FAT FINGERS OPEN PANZER TANK CONTROL BOARD
by Gerald Rude
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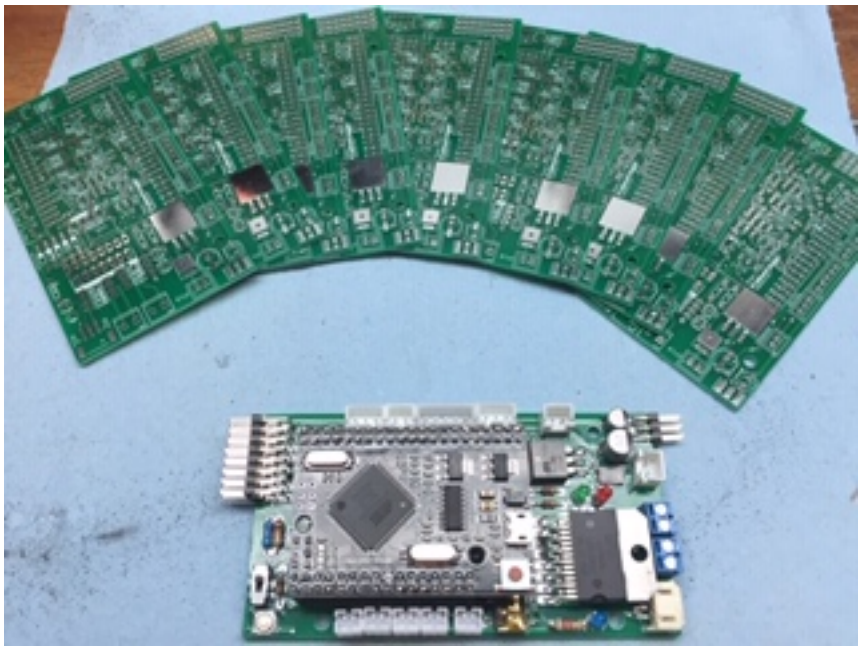
Assembly instructions/hints on putting this DIY version of the Open Panzer Tank Control Board together (OPTCB).



Here is the FatFingersV2 boards, one fully assembled with the Arduino installed and the remaining 9 boards not yet started. These are from Seed, but be aware that shipping took 3 months from China. OSH makes them here in the US, but they are more expensive, and didn't offer the thicker laminate (1.6mm). Of course there are many makers of prototype boards out there, so just do a web search and decide which fits your budget and time frame.

I took on this little project to be independent of the current tank control board manufacturers, and to ensure that Luke's wonderful work would possibly live on in a DIY version, just in case no one comes forward in the future to manufacture the original design as Hobby King did in the past.

The goals initially for the project are:

1) Make the board easy for an amateur to assemble, with the minimal tools, i.e. a soldering iron, cutters, screwdriver, and patience. The use of through hole components make this a possibility, ergo the name 'FatFingers' for those of us who cannot manage the tiny SMD components and flow soldering.
2) It should fit the original footprint of the OpenPanzerTankControlBoard, including mounting holes.

3) Identical connectors to the original and all in the same location, since all Luke's videos and instructions should be applicable.
4) Cost shouldn't be excessive.
5) Since I expected the geography of the board to be limited I included only essential functions so I removed:

