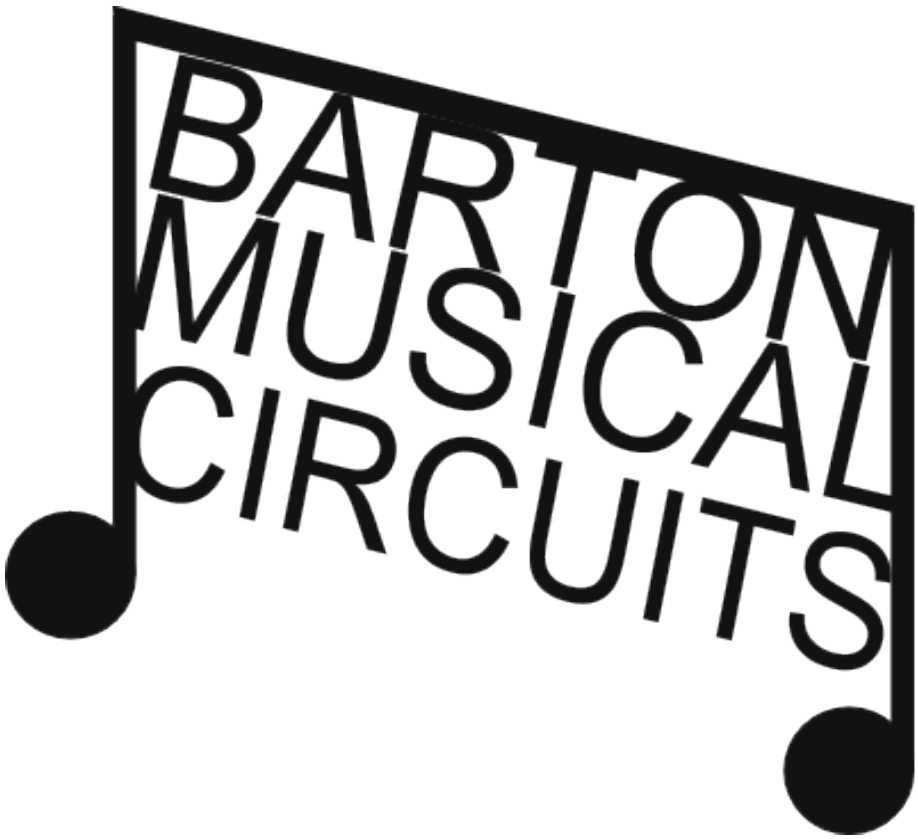


BMC 073. 4 Knob Dual Decaying Noise Manual/Build Documentation.

Based on BMC010 DDN. The differences between this version and the old version are:
1.A discrete R/2R ladder for digital to analog conversion
2.Separate knobs for control voltage attenuators.
3.Layout for an easier to find potentiometer

I. Using The DDN

A.Software Selection

The Dual Decaying Noise module is a microcontroller based project. As of this writing, there are three different sets of software designed to be used with the module. Most of this build guide is written in reference to building the first, most basic software called "Dual Decaying Noise." The other sets of software available are "Dual Delaying Noise" and "Dual Noise/Tones." The software is designed so that a user can simply swap chips or re-program chips and not have to rewire anything.

At the end of this document, the cheat sheets for alternative firmware for the original DDN are reproduced.

B. Outputs/Inputs/Controls

The Dual Decaying Noise module consists of two channels of digital decaying noise, useful for hi-hat, cymbal, snare and other percussive noises. The two channels are identical in their outputs/inputs and controls.

Outs/Ins
1.Output jack - Each channel has one output jack which outputs the decaying noise.
2.Timing input jack - Each channel has one input jack for timing signals. These would be trigger/gate/pulse type outputs from sequencers, keyboards, oscillators or other modules. It is recommended when building that channel 2's input be normalled to channel 1's.
3. Control Voltage Jack - A control voltage is inputted which controls the decay time or other parameters. A higher voltage results in a longer decay.

Controls
1.Parameter knobs - These knobs sets the parameters used in the software, usually Decay. The CV input and CV knob interact with this setting.
2.CV Knob. Attenuates the control voltage input before being mixed with the parameter knob.
3.Log/Lin Switch - This toggle switch selects the curve of the decay signal for the Dual Decaying Noise software.

-On the Dual Delaying Noise software, L1 and L2 are used to enable/disable knobs 1 and 2 so you can control a single parameter at a time.

