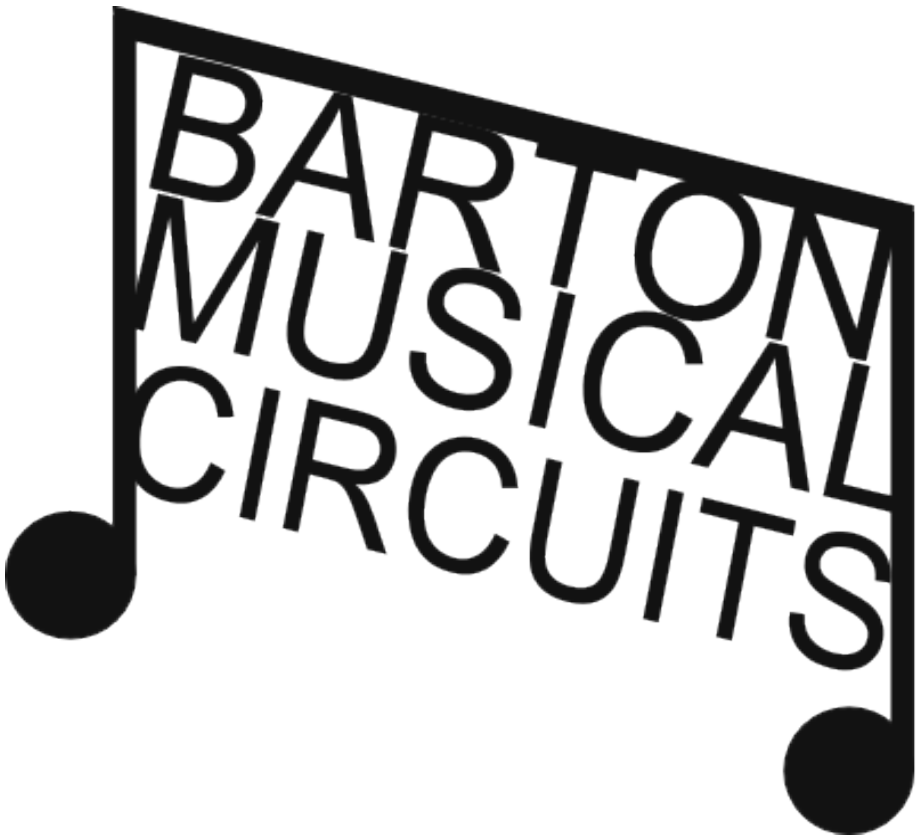


BMC 010. Dual Decaying Noise Manual/Build Documentation.

Written January 15, 2013
Last Edited April 16, 2018

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.

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. When using external CV for , this knob attenuates that control voltage.
2.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 they act as knob enable switches.

For Noise/Tone they select between noise or tone.

