IN-12 NIXIE CLOCK v1.1

Jakub Dorda © 2016-2017

ASSEMBLY GUIDE

What You will need:

- Soldering iron with standard and precise tip
- Side cutters
- Solder
- Solder pump or solder wick (for correcting mistakes)

Optional:

- Pliers / small tongs / twisters
- Crocodile clip
- Multimeter

Estimated assembly time: 7-9h

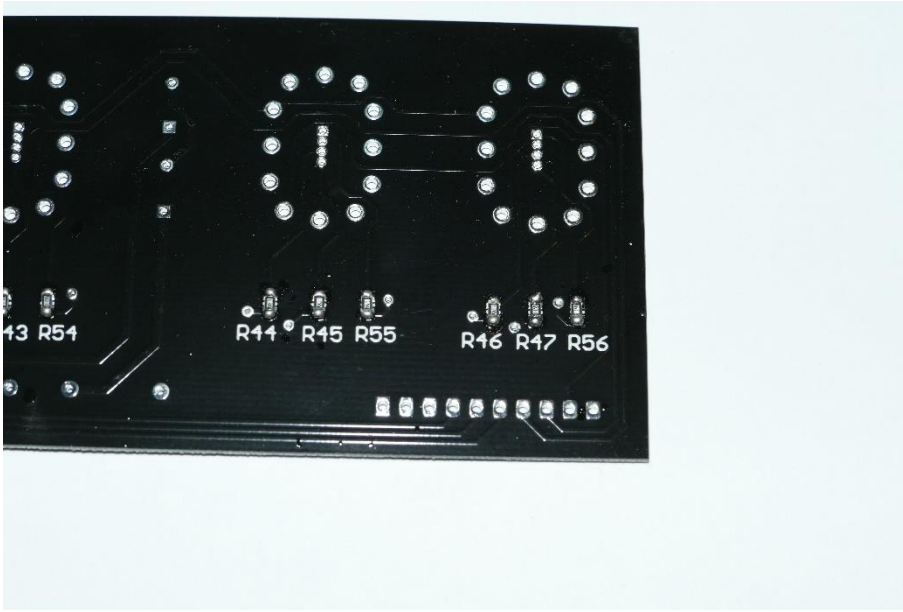



Table of elements

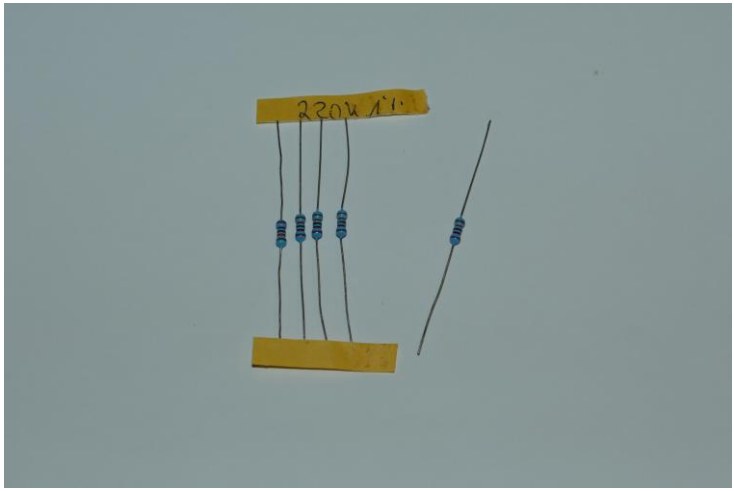
Designator	Value	Symbol	Quantity
Y1	32.768KHZ	-	1
Y0	8Mhz	-	1
X6-X9	nixie IN-3	-	4
X0-X5	nixie IN-12B	-	6
VR0	LM7805	-	1
U3	K155NA1/SN74141N	-	1
U2	NE555P	-	1
U1	DS1307	-	1

U0	ATmega8A-PU	-	1
SW0-SW2	6mm switch	-	3
R64-R69	15k		6
R60-R63, R20	220k		5
R42-R59	220 SMD0805	220	18
R35-R41	100k		7
R28-R34	470k		7
R18, R21-R27	33k		8
R4-R7, R19	470		5
R1-R3, R15-R17	1k		6
R0, R8-R14	10k		8
Q14-Q20	MPSA92	KSP 92	7
Q7-Q13	MPSA42	A 42	7
Q6	BC547BG	-	1
Q5	IRF730	-	1
Q4	2N2907A	-	1
Q0-Q3	2N3904TF	-	4
P0	1k potentiometer	-	1
L0	100uH	-	1
J0	2.1/5.5mm 9v DC	-	1
D3-D8	LED 5mm RGB	-	6
D1	UF4007	-	1
D0, D2	1N4007	-	2
C16	2.2uF	-	1
C15	47pF	47	1
C14	470uF	-	1
C13	2.2nF	222	1
C7-C8	22pF	22	2
C2, C4-C6, C12	100nF	104	5
C0, C1, C3	100uF	-	3
BT0	coincell CR2032 holder	-	1
B0	Buzzer Piezo 5v	-	1
Connector	M20 Vertical Pin Header	-	21

