

Neutron sound / Magpie modular dodeca building tips.

Mouser cart:

<https://ca.mouser.com/ProjectManager/ProjectDetail.aspx?State=EDIT&ProjectGUID=0082110f-d597-4c76-925b-8146d7b16813>

The Dodeca uses SMD components but they are not very small except one of the diodes. Passives are 805 size and the ICs are SOIC.

It is quite easy and actually faster than through hole because there is no “lead bending” and “lead cutting” steps.

decide how many trimmers you want before you buy. And edit your cart.

Trimmers are one of the more expensive parts, you can have 0-3 of them. They are for trimming 1v/octave on some of the outputs.

In the BOM you will see 9x 20k resistors, 3x 16.9k resistors, and 3x trimmers.

If you want to remove trimmers, then remove also the 16.9k resistors and add 1 20k for each trimmer you remove.

For example with 1 trimmer there would be 11x 20k, 1x 16.9k, and 1x trimmer.

LED brightness and resistors.

The BOM calls for 1k resistors which is fine for super efficient red ones, but some other colors have a higher voltage drop, and need a much lower resistance.

Programming the Teensy.

Before you start assembly, it is a good idea to program the Teensy to become familiar with the Arduino software and the Teensy loader.

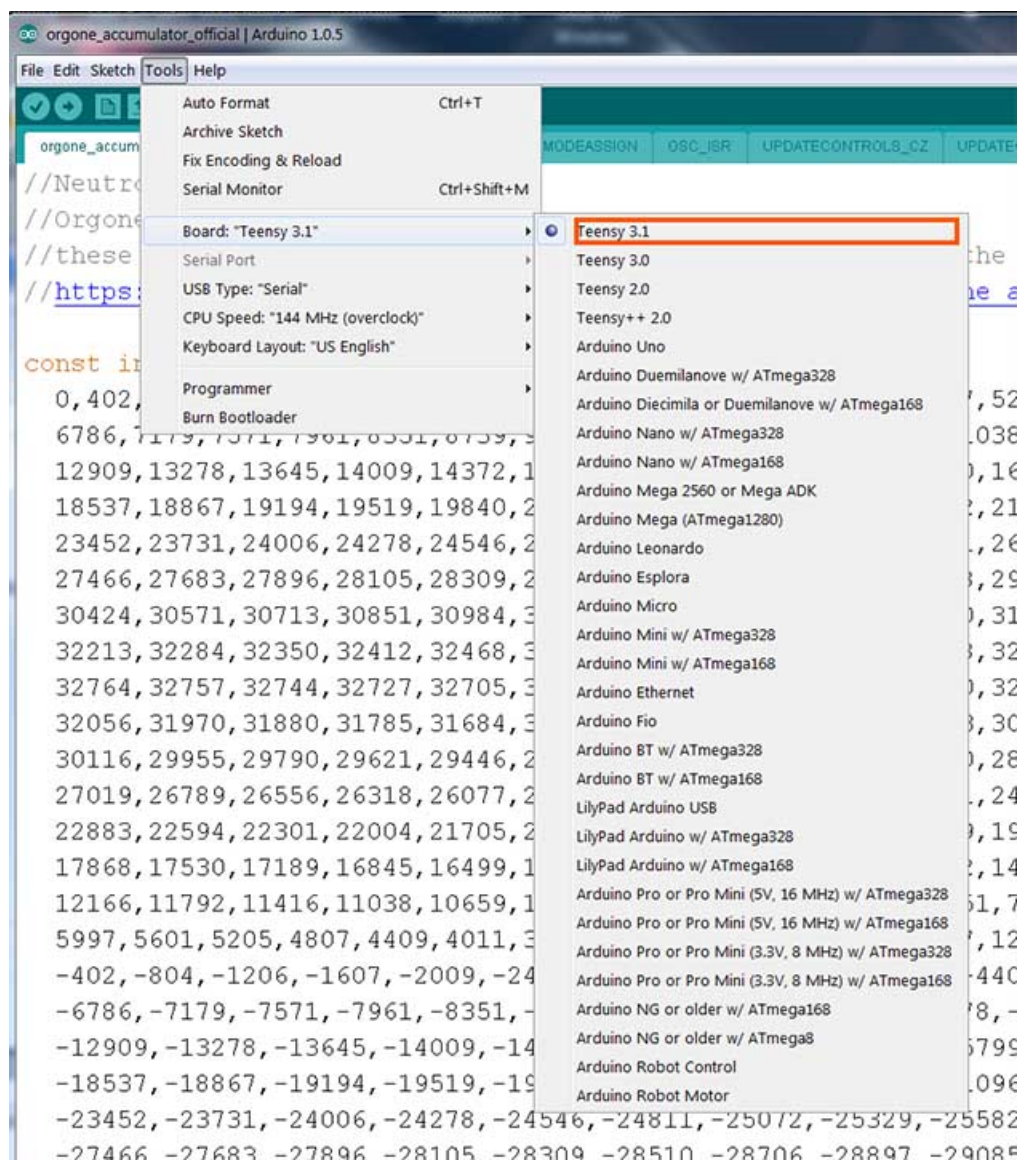
First go to this site and follow the instructions to install Arduino and the Teensyduino software.

