ALM042 'CIZZLE' Operation Manual

Version 0.2 / Firmware 101

March 14, 2024

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1 INTRODUCTION

The 'CIZZLE' is a dual digital 'phase distortion' VCO inspired by the classic Casio 'CZ' series synthesizers. It brings the specifics of 'CZ' style phase distortion (PD) synthesis into Eurorack with the inclusion of primary and secondary oscillator layering and detuning (with up to 8 voice chord generation), extended morphable PD wave generation algorithms, unique resonance wave generation, plus specific 'end of chain' ring modulation and noise modes that are key to the CZ sound.

The voices also feature built in VCAs and various modulation controls and inputs, a cv-able chord mode, tracking ability, triggered mode switching and can be output independently or mixed with stereo widening.

The 'CIZZLE' finally brings characteristic CZ style synthesis to Eurorack with a rich palette of sounds from mellow ambient tones, 90s Detroit Techno inspired chords, Reese style basses, and synth tones with unique faux resonance squelch.

2 FEATURES

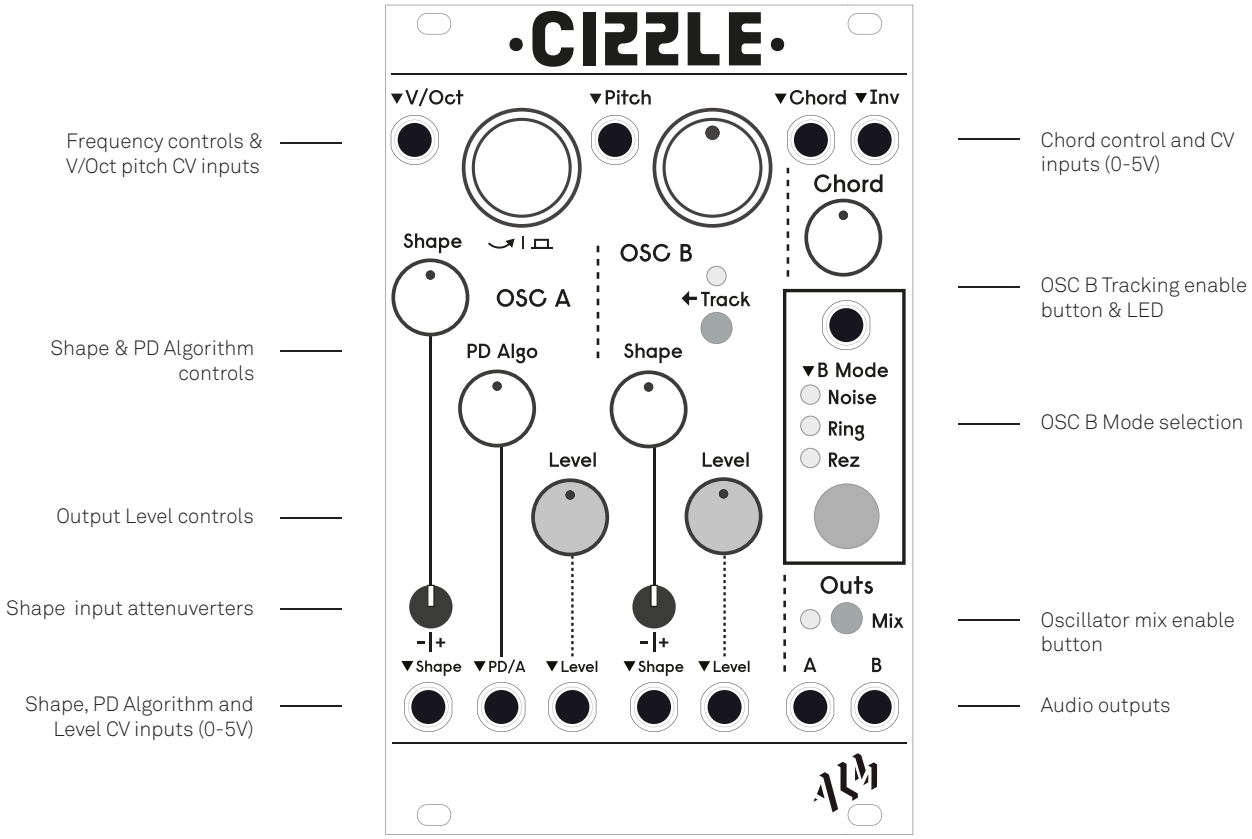
- Dual phase distortion VCO with direct and voltage controlled parameters.
- Easy, quick and accurate tuning via an encoder control.
- 9 morphing phase distortion 'Algorithms' (Osc A) with direct and CV control.
- PD Offset 'Shape' with direct and CV control.
- Unique CZ resonance waveform (Osc B) with direct and CV control.
- Multiple Osc B modes; Rez, Ring Mod, and Noise based on classic CZ synthesis.
- Mode switchable via direct and trigger control.
- Optional Osc B frequency tracking of Osc A with offset.
- Voltage controlled chord mode with inversion and up to 8 voices.
- Dedicated oscillator output level VCAs.
- Separate dual or mixed outputs with stereo widening effect.
- Skiff friendly with reverse power protection.
- 2 Year Warranty.
- Made in England.

