# x0xb0x fabrication manual
## power supply

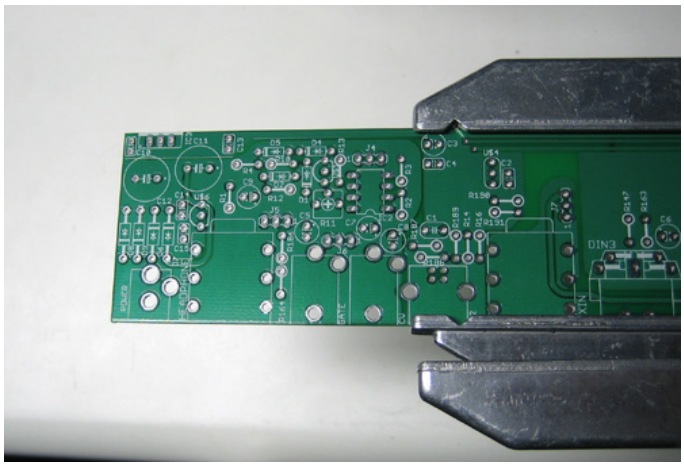
*history*
*last edited: May 15, 2005*

### Introduction

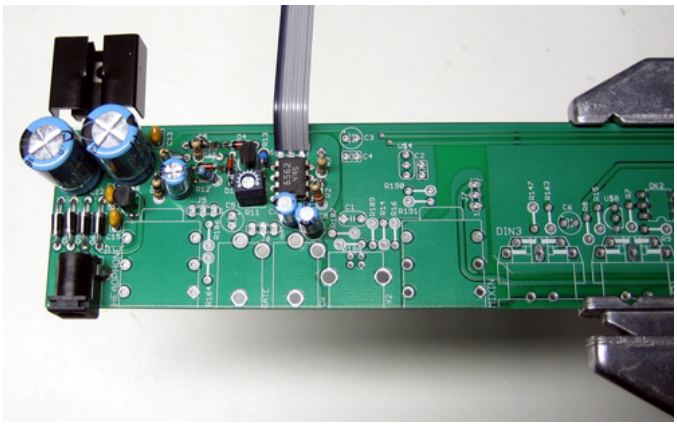
The power supply is the first thing to build. Getting this part right is key! A bad power supply will keep the rest of the synth from working so be sure to test it after its built.

The power supply takes the 9VAC from the power plug and doubles it to 18VAC which then gets regulated down to 12VDC and also rectifies and converts the 9VAC into 5VDC, 6VDC and 5.333VDC.

### You are here



*Before: all of the soldering for this part happens on the IO board*



*After: Umm, that grey jumper wire shouldn't be there. You should use 3 pieces of every day wire for now, the jumper is too delicate to install now.*

## Testing & Calibration

Since its easy to destroy electronics if the power supply is not built properly, it may help to do this section in steps with constant testing.

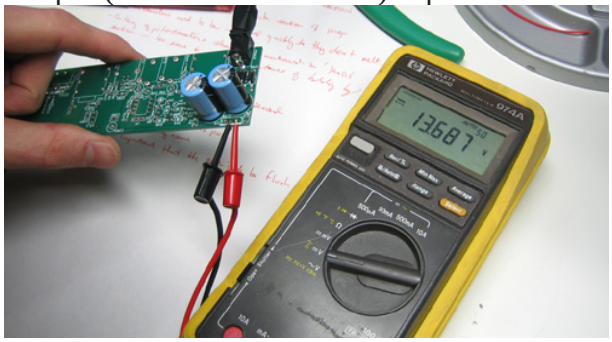
Remember to solder with the power disconnected and test with the power connected, eh?

If you plug in the supply at any point, charge will build across the large caps which is retained for a while. This can cause sparking during soldering later, so its a good idea to discharge the caps using a screwdriver (touch both terminals at once w/something metallic)

1. Solder the power jack, 2200uF caps **C3** and **C5**, and the 4 1N4001 power diodes (**D40-D43**). Test that the votage across the jack terminals is 12VAC or so. Be sure to solder in the jack flush and square with the PCB and use a lot of solder (completely fill the hole with solder) as this will reduce the stress on the part from constant un/plugging.

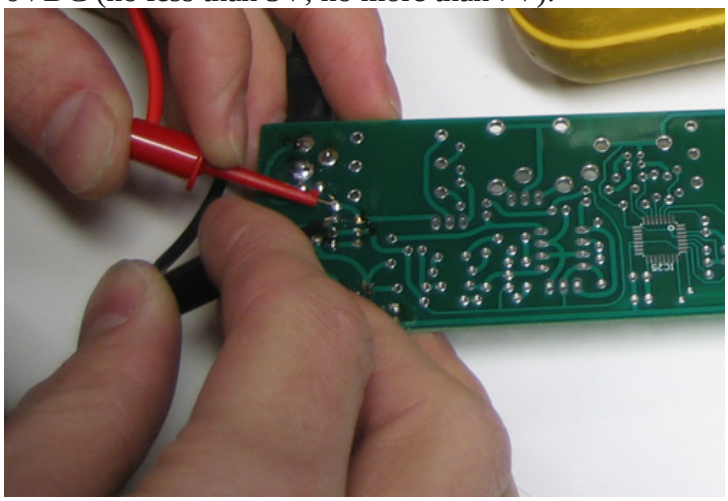

and that the voltage across each large capacitor is about 15VDC.


2. Verify that the voltage between the middle pin for the placement of **IC20** (large 7805) and the left pin (next to the white dot) is positive and is higher than 8VDC.

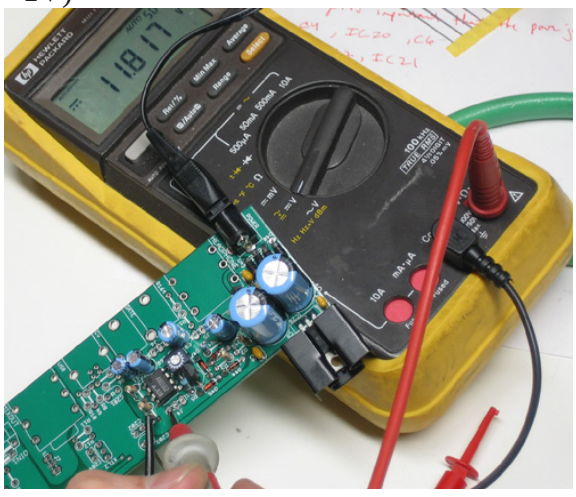


3. The 7805 and heatsink need breathing room, so bend the IC backwards a bit so it juts out beyond the PCB before soldering it. (See picture above) Solder in **IC20**, attach the heat sink by sliding it on, it should fit snugly. Solder in .1uF capacitors **C4** and **C6**. Verify that the voltage across **C6** about 5VDC (no less than 4.5V, no more than 5.5V).

4. Solder in the 7806 (**IC21**), .1uF capacitors **C1** and **C2**. Verify the votage across **C1** is approx 6VDC (no less than 5V, no more than 7V).

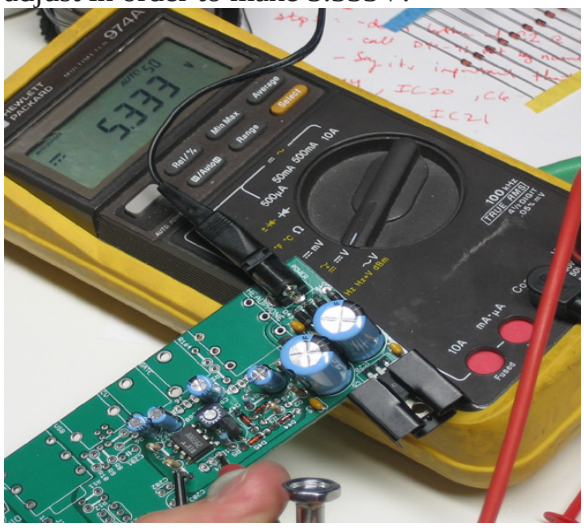


5. Solder in the rest of the components. Verify that the voltage at pin #3 **J4** is around 12VDC (+ or - 1V)



6. The voltage at pin #1 of **J4** should be 5.333V which is the tuning voltage and therefore must be

as precise as possible. This voltage is set by the trim potentiometer **TM6**, which you should adjust in order to make 5.333V.




To test the rest of the kit solder three wires from **J4** to **J4** on the main board making sure to match pin #1 on both sides. **J4** passes 5.333V and 12V to the mainboard for the analog section. In some of the pictures, **J4** is soldered with the jumper wire. Unfortunately, the jumper wire is too delicate to be soldered in while the boards are still being worked on, so don't solder in the jumper wire! You'll remove these 3 wires at the end and replace them with the grey jumper.

| | | |
|---|---|---|
| | Heat sink (TO-220) | IC20' |
| | 2.2mm power jack | POWER |
|  | 1N4001 | D40-D43 |
|  | 1N4148 | D44-D47 |
|  | 100 ohm 5% resistor | R1 |
|  | 1K 5% resistor | R2 |

| | | |
|---|---|---|
|  | 1.8K 5% resistor | R179 |
|  | 2.2K 5% resistor | R178 |
|  | 6.8K 5% resistor | R3 |
|  | 2.4K 1% resistor (red yellow black brown brown) | R5 |
|  | 5.6K 1% resistor | R4 |
| | 2K (202) trim potentiometer | TM6 |
|  | .1uF (104) ceramic capacitor | C1, C2, C4, C6 |
| | 10uF electrolytic capacitor | C60, C61 |
| | 100uF 25V electrolytic capacitor | C7, C8 |
| | 2200uF electolytic capacitor | C3, C5 |
| | AN6562 8-DIP dual Op-Amp | IC23 |
| | (78x05) voltage regulator | IC20 |
| | (78L06) 6V voltage regulator | IC21 |
| | (LM336Z-5.0) 5V voltage reference | IC22 |

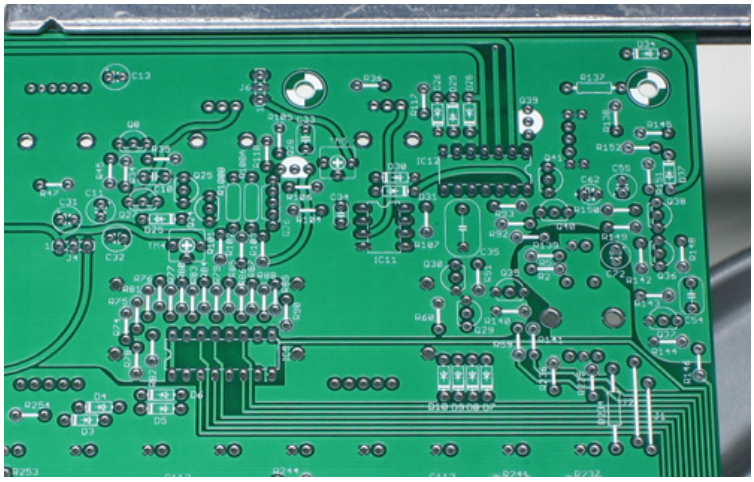
# x0xb0x fabrication manual VCO

*history*
*last edited: May 16, 2005*

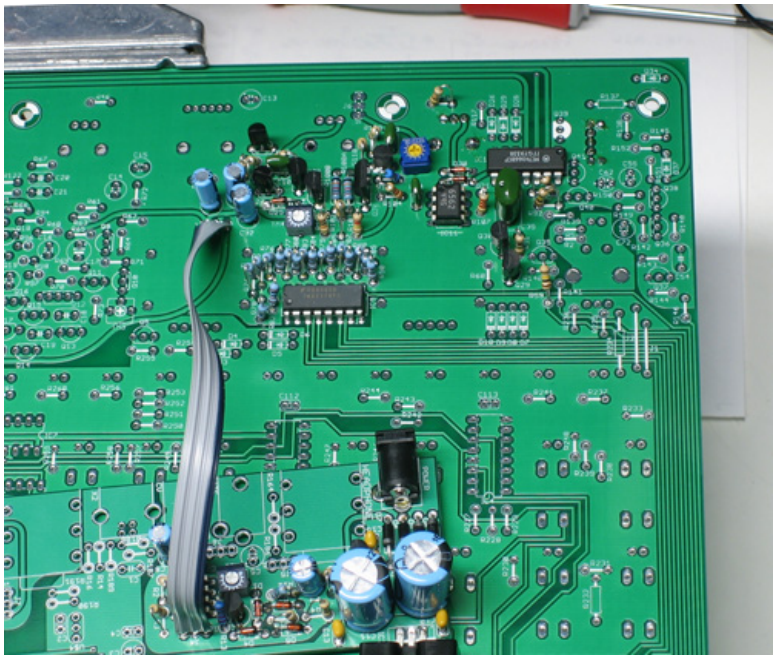
## Introduction

The first section of the main board to be assembled is the VCO (voltage controlled oscillator). This section converts a logarithmic voltage into a scaled oscillation. The relationship between the voltage and oscillation is called "1V/octave" because every 1V increase corresponds to a 1 octave increase in sound. For example, low C (65.4Hz) is generated by 2.0V, middle C (130.8Hz) is generated by 3.0V, and high C is generated by 4.0V.