-For Noise/Tone they select between noise or tone.

4.Open/Closed Switch - This toggle selects whether the module begins to decay at the rising edge of the input signal (Closed mode) or on the falling edge (Open mode) in Dual Decaying Noise software.

For Dual Delaying Noise, switch C1 selects whether the parameter knobs control channel 1 or channel 2. Switch C2 controls selects which parameters are controlled by the knob.

For Noise/Tones these knobs select whether the parameter knobs are controlling frequency or decay time.

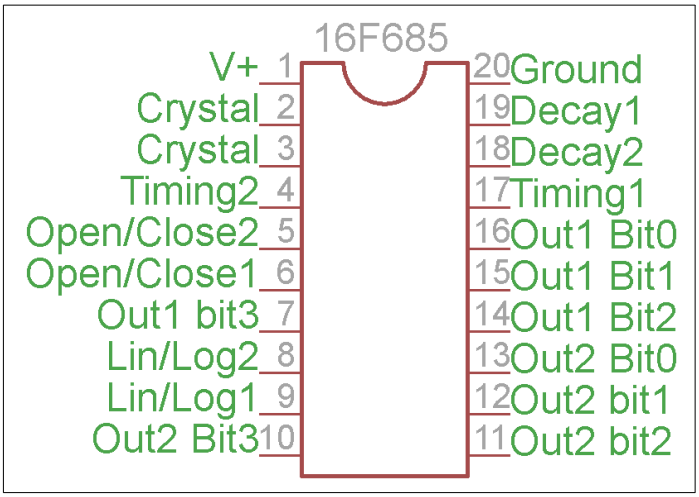
On page

II. Building The DDN

A. Circuit Description/Schematics

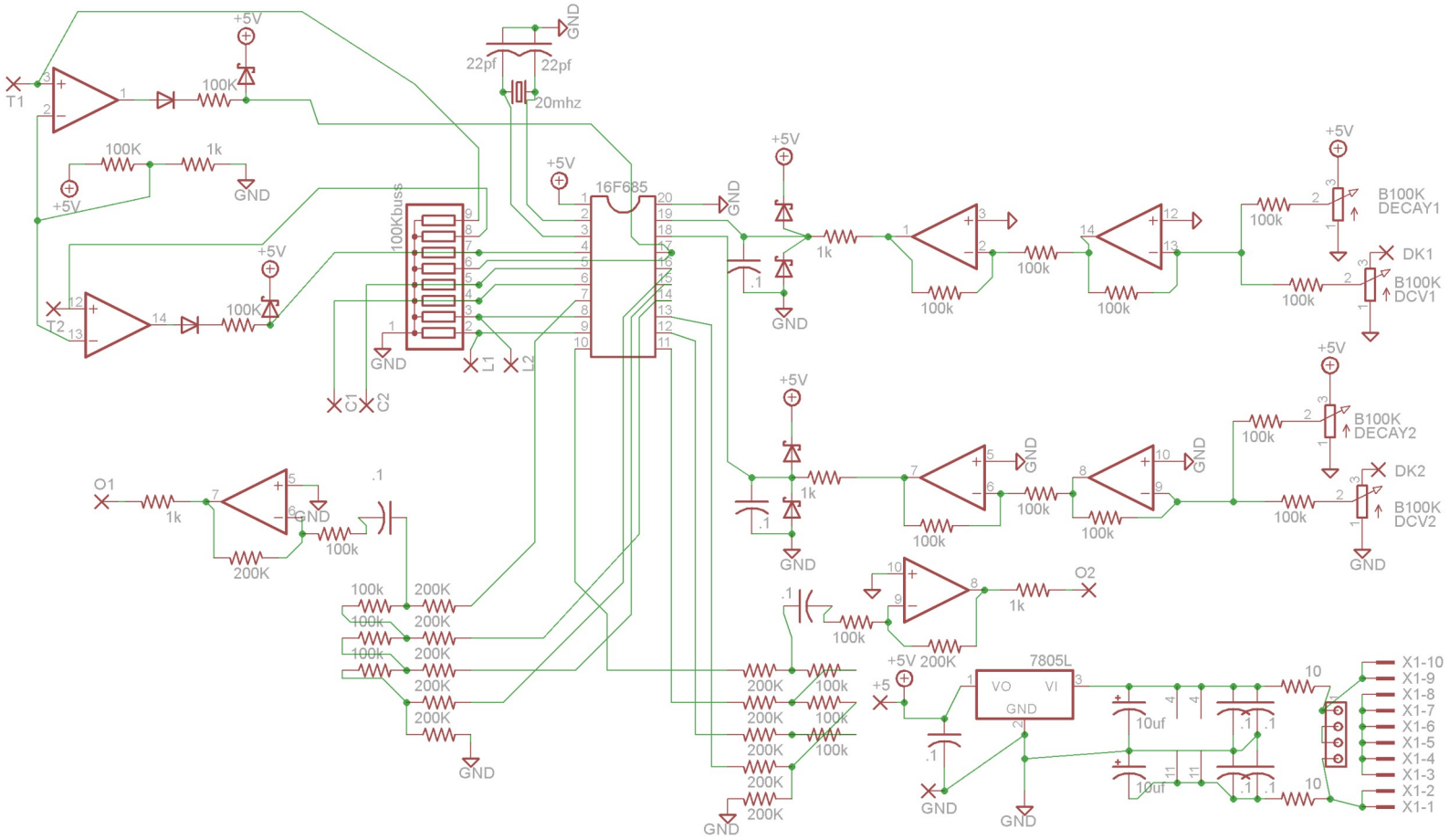
1.The Chip.

