BMC 092. Sample Release Build Documentation.

Current PCB Revision: 1.1
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I. Using The Module.

The Sample Release is a 4 channel bipolar envelope generator module that can also act as a sample-and-hold or track-and-hold. Each channel takes a voltage input, samples it and then that voltage goes to zero volts with it's rate controlled by the release knob. This generates control envelopes that fall when positive voltage inputs are applied and rise when negative voltage inputs are applied.

Each channel has a toggle that disables the release function and lets the channel act as a traditional sample-and-hold or track-and-hold. Additionally, a +5V supply is normalized to the voltage input so the module can also be used as a normal release generator.

No modifications are required if building this module for a +/-15V system.

CONTROLS

1.Release knob – As this knob is turned clockwise the amount of time it takes for a voltage to reach zero is increased. Release times range from 1.2 seconds at the maximum to 0.01 seconds.

2.Hold Toggle – When engaged, voltages will no longer release but stay at their sampled voltage until the next voltage is sampled.

INPUTS/OUTPUTS

1.Voltage Input – Any voltage source can be input here. These jacks are normalized so that inputting a voltage on channel 1 goes to channel 2 and so forth. When nothing is plugged in +5V is normalized to channel 1 and then down to the rest of the channels. So plugging voltages into channels 3 and 4 would result in having two channels of normal release generation and two channels of sample-release generation.

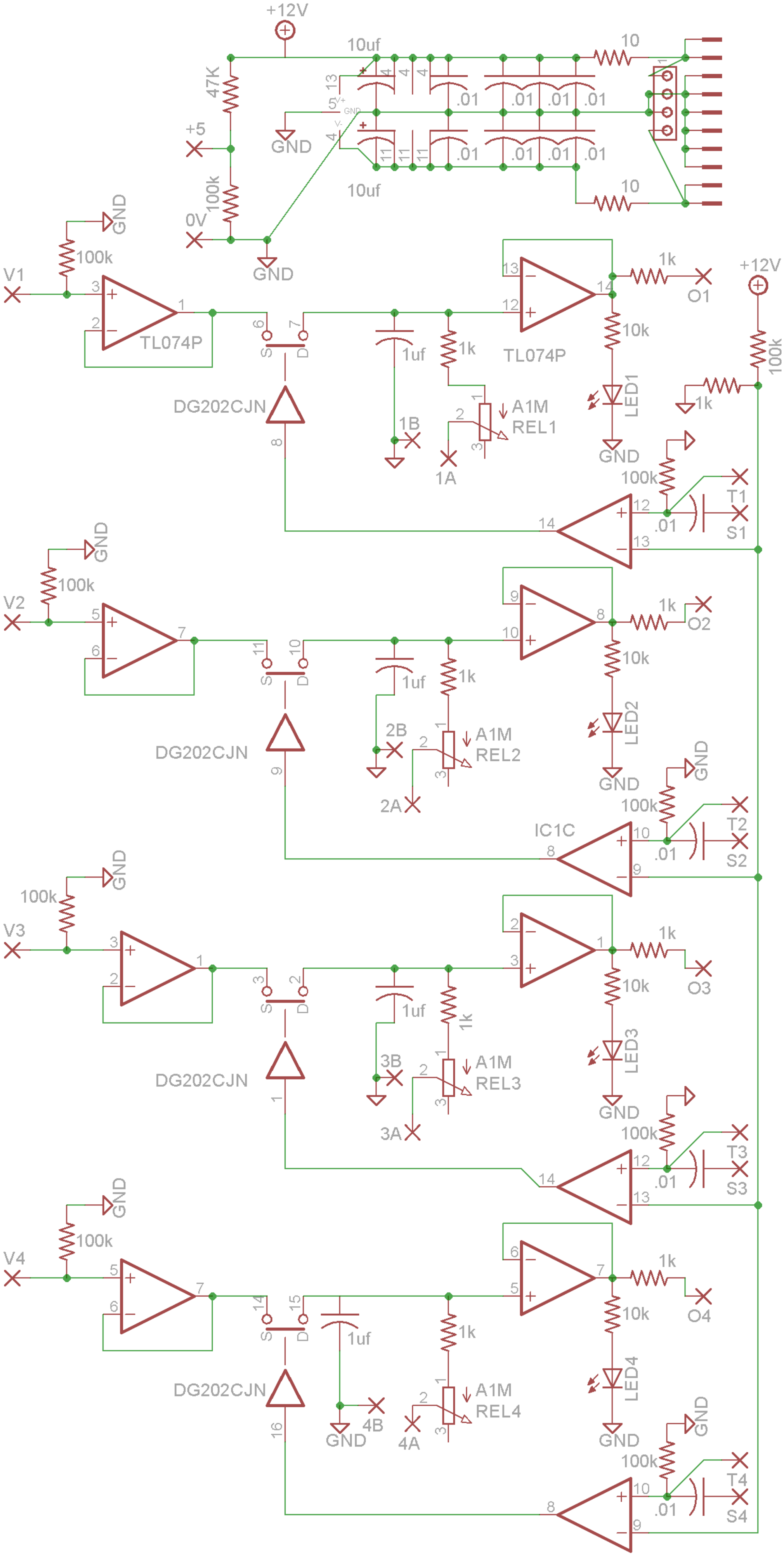
2.Sample Input – Use a signal with a sharp upward waveform like a trigger, gate, sawtooth or square wave. When this input goes high the voltage input will be sampled and immediately the release or hold phase will start.