## You are here



*Before: The VCO is in the top right corner of the mainboard*



*After: The completed VCO connected to the power supply. (The jumper wire should be replaced with plain wire)*

## Notes

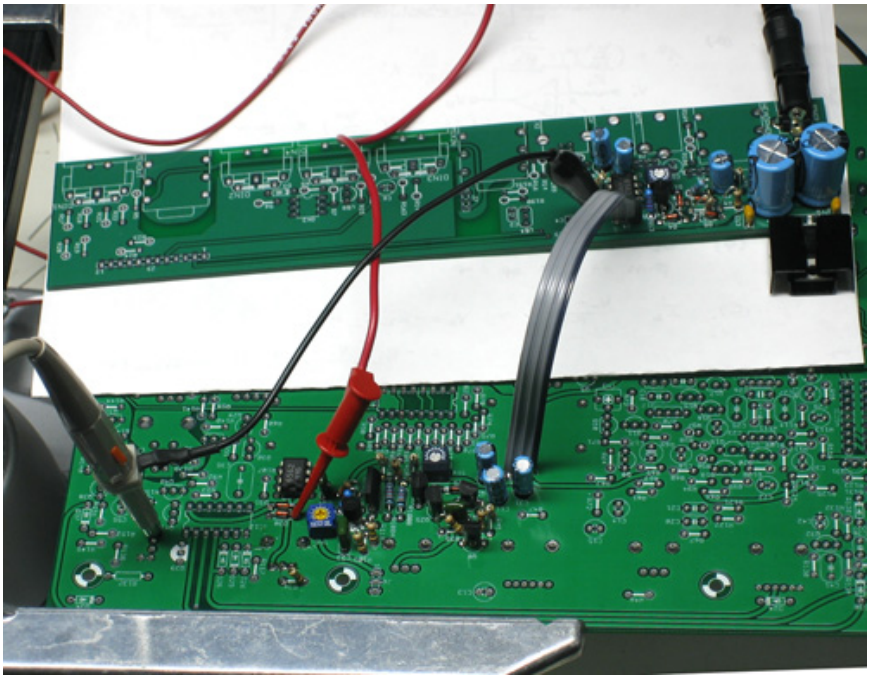
- The be sure not to confuse the 2SC536, 2SA733 and 2SK30 transistors, or the 2SC1583 and 2SC2291 matched pairs: they look similar. The PCB drawings of the 2SK30 show a filled in transistor, the drawing of the 2SA733 is hollow with a line through it, and the 2SC536 drawing is hollow.
- The resistors, thermistors, and non-electrolytic capacitors have no polarity. This is not true for the diodes, transistors, electrolytic capacitors, and op-amp. Putting them in backwards can destroy them.
- Both sides of the jumper **J4** have a "1" printed next to the first pin, make sure that you have correctly corresponding pins connected.
- Don't forget that **VR2** and **SW1** are soldered on the top, opposite side of all the components.

## Recommended order

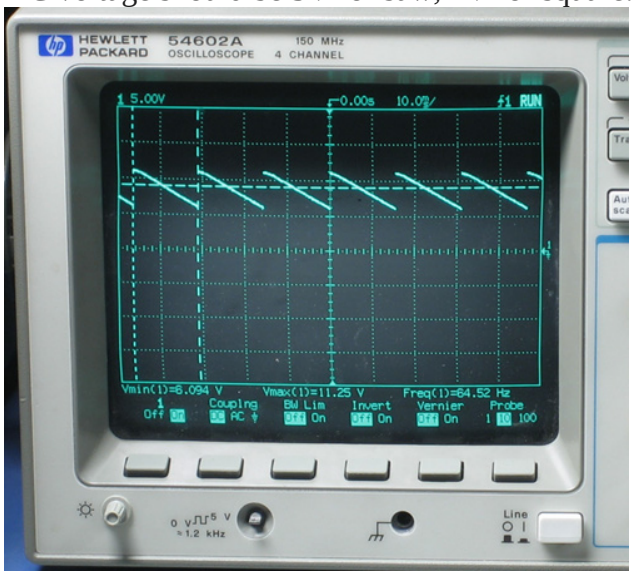
1. Solder in all parts except for **S1** and **VR2**
2. Solder in **S1** and **VR2** (on opposite side)
3. Do basic calibration/testing.

## Testing & Calibration

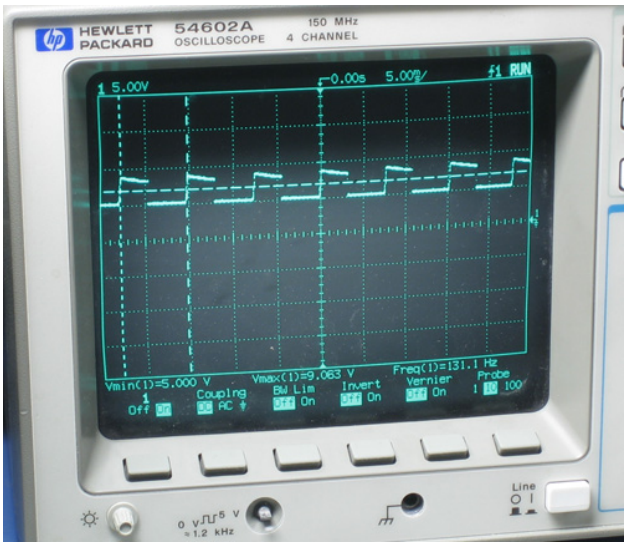
The VCO can be simply tested without the use of an oscilloscope (although it helps a lot). The power supply 5.333V *must* be calibrated before this step:



1. Apply power (make sure **J4** is connected with wires)
2. ***With the tuning knob VR2 centered***, apply 2.0VDC using your powersupply to **R89** (also pin 5 of **IC11**). Also center **TM4** and **TM5** to start.
3. Use a multimeter with frequency-detection, or an oscilloscope, or a pair of cheap headphones, to probe pins 1 or 3 of the waveform switch. Switch between 2.0VDC and 3.0VDC to **R89** while turning **TM5** ('width') until the frequency at 3.0VDC is twice that of 2.0VDC.
4. If you have an oscilloscope, verify also the offset voltages are correct (Vmin = 6V for saw, 5V for square, Vmax = 11.5V for saw, 9V for square), if you have only a meter, the DC voltage should be ~9V for saw ~7V for square, the AC voltage should be 5V for saw, 4V for square.




*Tuning the sawtooth wave to C1. Note that the tip of the saw isnt 'sharp,' also the min and max voltages.*




*Tuning the square wave to C2. Note that the square wave droops slightly and isnt 50% duty cycle.*

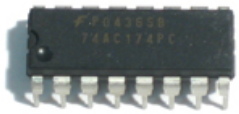
5. Now apply 2.0VDC to **R89** and probe the waveform switch again, adjusting **TM4** ('tune') until you see/hear *C1*, 65.4Hz.

The precise calibration step can be delayed until the rest of the synthesizer is completed, when you can just press a button to generate 2.0V and 3.0V to the VCO.

If you don't have a bench power supply you should center **TM4** and **TM5** (which will get you close enough) and listen to the square waveform using a pair of cheap headphones: probe the middle pin of the waveform switch while its set to SQR. Now touch the metal leads of the 200K resistors to vary the frequency and turn **VR2** and note that the frequency changes.

| | | | |
|---|---|---|---|
| | Toggle switch | 1 | SW1 |
|  | 1N4148 | 3 | D25, D30, D31 |
|  | 2.2K 5% resistor | 2 | R107, R104 |
|  | 10K 5% resistor | 4 | R34, R36, R105, R101 |

| | | | |
|---|---|---|---|
|  | 22K 5% resistor | 1 | R45, R60 |
|  | 100K 5% resistor | 6 | R35, R93, R92, R59, R102, R118 |
|  | 220K 5% resistor | 1 | R103 |
|  | 1MEG 5% resistor | 1 | R91 |
|  | 24.0K 1% resistor (red yellow black red brown) | 1 | R106 |
|  | 200K 1% resistor | 17 | R74-R90 |
| | 5K (502) trim potentiometer | 1 | TM5 |
| | 50K (503) trim potentiometer | 1 | TM4 |
|  | 50K B (linear) potentiometer | 1 | VR2 |

| | | | |
|---|---|---|---|
|  | 1K PTC Thermistor | 2 | R100A, R100B |
|  | .001uF (2A102K) capacitor | 1 | C34 |
|  | .01uF (2A103K) capacitor | 2 | C33, C10 |
|  | .22uF (2A224K) polyester capacitor | 1 | C35 |
| | 1uF electrolytic capacitor | 1 | C11 |
| | 10uF electrolytic capacitor | 2 | C31, C32 |
|  | 4066 analog switch | 1 | IC12 |
|  | 74AC174 | 1 | IC9 |
|  | 2SA733P, TO-92 PNP transistor | 2 | Q8, Q27 |

| | | | |
|---|---|---|---|
|  | 2SC536F, TO-92 NPN transistor | 4 | Q29, Q30 , Q25 , Q24 |
|  | 2SK30 JFET | 1 | Q28 |
|  | AN6562 8-DIP dual Op-Amp | 1 | IC11 |
|  | 2SC1583 5-SIP matched pair with common emitter | 1 | Q26 |

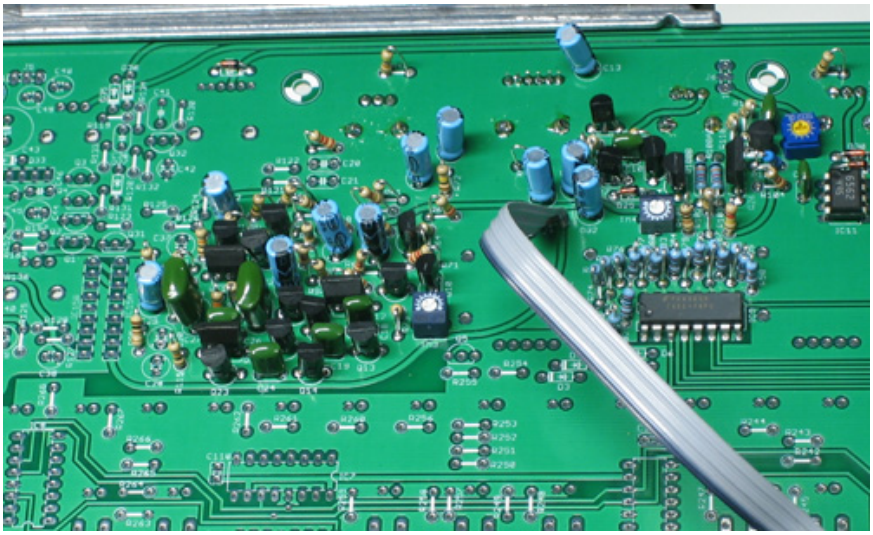
# x0xb0x fabrication manual
## VCF

*history*
*last edited: May 16, 2005*

### Introduction

The VCF creates the high-frequency sub-oscillations, as controlled by the cutoff and resonance knobs.