At the center of the DDN is a PIC 16F685 microcontroller. On the right is the pinout for this microcontroller.



2.Schematic.

Below is the full schematic for this project. It is described in full on the next page.



In the top left of the schematic we see the Timing inputs “T1” and “T2.” Each of this is input to an op-amp wired as a comparator with it's threshold set at .05V by the 100k/1K resistor pair. The outputs of the comparators are limited to a range of 0 to +5V by a switching diode in series with a switching diode, followed by a Schottky diode to +5V and 100K resistor to ground in parallel with the input pins of the PIC they are attached to. The switching diode allows only positive voltage to pass, the two 100K resistors form a voltage divider to limit output to half of the postive rail and the +5V schottky shave off any excess voltage to limit to +5V

On the right hand side of the schematic we see the Decay controls and CV inputs. The voltages on the wipers of these pots are summed by a pair of inverting amplifiers with a gain of 1. The output of the second amplifier is in series with a 1K resistor before reaching the input pin of the PIC. The input pin is in parallel with a .1uf capacitor to filter out high frequency noise as well as two schottkys to ground and +5V to limit the input voltage.

Below the PIC and to the left is the output circuitry for channel 1, and channel twos is below and to the right. The output pins of the PIC connect to an R/2R ladder, this configuration of resistors converts the 4 digital output pins of the PIC into a single analog voltage. A .1uf capacitor connects this voltage to an output amplifier and removes the positive voltage bias. The output amplifier is set to a gain of two, giving a +/-5V voltage swing on the output.

In the bottom right hand corner are the power connections. PCB footprints for Eurorack and MOTM style power connectors are in parallel with each other, the positive and negative voltage rails are each filtered by a passive RC filter formed by a 10 ohm resistor and 10 uf capacitor. .01uf capacitors to ground are then placed near the power pins of each IC to further filter. The +5V supply provided by a 7805 voltage regulator

B. Parts List

This parts list assumes that 220Ks are used as resistor "R" and .1ufs are used as "C"

Semiconductors

Value	Quantity	Notes
16F685	1	Should have come with your PCB
TL074	2	
7805	1	in TO-220 Package
SD101C	6	or any other small Schottky
1N4148	2	Or other small signal diode

Resistors

Value	Quantity	Notes
10 ohm	2	5mm lead spacing. Use 3.5mm body length or stand up
1Kohm	5	" "
100 Kohm	21	" "
200 Kohm	14	" "
B100k PC mount Pot	2	16mm PCB Mount

100k Bussed array	1	9 Pin version. Or make your own from 8 100K resistors.