1. SMD elements

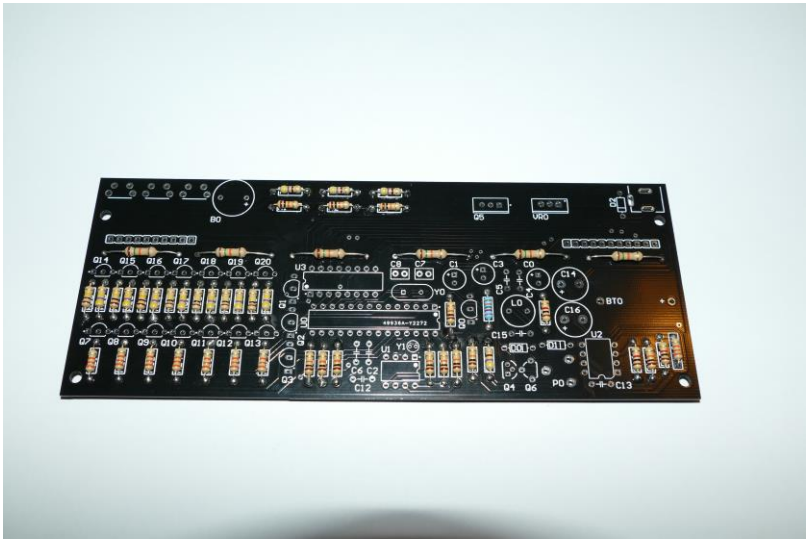


Notice that all SMD elements come pre-installed. It is because this DIY kit is targeting mainly beginners. You will only have to solder THT components.

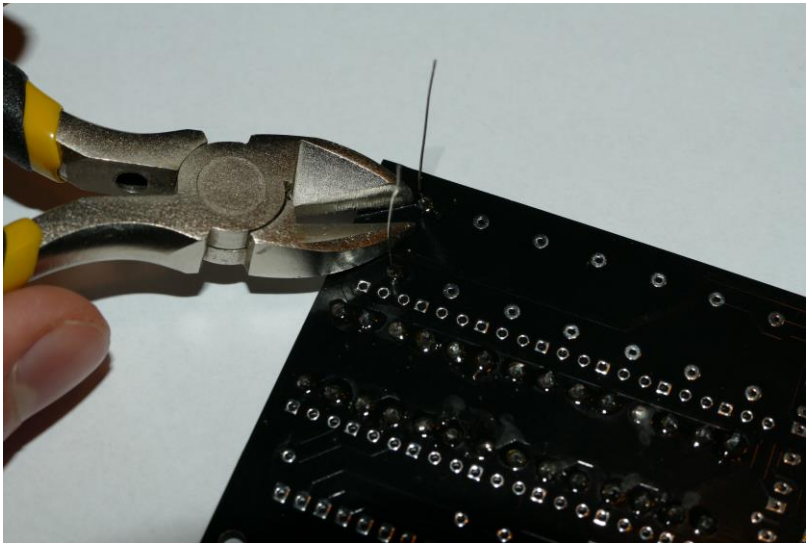


2. Resistors

Start by mounting resistors to the main board.