3 TECHNICAL SPECIFICATIONS

- Supply: +12V 65mA / -12V 25mA
- Size: 16HP
- Depth: 32mm

4 CORE OPERATION

4.1 Panel Layout



4.2 General Overview

The CIZZLE consists of a pair of digital oscillators - the primary oscillator A and secondary oscillator B. Both can be used independently but are primarily intended to be layered together, B optionally tracking the pitch of A, for rich and more interesting sounds, as is often the case with CZ synthesis. Oscillator A utilises various phase distortion algorithms to produce a wide range of classic CZ style waveforms and more. To compliment A, Oscillator B produces the classic CZ resonance waveform for faux analog squelch and also, via the mode control, optionally combines it with a ring mod type effect for complex bell or vowel like tones or mixes in a CZ style digital noise wave for mellow percussive textures.

The output level of each oscillator is controllable via built in digital VCAs with level controls. Each oscillator can be output independently or mixed together with the optional stereo output mode.

Finally a chord mode can be engaged for up to 4 voice chords from either oscillator (giving 8 voices in total).

Numerous CV and a trigger input allow for modulation of generated waveforms, levels, chord selection and mode.

4.3 OSC A and B Frequency Controls

The upper section of the module provides controls and inputs for setting the pitch of the two oscillators.

Oscillator A (the primary oscillator) uses an 'endless' clickable encoder to set its base frequency. By clicking the encoder the frequency increment cycles between octaves, semitones and cents (approx). Quickly double clicking the encoder initialises the base frequency to C3 (approx 261.63Hz) and returns to octave increments. Oscillator A's V/Oct pitch input is added to the base frequency set by the encoder.

Oscillator A's total range is approx 8 octaves *~32hz - ~8.3kHz*

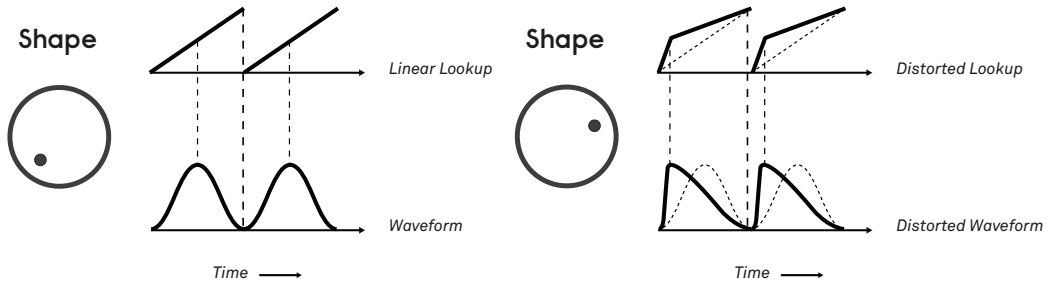
Oscillator B (the secondary oscillator) works in 2 modes: Standalone and tracking V/Oct or tracking OSC A with an optional semitone offset. In classic V/Oct mode the frequency knob sets OSC B's base frequency with the pitch input added to it and following the volts per octave standard. In tracking mode (enabled via the track button) OSC B instead follows the pitch of OSC A, with an optional -/+ 12 semitone offset set by both the Frequency Knob and any voltage at the pitch input. (1 volt now corresponds to approx 7 semitones)

In standalone mode, Oscillator B's Knob range is approx 3 Octaves *~32Hz - ~387Hz*. Turning the frequency knob full Counter Clockwise will produce a C. Its total range (with input voltage) is approx 6 octaves *~32hz - ~2kHz*

4.4 OSC A Shape Control

The waveform of OSC A is controlled by the combined settings of both its 'Shape' and 'PD Algo' controls. The 'Shape' control sets the 'amount' of phase distortion, starting from a pure sine wave when fully CCW, increasing to full timbral complexity when set to maximum.