## You are here



After

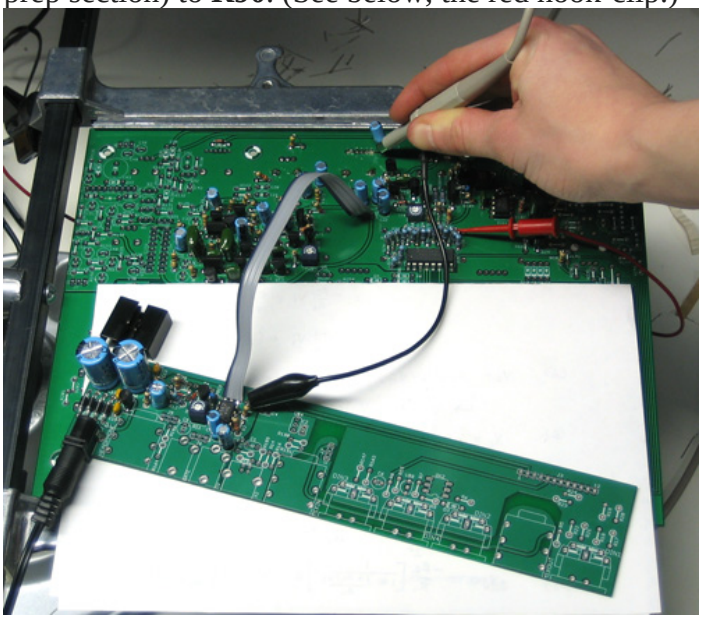
## Notes

Again, solder in the large potentiometers last.

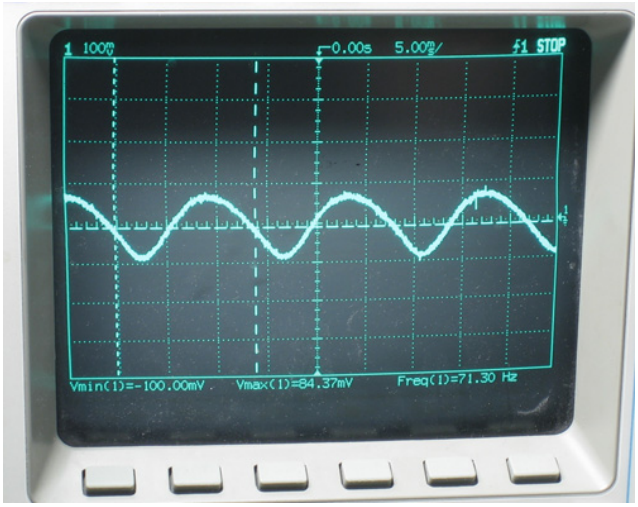
## Testing

At this point one can test whether resonance/cutoff affect the note.

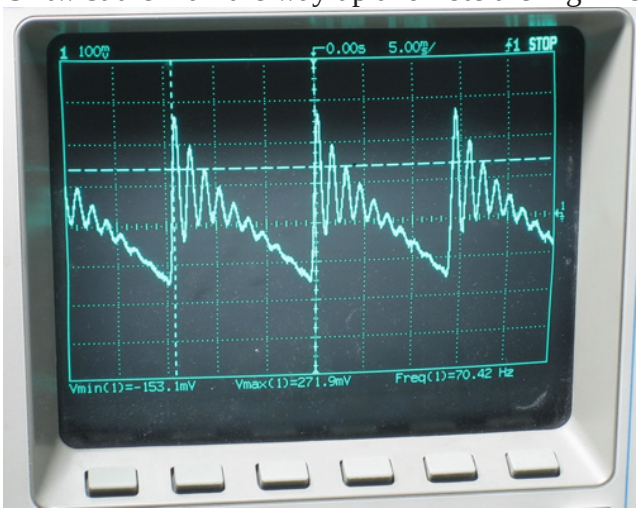
1. Power up as described in the power supply section, connect 3VDC (using a power supply or some other method as discussed in the prep section) to **R90**. (See below, the red hook-clip.)



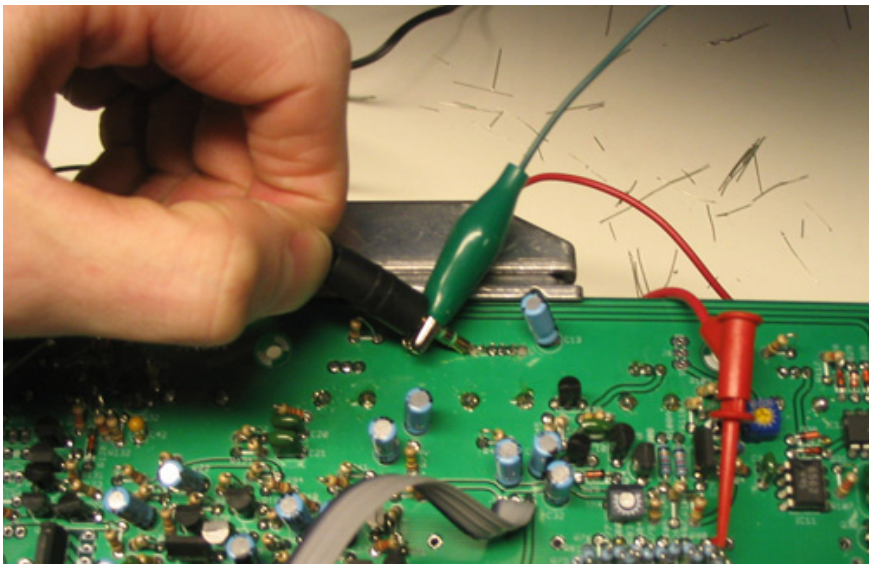
2. If you have one, use a scope to probe the potentiometer, twist the cutoff (**VR3**) and resonance (**VR4**) pots all the way down and examine the almost sinusoidal notes.




3. Or twist them all the way up and note the high frequencies.




4. Or, lacking a scope, use a high-impedance (32ohm) headphone to probe the same pin. Connect the sleeve to ground and use the tip to touch the point you want to hear. Make sure that its a pair of really cheap headphones: high quality ones are as low as 2ohms and will pull the signal low. Sinusoudal notes will sound "soft" whereas the high resonance notes are 'aciding.'



## Tuning

There is an 'official' tuning for the VCF. According to the Roland TB-303 manual, when playing *C1* (65.4Hz) with the cutoff frequency knob set to 50%, saw waveform, and resonance knob at 100%, the resonance frequency should be 500Hz (give or take 100Hz depending on how it sounds to you). You can perform this tuning by either applying 3.0VDC to the VCO or finishing the entire assembly and using something like Keyboard mode to trigger the note. The resonance can be adjusted by tweaking **TM3**.

## Parts

| | | | |
|---|---|---|---|
|  | 1N4148 | 1 | D24 |
|  | 100 ohm 5% resistor | 1 | R95 |
|  | 2.2K 5% resistor | 7 | R67, R68, R69, R70, R71, R98, R108 |

| | | | |
|---|---|---|---|
|  | 10K 5% resistor | 11 | R47, R61, R64, R65, R94, R96, R97, R109, R112, R115, R116 |
|  | 22K 5% resistor | 2 | R110, R111 |
|  | 47K 5% resistor | 1 | R46 |
|  | 100K 5% resistor | 6 | R66, R72, R73, R99, R113, R114 |
|  | 220K 5% resistor | 2 | R62, R63 |
| | 500K (504) trim potentiometer | 1 | TM3 |
|  | 50K D (log) potentiometer | 2 | VR3, VR5 |
|   | 50K B (linear) dual potentiometer | 1 | VR4 |

| | | | |
|---|---|---|---|
|  | .018uF (2A183K) polyester capacitor | 1 | C18 |
|  | .033uF (2A333K) polyester capacitor | 3 | C19, C24, C26 |
|  | .1uF (2A104K) capacitor | 2 | C25, C27 |
| | 10uF electrolytic capacitor | 2 | C16, C30 |
| | 47uF electrolytic capacitor | 1 | C28 |
| | 1uF electrolytic capacitor | 7 | C13, C14, C15, C17, C22, C23, C29 |
|  | 2SA733P, TO-92 PNP transistor | 2 | Q9, Q10 |
|  | 2SC536F, TO-92 NPN transistor | 10 | Q11, Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q20, Q23 |

| | | | |
|---|---|---|---|
|   | 2SC2291 5-SIP matched pair with common base | 1 | Q22 |
|   | 2SC1583 5-SIP matched pair with common emitter | 2 | Q12, Q21 |

# x0xb0x fabrication manual

## Envelope

*history*
*last edited: May 10, 2005*

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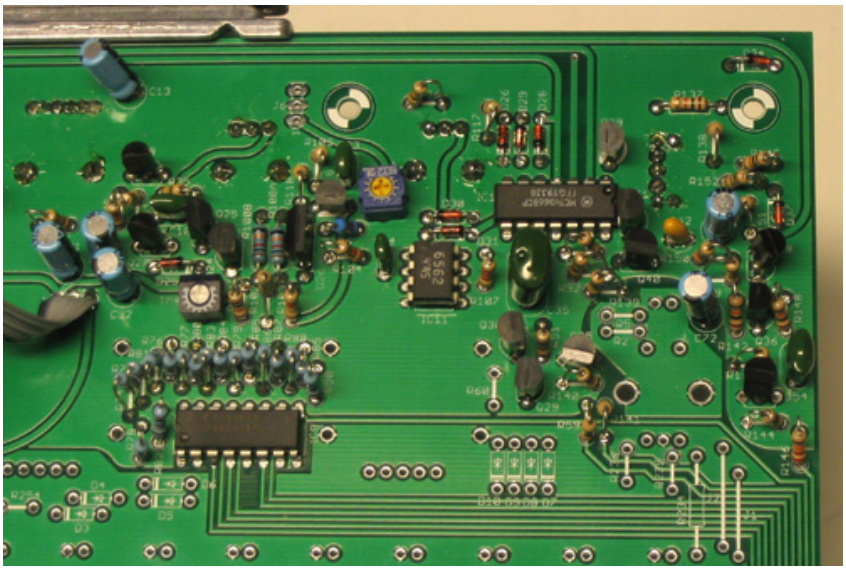
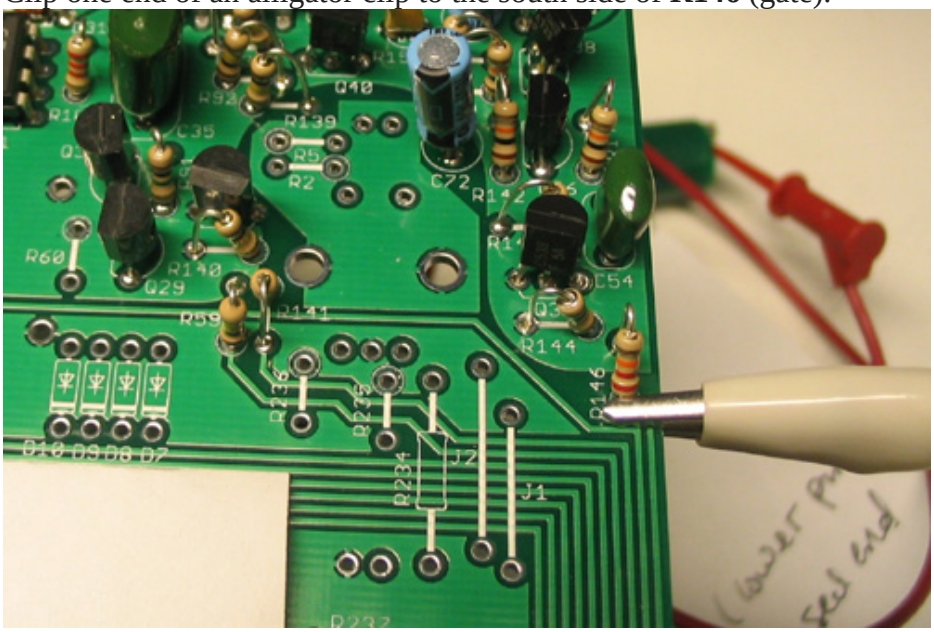