https://www.pjrc.com/teensy/td_download.html

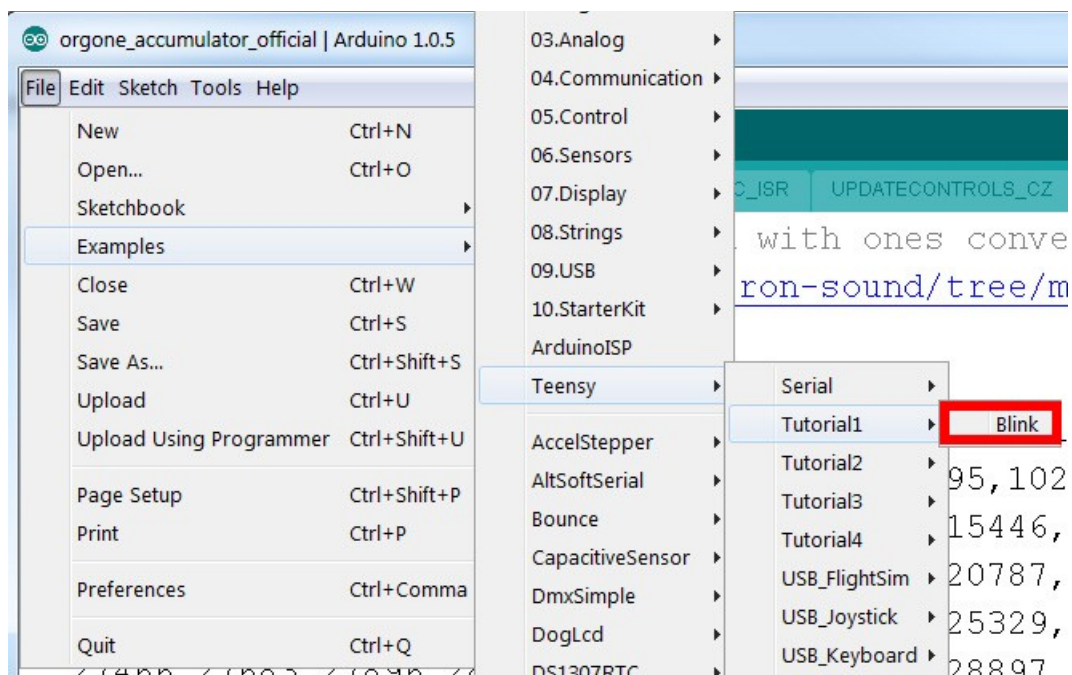
Note! Quite often, arduino is one version ahead of teensyduino, so get teensyduino first, and then get the latest version that is supported from the arduino “older versions” page.

Connect your teensy to the computer via USB A to Micro-B cable

Open the arduino IDE program and set the board to Teensy 3.1/3.2



open the "blink" sketch in the teensy examples



You will need to do a small edit for the blink program to work

```

Blink | Arduino 1.0.5
File Edit Sketch Tools Help
Blink
/* LED Blink, Teensyduino Tutorial #1
   http://www.pjrc.com/teensy/tutorial.html

   This example code is in the public domain.
   */

// Teensy 2.0 has the LED on pin 11
// Teensy++ 2.0 has the LED on pin 6
// Teensy 3.0 has the LED on pin 13
const int ledPin = 11; change to:
                        ledPin = 13;

// the setup() method runs once, when the sketch starts

void setup() {
  // initialize the digital pin as an output.
  pinMode(ledPin, OUTPUT);
}

// the loop() method runs over and over again,

```

Now press the button that looks like a checkmark, you will see a bunch of text on the bottom of the window while the code is compiled. Then, if the teensy is new to your computer, The software may ask you to press the button on the Teensy, you should only have to do this the first time. Press it, then it should load. The LED on the teensy should blink. Your Teensy works!