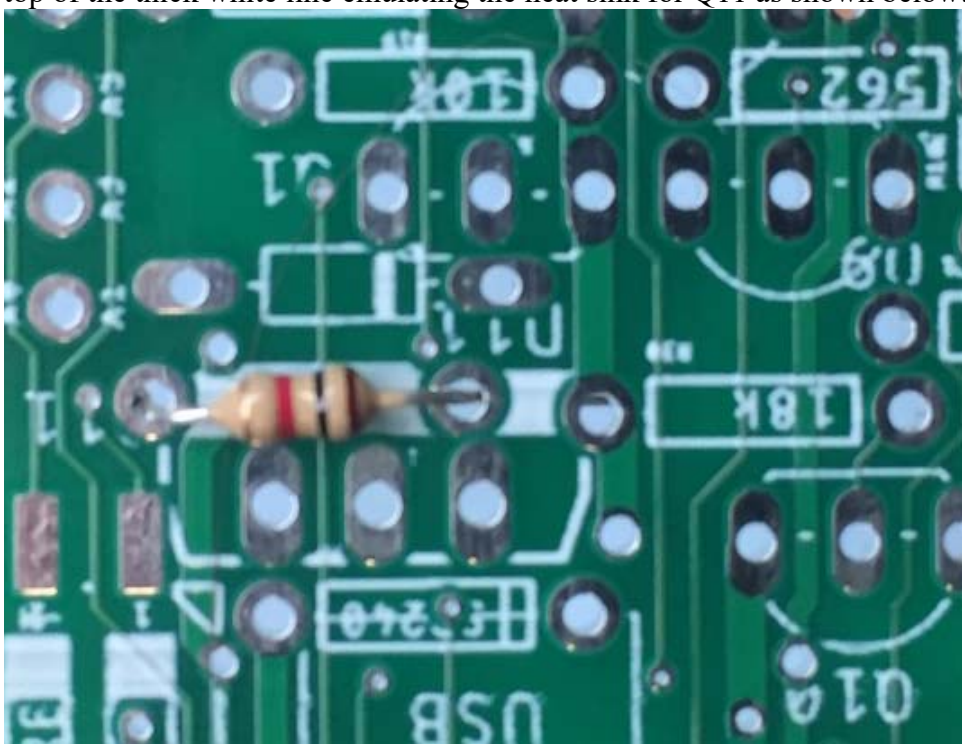
a) I2C	b) Serial 3	c) GP I/O A&B
d) Serial 1	e) ICSP	f) Rx2

I have not utilized any of the above in any of my 10 tanks that have the OPTCB so I felt reasonably safe in not including them. If you wish to have them included, the Eagle files of this board are available for your use and modification. It is pretty crowded on the board, and it took me a while to manage to get it into a 2 sided PCB, so it may be a challenge depending on your experience level.

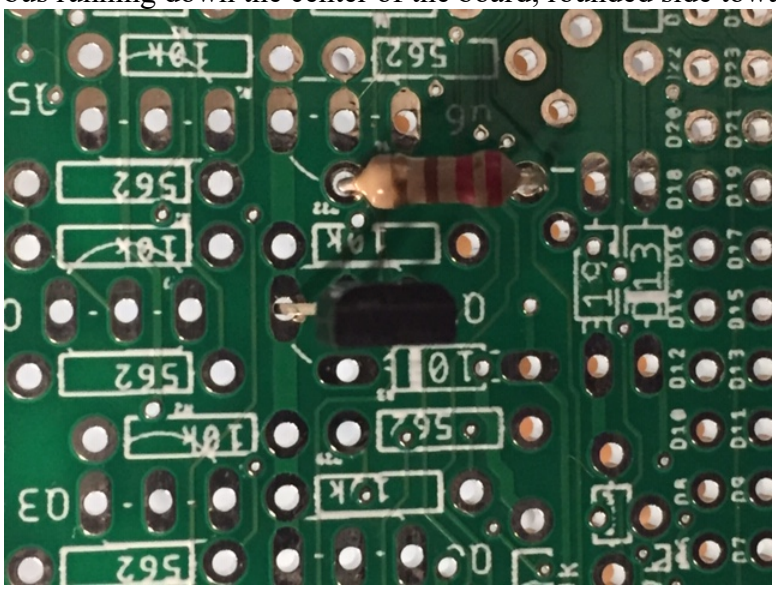
Assembling the board:

The board design continued in the Eagle format as shared on the OPTCB wiki page and website. However, as I'm new to this system, and this is my first PCB manufacturing experience, I'm not as agile, nor knowledgeable of all the intricacies of the program and as such, some things didn't get portrayed as I wanted them to. So here are a few items that need your attention to save some time in tracing the components:

