

ATmegaXX8 Board with 96x60 Pixel LCD

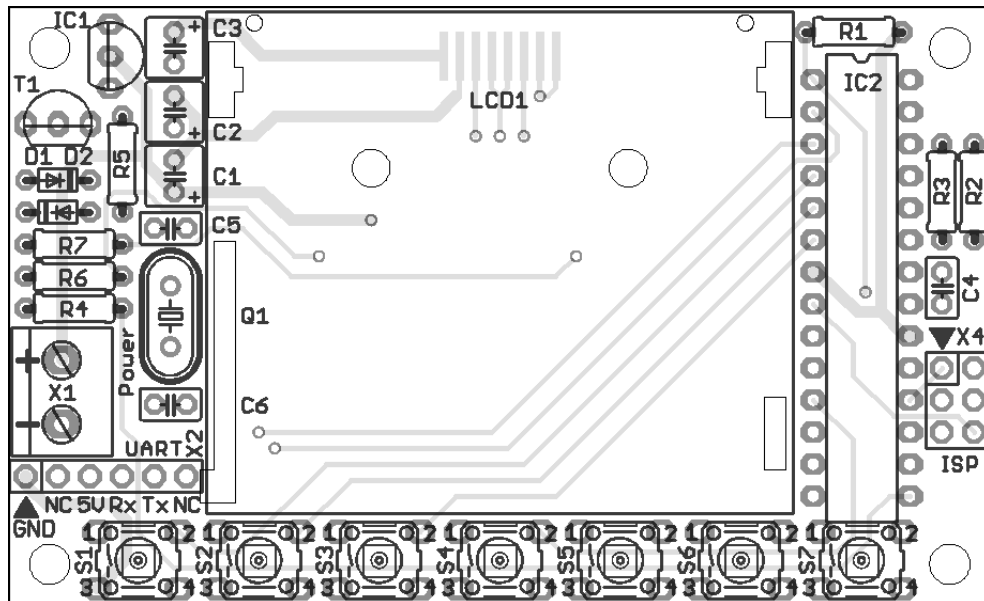
Contents:

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| 1 PCB, Rev. 1.0 | 2 Ceramic capacitors 33 pF |
| 1 Microcontroller ATmega168-20PU (DIP28) | 1 Ceramic capacitor 100 nF |
| 1 Voltage Regulator, 3.3V (TO-92) | 3 Tantalum capacitors 1 μ F |
| 1 IC socket, 28-pin | 1 Quartz Crystal 18.432 MHz (HC49U-S) |
| 1 LCD VG-G090651, 96x60 Pixels | 7 Push-buttons, 6 x 6 x 9.5 mm |
| 1 Paper label, white, 36 x 30 mm | 1 Terminal block, 2-pin |
| 1 Transistor, BC547C~BC550C (TO-92) | 1 Pin header, 1x6 pins |
| 2 LEDs, white (PLCC2) | 1 Pin header, 2x3 pins |
| 2 Diodes 1N4148 | 1 Stranded wire, 0.09 mm ² , 20 cm long |
| 3 Resistors 27 Ω | 4 Threaded spacers, M3, 5 mm long |
| 4 Resistors 4.7 k Ω | 4 Screws, M3 x 5 mm |

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 component lead and the solder pad for a second before feeding some solder wire between the soldering iron's tip, the board and the lead. Wait for the solder to flow around the pad before removing the tip from the solder joint. Don't move the board before the solder has solidified. After soldering, trim the leads with a wire cutter to about 1–2 mm length. For more detailed instructions, see http://mightyohm.com/files/soldercomic/FullSolderComic_EN.pdf.

I recommended soldering the components in the order listed below. Make sure the board is the right way up (component outlines visible, see image below) before starting.

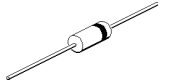


1. Resistors: Bend the leads 90° as close to the resistor body as possible before inserting them into the board. The resistor body should touch the board. Orientation doesn't matter. Clip the leads after soldering.

