Introduction

Congratulations on your BotBoard 07 Pro purchase! These instructions have been written in order to assist you in assembling your new BotBoard.

It is important to note that some soldering experience is required to build this kit - you must be acquainted with the use of a soldering iron and solder wick. In addition, basic debugging skills are important.

Let!s begin!

Tools

You will need the following:

- Soldering Iron

- Solder

- Solder wick

- Multimeter (preferably with continuity check)

- Needle-nose pliers

- Wire clippers

- Wire strippers

- Scotch tape

Step 1: 0.1 μF Capacitors

We begin with the shortest components, the 0.1 μF capacitors. This is so that the board will balance better when flipping over to solder it.

It is important to note that it is very easy to accidentally bridge a solder connection. This is why it is important to continually check your board for shorts with a multimeter or conductivity tester as you build - it is very hard to find an accidental short once the board is all made up. Check each of your connections to see if it shorts to ground, and if so, use solder wick to clean up and try again.

Once the wires are installed, clip the excess and put in the 5 nonpolarized capacitors, labelled C5, C6, C7, C8 and C11 on the parts placement diagram. Bend out the leads slightly, flip over, solder and test for shorts.

At this point, your board should look like this:
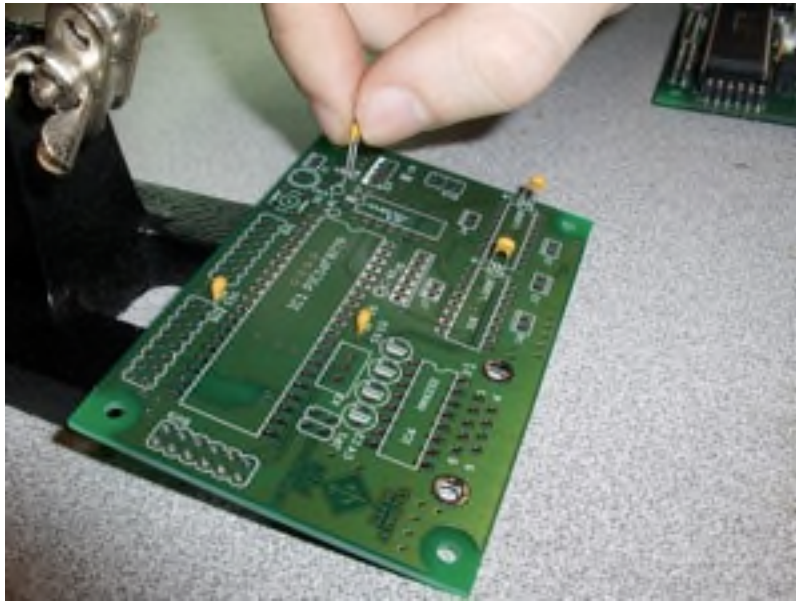
Step 2: 40-pin IC socket and headers

Next, mount the 40-pin IC socket in the space for IC1. Note that there is a small notch in the middle of one end - this should face the right of the board as shown below:
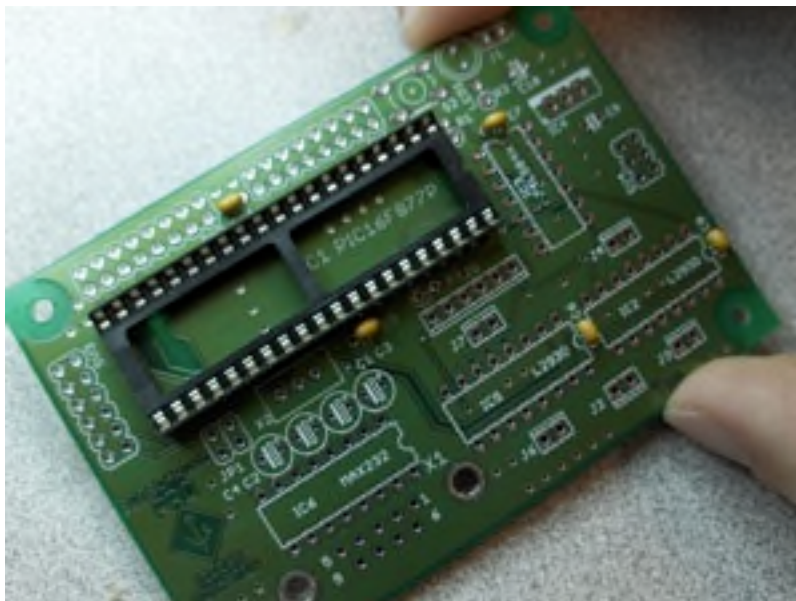

Tape this in place, flip the board over, solder and check each pin for shorts. Note that two pins are intentionally grounded - these have cross-type structures joining them with the copper area and are easy to spot.

