



# Assembling Infinity Shred's, "Datadealer," synthesizer

Created by Damon Hardjowirogo



<https://learn.adafruit.com/assembling-infinity-shreds-datadealer-synthesizer>

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# Table of Contents

Overview	3
Assembling the Digital Control Board	4
Assembling the Analog Filter Board	18
Testing your build	38
Patches	41

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# Overview



Datadealer is a functionally identical clone of the Mutable Instruments Shruthi-1 - a hybrid analog / digital mono-synth that's as powerful as it is versatile. This thoughtfully curated kit includes all of the components needed to assemble a functioning synthesizer, a lasercut matte black case with iridescent top plate, a set of black Chroma Caps with a glow in the dark encoder cap, and chips pre-loaded with sounds designed and used by Infinity Shred in creating Long Distance.

The design of this board uses only through-hole components which makes assembly a breeze but intermediate soldering experience is highly recommended due to the high volume of parts. Datadealer features a built in sequencer but external control via MIDI is recommended for the best experience.

Though this synth is functionally identical to the Shruthi-1, Mutable Instruments no longer offers support or troubleshooting assistance for this item. To honor their decision to move away from this product we urge you to take extra care when following assembly instructions and direct all support requests directly to Infinity Shred via [band@infinityshred.com](mailto:band@infinityshred.com)

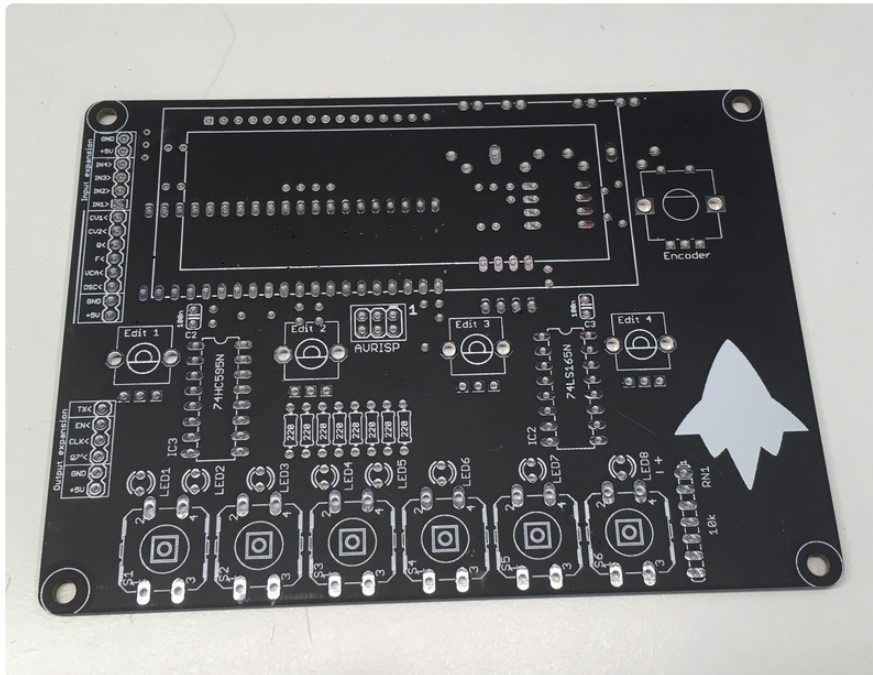
Datadealer is released under a cc-by-sa license that allows anyone with the files to reproduce the synth themselves as long as the same license is upheld. Files are available for download here --> <https://github.com/infinityshred/Datadealer> (<https://adafruit.it/rNf>)

Now let's get soldering!

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# Assembling the Digital Control Board

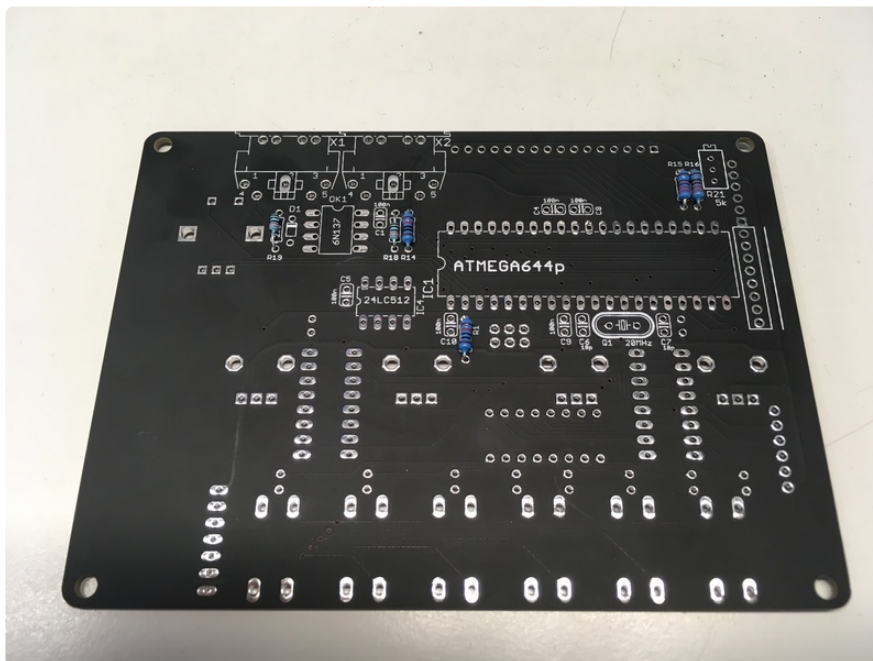
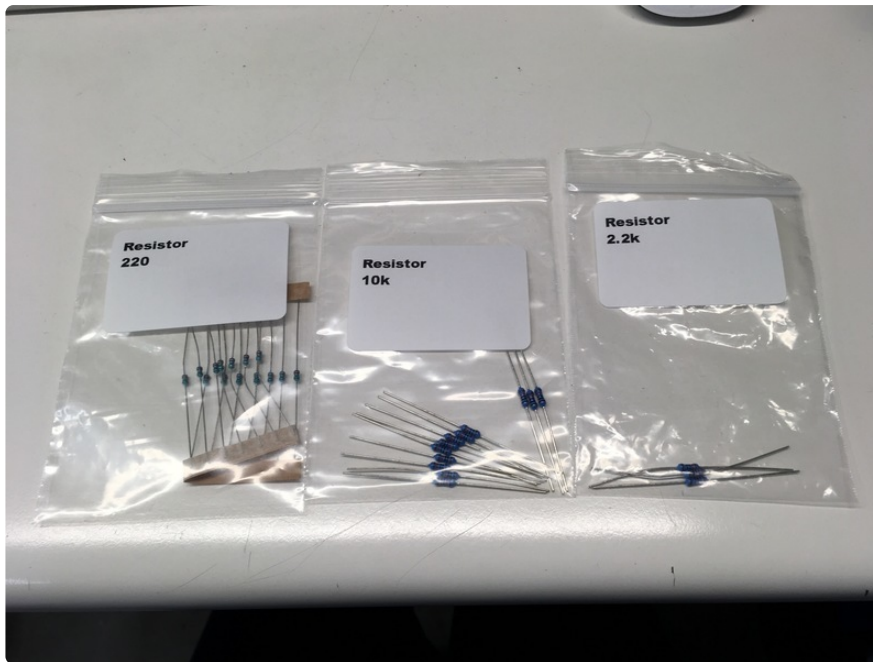
Let's start by soldering the component's on the bottom of the Digital Control board. The top of this board can be identified by the Infinity Shred spaceship logo on the right side.



## Step one

Let's start by placing the resistors needed on the bottom side of the digital control board. For this step you will need the following resistors...

- Resistor 220 for R18 and R19
- Resistor 10k for R1 and R14
- Resistor 2.2K for R15 and R16

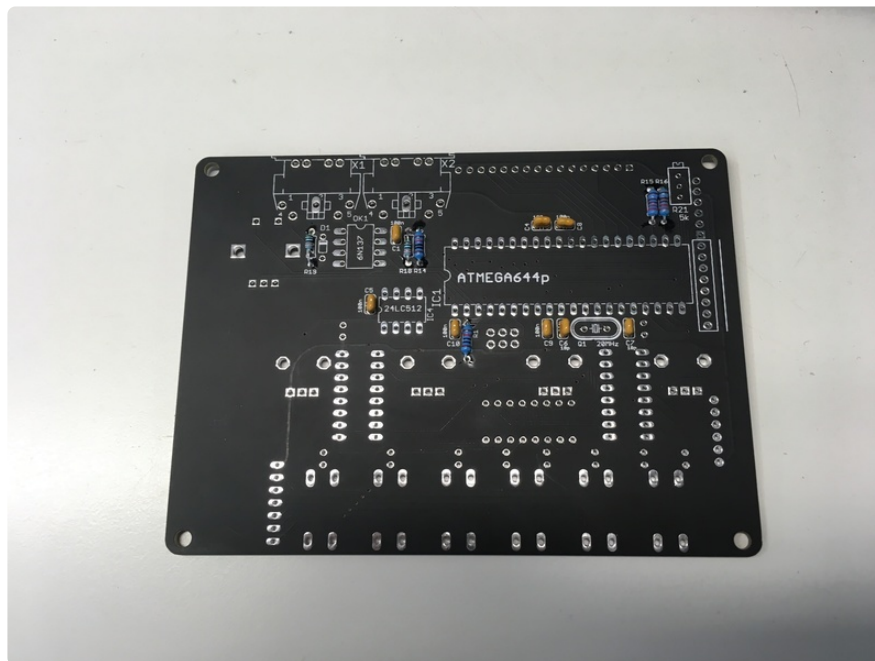


## Step two

Now let's place the capacitors for the same side of the board. You will need the following...

- Ceramic Capacitor 18p for C6 and C7
- Ceramic Capacitor 100n C1, C4, C5, C8, C9 and C10

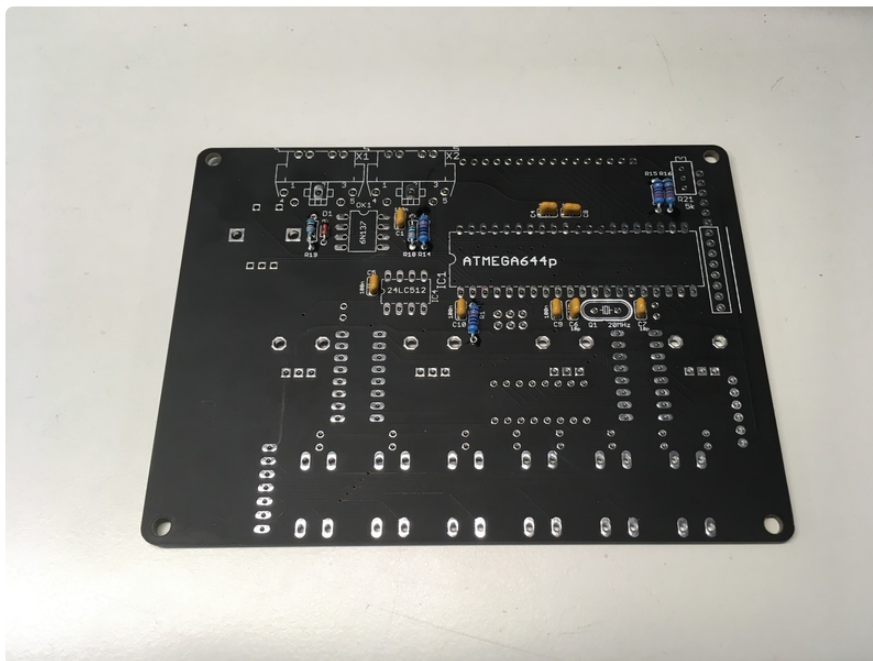
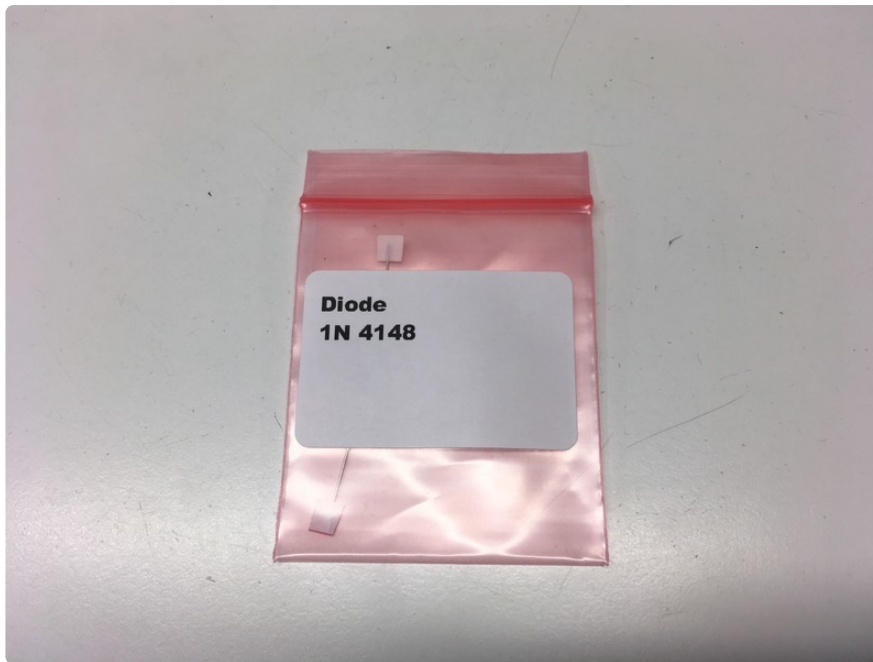




### Step three

Let's place the appropriate Diode on D1. Please note Diodes are **polarized** so be mindful of the direction you place it. The black ring of the diode should point towards the MIDI connectors. For this step you will need...