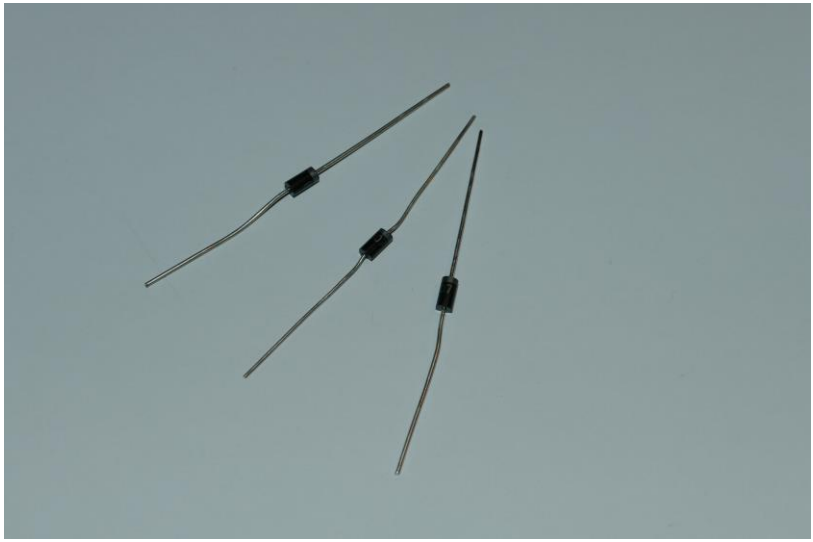


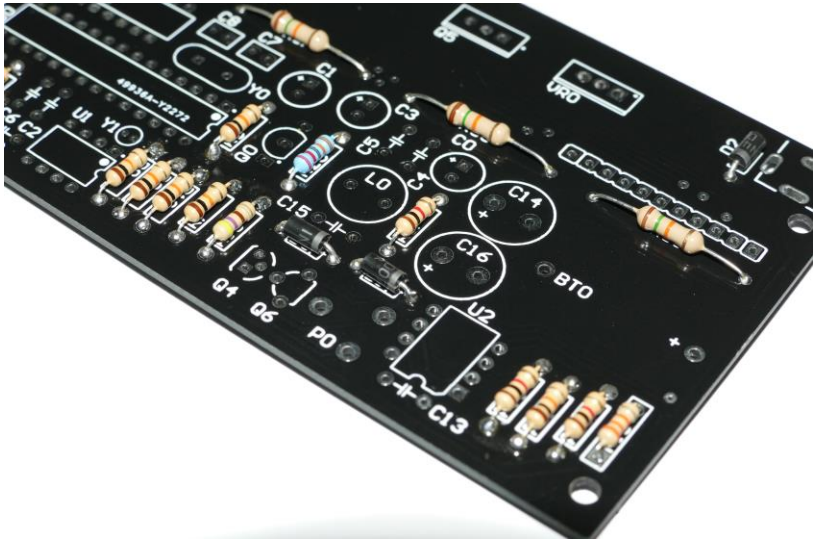
After soldering, use side cutters to cut remaining wire.



3. Rectifier diodes

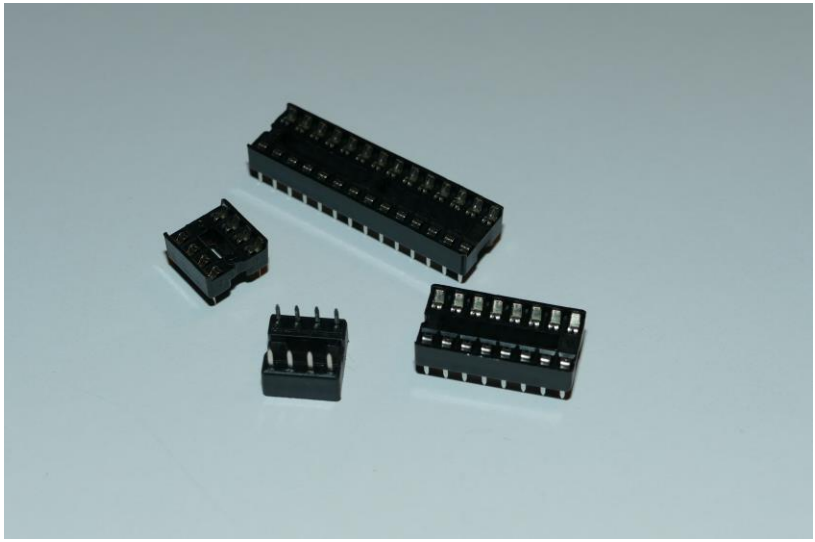
Next mount rectifier diodes.



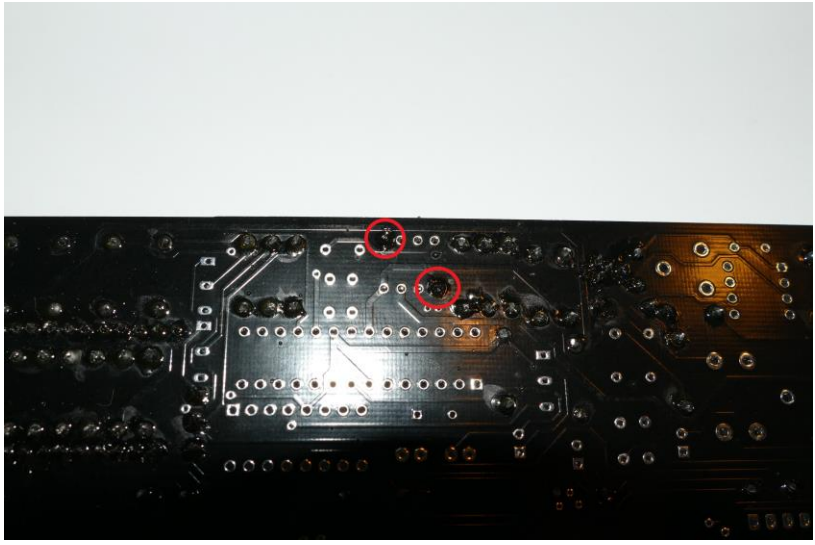


4. Integrated circuits sockets

Remember to match socket indention with symbol on the board.

