

Documentation of Nixieclock kit – Version 5.5

December 2004 (rev. 120018)

1. Attention - Important

This information is provided 'as is'. Readers should only attempt to build this design if they are competent at electronics assembly and understand the dangers of mains voltages.

No responsibility is accepted for any damage, injury (however serious) or death caused by anything remotely connected to this website.

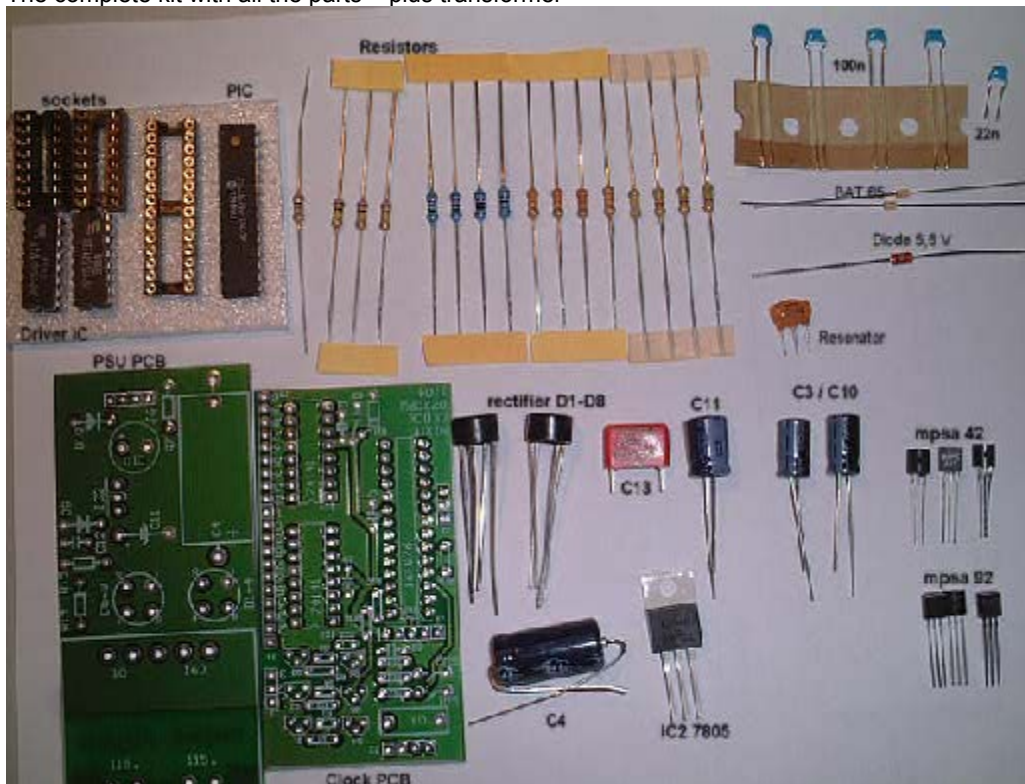
Potentially lethal voltages exist on the circuit board, so we recommend using it with the case.

We are not responsible for physical harm from misuse and ignorance of basic electrical safety!