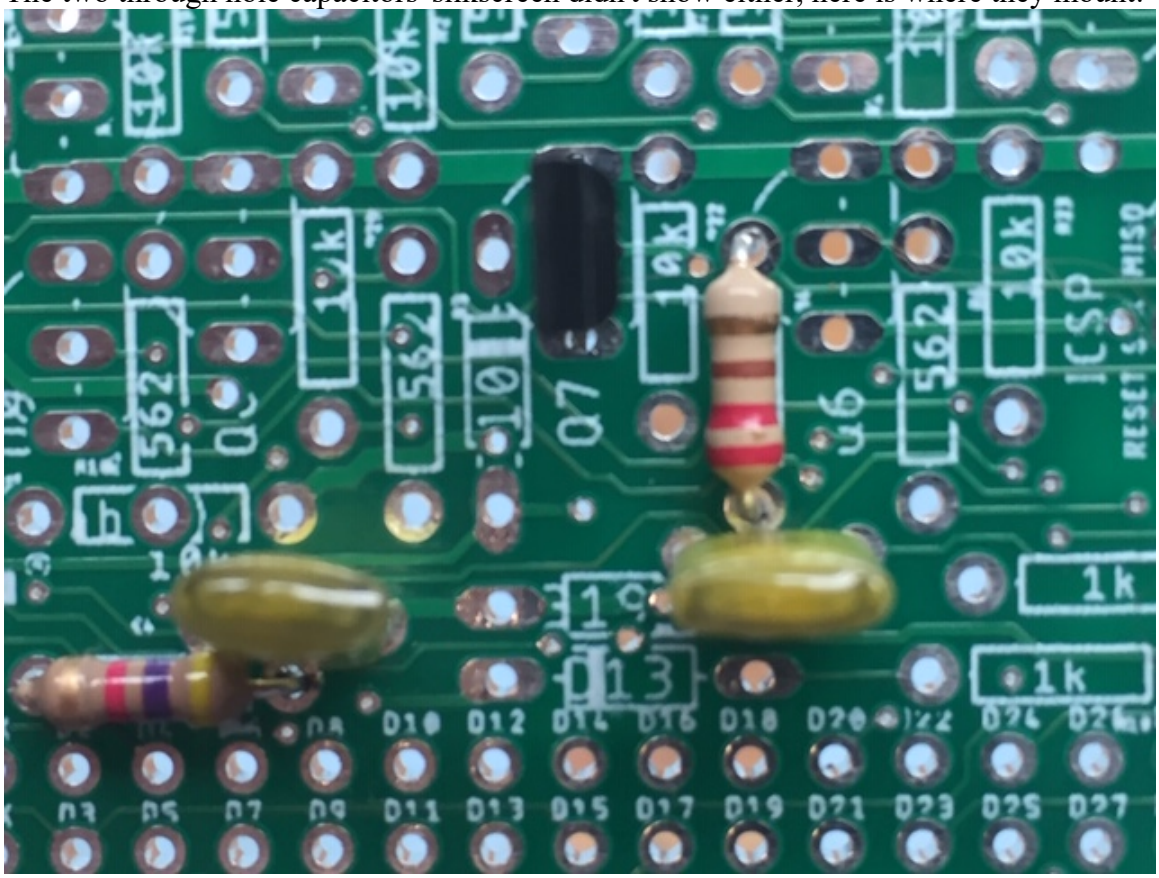
Resistor R8 (1k ohm) doesn't show on the board, but it resides between Q11 and D11, on top of the thick white line emulating the heat sink for Q11 as shown below:



Q7, which drives the airsoft unit needed to be upgraded from the BC337 transistor to the ZXT651. Both are TO-92 cases but one is EBC, and the other CBE. This necessitated rotating the transistor 180 degrees from the silkscreen emulation printed on the board. Here is a picture of the ZXT651 oriented correctly (emitter is connected to the ground bus running down the center of the board; rounded side towards the resistor shown):



The two through hole capacitors' silkscreen didn't show either, here is where they mount:

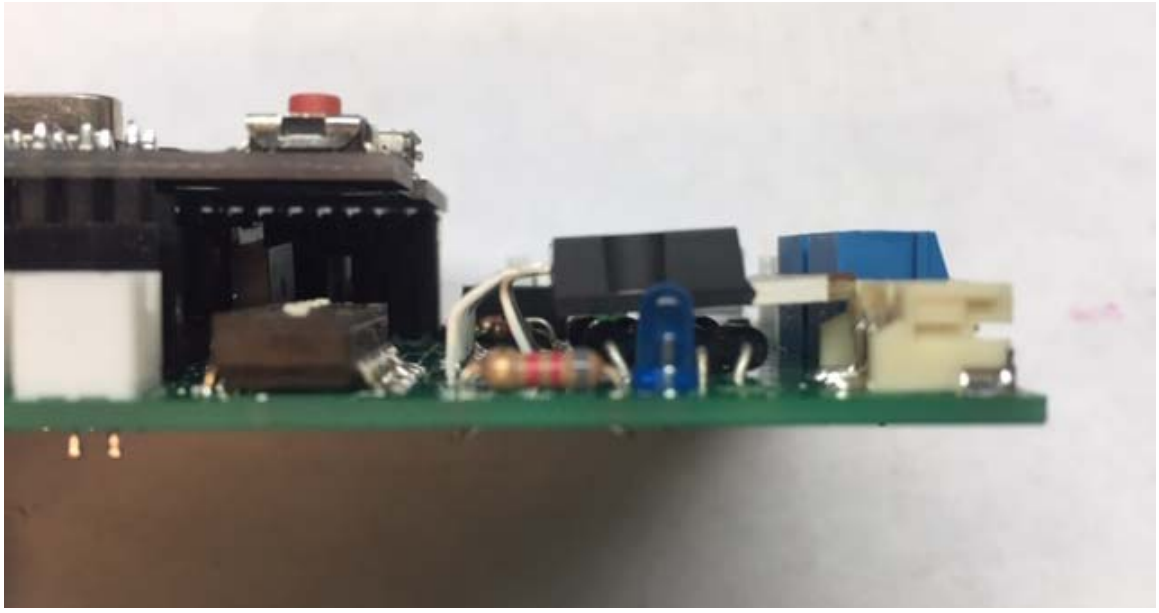


You can also see in the above picture where the 4.7k ohm resistor R16 mounts (bottom left of picture) as the printing was interrupted by a via.

When assembling, I recommend installing all the surface mount items first:

Especially the diode D12 as other components will impede your access to get them soldered.
I used a fine tip soldering iron for all the soldering, and laying the tip horizontally along the base of the regulator or D12 diode allows you to wick the solder under the pads. Be careful not to overheat or use too much solder.

The next step is to install the flyback diodes D1-8 as the motor controller lays down on top of them:



Install the two screw terminals next so you can judge how much to bend the pins of the motor controller so it will sit fully flat as above.

The 3 LEDs do not have their orientation shown, but all the negative leads are on the side towards the 5 volt regulator.

Be careful when installing the transistors and diodes since orientation is critical for proper function. Also note the use of Q9, which is a BC327 PNP transistor, the only one, but is identical in appearance to the BC337 NPN transistors which is the most common on this build. Here is a close up of the board with all the components installed, minus the Arduino:

Install the Arduino pin receptacles last, since they melt really easy when touched by a soldering iron. I recommend assembling the Arduino, its pins, the receptacles and the board all together before soldering any of it, so the pins will align correctly. Solder the pins/receptacles sporadically around the perimeter on both sides before doing final soldering, which ensures no warping. Remove the Arduino after final soldering to ensure all pins will align when reinstalling it.

Ordering the boards

When ordering the boards, the manufacturer you select will ask for a zip folder of the Gerber files, which are generated by the Eagle program. Make sure when doing the ordering that you ask for 2 oz copper, a 1.6mm board thickness, and top/bottom silk screening. The only reason for the 1.6mm board is that to pry out the Arduino you have to exert pressure on the outer portions of the board and the thin flex boards are not strong enough.

If you are generating your own Gerber files from the Eagle program, make sure you remember to check that the top and bottom silk screening is included (_tsilk and _bsilk) as I had to add that each time (it would not remember to include it and I couldn't find how to make it remember).

Flashing the Arduino

Initially, to install the .hex firmware onto the Arduino you can just plug the usb cable into the Arduino (unattached to the FatFingers board) following the information on Wiki. Make sure you select the DIY version in OPConfig or it won't work, though it will load. Once it is flashed, you cannot load the specific settings until you plug it into the board since the CPU has to read that DIP switch no. 5 must be in the ON position for it to read the input from the USB. Also, since the 5v power supply for the radio and other things won't be powered up, you will need to plug in a 7.2v power battery to the board battery terminals. Initially use a fused input, just in case, okay?

Well, that is about it....thanks for following along, and I hope this helps the OPTCB project in some small way.