Phase distortion works by distorting the usually linear wavetable lookup operation. With a sine wavetable, a linear phase lookup will produce a sine but by adding a variable 'kink' (or other more complex distortion) to the lookup function, various other waveforms can be produced.



The shape is set by the offset and associated CV input, with an attenuverter to attenuate and invert the CV.

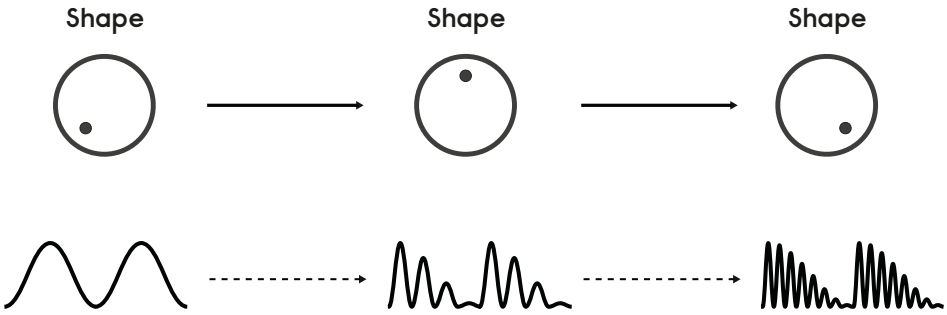
4.5 OSC A PD Algorithm

The 'PD Algo' control morphs continuously through 9 different phase distortion 'algorithms' (i.e lookup table distortion types) of varying complexity that determine the character of 'Shape' control's timbral sweep.

The PD Algorithm is set by the offset and associated PD/A CV input.

4.6 OSC B Shape Control

OSC B produces the classic CZ style resonance waveform intended for creating pseudo resonant filter sweeps. The 'Shape' knob and CV input control the sweep by setting the frequency of the resonance, starting from a pure sine wave when fully CCW. In practice this is used similarly to the cut off frequency control of a low pass filter.



The shape is set by the offset and associated CV input, with an attenuverter to attenuate and invert the CV.

4.7 OSC B Mode

The 'B Mode' button and associated LEDs select the operating mode for OSC B, acting like the line 'Modulation' section of CZ synthesizers. The 3 modes are as follows:

- *REZ* - Unmodulated, produces a pure resonant wave sweep. Like using a single Line with no modulation on the CZ.
- *RING* - Engages ring modulation between OSC A and OSC B, producing the result from OSC B's output. Like engaging Ring Mod between Lines 1+2 on the CZ.
- *NOISE* - Algorithmically blends digital noise modulation into the resonant waveform. The frequency of the noise is tied to both the OSC B frequency and Shape settings. Like using a single Line with noise modulation on the CZ.

The OSC B Modes are cycled through by either pressing the button or by a rising edge received at the associated trigger input.

4.8 OSC A and B Level Controls

Each oscillator's output is routed through a dedicated digital VCA with manual level control and CV input. When CV is inserted the associated level control functions as an attenuator for the CV.

4.9 Chord Controls

OSC A and B are each able to produce 4 voice chords simultaneously, with their fundamental frequencies setting the root note of the selected chord. The type of Chord is selected using the 'Chord' control and/or a control voltage at the associated Chord input.

The available chords are as follows:

- Octave (across 4 octaves)
- Fifth (across 2 octaves)
- Major Triad
- Major Triad chord IV (2nd inversion)
- Dominant 7th
- Major 7th
- Minor 7th
- Minor Triad
- Suspended 4
- Unison detune 1
- Unison detune 2
- Unison detune 3
- Unison detune 4

The selected chord may be inverted by applying a voltage to the chord 'Inv' input. Increasing the voltage increases the amount of inversion.

When chords are enabled a slight level drop occurs to compensate for an increase in dynamic range that chords may produce.

