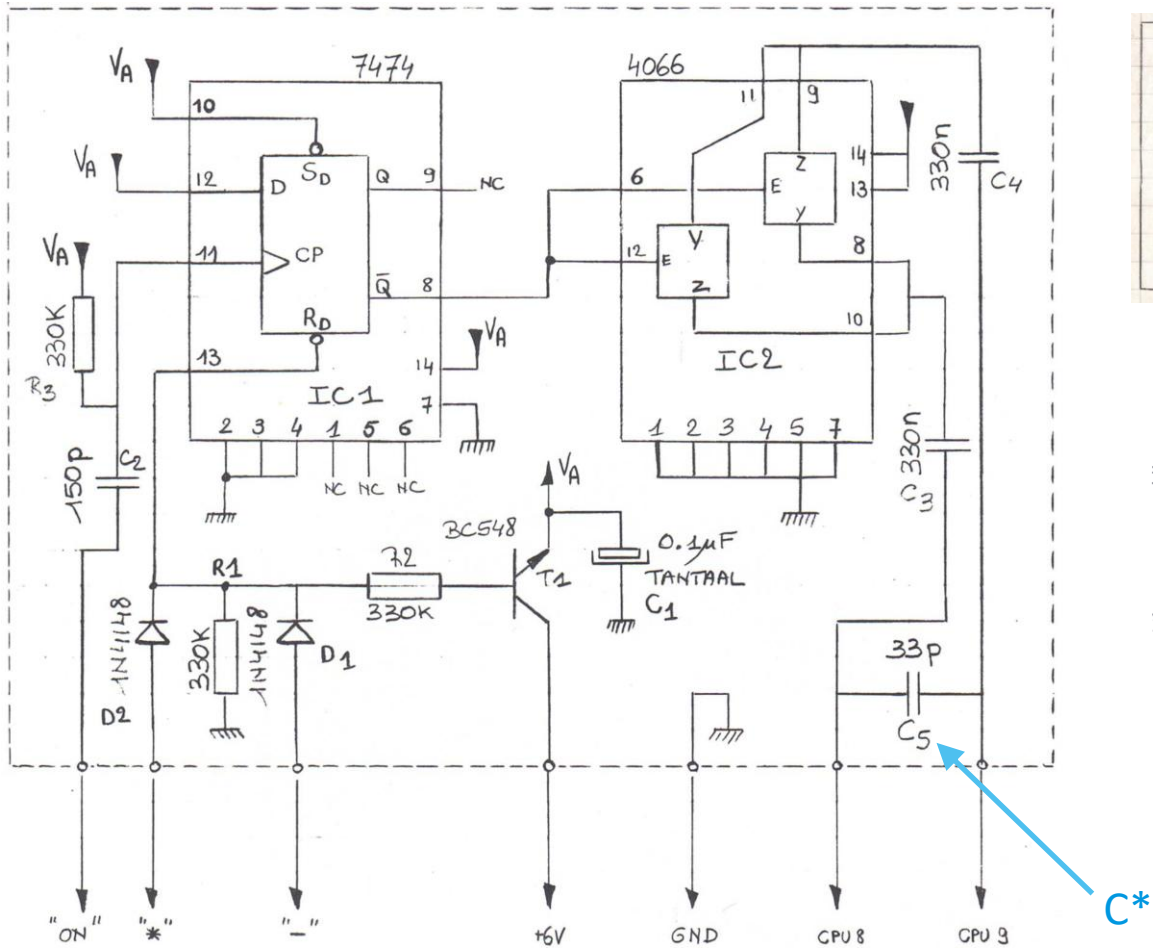
Not every HP-41 will run at speeds higher than 2 times the normal speed.

Some older HP-41 calculators will only reliably run at 1.8 times the normal speed.

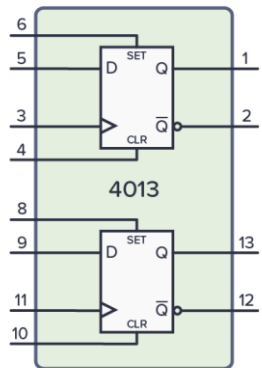
Note that the normal speed (low speed) is currently higher than the standard HP-41 speed.

The speed is approximately 1.2 the standard speed using 180p for C₃ and C₄.

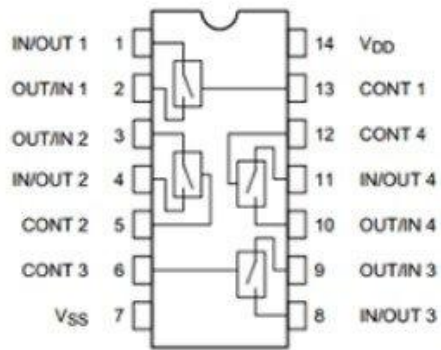
By increasing the C₃ and C₄ values you can lower the speed towards the default speed.