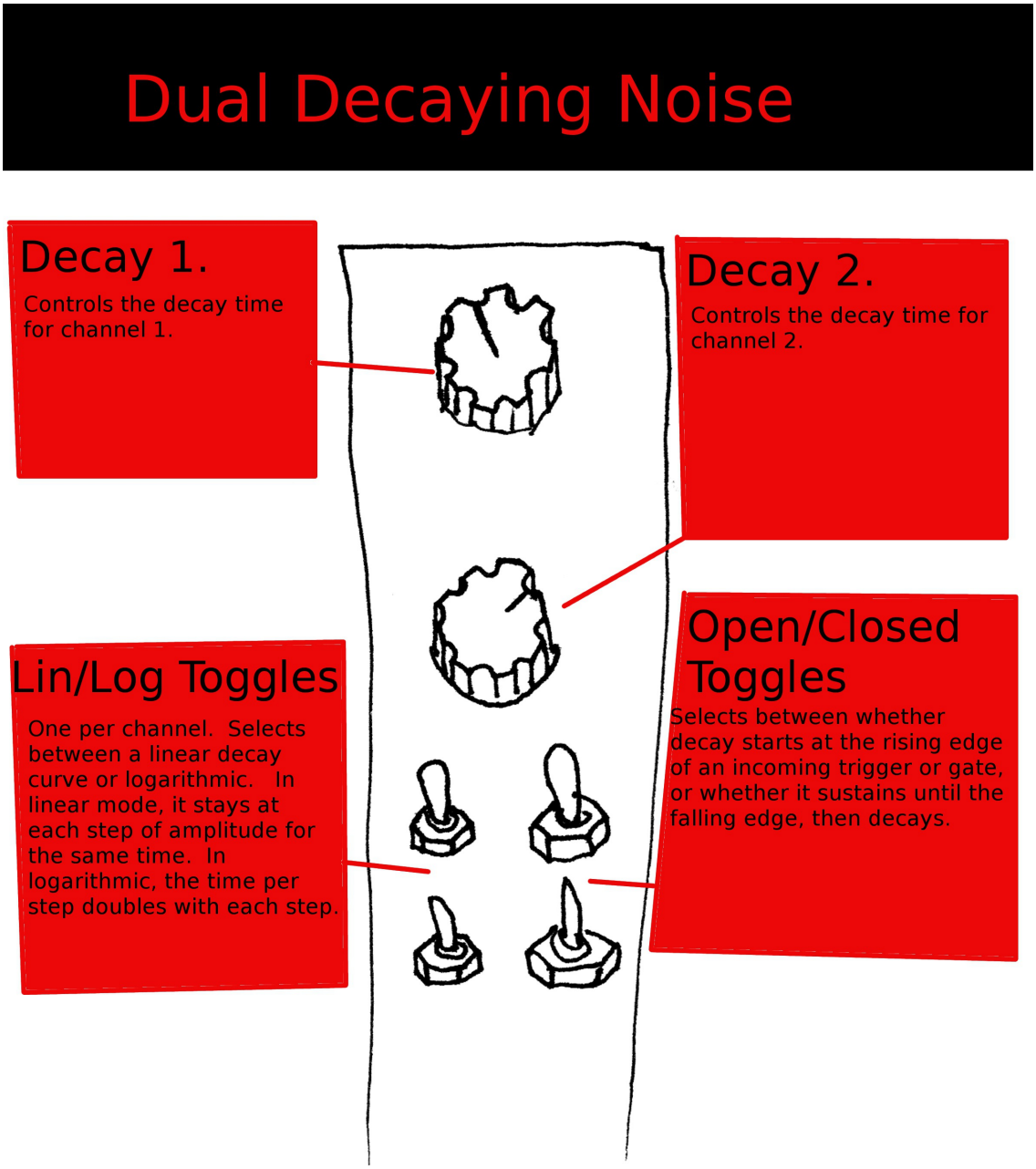
3.Open/Closed Switch - This toggle selects whether the module begins to decay at the rising edge of the input signal (Closed mode) or on the falling edge (Open mode) in Dual Decaying Noise software.

For Dual Delaying Noise, the channel 1 switch acts as a channel select switch deciding which channel the parameter knobs affect, the channel 2 switch selects between which set of parameters the knobs control.

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

C.Control Layouts for Different Software

Here is a small guide to use when swapping chips to avoid confusion as to what knob/switch is controlling what.



Dual Delaying Noise.