Next, we install the expansion headers. There are 4 8-pin headers, 2 6-pin headers, and 2 3-pin headers. We!ll start with the 8-pin. Mount them as shown below:
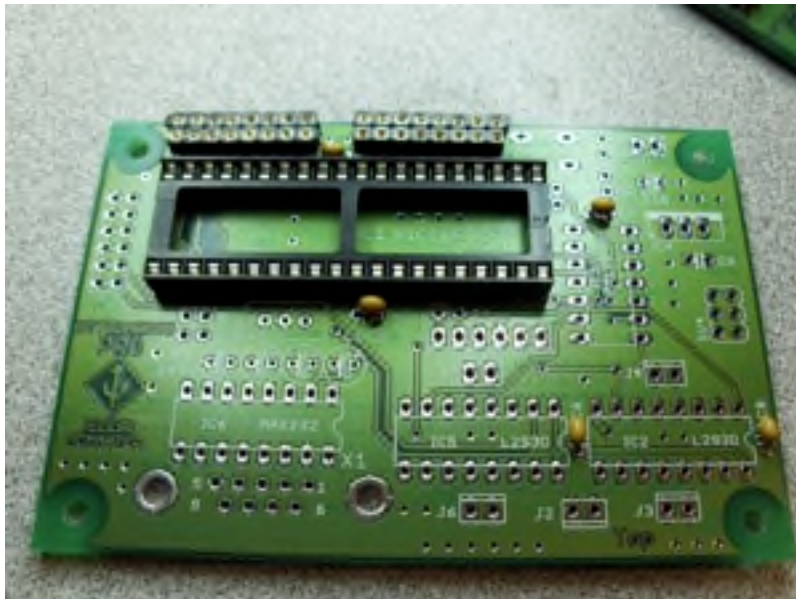

Tape these headers in place, flip the board over, and solder. All of the pads on the outer rows of headers are ground, so it!s OK to bridge them to each other. Just make sure not to bridge to any of the nearby traces - check continuity just to be sure.

You should now be looking at this:
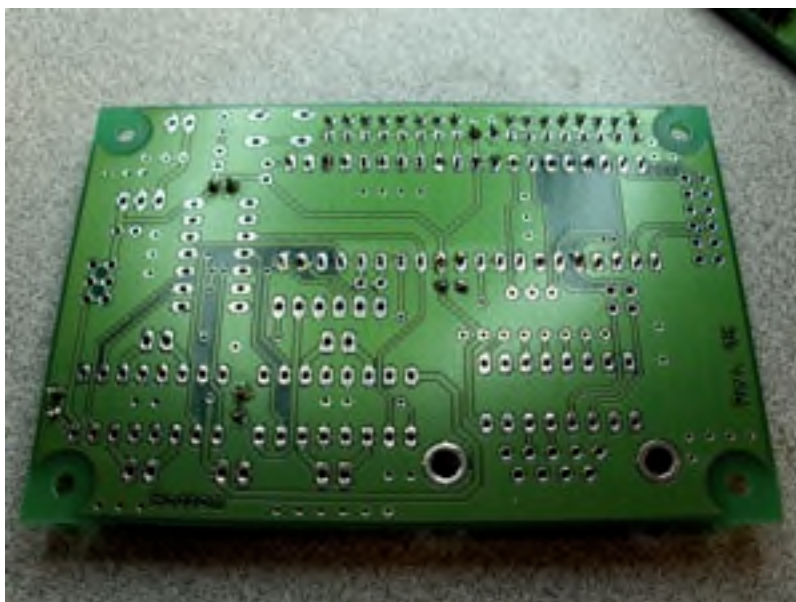
Repeat the placement and taping for the other 6-pin rows - their placements are indicated by SV1, SV2 and SV3 on the parts placement diagram. Remember to check each non-ground pin for shorts, and check any nearby traces as well. When you!re done, you should have this:
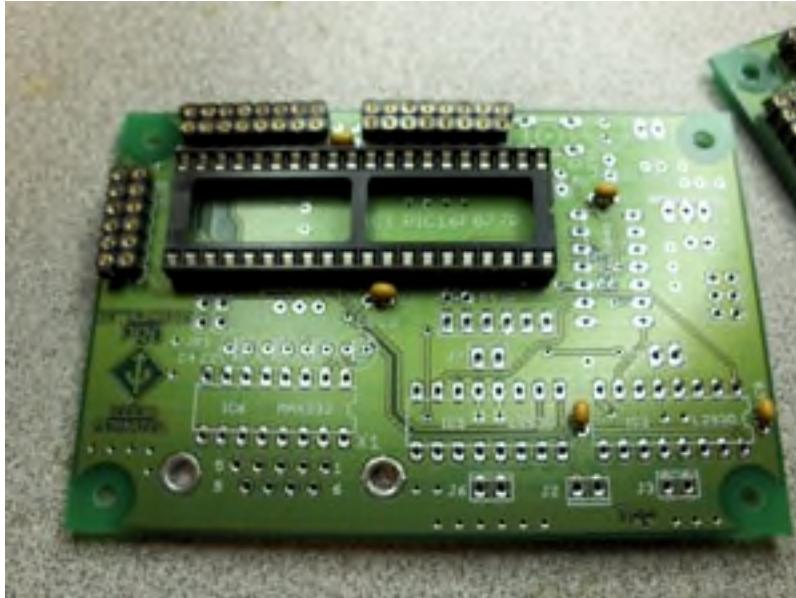

The only remaining headers are the 3-pin headers for SV4. Place and tape these all at the same time, and solder them in place. As they!re all connected to 5V, bridging between them is fine. Carefully check for shorts however - bridging 5V and ground is a recipe for a dead power supply.