Name	Value	Ring colours
R1~R4	4.7 k Ω	yellow–violet–red–gold ($47 \cdot 10^2$, 5% tolerance) yellow–violet–black–brown–brown ($470 \cdot 10^1$, 1%)
R5~R7	27 Ω	red–violet–black–gold ($27 \cdot 10^0$, 5% tolerance) red–violet–black–gold–brown ($270 \cdot 10^{-1}$, 1%)



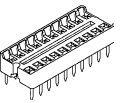
2. Diodes (D1, D2): The method of soldering is similar to the resistors, but the orientation is important this time. The ring on the diode must match the thick bar on the silkscreen printed on the PCB (printed circuit board). It always marks the cathode of the diode.



3. Quartz Crystal (Q1): Like the resistors and the diodes, the quartz crystal should lie flat on the board. Orientation is not important.

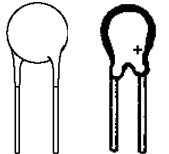


4. IC Socket (IC2): Insert the IC socket into the board, making sure the orientation of the small notch matches the outline on the PCB. You can bend two diagonally opposite pins of the socket to prevent it from falling out if you like, but setting the board with the socket inserted upside-down on a flat surface usually works just as well. There is no need to trim the leads.

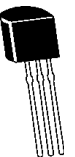


5. Capacitors: This kit contains two different kinds of capacitors: ceramic disc capacitors (which look like lentils with two pins sticking out at one side) and tantalum electrolytic capacitors (which look a bit like raindrops). Orientation is only important for the tantalum capacitors, there is a small + sign printed near one pin of the capacitor which must match the + sign on the PCB. There should be 1–2 mm distance between the capacitors and the PCB.

Name	Value	Type	Marking
C1~C3	1 μ F	tantalum	"105" = $10 \cdot 10^5$ pF = 1 μ F
C4	100 nF	ceramic	"104" = $10 \cdot 10^4$ pF = 100 nF
C5~C6	33 pF	ceramic	"33" or "330" = $33 \cdot 10^0$ pF = 33 pF



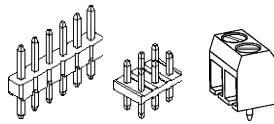
6. Voltage Regulator (IC1): The voltage regulator looks exactly the same as the transistor, you can only tell them apart by their markings. On the voltage regulator, you should find the numbers "1702" and "3302", which are part of the full type "MCP1702-3302". The orientation is important, the shape of the inserted regulator must match the outline on the PCB. Push the regulator into the board until there are about 2–3 mm of distance left between the regulator package and the board.



7. Transistor (T1): The transistor should have the marking "547", "548", "549" or "550" on it (corresponding to its type, "BC547C" to "BC550C"). Orientation is important, see step 6.



8. Connectors (X1, X2, X4): Start with the two pin headers X2 and X4. Orientation is not important. The black plastic part should touch the PCB and the pins should face straight up. Insert the terminal block (X1) with the openings facing toward the PCB edge. There is no need to trim the leads.

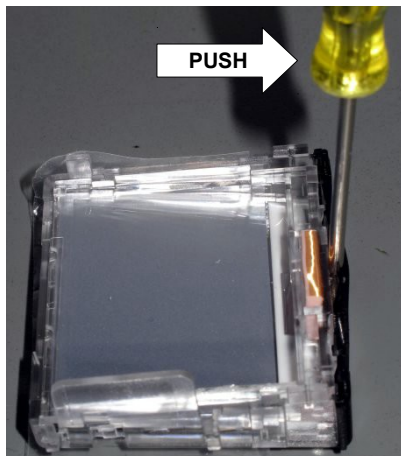


9. Push-buttons (S1~S7): Make sure the push-buttons are flat against the board before soldering. Solder two diagonal pins first, then push the button against the PCB and re-heat the two solder joints in succession to straighten it. Orientation doesn't matter. There is no need to trim the leads.