Decay/Repeats

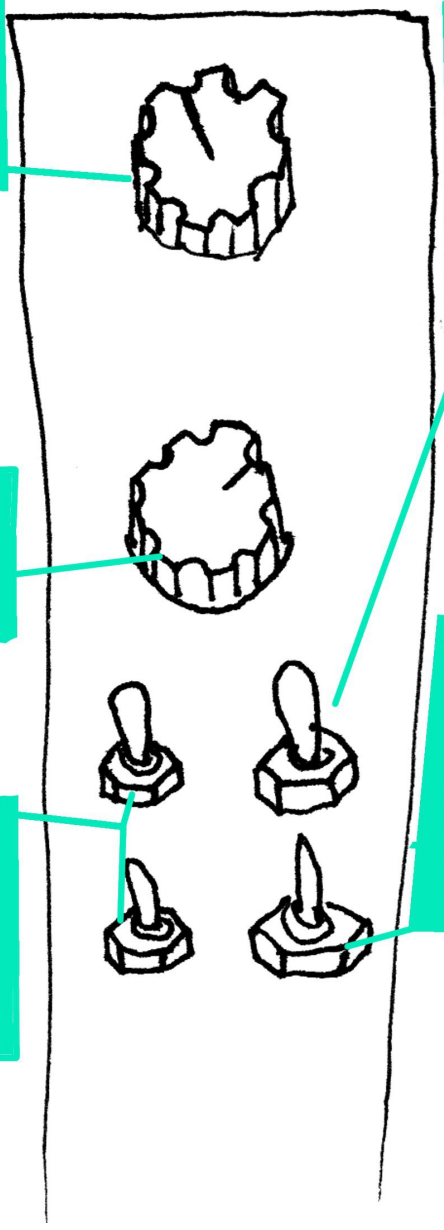
Controls either the Decay time or number of repeats in the delay signal.

Delay/Level

Controls either the delay time or the level of the delays in the output mix.

Knob Enable.

Engages and disengages the knobs. This allows you to edit a single parameter without worrying about the other knobs position.



Channel Select.

Selects which of the two channels parameters are being controlled by the knobs.

Parameter Select toggle.

Selects whether the knobs are controlling the Decay and Delay times or the Level and Repeats.

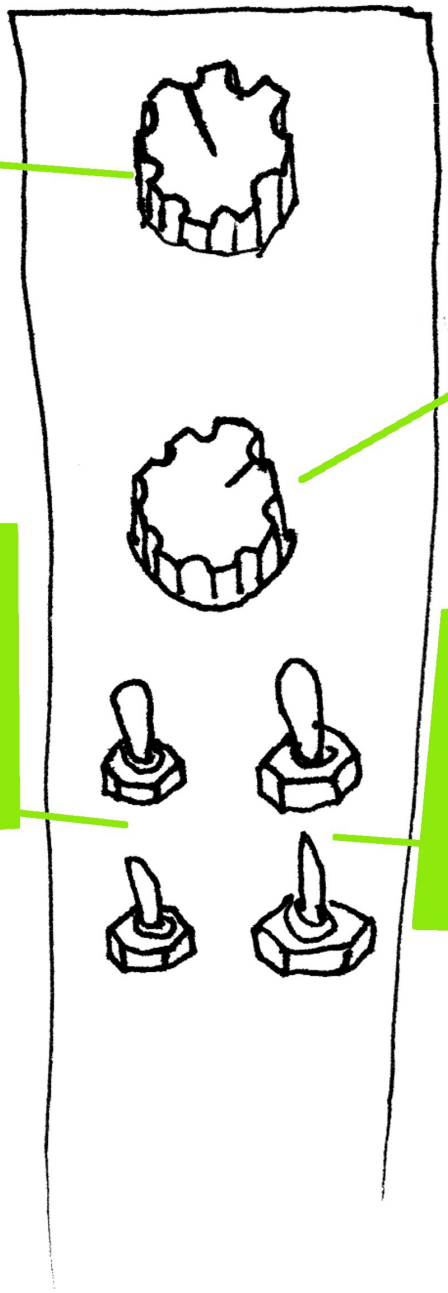
Decaying Noise/Tones

Frequency/ Decay 1.

Sets either the frequency or decay time for channel 1.

Frequency/ Decay 2.

Sets either the frequency or decay time for channel 2.



Noise/Tone Select

Selects whether a channel's output is either digital noise or a square wave.

Parameter Select.

