Assembly Instructions Z570M-1-V1 Nixie Clock

IMPORTANT
Unless you are very experienced with kit-building, it is highly recommended to follow the steps below. First read the entire document twice, before starting. At the end of the document there are two pictures to help you check which parts should go on the top or bottom of the pcb.

First step is to solder all the resistors. The resistors have numbers printed on them, and you should not mix them up.

The value of a resistor is printed as a small number, for instance 472. This should be read as 47 plus 2 zero's, so the value would be 4700 ohms, which is the same as 4K7. It can also be printed as 4701, meaning 470 plus 1 zero, again 4700 ohms or 4K7. A printed value of 3300 means 330 plus 0 zero's (!) so that is indeed 330 ohm. When you are in doubt, use a multimeter and simply measure the value.

The resistors are numbered in increasing order, using designators like R1, R2, R2 etc. Their values can be found in the schematic and/or component list.

For soldering you need:
  a) very thin solder, diameter 0.5 mm. (0.020 inch).
  b) insanely good eyesight, or a jewelers loupe, magnifying glass, or cheap +3 reading glasses.
  c) long sharp pointed soldering tip. 25-30 watt iron.
  d) steady hand.
  e) metal tweezers. Make sure the tweezers align properly, adjust them by either bending, grinding and sanding.

LAST WARNING
Believe it or not, but SMD components are like flees. They can jump hundred times their own size. Your tweezer has to be absolutely perfect, has to close 'parallel'. Even the best brand new tweezers need some bending, sanding, filing, etc. Make sure your table is clean. Make sure you have enough light. If an SMD components is upside down, don't try to turn it, it will jump away. Better is to lift it a couple of centimeters, using the tweezer, and let it drop again. With some luck, it is now facing up. Also, count all the components in the kit, so you will know how many have actually jumped away before you could solder them. No kidding!!!

Find a resistor and locate on the PCB where it has to go. First put a tiny bit of solder on one pad, about 2 mm. of solderwire is enough. Just make a nice little blob of solder on one of the pads. Now use the tweezer to place the resistor on the right pads, and reflow the solder on the pad you have just presoldered. Move away your soldering iron. Now the resistor won't move anymore, so you can let go of the tweezer. Solder the other pad, applying a few mm. of solder. Finally solder the first pad, adding some solder too. If the component has disappeared mysteriously, it probably hangs on the tip of your soldering iron.

Take your time, and don't panic. If you don't get the hang of it after 5 resistors or so, better stop and ask a friend to help you.

After you have done all the resistors, you can do the transistors. These have three legs. Again, find the place on the board where it has to go, and pre-solder the middle pad. Place the transistor and touch it with the soldering tip, so that the transistor is fixed in position. Solder the other 2 remaining pads, and finally add a tiny bit of solder to the first pad. Don't overheat the transistors, you should not spend more than a couple of second on each pad.

The high voltage FET (T26) is static sensitive. Take care. Do not walk over carpets and do not pet your cat before mounting this one. Washing your hands is a good way of discharging yourself. First solder the little pins, then solder the large tab.

Mount the electrolytic capacitors, the square hole indicates the (+) connection. Take care to mount these correctly. A reversed capacitor will certainly fail; your clock won't work.

Mount the inductor, potentiometer, these go on the bottom as well. The layout drawings suggest that the little pushbutton should be mounted on the bottom, but it can also be placed on top. Decide for yourself what you like best, as it depends a bit on the enclosure you intend to use. If you don't know yet, just insert in without soldering. It will make good contact even without soldering.

Mount IC1 (MC34063A) and diode D3. Mount the IC socket for IC101, but do not insert the PIC16F88 yet. Mount IC101 (oscillator). Insert the led through the center hole, with the legs bent in a nice u-shape. The long leg goes into the square hole.

Do not mount the nixie tube yet.

Mount all other parts on the PCB. Do not insert the PIC processor yet!

Connect a 12VDC/100mA (or better) adapter to the board. Only connect it for 1-2 seconds, then disconnect and check if the FET remains cool. If it gets warm or hot, check all the parts for the high voltage circuit. The FET should stay really cool. Then plug it in for 3-5 seconds and check again. If the FET stays cool, you're okay.

