# LOOPING VCADSR

# Build Guide

# Dannysound

# 1 Introduction

This module is based on a design from the fabulous Electric Druid! If you're interested in designing circuits they produce some incredibly useful PIC microcontrollers for use in synths and guitar effects, plus they have some really great articles and projects. For more information please visit https://electricdruid.net

The LOOPING VCADSR uses a Microcontroller to generate a Voltage Controllable, Loop-able Envelope. The individual parts of the Envelope (Attack, Decay, Sustain, Release and Level) can all be individually controlled via CV.

It has 3 MODES of operation:
Normal Envelope – Gate signal fires ADSR
Gated Looping Envelope – ADSR loops whilst gate signal is high.
Looping Envelope – ADSR loops regardless of gate signal.

When the envelope is looping, all 5 controls affect the output.
Attack and Decay operate, as one would expect.
The Sustain control sets the minimum voltage the decay part of the envelope will decay to.
The Release sets a release time from the end of the Sustain period to the beginning of the next cycle.
When the Sustain is set to 0 you can use the Release control to add a delay between Attack and Decay cycles.

In Normal Envelope mode the Sustain CV input can be used with an LFO source to add amplitude modulation that gradually increases as the Envelope transitions from the Attack/Decay part of the envelope into the Sustain part.

The Level CV is also a useful point for amplitude modulation or can be used for Velocity Sensitivity CV.

## Features:

3 Modes of operation:
Normal
Gated Loop
Constant Loop

CV control over:
Attack
Decay
Sustain
Release
Level

Works with GATE signals from +5V to +12V
Output CV range 0V to +10V

Connections:

**Inputs**

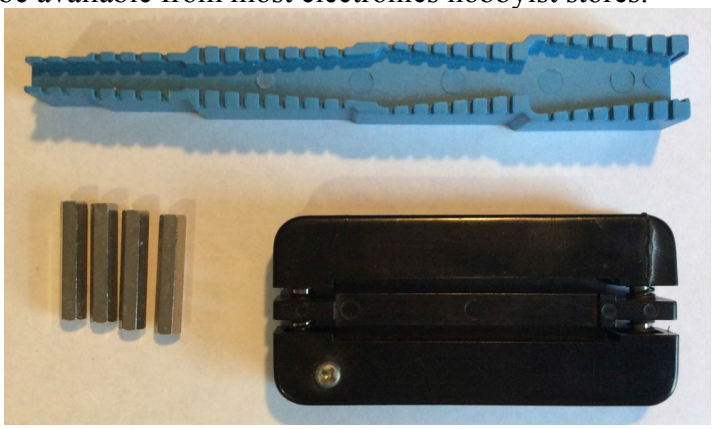
ATTACK CV
DECAY CV
SUSTAIN CV
RELEASE CV
LEVEL CV
GATE

**Output**

ENVELOPE OUT

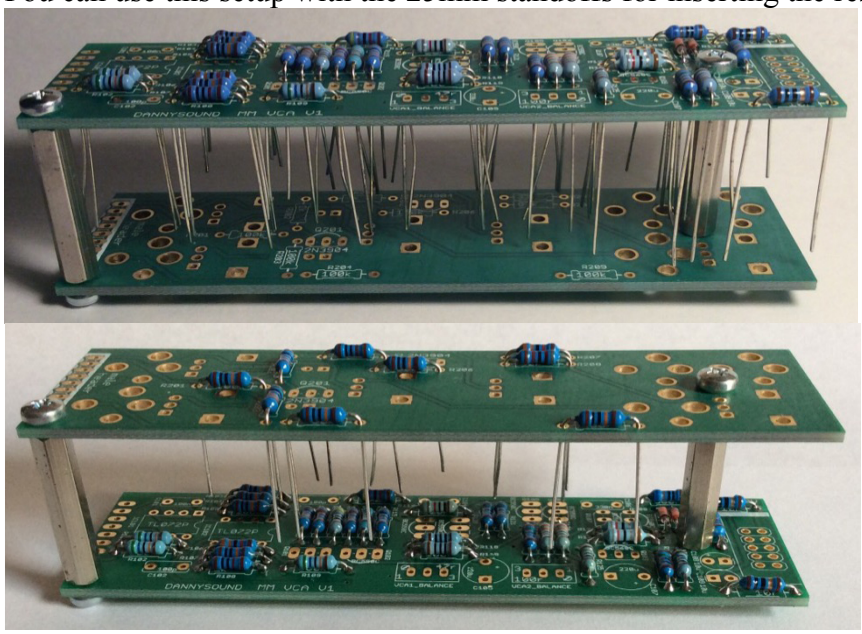
## 2 Construction Tips

These tools come in very handy, especially if you do a lot of DIY projects. They should be available from most electronics hobbyist stores.

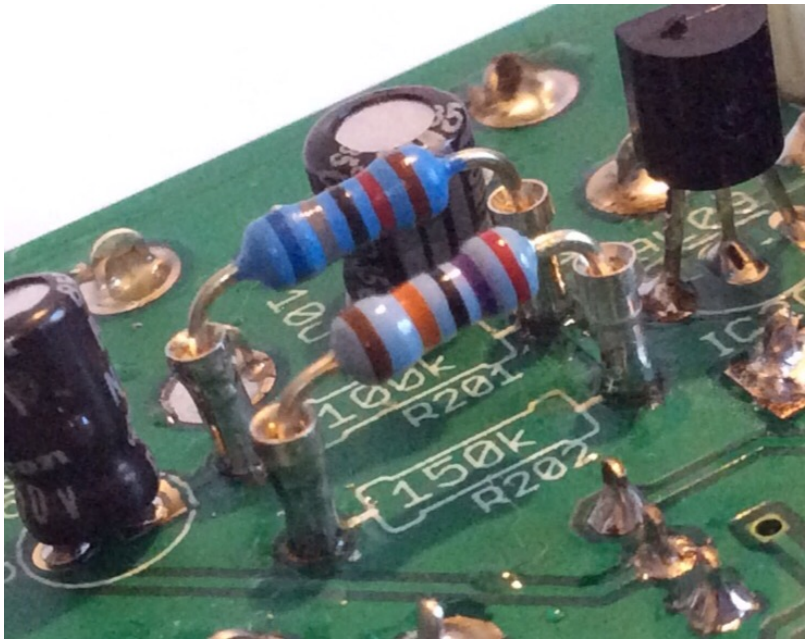


The blue bending guage is for bending the resistor and diode legs to the right size.
The black IC straightener is for straightening pins of op-amps etc.
The silver standoffs are 25mm Female to Female.

You can use this setup with the 25mm standoffs for inserting the resistors and diodes.



The top picture is for stuffing the Outer Board. It has the advantage of being much quicker to place all the resistors etc and it's easy to fix any mistakes. You can then solder everything from the top in one go (make sure you have decent temp. solder iron with not too fat tip!). Then unscrew the standoffs and clip all the legs. Reverse both boards as in the lower picture for the Pots Board.



Cutting the pins from a SIL connector and soldering as shown above is useful for experimenting with different component values if you want to try out any of the modifications.

# 3 Parts Lists

| VCADSR OUTER PARTS LIST | | |
|---|---|---|

| RESISTORS | | |
|---|---|---|
| 1k | 3 | R105 R103 R120 |
| 4k7 | 5 | R110 R116 R117 R118 R119 |
| 8k2 | 1 | R113 |
| 10k | 6 | R107 R121 R122 R123 R124 R125 |
| 12k | 1 | R106 |
| 27k | 1 | R101 |
| 91k | 2 | R102 R108 |
| 100k | 5 | R104 R111 R112 R114 R115 |
| 220k | 1 | R109 |

| CAPS | | |
|---|---|---|
| 100n 2,5mm pitch leads ceramic | 8 | C104 C105 C108 C109 C110 C111 C112 C113 |
| 6n8 polyester box - 5mm pitch leads | 1 | C107 |
| 68n polyester box - 5mm pitch leads | 1 | C106 |
| 10u electrolytic | 4 | C101 C102 C103 C114 |

| DIODES | | |
|---|---|---|
| 1N4148 | 1 | D101 |

| OPAMPS | | |
|---|---|---|
| PIC from Electric Druid | 1 | IC103 |
| TL074 | 1 | IC102 |
| TL072 | 1 | IC103 |

| BEAD INDUCTORS | 2 | L101 L102 |
|---|---|---|

| TRANSISTORS | | |
|---|---|---|
| 2N3904 | 2 | Q101 Q102 |

| REGULATORS | | |
|---|---|---|
| 79L05 | 1 | VR101 |
| 78L05 | 1 | VR102 |

| SOCKETS | |
|---|---|
| 8 pin DIL socket | 1 |
| 14 pin DIL socket | 2 |

| HEADERS | |
|---|---|
| 1 X 6 FEMALE | 1 |
| 1 X 5 FEMALE | 1 |
| 1 X 4 FEMALE | 1 |
| Shrouded 2 x 5 power socket | 1 |

| VCADSR POTS PARTS LIST |
|---|

| RESISTORS | | |
|---|---|---|
| 100k | 5 | R201 R204 R205 R208 R209 |
| 200k | 4 | R203 R206 R207 R210 |
| 270k | 1 | R202 |

| ALPHA POTS | | |
|---|---|---|
| 10K | 5 | |

| LED | | |
|---|---|---|
| AMBER 3MM | 1 | |

| SOCKETS | | |
|---|---|---|
| PJ301 | 7 | |

| TOGGLE SWITCH | 1 | DPDT CENTRE OFF |
|---|---|---|

| HEADERS | |
|---|---|
| 1 X 6 MALE | 1 |
| 1 X 5 MALE | 1 |
| 1 X 4 MALE | 1 |

| VCADSR HARDWARE |
|---|

| STANDOFFS | |
|---|---|
| M3 FEMALE 11MM | 2 |

| SCREWS | |
|---|---|
| M3 | 4 |

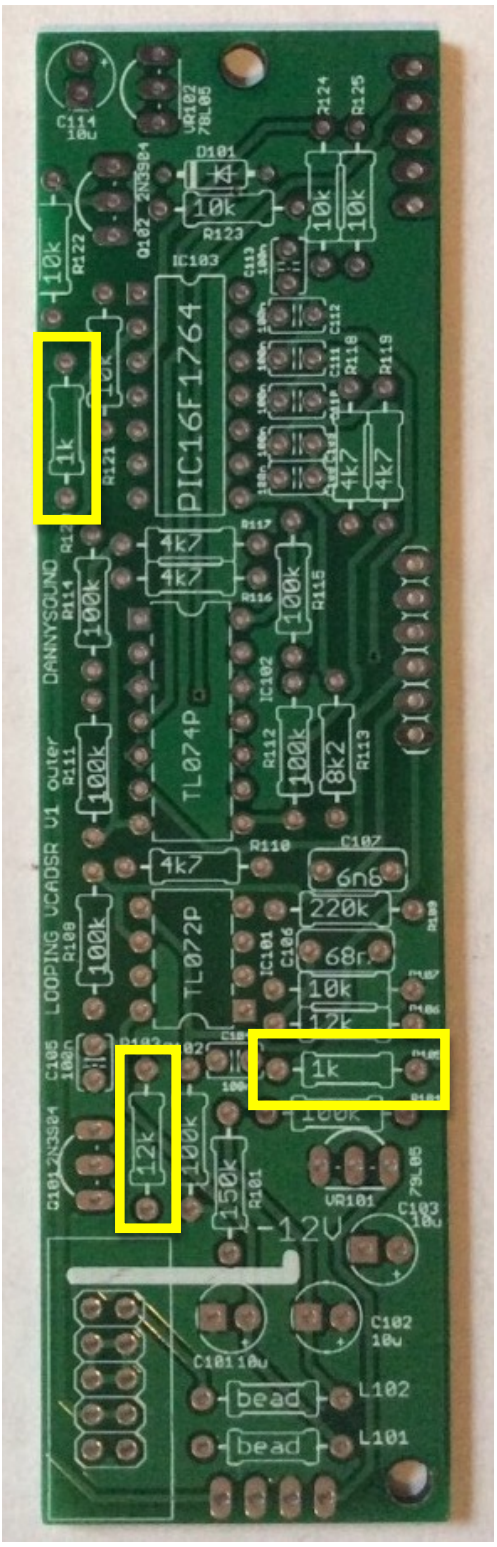
| KNOBS | |
|---|---|
| ROGAN SMALL | 5 |

| LIGHTPIPES | | |
|---|---|---|
| 5mm | 1 | VCC mouser 593-LFC025CTP |

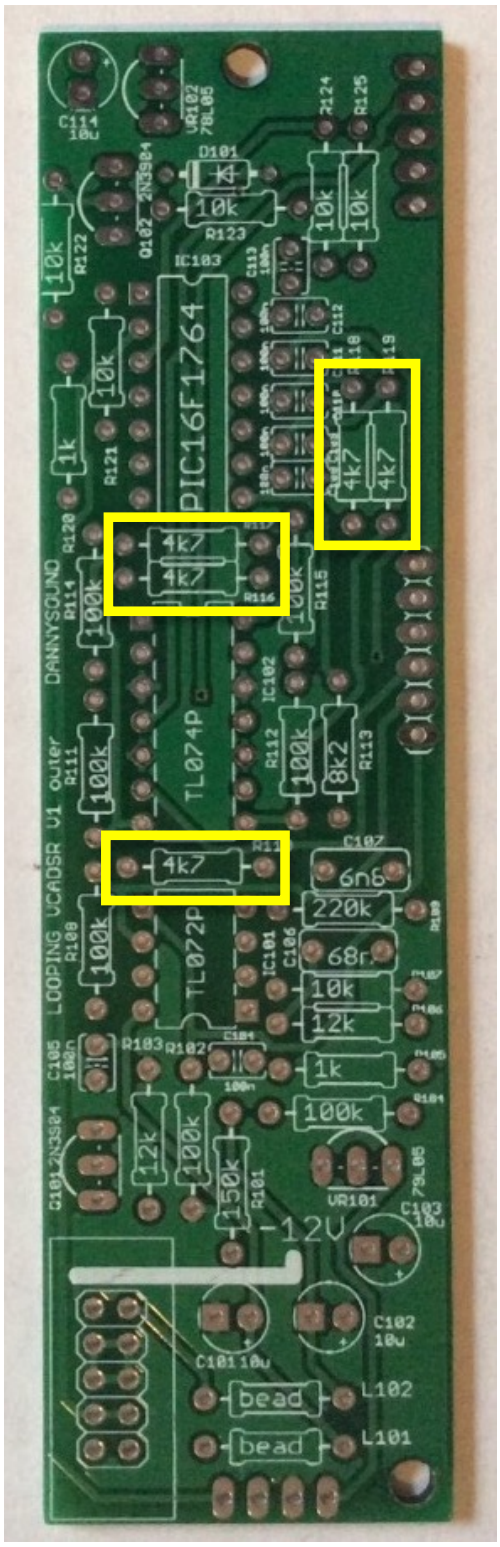
| TOGGLE SWITCH CAP | |
|---|---|
| RED | 1 |