Note: on windows 7 arduino IDE will sometimes display a message asking you to press the button on the teensy, but if you wait a little longer, it uploads anyway.

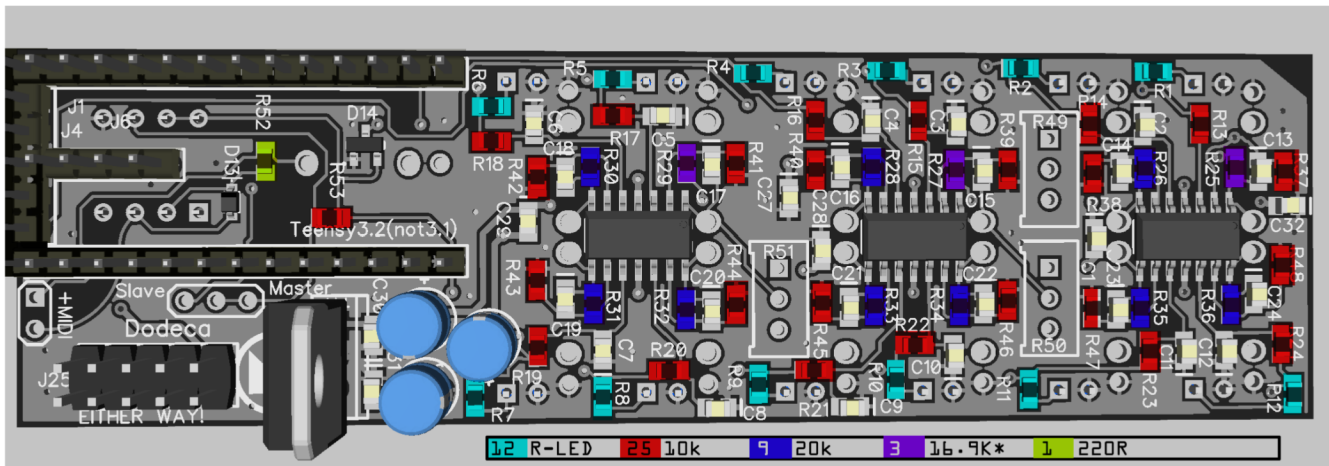
Next, go to

<https://github.com/jakplugg/neutron-sound>

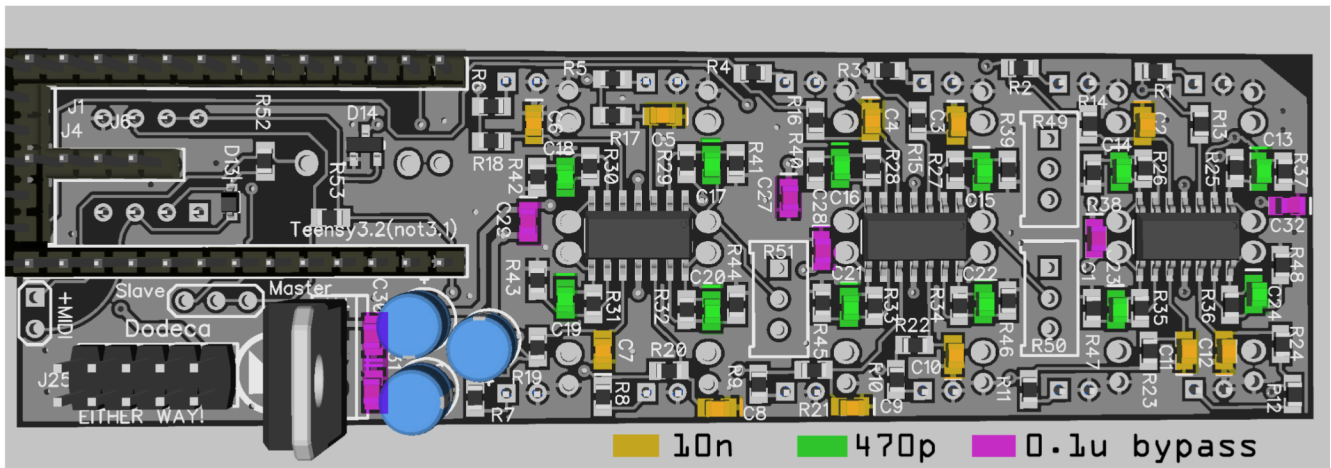
(add dodeca program examples here)