3.Track Input – Any signal can be used on this input. When the signal goes above 0V, the output will match the input, and when the signal goes low the release or hold phase will start.

MP3 DEMOS

Demo 1. An offset LFO signal is input to channel 1's voltage input. channel 1's voltage output is sent to channel 2/3's voltage inputs. All timing inputs are fed by different divisions of the same clock. Channel 2's v out is sent to VCF cutoff and Channel 3's v out controls a VCA. Release time and the release/hold switch are adjusted during the clip.

Demo 2. Showing bipolar envelopes. An LFO feeds voltage inputs of two channels with triangle waveform going to channel 1 and square to channel 2. Channel 1 control's a VCO's frequency mod and channel 2 controls a VCF's cutoff. Release knobs are the only thing touched during playback.


+12V
10uf
10
47K
+5
GND
100k
0V
.01
10uf
10
GND
V1
100k
TL074P
DG202CJN
1uf
1k
1B
1A
A1M
REL1
TL074P
1k
O1
10k
LED1
GND
+12V
100k
1k
100k
T1
S1
V2
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V3
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GND
DG202CJN
1uf
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3B
3A
A1M
REL3
1k
O3
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LED3
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V4
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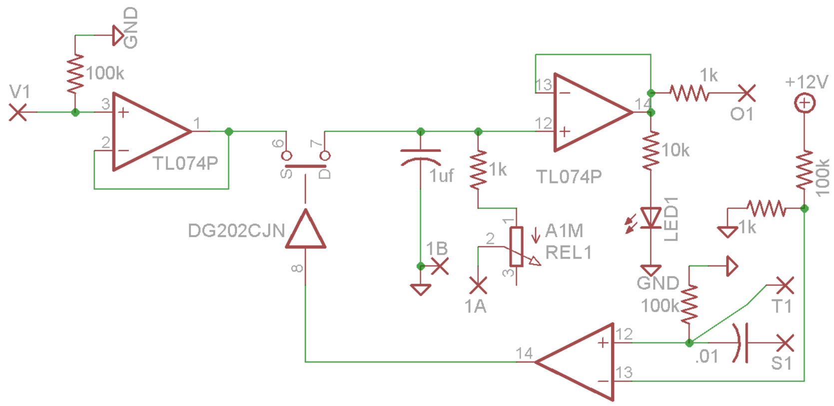
S4



II. Schematic.

On the previous page was the full schematic, above is just a single channel reproduced. Each channel is identical, so only one will be described.

On the left we see the voltage input, V1, which connects to a 100K input resistor to ground and then goes to an op-amp wired as a buffer. The output of the buffer goes to the input of a DG202 analog switch.

The output of the switch connects to a 1uf capacitor to ground in parallel with a 1K resistor in series with a 1Meg potentiometer. The potentiometer connects to a toggle switch which makes or breaks a connection to ground (1A and 1B wirepads go to the toggle). When the toggle is open, the module is in hold mode and when it is closed it is in release mode, allowing the capacitor to leak current to ground and lower it's voltage. The voltage on the capacitor is buffered by another op-amp buffer which feeds an LED through a 10K current limiting resistor and the output jack through a 1K resistor.

On the bottom right we see another op-amp, this one wired as a comparator. The S1 input is the sample input and the T1 input is the track input, the only difference in the two is that the sample input is in series with a .01uf capacitor. This capacitor forms a high pass filter with the 100K resistor to ground at the op-amp's positive input, so it captures only the leading edge of a pulse. A 100K/1K resistor divider sets the comparator's threshold at +0.12V. The comparator's output connects to the DG202's control input.