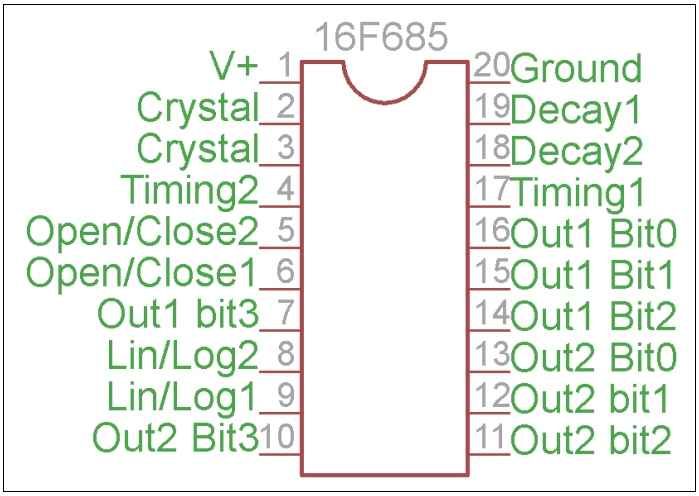
Selects whether the knob for a channel is controlling either the frequency or the decay time.

II. Building The DDN

A. Circuit Description/Schematics

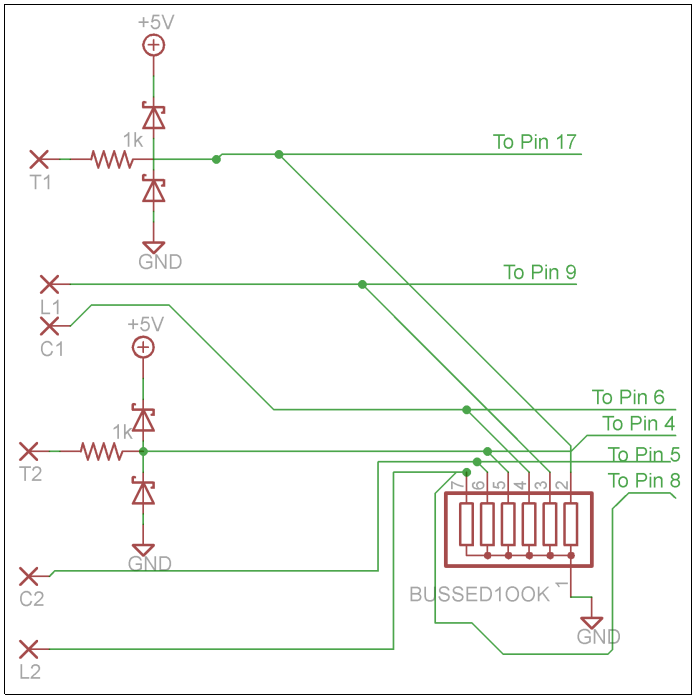
1.The Chip.

At the center of the DDN is a PIC 16F685 microcontroller. It uses a 20mhz crystal for the internal processing oscillator. The inputs/outputs on the 16F685 can be sub-categorized into three sections; digital inputs, analog inputs and digital outputs. Each of these sections will have it's own diagram showing it's accompanying circuitry.