## 4 Outer Board

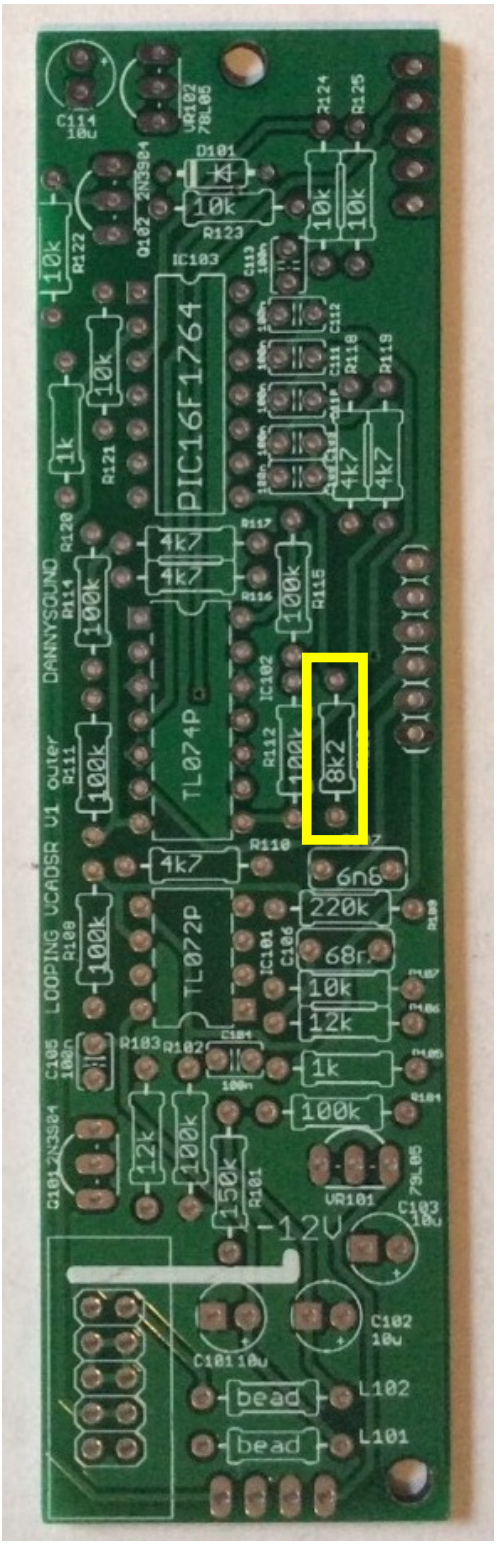
RESISTORS



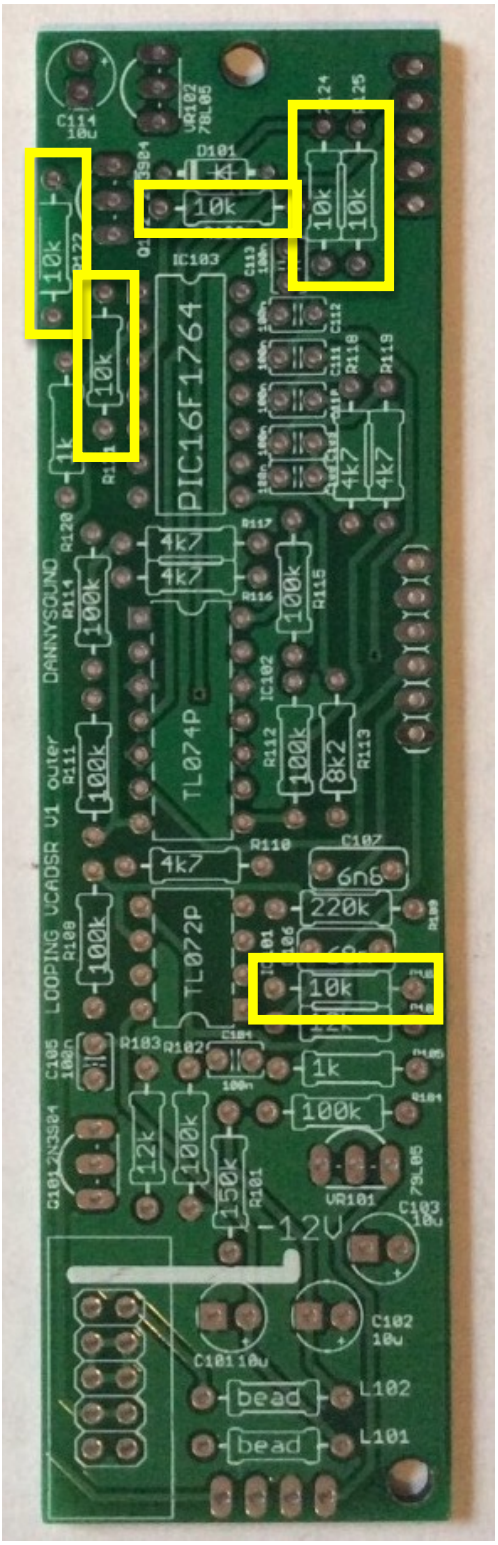

1 – 3 x 1k



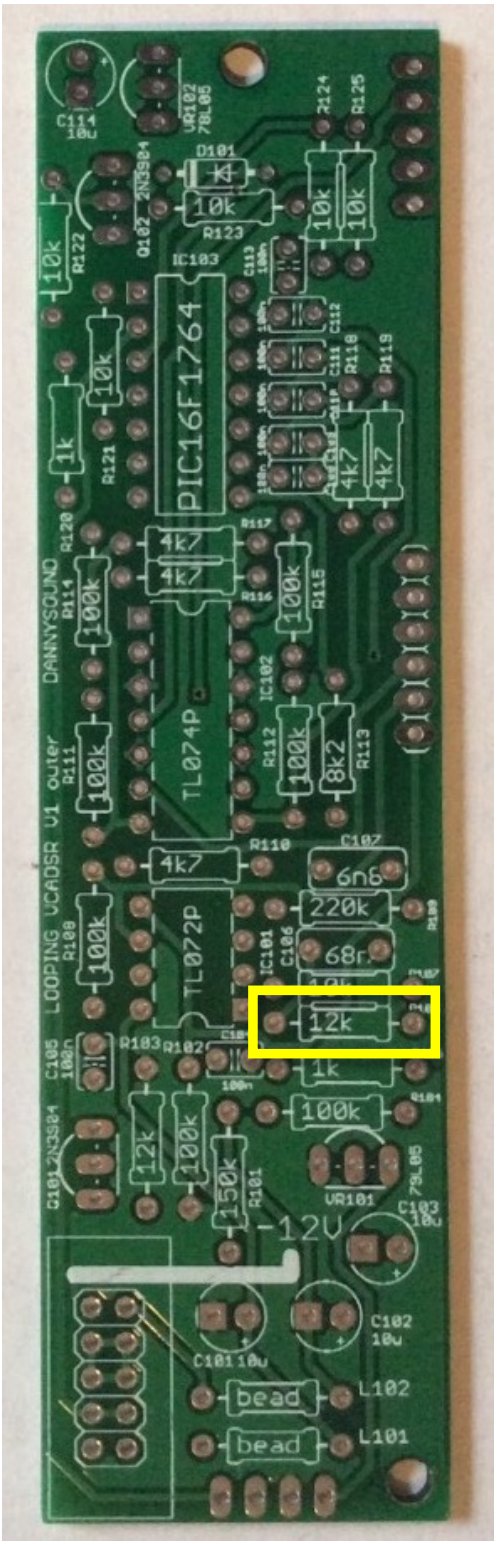

2 – 5 x 4k7



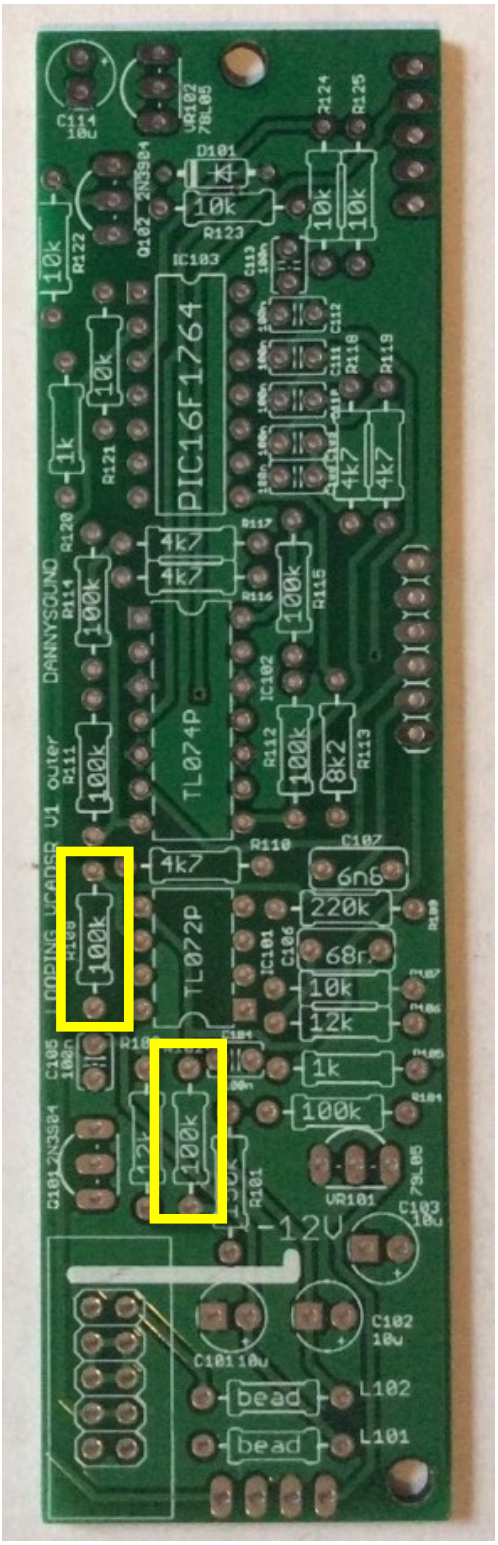
3 – 1 x 8k2



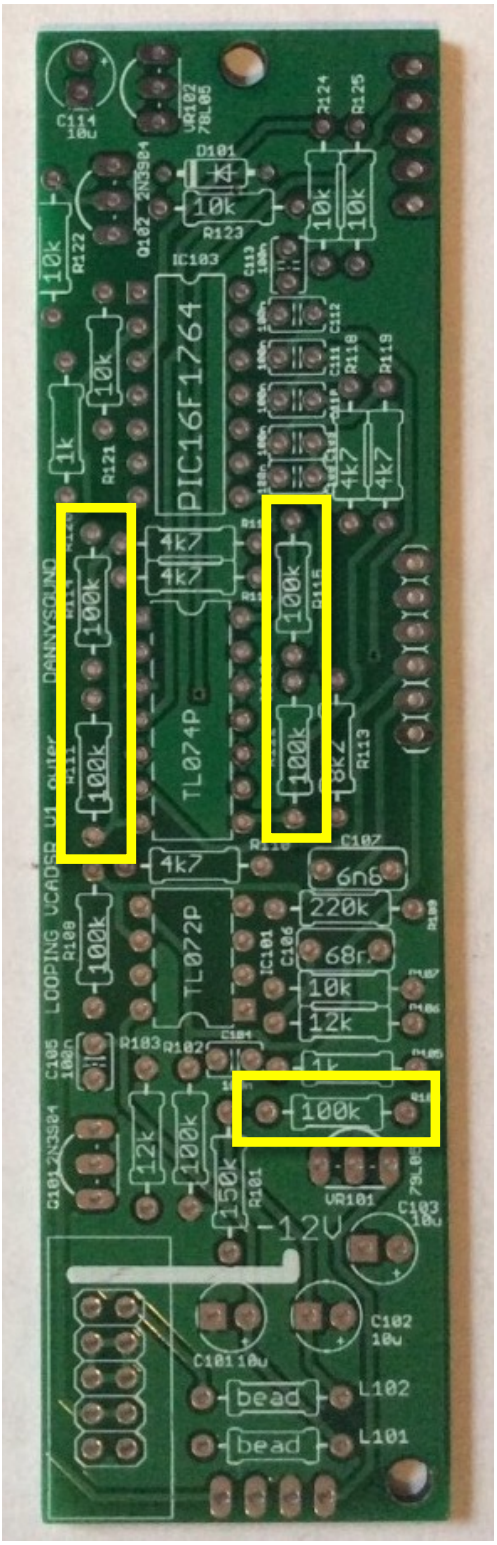
4 – 6 x 10k



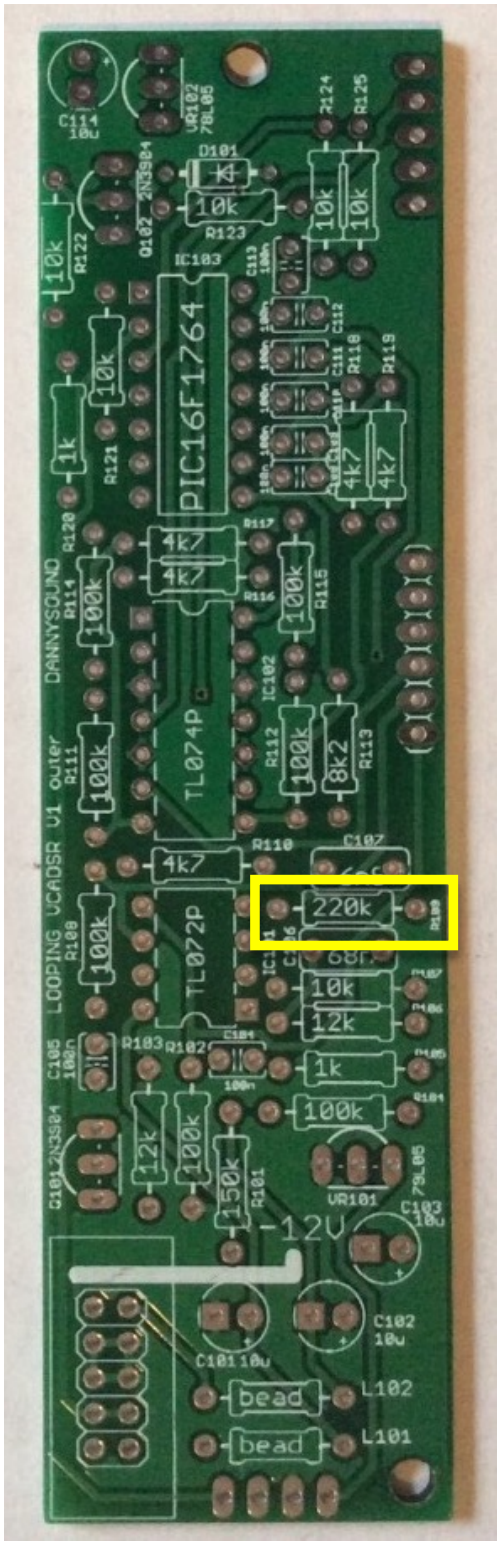
5 – 1 x 12k



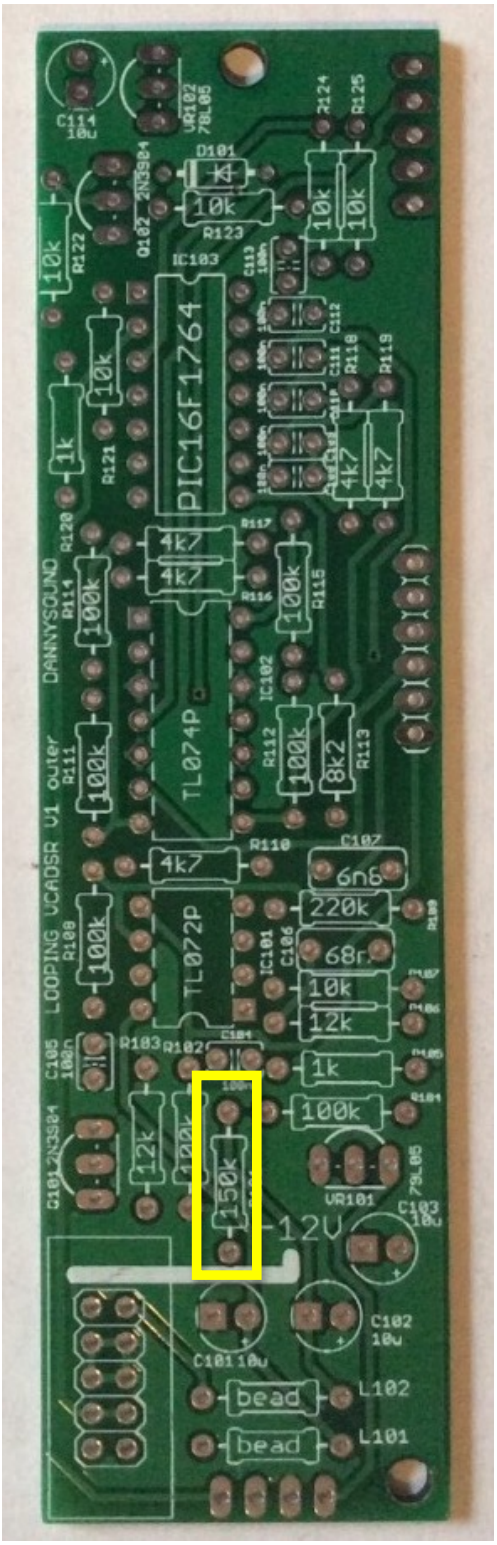
6 – 2 x 91k (will be correctly marked on PCB!)