solder the 3 TL074 ICs taking note of the polarity.

solder the SMD resistors and capacitors,



Resistors (note, someone who is color blind told me they couldn't tell the purple from the blue resistors, the purple (16.9k) are at the top right of each "square" formed around the ICs.)



SMD Capacitors

2 diodes noting polarity (the 1n4148 diode is tiny and the cathode mark is hard to see) on mine it was a black mark on a black body. There is a slight chamfer as well. The BAT 54 has 3 legs and you cant really get it wrong.

solder the ferrite beads And rectifier on the jack side of the board

solder the middle 4 pin female header for the teensy on to the dodeca board.

solder the IC socket for the 6n137 (jack side of board)

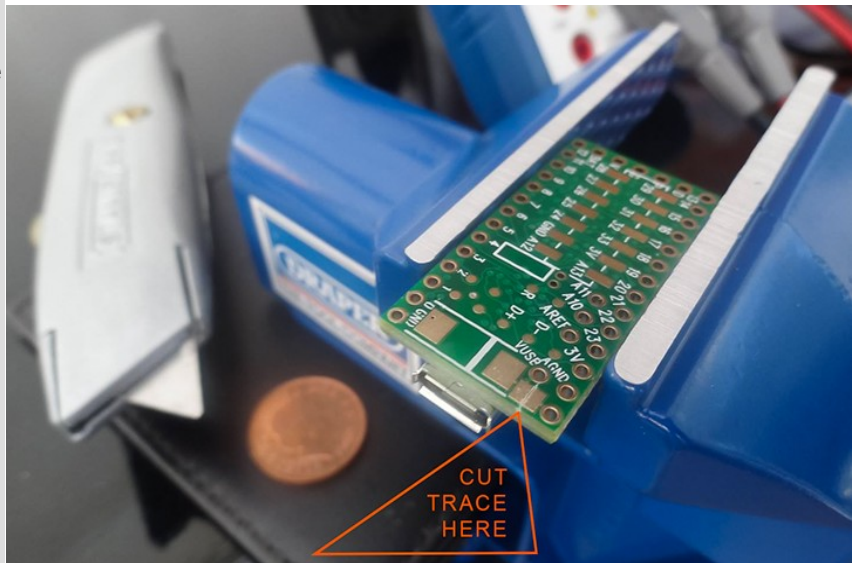
Teensy Headers.

Cut the trace:

You should have programmed the Teensy by now with at least the blink program to make sure you know how to operate the software, and that the Teensy is working. Now you need to separate the 5V VIN from the power supplied by USB. Make the cut between the two rectangular pads. If you have a multimeter, check that the two pads no longer make an electrical connection.

Cutting this trace still allows the Teensy to be programmed via USB while it is connected to the synthesizer power, however, the Teensy will no longer work on USB power alone.

If the trace is not cut, the 5v regulator and the computers USB power will be connected together, which could break something.



Mounting the pins on the teensy:

The Teensy needs to have pins along both long sides, along the short side, a group of three near one edge, and a special set of 14 pins in the middle which use a SMD connector. Lining these all up correctly can be tricky, so proceed as follows.

Warning! be careful not to get any solder on any of the pins long ends, even the tiniest blob of solder makes it impossible to insert the pins in to the headers, and it is hard to clean off without a vacuum desoldering tool.