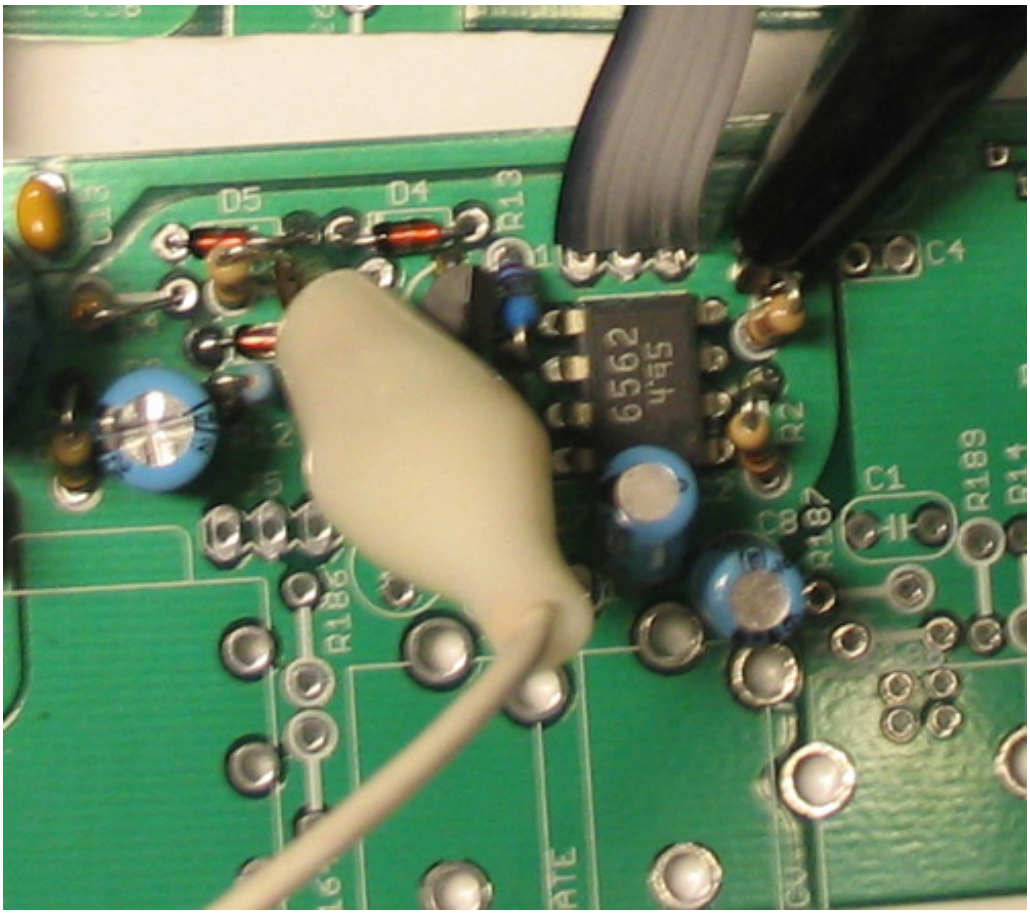
## Testing

The only thing that can really be tested is the gating circuit.

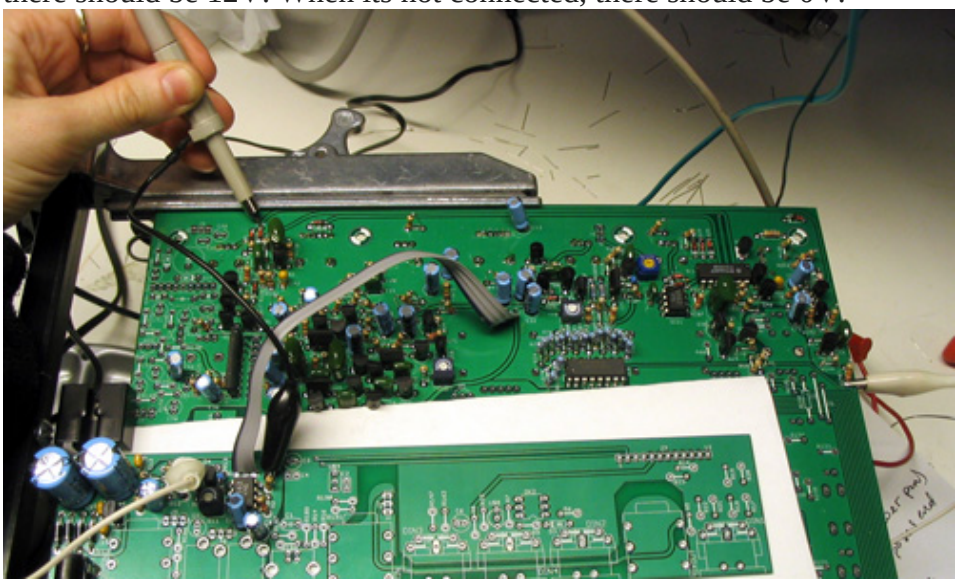
1. Power up the main board by connecting **J4** as before.
2. Clip one end of an alligator clip to the south side of **R146** (gate).




3. Connect the other end to the exposed side of **R10** on the IO board (which provides +5V)




4. Check the voltage at **D35** using a scope or meter. When the clip is connected, there should be 12V. When its not connected, there should be 0V.



5. Check the voltage at **D36**. When the clip from **R146** is disconnected and touched to **R10** again, there should be a brief pulse to 12V, if your meter has a 'max hold' setting, you can use this to see whether there is a pulse.

Parts

| | | | |
|---|---|---|---|
|  | 1N4148 | 7 | D26, D28, D29, D34, D37 |
|  | 22 ohm 5% resistor | 1 | R150 |
|  | 100 ohm 5% resistor | 1 | R152 |
|  | 1K 5% resistor | 1 | R137 |
|  | 10K 5% resistor | 6 | R142, R143, R144, R145, R148, R149 |
|  | 22K 5% resistor | 3 | R117, R146, R151 |
|  | 68K 5% resistor | 1 | R138 |
|  | 100K 5% resistor | 3 | R139, R140, R141 |

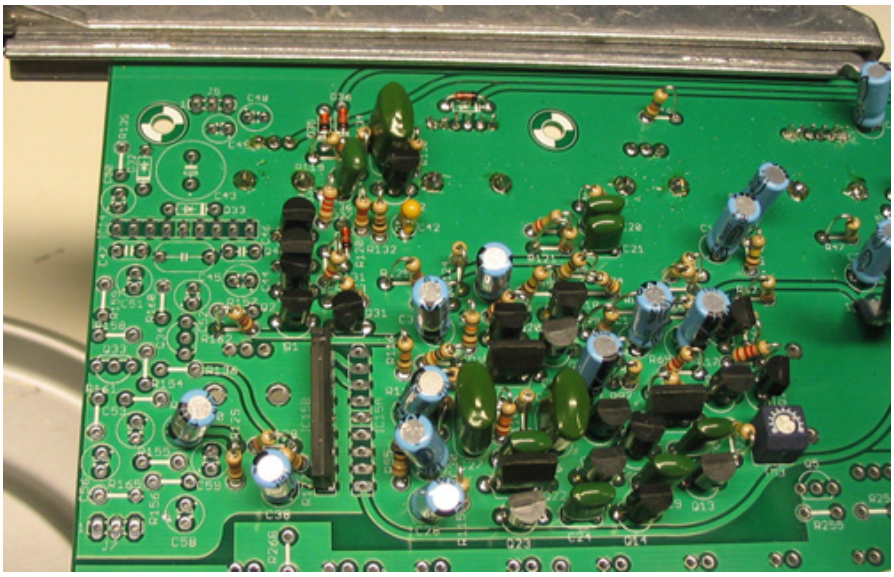
| | | | |
|---|---|---|---|
|  | 1Meg A (log) dual potentiometer | 1 | VR6 |
|  | .047uF (2A473K) capacitor | 1 | C54 |
|  | 1uF tantalum capacitor | 1 | C62 |
| | 10uF electrolytic capacitor | 1 | C72 |
| | 47uF electrolytic capacitor | 1 | C55 |
|  | 2SA733P, TO-92 PNP transistor | 2 | Q36, Q38 |
|  | 2SC536F, TO-92 NPN transistor | 4 | Q35, Q37, Q40, Q41 |

| | | | |
|---|---|---|---|
|  | 2SK30 JFET | 1 | Q39 |

# x0xb0x fabrication manual
## VCA

*history*
*last edited: May 9, 2005*

### You are here



### Notes

The VCA can either use the BA662 *or* BA6110 chips. The kit comes with BA6110, which means that Q1-4 are also required. If you decide to go with a BA662, **do not solder in** Q1-4! Also, each chip has a different pinout so use **IC15B** for BA6110 and **IC15A** for BA662.

Dont put in your BA6110 upside down: the notch in the chip goes at the end of the socket that has a tapered end in the silkscreened picture (pointing north as seen above).

## Testing

1. Connect power from the IO board and provide 2.0VDC to **R90**, as before.
2. In a quiet room, connect up a pair of low-fi (32ohm or greater impedance) headphones as before: ground the sleeve, and use the tip for probing. Touch the tip to rightmost pin (the one that is not connected to the ground plane) of where the volume potetiometer **VR8** will go.
3. Connect up an alligator clip as it was for testing the gate (clipped to **R146**) and touch the other end to **R10** to generate a gate pulse. You should hear a struck note! Hooray, you're basically done with the analog section of the synthesizer!