74HC74

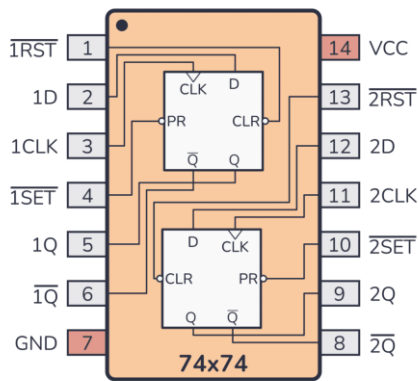
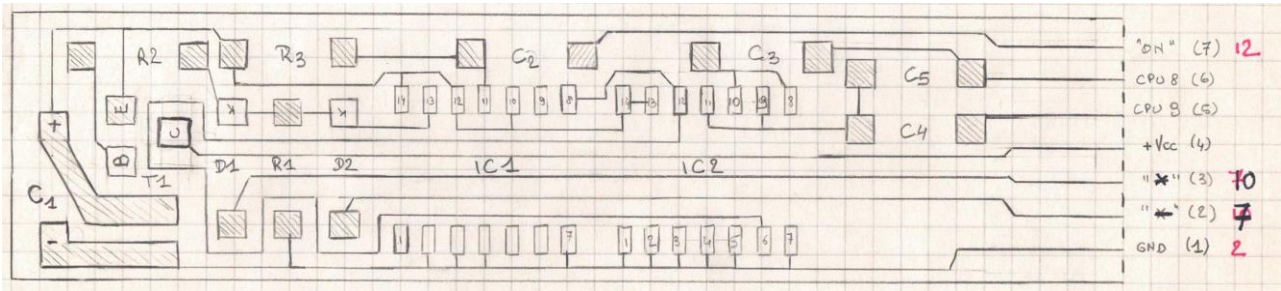
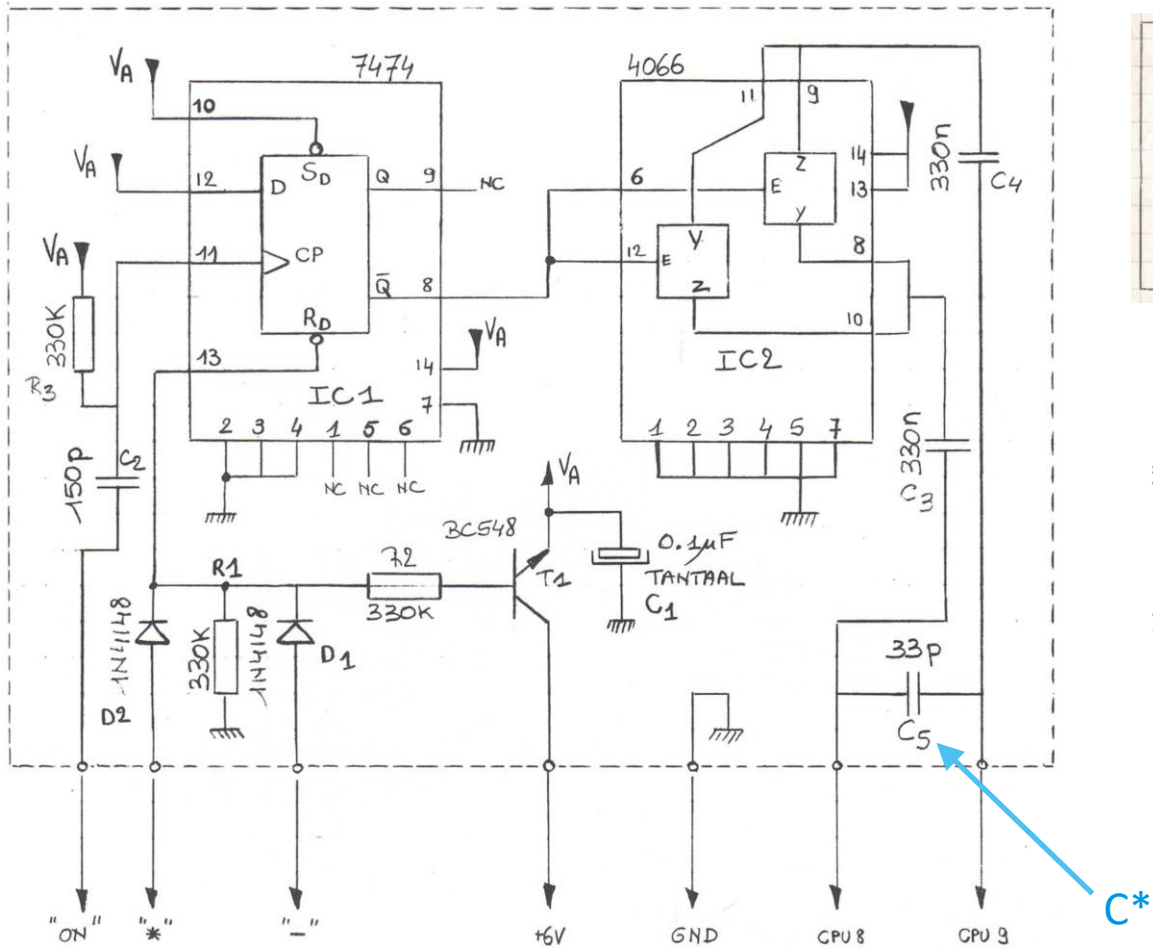


CD 4013

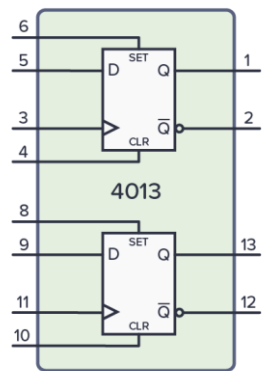


CD 4066

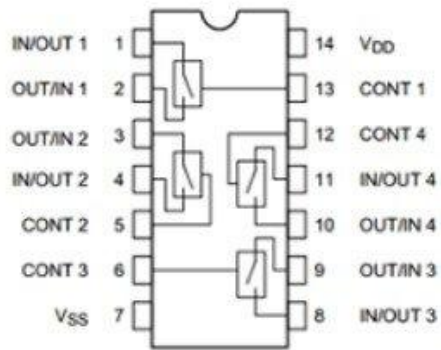
There is a clear error in the schematics, do you see it?



74HC74



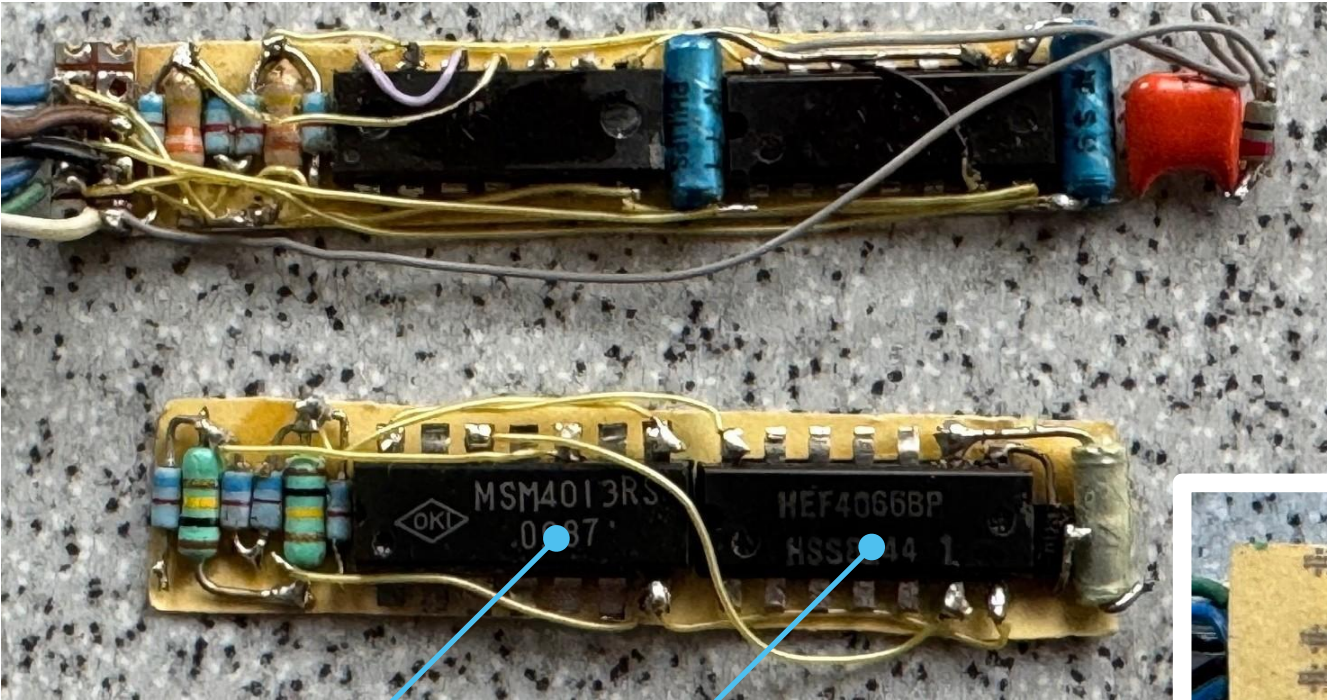
CD 4013



CD 4066

Schematic error: C₃ and C₄ should be 330p instead of 330n

Some pictures of the initial prototypes of the 41 Turbo (version 1)