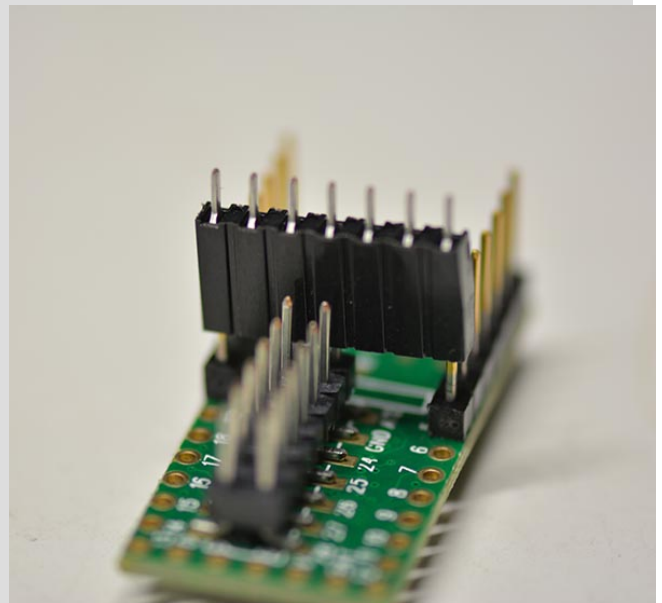
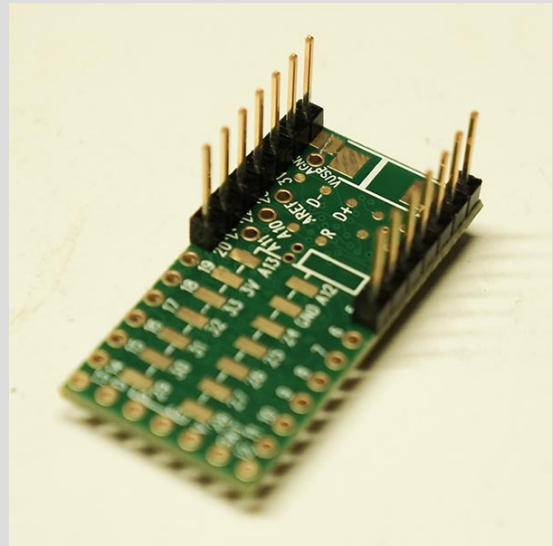
Instead of the 14 rows you might expect for the two long sides, break off 2 rows of seven from the breakaway pin strip. These will cover half of each long side, nearest the USB connector. This makes getting at the SMD pins easier, while also giving you an alignment point.

Get the 7 pin female board header, we are going to use that as an alignment tool, we will call it “alignment tool” for now.

Solder in 2 of the 7 pin rows, at the USB end of the Teensy.

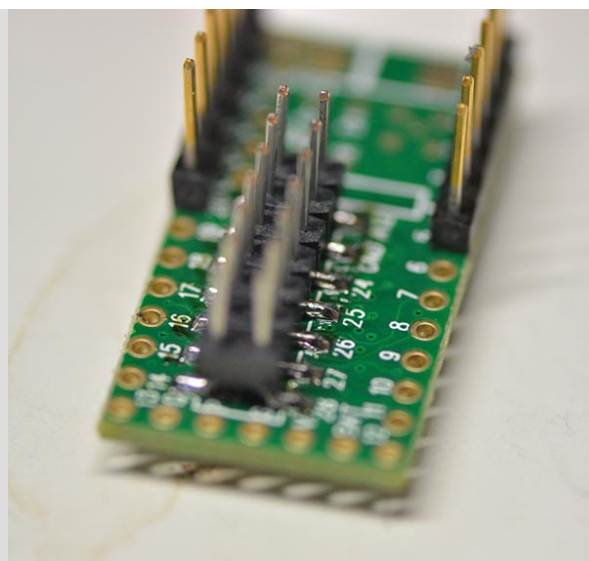
Just solder one pin for now. Make sure they are vertical and flush to the teensy (you can use “alignment tool”)

Now place the alignment tool over the rows you soldered, and also the SMD header,



