Assembly Instructions Binary Led 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 all numbered, 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 component 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 tiny 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, adding a tiny bit of solder. 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 and capacitors, 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 the pre-soldered pad 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 if need be. Don't overheat the transistors, you should not spend more than a couple of second on each pad.

Mount the electrolytic capacitor, the square hole indicates the (+) connection. Take care to mount this part correctly. A reversed capacitor will certainly fail; your clock won't work. You may want to mount this capacitor on the bottom, or else it may touch the front panel, if you are going to use a front panel. You will notice that the holes for the DC connector are quite large, leaving some big gaps. Don't worry, just apply a lot of solder here, and the gaps will close nicely.

When mounting the leds, also take care mounting them correctly. The long leg of the led goes into the square hole. Leds are like diodes, they only work in one direction. If you mount them reversed they will never lit up. Do not solder for too long, leds are also rather sensitive and easily damaged. The leds I used are very bright and perhaps too bright for direct view. It depends on the enclosure and filter. If you are going to use an opaque white filter, you're probably okay. If you use a transparent colored filter, it may be an idea to file off the leds. You can use a sanding block for this, and sand off all leds at the same time. You can sand off the entire dome of the led, giving them a nice flat surface. You can also decrease the current through the leds, using higher value series resistors.

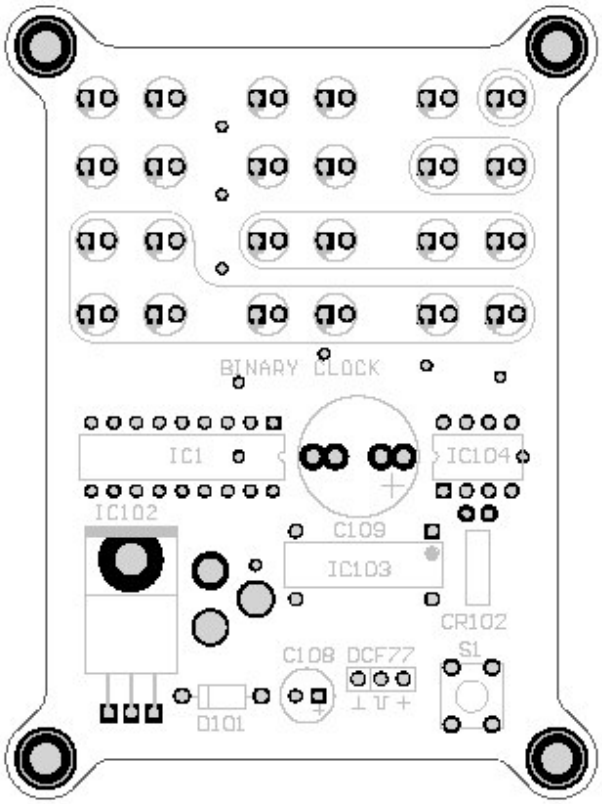
Mount all other parts on the PCB. Do not insert the PIC processor yet!

Connect a 9VDC/100mA (or better) adapter to the board. Test 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.

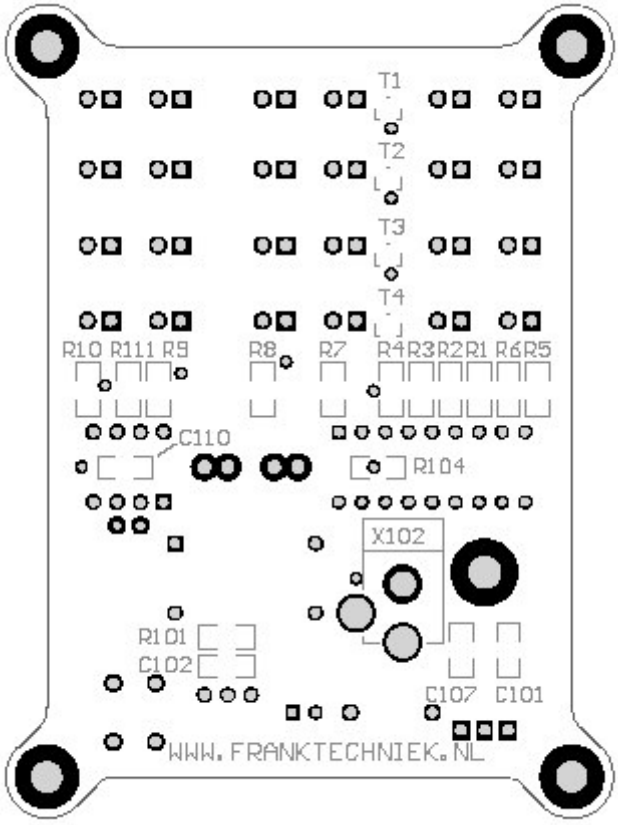
The next step is to insert the PIC processor. Be careful to align the pins, not to bend them as you insert the IC in its socket. All pins first should go in about one millimeter, without any brute force needed… and **then** you may press a bit harder so that it firmly sits in the socket. Please don't 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 will have to contact me for a replacement.

Connect the DC adapter again, and with a bit of luck, you should see the all the leds go on, and making patterns. If you don't see the leds turned on or blinking, disconnect the adapter, and check the board for shorts. Closely examine the entire board. Check if all parts have all their pins soldered.

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.



And some parts go on the bottom….