So, when the comparator on the bottom right goes high from one of it's inputs going high, current flows from the input buffer to the 1uf capacitor and the output voltage becomes equal to the input voltage. When the comparator's output goes low, the connection is broken between input and output and the capacitor either stays at the voltage (hold mode) or its voltage creeps to zero volts.

On the previous page at the top are the power connections. The PCB has footprints for MOTM and Eurorack style power connectors in parallel. The voltage rails are filtered by passive 10 ohm/10uf low pass filters, and .01uf capacitors are placed next to the power pins of all ICs to provide extra high frequency filtering. On the left a 47K/100K voltage divider creates the +5V supply

III. Construction
A. Parts List
Semiconductors

Value	Quantity	Notes
TL074	3	14 pin DIP
DG202	1	16 pin DIP
LED	4	3mm, two pin bi-color LEDs work especially well. Like these.

Resistors

Value	Quantity	Notes
10 ohm	2	5mm lead spacing. Use 3.5mm body length or stand up
1K ohm	9	
10K ohm	4	
47K ohm	1	
100K ohm	10	
A1Meg Potentiometer	4	PC Mounted 16mm/17mm. Like this.

Capacitors

Value	Quantity	Notes
.01uf	12	Small ceramic disc. Value not critical
1uf	4	Film or Tantalum, increase value to get longer values
10uf	2	Electrolytic