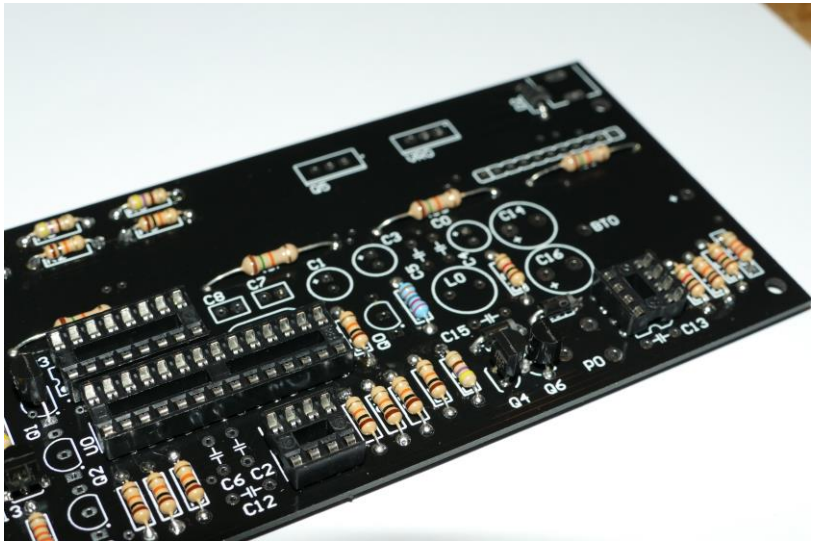


In order to mount them properly, start soldering pins on the diagonal sides. (As shown below)



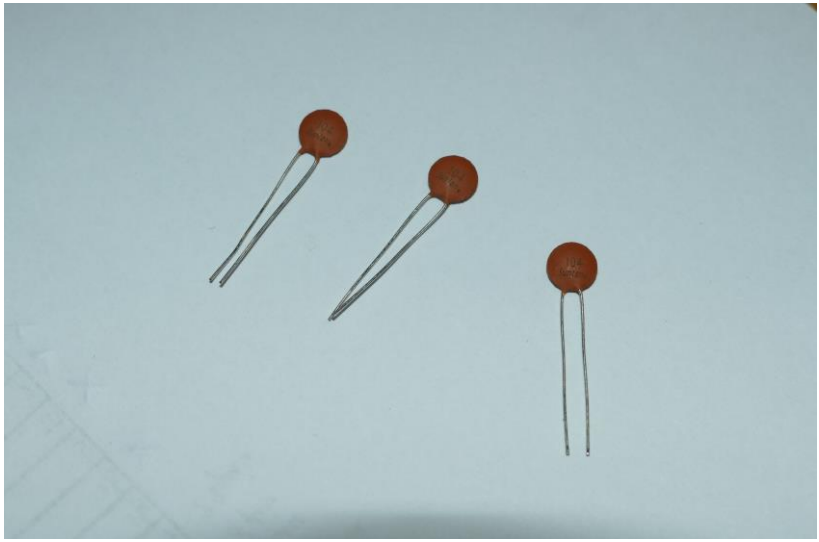
5. Transistors

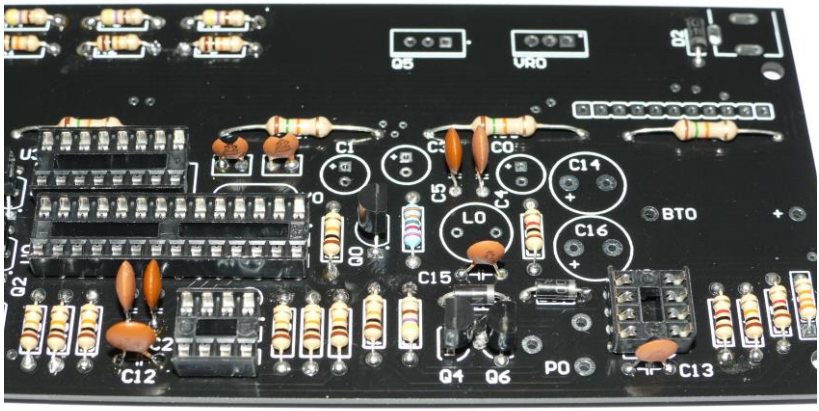
Mount all small transistors.