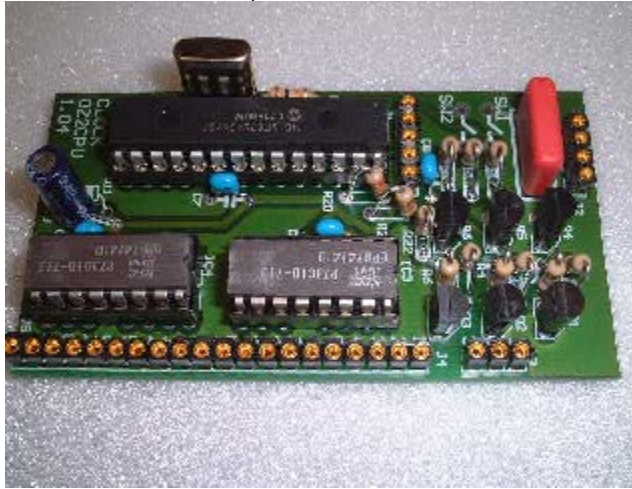
2. The part list

Amount	Part	Part No on PCB
1	1M	R14
1	4 MHz	Resonator
2	B380 C1500	D1-D4/D5-D8
1	5V6	D11
1	4.7uF to 22uF 350-360V	C4
4	10k	R16 R17 R18 R19
2	10u-100u 16-25V	C3 C10
4	33k	R15 R20 R21 R22
3	100k	R1 R3 R5
4	100n	C5 C7 C8 C9
1	22n	C12
1	1-100n / 250V	C13
1	330u-470uF 16-25V	C11
4	470k	R2 R4 R6 R7
1	7805	IC2
2	74141	IC3 IC4
2	BAT85	D9 D10
3	MPSA42	Q4 Q5 Q6
3	MPSA92	Q1 Q2 Q3
1	PIC16F876	IC1
3	sockets for ICs	