## Parts

| | | | |
|---|---|---|---|
|  | 1N4148 | 3 | D27, D35, D36 |
|  | 100 ohm 5% resistor | 2 | R130, R132 |
|  | 2.2K 5% resistor | 5 | R125, R126, R124, R133, R162 |
|  | 22K 5% resistor | 3 | R120, R129, R134 |
|  | 47K 5% resistor | 2 | R119, R127 |

| | | | |
|---|---|---|---|
|  | 100K 5% resistor | 1 | R122 |
|  | 220K 5% resistor | 4 | R121, R128, R131 |
|  | 1.5MEG 5% resistor | 1 | R123 |
|  | 50K B (linear) potentiometer | 1 | VR7 |
|  | .01uF (2A103K) capacitor | 2 | C21, C20 |
|  | .033uF (2A333K) polyester capacitor | 1 | C36 |
|  | .1uF (2A104K) capacitor | 1 | C41 |
| | 1uF electrolytic capacitor | 1 | C38 |

| | | | |
|---|---|---|---|
|  | 1uF (105) tantalum capacitor | 1 | C42 |
| | 10uF electrolytic capacitor | 1 | C37, C40 |
|  | 2SA733P, TO-92 PNP transistor | 3 | Q1*, Q2*, Q31 |
|  | 2SC536F, TO-92 NPN transistor | 3 | Q3*, Q4*, Q32 |
|  | BA6110 9-SIP | 1 | IC15B* |
|  | BA662A 9-SIP | 1 | IC15A* |

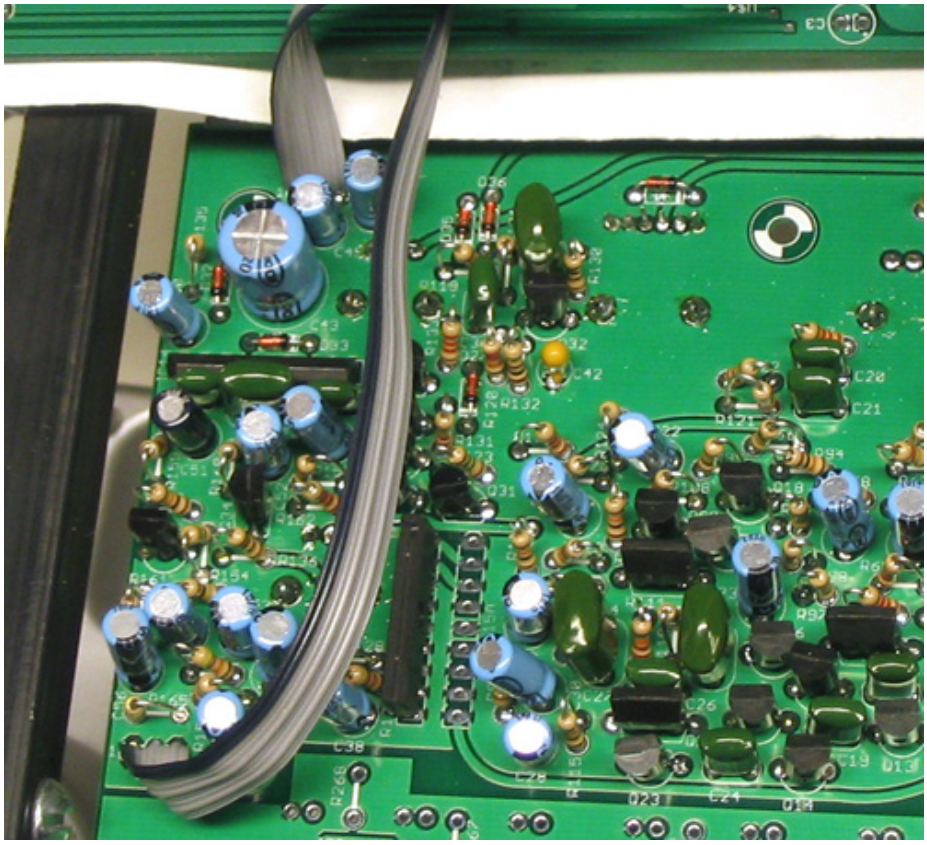
# x0xb0x fabrication manual
## Headphone & Mixer

*history*
*last edited: May 10, 2005*

### Introduction

This is the final step of the analogue section: the headphone amp, volume control, and mixer.

### You are here



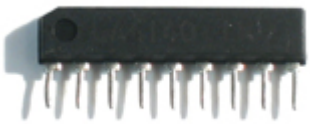
### Testing

The headphone amp is best tested at the end once all the jumpers are attached.

Parts

| | | | |
|---|---|---|---|
|  | 1N4148 | 2 | D32, D33 |
|  | 100 ohm 5% resistor | 1 | R136 |
|  | 1K 5% resistor | 1 | R161 |
|  | 4.7K 5% resistor | 1 | R135 |
|  | 10K 5% resistor | 3 | R157, R158, R160 |
|  | 33K 5% resistor | 1 | R159 |
|  | 47K 5% resistor | 1 | R155 |
|  | 100K 5% resistor | 4 | R153, R154, R156, R165 |

| | | | |
|---|---|---|---|
|  | 50K D (log) potentiometer | 1 | VR8 |
|  | .0068uF (2A682K) capacitor | 1 | C47 |
|  | .01uF (2A103K) capacitor | 1 | C46 |
|  | .068uF (2A683K) capacitor | 1 | C45 |
| | 1uF electrolytic capacitor | 3 | C58, C59, C56 |
| | 2.2uF electolytic capacitor | 1 | C51 |
| | 10uF electrolytic capacitor | 2 | C50, C52 |
| | 47uF electrolytic capacitor | 2 | C44, C53 |
| | 100uF 10V electrolytic capacitor | 2 | C48, C49 |
| | 1000uF electrolytic capacitor | 1 | C43 |

| | | | |
|---|---|---|---|
|  | 2SA733P, TO-92 PNP transistor | 1 | Q33 |
|  | 2SC536F, TO-92 NPN transistor | 1 | Q34 |
|  | LA4140 9-SIP | 1 | IC14 |

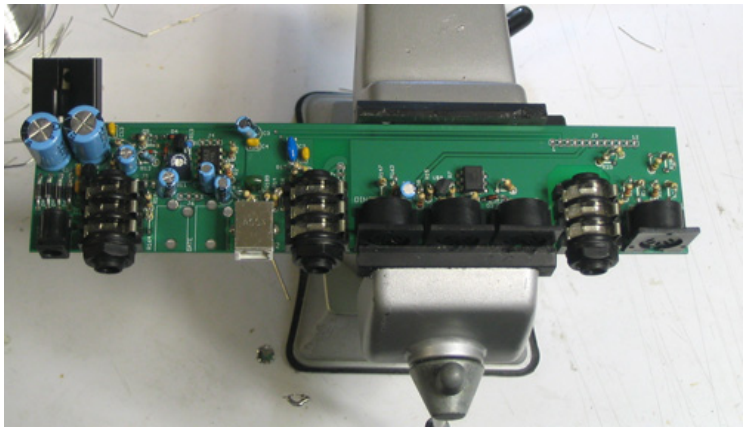
# x0xb0x fabrication manual IO Board

*history*
*last edited: May 10, 2005*

## Introduction

In this section, the entire IO board is soldered together and the USB is tested. Be sure to follow the instructions for how to solder in the surface mount USB chip.

## You are here



## Testing and soldering order

If you are concerned that you will not be able to solder the USB chip, we are offering, as an extra service, to prebuild & test USB. Just make sure you request it when you order your kit.

Since the USB chip is the most difficult part to solder, this should be done first, so that there is plenty of space to work in. There are a few techniques for soldering SMD parts. The two I am a fan of are either

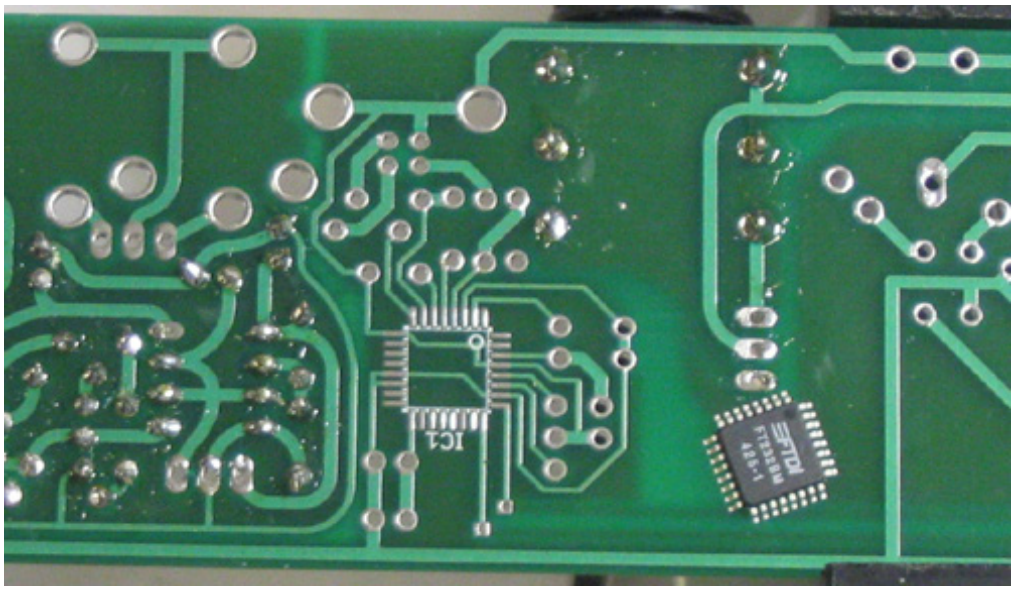
1. Soldering with silver solder as carefully as possible, and then using solder wick to clean up
2. Soldering with solder paste, and then using solder wick to clean up.

There are a bunch of tutorial sites on this (just search on google!):

- The SMD tutorial from SILabs (just the part about adding parts)
- Kevin Ro's tutorial

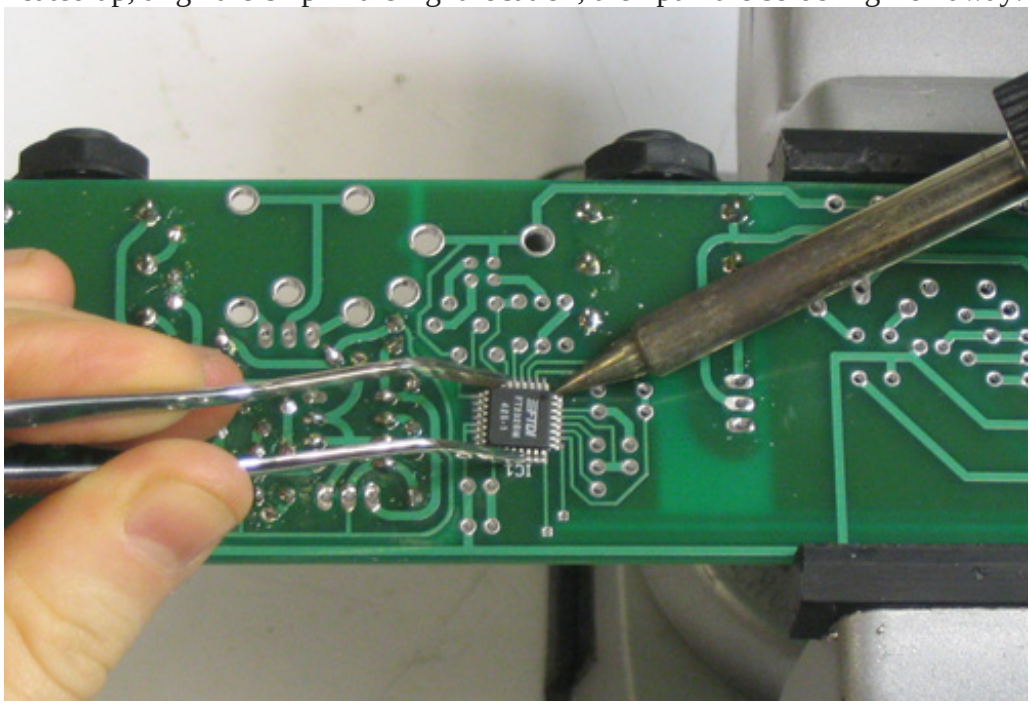
Here's a straightforward method for soldering this chip using solder & wick. The magnifying glass comes in very very handy here! Its essential to check for bridged pins and unconnected pins.