6. Ceramic capacitors

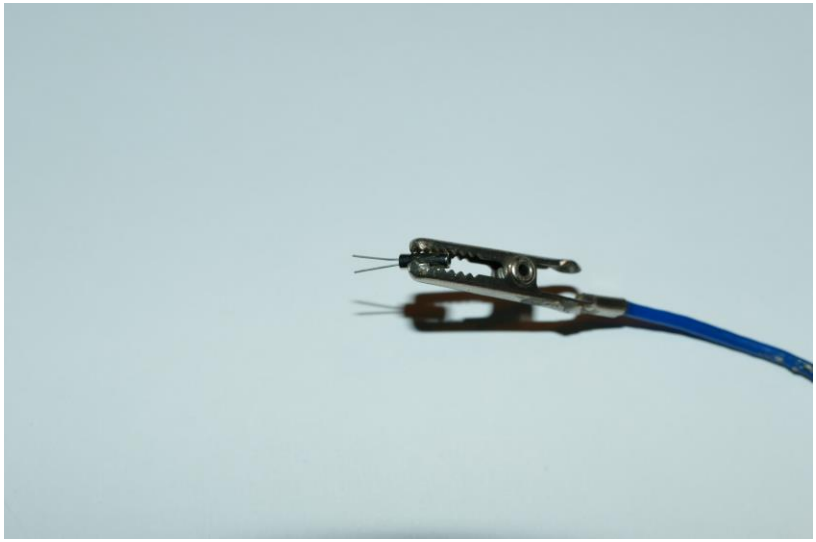
Solder ceramic capacitors. You can use codes from table of elements to distinguish them.

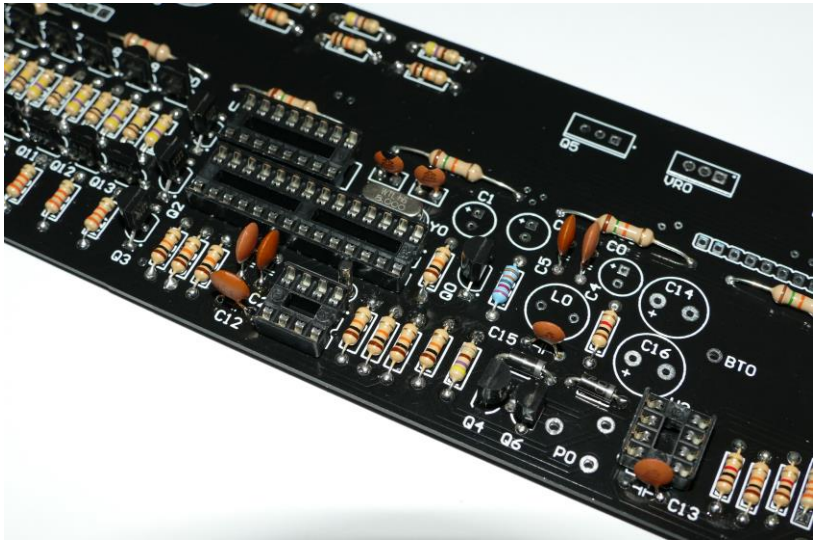




7. Crystals

While soldering small crystal, it is advisable to use crocodile clip in order to protect it from overheat. (it may have impact on clock accuracy over time)





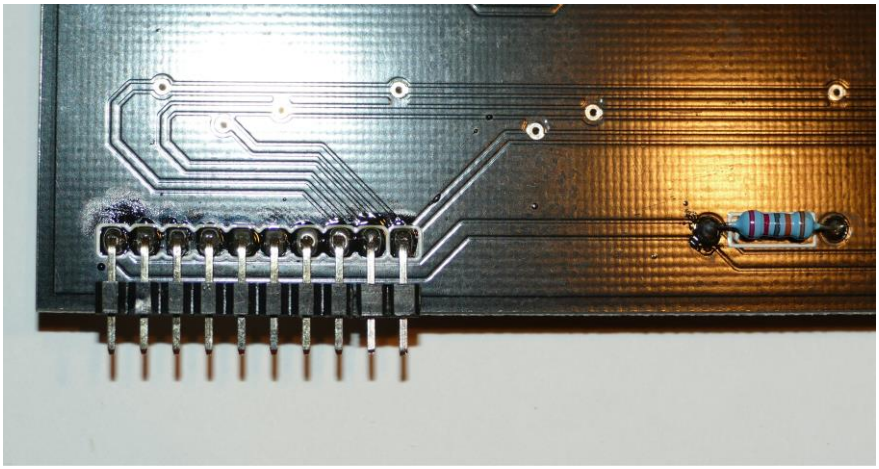
8. Foil capacitor and other parts

Mount foil capacitors, power socket, battery holder etc.

At the end; solder voltage regulator (VR0) and mosfet transistor (Q5).