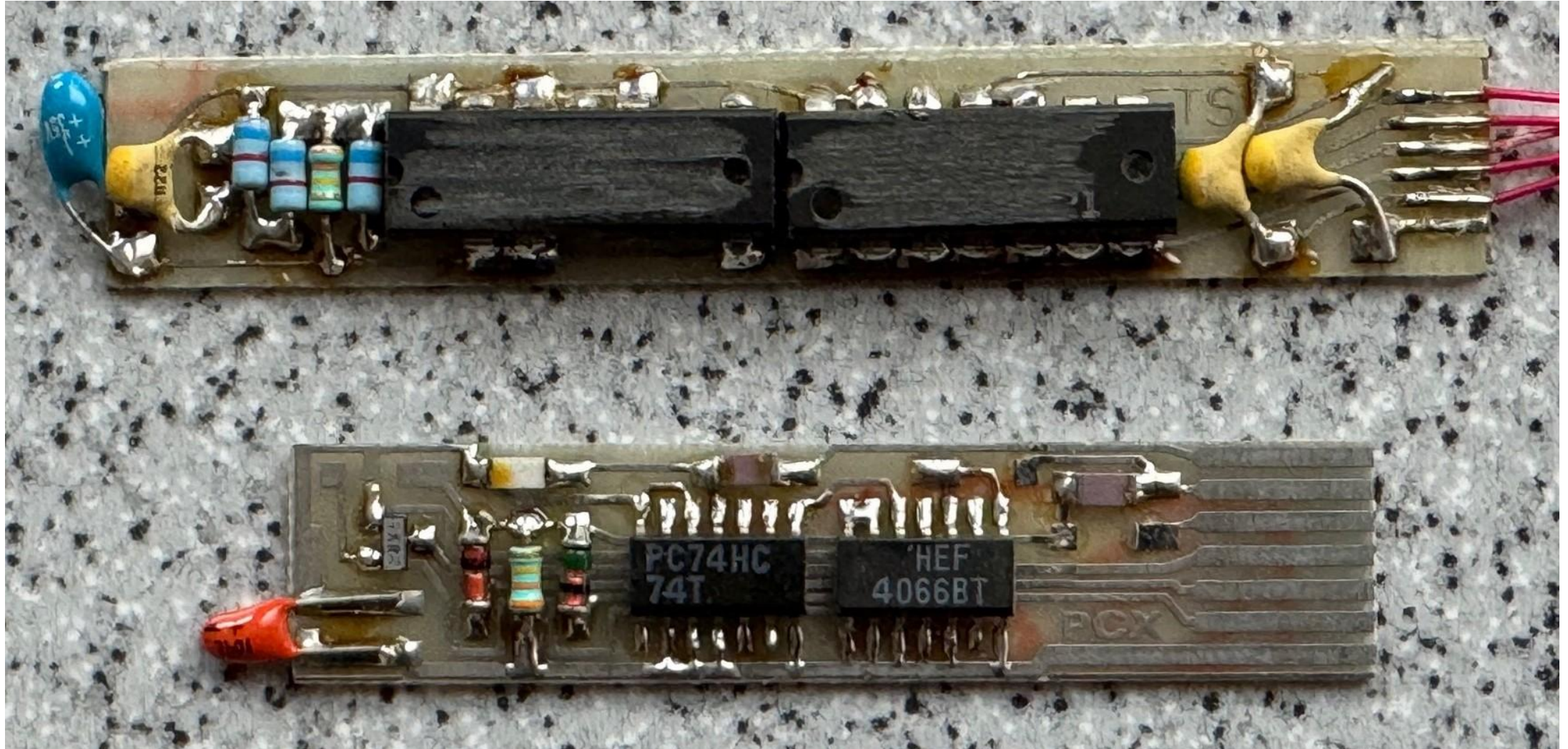


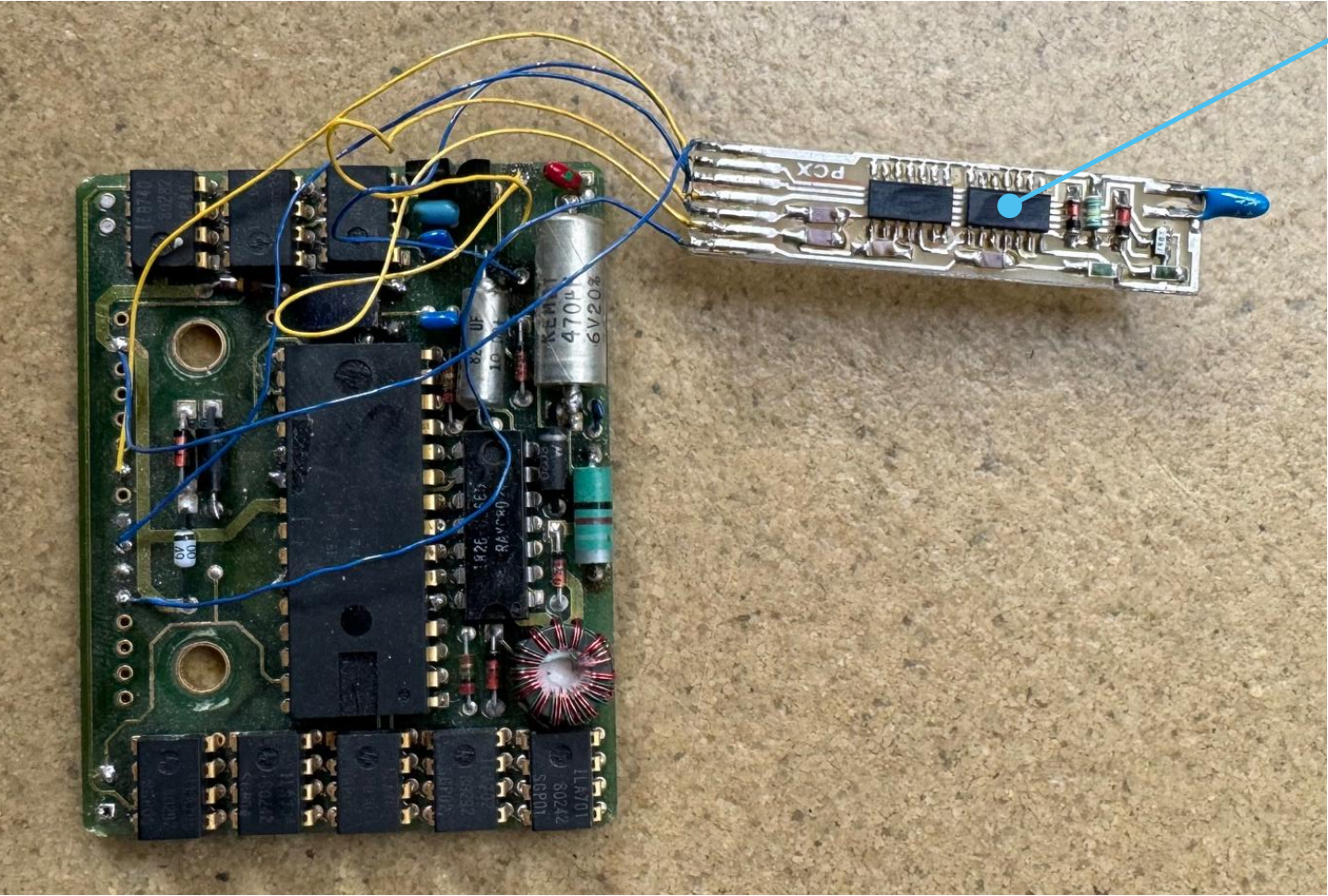
HEF4013

HEF4066

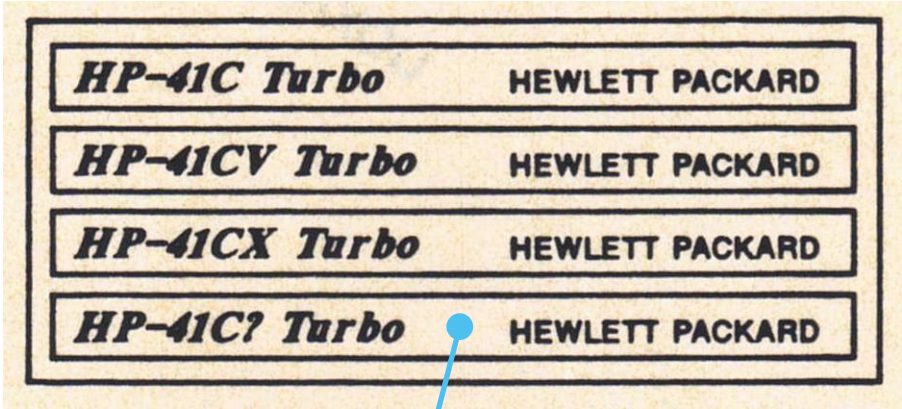
Paper/Cardboard



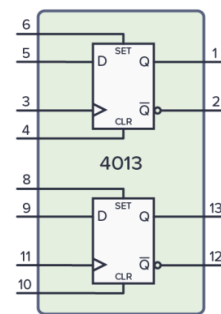
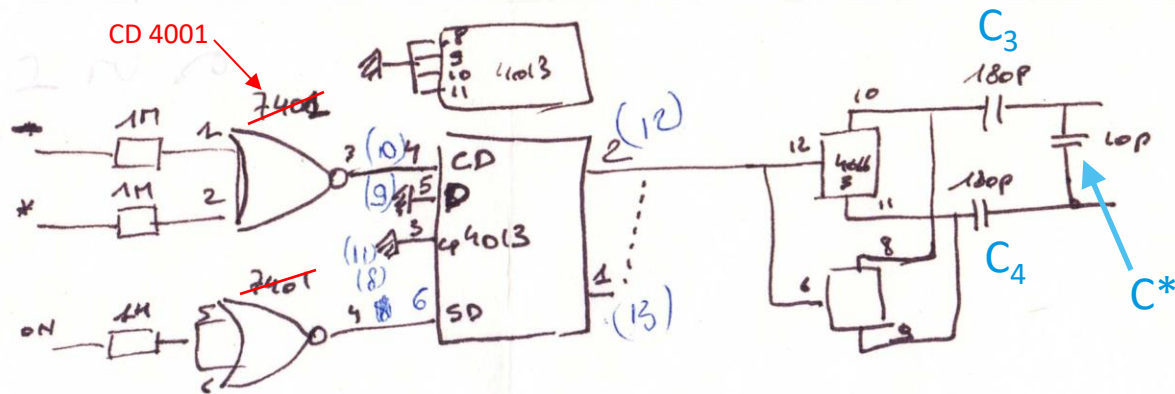




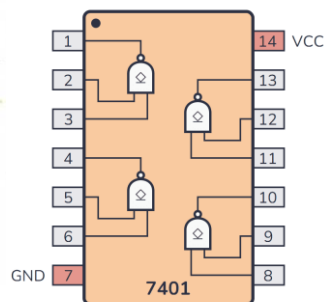
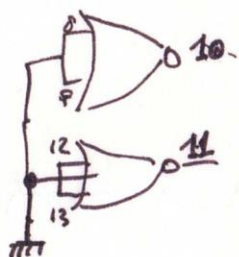