7 – 5 x 100k

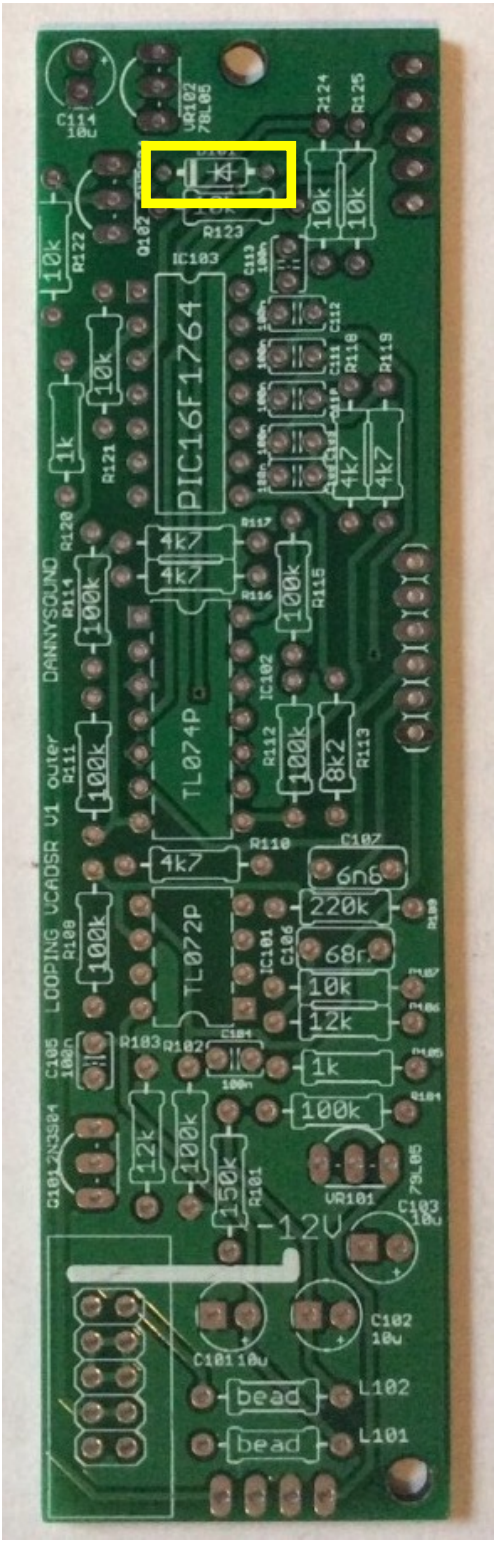



8 – 1 x 220k

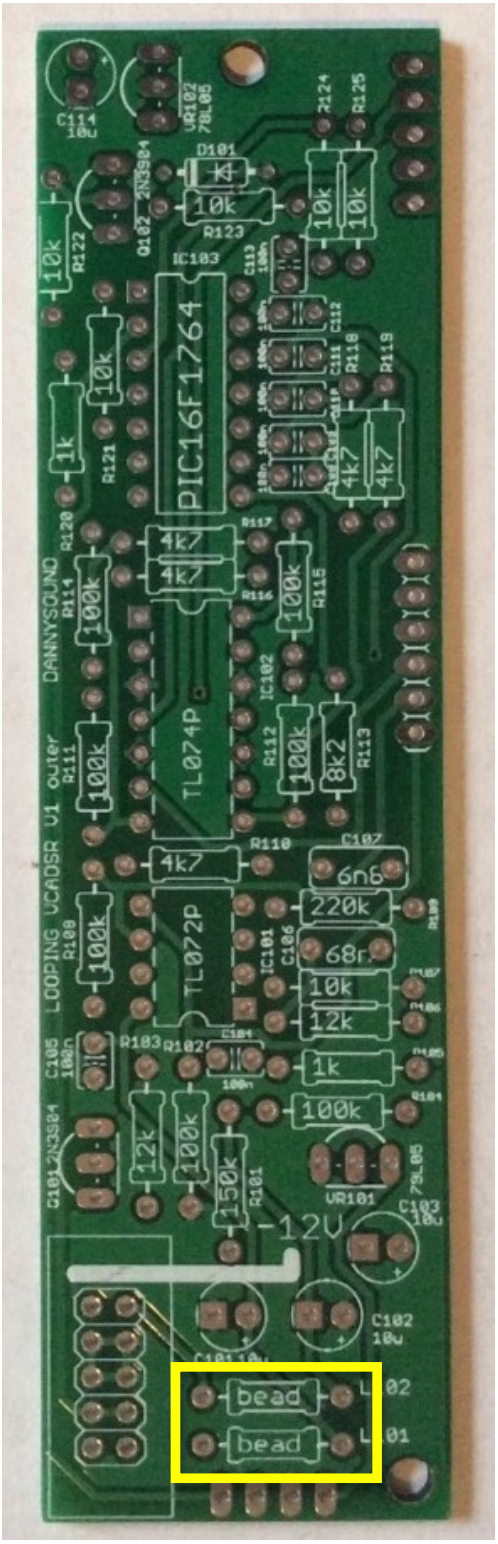



9 – 1 x 27k (will be correctly marked on PCB!)

DIODES AND BEAD INDUCTORS

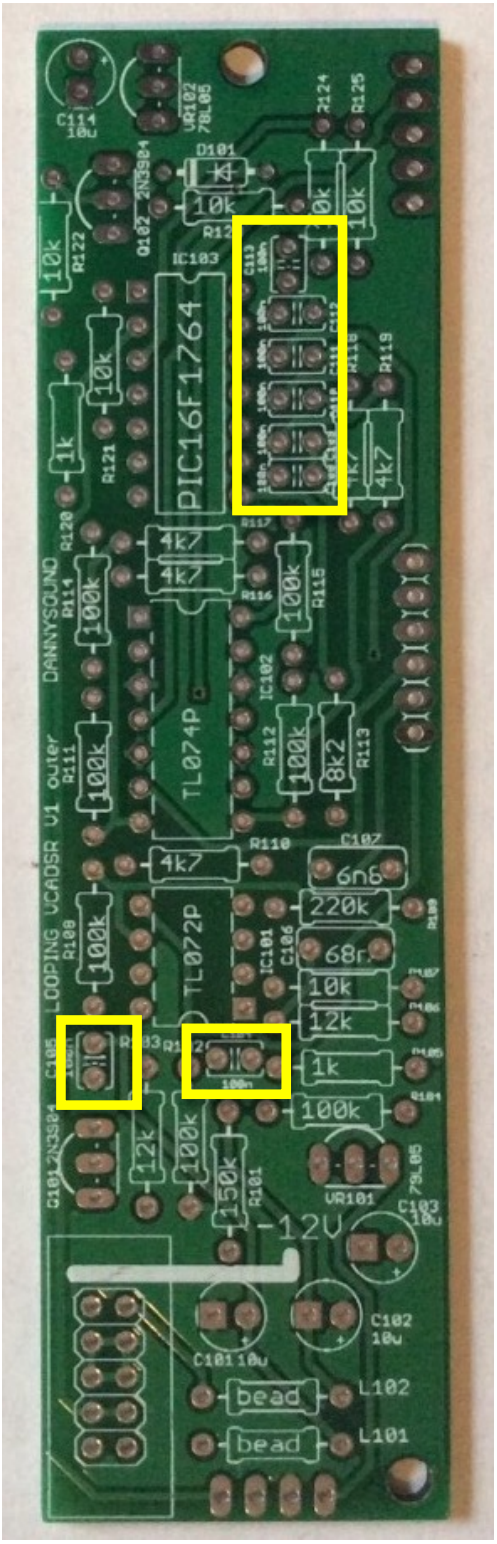



10 – 1 x 1N4148 Diode



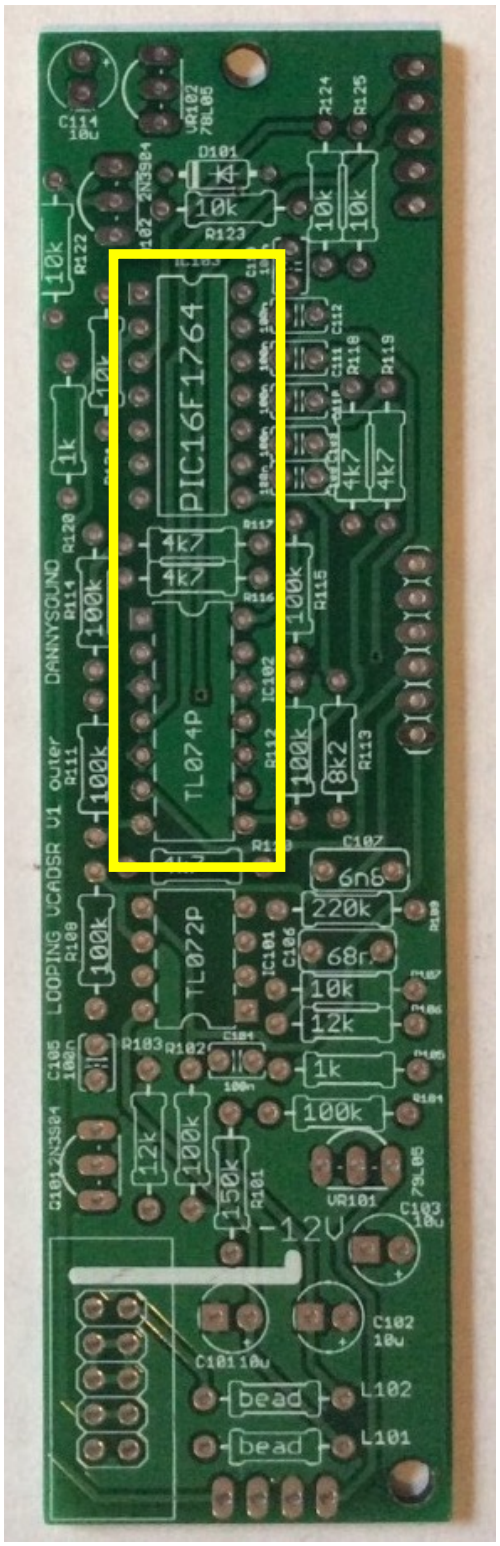

11 – 2 x Bead Inductors

LOW PROFILE CAPS

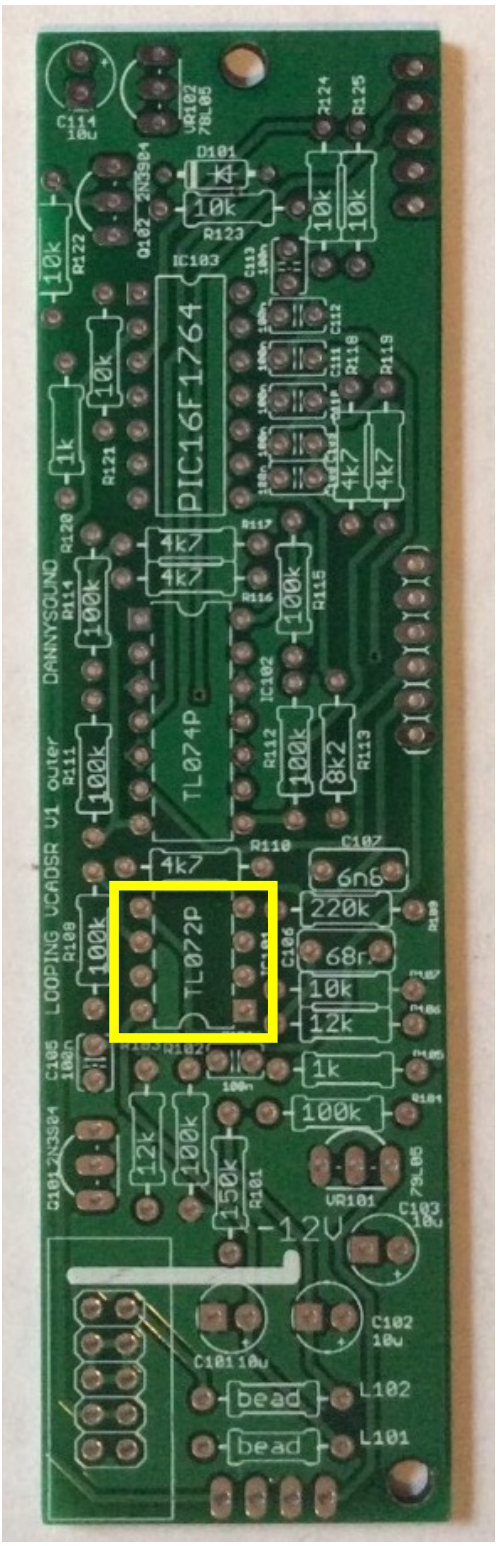



12 – 8 x 100n Caps (2.5mm pitch leads)