1. If you have flux, spread some on the pads, this will help bridging. The solder mask should also help a lot.

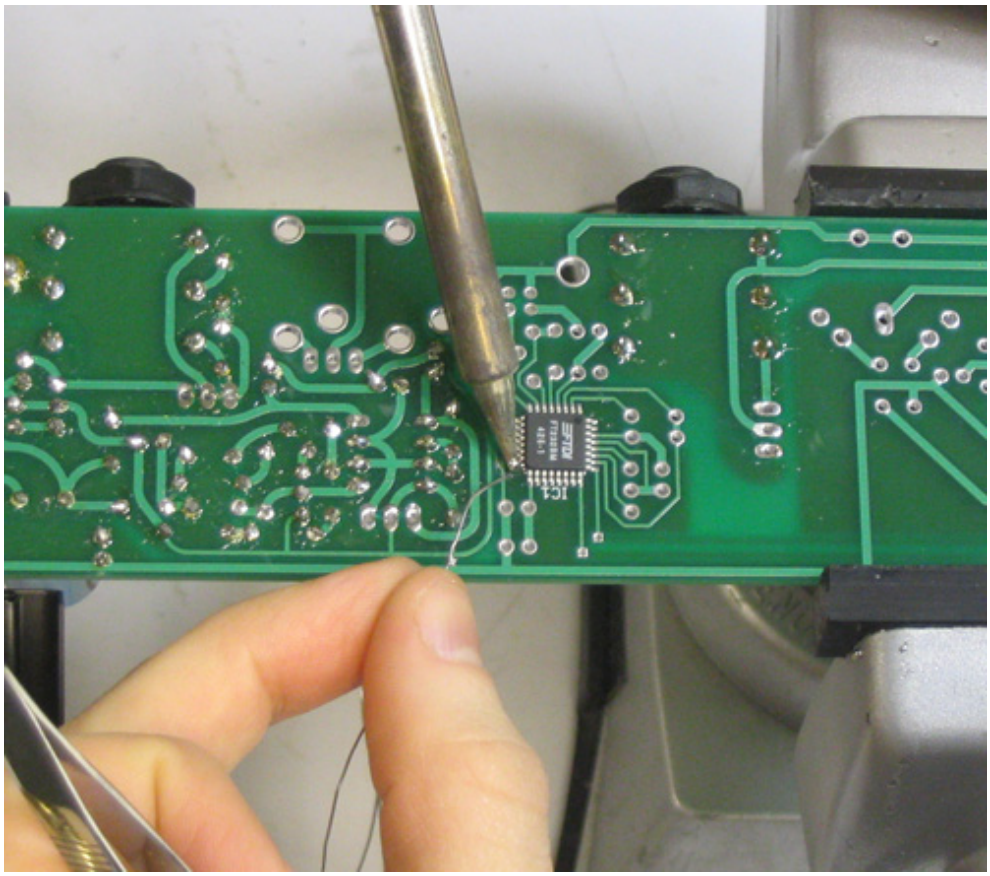



2. Place a small amount of solder on a corner pad.

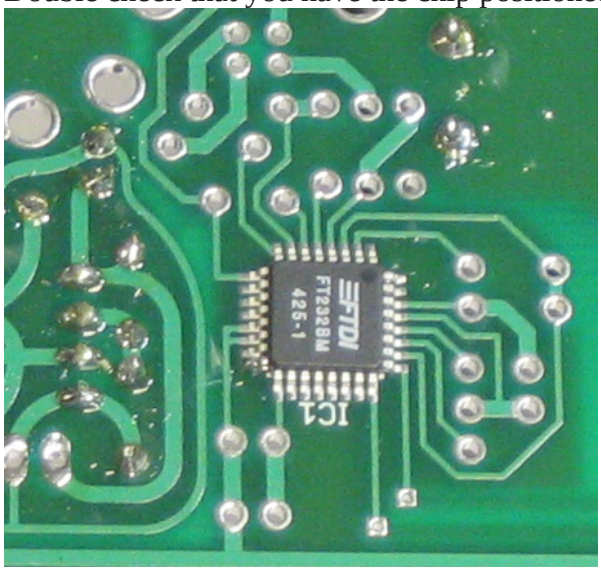
3. Using tweezers, position the chip correctly (the circle on the picture matches the circle indent on the chip) and heat the corner pad. When the soldered pad is heated up, align the chip in the right location, then pull the soldering iron away.



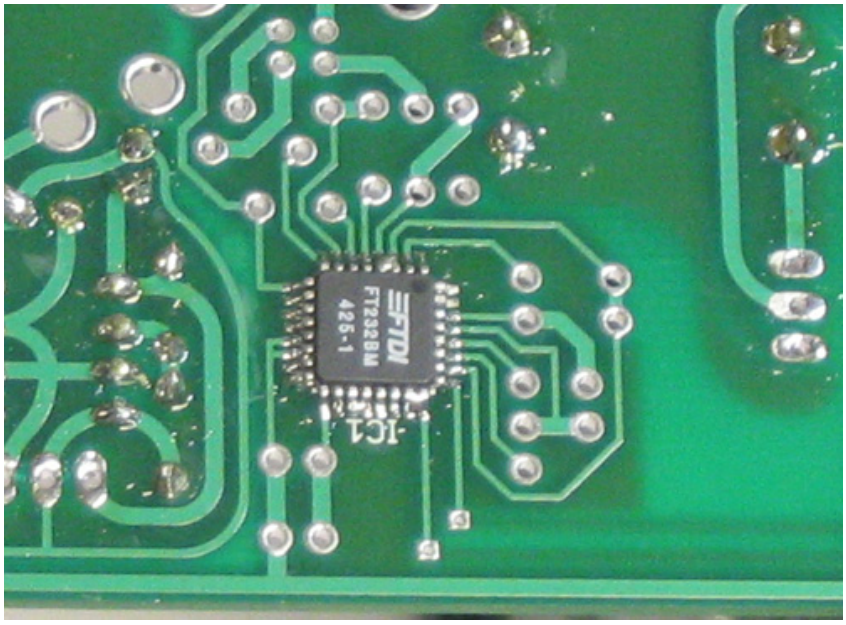

4. Place a small amount of solder on the iron tip. Tack the opposite corner, holding the chip steady with the tweezers.



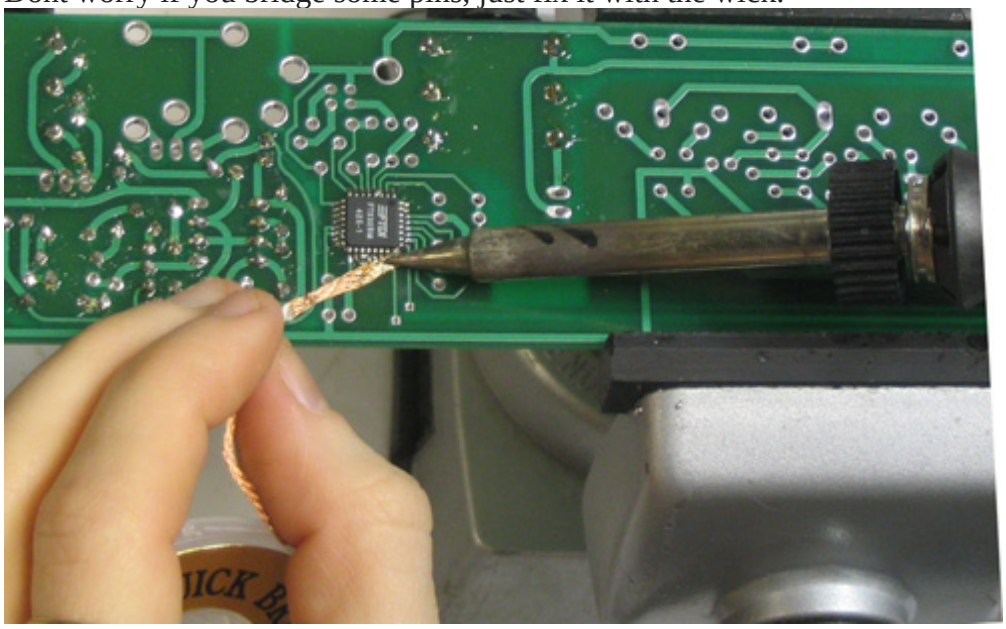
5. Double check that you have the chip positioned right.



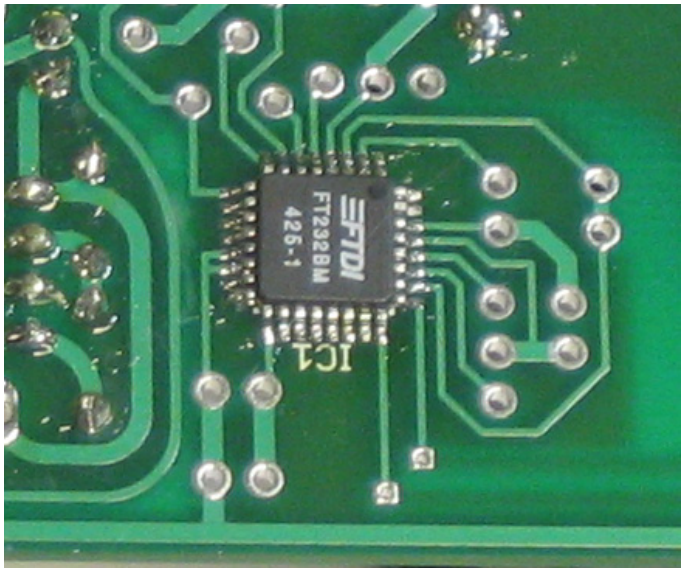

6. As carefully as possible, solder the remaining pins. Heat where the pin and pad meet, then quickly touch some solder to the pin, the solder should flow down to the pad.




7. Dont worry if you bridge some pins, just fix it with the wick.



8. When you're done, look at the board under a magnifier, or hold up to the light at an angle to see all the pins



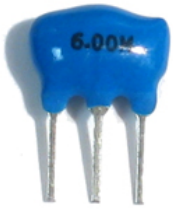

9. Ok now that you're done with the USB chip and you're pretty sure its soldered correctly, solder in all the rest of the components on the IO board. When soldering in the MIDI/DINSYNC connectors, make sure to 'pre-stress' them as they are a little flimsy: press them back so that the face is flush with the PCB while soldering them in. Be sure to use lots of solder on all the connector components to make a good mechanical bond.
10. Power the IO board, but don't connect it to the main board
11. Plug in the USB into a computer.
12. The computer should detect a "Serial <-> USB" chip and request a driver.
13. Download the driver from FTDI. Make sure to grab the VCP driver. Install it. Verify that a new COM port is created (under Windows, look under hardware control panel)

## Parts

| | | | |
|---|---|---|---|
|  | 1/4" stereo jack | 3 | MIXOUT, MIXIN, HEADPHONE |
|  | 1/8" jack | 2 | CV, GATE |

| | | | |
|---|---|---|---|
|  | USB type-B jack | 1 | USB |
| | MIDI/DINSYNC jack | 4 | DIN1-4 |
|  | 1N4148 | 1 | D48 |
|  | 10 ohm 5% resistor | 2 | R186, R164 |
|  | 22 ohm 5% resistor | 1 | R20 |
|  | 27 ohm 5% resistor | 2 | R6, R7 |
|  | 100 ohm 5% resistor | 1 | R16 |
|  | 220 ohm 5% resistor | 5 | R13-R15, R18, R19 |
|  | 470 ohm 5% resistor | 1 | R12 |
|  | 1K 5% resistor | 1 | R17 |

| | | | |
|---|---|---|---|
|  | 1.5K 5% resistor | 1 | R8 |
|  | 2.2K 5% resistor | 4 | R21-R24 |
|  | 4.7K 5% resistor | 1 | R9 |
|  | 10K 5% resistor | 2 | R10, R11 |
|  | 100K 5% resistor | 4 | R25-R28 |
|  | .033uF (2A333K) polyester capacitor | 1 | C201 |
|  | .1uF (104) ceramic | 2 | C202, C204 |
| | 10uF electrolytic capacitor | 2 | C203, C205 |

| | | | |
|---|---|---|---|
|  | 2SC536F, TO-92 NPN transistor | 1 | Q50 |
|  | 4N37 optoisolator | 1 | IC24 |
|  | FT232 USB chip | 1 | IC25 |
|  | 6MHz ceramic resonator | 1 | XTL2 |