41 Turbo (version 1)



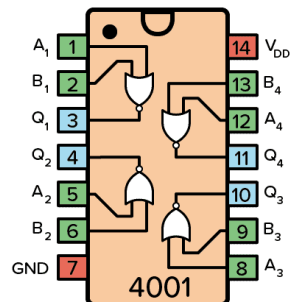
self-adhesive labels printed
with the HP-Plotter



CD 4013



74HC01
NAND

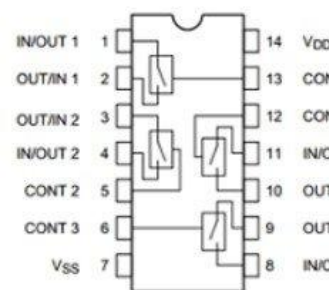


CD 4001
NOR

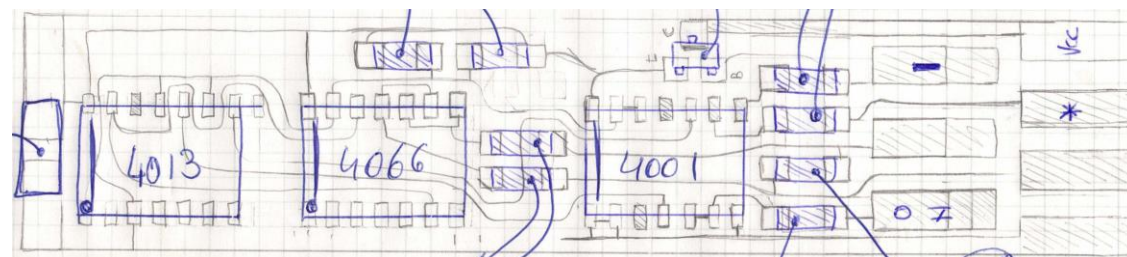
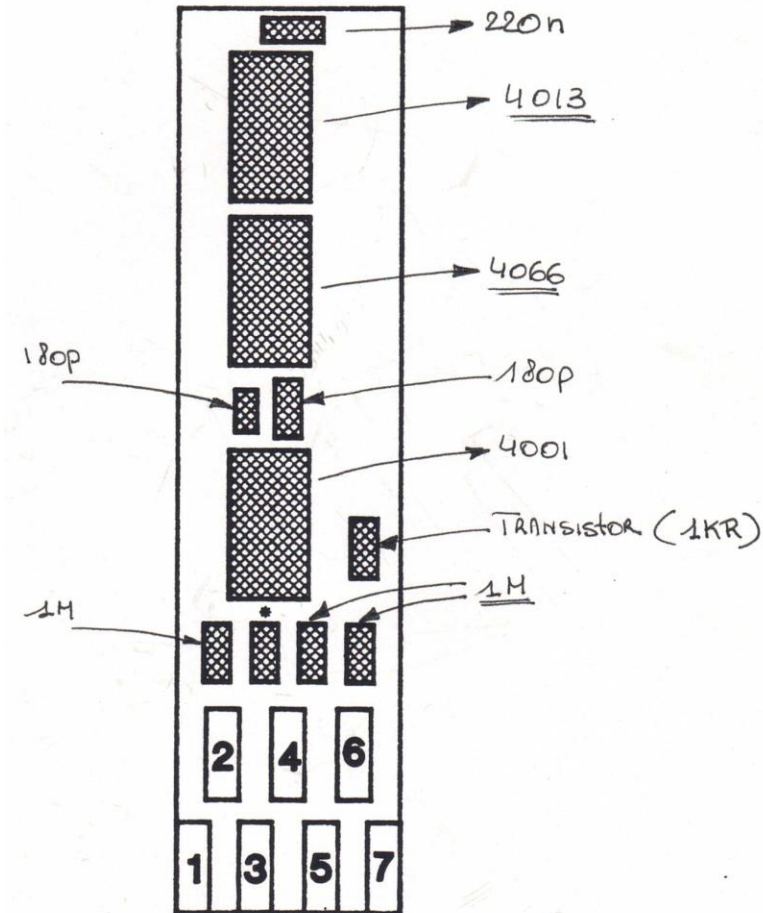


H = HIGH voltage level; L = LOW voltage level.

