BENJOLIN V2 MANUAL

Manual Revision A

HISTORY

The Benjolin has it's origins in a DIY kit that could be assembled in one sitting. The kit resulted in a standalone instrument that could be run on 9V battery power. Rob made the schematics available (non-commerical use) for folks to expand their learning. The instrument was so much fun that folks leveraged that schematic to port the design to many modular formats and additional standalone instruments. The overall popularity resulted in officially licensed versions of the Benjolin being made available in various formats.

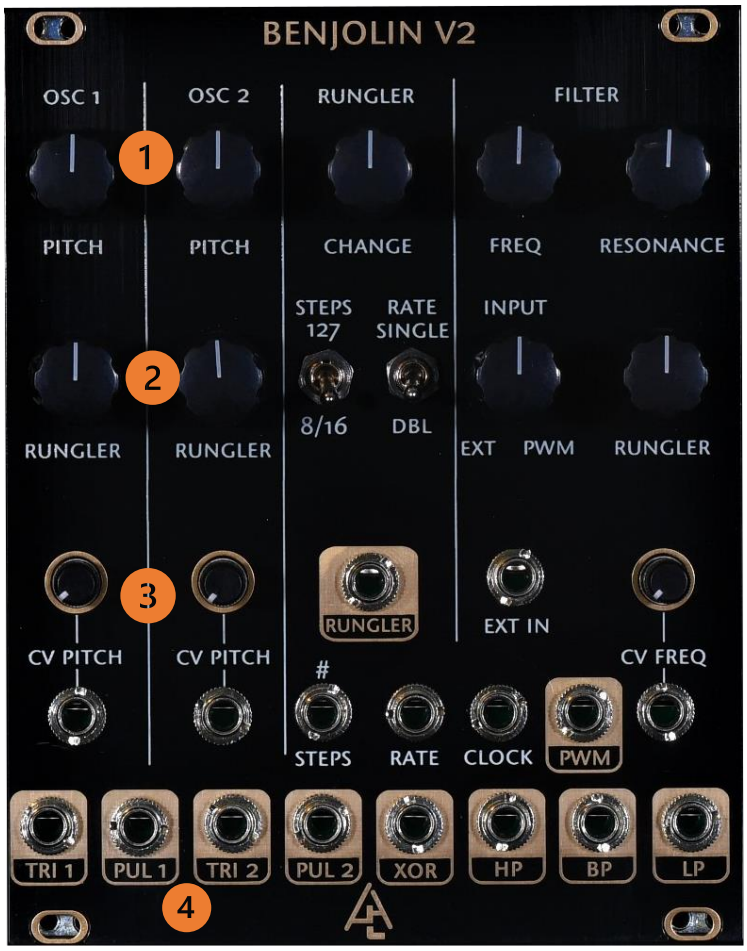
DESCRIPTION

There are four main sections to the Benjolin: two oscillators, the Rungler (stepped CV generator), and a multimode filter. The oscillators feed data and clock into the shift register that outputs a stepped CV voltage (via an R2R DAC) that can then be mixed back into the oscillators creating a chaotic system that is constantly seeking balance. The outputs of the oscillators are then mixed into a PWM signal that is sent to the multimode filter section.

It is highly recommended to spend some time reading the signal flow and playing with the module. It should help you get a feel for how to control this complicated chaos machine.

New to the Benjolin V2:

- Reworked oscillator and filter sections
- All levels are adjusted to eurorack standards
- Two different steps modes (8/16 and 127)
- Double and single clock rate
- Externally clockable
- External filter input with blend control
- Support for the Turing Machine expanders (with Tom's permission)



OSCILLATORS

Oscillator 1 and 2 have identical controls and inputs/outputs.

1. Pitch: Coarse pitch control to control the frequency of each oscillator.
2. Rungler: The ammount of Rungler stepped CV that is applied to each oscillator.
3. CV Pitch: CV pitch input with an attenuator to control the amount of impact on the pitch of the oscillator. The jack is normalled to the triangle output of the opposite oscillator (OSC1 CV pitch input is normalled to the OSC2 triangle wave).
4. Waveform Outputs: Triangle and Square/Pulse outputs for each oscillator.

It is important to note that the oscillators sections do **not** support v/oct. This might feel odd but once you play with the module it will become clear why this is not important.