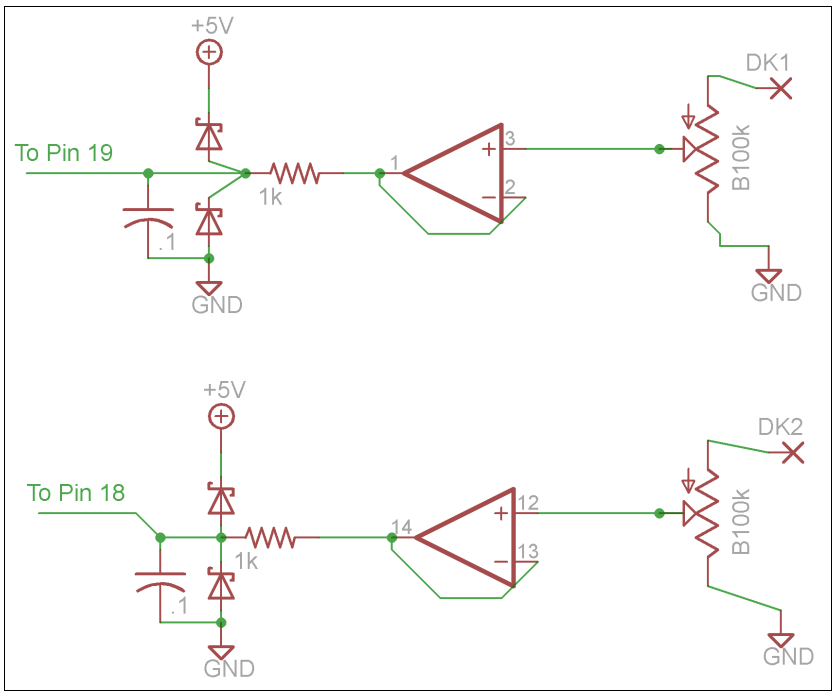
2. Digital Inputs

All digital inputs are normally held at ground through a 100K resistor bussed array. The switch inputs (L1, L2, C1, C2) should all be connected to toggle switches which are also connected to +5V. The T1 and T2 inputs are in series with a 1k resistor and the input pins are paralleld with a pair of Schottky diodes, which prevents over-voltage and under-voltage from damaging the microcontroller.



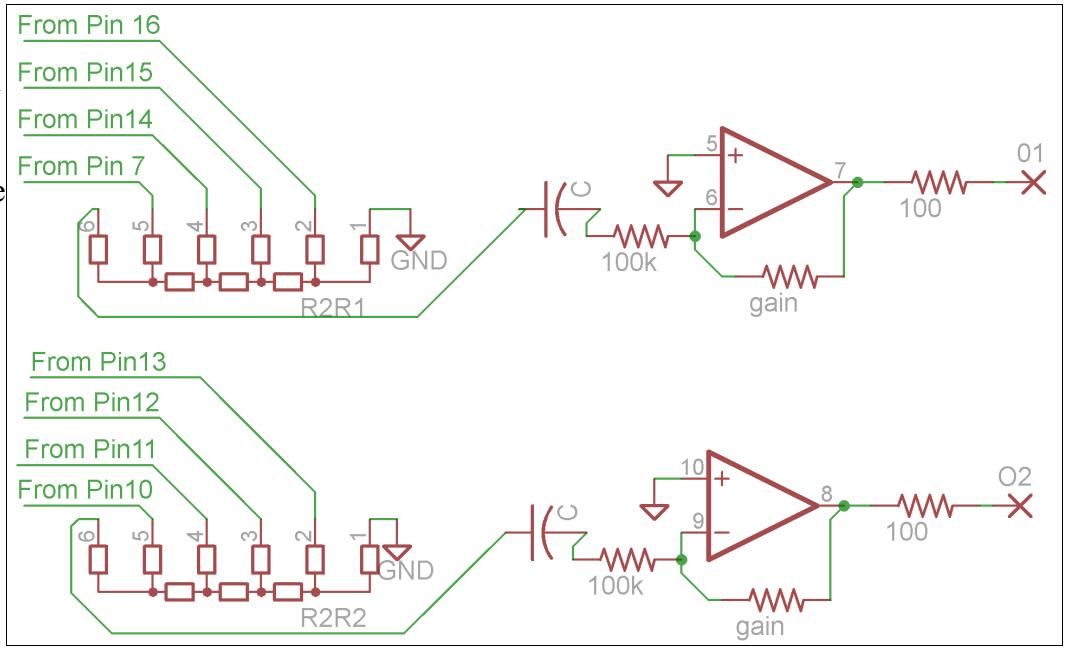
3.Analog Inputs

The two analog inputs each go through an attenuater and are then sent to a buffer and the same 1k/2schottky network as the timing inputs for over/undervoltage protection.