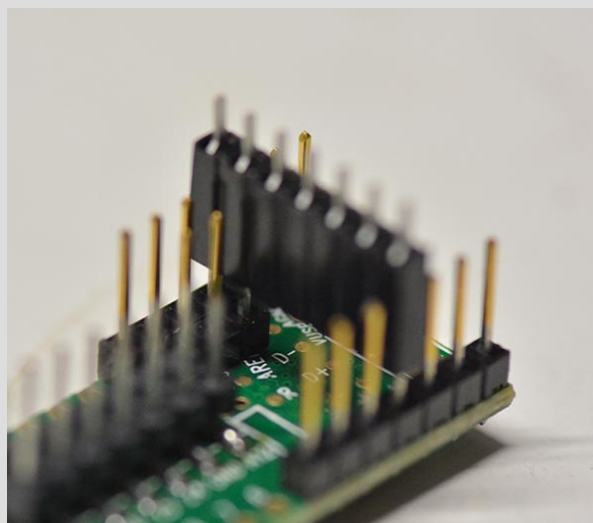
Solder a couple of the SMD pins, and then remove the “alignment tool”

Now you can solder the rest of the SMD pins fairly easily.



Now break off 3 pins from the breakaway header and use the alignment tool to hold them in the 3 holes marked AREF, A10, and A11 on the Teensy.

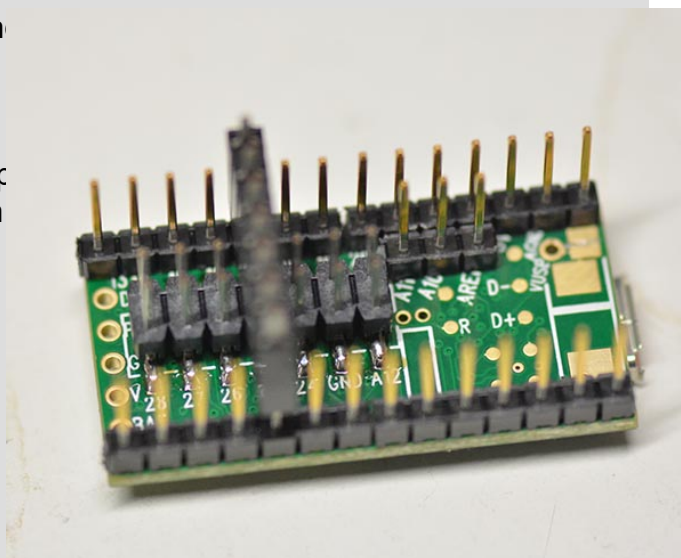
And solder one pin, to hold them in place.



Now you can break off 2 more strips of 7 pins and place them along the remaining side holes. The alignment tool can be used again

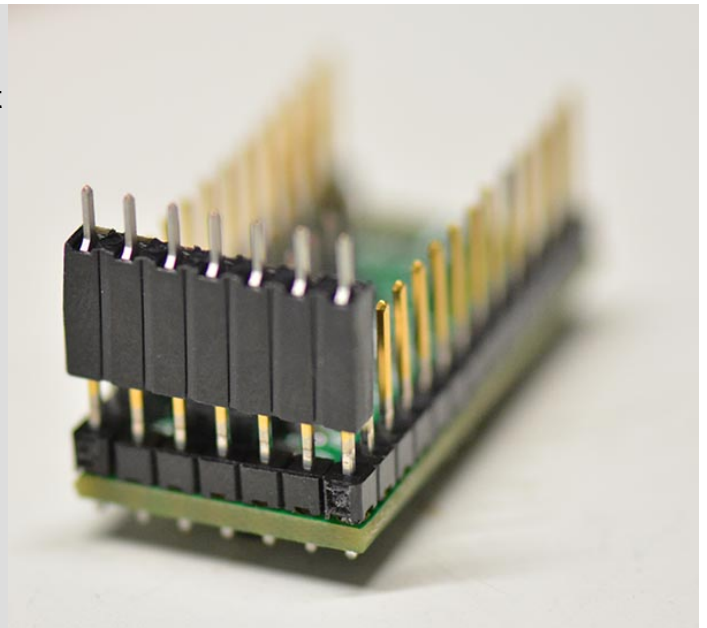
You may need to file or sand the ends of the strip you cut, if they interfere with the strips already in place.

Just solder 1 pin on each for now.



Now utilize the alignment tool yet again for the remaining 5 pins at the short end of the Teensy. You may now retire the alignment tool and call it board header again.

Again solder only 1 pin.



Mounting the Board Headers

You can put all the headers on their respective pins, to align them all. You will not be able to push them all the way down though; this is fine.