Step 3: Support ICs

The next step is to mount IC6, the MAX232 Serial Level Shifter. It is very important to observe proper polarity on this part - note the notch on the right side of the part in the parts placement diagram. The notch on the part itself corresponds to this.

To install this part, you must first bend its leads inwards slightly, so that the two rows of leads are parallel. To do so, grasp the part ONLY by the black plastic, and use a table to bend all of the leads ever so slightly.

Insert the chip into the board - if it won!t fit in the holes, make sure the pins are all straight, and that you!ve bent them inwards enough. The chip should hold itself in with friction, Flip the board, solder, and check for shorts. Note that pin 15 is supposed to be grounded. You should have this:
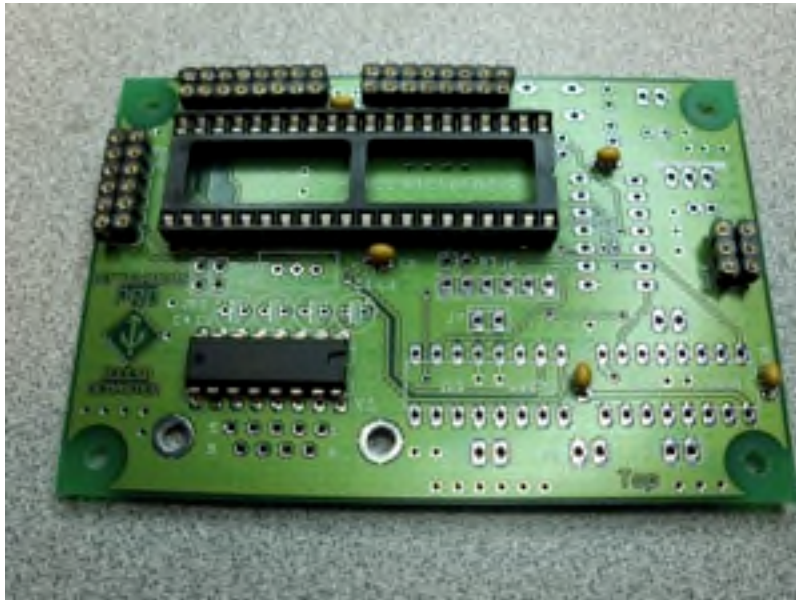
Next, place IC3, the 74HC04 inverter. You will need to bend its pins as you did the MAX232s. Insert it as shown, notch side up:
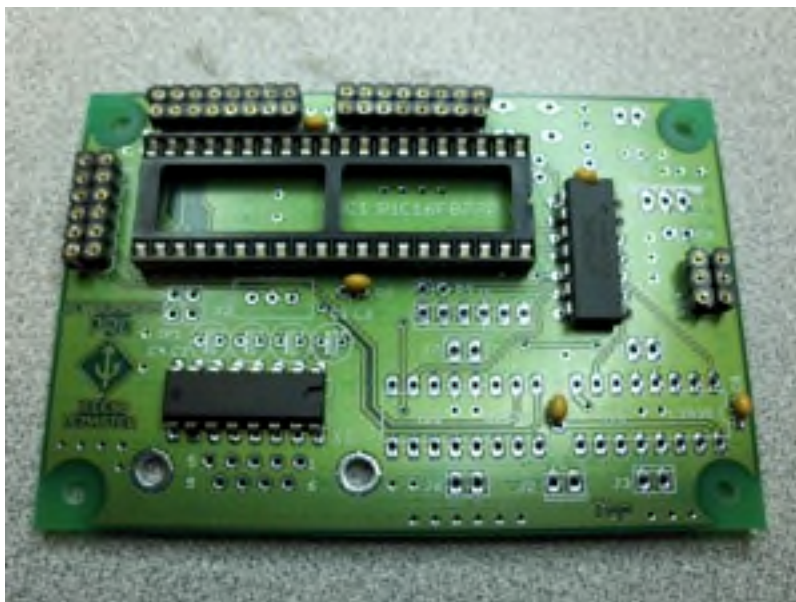

Note that the bottom end may be resting on the wire, keeping the chip from being pushed in fully. So long as all of the pins come through the other side, this should be fine. Solder and check for shorts. Pin 7 should be grounded.