9. Miscellaneous elements on the display board

Solder four resistors onto the display board. Mount connectors in the way that they stick out of bottom of the board as far as possible. (Connector in Your DIY kit might be different then the one on the picture)

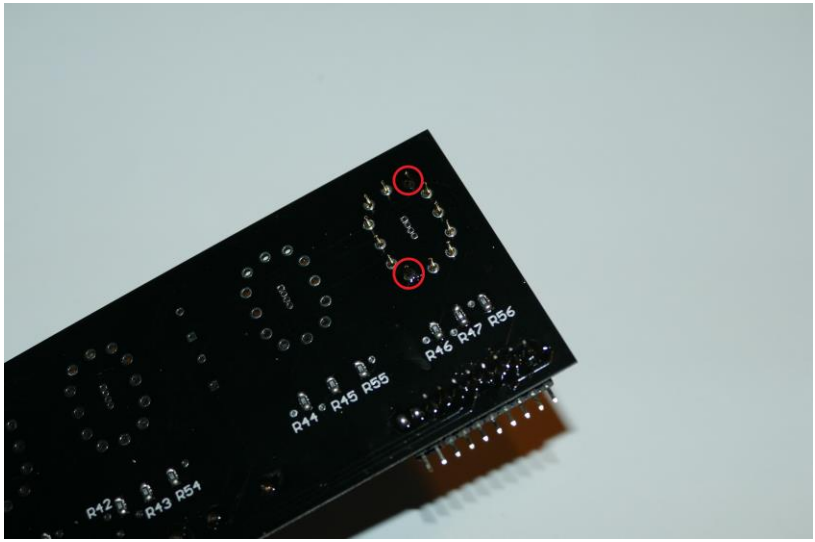


10. Prepare nixie tubes

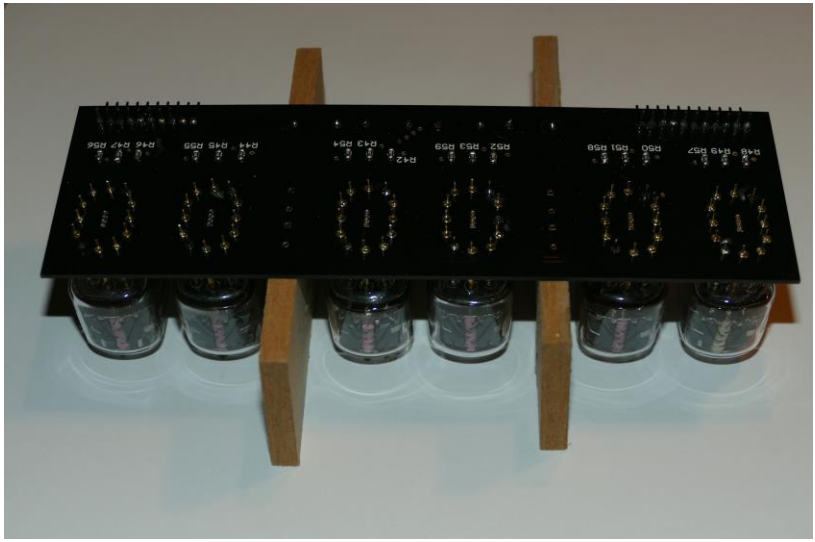
Put sockets on the nixie tubes' pins. Handle nixies with care, small cracks in glass near pins can cause "vacuum to escape", and tube won't light up!

11. Solder nixie tubes' sockets

Solder nixies' sockets diagonal pins first (the same as IC sockets).



You can use support to make soldering easier.

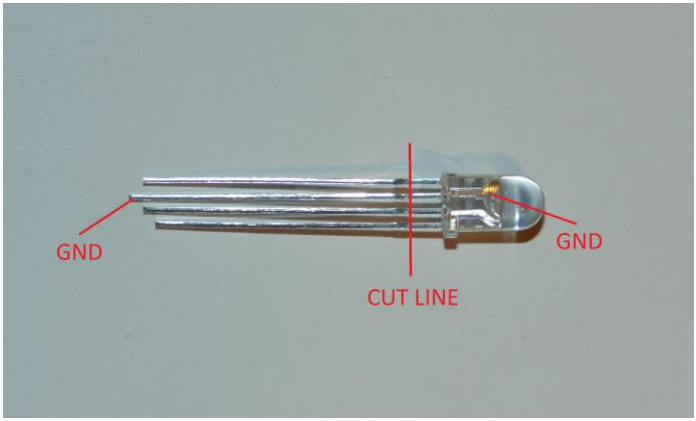


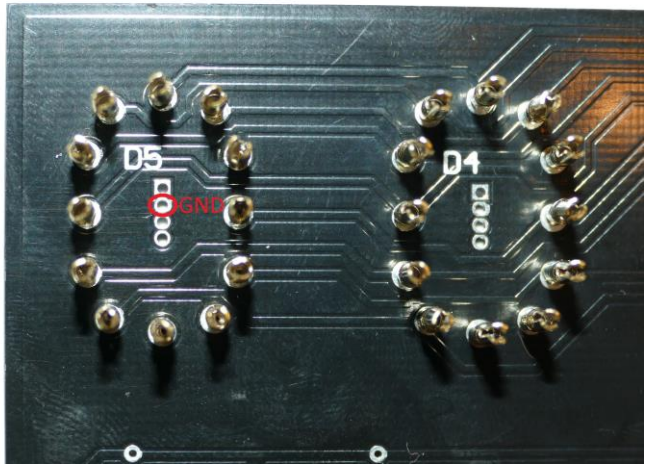
12. Remove nixies from sockets

Gently and slowly remove nixie tubes from sockets. Remember which nixie goes to which socket. (it will help You put them back later)

