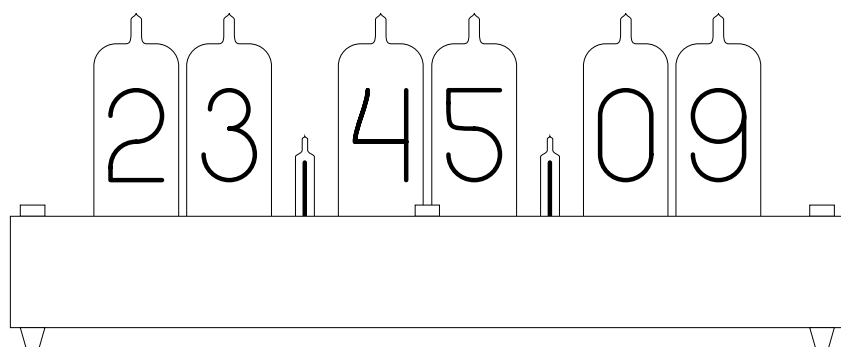




MIGHTY-6

Nixie clock DIY kit assembly manual

Proudly made in Georgia



WARNING!

THERE IS A LETHAL VOLTAGE ON THE PCB OF THE KIT. IF NOT HANDLED PROPERLY, IT WILL CAUSE DEATH OR SERIOUS INJURY. PLEASE FOLLOW THE MANUAL WHEN ASSEMBLING THIS KIT FOR STAYING ALIVE AND IN GOOD HEALTH. THIS IS NOT A JOKE!

PLEASE READ THIS MANUAL CAREFULLY. DO NOT SKIP OR CHANGE ORDER OF ANY STEPS GIVEN IN IT. IF YOU WILL NOT FOLLOW THESE STEPS IN THE CORRECT ORDER, AT END YOU WILL HAVE NON-WORKING CLOCK, WHICH, MOST LIKELY CAN'T BE FIXED.

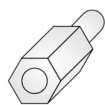
Please note: This is the manual for electronical and mechanical assembly of the clock kit. For the menu options and configuration data, follow the regular user manual, which is available for download at www.tiktoki.ge/projects/mighty6

This manual has both textual and graphical data, for ease of use and understanding. So, just read this text (it is not long or hard to understand) and then use slides as guides while assembling the clock.

The tools you will need: Soldering iron, tweezers, solder (preferably, lower temperature – 190-220C)

First step – let's check that we have all parts on hands. Your clock kit should include the following parts:

Main PCB	1 pcs
LCD screen	1 pcs
Nixie tubes	6 pcs
Dot tubes	2 pcs
Nixie tube diffusers	6 pcs
Nixie tube spacers	6 pcs
Dot diffusers	2 pcs
Dot spacers	2 pcs
Nylon hex standoff	3 pcs
Nylon hex nut	2 pcs
Nylon screw	3 pcs
Button cap	2 pcs