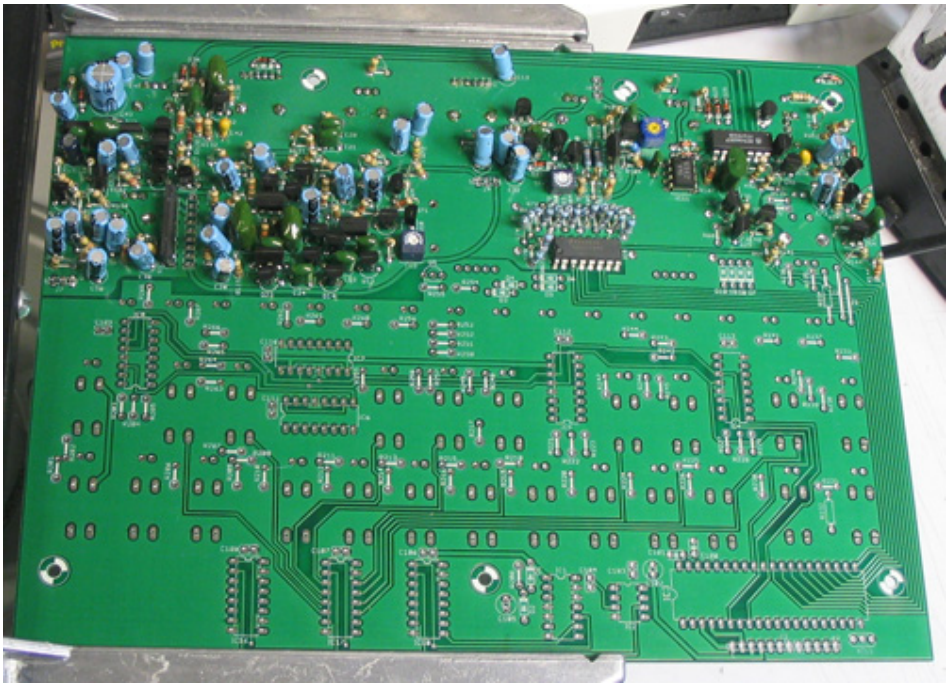
# x0xb0x fabrication manual sequencer

*history*
*last edited: May 10, 2005*

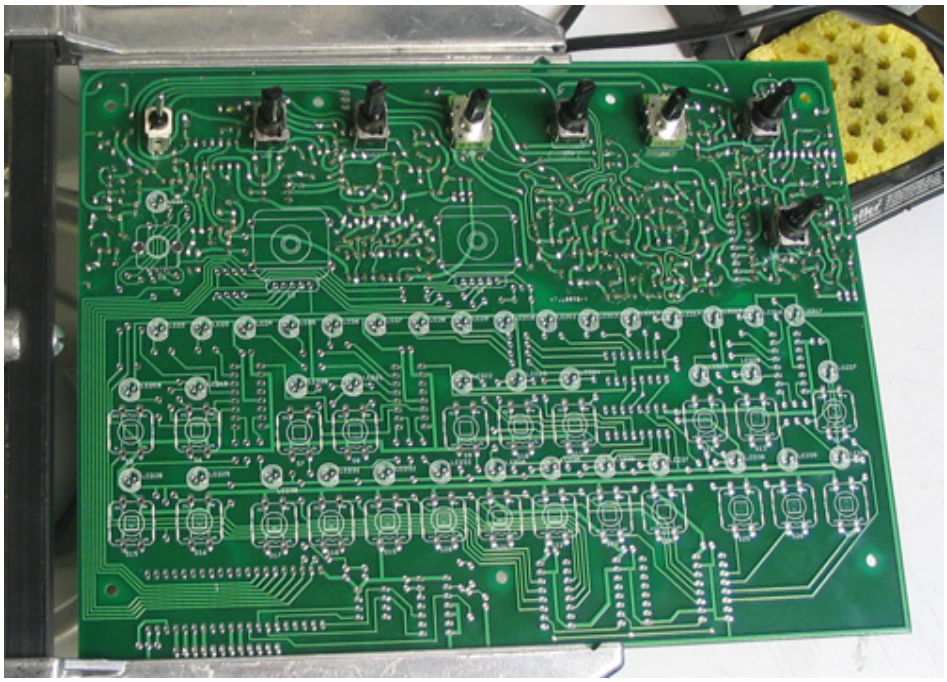
## Introduction

The sequencer is pretty much all of the digital control and I/O. There are a lot of parts but note many kinds of parts (70 10K resistors, 40 LEDs, 32 buttons, etc.)