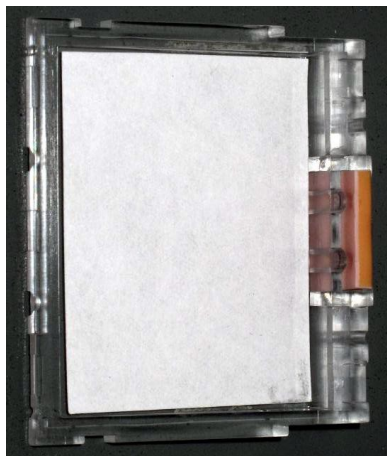


10. LCD (LCD1): The LCD must be modified first. Please follow the steps below.

- 10.1 Remove the green EL foil from the back of the LCD. It is not required, you can keep it for one of your own projects.
- 10.2 Open the LCD: Insert a small flat-head screwdriver between the black and transparent parts above the connector strip. Avoid touching the connector strip! Then push the screwdriver handle outward until the LCD comes apart.
- 10.3 Cut the paper label along the lines and apply it to the *inside* of the back part of the LCD. Apply firm pressure all over the label, especially along the edges.
- 10.4 Close the LCD by inserting the back part with the label into the LCD frame. Insert the thin side first, then apply pressure next to the connector strip. As before, try not to touch the connector strip.
- 10.5 Cut the piece of stranded wire into 4 parts of equal length (about 5 cm each). Strip the wire about 1 mm (very short!) on both ends. You can use wire cutters or scissors for this, or if you are afraid that you will cut the inner wires by accident, use an alligator clip or your fingernails. Tin both ends.
- 10.6 Solder the wires to the sides of the LEDs. Observe the orientation in the picture: the beveled corner of the LED is at the bottom left. Don't use too much solder – the solder joint mustn't protrude above or below the the LED. If possible, test the LEDs after soldering the wires.



Step 10.2



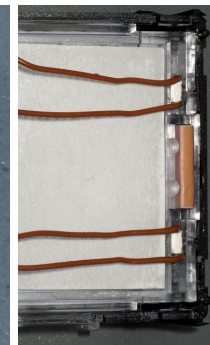
Step 10.3



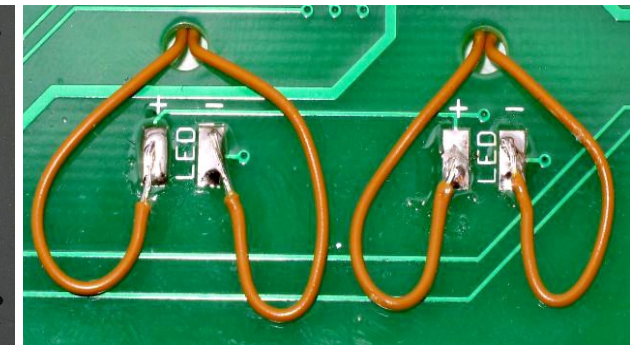
Step 10.5



Step 10.6



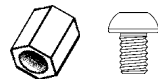
Step 10.7



Step 10.10

- 10.7 Insert the LEDs into the two slots on the bottom of the LCD. The yellow opening of the LED must face toward the inside of the LCD. Slide the LEDs to the bottom of the slots and close to the connector strip. Secure the LEDs in place with a drop of superglue.
- 10.8 Optional: Put a piece of black adhesive tape over the top part of the LCD. This will shield the light from the LEDs underneath.
- 10.9 Insert the LCD into the PCB. The wires from the LEDs go into the two round holes. Make sure the wires lie flat under the LCD. The upper two plastic protrusions on the LCD are latching and might require quite a bit of force until they can be inserted into the openings in the PCB. If everything went correctly, the LCD should now lie flat against the PCB.
- 10.10 Solder the LED wires to their corresponding pads on the bottom of the PCB. Tin the pads first, then heat them again and move the already tinned wire ends into the molten solder. If the wires don't cross, they should already be next to the correct pads (see image above).

11. Spacers and screws: Mount the four metal threaded spacers (used as feet) to the four corner holes with the screws.



12. Controller (IC2): Insert the controller into the IC socket. Make sure the notch on one end matches with the socket and the outline on the PCB.



13. Turn it on! Connect a power supply with 5 V to 12 V (e.g. a 9 V battery or a USB cable) to the terminal block. The LCD backlight should turn on and the main menu should appear on the LCD. If the menu appears but the LEDs remain dark, try swapping the LED wires. If the LEDs turn on but the LCD remains blank, check if the contact strip is damaged and if the LCD it is properly inserted into the PCB.
 Connector X2: UART (3.3V level, pinout compatible with FTDI cable TTL-232R-3V3).
 Connector X4: AVR In-system programming (**3.3V!** Pinout: Atmel Appnote AVR910).

Questions? Problems? Comments? Please feel free to contact me!
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 Project webpage: http://wiki.blinkenarea.org/index.php/ATmegaXX8_LCD_Board_English