4. Digital Out

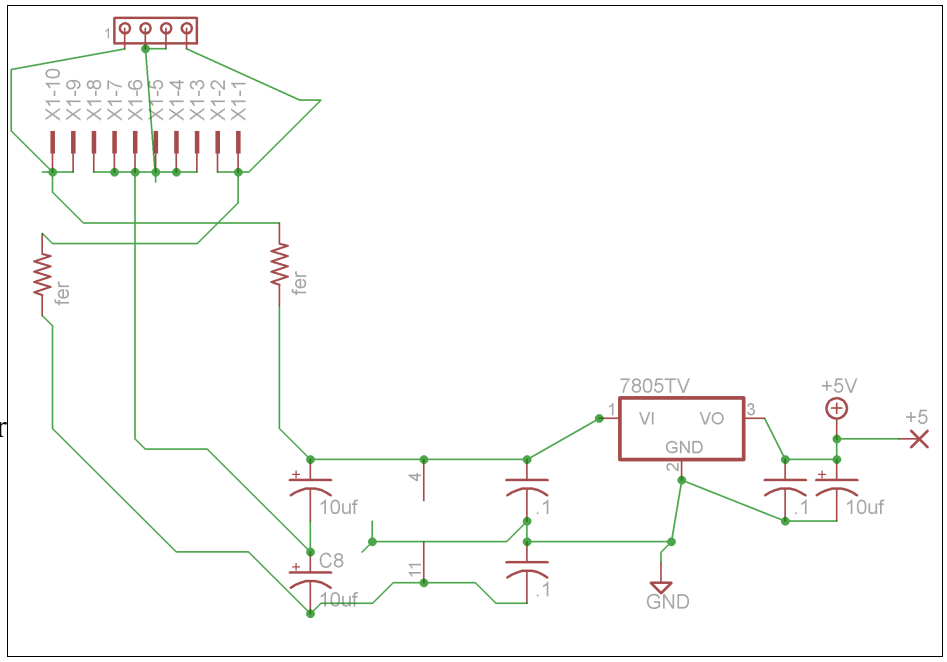
Each channel has 4 digital output pins, each one corresponding to one bit of the output signal for that channel, for a total of 16 levels of amplitude per channel. Each channel uses a Resistor/2Resistor Digital-To-Analog conversion network to turn the 4 outputs into a single analog signal. Capacitor "C" decouples the DC offset of the microchip from the output. The inverting amplifier increases the gain of the output signal and provides a low impedance output. Resistor "gain" sets the gain of the amplifier.



In my first prototype I used a .1uf cap for capacitor "C" and a 220k resistor for resistor "gain," this resulted in a suitably wide frequency band at an amplitude of 10v peak to peak. To reduce bass, use a smaller capacitor for decoupling, to reduce high frequency, put a capacitor in parallel with resistor gain.

5. Power Supply

Here we see two connecters, one for Eurorack and one for MOTM format synthesizer modules. The two resistors marked "FER" can either be ferrite beads or low value resistors for power supply filtering. A pair of 10uf electrolytics filter the positive and negative rails of the power supply, and a 7805 provides a +5V supply, which is then filtered with another 10uf. There are additional .1uf caps for the power supply pins of each IC.



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	1	
7805	1	in TO-220 Package
SD101C	8	or other Schottky

Resistors

Value	Quantity	Notes
100 ohm	2	5mm lead spacing. Use 3.5mm body length or stand up
1Kohm	4	" "
100 Kohm	2	" "
220 Kohm	2	" "
10 ohm	2	7.5mm lead spacing
B100k PC mount Pot	2	Alpha RV120F-20-15F-B100K part.
100k Bussed array	1	7 Pin version.
10K R2R Array	2	6 Pin version. 10K value not critical

Capacitors

Value	Quantity	Notes
22pf	2	5mm lead spacing, cheap ceraics are fine
.1uf ceramic	5	For power supply decoupling, value not critical 7.5mm lead spacing
.1uf Polyester	2	For audio coupling.
10uf 16v electro	3	