Capacitors

Value	Quantity	Notes
22pf	2	Cheap ceramics are fine
.1uf ceramic	7	Cheap ceramics are fine
.1uf Poly or film	2	For audio coupling.
10uf 16v electro	2	

Other/Off Panel

Value	Quantity	Notes
20mhz Crystal	1	7.5mm lead spacing
20 Pin DIP socket	1	
14 Pin Dip Socket	2	
SPST switch	4	or SPDT
Switching Jack	3	
Mono Jack	3	

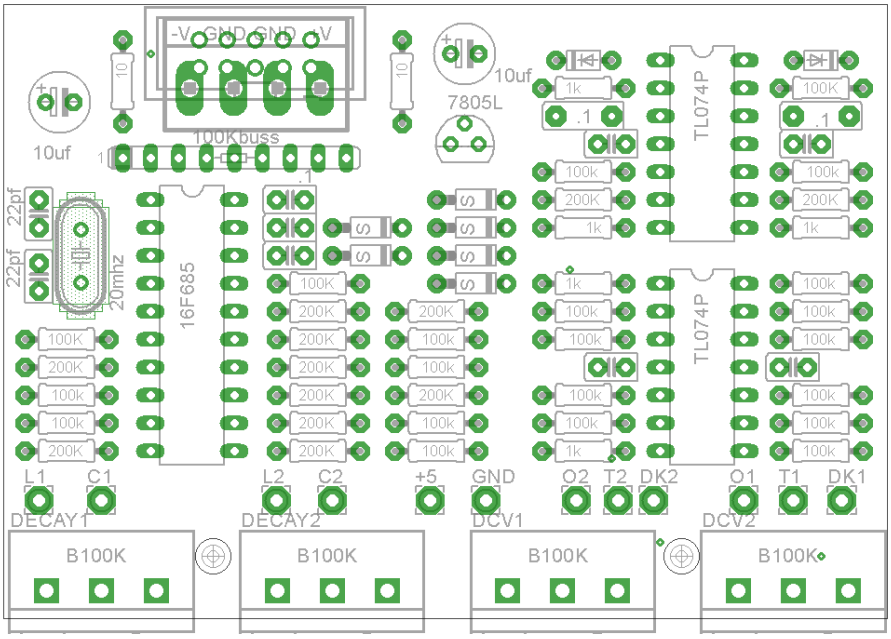
C. PCB Overlay/Information

The circuit board measure 80mm x 56mm. The potentiometers are spaced 21mm apart. On the next pages are images of the PCB with and without traces and a photo of a completed build.

WIRING INSTRUCTIONS

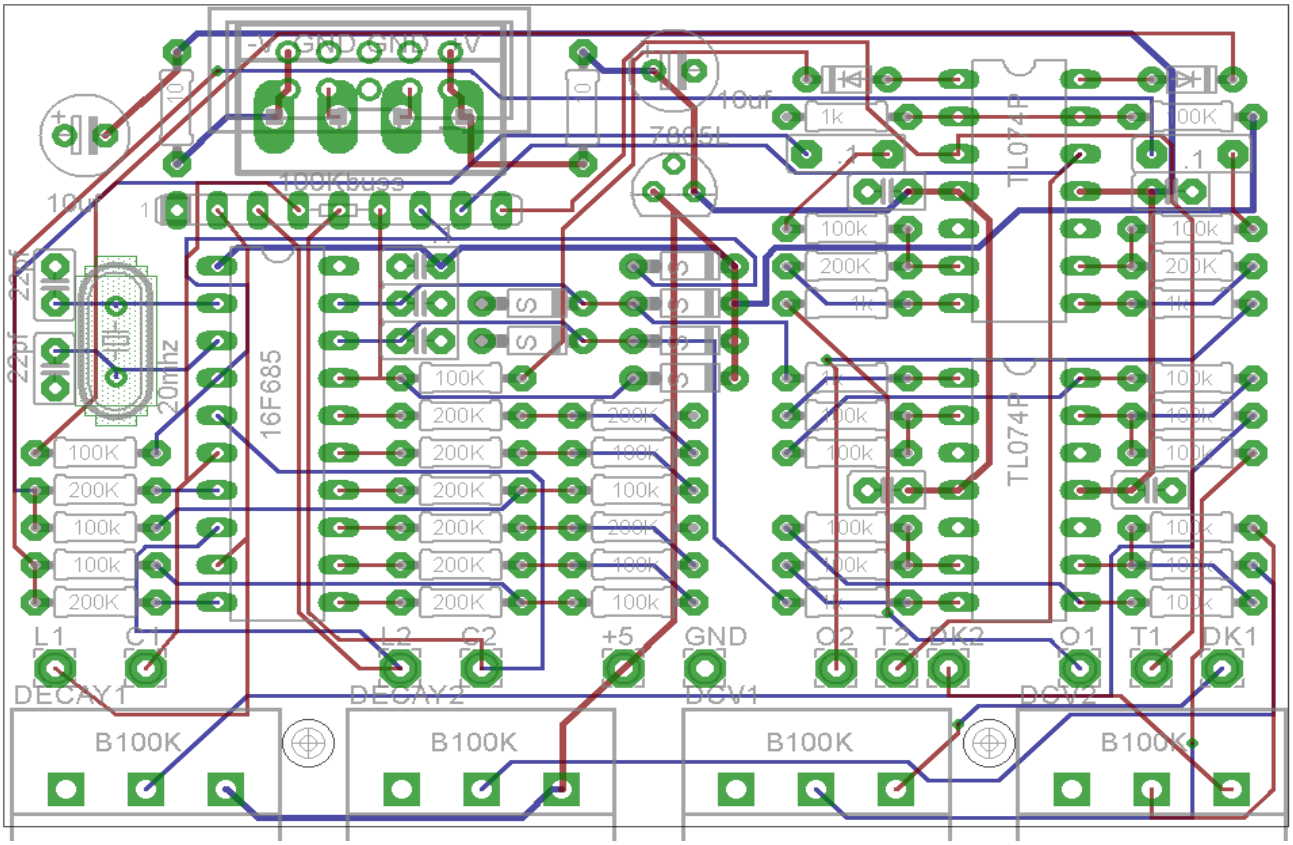
Toggles – All toggles should have their bottom lug wired to +5V and their center lug wired to their appropriate wirepad. The toggle wirepads are:
L1 / L2 for the Lin/Log toggles
C1 / C2 for the closed/open toggles