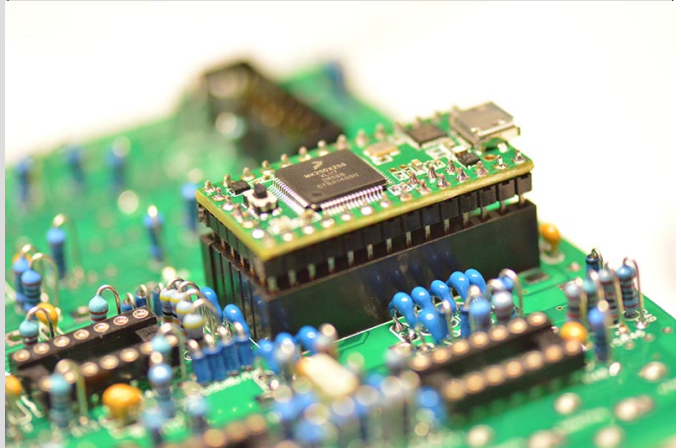
Press the 4 pin one on the middle row of the SMD pins on the 4 pins farthest from the USB port first and use that as a guide for how far to press the others.

Note that only the “middle” row is used on the SMD header. It is the row that goes down the middle of the Teensy. The other row is just to add stability to the SMD contacts if you have to remove the Teensy.

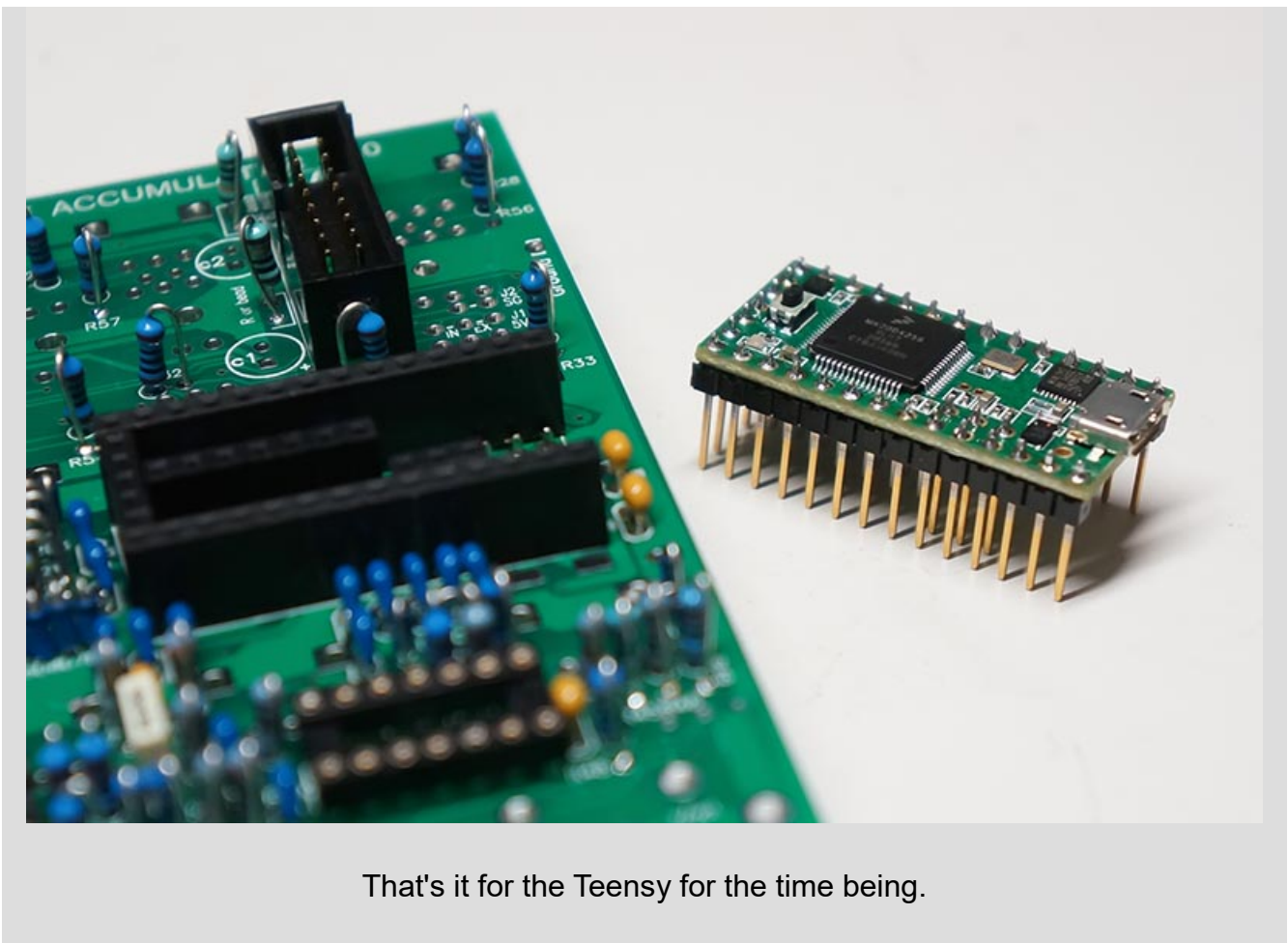
It can be a bit tricky to get all the header pins in to the Orgone Accumulator board, and you may need to move the pins/header a bit to make it work nicely. This is why you only soldered one pin on each (Idea thanks to hexinverter).