IC SOCKETS

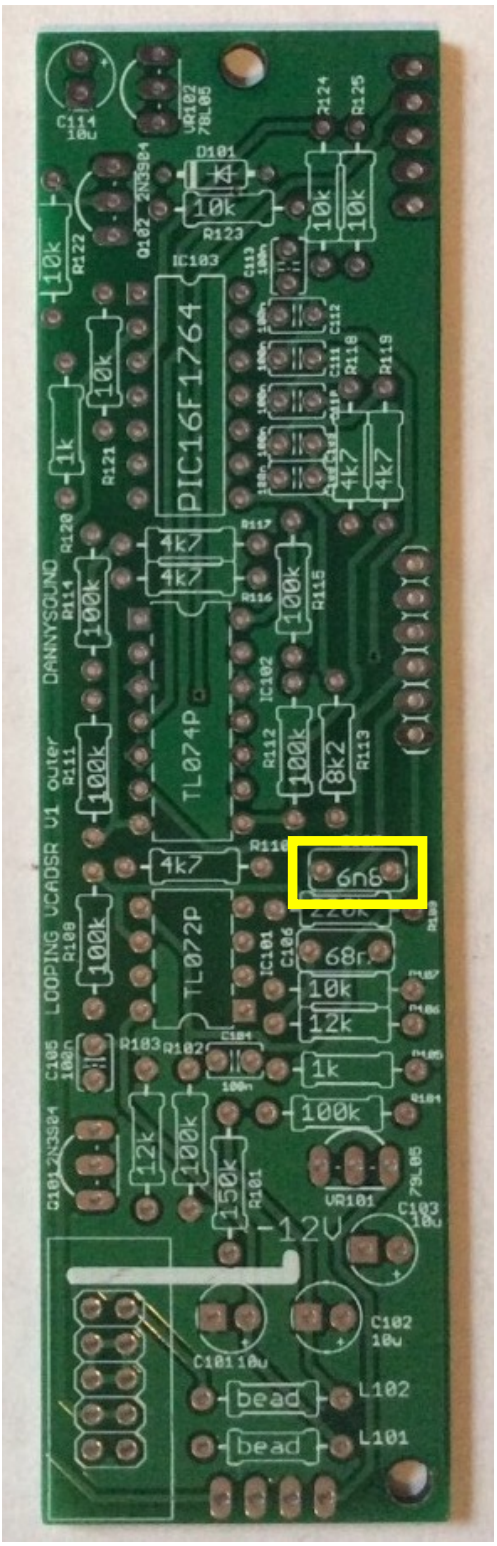



13 – 2 x 14 pin

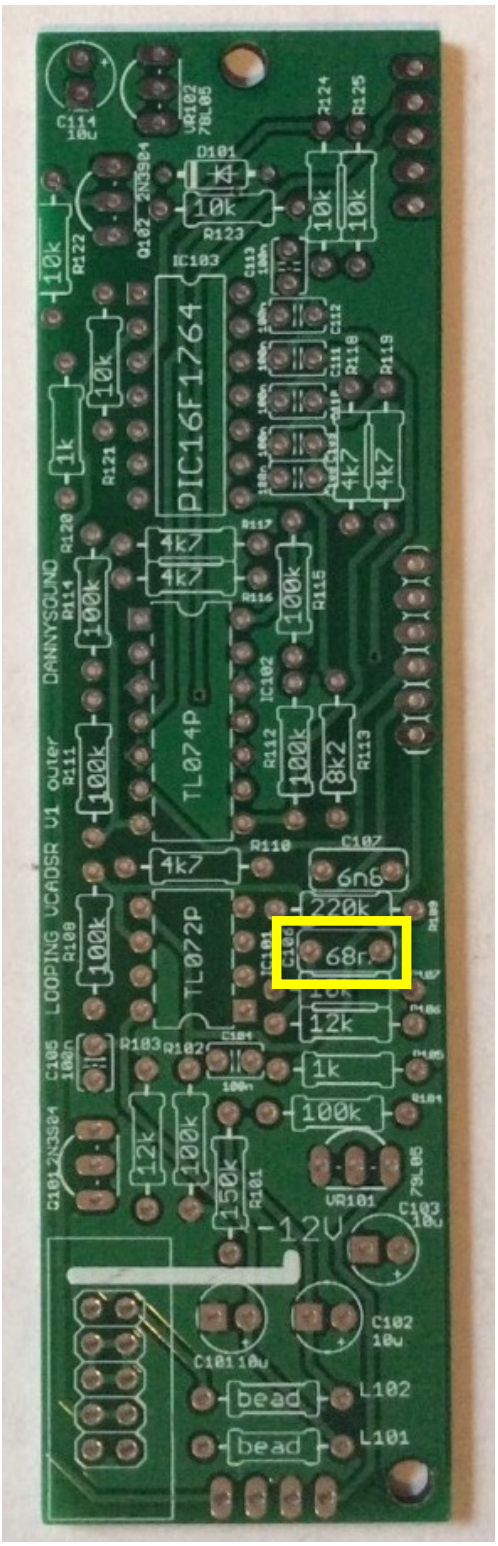



14 – 1 x 8 pin

CAPS – MKT POLYESTER BOX

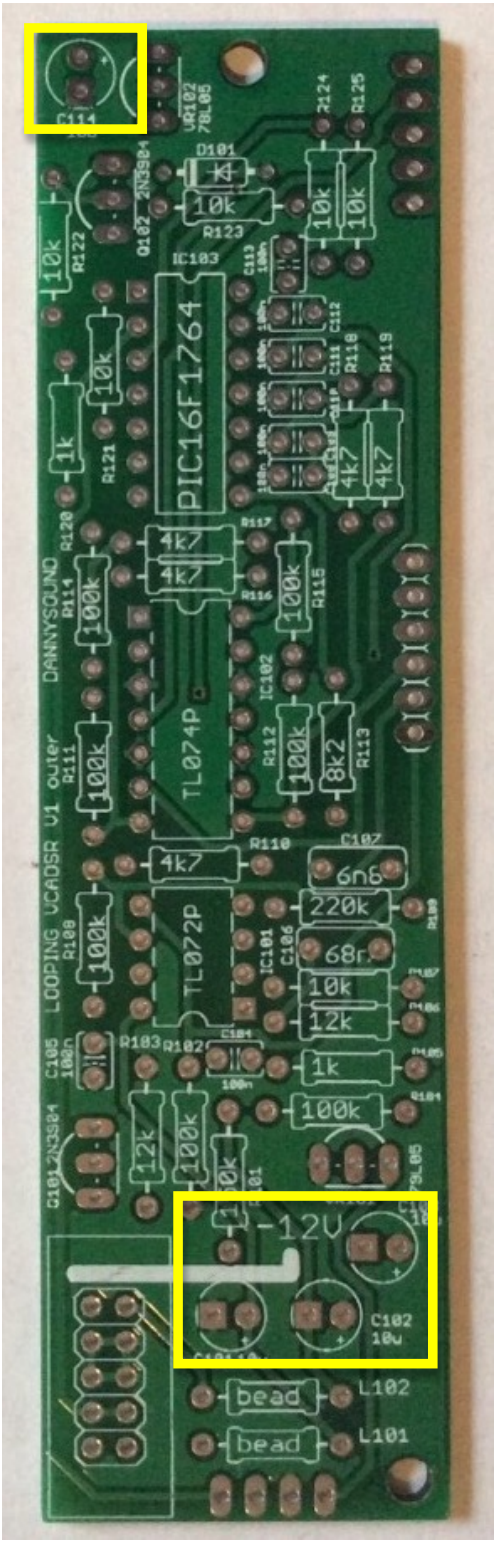



15 – 1 x 6n8



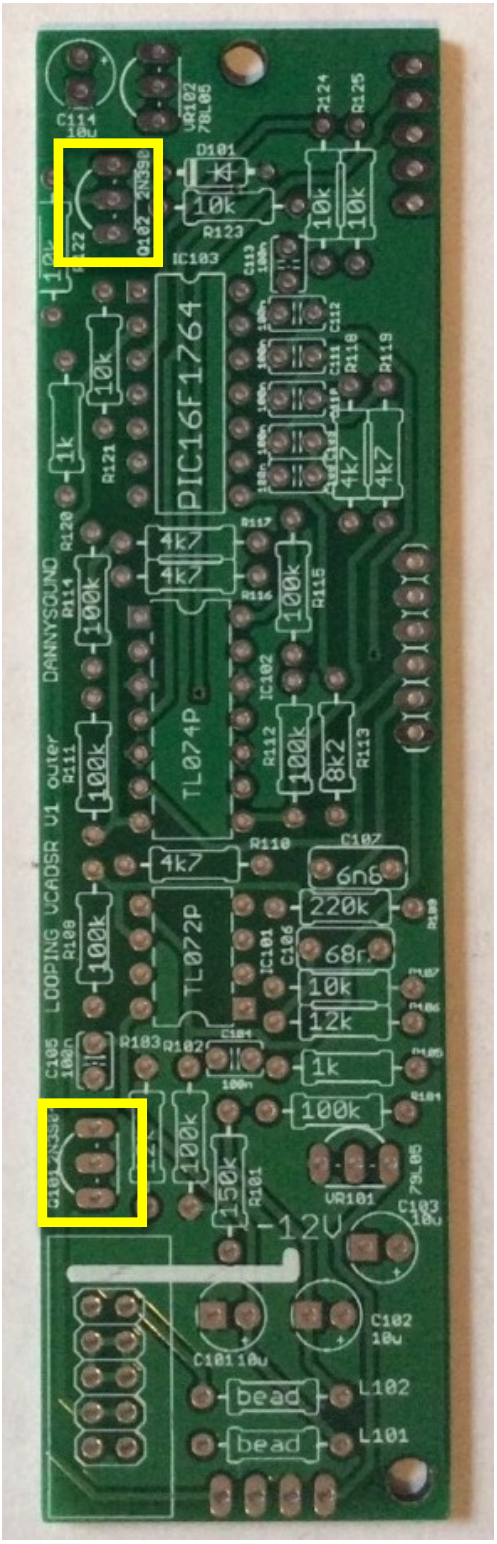

16 – 1 x 68n

CAPS - ELECTROLYTIC



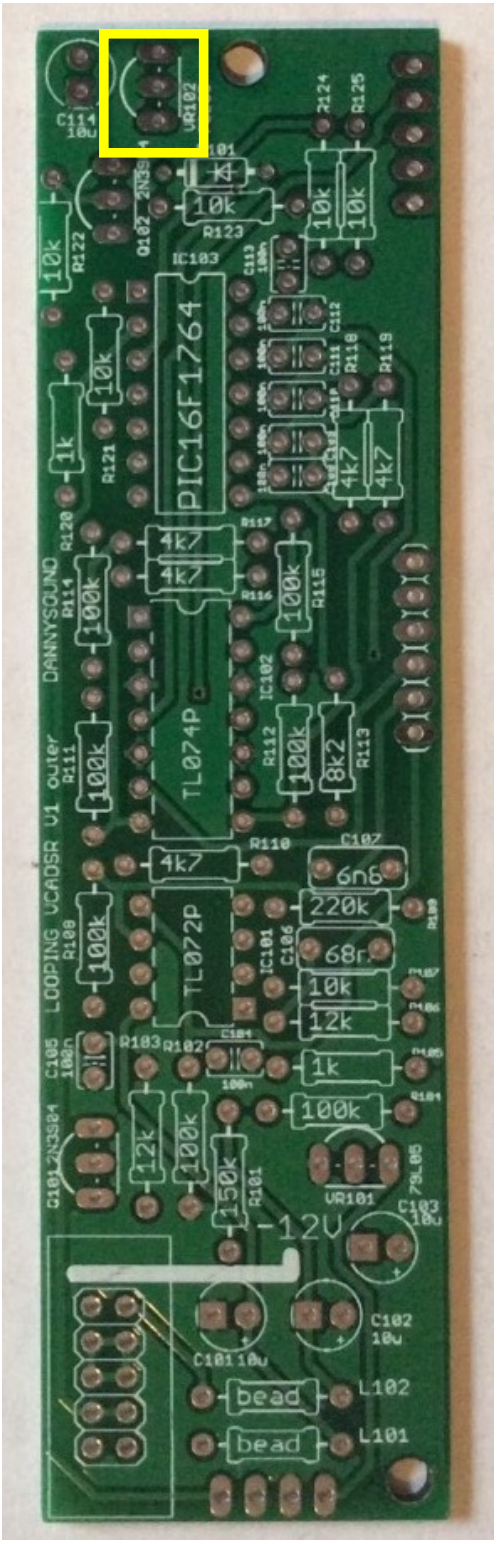

17 – 4 x 10u (square pad is negative longer lead)