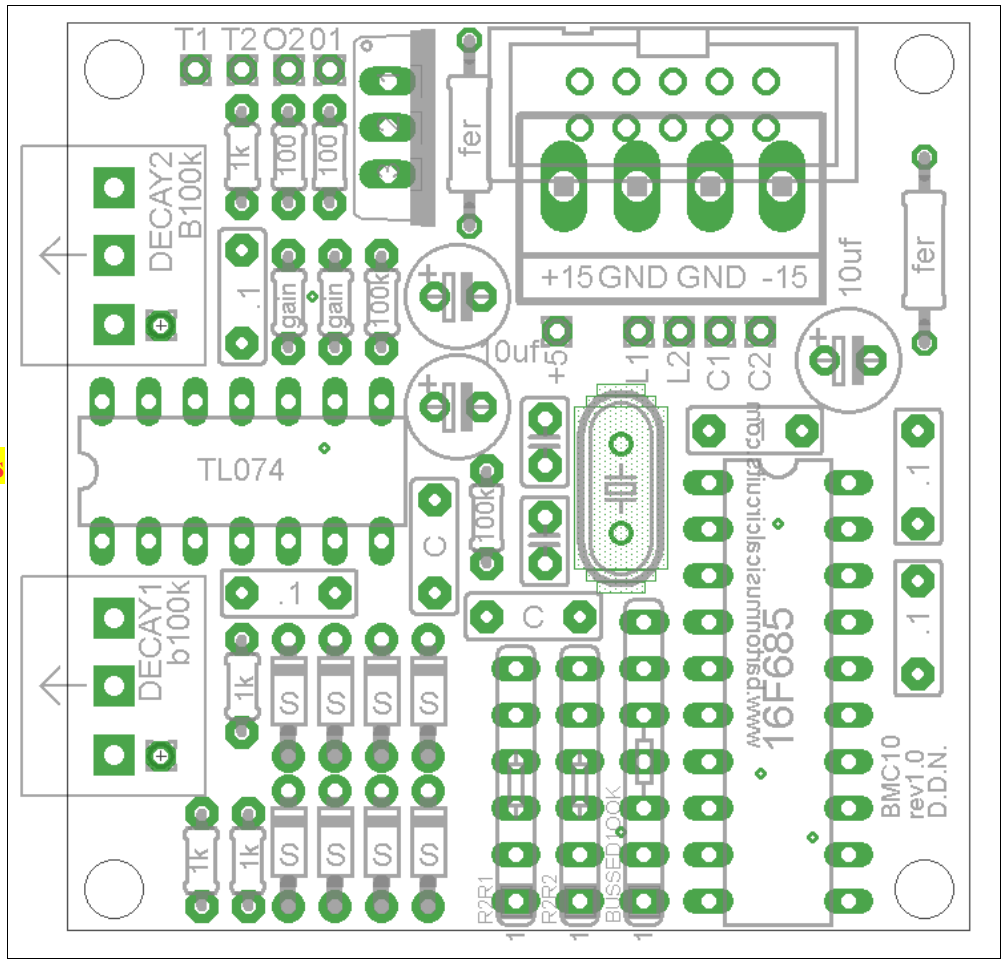
Other/Off Panel

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

C. PCB Overlay/Information

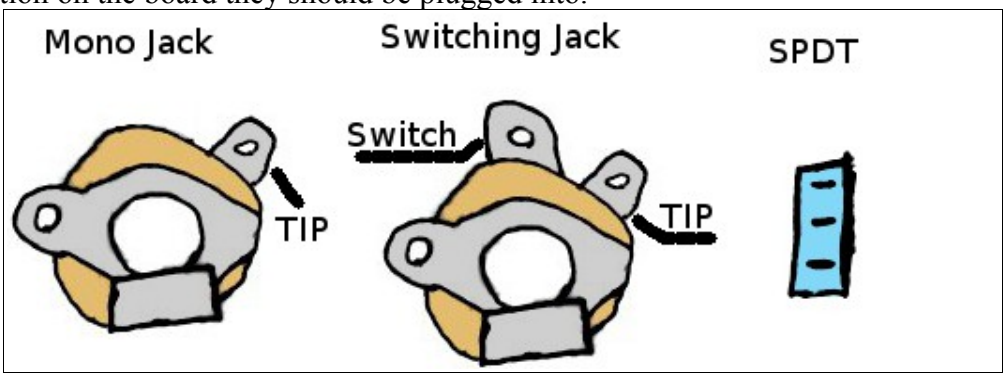
This is the layout of the printed circuit board. It's dimensions are 50mm x 50mm.