The next chip to install is IC2, an L293D / SN754410 motor controller, notch side to the right. Bend the leads as before and insert:
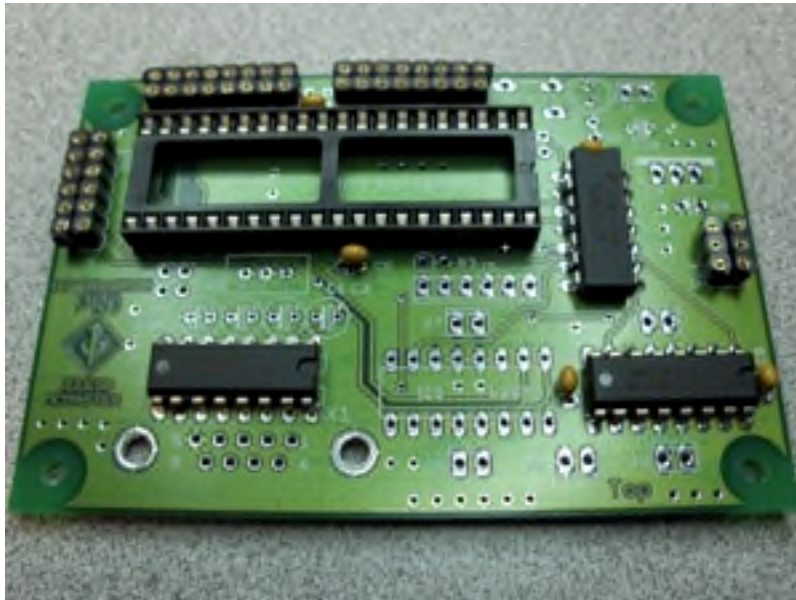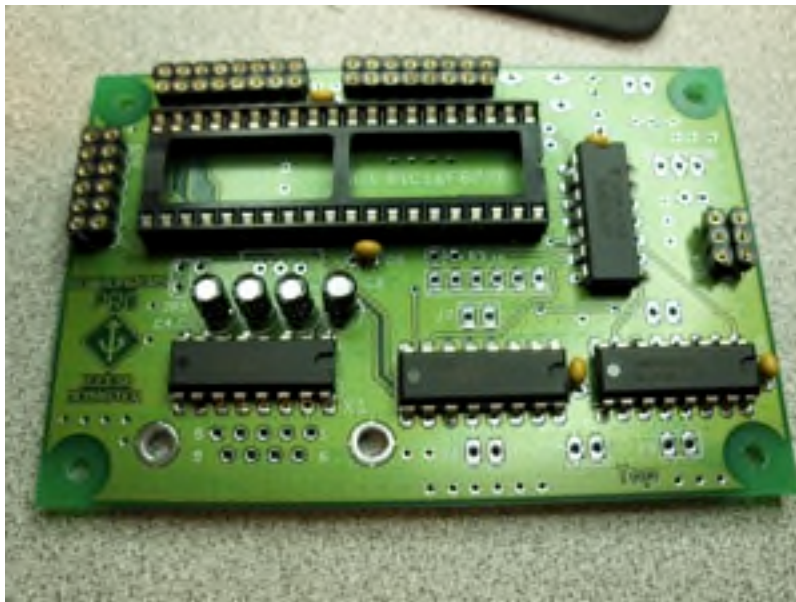
Solder and check for shorts - pins 4, 5, 12, and 13 should be grounded. Next install IC5 next to it, solder and check for shorts. The same pins on IC5 should be grounded.
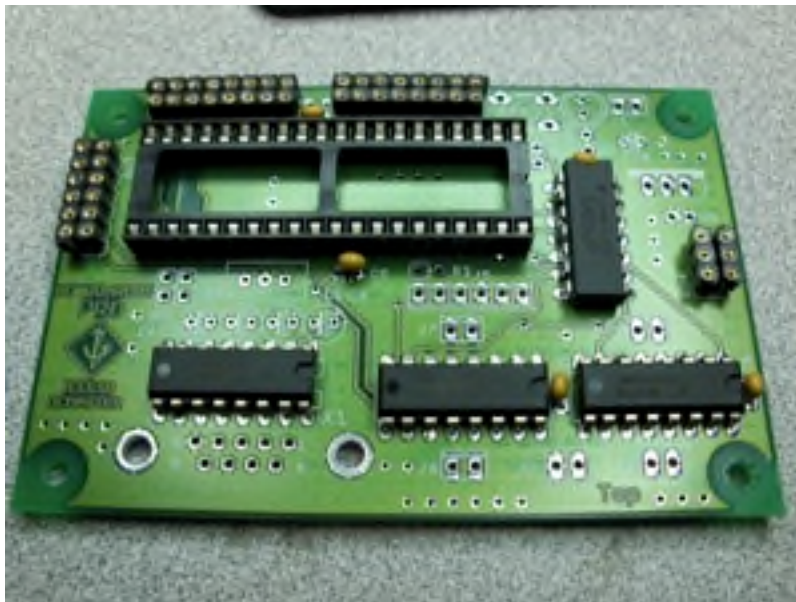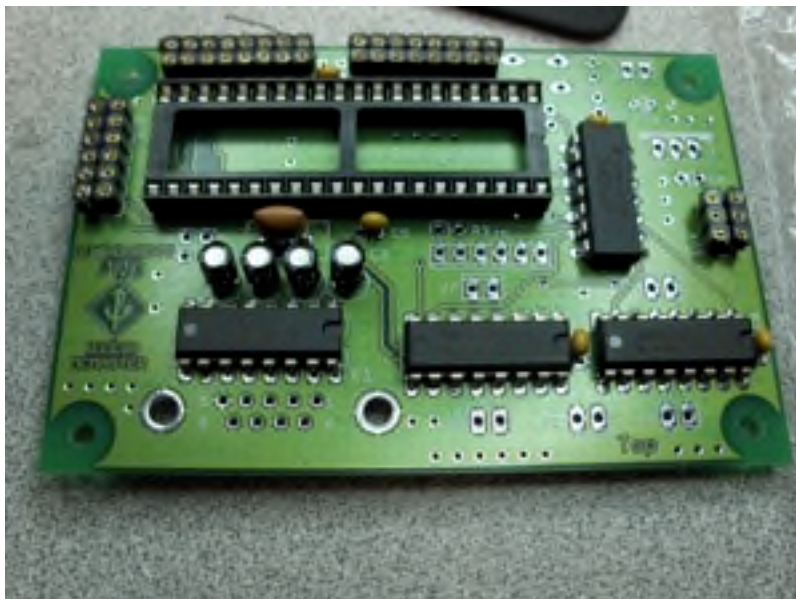