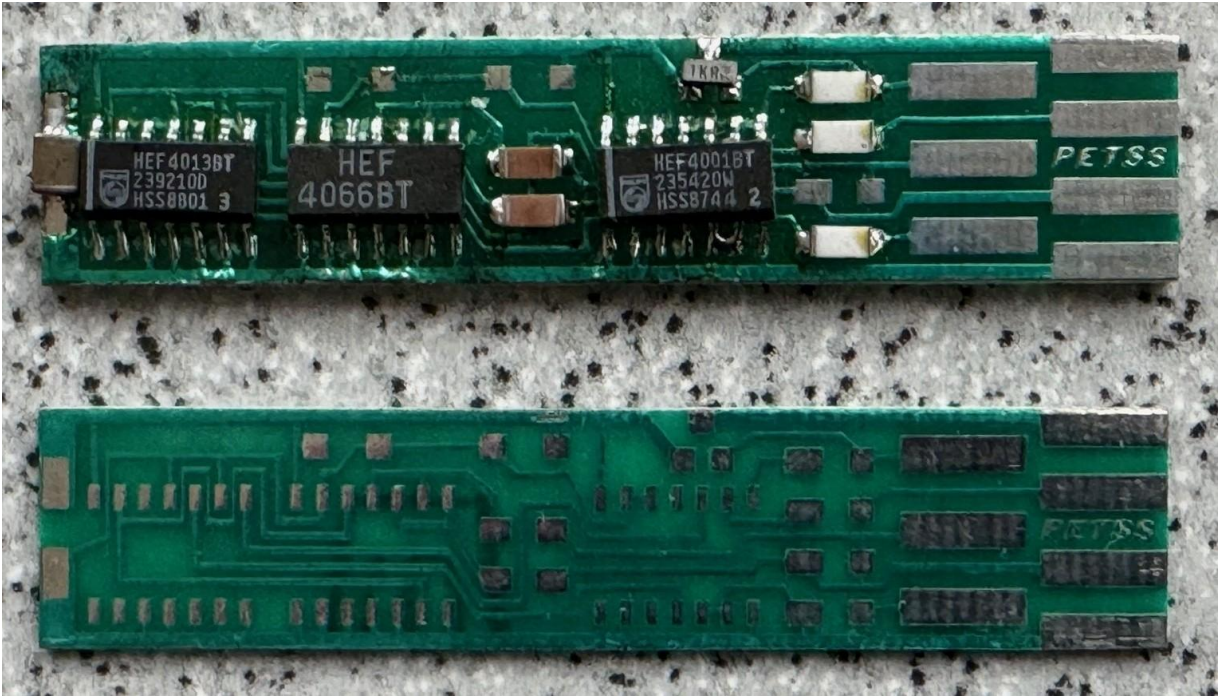
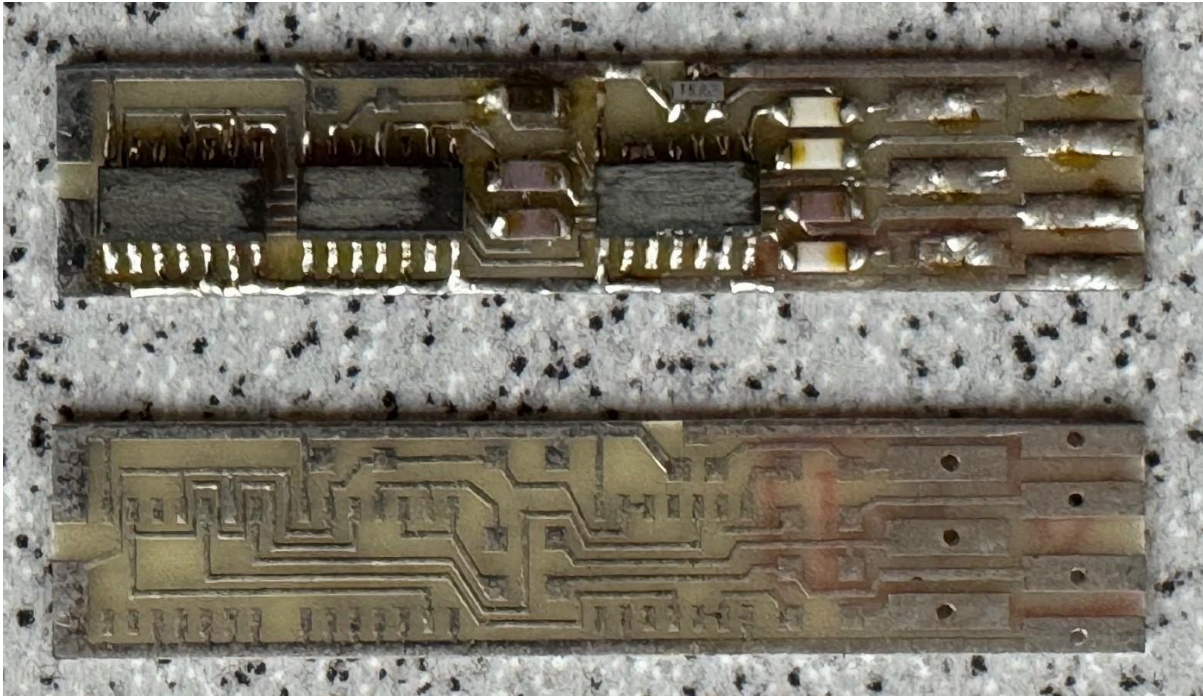
Input		Output
nA	nB	nY
L	L	H
L	H	L
H	L	L
H	H	L