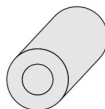
**Nylon hex standoff
3 pcs.**



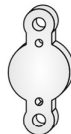
**Nylon hex nut
2 pcs.**



**Nylon screw
3 pcs.**



**Button cap
2 pcs.**



**Dot diffuser
2 pcs.**



**Dot spacer
2 pcs.**



**Tube diffuser
6 pcs.**



**Tube spacer
6 pcs.**



**LCD screen
1 pcs.**



**Main PCB
1 pcs.**



**Nixie tube
6 pcs.**

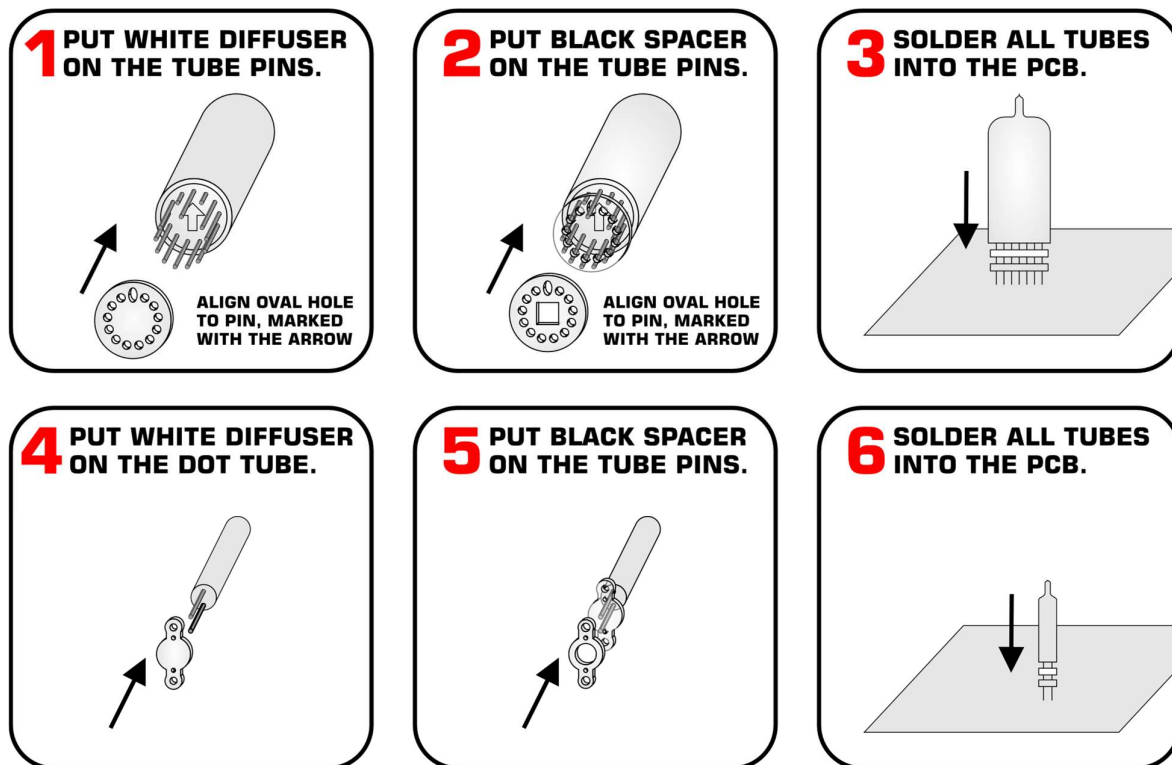


**Separator tube
2 pcs.**

Once confirmed that all parts are available, you can proceed with clock assembly.

First step - we need to put these diffusers (these are white ones) on the tube pins in the correct direction. As you can see, nixie tubes have two short legs (these are dots and we don't use them in this kit) and a longer leg in the middle of these two short legs. You should put the diffuser with oval pin over that leg (there is also a arrow on the bottom of the tube, pointing to that leg). Ensure that all legs go into own holes and there is no crossing or warping. Repeat same step, but this time using the spacers (black ones). Do same operations for the dot tubes.

Next step is to solder these assemblies onto PCB. This might appear tricky at first, but there's nothing hard in it, once you get the idea. Quite possible that you might think – “Why these tubes have such long legs, why not shorten them and solder directly?” Unfortunately, this does not work that way – these legs are flexible and you will have hard time fitting them into holes on PCB, if they will be short. Instead, do this in the following way: Put one or two legs thru the holes and use tweezers to guide remaining ones thru the holes – these legs are quite flexible so don't be afraid that you will easily break or damage them. Once all legs are in, bend them slightly to sides, so tube won't fall out. Using your fingers (or included T.I.T.S. if you have ordered it) align tube vertically in all directions and solder all pins. **Please note: Bottoms of IN-14 nixie tubes are NOT perpendicular to their sides!** So if you just press tube down until it's bottom touches diffuser and solder in that way, you will get tilted tubes as result. Repeat same steps for dot tubes. Check the image below for the visual representation of the text above.



Once soldering is complete, we can proceed to the next step – checking whenever all pins of all tubes are soldered properly. **DO NOT TRIM TUBE LEGS YET** – you might have to re-solder them.

Special and important note about the power supply. This clock requires USB PD compliant power supply of at least 18W of power. We include the matching power supply by default. **WE CAN NOT GUARANTEE THAT THIS CLOCK WILL WORK WITH YOUR POWER SUPPLY, SINCE THERE ARE THOUSANDS OF DIFFERENT POWER SUPPLIES ON THE MARKET. SO PLEASE ONLY USE THE INCLUDED ONE.**

First run – testing the tube soldering quality. We need to test that all the legs of tubes are soldered in properly before we solder the LCD. For that, do the following:

Place assembled PCB on a flat surface with tube faces clearly visible. Double check that it is not touching anything conductive and tube legs aren't shorted between each other.

(Firmware 2.32 and earlier:)

Apply the power and wait about 10 seconds – this is first run, clock is doing initialization. After that, you should see all tubes displaying 00s at low brightness – this is correct. The seconds tube should start counting and dots blinking. Wait for a minute and carefully watch for tube refresh sequence, the following segments should lit up (from left to right)

1st tube: 0 1 2

2nd tube: 0 1 2 3 4 5 6 7 8 9

3rd tube: 0 1 2 3 4 5 (Some random digits might come on after 5, this is normal)

4th tube: 0 1 2 3 4 5 6 7 8 9

5th tube: 0 1 2 3 4 5 (Some random digits might come on after 5, this is normal)

6th tube: 0 1 2 3 4 5 6 7 8 9

(If these segments are coming on too quickly, you can use your cell phone camera to record a video and then watch it frame by frame)

Dots will be also blinking once per second.

