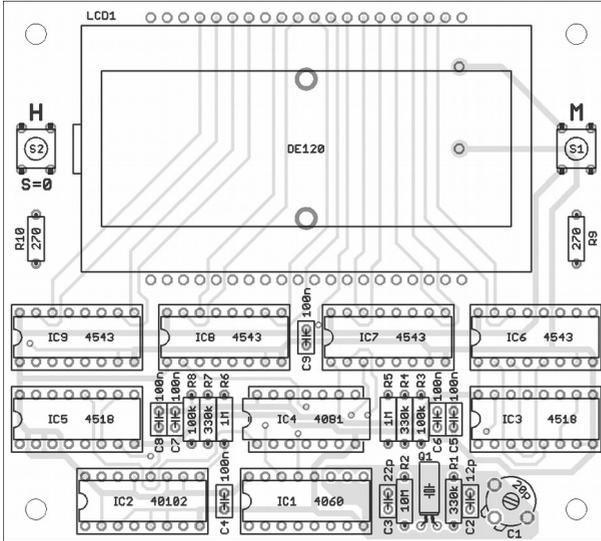


# LCD Clock Construction Kit

## Contents:

- |                               |                             |                              |
|-------------------------------|-----------------------------|------------------------------|
| 1 PCB "LCD Clock v1.0"        | 8 IC sockets, 16-pin        | 1 Ceramic capacitor, 22 pF   |
| 1 IC 4060 (oscillator/div.)   | 1 LCD "DE120" (4 digits)    | 6 Ceramic capacitor, 100 nF  |
| 1 IC 4081 (quad AND gate)     | 2 Resistors, 270 $\Omega$   | 1 Trimmer capacitor, 5-30 pF |
| 2 IC 4518 (dual BCD counter)  | 2 Resistors, 100 k $\Omega$ | 2 Push-buttons, 6x6 x 8 mm   |
| 4 IC 4543 (7-seg. decoder)    | 3 Resistors, 330 k $\Omega$ | 1 Battery Holder, 3x AAA     |
| 1 IC 40102 (BCD down-counter) | 2 Resistors, 1 M $\Omega$   | 2 Screw, M2.5x3, countersunk |
| 1 IC socket, 14-pin           | 1 Resistor, 10 M $\Omega$   | 2 Screw, M3x8, cheese head   |
|                               | 1 Ceramic capacitor, 12 pF  | 2 Threaded standoff, M3x15   |



## General Soldering Advice

Insert the components one at a time and bend the leads outward slightly to prevent the component from falling out. Heat up the solder joint for a second before feeding some solder wire between the soldering iron's tip, the board and the component's lead. Wait for a few more seconds before removing the tip from the solder joint. Don't move the board until the solder has solidified. After soldering, trim the leads with a wire cutter to about 1 mm length.

See [http://mightyohm.com/files/soldercomic/FullSolderComic\\_EN.pdf](http://mightyohm.com/files/soldercomic/FullSolderComic_EN.pdf) for more detailed instructions.

**I recommended soldering the components in the order listed below.**

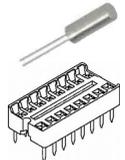
**1. Resistors (R1-R10):** Bend the leads 90° as close to the resistor body as possible before inserting them into the board. Orientation doesn't matter.



Resistor	Value	Colour Code
R1, R4, R7	330 k $\Omega$	orange, orange, yellow, gold <i>or</i> orange, orange, black, orange, brown
R2	10 M $\Omega$	brown, black, blue, gold <i>or</i> brown, black, black, green, brown
R3, R8	100 k $\Omega$	brown, black, yellow, gold <i>or</i> brown, black, black, orange, brown
R5, R6	1 M $\Omega$	brown, black, green, gold <i>or</i> brown, black, black, yellow, brown
R9, R10	270 $\Omega$	red, violet, brown, gold <i>or</i> red, violet, black, black, brown

**2. Quartz Crystal (Q1):** Bend the crystal flat against the board. Orientation doesn't matter.

**3. IC Sockets (IC1-IC9):** Insert the IC sockets into the board, making sure the orientation of the small notch matches the silkscreen outline. You can bend two diagonally opposite pins of the socket if you like to prevent the sockets from falling out.