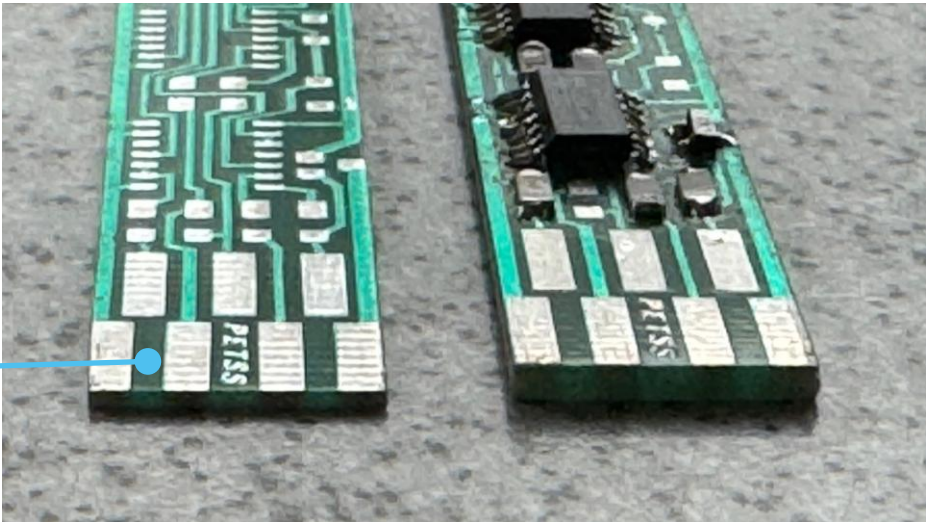
CD 4066

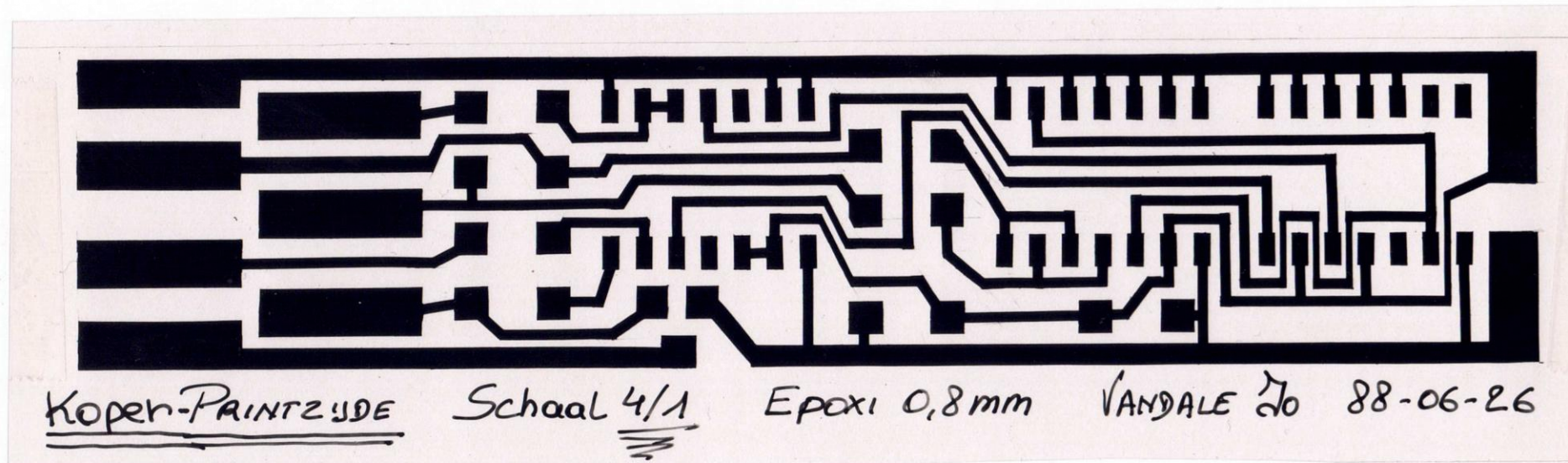
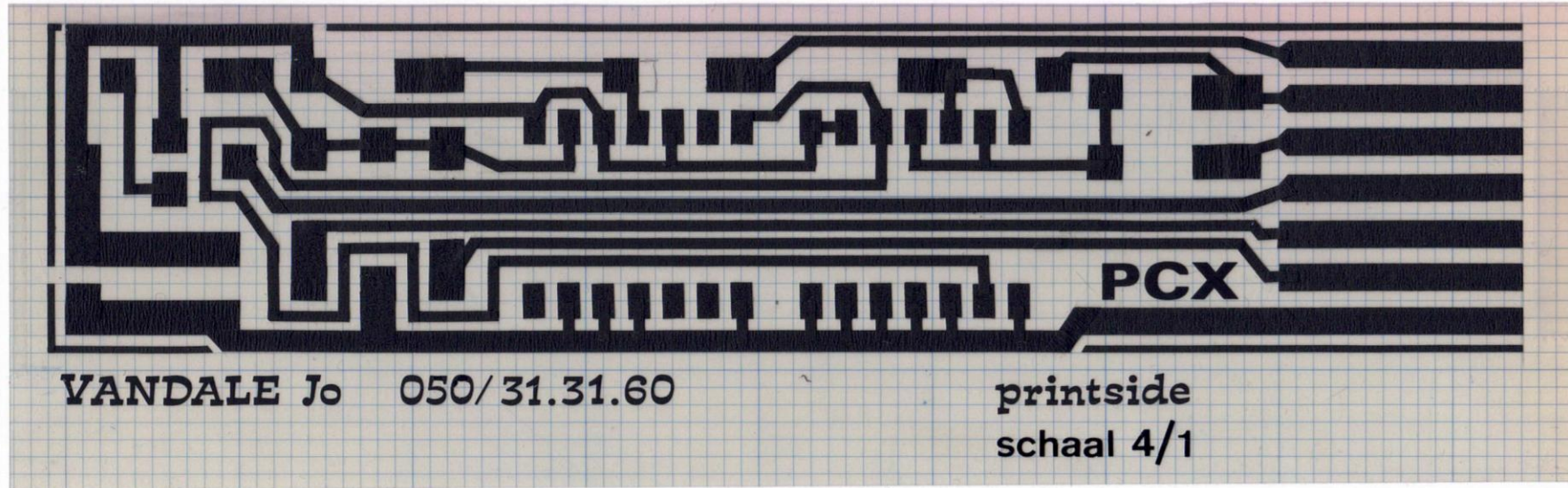


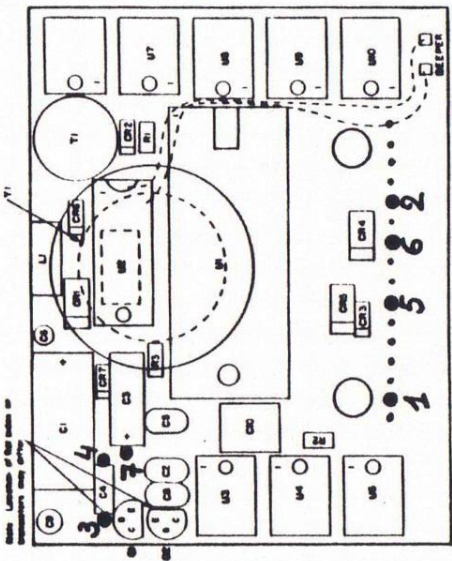
Some pictures of the initial prototypes of the 41 Turbo-2