The complete kit with all the parts – plus transformer

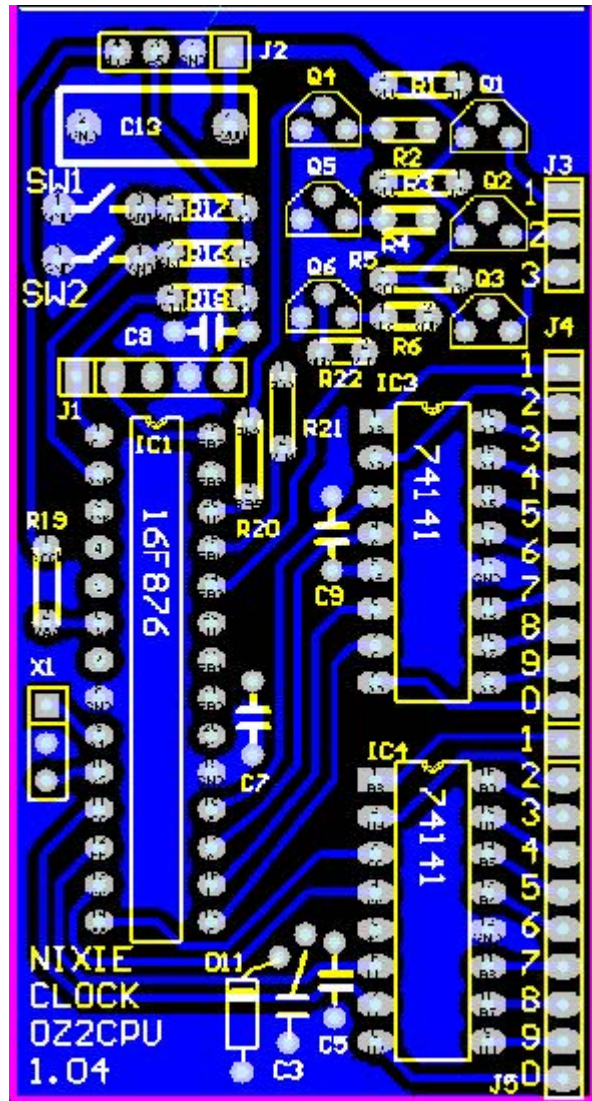


The clock PCB with all parts soldered



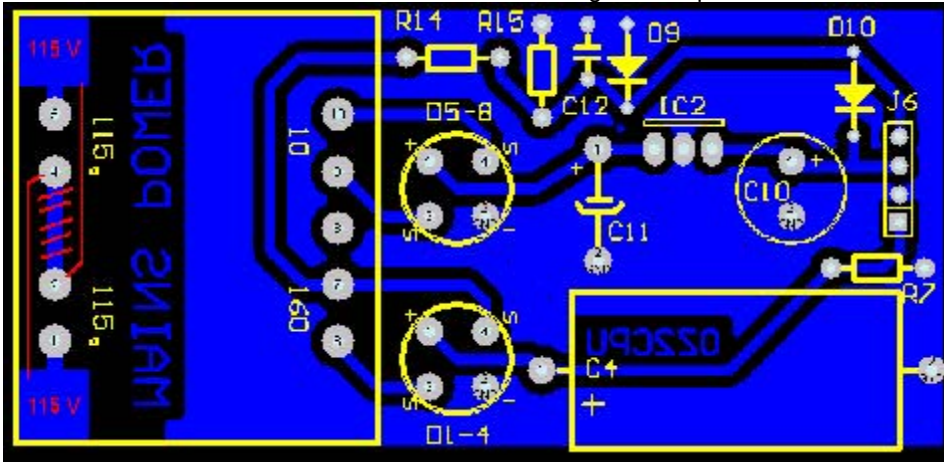
The component side of the clock PCB

If you mount the resonator it does not matter what direction you solder it. It works in both directions.



The power supply

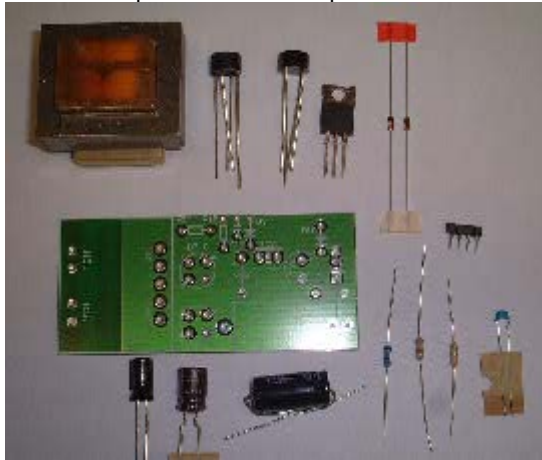
The unloaded voltage of the power supply is about 230-250 V DC. Be careful not to connect the high voltage line to the 5 volt line. When the tubes are connected the voltage will drop to about 170 – 180 volts.



If you use 115 volts please look at the schematic. Cut the track from pin 2 to pin 4 and solder new wires as shown in red.

3. Making the PSU

Here are all parts used for the psu.



Please solder the resistors, capacitors and the diodes first.



Now solder the rectifiers. Watch out the long leg is plus. You can in the picture how the rectifiers have to be mounted.

Solder the capacitors now. Watch out for correct plus and minus.



Now solder the 7805. Watch out for the cooling part. You can see a white rectangle on the pcb that is where the cooling part must be.

Solder the transformer. Solder a connector in J1 to make a connection from the psu to the clock PCB via a 4 wire cable later. Watch out for high voltage when connecting the psu to mains!!



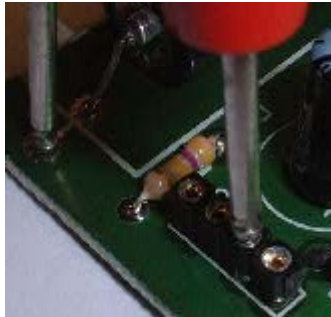
Now solder the mains as shown in the schematic in chapter 2. If you use 115 volts follow the description in chapter 2. – **Danger high voltage.**

Check all soldering and get a multimeter set to DC. Measure as shown in the photo



You should measure 240-250 Volt DC without any tubes mounted to the psu. Don't touch any parts on the board.

Now make the second measurement as shown in the photo. Voltage should be 5V DC.