RUNGLER

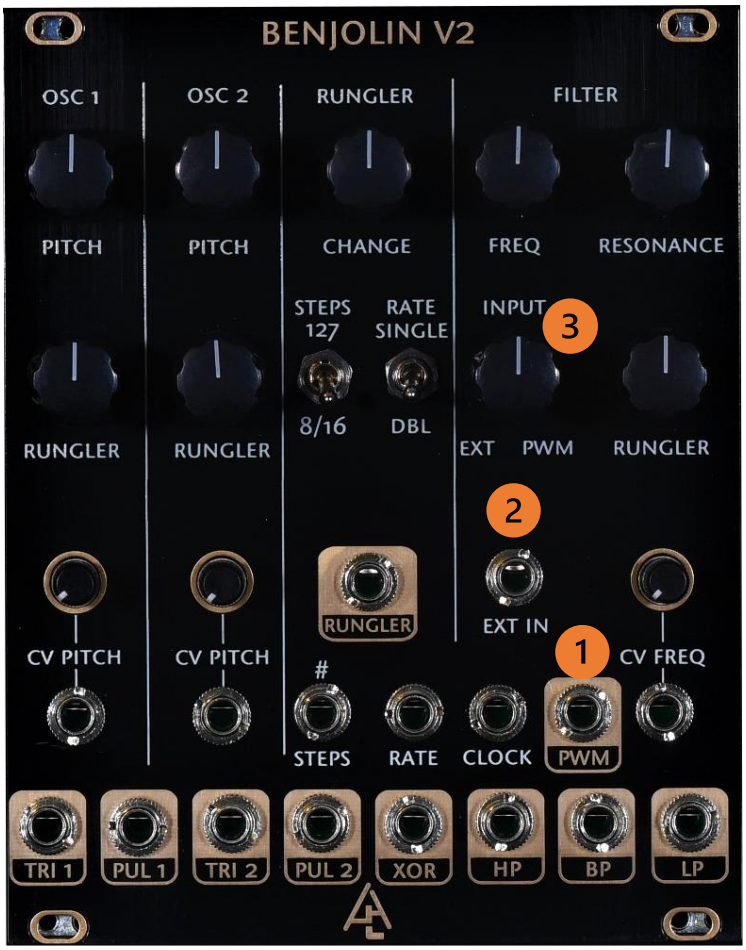
The Rungler section is centered on a shift register that uses an R2R DAC to create a stepped CV voltage. There are two inputs into the shift register, the data to sample (which comes from OSC1) and clock speed (which comes from OSC2). You can play with the speed of both of the oscillators and see how they influence the stepped CV output from the Rungler.

1 Change: Controls how much the rungler is allowed to take in new data, and therefore change the stepped CV output. Full CCW and CW does not allow new data into the shift register, and therefore locks the stepped CV loop. When the knob is at the midpoint/top, the Rungler takes in all new data and does not recirculate any data.

2 Steps: Toggle switch to control how the data in the shift register is recirculated. There are two modes of 8/16 steps and 127 steps.

3 Rate: Controls how the clock on the shift register is advanced. The single clock rate only advances on the rising edge. The double clock rate will advance on both the rising and falling edge of the clock signal.

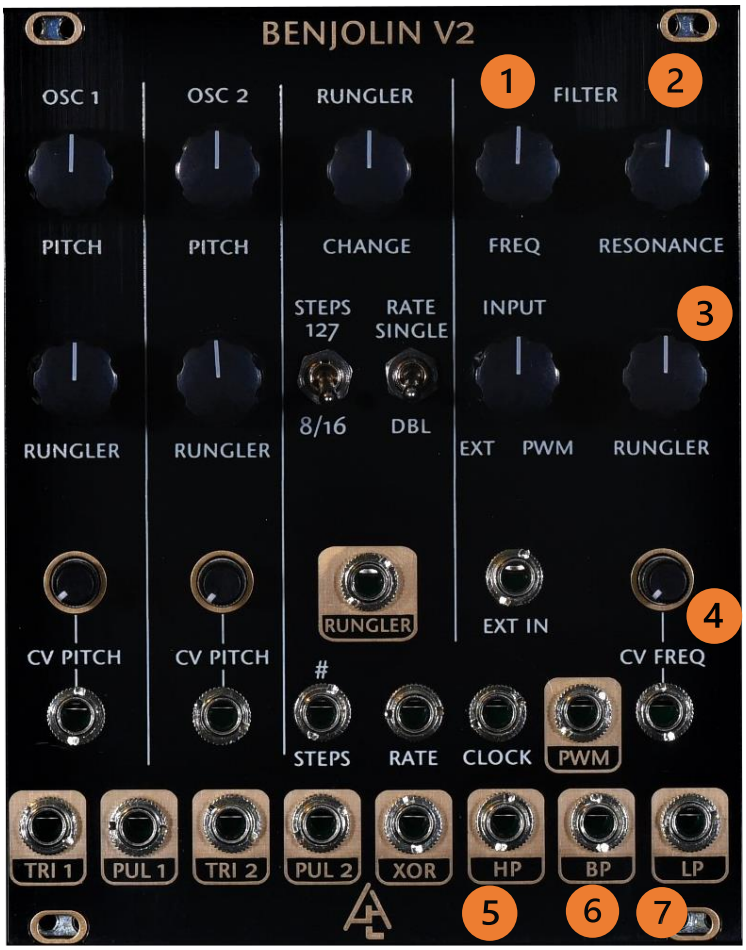
4. Rungler: The actual stepped CV output that ranges from -5V to +5V.
5. Steps/Rate CV Inputs: The switches are configured so that when the switch is up you will get the same behavior as passing a high voltage.
6. XOR: The output of one bit from the shift register resulting in a random gate output.
7. Clock: Control the clock rate of the shift register and therefore the stepped CV output of the Rungler. This jack is normalled to the frequency of OSC2.