TRANSISTORS

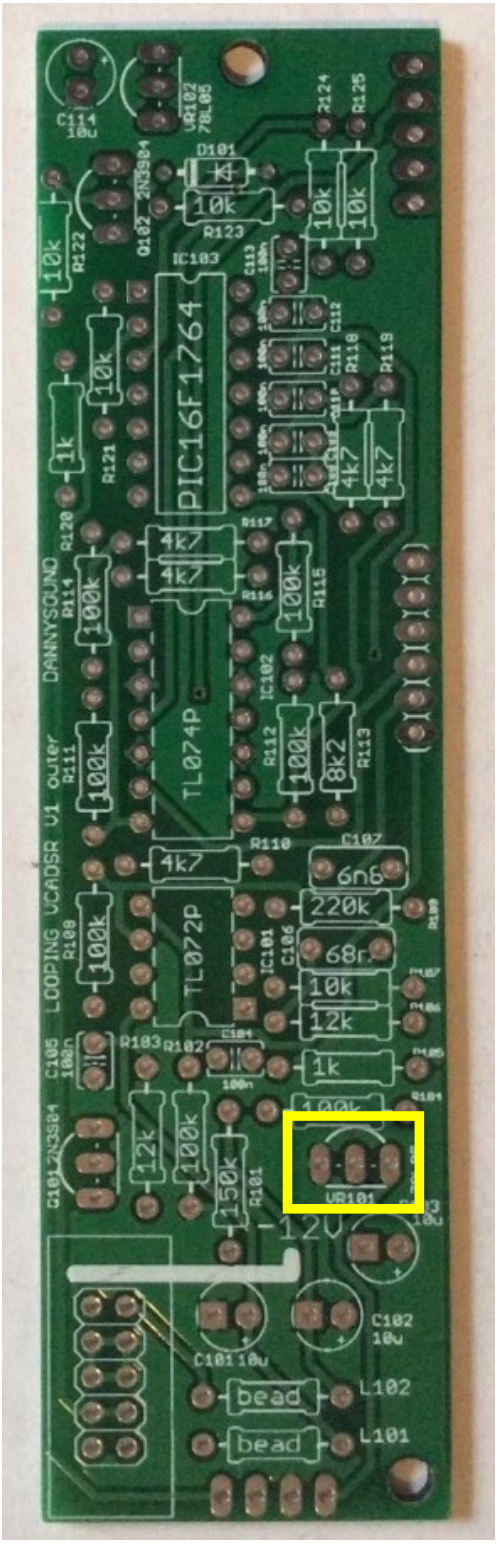



18 – 2 x 2N3904

VOLTAGE REGULATORS

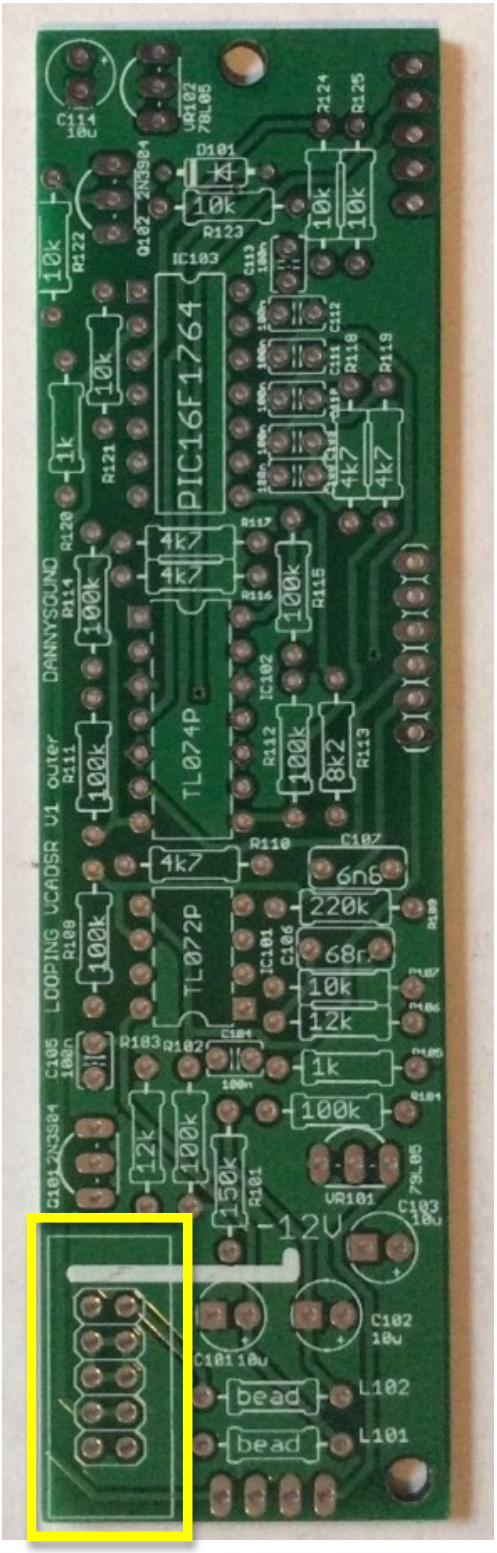



19 – 1 x 78L05



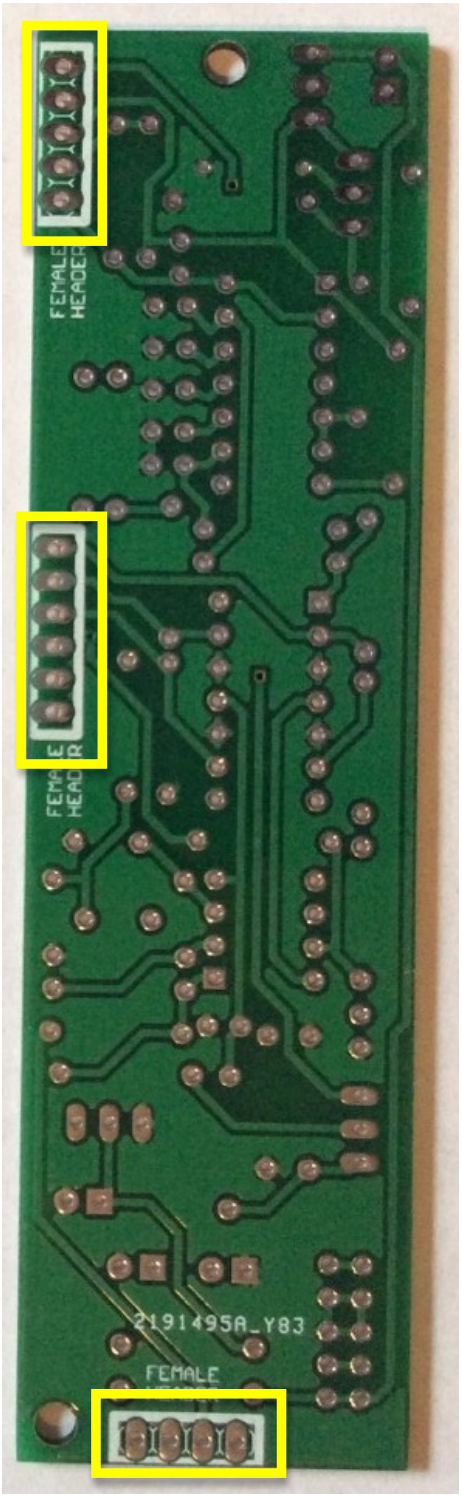

20 – 1 x 79L05

POWER HEADER



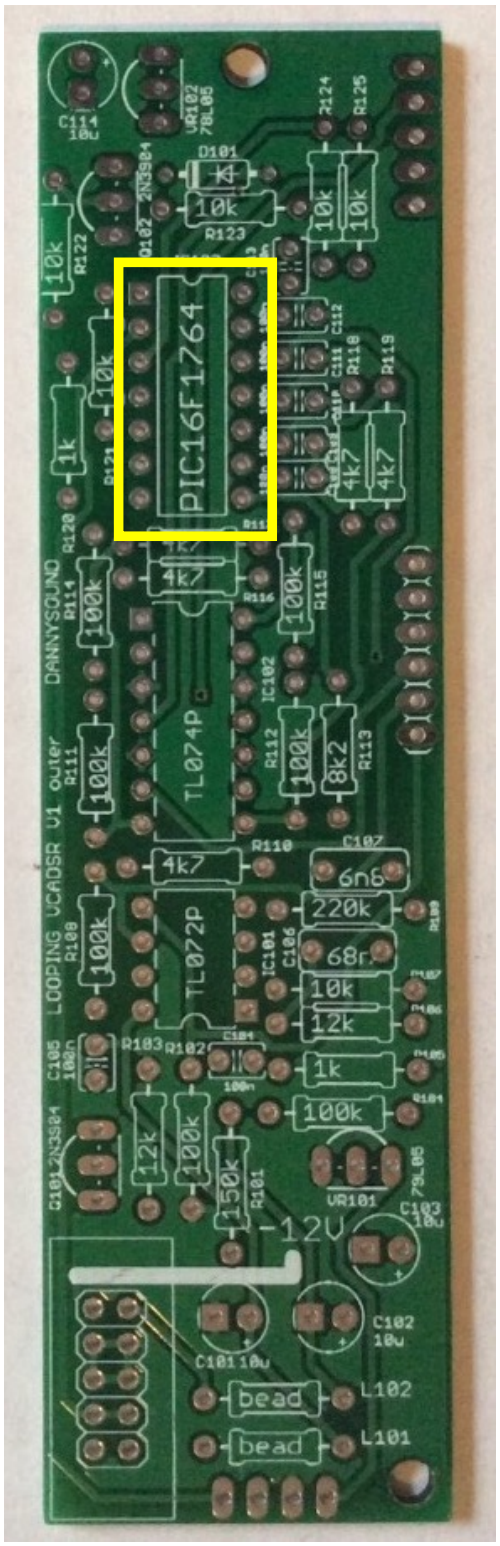

21 – 1 x 2x5 Power Header

FEMALE HEADERS

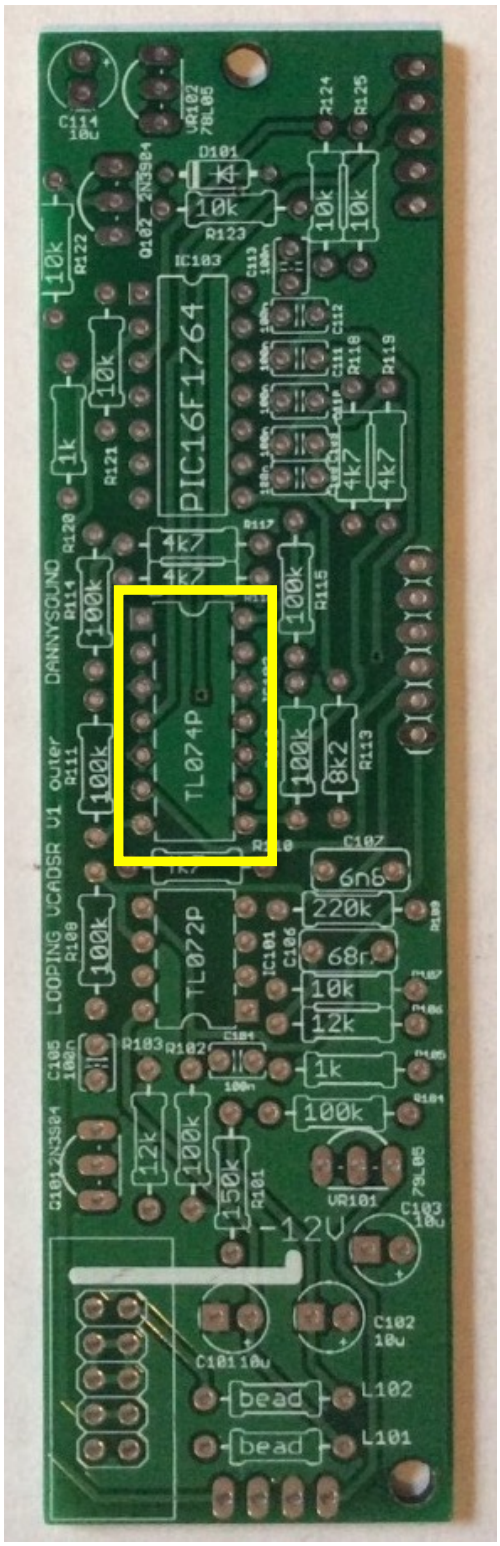



22 – 3 x FEMALE Headers

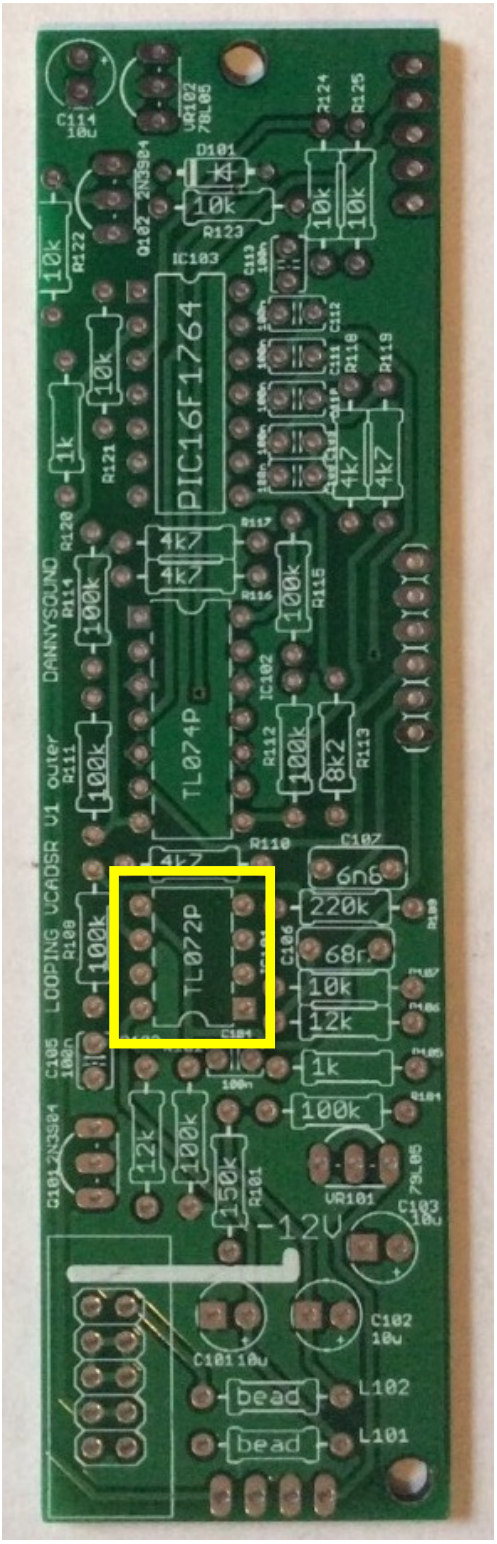
ICs



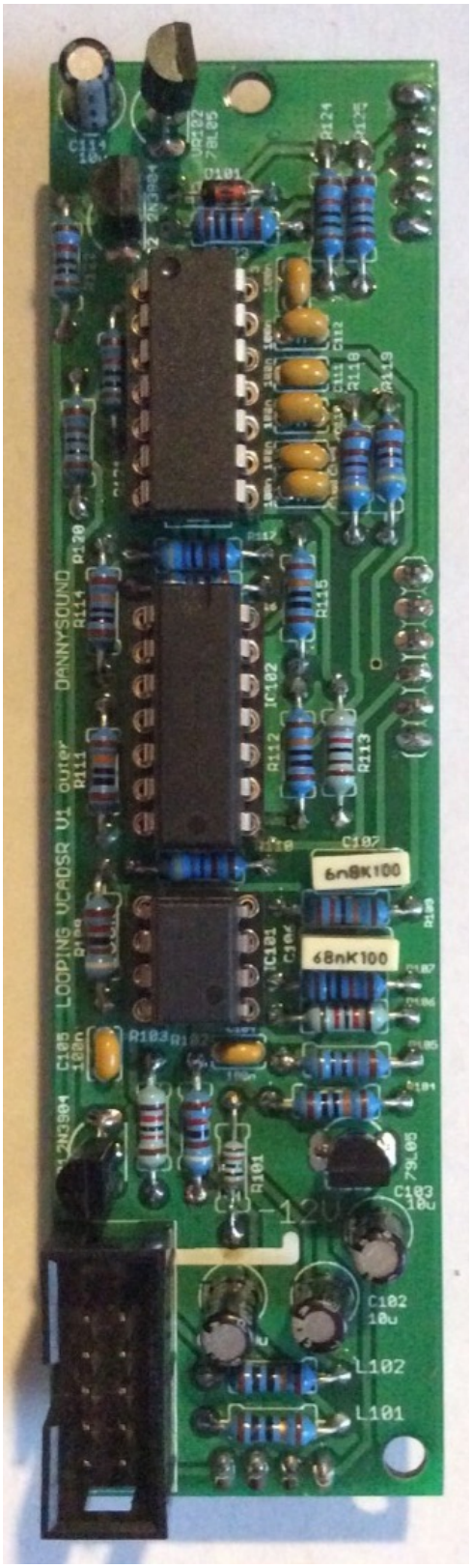

23 – 1 x Electric Druid IC

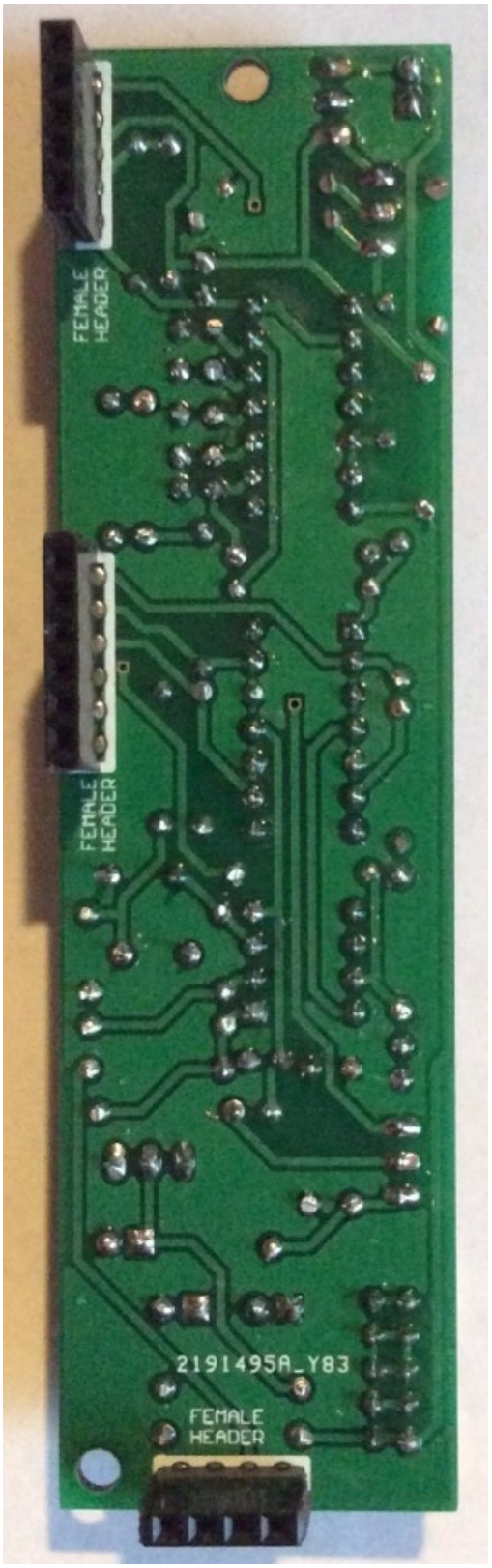



24 – 1 x TL074


DANNYSOUND