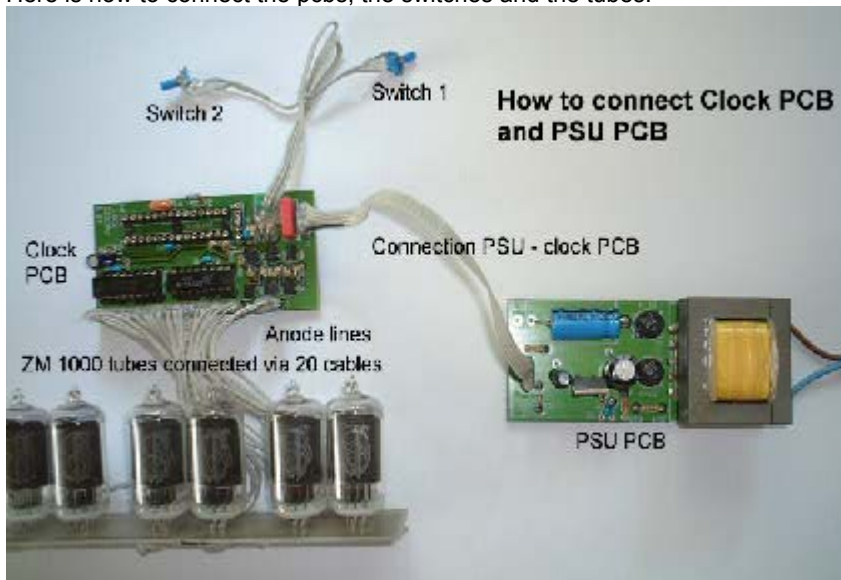
The psu is now ready. Unplug the psu and go on with making the clock PCB.

4. Making the connections

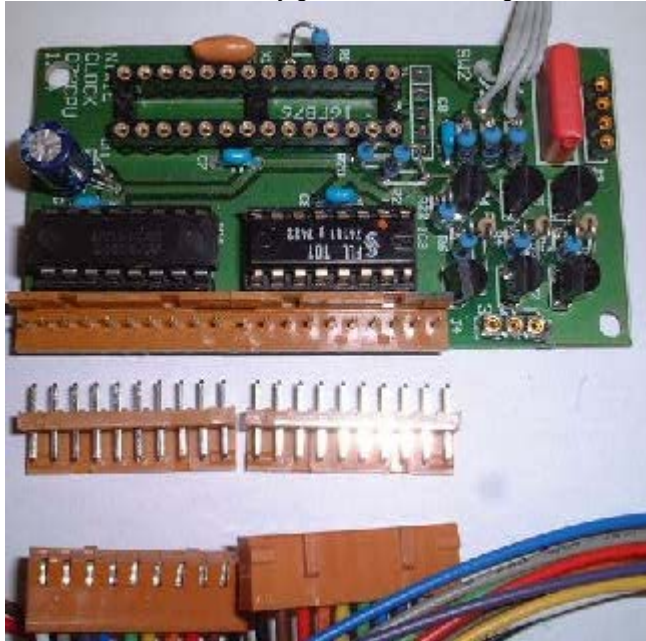
If you have finished the psu and the clock PCB check all soldering and double check them again. Now you have to connect the psu and the clock kit with a 4 wire cable.

Please be careful and make a marking so you do not mix up the high voltage line with the 5 volt line!

Here is how to connect the pcbs, the switches and the tubes:



These connectors are very good to solder and give a firm contact. Even the wires are connected for the tubes.



5. Overview of software modes - all using the same hardware

Mode 1 for 6 tubes

Display update speed is 600Hz for all 6 digits, so this is really a non-flicker display. The special feature of this kit is the fading of the digits in the max brightness' setting. The connections from the controller part to the Nixie tubes are made with wires, so that nearly all nixies types can be used.

Mode 2 for 4 tubes

Display update speed is 600Hz for all 6 digits, so this is really a non-flicker display. The connections from the controller part to the Nixie tubes are made with wires, so that nearly all Nixie types can be used.

Mode 3 for 4 tubes (Dual Anodes e.g. 1030)

Display update speed is 600Hz for all 6 digits, so this is really a non-flicker display. The connections from the controller part to the Nixie tubes are made with wires, so that nearly all Nixie types can be used.

Mode 4 for 2 tubes

The time is displayed with 2 tubes. The hours are shown, then the minutes and so on. That is done by fading the digits. It looks absolutely great, when the digits are fading. This version is directly driven, not multiplexed.