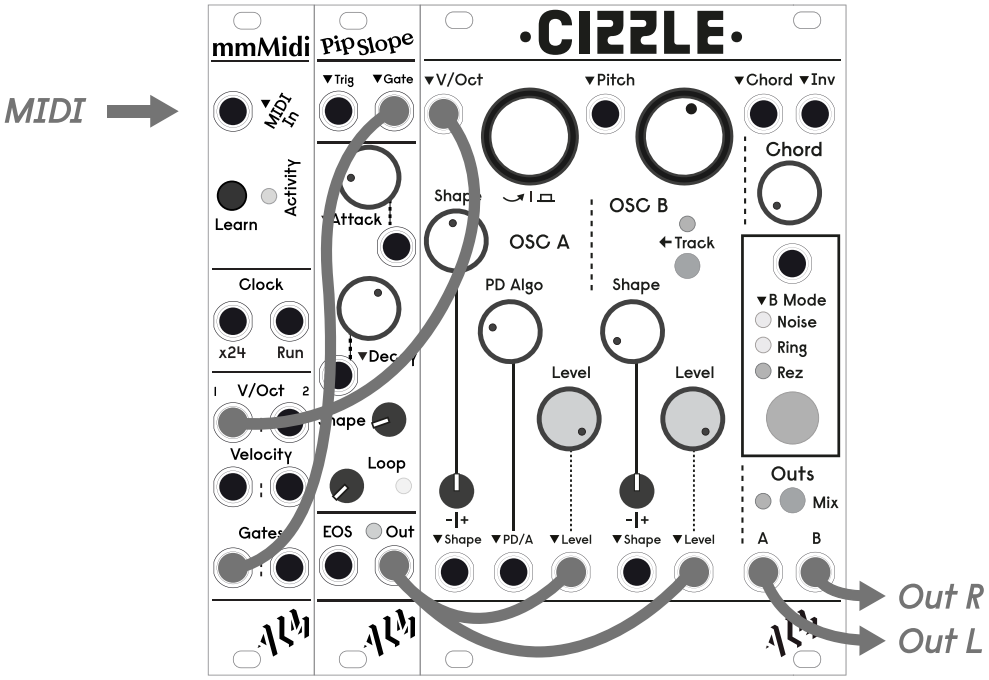
4.10 Output Mix Mode

By default OSC A and OSC B are output directly from the corresponding A and B outputs. Engaging the 'Mix' switch produces a mix of the two oscillators at both outputs, applying a subtle stereo widening effect to the result.

5 PATCH EXAMPLES

5.1 Stereo 'Reese' Bass Voice

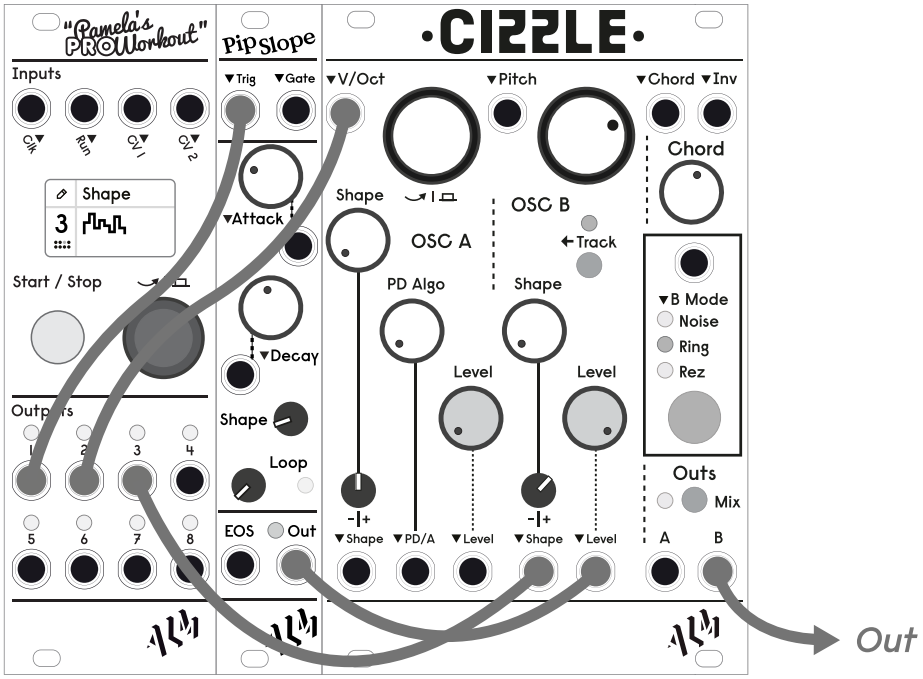
1. Engage the Mix switch and increase both Level controls.
2. Engage the OSC B Track switch and detune its frequency +/- 1 semitone from OSC A.
3. Patch a pitch CV to the OSC A V/Oct input and mult an envelope to both Level CV inputs.
4. Dial in the tone of both oscillators to taste using the Shape controls.