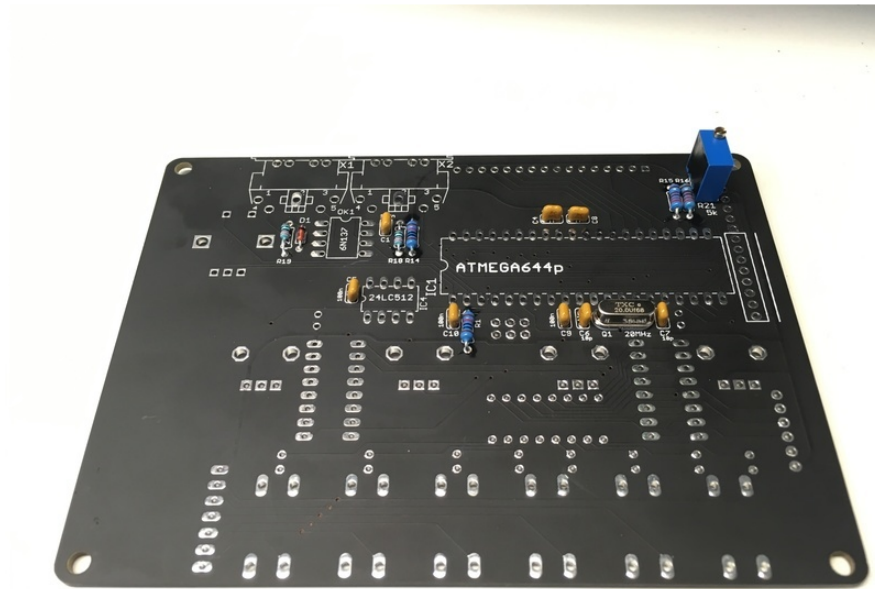
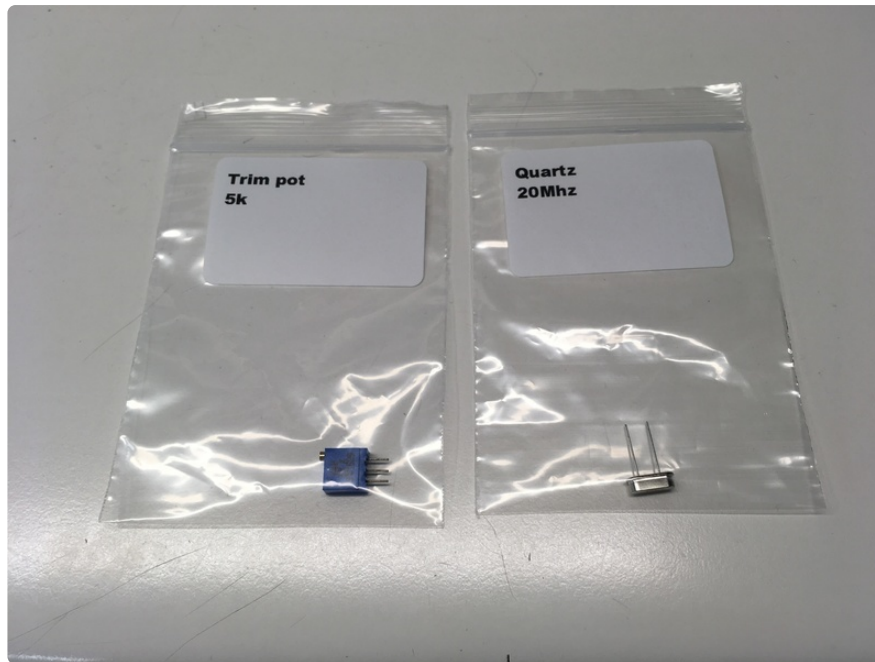
- Diode 1N 4148



#### Step four

Let's place the 5K Trim Pot and the 20Mhz Quartz Crystal. Place the trim pot with the screw facing outwards to make it easier to access. For this step you will need...

- Trim Pot 5K for R21
- Quartz 20Mhz for Q1



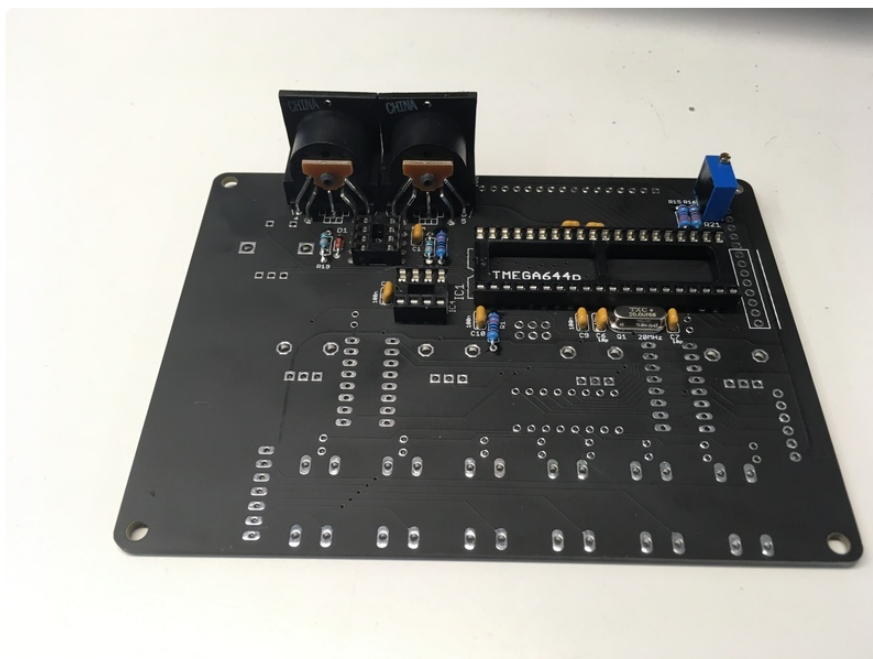
### Step five

Now place the 40 pin socket, two 8 pin sockets, and the MIDI connectors. Make sure that the notch on the sockets matches the screen print on the board. For this step you will need...

- Socket 40 pin for IC1
- Socket 8 pin for IC4 and OK1
- MIDI Connectors from bag labeled “Audio, MIDI, Power” for J2 and J3



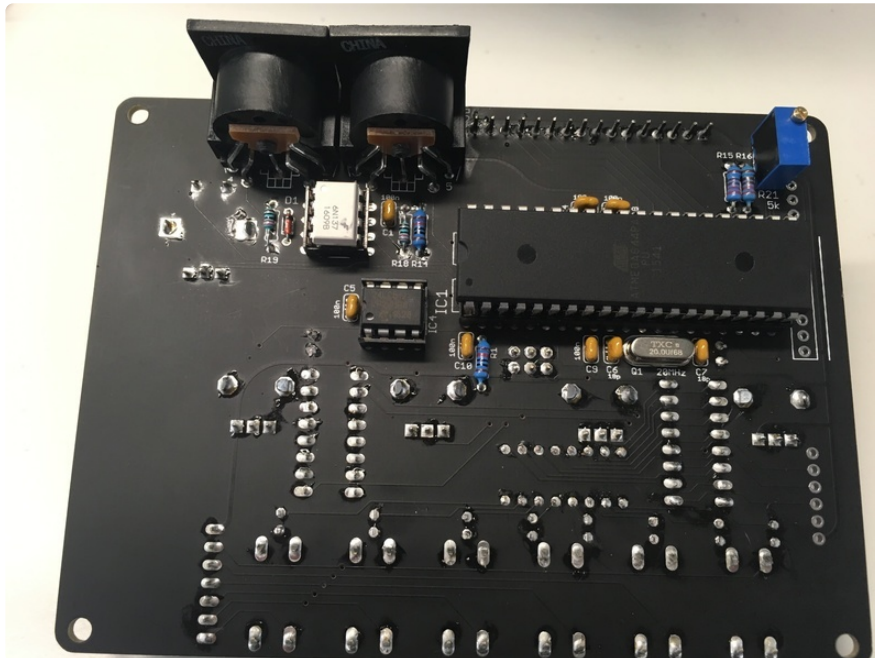
Later on we will be placing components on the other side of this board. While you should trim all of your leads throughout this project, it is particularly important to carefully trim all leads from this step as much as possible to allow room for the parts that will later sit on top of this area.



### Step five pt 2

Let's slot the ICs for this side of the board. Make sure the notches on the chips are aligned with the notches on the sockets (which should be aligned with the silk screen on the PCB!) For this step you will need...

- IC 6N137 for OK1
- IC ATMEGA644 for IC1
- IC 24LC512 for IC4



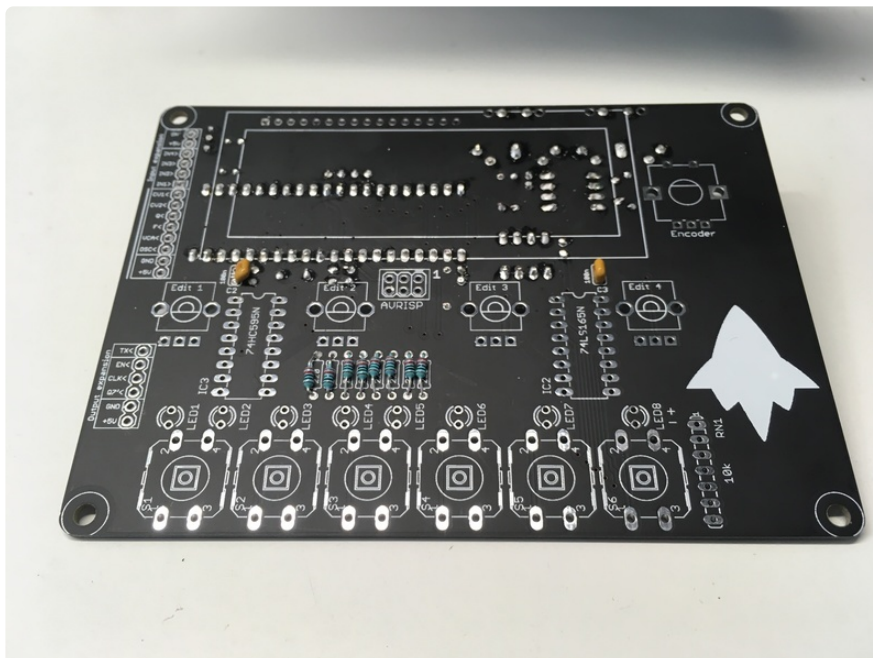
You're now done placing components on this side of the board.

#### Step six

Flip the board to the top side with the Infinity Shred logo. For this step you will need...