(Firmware 2.35 and above:)

Keep any of the buttons pressed and power the clock that way. All digits should display "0". Pressing any of the buttons will change the digit readings to the next value, as shown in the table above. Dots will also blink on each keypress.

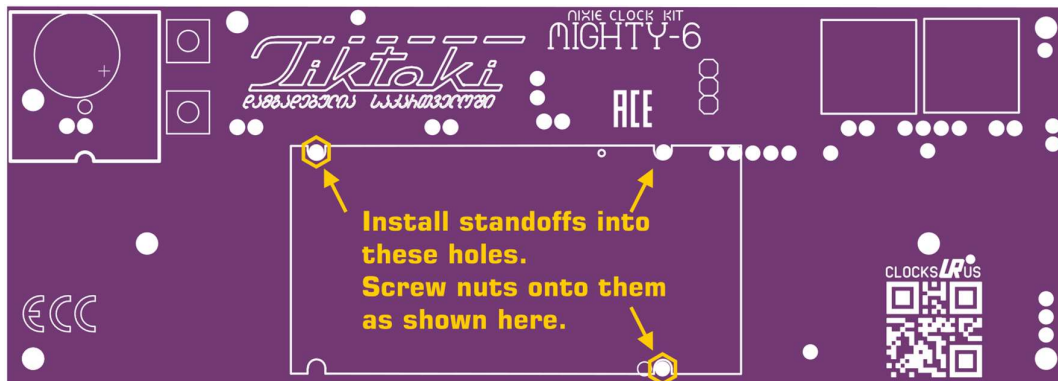
If all numbers are shown in proper sequence and dots blink too, then you can proceed to the next step. If not, unplug the clock power, wait at least 30 seconds and re-solder pins of the troubled tube.

Once all done, it would be wise to leave clock running for 1-2 hours. This is because, not all users have good soldering skills, and since tube gets warm when running, there might be a cold solder joint, which can disconnect later, so it will be good to do this pre-check.

After ensuring that all digits are lit up properly and working fine, turn off the clock and trim the protruding tube legs.

LCD Screen Installation.

Disconnect clock from the mains, wait at least a minute. Using included nylon nuts, attach hex standoffs to the PCB. There are 3 standoffs but only two nuts included. This is not error – only two nuts are needed, 3rd standoff is being held by LCD Screen itself. Please refer to picture below to see where you should install standoffs and use nuts only over which ones.



Once standoffs are installed, place the LCD over them, carefully aligning it to pins on the PCB. Secure the LCD with the included nylon screws and solder the terminals.

Apply power to the clock, LCD screen backlight should come on and text “Press any key to enter setup” should appear. If there is no LCD backlight or screen displays squares instead of text, this means that you have not soldered all the pins. Turn off the power, resolder the pins and try again.

Once LCD screen is working fine, put keycaps over the buttons and you're done! Power the clock, enter the setup and set date/time/alarm/backlight as you desire – read the manual available at www.tiktoki.ge/projects/mighty6 for the details on setup sequence and options available.

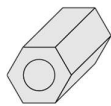
If you have bought the DIY acrylic case kit from us, or want to read the FAQ section, then please proceed to the next pages of this manual.

Assembling the acrylic cabinet for this nixie clock

The tools you will need: Cross head screwdriver – PH01 size, Hex key – M2 size.

First, let's start with the parts check list – you should have the following parts at hands:

Top panel	1 pcs
Bottom panel	1 pcs
Rear panel	1 pcs
Front panel	1 pcs
Sides	2 pcs
Brass hex standoffs	4 pcs
Nylon hex standoffs	4 pcs
Flat head screws	4 pcs
Hex head screws	4 pcs
Small head screws	4 pcs
End cap	4 pcs



Nylon hex spacer (white)
4 pcs.



Brass hex standoff (gold)
4 pcs.



Small screw (silver)
4 pcs.



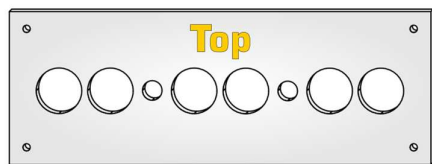
Flat head screw (black)
4 pcs.



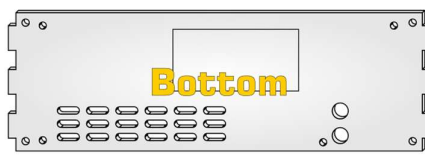
End cap (black)
4 pcs.



Hex head screw (black)
4 pcs.