MIXER

Controls the input into the filter section.

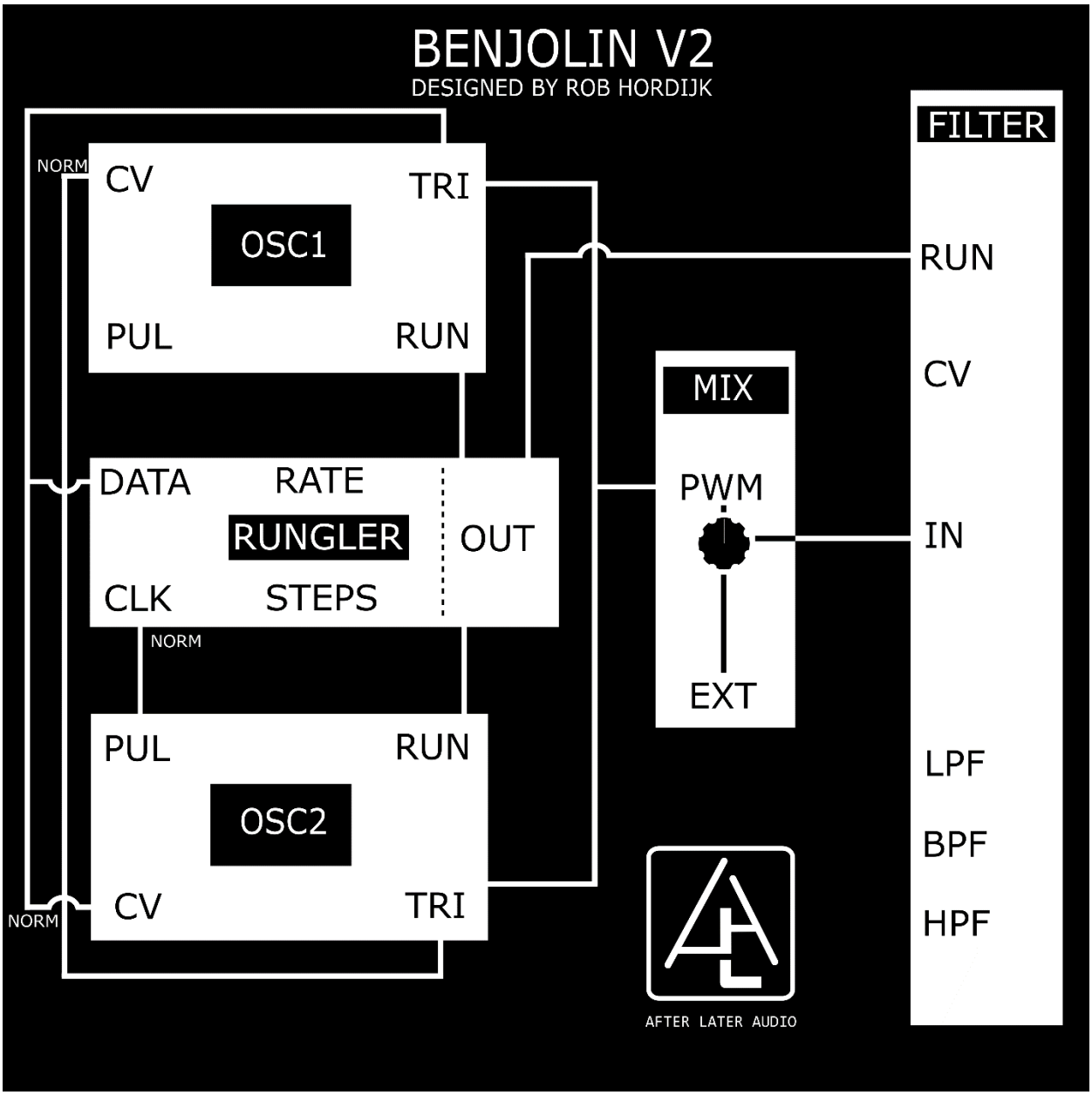
1. PWM: The output of the comparator of the triangle wave from OSC1 and OSC2 resulting in a square wave with variable width.
2. Ext In: An external audio input
3. Input: Controls the blend between PWM and Ext In that is fed to the filter input.