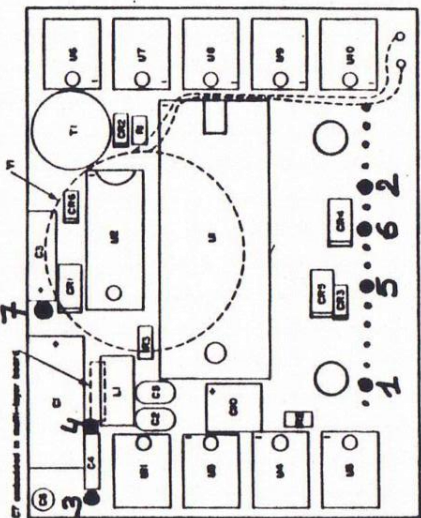
0.8mm PCB board



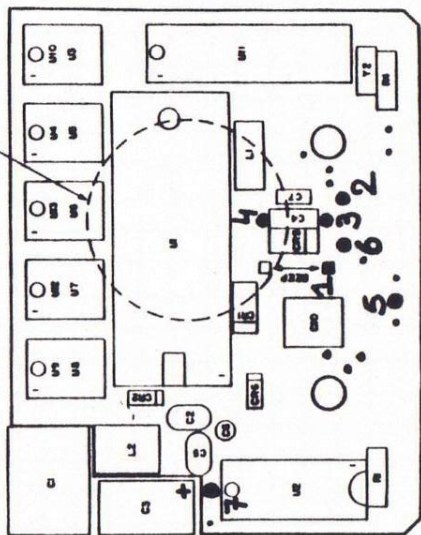




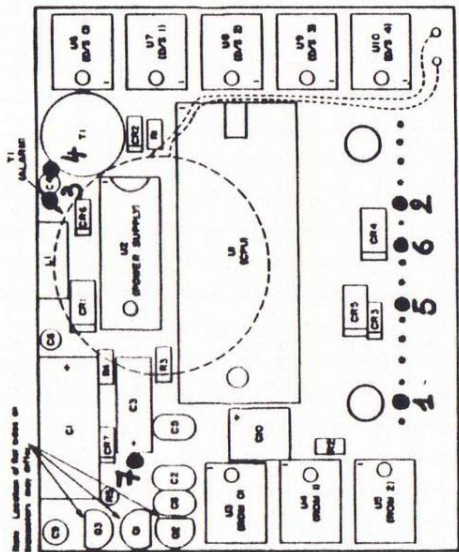
HP-41C Two Transistor



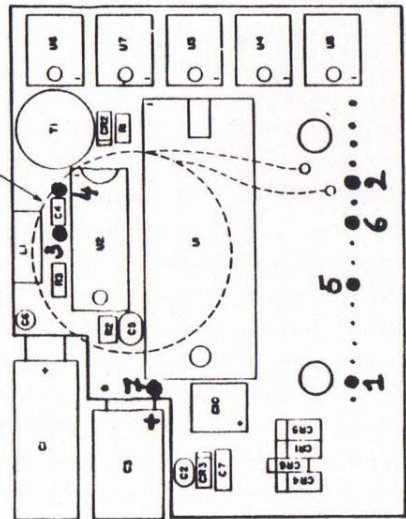
Initial HP-41C



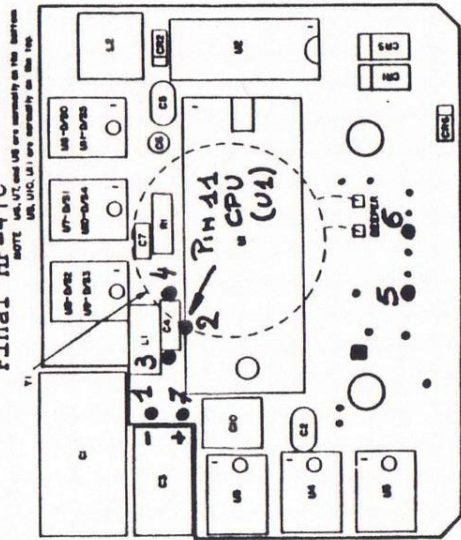
HP-41C/CV/CX Common Board



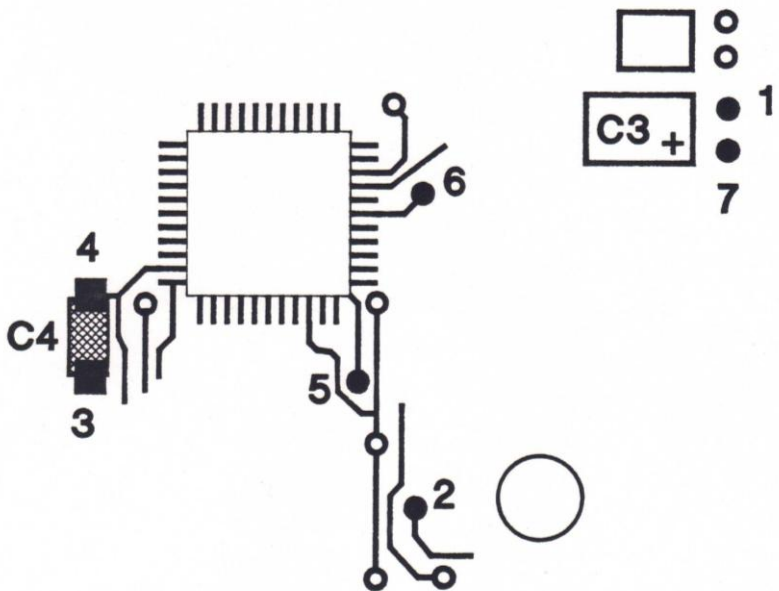
Initial HP-41C



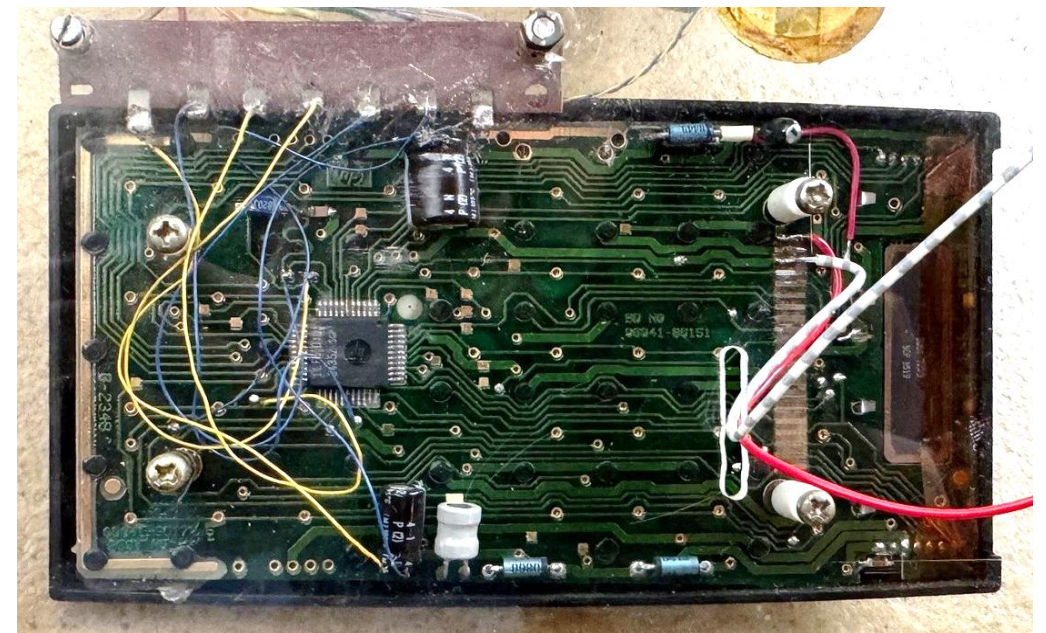
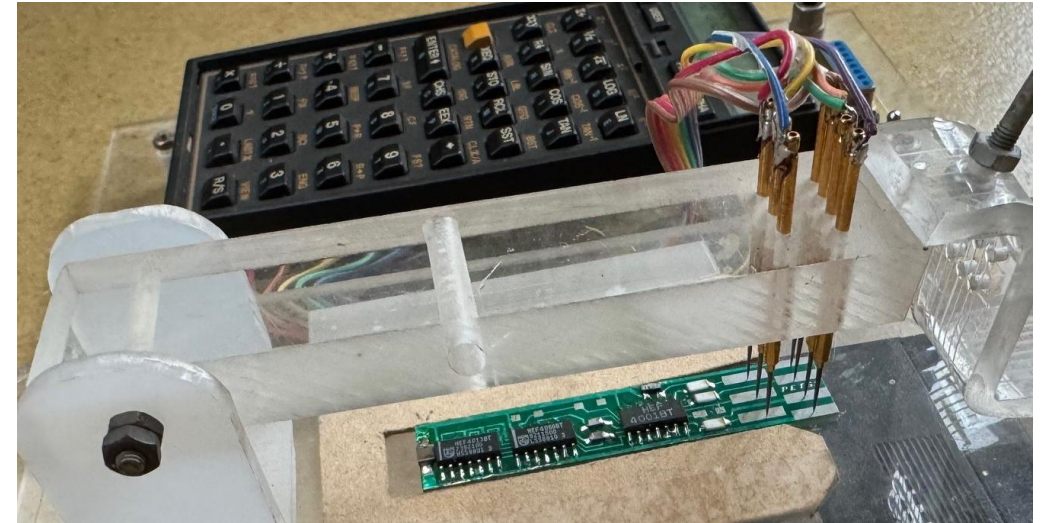
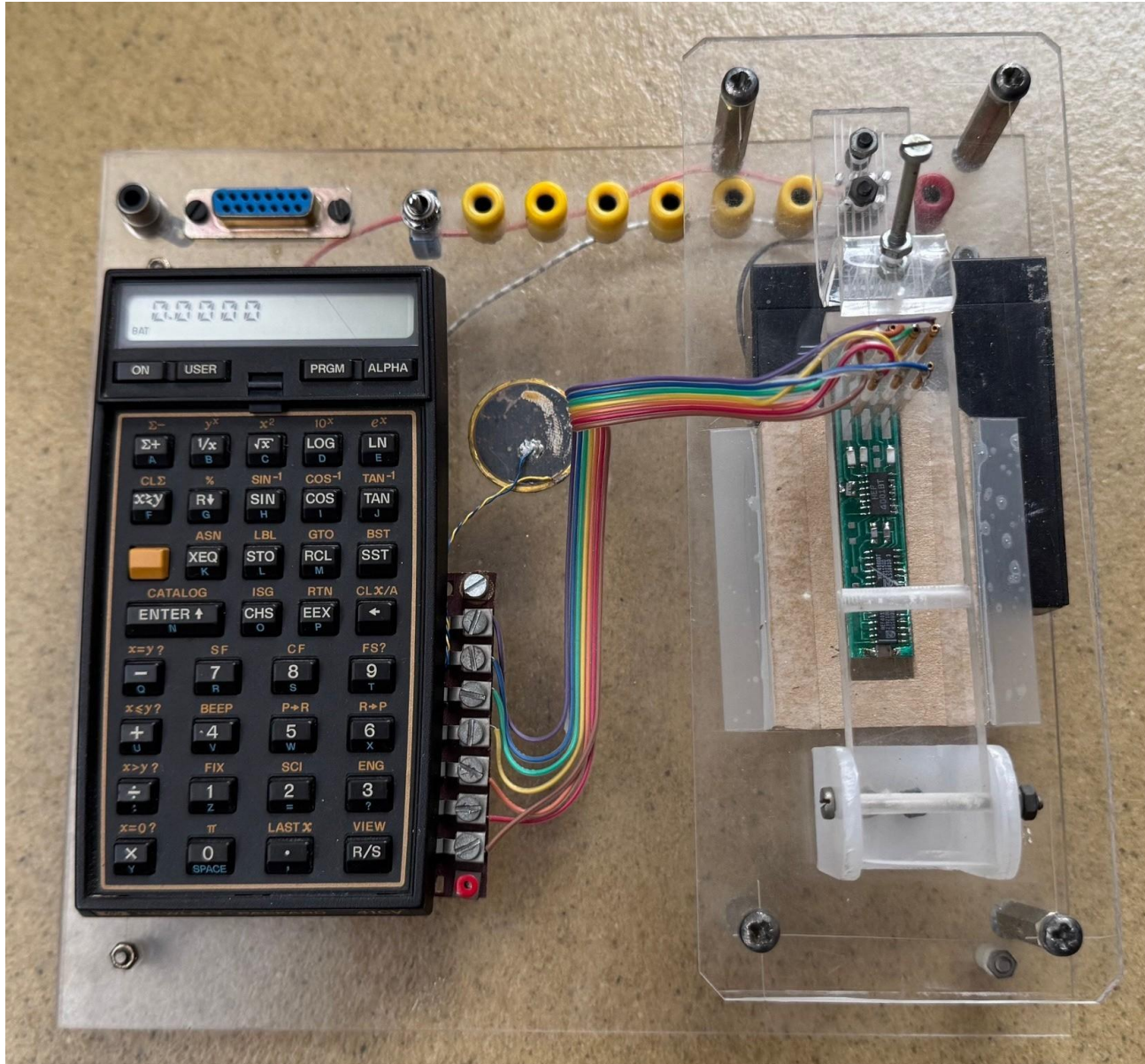
Final HP-41C



HP-41C/CV Common Board



Half-Nut board



All measurements were executed with a battery voltages of 6V and 4V.
Lower voltages result in a reduced current in sleep and standby mode, but an increased current in run mode.
The following program was used in run mode.

```
01 LBL 'TEST
02 LBL 01
03 TONE 9
04 GTO 01
05 END
```

Operation mode	Vbat	Basic	Turbo
Standby (ON)		1mA	1mA
Sleep (OFF)	6V	60uA	60uA
Sleep (OFF)	4V	19uA	---
Run default speed	6V	5.0mA	5.0mA
Run default speed	4V	8.5mA	---
Run speed x 2	6V	6.5mA	6.5mA
Run Speed x 2	4V	11mA	---
Run speed x 4	6V	11mA	---
Run speed x 4	4V	18mA	---

Basic: The basic HP-41 without 41 Turbo electronics.
C4 was replaced on the main HP-41 board to achieve the speed x 2 and speed x 4.

Turbo: Measurement with the 41 Turbo installed.

Note: Running a normal program will consume a bit less as this running program is using a Tone command on line 03 which is consuming a bit more.



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Thanks for listening
to my presentation