13. RGB LEDs

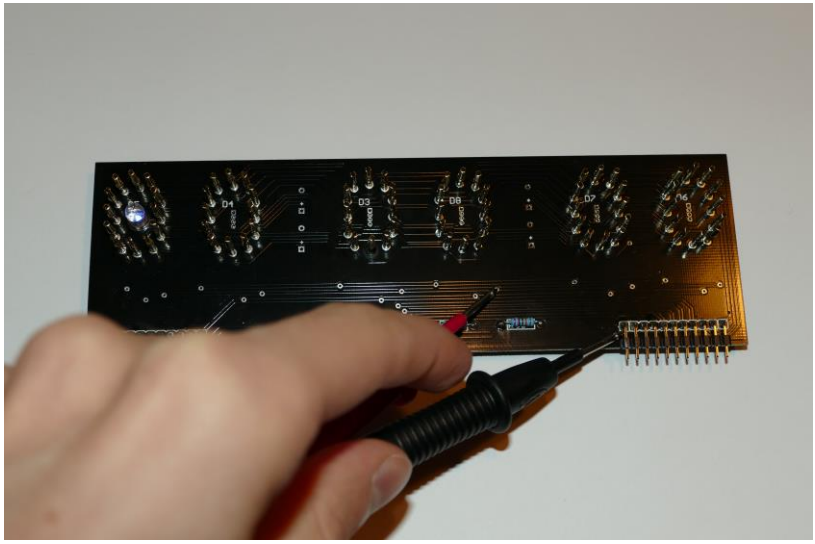
This is probably the hardest part of assembly. Changing soldering tip to precise one is advisable. Solder pump will be useful in this step. First cut LEDs as shown below. Place LEDs so that there is no space between theme and board.

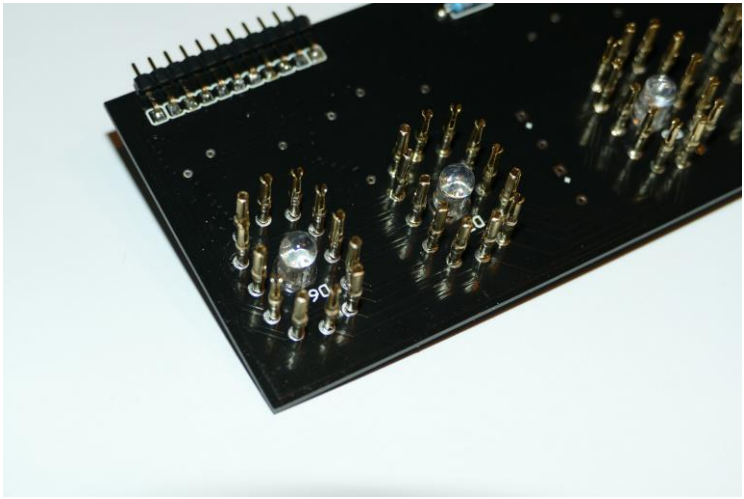




While mounting LEDs ensure that GND pin (the longest) is correctly placed in second hole from the top of the board.

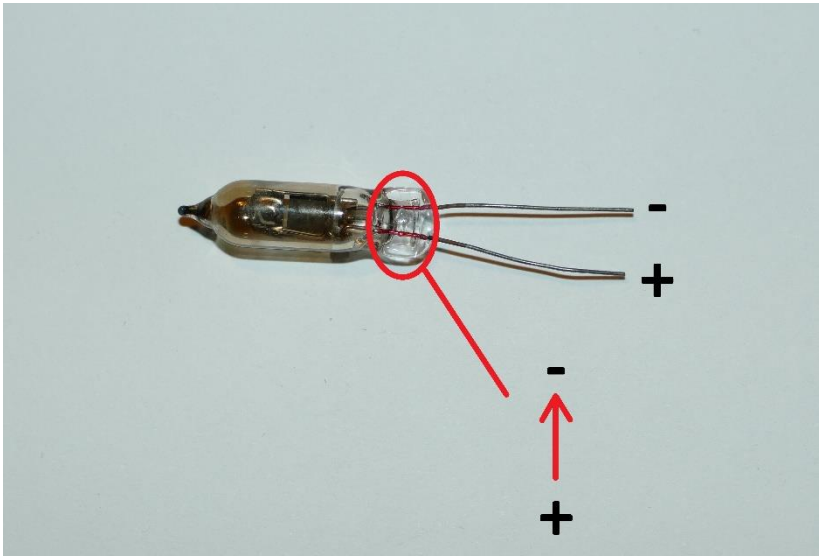
You can use multimeter's diode test mod or other power source to ensure that there are no shorts in-between LED color pins or GND. Plug ground to the most left connector, and positive to vias above (As shown below)