- Resistor 220 for the 8 spaces labeled “220” found below “Edit 2”
- Ceramic Capacitor 100n for C2 and C3

**PLEASE NOTE:** This kit comes with white LEDs. If you are sensitive to bright lights we suggest replacing the 220 resistors in this step with 1K resistors to dim them OR using red or green LEDs instead of the white when it comes time to place those

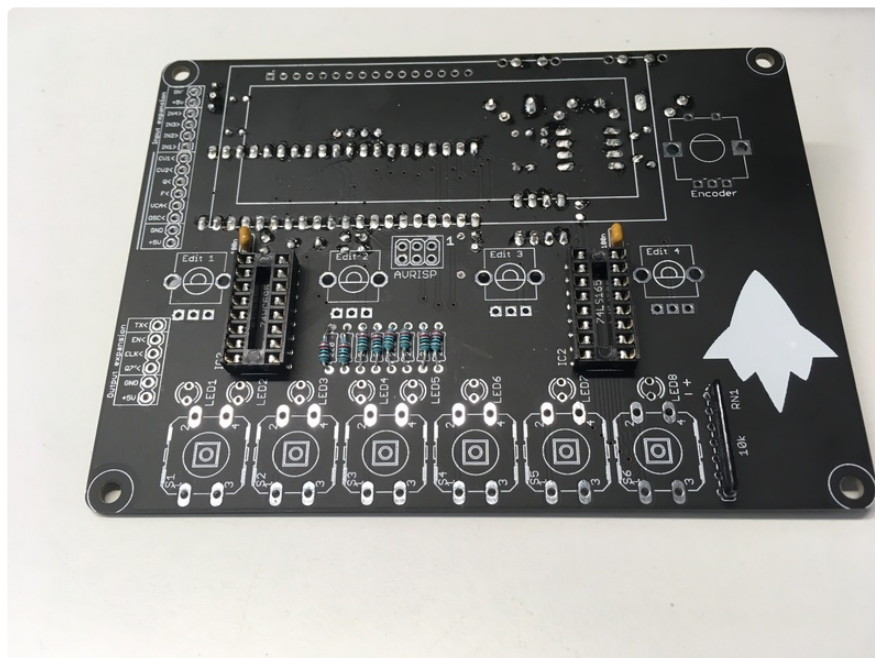
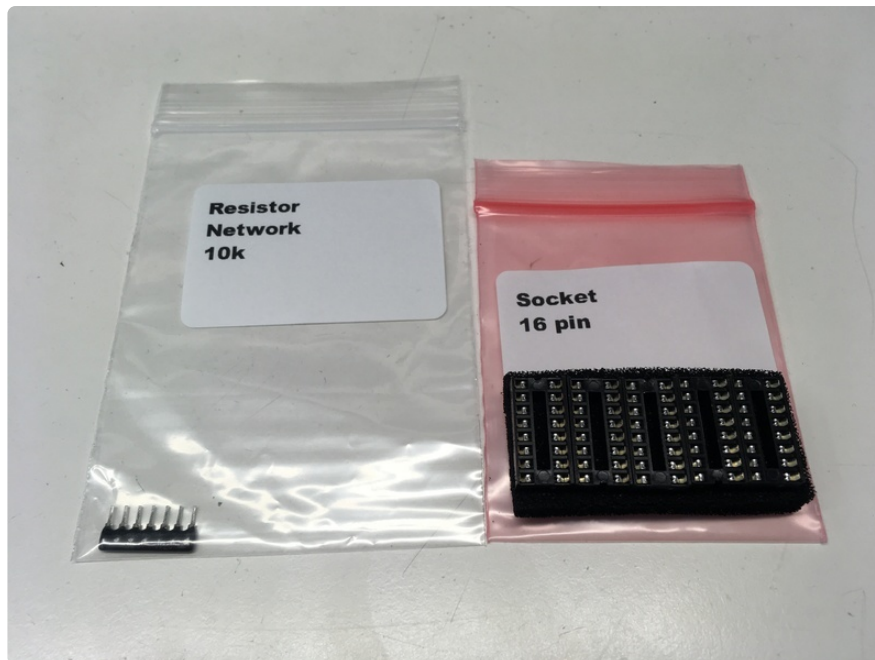


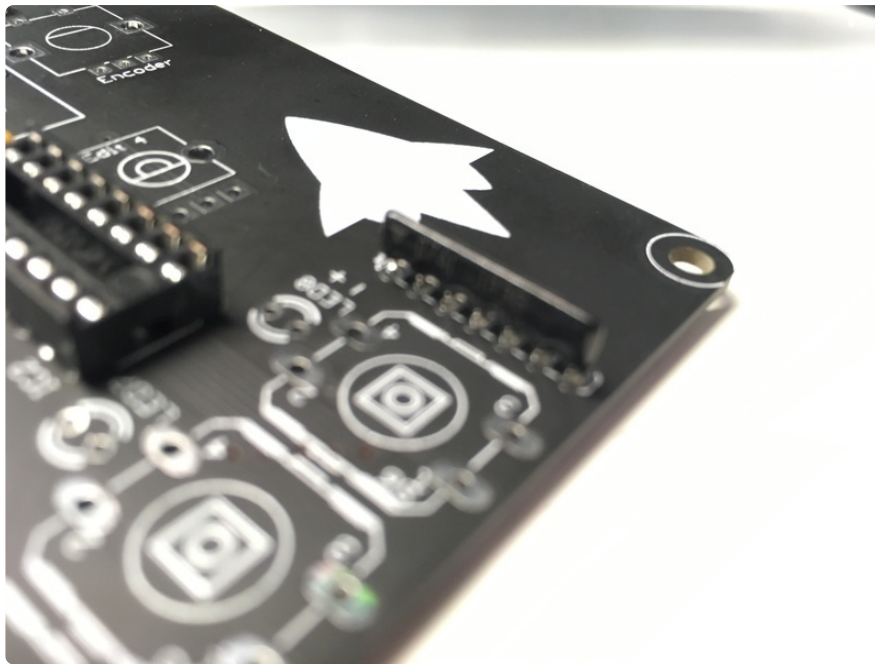
Step seven



We'll now place two more sockets and a resistor array. For the sockets make sure the notches match the screen print. For the resistor network make sure the white arrow is oriented closest to the RN1 text on the board. For this step you will need...

- Resistor Network 10k for RN1
- Socket 16 pin for IC2 and IC3





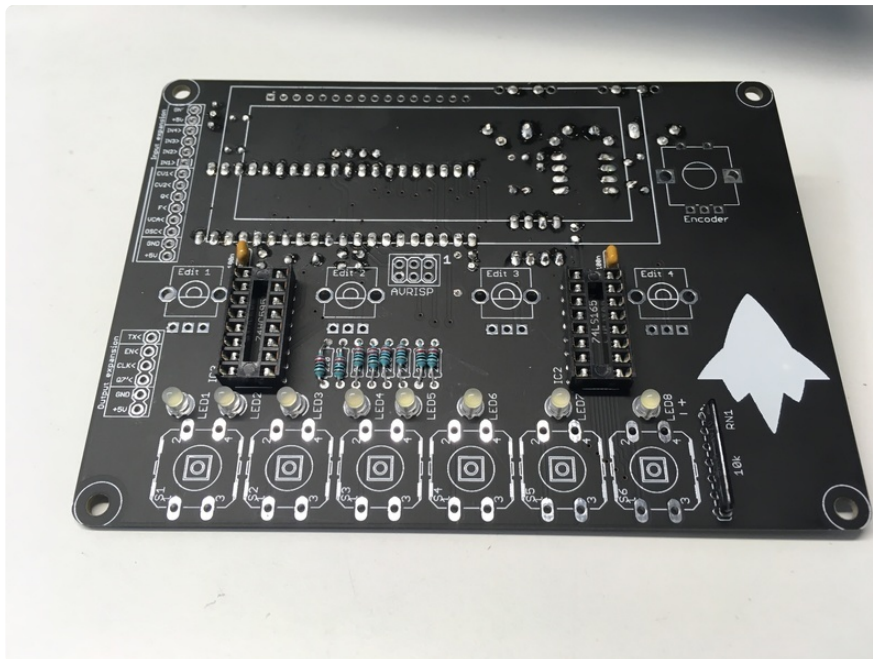
### Step eight

LEDs! LEDs are polarized- the short lead is your (-) and your long lead is your (+) Make sure to place all of them according to the markings on the board - the long lead (+) will be facing towards the top of the board. For this step you will need...

- LEDs for LED1, LED2, LED3, LED4, LED5, LED6, LED7 and LED8





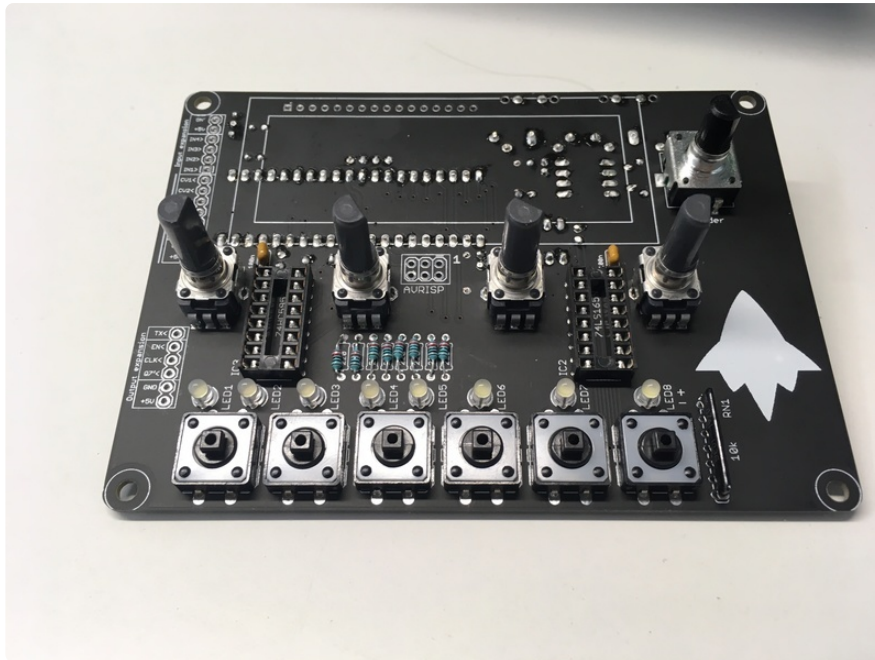


## Step nine

Let's add the controls. For this step you will need...

- Pots for Edit 1, Edit 2, Edit 3, Edit 4
- Encoder for Encoder
- Buttons (leave the black plastic rectangles in the bag for now) for S1, S2, S3, S4, S5 and S6



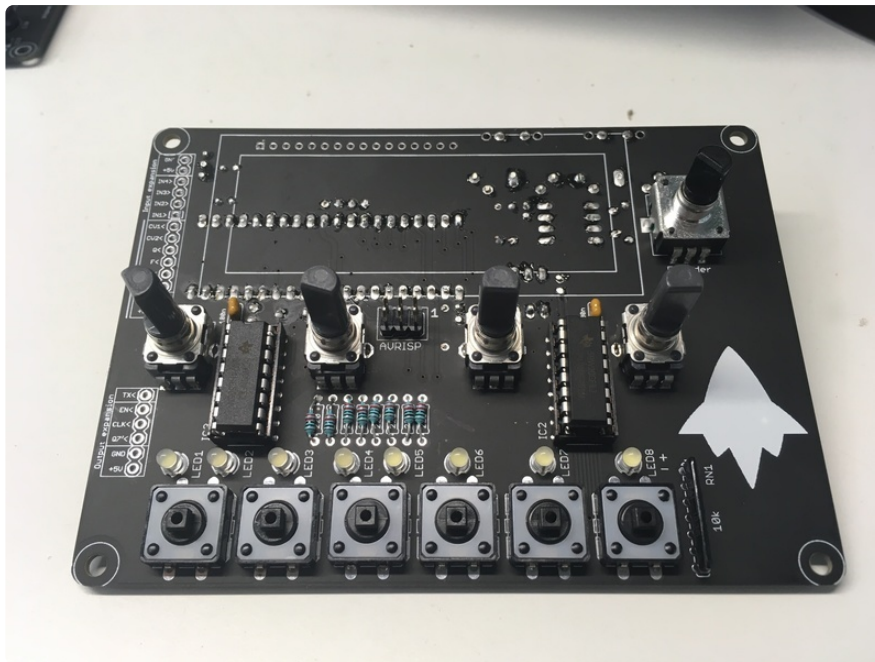


## Step ten

Let's slot the ICs for this side of the board. Make sure the notches on the chips are aligned with the notches on the sockets (which should be aligned with the silk screen on the PCB!) For this step you will need...