6. Software Version 5.5

Fixed in Version 5.5:

1. Fading is now active in 1pps input both in the 2 digit clock and the 6 digit clock modes.
 2. Blink1 and blink2 outputs now also work in 1pps input mode. That means that blink 1 is exactly the same as it was in version 5.4. Blink 2 is active when blink 1 is not active.
 3. In the 2 digit clock mode there was a bug in version 5.4 so that sometimes the 12 and 24 hour mode was impossible to change. That has been fixed now.
 4. The mains frequency it has measured will now be displayed in the 2 digit mode.
- This version has autodectect for 1 Hz, 50 Hz and 60 Hz. This is the actual replacement for version 5.4. At power up it shows the version 3 times blinking in HR (55) then it flips the digits fast for exactly 1 sec to show counting the input frequency. Then it shows the software version in HR and input frequency in MIN for about 5 sec. Then it goes to normal clock mode. The time is now preset to 00:00:00 if in 24 hr mode, else 12:00:00 if in 12 hr mode.

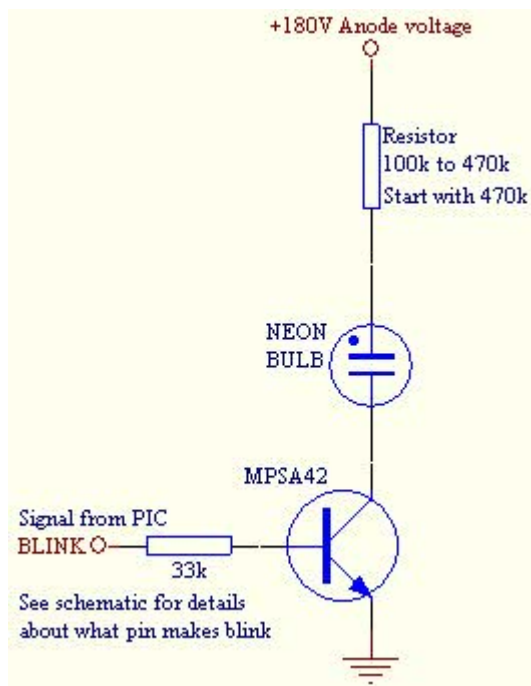
No leading zero

If you want to blank the leading zero, then just cut the connection to the first hr "zero sign".

External outputs

PIN4 and PIN5 of the PIC16F876 are now outputs to drive blinking colons with, there are 0,5Hz and 1 Hz outputs (if 50Hz and 60Hz input) so you can choose the blinking speed you prefer.

You need to add one more NPN transistor like Q4 and a neon bulb. If you prefer an LED just connect a 470 ohm resistor to pin 4 or pin 5. It is all up to you.



Dimming

The UP/DIM button changes the 4 dim levels when clock is in normal RUN-MODE. There are 4 dimming levels. Dimm level 4 is the fading mode for 6 tubes at maximum light output.

Setting the clock

Push the SET button to enter the set mode.

Then the UP/DIM button adds 1 to the highlighted hours or minutes. The SET/RUN mode button enters SET MODE when pressed first time, secs are reset and blanked during set mode. HOURS lights up, MINUTES are dimmed for easy indication that it is HOURS that are adjusted now. One more click on the SET/RUN button, changes to MINUTES, now HOURS are dimmed.

When pressing SET/RUN the last time, the clock will start in normal run-mode.

12-24 hour selection

Hold UP/DIM button for 3 sec to change from 12 hr to 24 hr mode and back. The EPROM will keep the setting for 12 or 24 hours mode even if the clock has been powered off.

The number of tubes mode settings

To change operating mode, hold down SET, then power up.

WHILE you still hold down SET, now press DIM until right mode is working, to store this and continue, simply release SET.

To make it easy to see when right mode is chosen, the digits will display the tube number as in the schematics:

1-2 is two tube non multiplexed mode

1-2-3-4 is four tubes 2x2 mode using normal Nixie tubes

1-2-3-4 is four tubes using dual anode tubes

1-2-3-4-5-6 is six tubes 2x3 mode

If you use the wrong mode the clock's display will just not look right, but no harm can be done to tubes or electronics. Simply try again until it looks right.