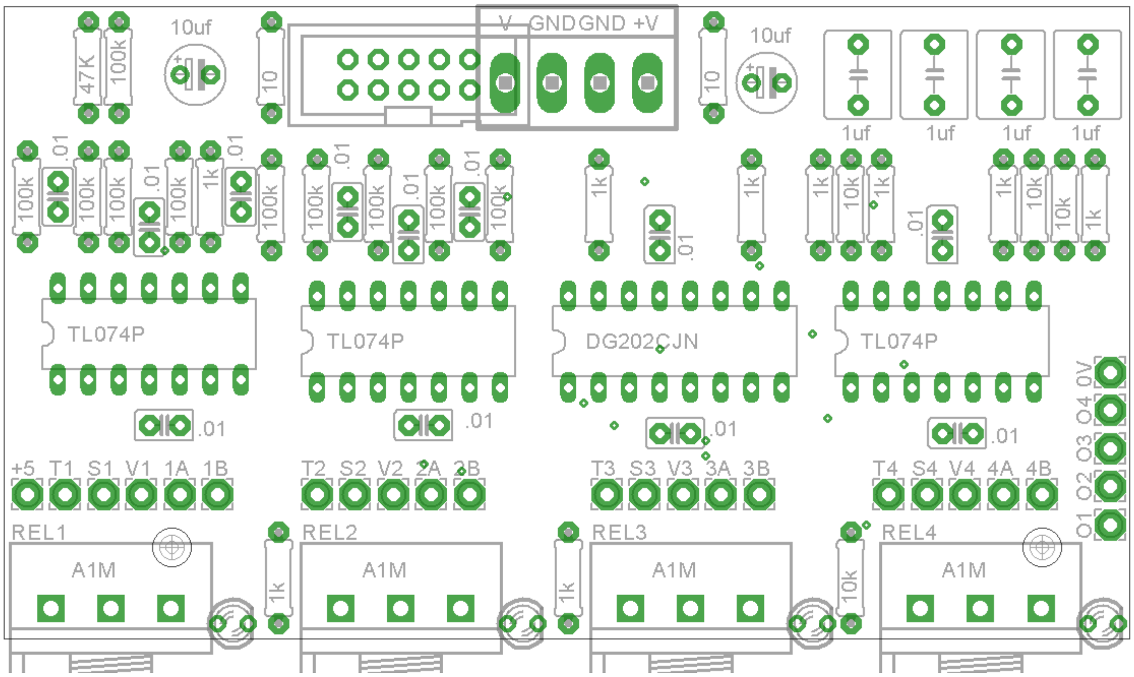
Other/Off Panel

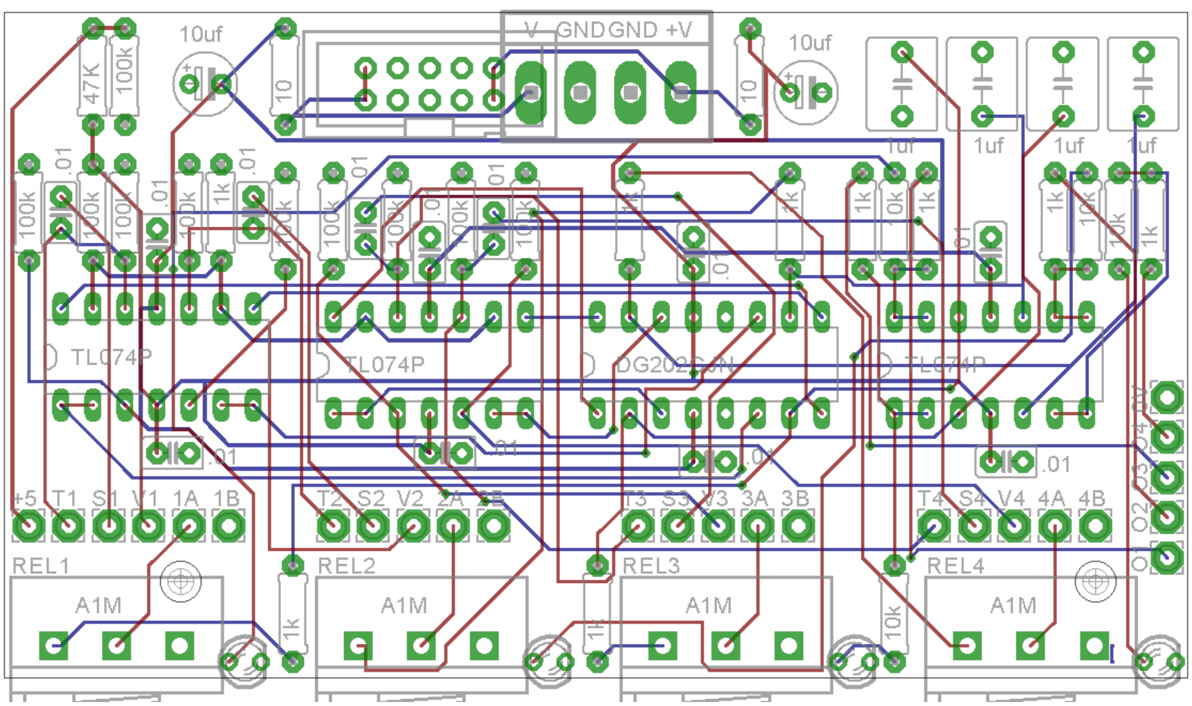
Value	Quantity	Notes
Power connecter	1	Eurorack or MOTM style
Jacks	16	
SPDT Toggle	4	
14 pin DIP Socket	3	
16 pin DIP socket	1	
Knobs	4	

B. PCB Layout

Below are renderings of the PCB. The rendering showing the traces does not show the ground fill plane, so assume any missing connection is a ground fill.