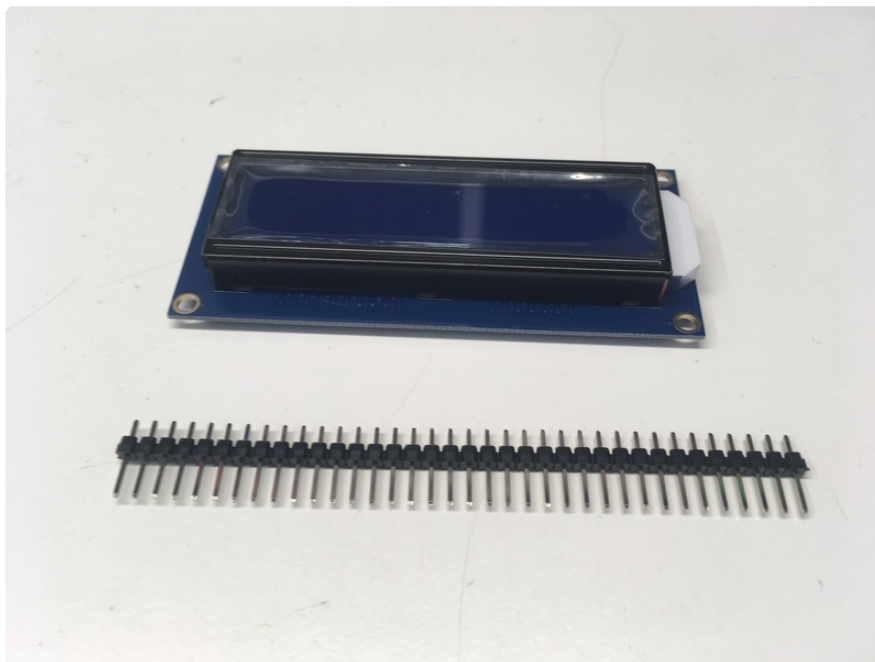
- IC 74HC595 for IC3
- IC 74LS165 for IC2

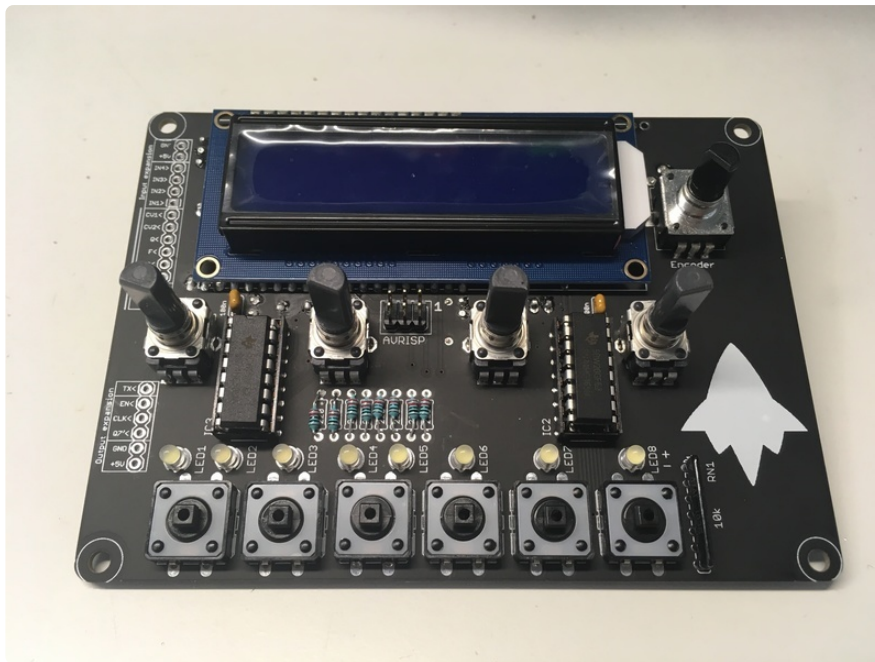




### Step eleven

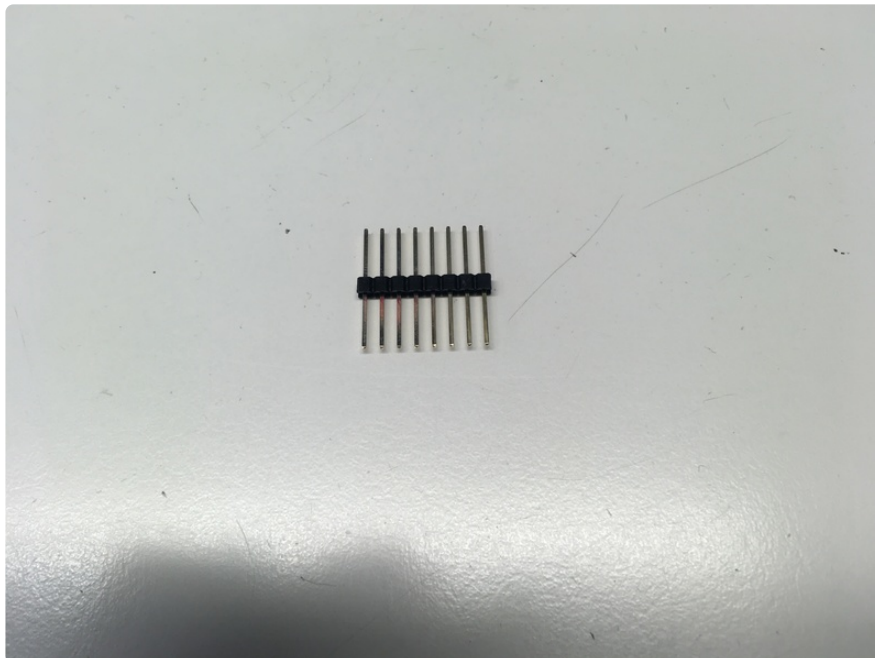
Now that everything else is placed we can solder in our LCD. Begin by soldering the header to the screen, then solder the LCD to the board.



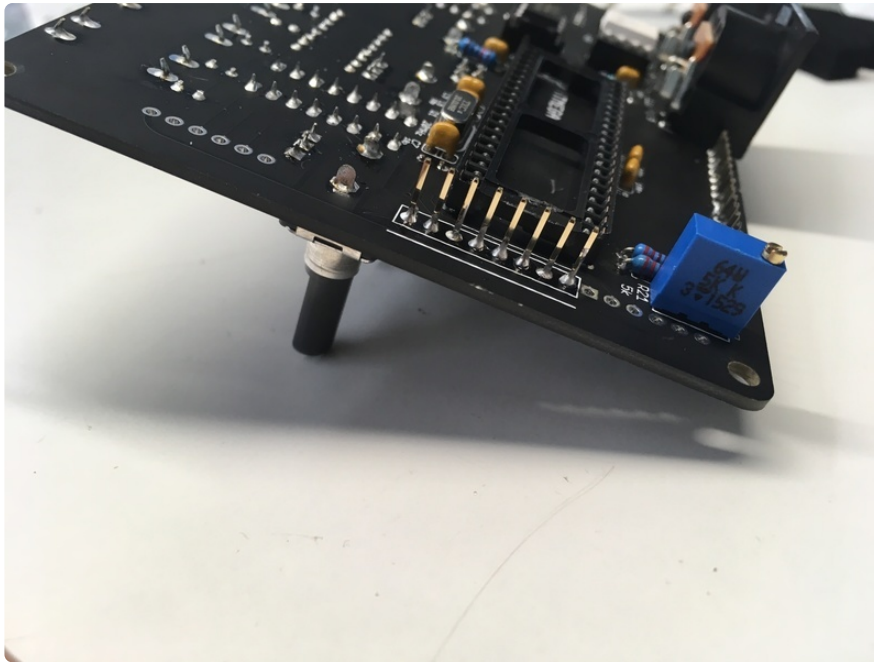


## Step twelve

Finally let's add the long 8-pin header from the bag labeled "Headers." Place this header so that the plastic piece is on the top side of the board. When you are done soldering this remember to trim the leaders that stick up on the same side as the screen and pots!







You're now done assembling the Digital Control Board!

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## Assembling the Analog Filter Board

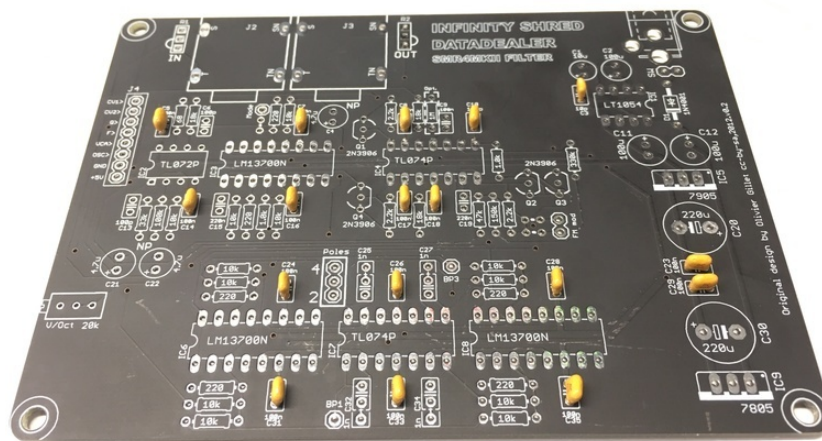
Let's grab our second PCB. For this kit we included the standard SMR4MKII filter board. Unlike the control board this board is single sided. Make sure you are placing all components on the side with the screen prints.

### Step one

Let's start by placing some capacitors. For this step you will need...

- Ceramic Capacitors 100n for C5, C7, C8, C9, C14, C16, C17, C18, C23, C24, C26, C28, C29
- Ceramic Capacitors 10p for C3

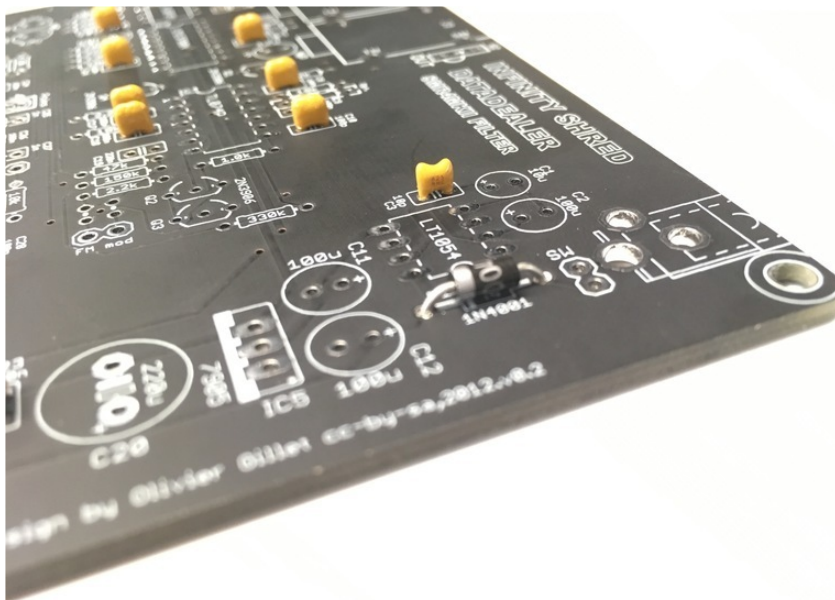
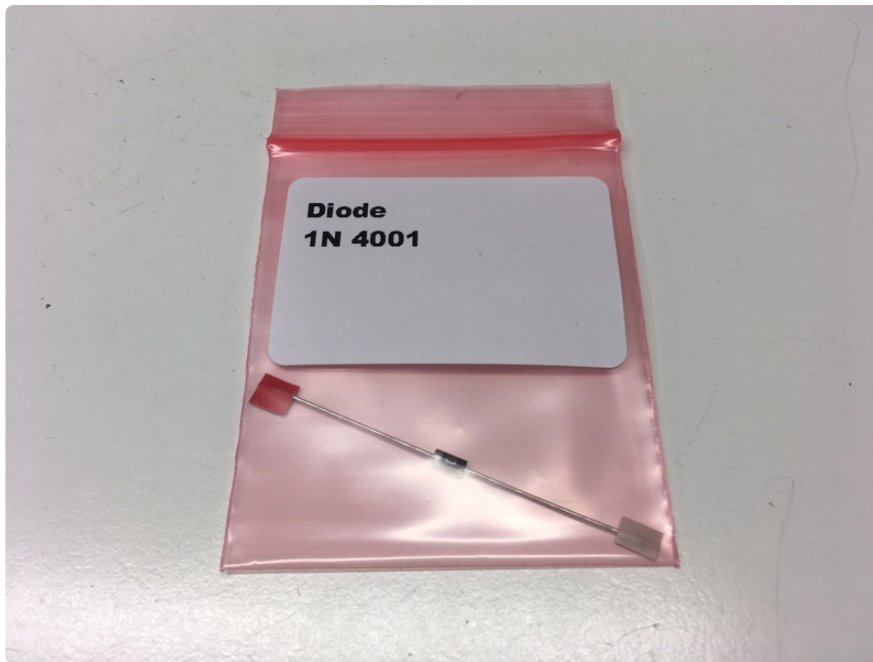




## Step two

Let's place the protection diode at D1. This part is polarized! Make sure the stripe matches the markings from on the screen print. For this step you will need...