Solder all the board headers to the PCB, then all the Teensy pins to the Teensy. Be careful not to get any solder on any Teensy components.

Note this picture is not of the dodeca board. Being lazy, I just copied this section of the orgone accumulator build manual.



At this point, remove the Teensy. You should be able to pry it out quite easily by going around it bit by bit with a screwdriver. Don't rush it and bend pins.



That's it for the Teensy for the time being.

and the through hole components. 3 capacitors, the power header, and the 2 and 3 pin male headers. All on the component side.

If you decided on trimmers, then solder them now, where there are no trimmers, then you need to solder a jumper (a bit of component lead wire you just cut off the capacitors is fine)
the trimmers are for these outputs:

R49 > out2 (DAC)

R50 > out6

R51 > out 10

The jumpers go between the square pad and the middle one.

solder the rest of the teensy headers using teensy as an alignment tool.

Solder the thonkiconn jacks flush to the board using the panel to align them
Dont solder the stereo jack until after the 12 thonkiconn ones.

After the thonkiconn jacks are soldered cut the tabs from the stereo jack, leaving as much of the pin as possible. Place the jack but do not solder yet. Attach the panel to a couple of the jacks with the nuts

now tighten the nut on the stereo jack which will pull it forward and align it on the panel with the taller thonkiconn jacks.

Now you can solder the stereo jack pins..

the LEDs can be a bit tricky. There might be a better way, but what I did is this: I put them in their places on the board, then attached the panel with a couple of jack nuts, then held a card over the front to stop the LEDs sliding all the way out and turned it over so it was face down on the desk. I wanted the LEDs flush, so I found something the same thickness as the front of the jacks (another circuit board) and put it under the tops of the LEDs careful not to jiggle this contraption about as you are soldering because the LEDs love to jump out of position with the slightest provocation. Please note LED polarity. The longer pin on the LED goes through the square pad.

substituting op-amps

if you decide to use different op amps for some reason, be aware that this circuit relies on the TL074 internal 128 ohm resistor as the output resistor. It means the output can drive more modules before the voltage starts to droop, but if you use a “better” op amp that is not short circuit protected, a short could kill it. There is probably no point anyways!

Before you put the teensy back in, its a good idea to do some basic power bus tests,

the tab of the 7805 regulator is at ground, and a handy place to measure from.
check the continuity of the “+” pin of the rectifier to pin 4 of each TL074
check the continuity of the “-” pin of the rectifier to pin 11 of each TL074
make sure there is no continuity between + and ground, - and ground. (if you use a meter with continuity beeper, it may beep briefly as the capacitors charge)

power up and check that there is + approximately +11.4v on the + side of the rectifier output.
-11.4v on the negative side. (careful you dont short those 2 pins while measuring)
5v on the output of the regulator, (bottom pin when viewed as the resistor and capacitor diagrams above)

if everything is good, then install the teensy, and you should be ready to go!

Most of the dodeca programs on github have a LED test sequence at startup. Note, the LED on output 2 appears dimmer than the others at low level, because it uses the DC output of the teensy DAC instead of PWM. Its not a build fault.