Step 4: MAX232 Capacitors

Next, mount the 1 µF capacitors C1-C4. Note the polarity on the capacitors (the stripe indicates the negative side) and on the parts placement diagram.

Solder, check for shorts, and clip the leads.

Step 5: Resonator

Place and solder X2, the 10 MHz resonator. The middle pin is grounded - keep this in mind when checking for shorts.


Step 6: Motor Connectors and Serial Jumpers

Take the 12-pin male header and clip off two pins.

Place this header in the J7 space. Tape in place, flip, solder, and check for shorts. Repeat for J3, J4 and J6. Also, place and solder 2 2-pin headers in the JP1 space. After soldering them in place, be sure to fit the two 2-pin shorting jumpers over the headers vertically (ie one bridging the two left pins, one bridging the two right pins). These jumpers allow you to disable the serial port and reclaim 2 I/O pins should you desire to.
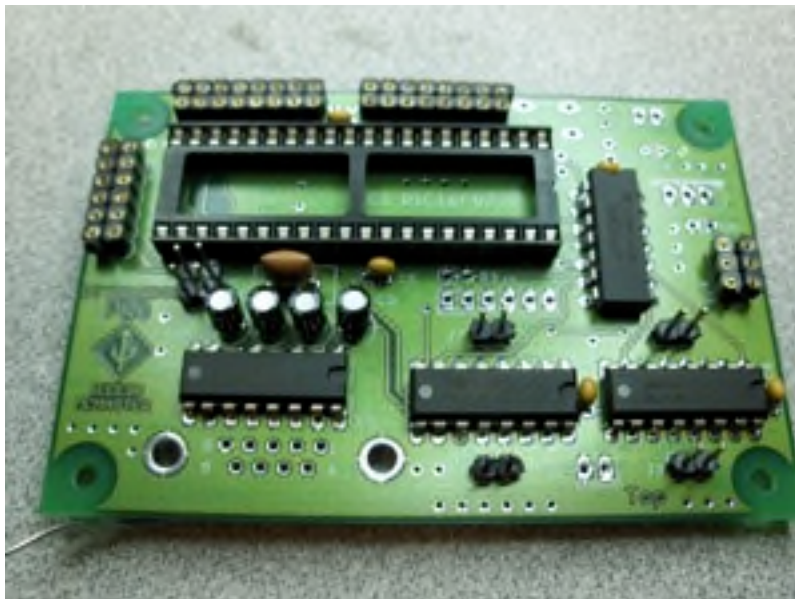


Step 7: Power LED and resistors

Take the Green LED, and mount it in the place for LED1, with the flat side towards the board edge. Tape, solder, check for shorts. Next, take the 330 ohm resistor (Orange-Orange-Brown), and bend one lead very close to the body, such that both leads are parallel. Insert this into the