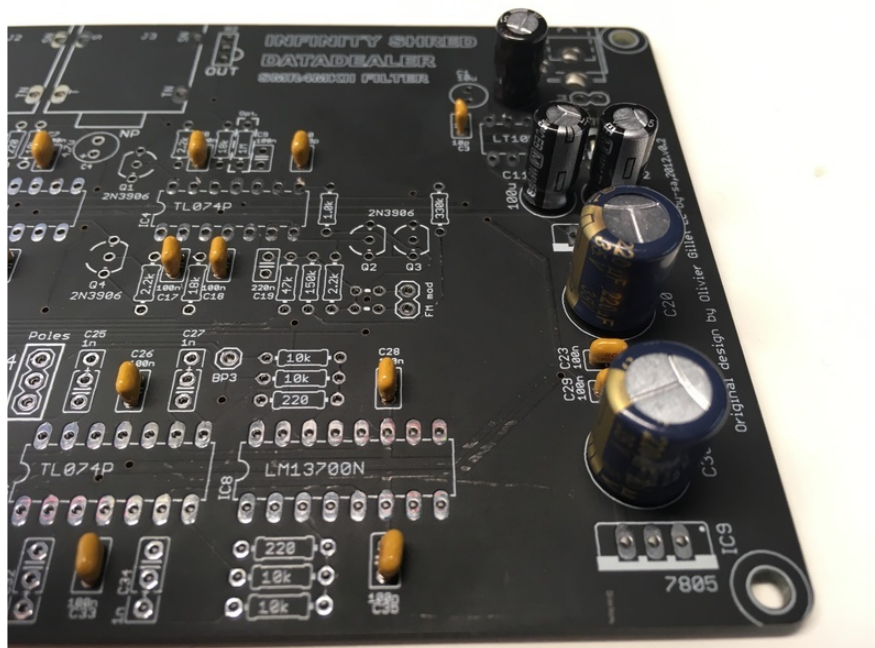
- Diode 1N 4001



### Step three

Let's place some electrolytic capacitors. Please note unlike the ceramic capacitors, these are polarized. Just like with LEDs, your longer lead is your (+) end. For this step you will need...

- Electrolytic Capacitor 220u for C20 and C30
- Electrolytic Capacitor 100u for C2, C11 and C12



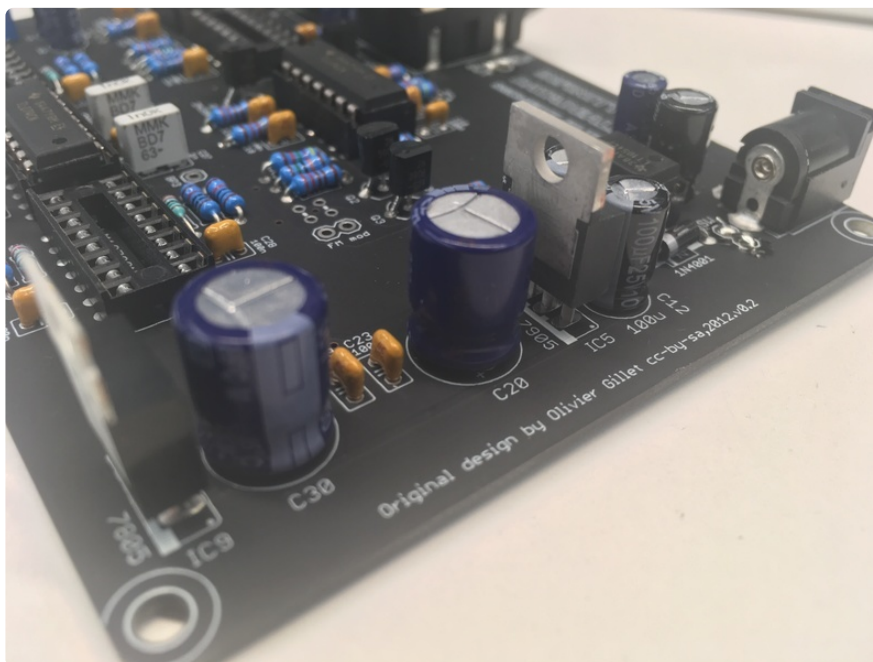
#### Step four

Let's now place the voltage regulators (LM7905 and LM7805) and the DC connector. The voltage regulators have VERY similar part numbers and orientation is important so please be extra careful when placing these. For this step you will need...

- DC connector from bag labeled "Audio MIDI Power"
- IC LM7805 +5V Vreg for IC9
- IC LM7905 -5V Vreg for IC5



If you'd like to add an on / off switch to the synth you can do so by placing one in the area next to the DC connector labeled SW. If you don't plan to use this, bridge these connections with a small piece of wire (you can use trimmed leads from other parts). The included acrylic case does not have space for an on/off switch.

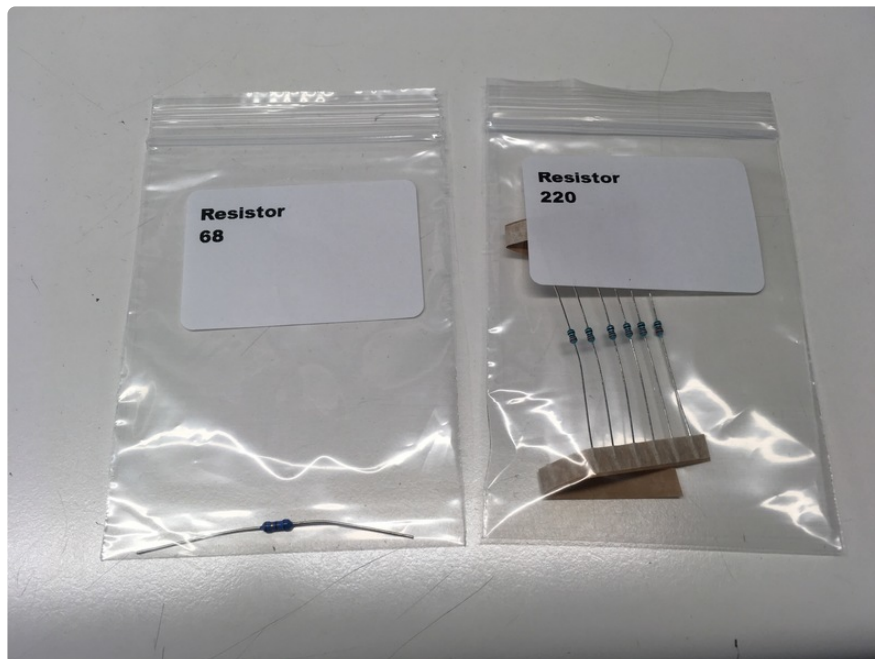




### Step five

Back to resistors. Grab the following...

- Resistor 68 - this is the top left most resistor on this board, it is labeled “68” and can be found directly to the right of C5 and below J2
- Resistor 220 for all places labeled “220,” you will need x6 of them



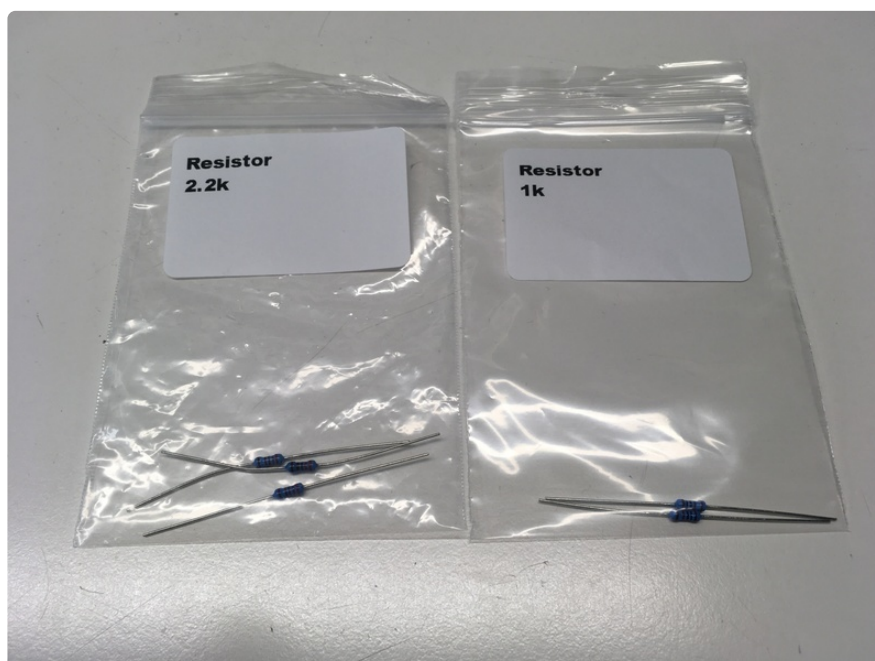


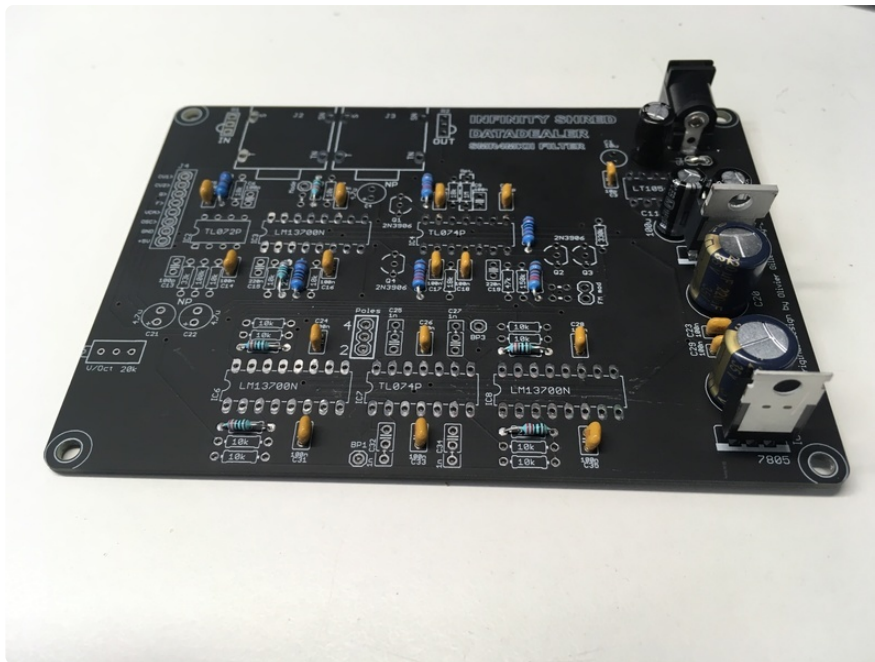


## Step six

For this step you will need...