**4. Capacitors (C1-C9):** Orientation is only important for the trimmer capacitor (C1). If your kit contains a 3-pin trimmer, it will only fit one way. If you have a 2-pin trimmer, use the two left holes in the board, and insert the trimmer with the flat side pointing down (towards the "C1" label).

Capacitor	C1	C2	C3	C4-C9
Value	Trimmer 5~30 pF	12 pF	22 pF	100 nF
Marking	none	12	22	104 (10·10 <sup>4</sup> pF = 100 000 pF = 100 nF)



**5. Push-buttons (S1, S2):** Insert the push-buttons to the intended locations. They will fit in two orientations, both are fine.



**6. Battery Holder (BAT1):** Insert the battery holder from the bottom side of the board and cut the two leads of the battery holders **flat against the board** (if they stick out too much, they could damage the LCD), using **heavy-duty side cutters** (the leads are very hard and will ruin normal lead cutters). You might have to remove the battery holder from the board again to cut the leads short enough. Mount the battery holder to the board using the two small countersunk screws (the screws will cut their own threads into the holes in the PCB). Be careful not to over-tighten the them, stop when the required torque increases and the battery holder is held firmly in place. Finally, solder the battery holder leads to the board.



**7. LCD (LCD1):** Insert the LCD and make sure its bottom surface doesn't touch the battery holder leads or solder joints. The LCD has a small bulge on one side, it must face left to match the marking on the silkscreen outline. Double-check the LCD's orientation and the soldering quality on the battery holder before soldering the LCD as it will be hard to remove again.

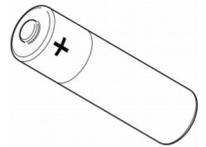


**8. ICs (IC1~IC9):** Insert the ICs into their corresponding sockets. You may have to bend the pins inward slightly before they will fit into the socket. Make sure the IC's notches match those of the sockets and the silkscreen outlines. Sometimes, the notch is replaced by a tiny dot near pin one, which should also face towards the notch of the socket.



IC	IC1	IC2	IC3, IC5	IC4	IC6~IC9
Type	4060	40102	4518	4081	4543

**9. Batteries (not included):** Insert 3 AAA batteries into the battery holder. Numbers should appear on the LCD immediately. The counters start up at a random position, so it's possible the display won't show a valid time at first. This will fix itself when you set the time.



**10. Set the Time:** Use the "H" (hours) and "M" (minutes) buttons to set the time. The seconds counter is reset every time the "H" button is pushed. To set the time second-accurate, follow this procedure:

- Set the hours to the current hour minus one (for 00:xx, set the hour to 23).
- Set the minutes to the current minute plus one.
- At the next full minute (when the time "catches up" to the minutes you set), push the "H" button one more time.

**11. Mount the Clock.** If you want to hang the clock, you can use two nails exactly 3.3" (83.82 mm) apart. They will fit in the two top holes in the board. To make a standing clock, mount the included standoffs to the bottom two holes using the M3x8 screws (screw from the front, standoff from the back).

**12. Improve Accuracy:** If the clock is slightly fast or slow, you can change the oscillator frequency by adjusting the trimmer. You need a frequency counter with an accurate reference, ideally a rubidium frequency standard. Probe the frequency at IC1 pin 9 and adjust the trimmer for exactly 32768.00 Hz. The adjustment should be done at the same temperature as that of the room where the clock will be operated. Make sure not to heat up the crystal by touching it.

**Questions? Problems? Comments? Ideas?**

Please contact me! E-Mail: [arne@blinkenarea.org](mailto:arne@blinkenarea.org)

**Project webpage:**

- de: <http://wiki.blinkenarea.org/index.php/LcdClock>
- en: <http://wiki.blinkenarea.org/index.php/LcdClockEnglish>