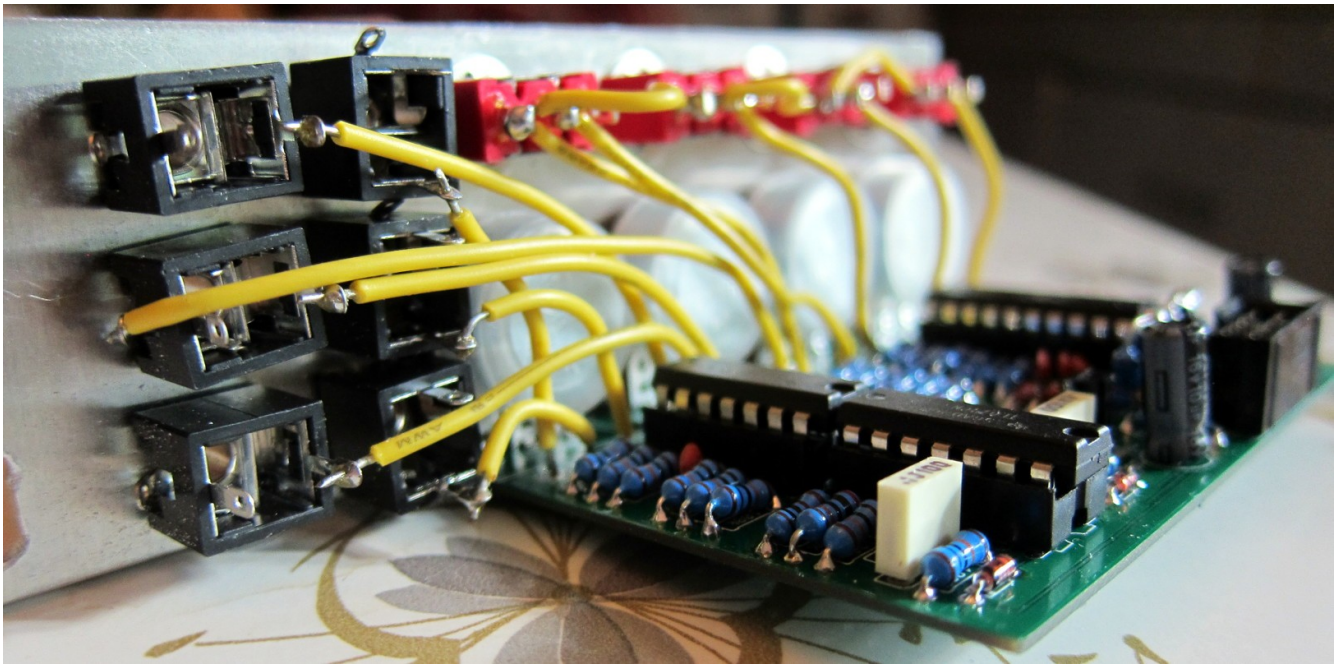
Jacks – All jacks should have the tip connection wired to their appropriate wirepad. One jack's sleeve should be wired to the "GND" wirepad. The jack wirepads are:
T1 / T2 for the timing/trigger input jack.