- Resistor 2.2k
- Resistor 1k





## Step seven

Now add all of your 10K resistors. BE CAREFUL to not place these in any of the spots meant for 18k resistors as the text on the board can appear similar when not paying close attention.





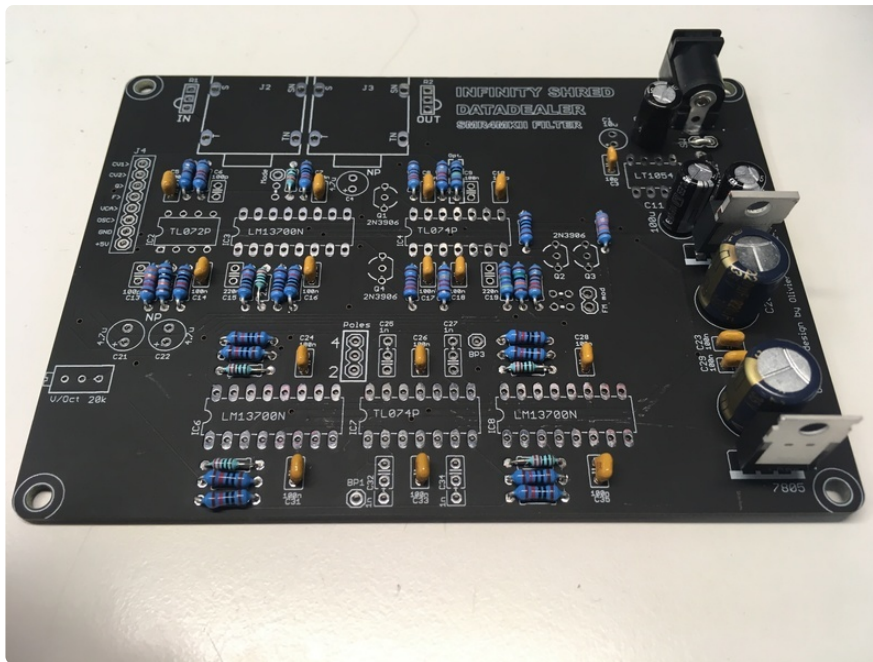
## Step eight

THE END OF RESISTORS. Take the rest of your resistors. Take your time, be careful placing all of them. This should include the following...

1. 3x Resistor 18k
2. 1x Resistor 33k
3. 1x Resistor 47k
4. 1x Resistor 100k
5. 1x Resistor 150k
6. 1x Resistor 330k





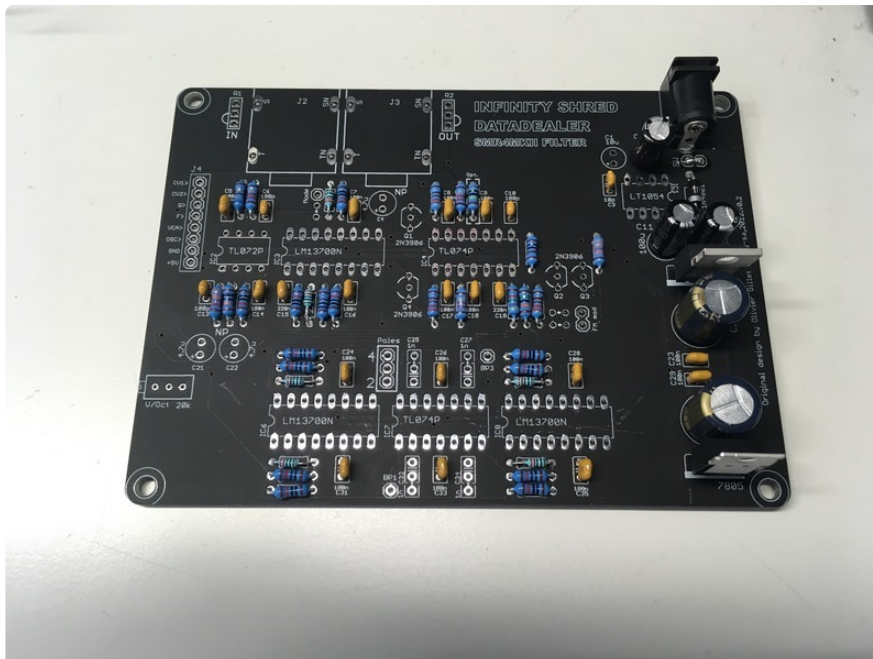


## Step nine

Final ceramic caps. For this step grab...

- Ceramic Capacitor 100p
- Ceramic Capacitor 220n





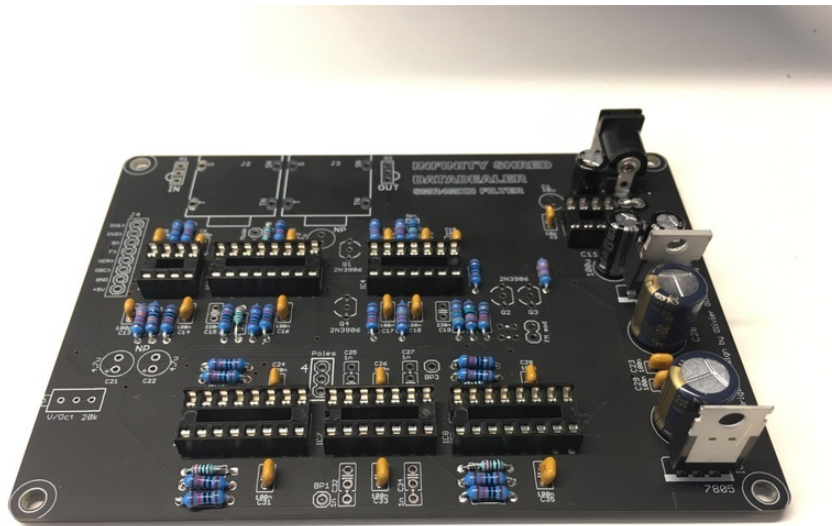
## Step ten

Solder in the rest of the sockets - be mindful to line up the notch with the notch on the screen print. The remaining sockets are include...

- Socket 14 pin x2
- Socket 8 pin x2
- Socket 16 pin x2





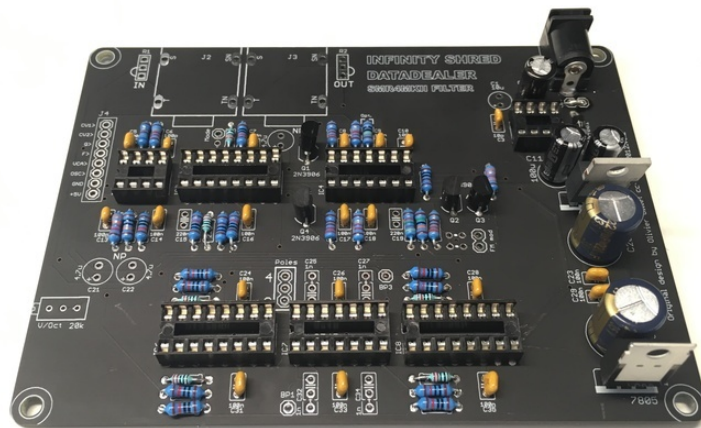


## Step eleven

Let's place our transistors - these are polarized so be mindful of their orientation. You'll notice one side of these is flat and one is round, the silk screen on the board will match this to help you orient correctly. Grab...

- Transistor 2N3906 for Q1, Q2, Q3 and Q4



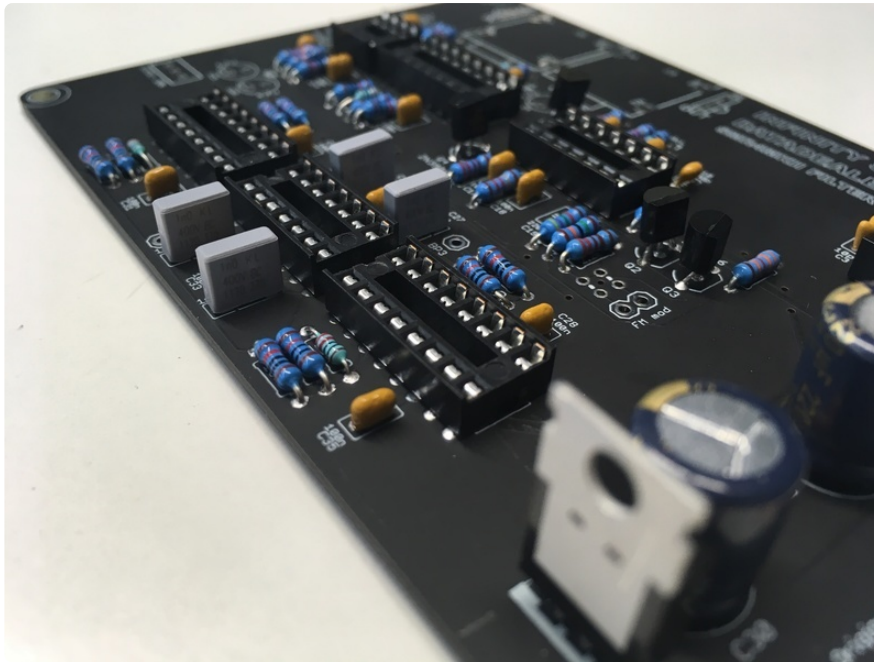


## Step twelve

Let's place the film capacitors. Grab...

- Film Capacitor 1n for C25, C27, C32, C34



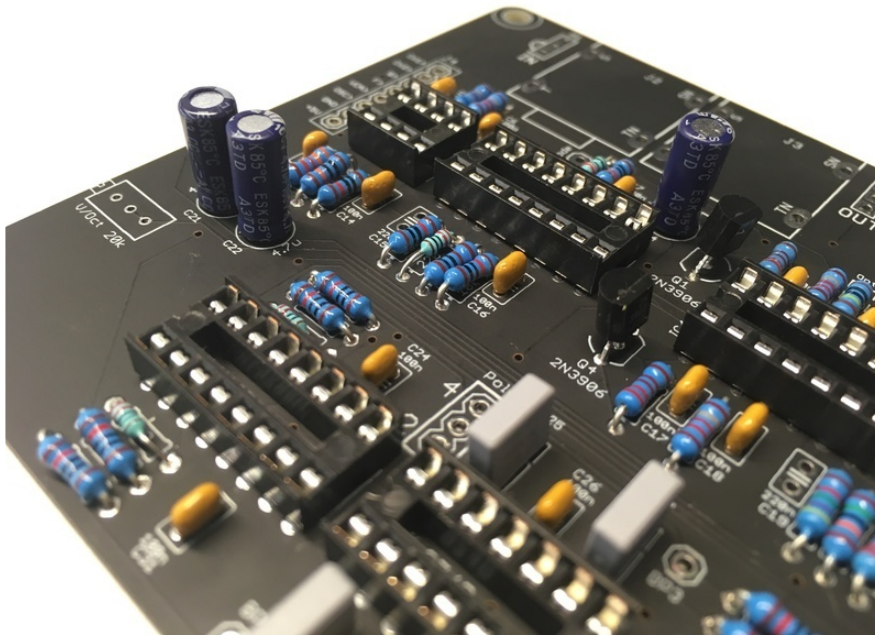


### Step thirteen

Let's place the final electrolytic capacitors - remember these are polarized - the long lead is your (+). Grab...