R2 position. Next, take the remaining 100K resistor, bend and install for R1. DO NOT populate the 100K resistor for R3, it is left over from an earlier design.
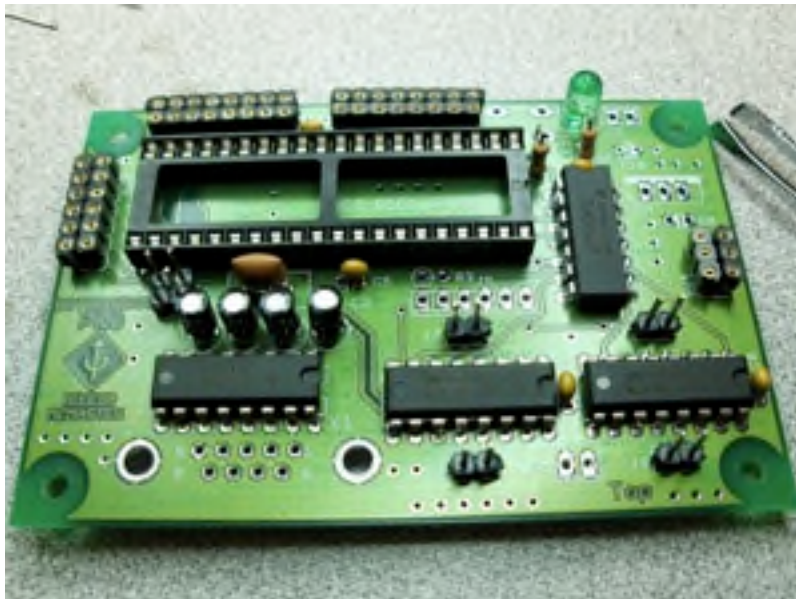
Step 8: Power Capacitors

Next, install the 47 µF capacitor for C10 and the 10 µF capacitor for C9. Observe polarity - the negative side is noted on the capacitor with a stripe. The striped sides should be facing each other.
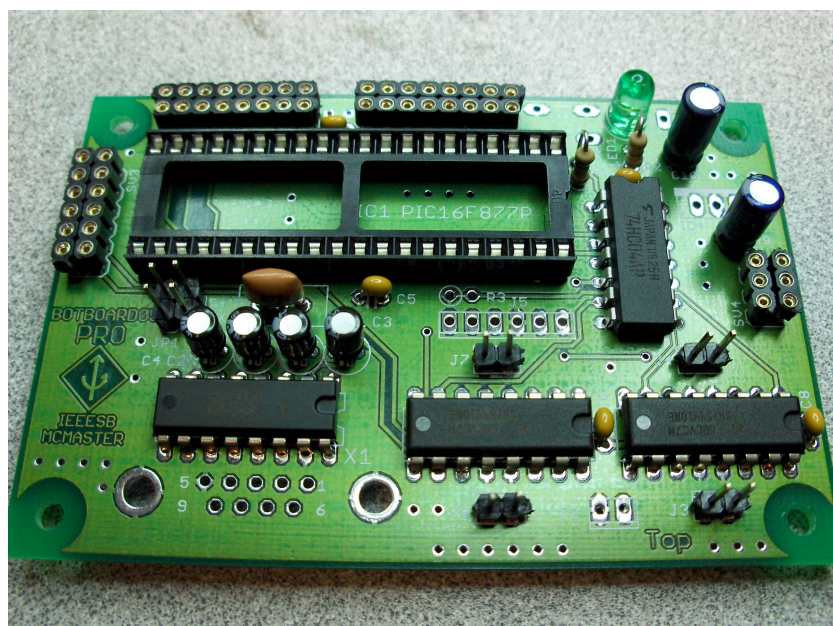
Step 9: ICSP connector

Now mount the 6-pin polarized header, J5. Note the direction the tab is facing - the bottom side of the board.


Step 10: Power Connectors

Next, place the power input connector J1. Note that the polarizing tab should be on the inside of the board, not the edge. Tape, solder and check for shorts - only one of the pins should be grounded. Next, mount and tape J2, again with the polarizing tab on the inside of the board, not the edge:

Step 11: Voltage Regulator

Now mount the 7805 Voltage Regulator, IC4. Note the device polarity - the heatsink tab should be facing the top side of the board.
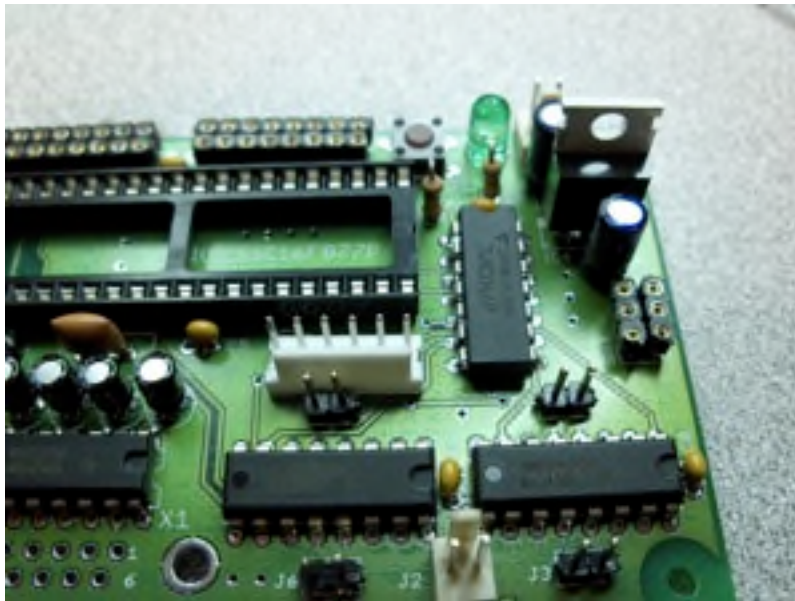
Step 12: Reset button and serial port

Mount the reset button next. Note that its pins are slightly bent - do not straighten them. Line up the pins with the holes and push the button in - the pins should pop into the place, with the bends holding the button in place. Solder and check for shorts.