Now that the FET stays cool, you can keep it plugged in, and measure if you have 5V on the 7805 regulator. If you don't have 5V, check the polarity of your DC-adapter, you may need to reverse the +/- and check things again. Proceed if you have a clear +5V. If the polarity of the adapter was wrong, you have to check again if the FET does not run hot, see above.

The next step is to insert the PIC processor. Be careful to align the pins, not to bend them as you insert the IC in its socket. All pins first should go in about one millimeter, without any brute force needed… and **then** you may press a bit harder so that it firmly sits in the socket. Please don't insert the PIC in the wrong way, there is a little notch on one end, that should match the notch on the PCB/Socket itself. Inserting it wrong will damage the PIC for 100% sure, your clock will never work, and you have to contact me for a replacement.

Put the screw of the potentiometer in the middle. Connect the DC adapter, but be careful not to touch any parts, after all there is a high voltage converter on the circuit board !!! Although it probably won't kill you immediately, it can be very uncomfortable. Check the high voltage generator, it should be 140V-145V. Later you can set the voltage higher, if you want the tube to be brighter.

The last step is to mount the nixie tube. The kit contains a piece of transparent sleeve. Cut pieces of 10mm and slide these over the wires of the tube. Insert the wires into the board, one by one. After all wires are inserted, move the tube a bit backward and forward, from left to right, to work it down until it sits tight on the plastic sleeves. Turn the board upside down, and solder two or three wires, and check again if it is firmly down. Also check if the position is not at an angle. If all is okay, solder the other wires.

Okay, now we can now connect the DC adapter again. The tube should display the time, starting at 12:00 hours. If the tube is a bit dim, turn the potentiometer a little bit until the display improves. If you miss one or more digits, check the board again, maybe you forgot to solder one or more legs of some transistor.

Now your clock is ready! Congratulations! If it doesn't work and you can't find what is wrong, just send me an email at support@franktechniek.nl
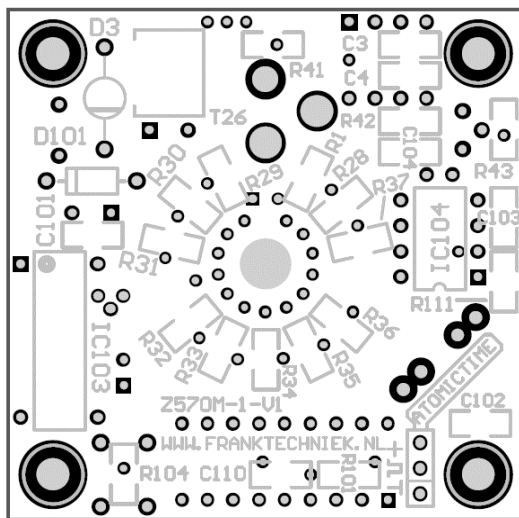
This picture shows which parts should be fitted on the top. The pushbutton can be mounted on top or bottom, whatever you like best.
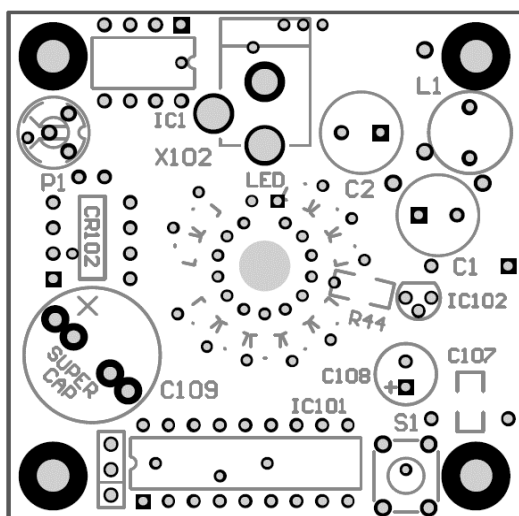
The transistors are mounted in a circle, on the bottom side. Also take care mounting the capacitors, placing them in the right direction (polarity). The long leg of a capacitor should go into the square hole.