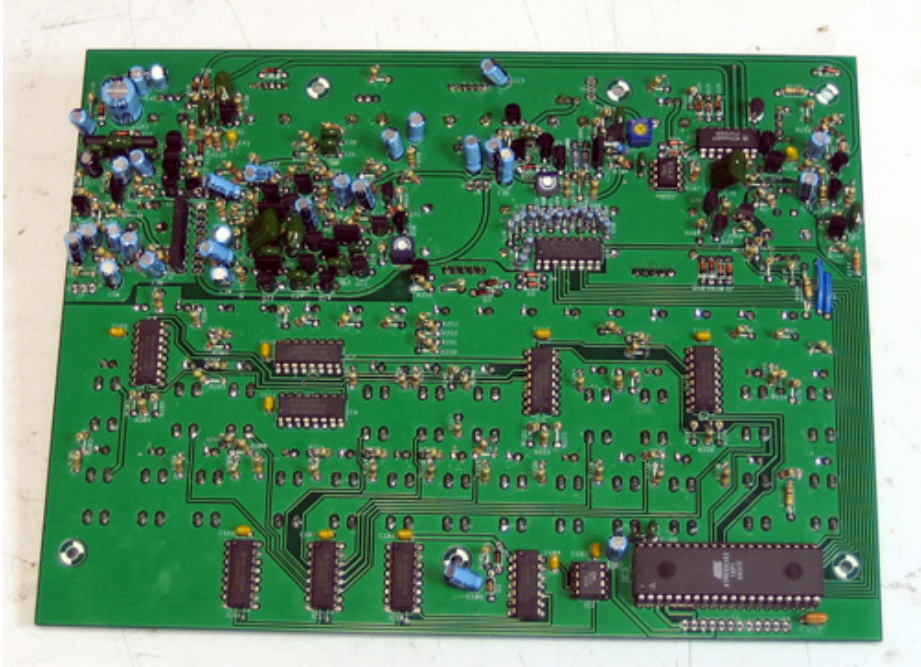
You are here



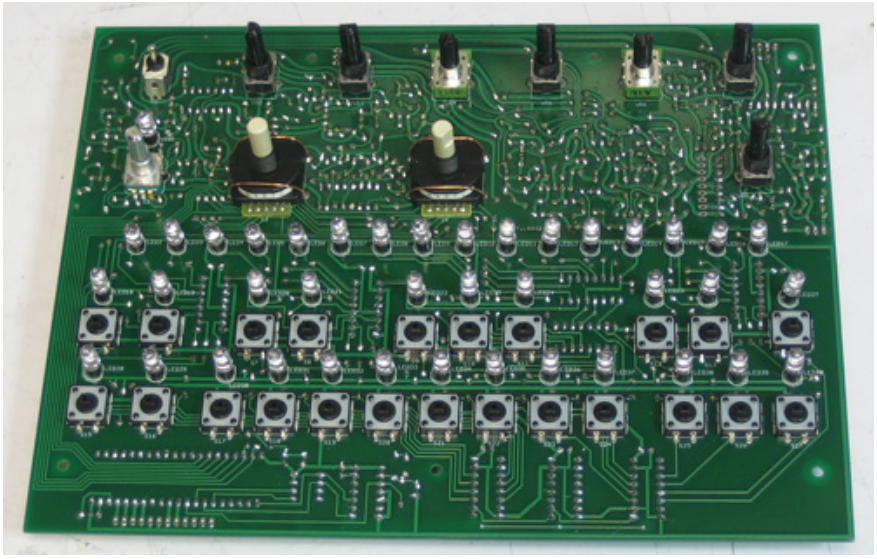
*Before, bottom of mainboard*



*Before, top of mainboard*



*After, bottom of mainboard*

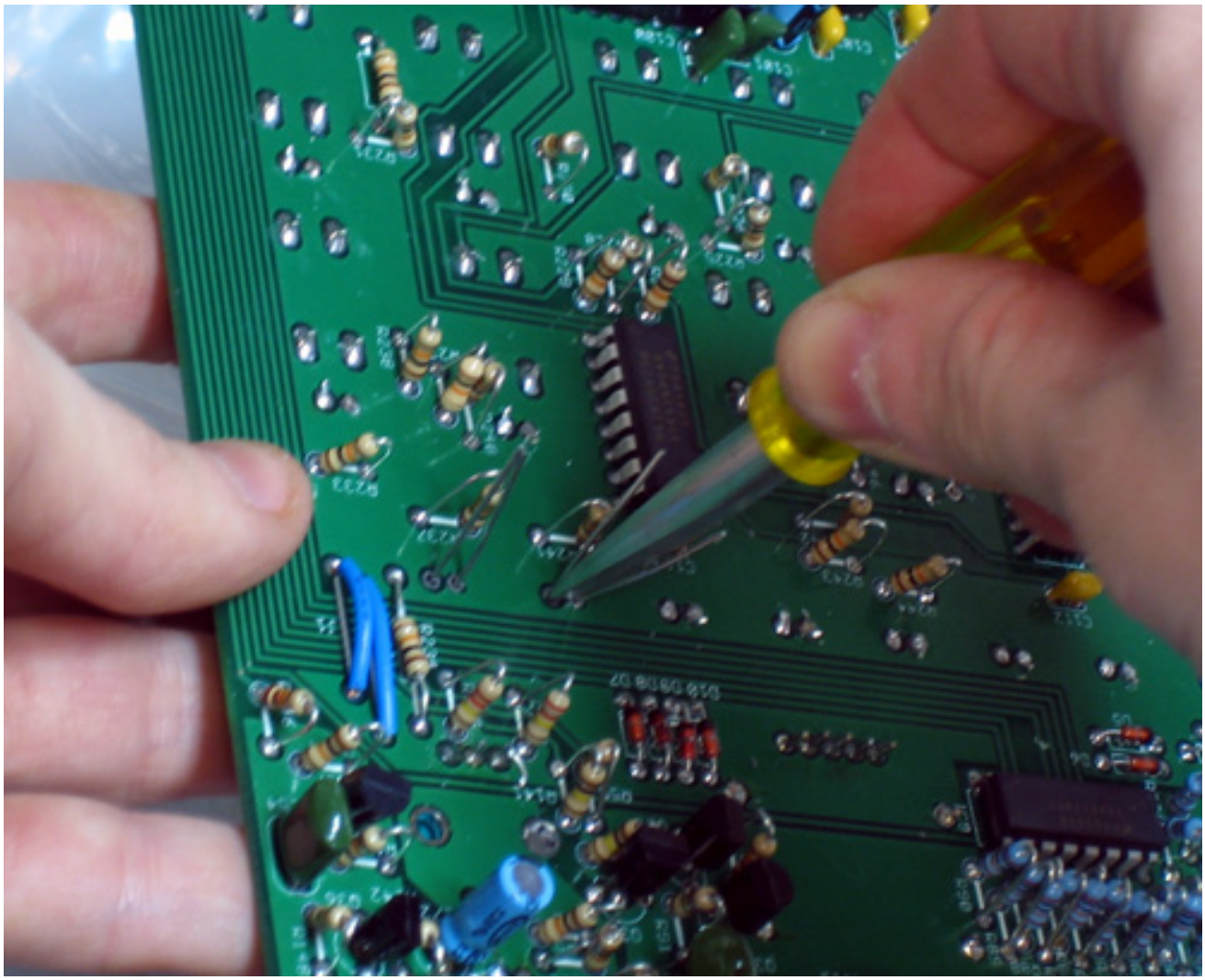


*After, top of mainboard*

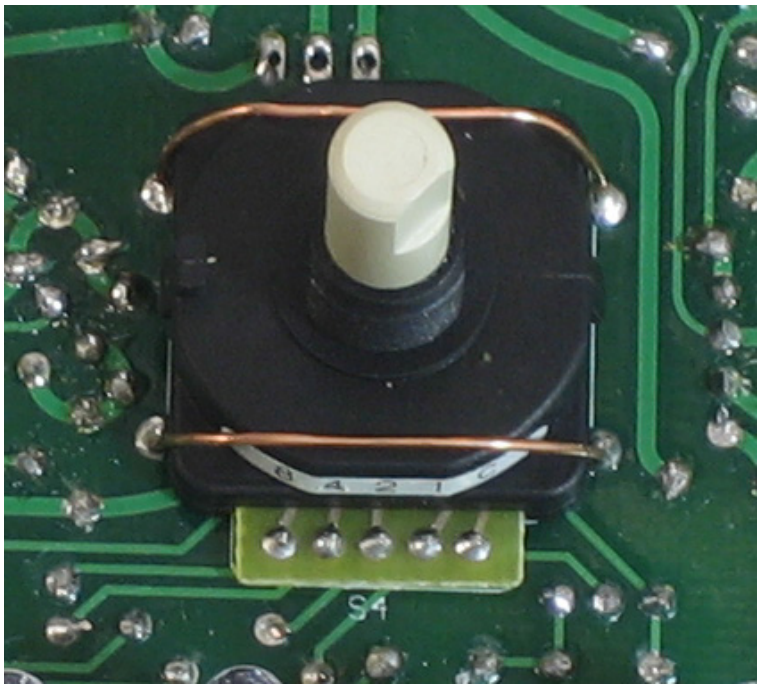
## Notes

Make sure you dont confuse the two types of serial/parallel converter chips. Also, put in the LEDs correctly or they wont light up: the flat side of the LED goes with the flat side of the picture

The LEDs use standoffs, the EEPROM and microcontroller are socketed.



To get the LEDs seated best, use something like a screwdriver to kink the leads (twist firmly between both leads) while pressing down on the LED into the board.



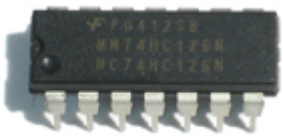
Before soldering the 5 pins of the rotary switches, they need to be secured & centered onto their silkscreen outline. Use bare wire to 'staple' the switches down. After soldering both ends (but before clipping off the excess), pull on the wire while heating one end at a time to make a snug fit.

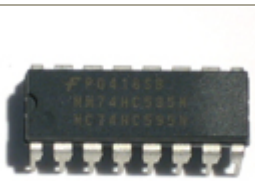
Don't forget about the two wire jumpers, **J1** and **J2**! They are seperate from the wires used to hold down the rotary switches above.

There are a lot of 10K resistors, LEDs and switches. It might be best to solder them in that order, although you should do whichever is best for your soldering iron and setup. Basically just think about what would be the easiest way to solder so that you dont melt the switches when soldering the other parts.

## Parts

| | | | |
|---|---|---|---|
| | 40-pin DIP socket | 1 | IC3* |
| | 8-pin DIP socket | 1 | IC2* |
| | Rotary encoder | 1 | S2 |
|  | 16 position rotary switch | 2 | S3, S4 |
| | Solid gauge wire (jumpers) | 2 | J1, J2 |
| | Solid gauge wire (straps) | 2 | S3*, S4* |
|  | Tact switch | 23 | S5-S27 |
|  | Red 5mm LED | 40 | LED1-LED40 |
|  | 0.22" LED standoff | 40 | LED1*-LED40* |

| | | | |
|---|---|---|---|
|  | 1N4148 | 10 | D1-D10 |
|  | 10K 5% resistor | 68 | R201-R234, R237-R270. |
|  | 220K 5% resistor | 2 | R235, R236 |
|  | 1MEG 5% resistor | 1 | R200 |
|  | .001uF (2A102K) capacitor | 2 | C100, C101 |
|  | .1uF (104) ceramic | 10 | C103, C104, C106-C113 |
| | 1uF electrolytic capacitor | 1 | C105 |
| | 100uF 10V electrolytic capacitor | 1 | C102 |
|  | 74AC126 | 1 | IC1 |
| | 74AC165 | 3 | IC16-IC18 |

| | | | |
|---|---|---|---|
|  | 74AC595 | 5 | IC4-IC8 |
|  | 2SC536F, TO-92 NPN transistor | 1 | Q5 |
|  | ATmega162 microcontroller | 1 | IC3 |
|  | 25LC33 EEPROM | 1 | IC2 |
|  | 16MHz ceramic resonator | 1 | XTAL1 |

# x0xb0x fabrication manual

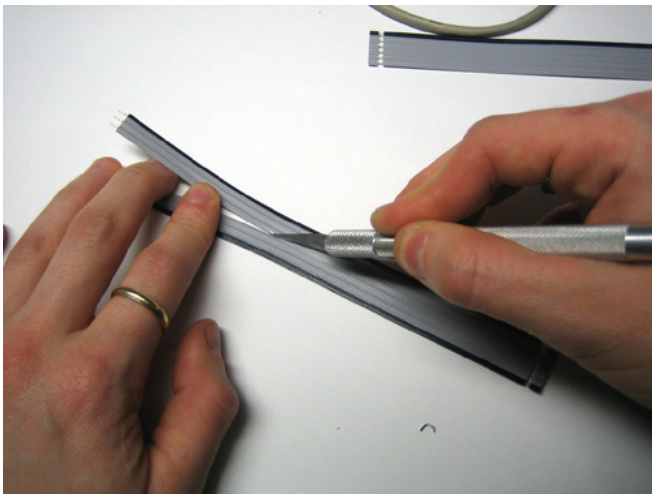
## Finishing up

*history*
*last edited: May 10, 2005*

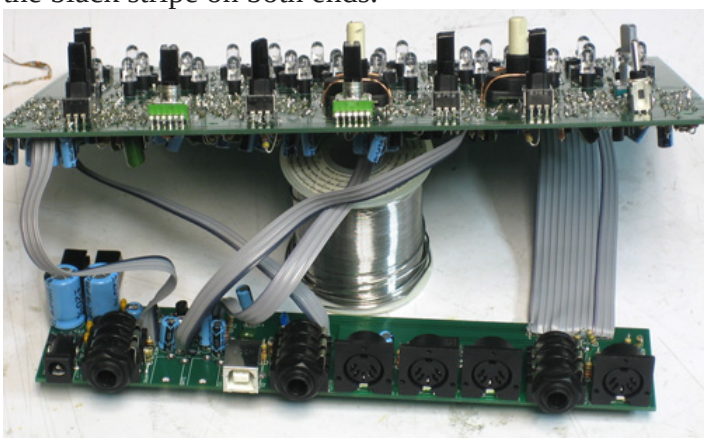
### You are here


### Steps

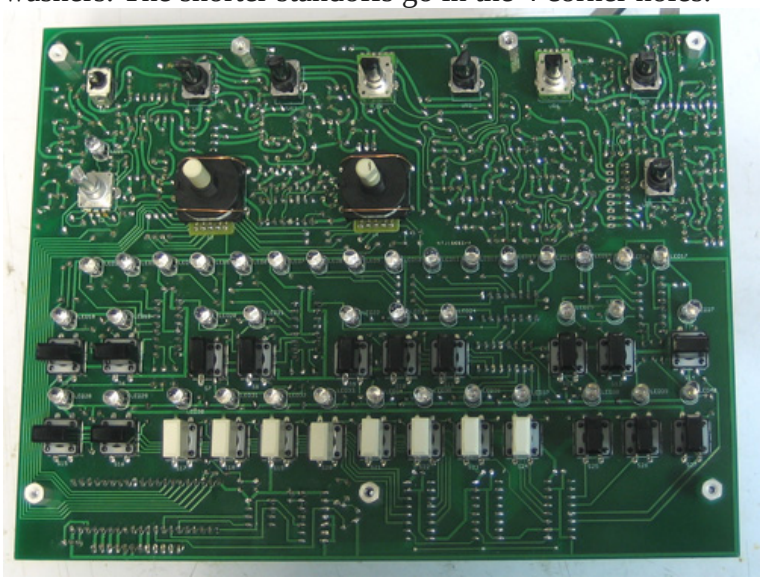
1. Split the 6 conductor jumpers. Make a black mark on the unmarked side of the jumper using a marker, the carefully cut down the center with a knife.

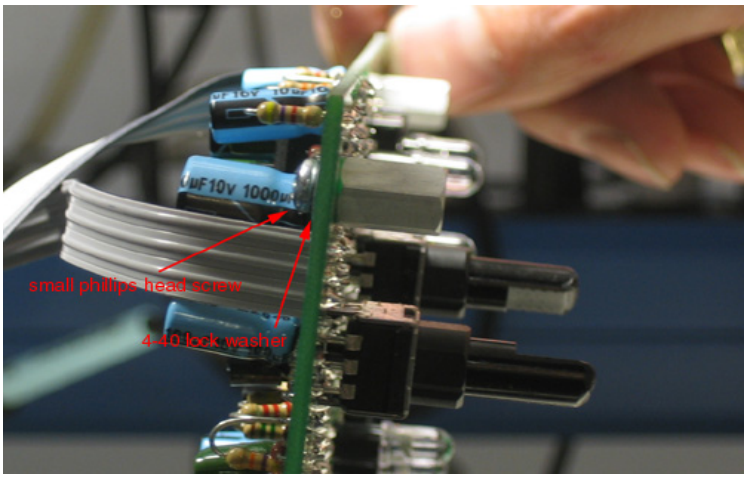


2. Solder all of the jumper wires, desolder the 3 wires you put in for power earlier (or leave them in if they're pretty short.) Make sure to match up pin 1 of the jumpers with the black stripe on both ends.



3. Snap on the switchcaps. Attach the standoffs from below using the phillips head machine screws and 4-40 lock washers. The shorter standoffs go in the 4 corner holes.






4. Finish assembly by attaching the mainboard to the frontplace and the case with the hex button head screws. To keep from overtighting and cracking the panel, place the four 4-40 washers in the flanges and tack down with a little glue (just to keep them from shifting around while attaching the frontpanel to the PCB

5. The back panel is attached by threading the 1/4" jacks through the panel

6. Put the pot knobs on. Attach the rubber feet and screw the case together using the longer 4-40 screws.

7. Turn on the synth and set it to keyboard or random mode to test the sound generation. Make sure you dont start it up into bootloader mode or the firmware wont boot. Now would be a good time to read the user manual.

## Parts

| | | |
|---|---|---|
| | ABS Case (PT-10) | 1 |
| | Set of main and I/O panels | 1 |
|  | 15/32" x 1/4" standoff | 3 |
|  | 3/8" x 1/4" standoff | 4 |
|  | 4-40 lock washer | 7 |
|  | 4-40 washer | 4 |
|  | 4-40 x 1/4" hex button | 7 |
|  | 4-40 x 1/4" phillips button | 7 |
|  | 4-40 x 1/4" phillips cheesehead (i swear its called that) | 4 |
|  | Rubber feet | 4 |

| | | |
|---|---|---|
|  | Switch cap (white) | 8 |
|  | Switch cap (black) | 15 |
|  | Potentiometer knob | 8 |
|  | Switch knob | 2 |
|  | 6 wire jumper ribbon cable | 4 |