- Electrolytic Capacitor 4.7u for C4, C21 and C22





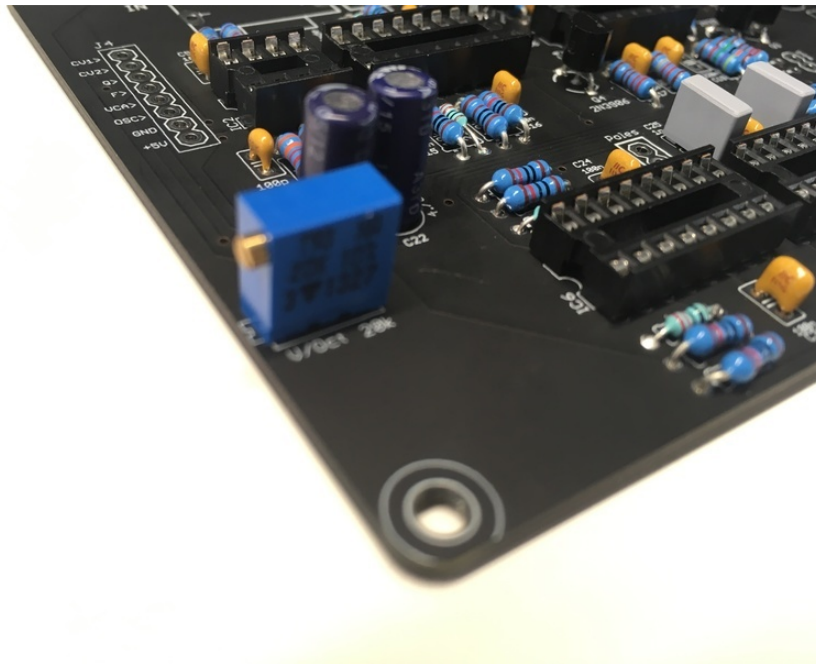
#### Step fourteen

Place the 20k trimpot in the “V/Oct 20k” spot with the screw facing outward to match the screen print on the board. Grab...

- Trim pot 20k





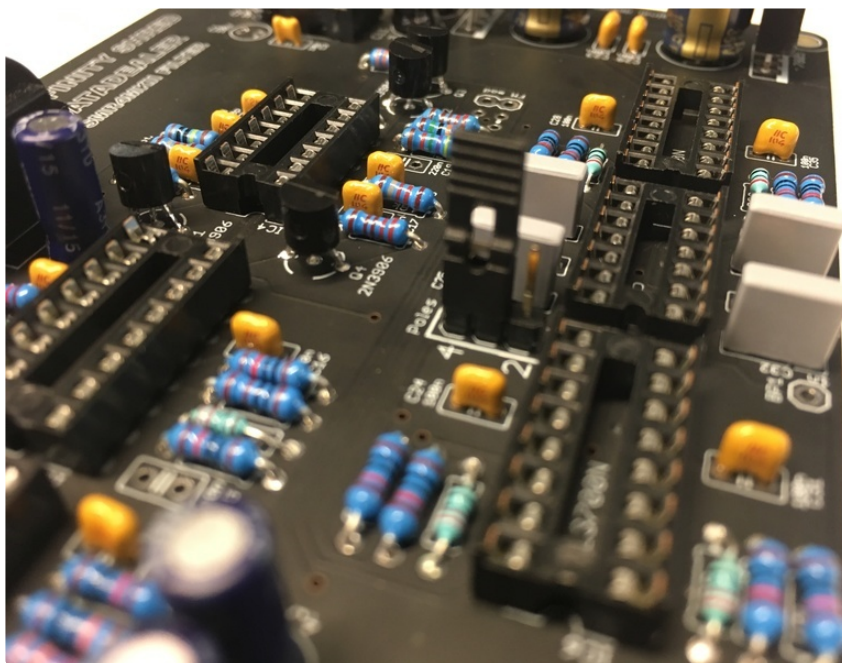
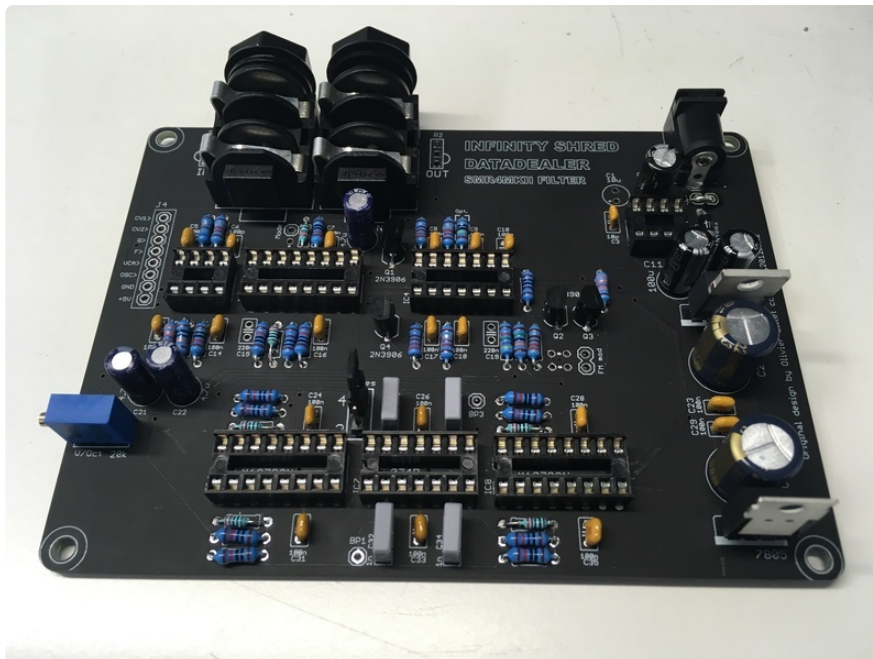


### Step fifteen

Let's place the audio jacks and the pole selection header. We recommend placing the jumper on 4-pole mode to get the most out of this filter. Grab...

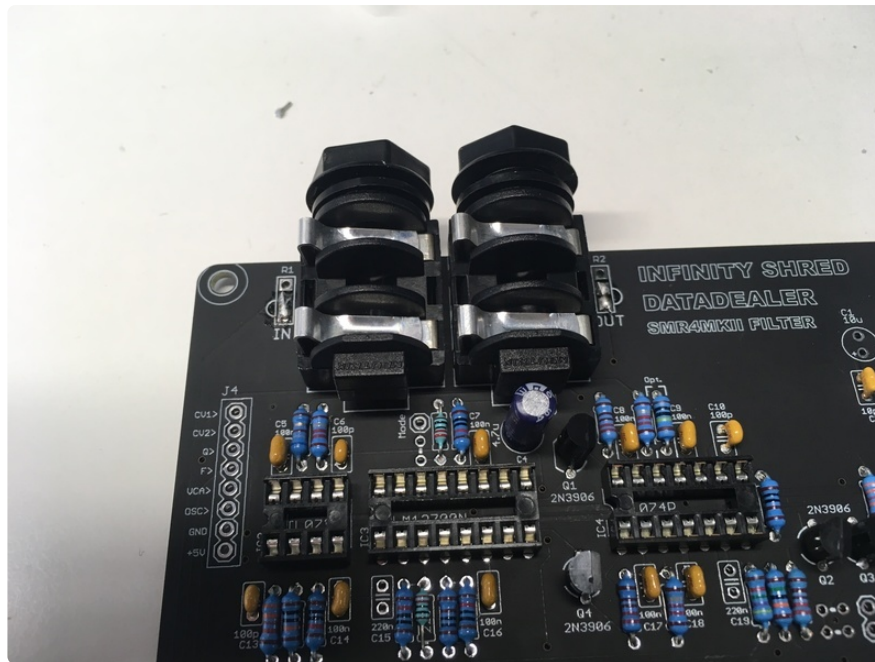
- Audio jacks from bag labeled "Audio MIDI Power," for J2 and J3
- 3 pin header from bag labeled "Headers," to place in the Poles section
- 2 pin jumper from bag labeled "Headers,"





## Step sixteen

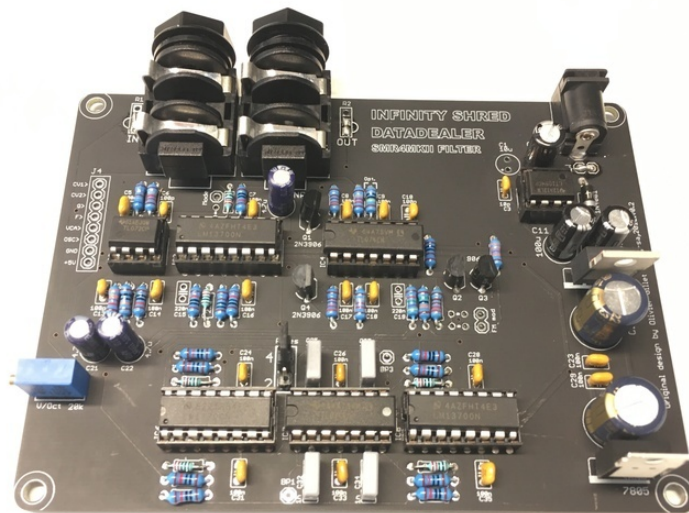
Using the acrylic case included with this kit there will not be much room to add gain pots for volume in and volume out (though it is possible using the additional side panel with holes included with the kit). If you do not plan to add gain pots bridge the bottom pad of each jack to the middle pot using some scrap trimmed leads as pictured below.



## Step seventeen

Let's slot the rest of our ICs! Grab...

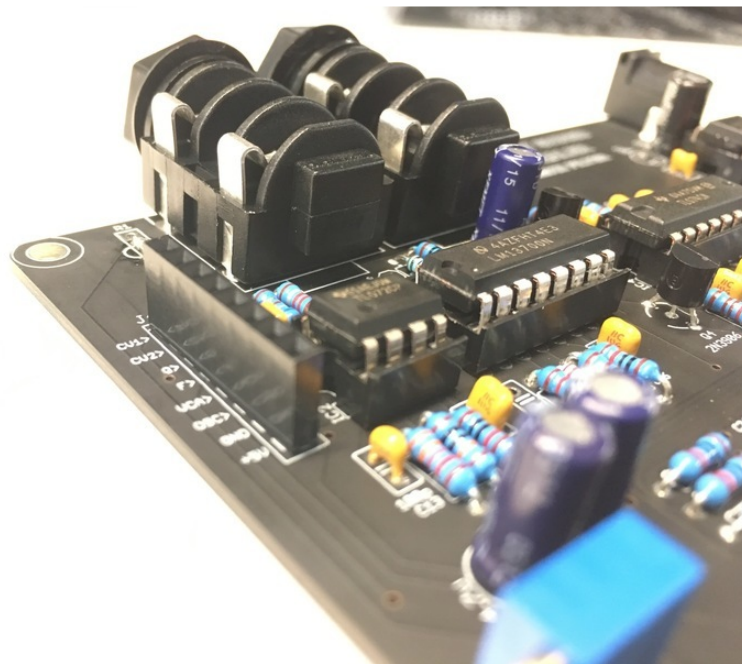
- IC LM13700 dual OTA for IC3 and IC6
- IC TL072 dual op-amp for IC2 (dot on the chip should be closest to the notch on the socket!)
- IC LT1054 DC/DC converter for IC1 (dot on the chip should be closest to the notch on the socket!)
- IC TL074 quad op-amp for IC4 and IC7

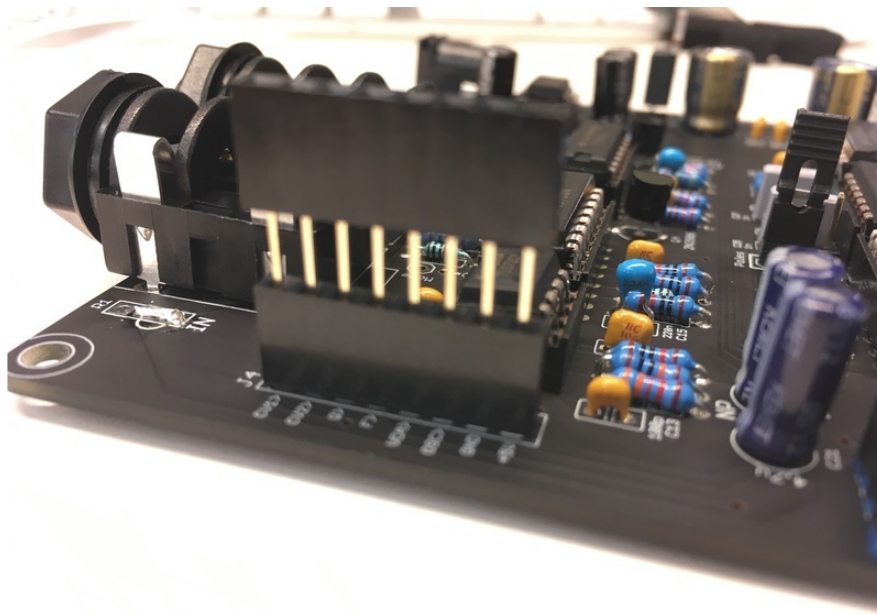


## Step eighteen

Grab the 8-pin stacking headers from the bag labeled “headers,” and solder one on to J4. Keep this as straight as possible as this is how the filter board connects to the control board. Plug the second one on top of this one.