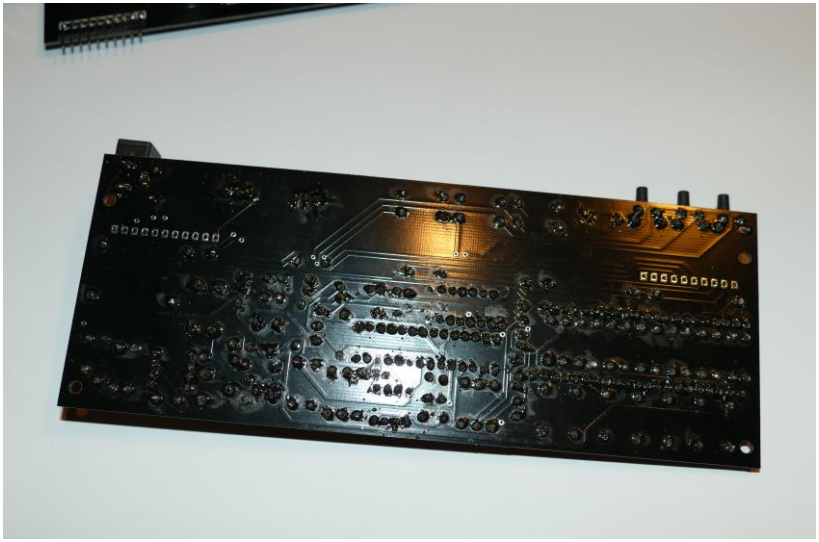
14. Mount separators

Solder separators at desirable pins height, be careful pins might be fragile!
The arrow on tube indicates polarity. (As shown below)



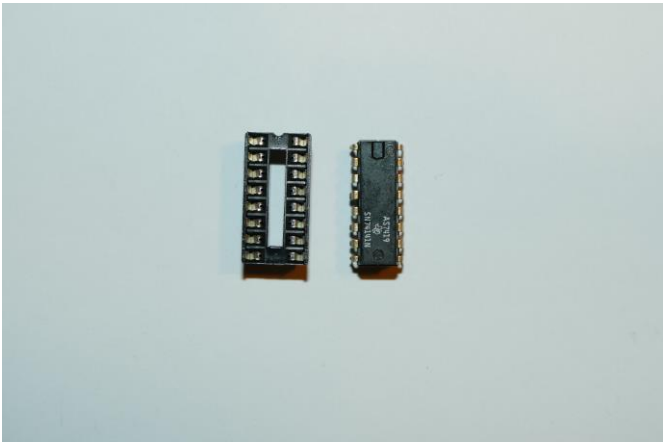
15. Place nixie tubes back in their sockets

16. Double check all solder joints!



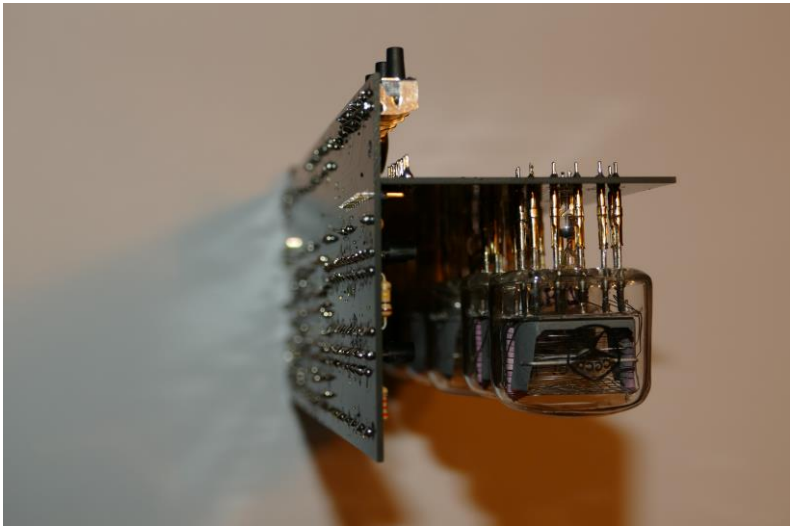
17. Place IC in their sockets

Remember to place them in correct orientation!



18. Solder boards together

Place clock on the side for better access to connectors' pins. Solder two furthest apart pins first. (the same as with IC or nixies' sockets)



19. Turn on

After last step, the clock should be completed. Just insert battery (will not boot up without it!), plug the power supply and You are ready to go!

Don’t forget to set up time first and adjust brightness. You will find instruction how to do that in the User Manual.

I hope everything went as planned, and Your nixie clock is working flawlessly and it will serve You for many years to come!

Sincerely, Jakub Dorda