Tip: The 4 unison chords found at the end of the Chord control can be used as an alternative method for detuning.

5.2 Ring Modulated Chords

1. Increase the OSC B Level control and set the mode switch to 'Ring'.
2. Engage the OSC B Track switch and adjust its frequency to taste, emphasising different harmonics in the ring mod.
3. Select a chord with the Chord control.
4. Patch a pitch CV to the OSC A V/Oct input and an envelope to the OSC B Level CV input.
5. Patch random or smooth modulation to OSC B's Shape CV input to add unique tonal changes to the ring modulated chord voice.



Tip: For wider ranging more experimental ring mod sounds disengage the OSC B track switch, unlocking the two oscillator frequencies and allowing them to be set freely.

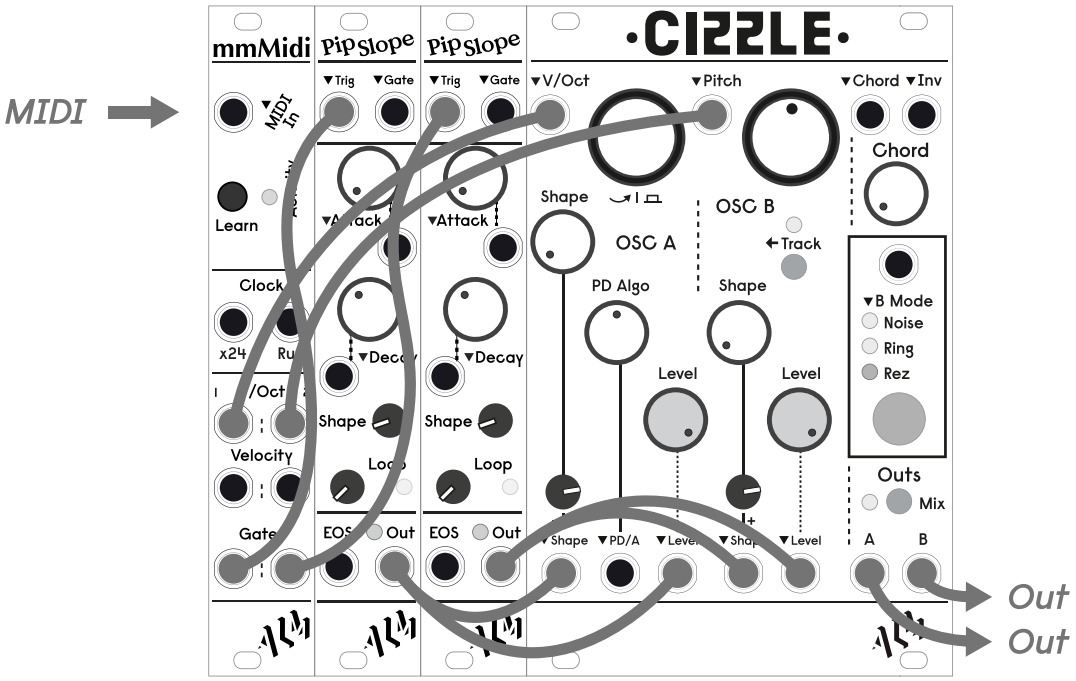
5.3 Dual Synth Voices

1. Increase both Level controls and tune the two oscillators to the same fundamental frequency.

2. Patch the first pitch CV to the OSC A V/Oct input and the second to the OSC B Pitch input (V/Oct).

3. Mult the first envelope to OSC A's Shape and Level CV inputs and the second envelope to OSC B's Shape and Level CV inputs.

4. Set the Shape attenuverters to taste to change the amount of timbral modulation for each voice.



Tip: The two voices can be independently patched for further processing or mixed together in stereo by engaging the Mix switch.

6 LIMITED WARRANTY

From the date of manufacture this device is guaranteed for a period of 2 years against any manufacturing or material defects. Any such defects will be repaired or replaced at the discretion of ALM. This does not apply to;

- Physical damage arising for mistreatment (i,e dropping, submerging etc).
- Damage caused by incorrect power connections.
- Overexposure to heat or direct sunlight.
- Damage caused by inappropriate or mis-use including physical 'modding'.
- Use of incorrect or non official firmware

No responsibility is implied or accepted for harm to person or apparatus caused through operation of this product. By using this product you agree to these terms.