## Step nineteen

Congrats! You've built the Datadealer. Before placing this synth in to the included acrylic casing let's run some tests.

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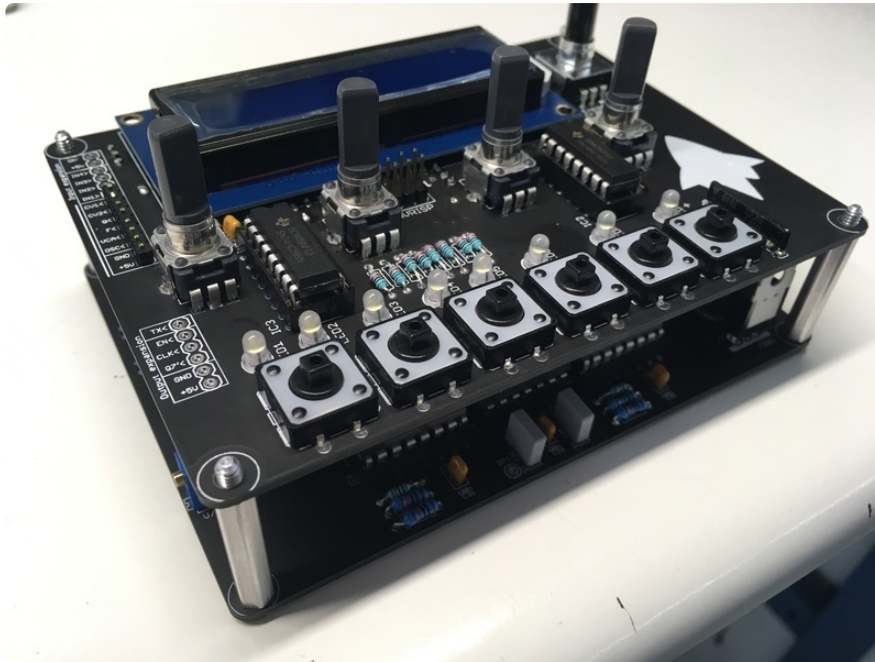
# Testing your build

## Initial power on

Before diving in to using your new synthesizer let's ensure everything is working and tuned properly. Screw in standoffs to the filter board then attach the filter board to the control board via the 8 pin headers on the left side of each board. Once everything is sandwiched together plug in a 9-12V DC power supply. The LCD and LED's 3 and 7 should light up. Click around the buttons to switch through menus and ensure each LED lights up when it's corresponding button is pressed.

**NOTE:** If the LCD is lit but you do not see any characters adjust screw trim pots on the bottom of the control board until you see text. This may require detaching the two boards from one another.

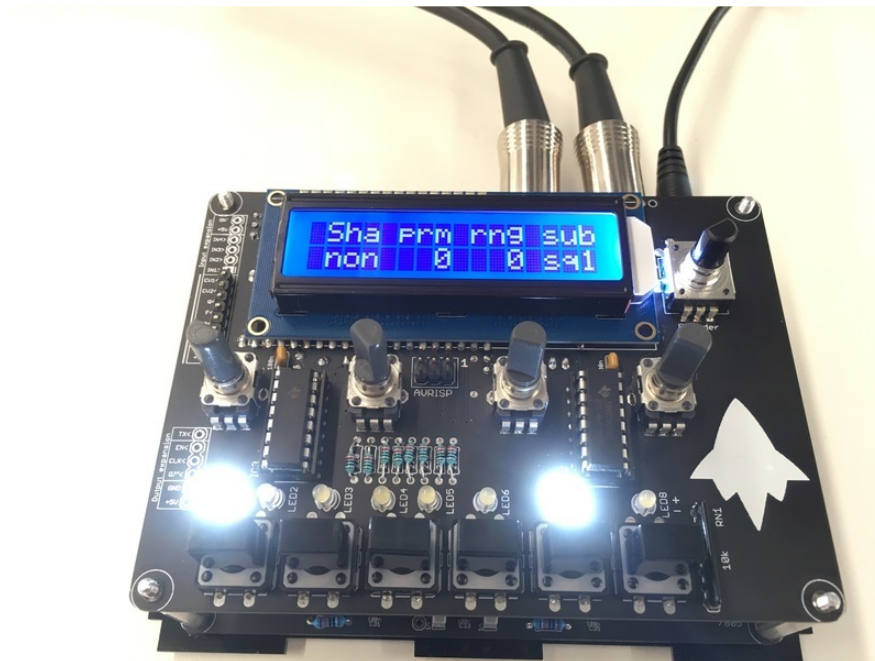
At this point you should familiarize yourself with the manual for this synth to understand the basic operations of how to interact with it. The full manual can be found here - [https://mutable-instruments.net/archive/shruthi/build/digital\\_xt/](https://mutable-instruments.net/archive/shruthi/build/digital_xt/) (<https://adafruit.it/Cgw>)

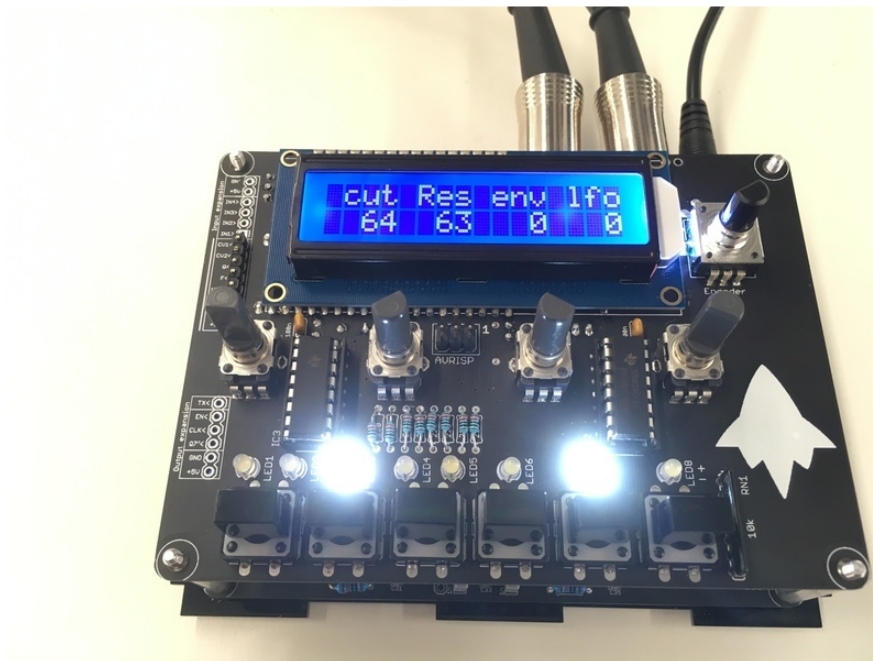
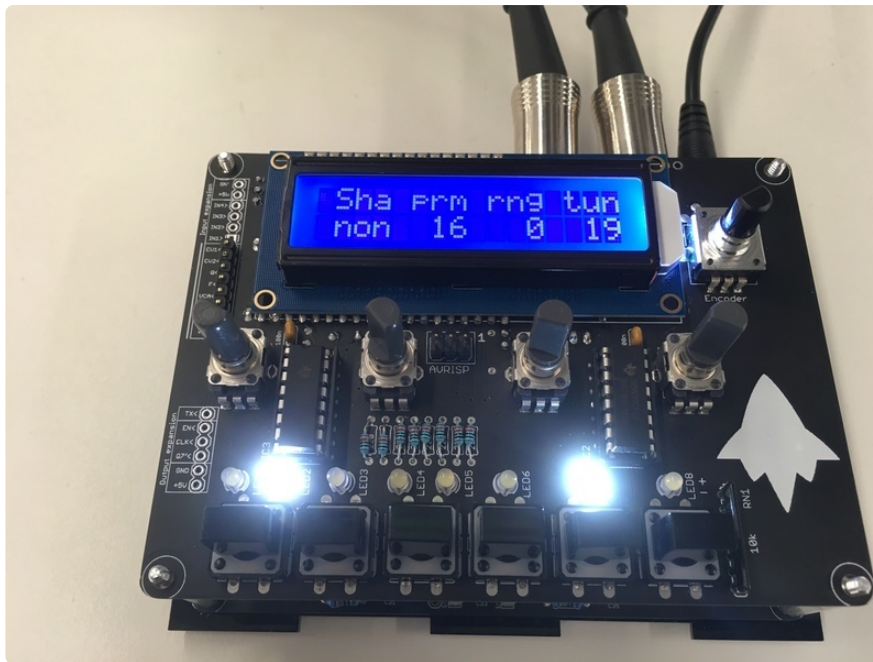


## Tuning

To tune the synth you will need to dial in the following settings.

- Oscillator 1 shape: **none**
- Oscillator 2 shape: **none**
- Filter cutoff: **64**
- Filter resonance: **63** (maximum value)
- Filter envelope and LFO modulations: **0**





You'll need a MIDI source to test this - preferably a keyboard. When playing notes you should hear a pure tone (sine wave), which does not come from the Datadealer's oscillators but from the filter self-oscillating. Adjust the V/Oct trimmer with a flathead screwdriver so that **intervals** are respected between octaves. Playing C3 won't necessarily play a C but C3 and C4 should be one octave apart. If you have trouble tuning by ear you can try a tuner built in to a DAW such as Ableton. If the filter is correctly tuned, you should be able to play the filter "self oscillation tone" across roughly 4 octaves with correct tuning.

If you're having trouble please visit the troubleshooting sections of <http://mutable-instruments.net/shruthi1/build/smr4mkII> (<https://adafru.it/qRA>) and [©Adafruit Industries](http://mutable-</a></p>
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[instruments.net/shruthi1/build/digital](https://adafruit.com/learn/adafruit-shred) (<https://adafruit.com/learn/adafruit-shred>) for solutions to common issues. If you're having no luck after that please send a detailed email to [band@infinityshred.com](mailto:band@infinityshred.com)

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## Patches

Datadealer ships with 16 presets flashed on to the main chip.

**1. Shred** a simple percussive saw sounds that works as a rhythmic bass or as a soaring lead when run through distortion and delay

**Patches 2-16** were featured in the making of Infinity Shred's albums and are named after their corresponding songs

**2. DATADLR** a dreamy attack laden saw sound prime for dreamy arpeggios. Run through lots of reverb for peak-dreaminess

**3. DATADLR2** a vocal sound with a short decay. Ghost-y.

**4. DATADLR3** a spooky but pleasant bell-like sound

**5. LONGDIST** a long attack detuned saw for creating swells

**6. LONGDIS2** a short blipp-y saw sound prime for fast arpeggios

**7. VOIDRPPR** a crunchy short decay sound perfect for making your song sound more complicated than it actually is.

**8. VOIDRPR2** a short decay vocal sound. Great with lots of delay and reverb - but what isn't these days?

**9. SHDWJWLR** VERY long attack detuned saw pad for dramatic swells

**10. SHDWJWL2** a short beautiful bell sound for creating haunting memories

**11. MAPPER** a short decay rhythmic bass. Great for strict marching arps.

**12. MAPPER2** an aggressive sustain saw bass. Sounds great with filter open or closed.

**13. TOURIST** we get it. Infinity Shred LOVES saws. This sound was used to make a fast delay heavy arpeggio.

**14. KODIAK** a noisy sweeper. Play around with the cutoff / resonance values while playing notes to emulate a terrible windstorm on a cold ice planet you now must call home

**15. MONOLITH** shred it up with this hot riff maker

**16. MONOLTH2** cute but effective square wave for poppy arps

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