FILTER

1. Freq: Controls the cutoff frequency of the multimode filter
2. Resonance: Controls the resonance of the multimode filter. Delivers more wetness than a Seattle winter.
3. Rungler: The amount of Rungler stepped CV that is applied to cutoff frequency.
4. CV Freq: CV pitch input with an attenuator to control the amount of impact on the cutoff frequency.
5. HP: Highpass output of the filter.
6. BP: Bandpass output of the filter
7. LP: Lowpass output of the filter.

SIGNAL FLOW


BENJOLIN V2
DESIGNED BY ROB HORDIJK
FILTER
NORM
CV
TRI
OSC1
PUL
RUN
RUN
CV
MIX
PWM
IN
DATA
RATE
RUNGLER
OUT
CLK
STEPS
EXT
NORM
PUL
RUN
OSC2
LPF
BPF
HPF
CV
TRI
NORM
AFTER LATER AUDIO

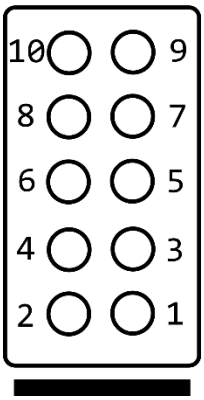
PATCH SUGGESTIONS

1) The filter can be changed easily into a pure sinewave oscillator by feeding back the BP output to the crossfader input, setting the crossfader to the ext-in position and setting the resonance knob about ¾ open. When resonance would be fully open you will hear clipping in the sinewave. The sine signal can be taken from both the LP and the HP outputs.

2) When you would want to do FM crossmodulation with two of the Benjolin filters used as sine oscs, then you apply this BP feedback so both filters turn into sinewave oscs, listen to the LP outputs and crossconnect the HP outputs to the other filter modulation inputs.

EXPANSION HEADERS

CORE

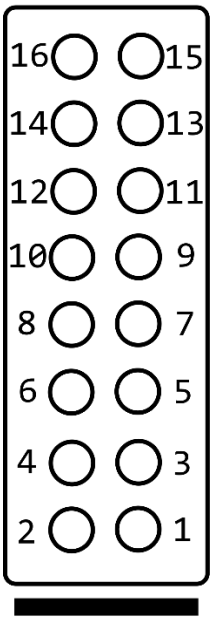


10: GND
9: rungler stepped cv output
8: hpf output
7: bpf output
6: lpf output
5: pwm output
4: oscillator 2 triangle output
3: oscillator 1 triangle output
2: oscillator 2 pulse output
1: oscillator 1 pulse output

TURING MACHINE EXPANDER SUPPORT

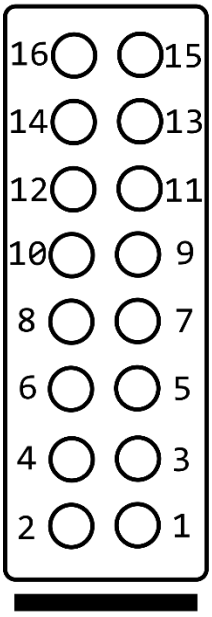
Thanks to Tom Whitwell for making this possible

PULSES



16: +12v power rail
15: +12v power rail
14: GND
13: GND
12: -12v power rail
11: -12v power rail
10: rungler clock (only support single mode)
9: rungler clock (only supports single mode)
8: rungler bit 8 pulse
7: rungler bit 7 pulse
6: rungler bit 6 pulse
5: rungler bit 5 pulse
4: rungler bit 4 pulse
3: rungler bit 3 pulse
2: rungler bit 2 pulse
1: rungler bit 1 pulse

GATES



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1: rungler bit 1 gate

MORE CONTENT

Rob Hordijk's blog post that explains the Rungler

Video of Rob Hordijk explaining the Rungler.