LOOPING VCADSR V1 outer
PIC16F1764
TL074P
TL072P
-12V
bead
bead

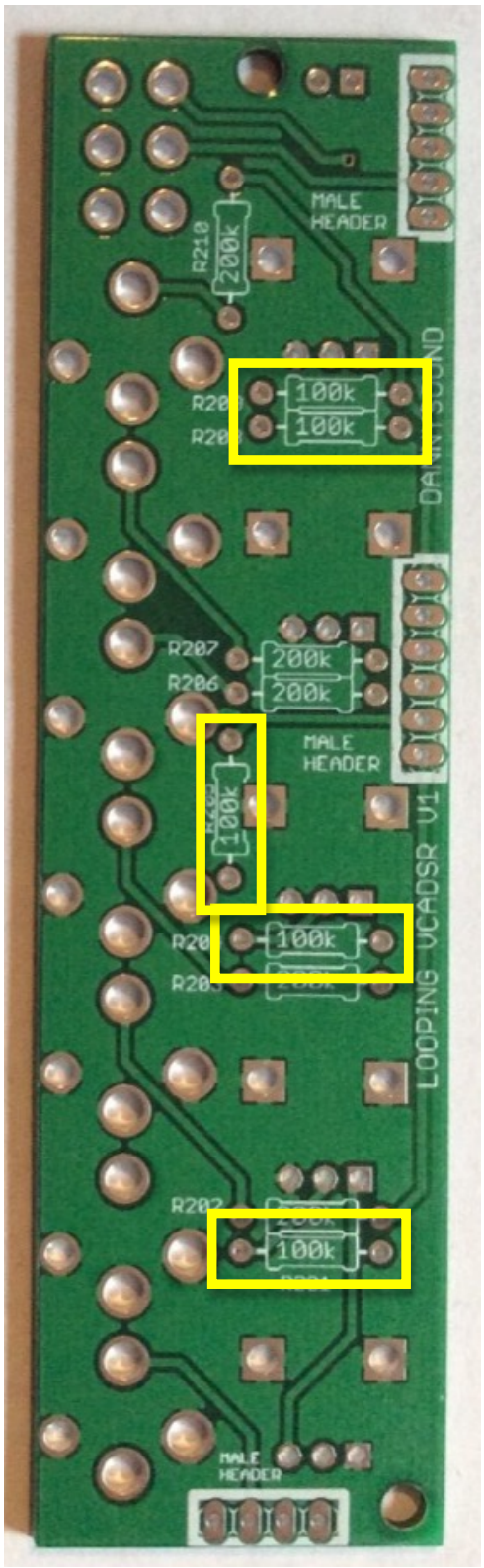
25 – 1 x TL072


LOOPING VCADSR V1 outer DANNYSOUND
C107
6n8K100
68nK100
C105
100n
2N3904
79L05
C103
10u
C102
10u
L102
L101

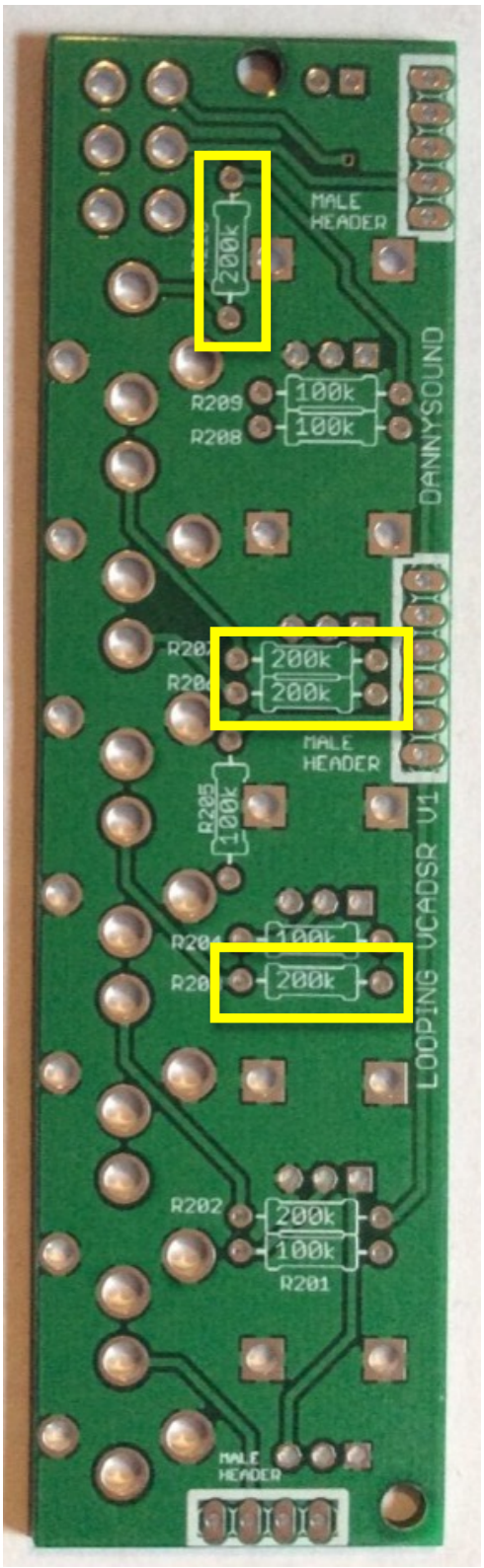

FEMALE HEADER
FEMALE HEADER
2191495A_Y83
FEMALE HEADER

## 5 Outer Board

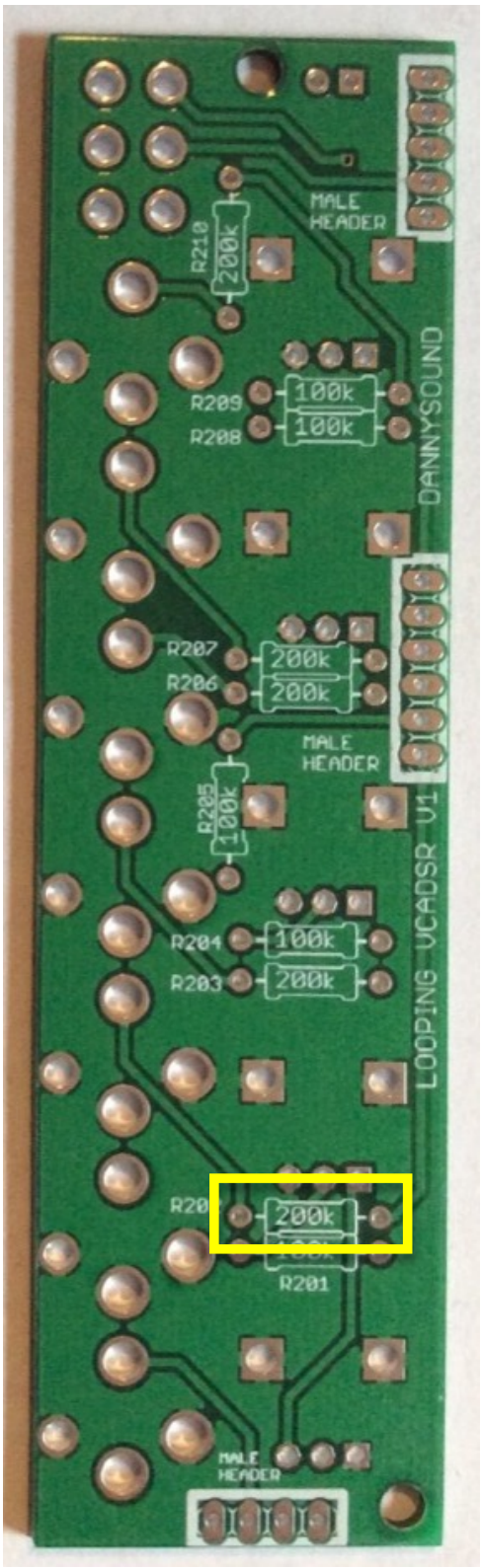
RESISTORS




26 – 5 x 100k

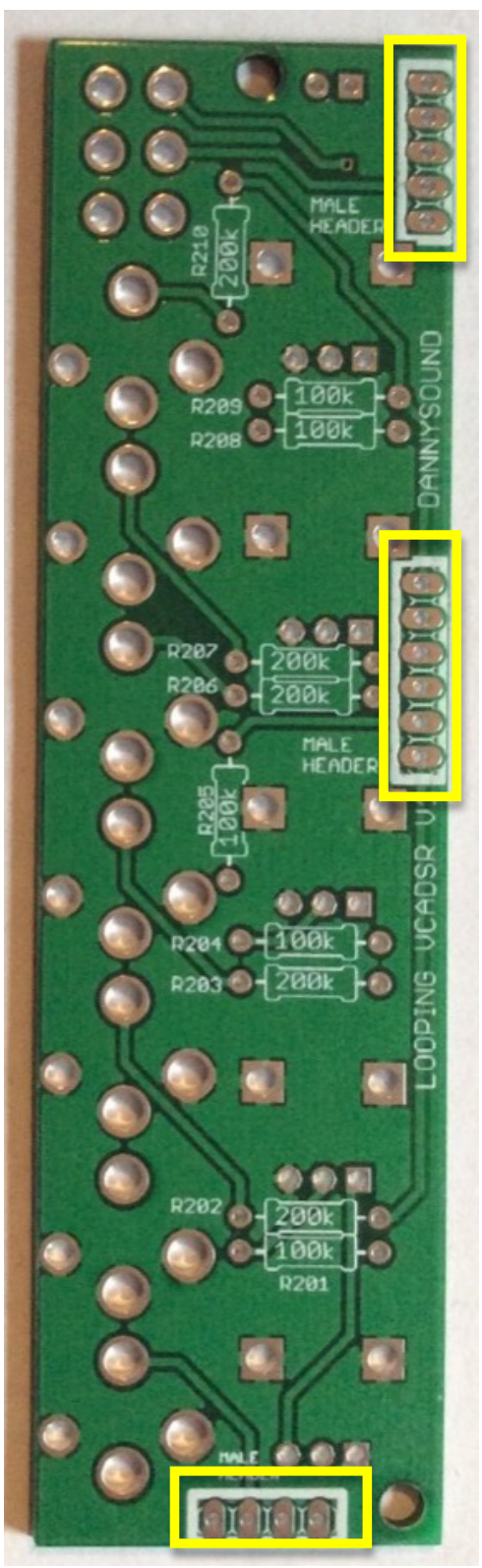


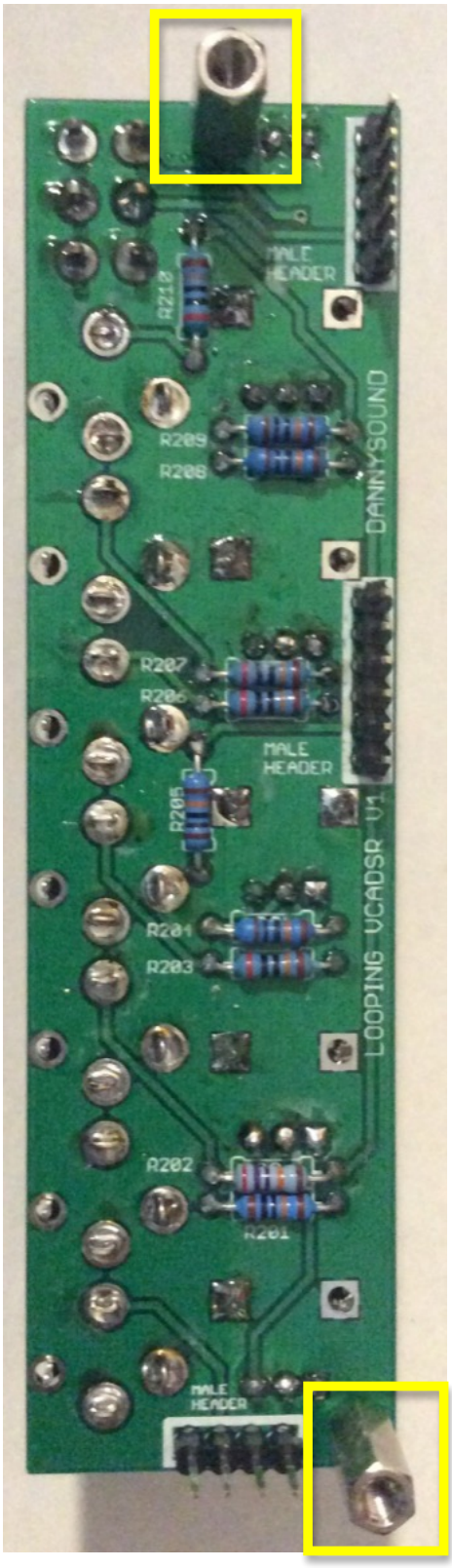

27 – 4 x 200k




28 – 1 x 270k (will be marked correctly on PCB!)