Next, mount the serial connector. This part mounts easily - two clips should hold the connector in place.
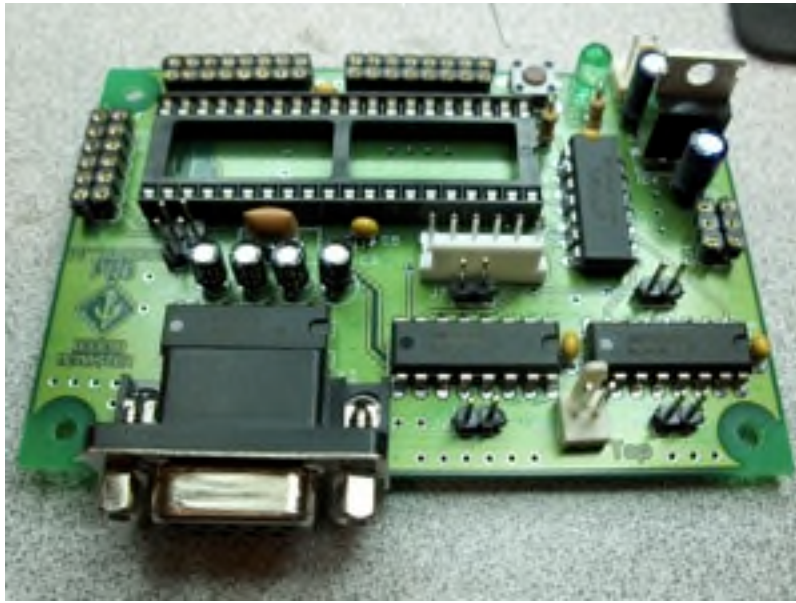
Soldering this part is somewhat difficult - the pins just barely come through the board, so make sure to get solder into the hole. You may at your discretion solder the retention clips as well.

Step 13: Install the PIC

The last part to install in the board is the PIC itself, IC1. As before, bend the IC!s pins slightly, then insert into the socket, noting the position of the notch with respect to the parts placement diagram. Press firmly, but not too hard, until the chip is fully seated in the socket.
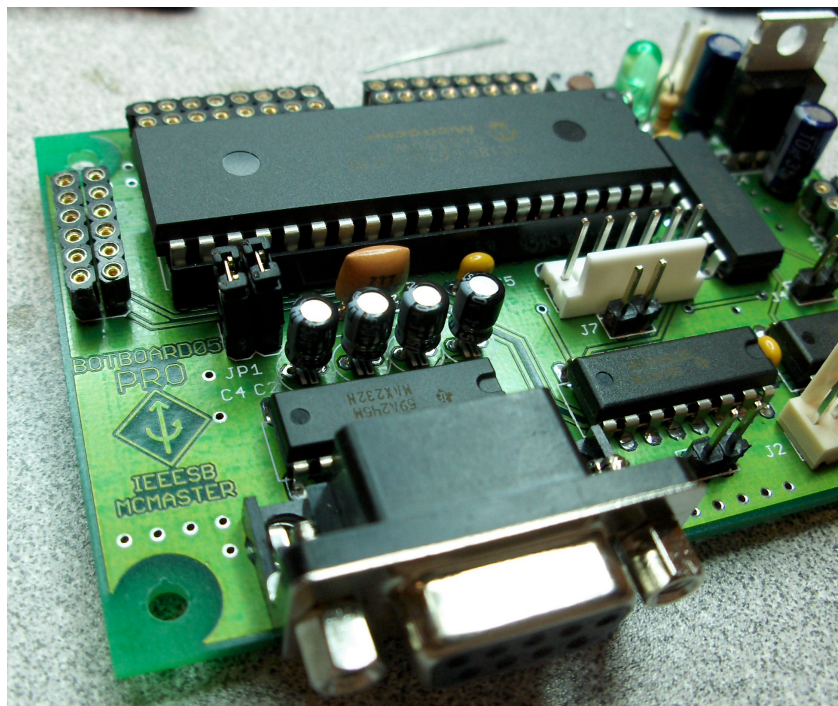
Step 14: Battery Holders

Take the 9V battery snap, a 2-pin housing, and 2 of the attached metal pins. Cut off the pins from the strip.

Take the stripped end of the battery snap!s red wire, and lay it in the channel in the pin. It should be positioned so that the insulated part lies between the first set of tabs, and the bare part within the second pair. Using pliers, squeeze the tabs over the bare end, one at a time. Next, squeeze the tabs over the insulation. Add a drop of solder over the bare end!s tabs - not too much, as this will interfere with the pins! operation.