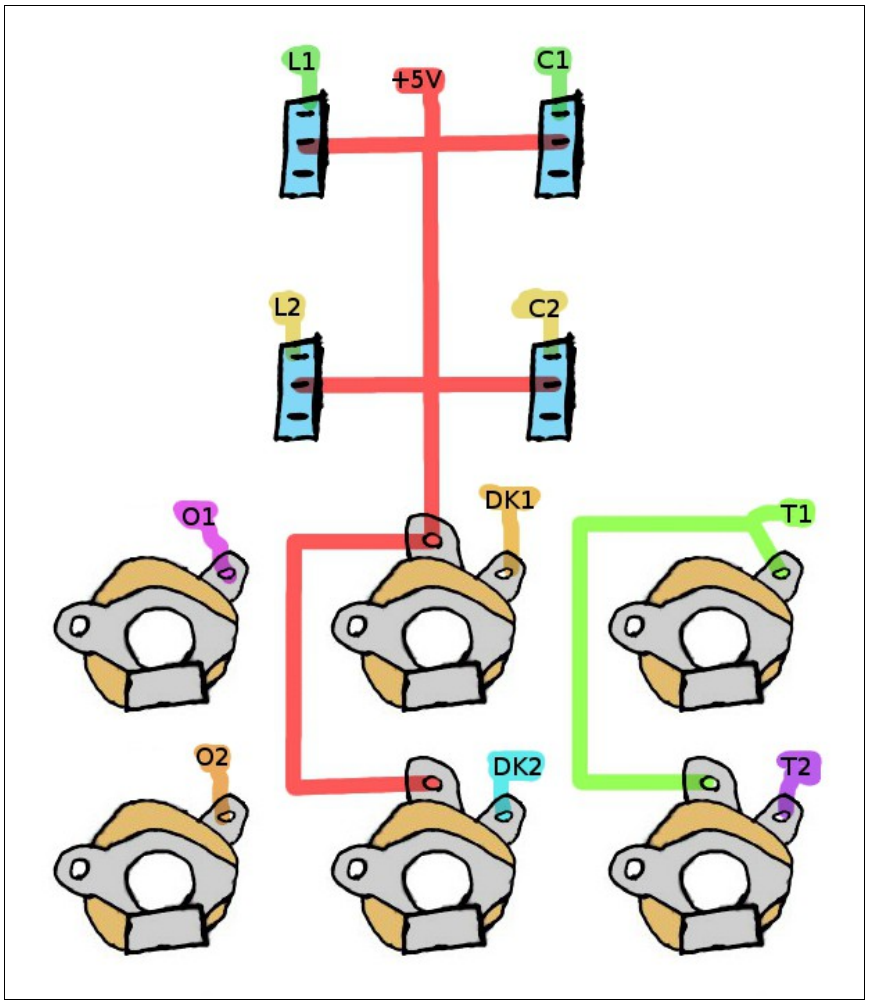
WARNING: There is an error on a recent run of PCBs for this which show the +V and -V connections backwards on the PCB. If your pcb says "+V" instead of "+15" ignore it and use the image to the right as your reference for voltage inputs. Sorry for the confusion.



D. Wiring Diagram.

Here is a legend for symbols used in the wiring diagram on the next page. The colored lines indicate which solder lugs should be wired together. The text that the colored lines connect to indicate what connection on the board they should be plugged into.




L1
+5V
C1
L2
C2
O1
DK1
T1
O2
DK2
T2