HEADERS



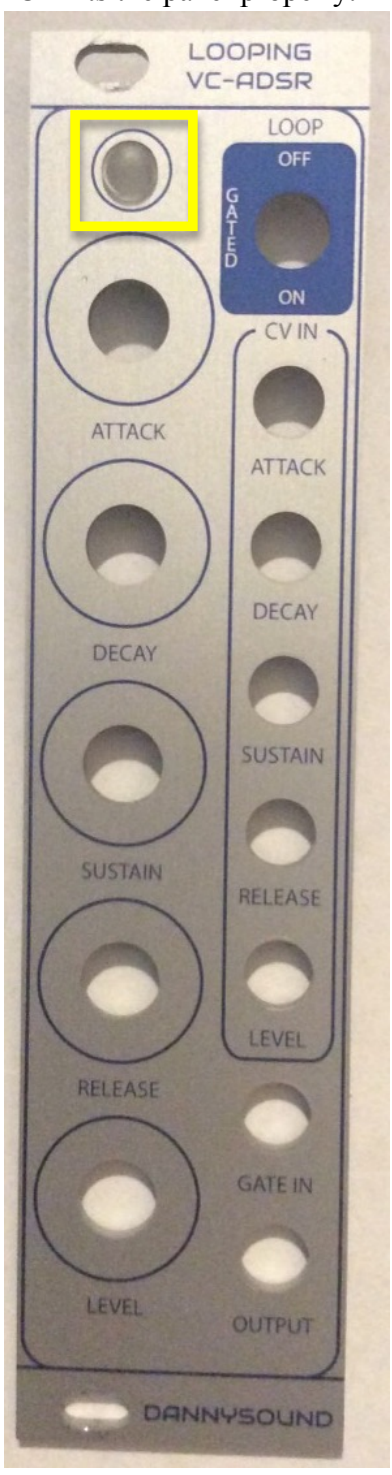



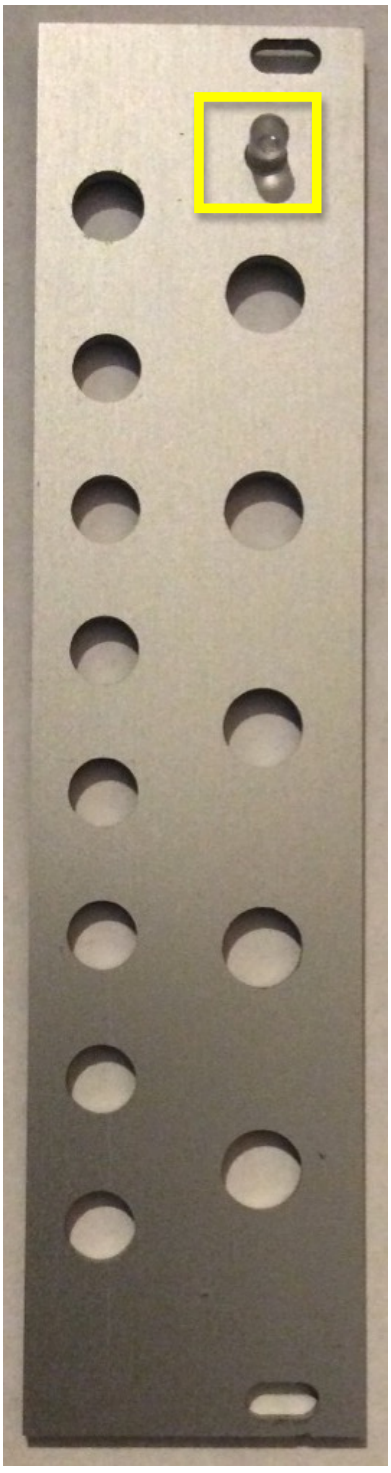

29 – 3 x MALE Headers

30 – 2 x 11mm female standoffs

## 6 Panel Components and Final Assembly

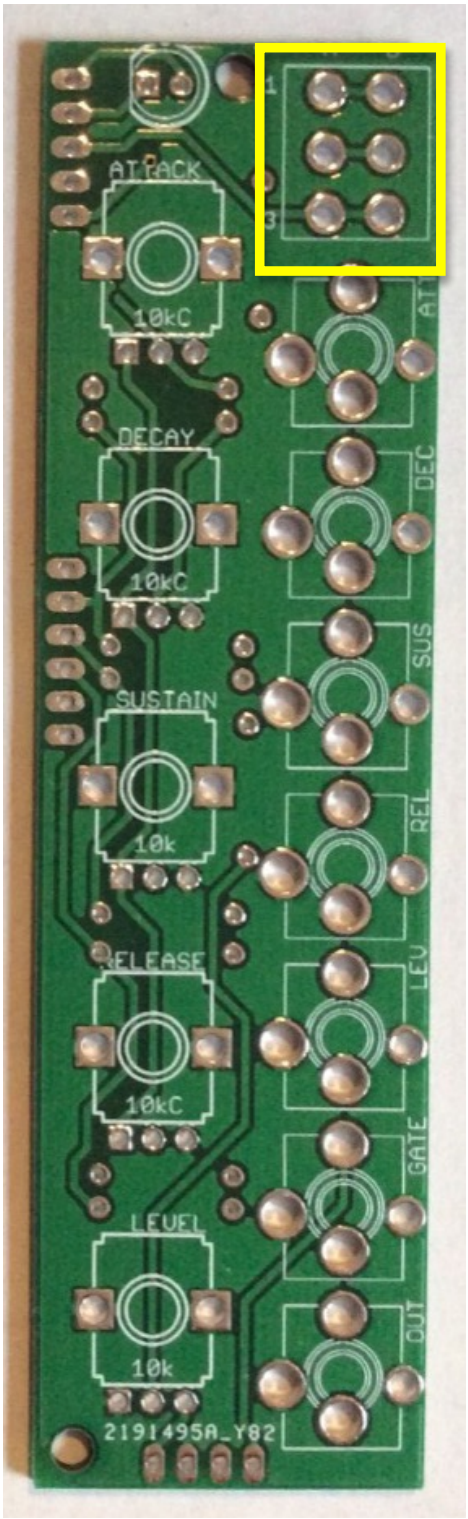
Apart from the toggle switch, these Components should be inserted but NOT SOLDERED until the panel has been placed on top of the PCB. This is to ensure that the PCB fits the panel properly.



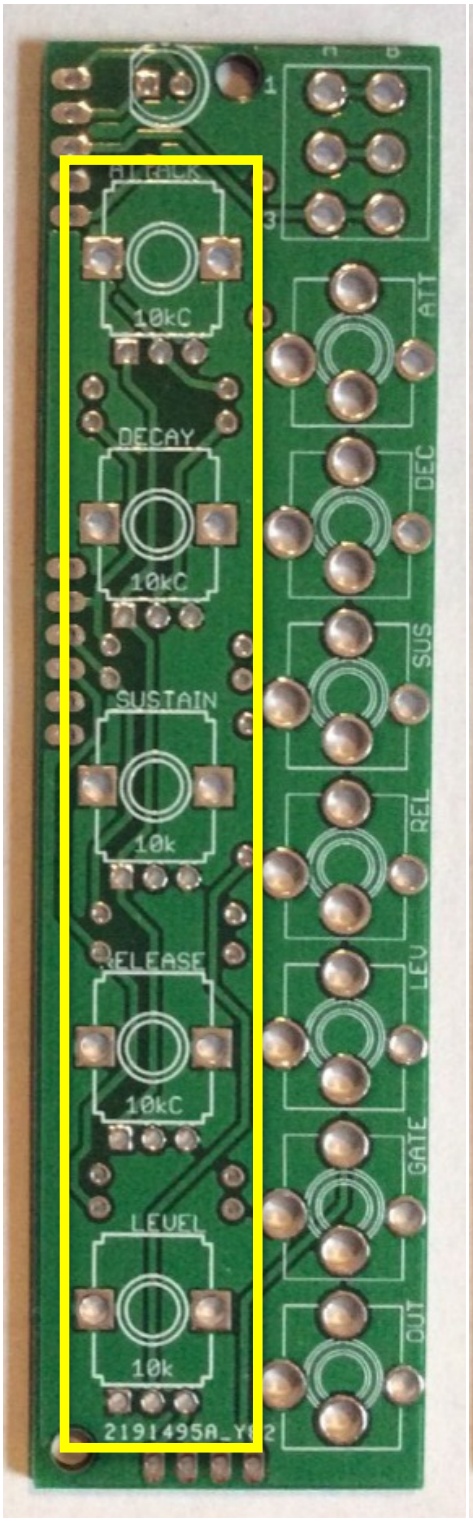
31 – 1 x 5mm light pipe.

SWITCH
Solder ONE PIN of the DPDT switch to keep it in place and allow easy repositioning if required.

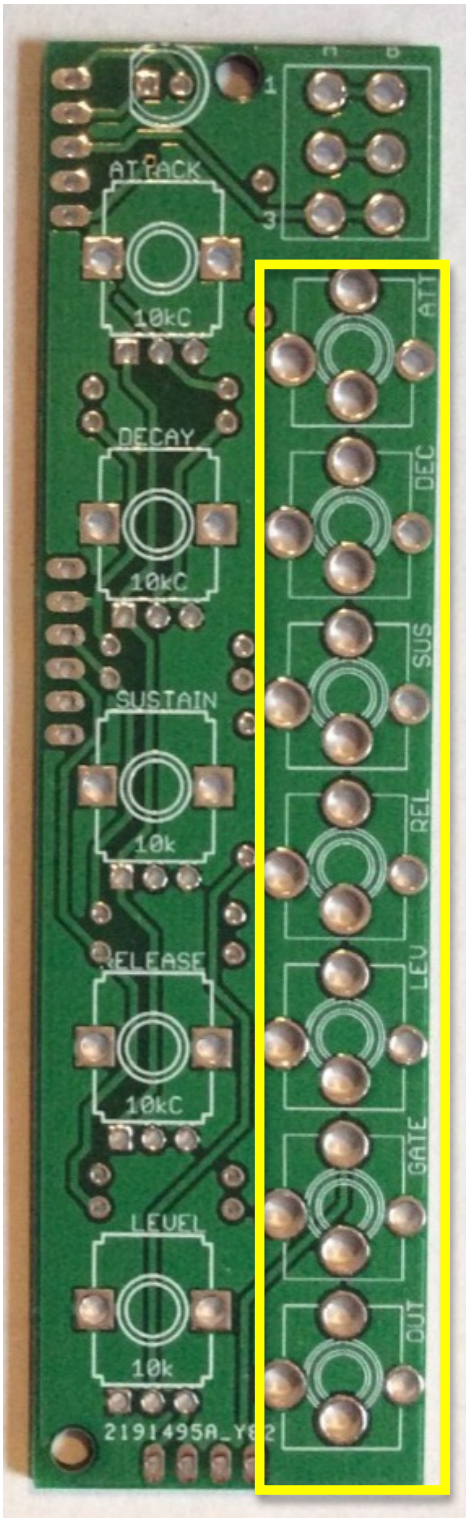



32 – 1 x DPDT (centre off) Toggle Switch

POTS AND JACK SOCKETS

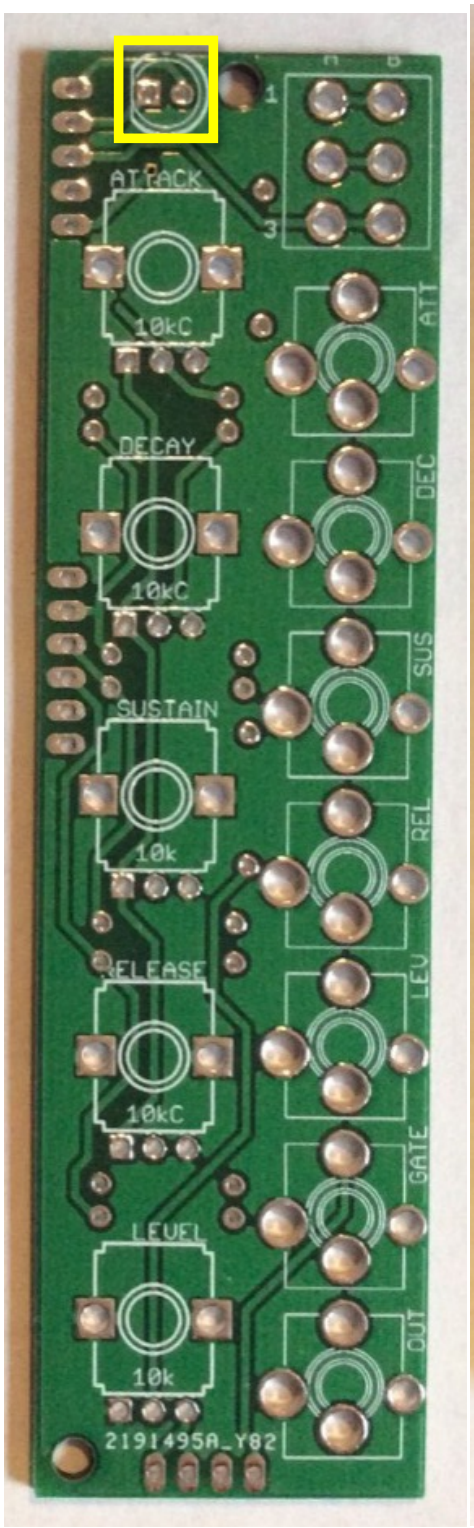



33 – 5 x 10k lin
(PCB maybe marked incorrectly
for some pots)