With the tabs on the housing facing up and away from you, slide the pin assembly into the right hand slot with the rounded side up, until the assembly clicks into place.
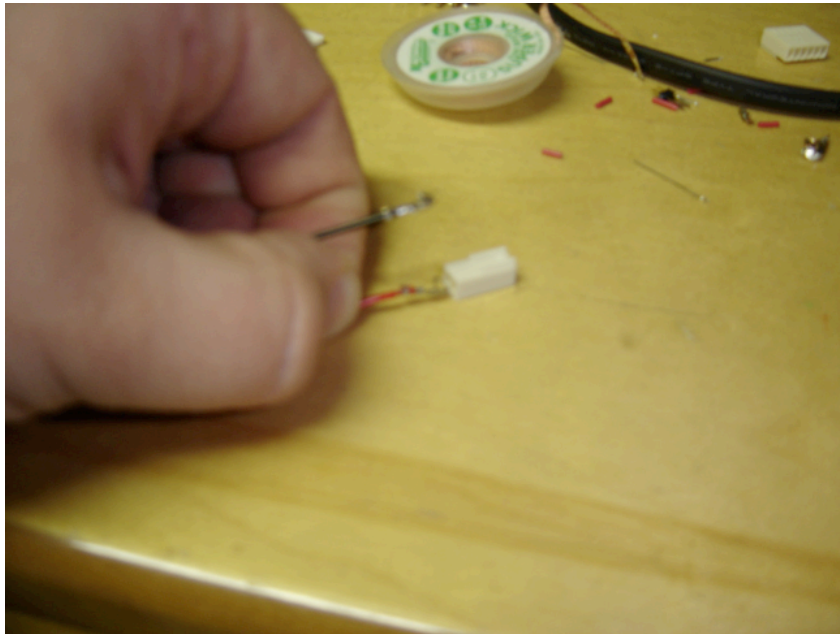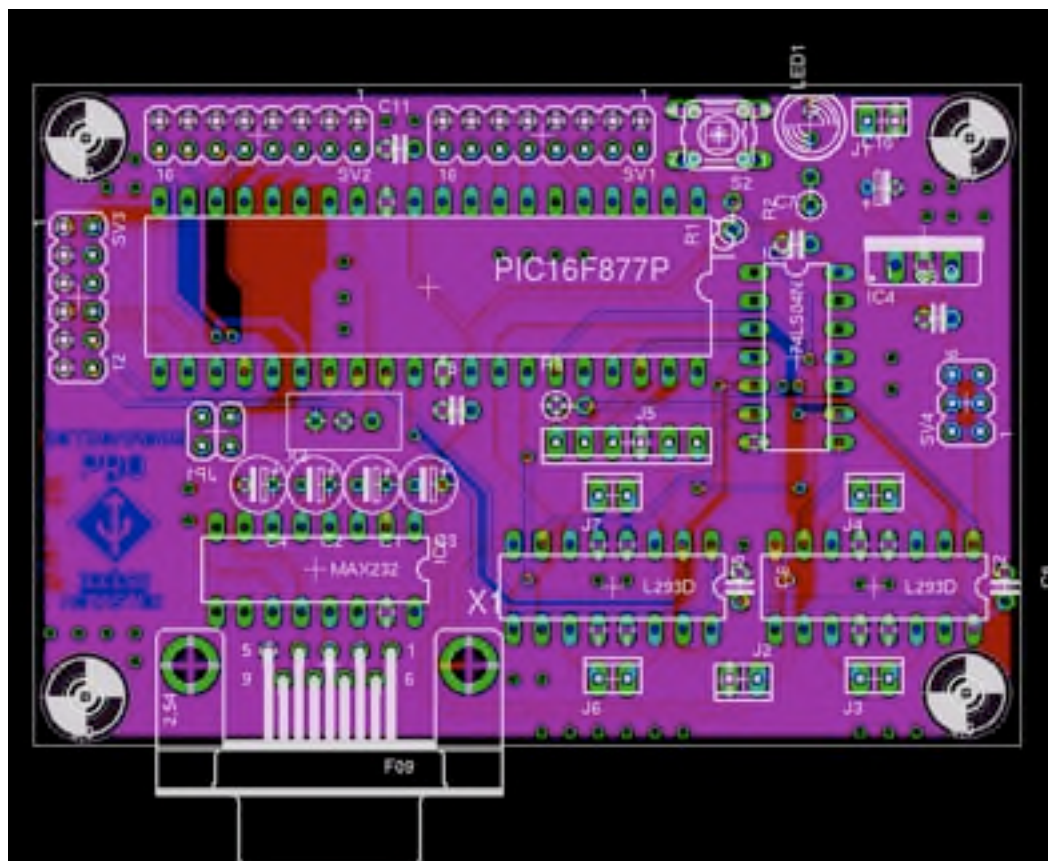
Repeat the process for the black wire, and test the fit with J1 on the BotBoard.

Install the connectors on the wires for the 4-AA holder the same way, but remember to strip the wire ends first - not too much, only about 3-4 mm is necessary. Remember to observe the same polarity. Test fit it as well.

Congratulations! You!ve assembled your BotBoard!

Parts Placement Diagram

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