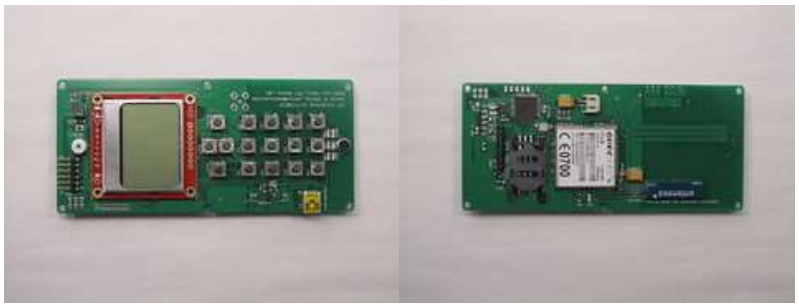
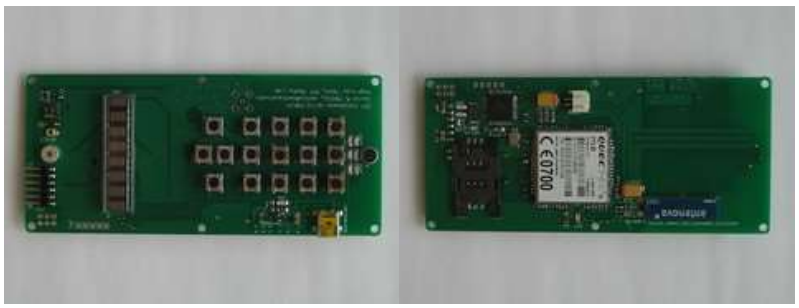
DIY Cellphone

Soldering the Electronics



Images of the assembled circuit boards (LCD variant). Click to enlarge.



Images of the assembled circuit boards (LED matrix variant). Click to enlarge.

While the cellphone uses many small, surface-mount components, it's possible to solder it together by hand with a good soldering iron (see my recommended tools) and some practice. Most of the components are straightforward to solder (apart from their small size), with a few exceptions:

- *Capacitors*: Be careful of the polarity on the large (1000 uF) capacitors, they may explode if you solder them backwards. Use the orange stripe to orient them correctly.
- *Polarity*: Other components with polarity include the super-capacitor, the LEDs (note the two small green dots on one side), the ATmega1284P microcontroller (note the circle in one corner), the M10 GSM module (which has an arrow in one corner), the SIM card socket, the microphone, and the diode (note the faint grey line on one side). These components have no polarity (can be soldered either way around): the crystal (8 MHz), speaker, reset button, small capacitors, and resistors. Other components only physically align in one orientation (but make sure the transistors aren't upside down and that the buttons aren't rotated 90 degrees).
- *Antenna*: When soldering the antenna, start with the pad that faces the GSM module. That's the one that carries the electrical signal; the others are simply there for structural support (to hold the antenna down). You may even be able to heat the solder on that pad from the top of the antenna, the heat can be conducted through the two vias (small holes) in it.

- *Antenna Connection*: on and next to the trace between the antenna and the GSM module, there are footprints for three small (0603) components. Solder a 0-ohm resistor on the two pads that are on the trace and leave the others empty. (Theoretically, they can be used to tune the precise electrical characters of the trace to improve the performance of the antenna.)
- *Solder Jumpers*: There are two solder jumpers on the bottom of the board and one on the top, all labelled "Cell" and "uC". Solder the center pad of each to the pad labelled "uC". (The jumpers on the bottom connect the RX and TX lines from the FTDI header to the ATmega1284P on the board so that they communicate over serial. If you instead solder the center pad to the "Cell" pad, the FTDI cable connects directly to the GSM module so that you can communicate with it from the computer. The jumper on the top of the board connects the buzzer.)
- *Speaker*: The speaker is awkward to solder because it has no legs. First, apply solder to the pads on the PCB. Then rest the speaker on top of the PCB (aligning its pads with those on the board) and solder it from the bottom. You can feed in solder or melt the pre-applied solder from below. If it doesn't work, *don't remove the speaker* (you might rip its pads off). Instead, try to re-melt the solder on its pads by inserting the iron into the holes from below.
- *USB Connector*: Only the two outer (of the five small) legs of the USB connector are used, so you don't have to solder the three central legs. (Do solder the four corners, though, they provide structural support).
- *ISP Header*: Because you only need to burn the bootloader once, I typically don't solder pins into the ISP (2×3) header. Instead, you can insert pins into the connector on your ISP and hold them against the pins (from the top of the board) while you burn the bootloader. If you have trouble, you can solder pins to the holes but you'll have to adjust the case to make room for it.
- *LCD* (LCD variant only): You only need to solder the eight pins at the top of the screen, not the eight pins on the bottom. To solder them, insert male header pins from the bottom (so that their plastic portion is under the board). First solder them to the PCB, then put the display on top (verifying its orientation). Then solder the pins to the display.

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