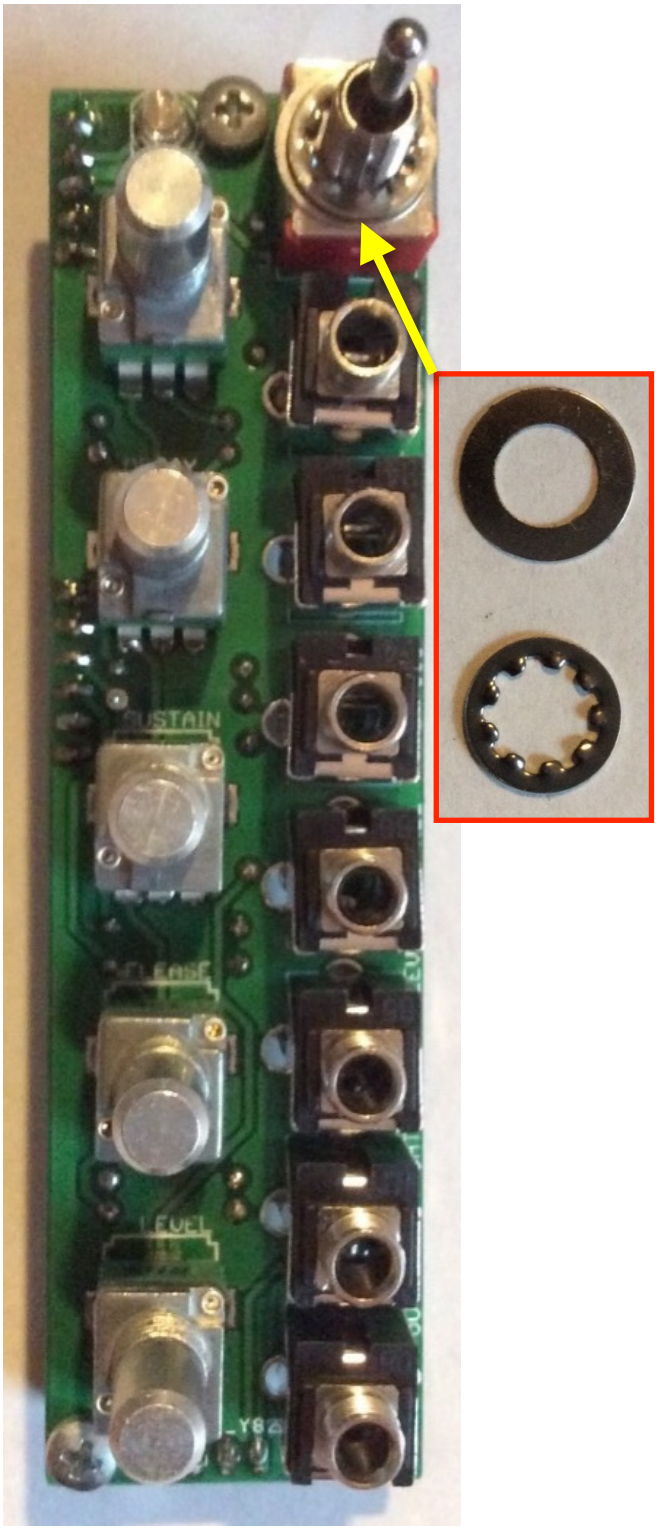



34 – 7 x PJ301 Jack Sockets

LED AND MALE HEADERS

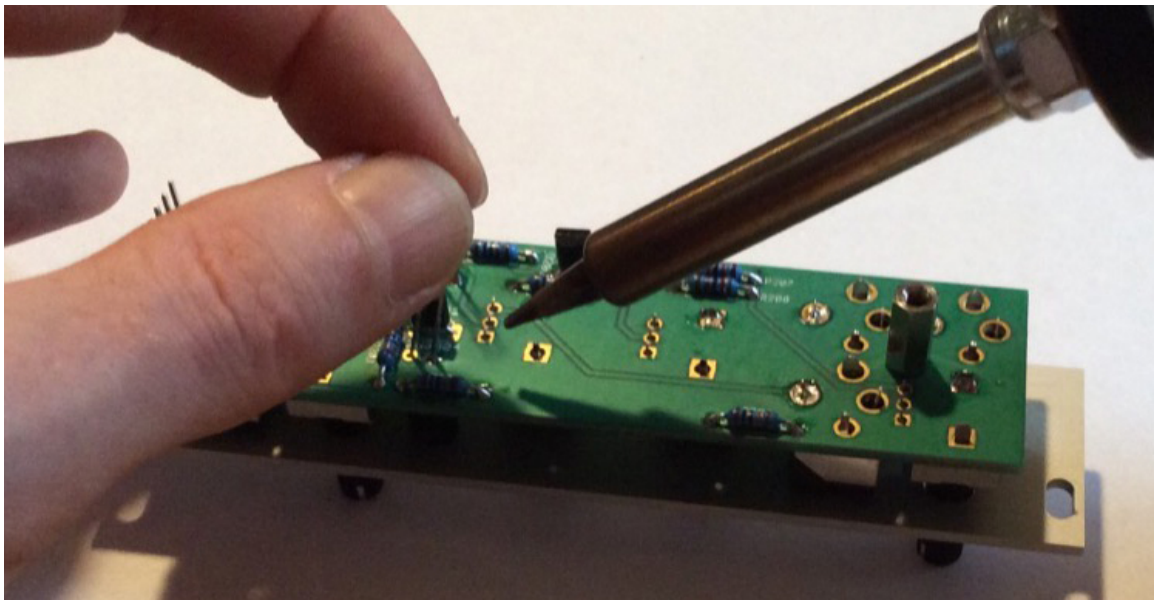


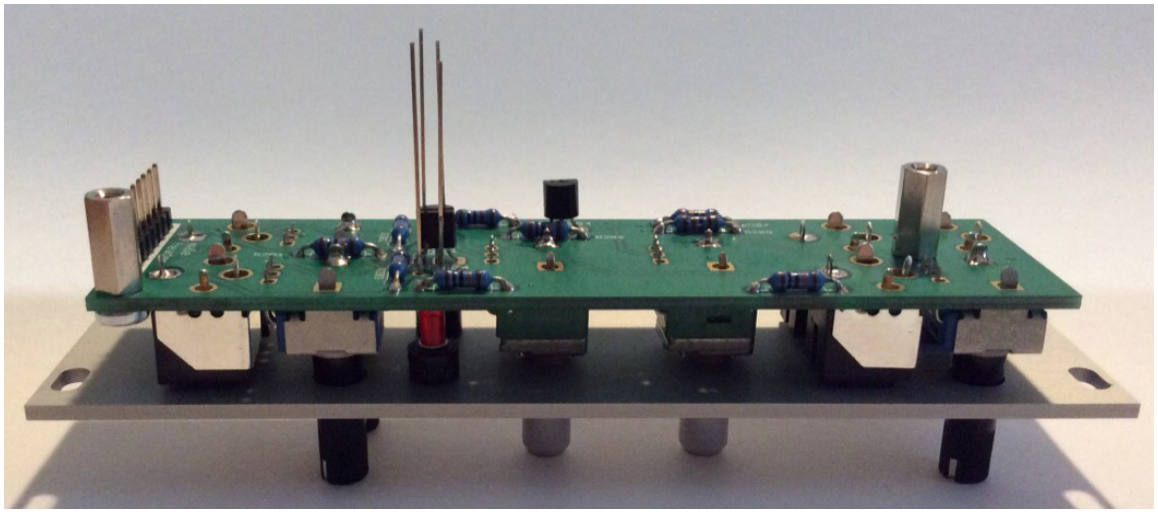

35 – 1 x Amber LED



36 – 1 x flat washer 1 x crinkle washer

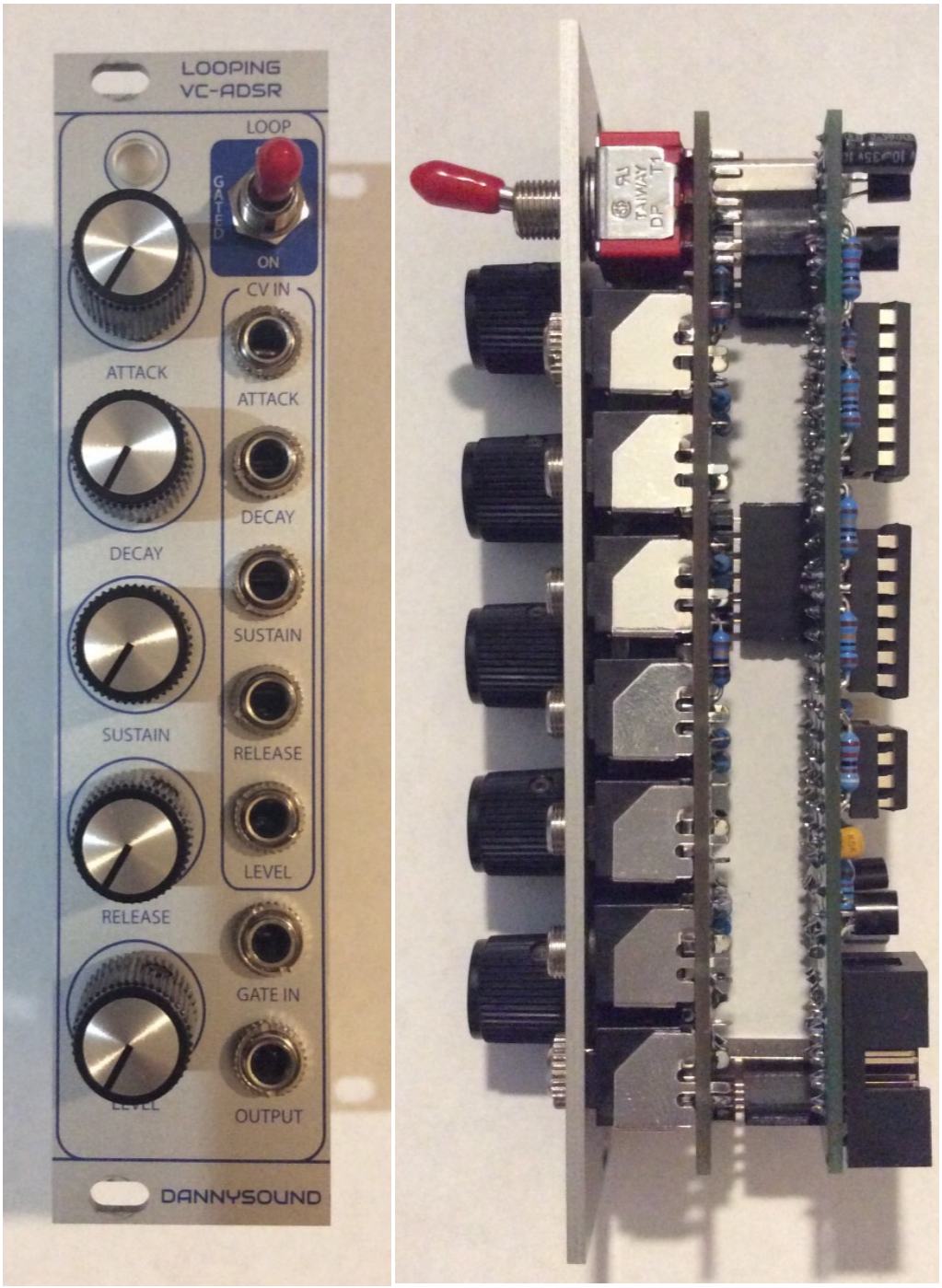

37 – Fit the panel in place then while holding everything together turn over and solder one pin of the ATTACK CV jack socket and one pin of the OUTPUT jack socket. Ensure these sockets are pressed to the PCB properly (reflow the solder whilst applying pressure to the socket if its not a snug fit) then attach the 2 nuts as shown above to keep everything in place.





TIP – Solder only one leg of the LED, you can then reflow the solder to that pin while holding the LED legs to position it against the light pipe when the pots PCB is attached to the panel.


38 – Add the knobs then solder one of the ground tabs of each pot. There is a little room for adjustment of the pots so if they look out of alignment against the graphics you can reflow the solder whilst applying a little pressure to get them positioned perfectly.

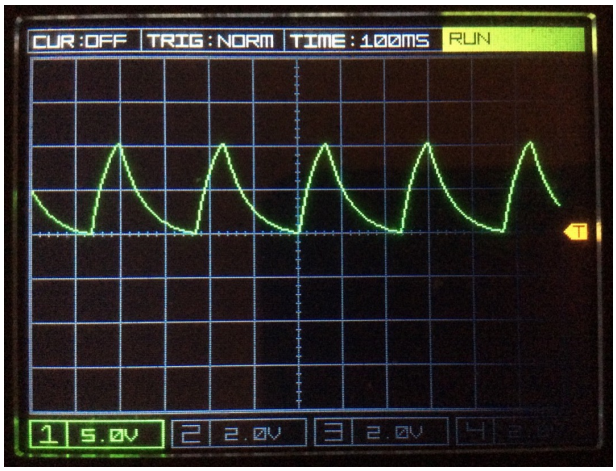



39 – Add the rest of the nuts to the jack sockets to hold everything together firmly. Once that's all done and looking good you can solder the rest of the pins of each component. Finally add the the outer PCB and screws.

# 7 Testing

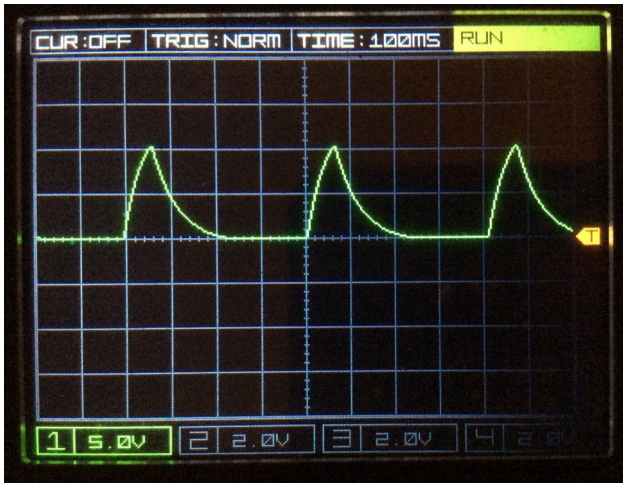
There is no calibration required for the Looping VCADSR, only testing. If you have an oscilloscope you can connect it to the output of the VCADSR. If you don't have an oscilloscope you can monitor the VCADSR LED as a visual indication that the module is functioning properly.

Set the control as follows:
LOOP – ON
ATTACK – 50%
DECAY – 50%
SUSTAIN – 0
RELEASE – 0
LEVEL – 100%



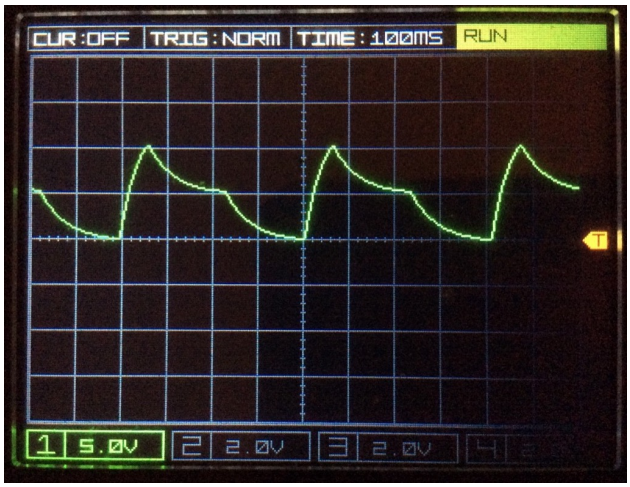

You should see the LED flashing quite fast and the wave form shown above.

Increase the RELEASE to add a delay between the ATTACK / DECAY cycles.



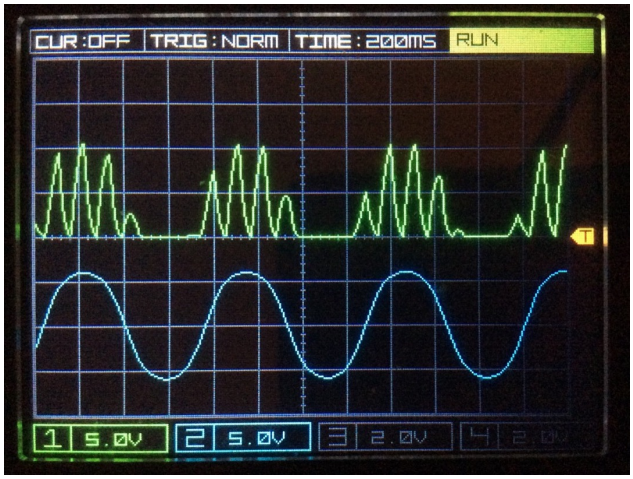

You should see the LED flashing a bit slower and the waveform shown above.

Increasing the SUSTAIN will add a midpoint voltage level between the decay end and the release start.

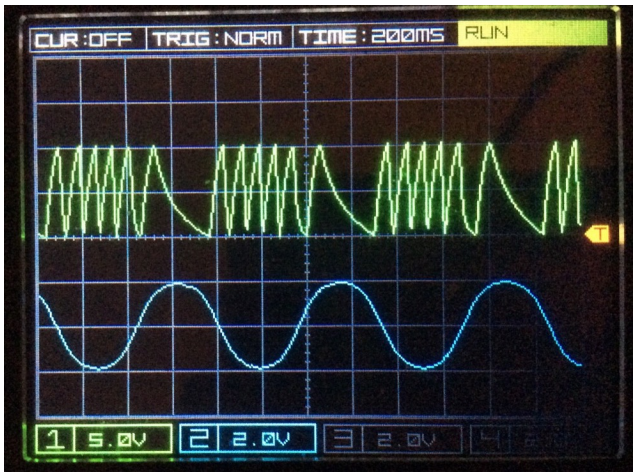



You should see the LED flashing in keeping with the waveform shown above.

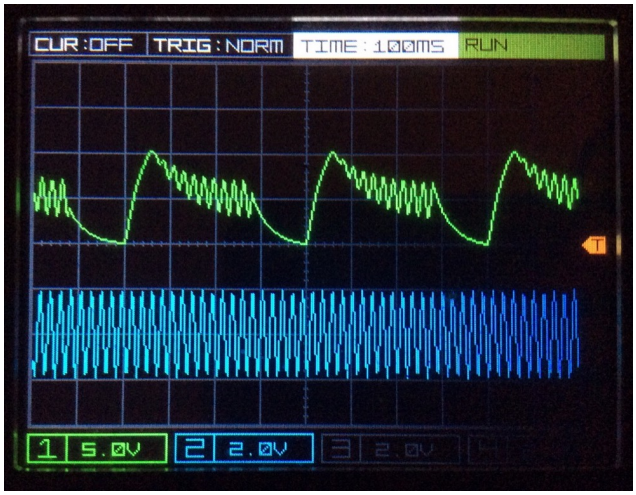
To test the CV inputs you can connect an LFO (preferably through an attenuator) to the CV inputs and observe the output.




The oscilloscope plots above show the ADSR output in green being amplitude modulated by the LFO in blue. The LEVEL control is set to 50% and the LFO is providing ±5V into the LEVEL CV.




The plots above show the LFO modulating the DECAY CV. The LFO has been attenuated to ±2V.




These plots show the SUSTAIN CV being modulated by a much faster LFO (in blue). The SUSTAIN control is set to 50% and the LFO is providing ±2V into the SUSTAIN CV.

You can now test the GATE input by setting the LOOP mode to GATED or OFF and apply a gate signal to the GATE input.

NOTE:
To use the module with Velocity Sensitivity (0V to 10V) set the LEVEL control to 0 and connect the Velocity CV to the LEVEL CV input.

# 8 Modifications

The CV input resistors can be increased to reduce the amount of CV sent to the microcontroller. This might be useful if you wish to connect LFOs directly without attenuating the signal first.

The input resistors are:
ATTACK – R210 (200k)
DECAY – R207 (200k)
SUSTAIN – R206 (200k)
RELEASE – R203 (200k)

If the value of the resistor is doubled (390k would be fine), the CV amount will be halved.

The LEVEL CV works with 0V to 10V signals. If you wish to use it with 0V to 5V can try reducing the value of R202 from 270k to around 100k. This hasn't been tested though!