7 SUPPORT

For the latest news, additional info, downloads and firmware updates please visit the ALM website at `http://busycircuits.com` and follow @busycircuits on twitter and instagram.

Questions? please visit `http://busycircuits.com/support` .

8 Appendix

8.1 Firmware update

With the unit unpowered, connect a USB cable from the port at the left side of the PCB (near the PD Algo knob) to a computer. The CIZZLE will appear as a standard removable storage device. Copy a valid firmware file to the root directory to update. When complete, CIZZLE will automatically eject once the update completed and is ready to use powered normally (any 'unmount' errors from the computer can be safely ignored).

8.2 II. V/OCT Calibration

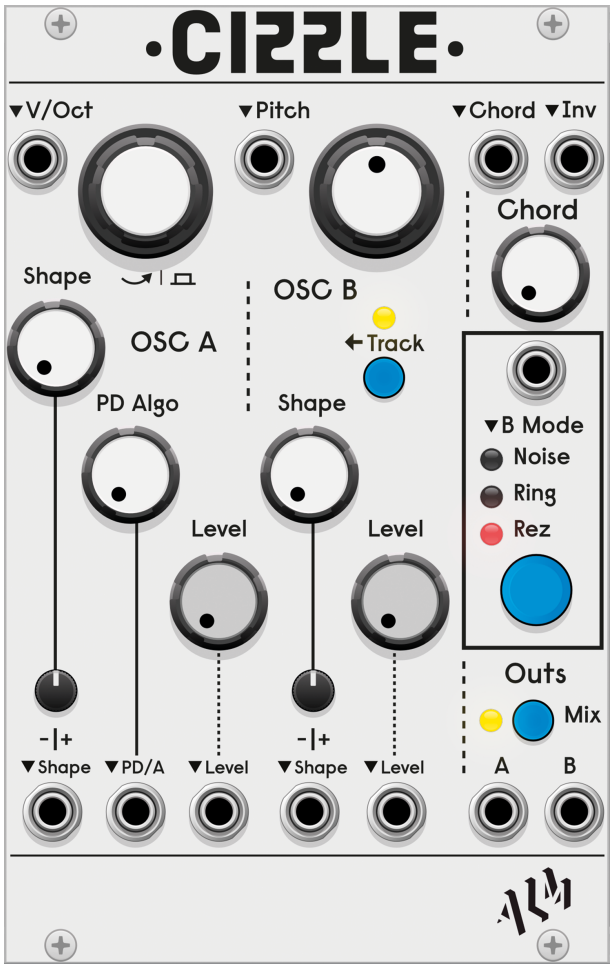
All CIZZLE shipped with the V/Oct expertly calibrated at the factory. If you wish to recalibrate, please follow instructions.

- With the CIZZLE powered off, turn all knobs full counter clockwise (CCW) to 0. Have all jacks unplugged.
- Power on the module with the encoder pressed down. The red and orange LEDs will be lit up.
- Patch 1V into both the OSC A V/Oct and OSC B V/Oct inputs. Click the encoder. The red and green LEDs will be lit up.
- Patch 3V into both the OSC A V/Oct and OSC B V/Oct inputs. Click the encoder. The orange and green LEDs will be lit up.
- Unpatch both V/Oct inputs. Turn OSC B frequency pot full CW. Click the encoder. The Calibration data will be saved and the Cizzle will reboot into normal function.
- If at any point all 3 of the Mode LEDs light up there is a calibration error, start the procedure over.

The ALM002 Beast's Chalkboard is recommended to be used to generate required precise voltage offsets (1V & 3V) for calibration. Alternatively Pams NEW or PRO workout can also be used by setting an outputs level parameter to 0% and then its offset parameter to 20% (1V) or 60% (3V).

8.3 III. VCV Rack Version

'VCV Rack' is an open-source cross-platform software based virtual modular environment. A fully featured emulation of the CIZZLE is now available for purchase via the VCV Rack store: `https://library.vcvrack.com/ALM042/`



The emulation runs identical core code and has the same user interface as the physical module. It does however additionally have a context menu.

8.3.1 Context menu controls:

Accessed by right-clicking module, the context menu allows for quick and immediate access to multiple internal functions. Standard VCV menu functions such as initialise, bypass and randomise behave as expected. The input range of the CV inputs can be selected between 10V and 5V.

Right clicking the encoder opens a small context menu for initialising and switching between Octave, Semitone and Cent increments, switching between increments can also be done by clicking the encoder as is done in the hardware.