Top



Bottom



Side



Side



Rear



Front

The next step is to remove the protective film from the acrylic parts. Do not try to put the parts together without removing the protective film – parts are made with high tolerance, and forcing them into together with film applied will cause them to break!

After the protective film is removed, attach the nylon hex standoffs to the rear plate as shown on the picture. Then install brass hex standoffs in a way that their screw end protrudes thru the panel. Screw the end caps on these ends to secure them in place.

Place PCB over the nylon hex standoffs, facing with LCD screen down and secure it in place using 4 small flat head screws. Take attention that button end caps are aligned properly and both buttons are easy to press.

Carefully insert sides into rear panel from below. Take that assembly and place it on the bottom part, taking care that USB port is protruding enough. At this stage, this part will be loose, but don't worry, it will snap in place later.

Place the front panel over the assembled parts and snap it into place, now whole enclosure should be centered around the bottom part, via the finger slots on the sides of the clock enclosure.

Place the top panel over the top of the clock PCB. Take care of the orientation – if you see that top is not aligning properly, just turn it upside down.

Use remaining hex head screws to secure the top part into place.

That's all, assembly is finished!

Answers to some possible questions.

As this is a DIY kit which requires knowledge of soldering, it means that owner of this kit has curious mind, desire of building something at of course – a lot of questions, too. Below I will try to answer for some of them.

Q: I want to build my own enclosure, where I can get PCB outline?

A: PCB mounting outline, as well as DIY acrylic cabinet plans, are available for download at www.tiktoki.ge/projects/mighty6

Q: Are there any specific requirements for the cabinet?

A: Yes, they are some. This clock consumes about 5W of power, which is mostly converted into heat. This means that your cabinet should allow adequate ventilation - no sealed cabinets are allowed. Also keep in mind, that power converter components, located at the rear end of the PCB, might reach up to 70C in certain circumstances (high heat, high brightness, etc.) So when designing your enclosure, consider that no plastic parts will be touching these components (there should be some clearance of at least 5mm, or the will melt).

Q: What are the power requirements?

A: This clock operates from USB PD compliant power supply and will “talk” to power supply and select the required voltage automatically. However, for some reasons you might want to power this power supply from different source. No problems, any DC voltage in between of 9-14 volts is accepted. Power consumption is about 6 watts at maximum brightness.

Q: Can I install different (larger, brighter, different color) LCD?

A: Yes you can. This clock uses standard, Hitachi HD44780 compliant LCD screen, so called 1602 LCD display, with standard, parallel interface pinout. So as long as your display matches these specifications, it can be easily swapped, just you might need to adjust voltage on pin #3 – to set the desired contrast. You even might noticed that there is a place for FPC connector on the PCB. It is for connection of different model

of LCD screen, which can display eastern languages natively. It also has standard 1602 LCD module pinout, so you can solder to it instead, if you prefer. Location of pin #1 is marked with white circle for both types of connection.

Q: Can I connect my own buttons?

A: Yes you can. Unsolder the button closest to the edge of PCB. Under it you'll find two holes, where you can connect your buttons – one button goes there directly, another one – via 10K resistor.

Q: Where I can download circuit diagram?

A: Nowhere. It is not public.

Q: What about firmware updates, are there any available?

A: No. clocks are delivered as “read-only” and you can't download or update firmware in them.

Q: What about the new features for this clock, will they be implemented?

A: Current PCB only supports addition of MP3 module for alarm sound, but still, it is not available for upgrade – if you ordered clock with MP3 function, you will receive appropriate programmed clock – you can't change functionality by yourself.

Q: Can I use different tubes with this board?

A: Yes you can, this board has beefy power supply, so it can handle any nixie tubes, as long as they do not require more than 180VDC.

Q: How can I connect other nixie tubes to this clock?

A: We do provide adapters for the following types of nixie tubes: IN-16, IN-8-2, Z570-574, LC-531, Z1000M, ZM1080T. Adapters sold separately and add \$10 to total order cost. The following tubes were connected directly and confirmed to be also working without any issues: IN-1, IN-4, IN-12, IN-18, Z560M, LC-511, ZM1020,

Q: Will be there an “extended” version of this kit available?

A: Yes, the extended version is in production. It will have much more memory, faster CPU and will be user-configurable – modules can be added as needed. The key functions are as follows: Support for 8 nixie tubes instead of 6 – it will be able to use IN-19 nixie tubes to display C/F or % signs for temperature and relative humidity display. Other features include GPS support, FM radio support, temperature and humidity measurements, configurable timer for external load control, graphical LCD support. Estimated ship dates are Q4/2023.

This is all so far!

FAQ section will be expanded as more questions will be asked.

Yours truly,

Alex