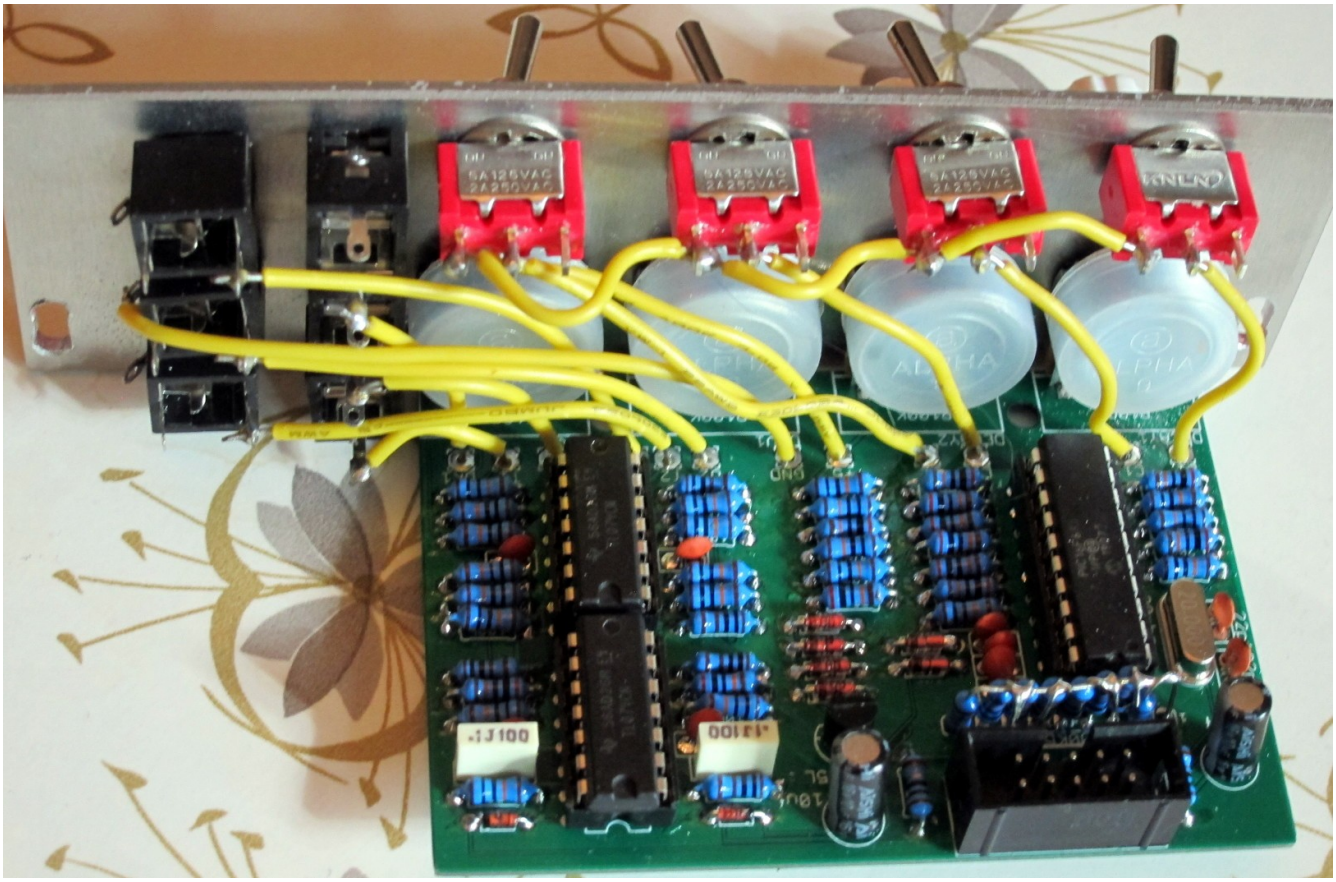


DK1 / DK2 for the CV/Decay input jacks
O1 / O2 for the output jacks

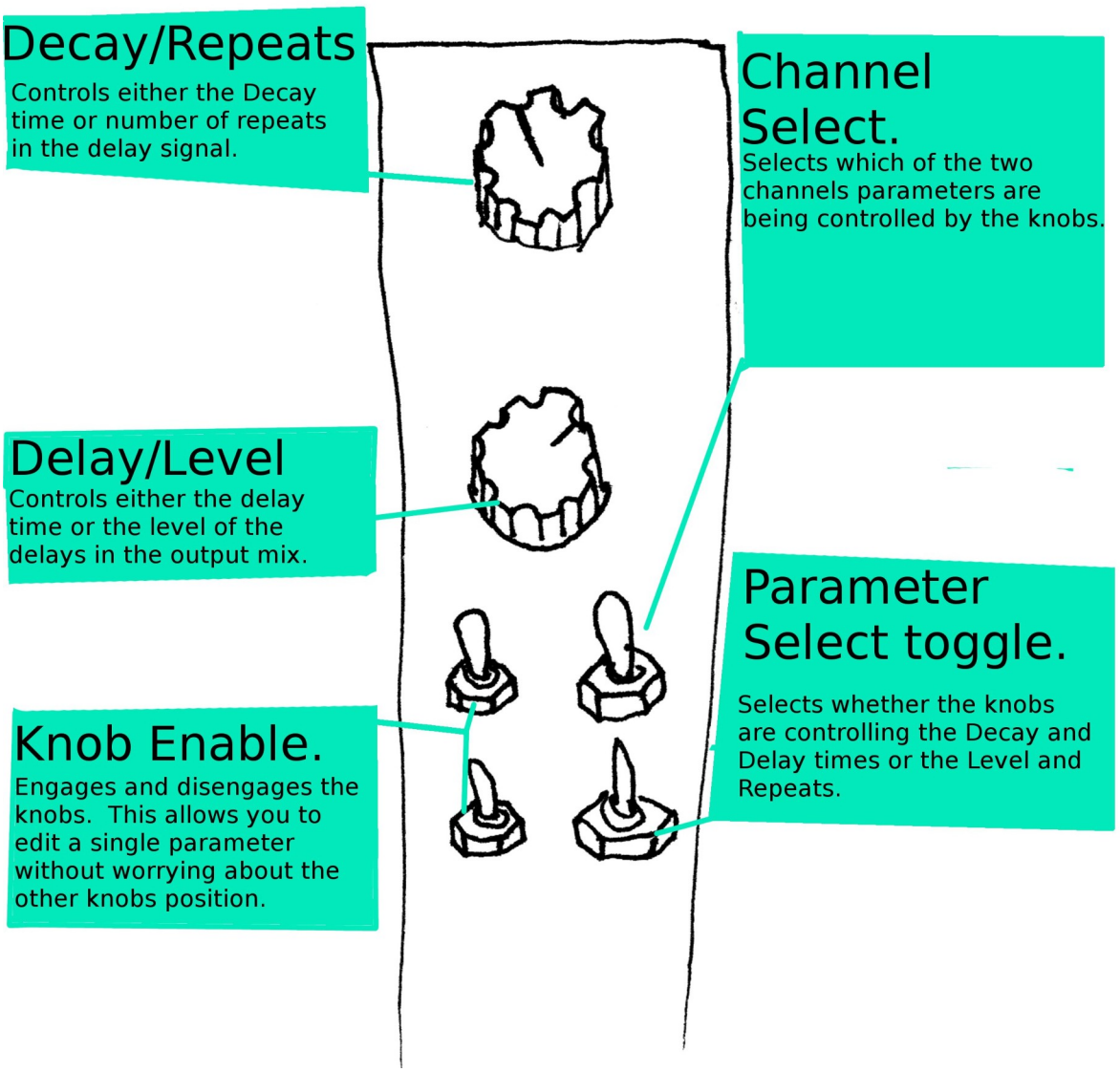
You may optionally also wire the switch of T2 to the tip of T1 to use a single gate/trigger to activate both channels at once.






5A125VAC
2A250VAC
ALPHA

Dual Delaying Noise.