The PCB measures 93mm x 53mm and the pots are spaced 24.13mm apart



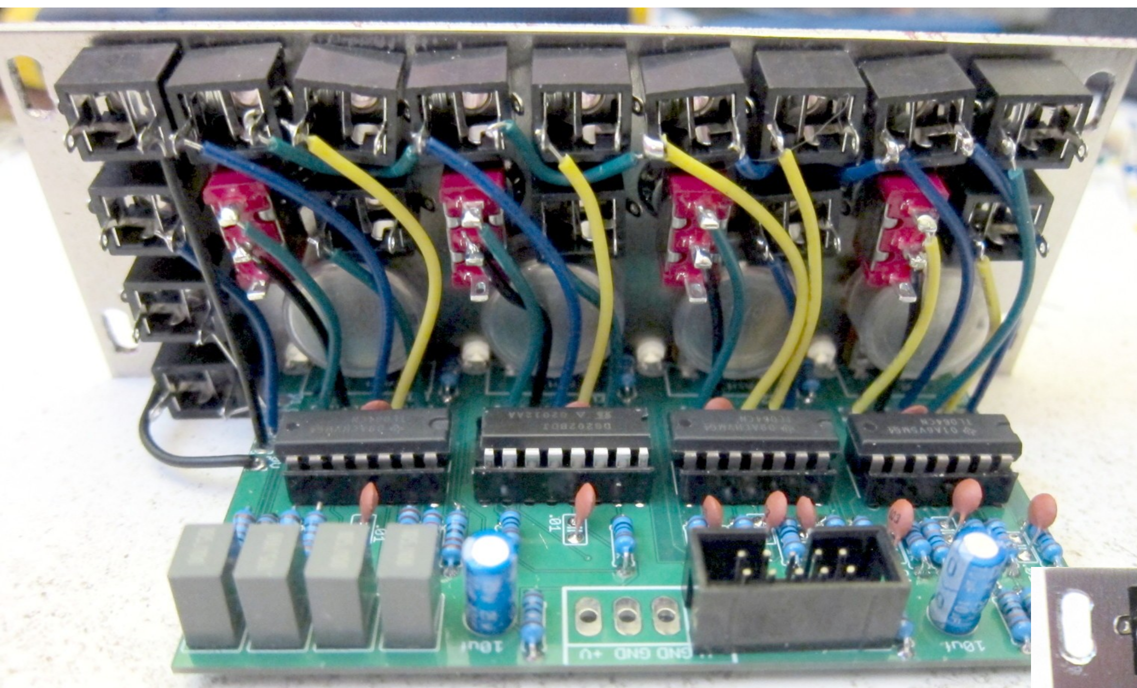


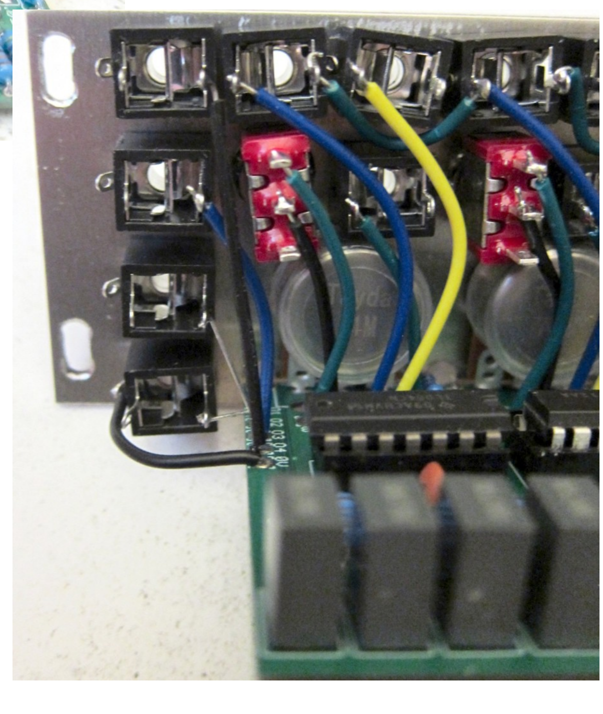
C. WIRING

First do your inter jack wiring. Wire the switch of the voltage input jack on channel 4 to the tip of the voltage input jack on channel 3, but only solder the end of the switch as you'll make another connection to the tip later. Then wire the switch of the channel 3 jack to the tip of channel 2 in the same way, and again 2's switch to 1's tip. This will normalize all the voltage inputs in a cascade.

Next wire from the wirepads to the jacks and switches. These should be connected as follows:
+5 – Connect to the switch of the channel 1 voltage input jack.
T1 (and T2, T3, T4) – Connect to the tip of the track input jack for that channel.
S1 (and S2, S3, S4) – Connect to the tip of the sample input jack for that channel.
V1 (and V2, V3, V4) – Connect to the tip of the voltage input jack for that channel.
1A (and 2A, 3A, 4A) – Connect to the middle lug of the Hold toggle for that channel.
1B (and 2B, 3B, 4B) – Connect to the lug of the hold toggle furthest from the board for that channel.
O1 (and O2, O3, O4) – Connect to the tip of the output jacks for that channel.
0V – Connect to the sleeve of any jack.

Below are some photos of a completed module to use as reference.





D. Tweaks/ Modifications

1. Adjust Release Range – As noted in the parts list, replacing the 1uf capacitors with larger tantalum or film caps should increase the release range. If you only needed very short release times you could lower the value of this cap.

2. Track/Sample Toggle – Instead of using separate inputs for tracking or sampling the input, the track and sample wirepads could be wired to the two outside lugs of an SPDT and the center lug wired to a single timing input jack. This would let you switch between track/sample without having to repatch and would also allow you to normalize the timing inputs. The downside is a slight increase in expense and having an even more crowded panel layout.

3.Skipping features – If you wanted to lose features to fit this module behind a smaller panel, the hold toggle can be turned permanently off by simply jumpering the A/B wirepads together. The Track/Sample inputs work in parallel so either can be left off completely without affecting anything.