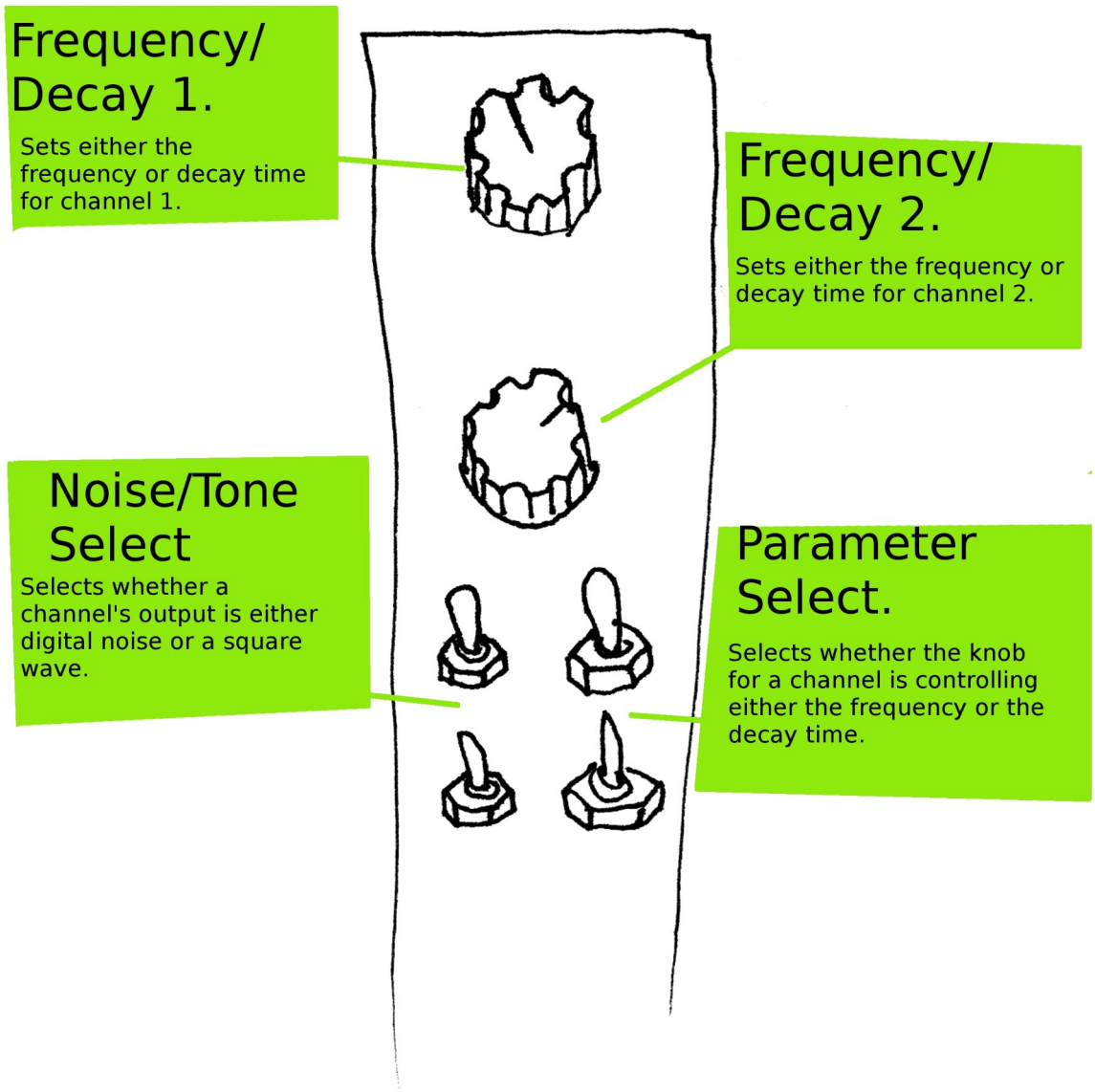


L1 = Knob 1 on/off
L2 = Knob 2 on/off
C1 = Channel 1/2
C2 = Decay/Delay

In Decay mode:
Knob 1 is Decay Time
Knob 2 is Delay Time

In Delay mode:
Knob 1 is Delay Repeats
Knob 2 is Delay Volume

Decaying Noise/Tones



KNOB1, KNOB2 = Sets frequency or decay time based on the parameter select toggle for that switch.

C1, C2 = Sets whether the knobs are controlling frequency or decay time.

L1, L2 = Selects whether the channel is outputting a square wave or digital noise.