Liber ex Doctrina

Sanguine Modules

MUTANTS

Liber version 2.3.0

Table of Contents

Sanguine Modules Mutants

It is our sincere hope these modules excite you as much as they did us when creating them and fuel all your musical ventures!

In a hurry? If you are looking for the instructions for a specific module, use the handy provided table of contents (it is clickable!). The base modules are presented in alphabetical order, followed by their alternative firmwares, if any are available.

The Modules

Aleae – Bernoulli Gates

A two channel randomizer for your voltages: whenever a trigger is received in one of the two inputs, a virtual coin is tossed, its results affecting the output in different ways.

This handy utility module is great for generative patches or adding movement to your existing one.

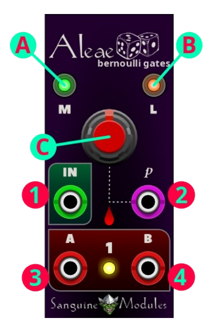
This module can be driven at audio levels to create a noise generator.

This module is polyphonic and will produce a different coin toss for every channel present in the input.

We aim for this module to serve your chaotic needs!

Based on Mutable Instruments' Branches.

The Controls



Aleae consists of two identical sections at the top and at the bottom, only the top section is pictured here.

Knobs and buttons

A. **COIN MODE**: this button selects between the two available "coin toss" modes:

- **Direct mode**: the LED in the coin mode button is lit green. Whenever a trigger is received, a virtual coin is tossed, if it lands on "heads" **OUTPUT A** (3) gets a trigger or gate (if **LATCH MODE** (B) is enabled); if the result is "tails" the trigger or gate goes to **OUTPUT B** (4).
- **Toggle mode**: the LED in the coin mode button is lit red. In this mode the outcome of the coin toss works as follows:
  - "Heads": continue sending the trigger to the same output it was being sent to after the last toss.
  - "Tails": the trigger is now sent to the opposite output until a new tails result is obtained.

  When the **PROBABILITY KNOB** (C) is set to its maximum value a trigger toggles between the two outputs.

B. **LATCH MODE**: this button toggles **LATCH MODE** on and off. When **LATCH MODE** is enabled the button glows orange.

When this mode is off and a trigger is received, a trigger is, in turn, sent to the output decided by the coin toss depending on the **COIN MODE** (A) setting.

When this mode is on, a gate is sent to one of the outputs and remains open (or high) until a trigger is received and a new output is selected, or this mode is disabled.

C. **PROBABILITY KNOB**: this knob changes the odds to obtain a particular result from the coin toss.

In **Direct mode** turning it all the way counter-clockwise makes every trigger go to **OUTPUT A** (3) ("heads") and turning it completely clockwise selects **OUTPUT B** (4) ("tails") every time.

In **Toggle mode** turning it all the way to the left makes every trigger go to **OUTPUT A** (3) and setting it to its maximum value to the right makes outputs switch on every coin toss.

Inputs and outputs

1. **Trigger input**: a trigger here makes the module throw a virtual coin and send a trigger or gate to one of the outputs depending on the result and your settings.

2. **Probability CV input**: change the odds of getting “heads” or “tails” along with the **PROBABILITY KNOB** (C).

3 and 4. Outputs: a 10V trigger or gate, depending on your **LATCH MODE** (B) settings, will be sent to one of these, according to the rules stated above, whenever a trigger is received in **Trigger input** (1).

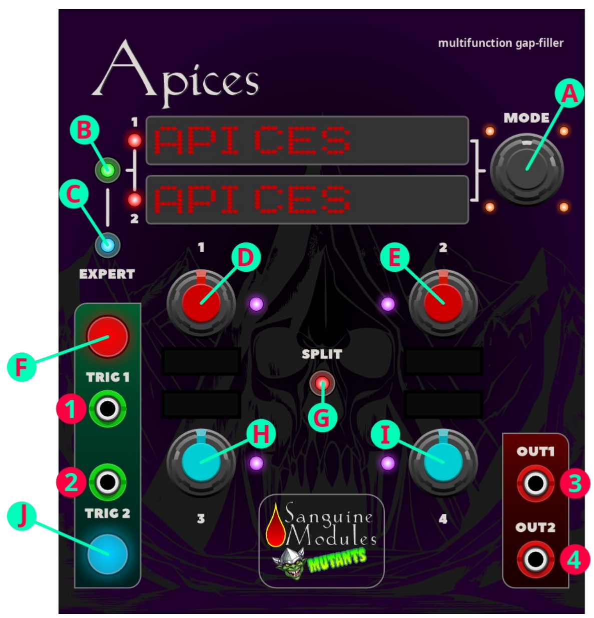
Apices – Multifunction Gap Filler

A two-channel multi-mode trigger/gate processor and noise maker. This fun module offers a lot of functionality that is made easier with our no holds barred interface. We hope this module can keep your beats kicking!

Based on Mutable Instruments' Peaks.

This manual covers basic operation; but some modes are better understood by connecting the module to a scope and experimenting with it.

The Controls



Knobs and buttons

A. **MODE:** selects one of the ten available modes for both channels or the currently selected channel (**EXPERT MODE** (B) and (C) dependent).

   The selected mode is displayed for each channel using one of the displays to the left of the **MODE** knob and the LEDs around it.

   The modes and their display are as follows (hardware "secret" modes are marked with "■" in the display; hardware "Easter-egg" modes are marked with "&", and hardware disabled modes enabled in Apices are marked with "@")

MODE	Display
Envelope	ENVELOPE
LFO	LFO
Tap LFO	TAP LFO
Drum generator	DRUM GENERAT
Sequencer	SEQUENCER■
Trigger delay/shaper	TRG. SHAPE■
Trigger stream randomizer	TRG. RANDOM■
Digital drum synth	DIGI. DRUMS■
Number station	NUMBER STAT&
Bouncing ball	BOUNCE BALL@

The different modes and how the knobs affect them are described in the **Module modes** section.

B. CHANNEL SELECT: selects between channels 1 and 2 when **EXPERT MODE** (C) is enabled, when it is disabled this button has no function.

The selected channel is shown using the red LEDs to the left of the mode displays: both LEDs are lit when **EXPERT MODE** is disabled, and either 1 or 2 blink using different rhythms when EXPERT is enabled to indicate the channel you are currently editing.

When **EXPERT MODE** is enabled this button glows either green or yellow depending on the channel selected for edition; the LEDs around **SPLIT** (G) (see below) change color, following this button, to show the channel the knobs are affecting.

C. EXPERT: enables and disables **EXPERT MODE**.

This module is quite versatile: when operating in standard mode (**EXPERT MODE** disabled) whatever mode you set using the knob is applied to both channels (indicated by both red LEDs next to the mode displays staying steadily lit). **EXPERT MODE** lets you control each channel independently, selecting modes and parameters separately for each one without affecting the other (check the Context menu section below for a note about the knobs).

When this mode is enabled the button glows blue and the **CHANNEL SELECT** button is ready for action, glowing either green or yellow depending on the channel selected for edition.

This mode offers complete, granular control of every parameter for each channel at the expense of complexity.

D, E, H, I: these red and blue knobs set the parameters for the currently selected mode and are dependent on it. The OLED displays adjacent to each knob display terse descriptions of which parameter a given knob affects and to which channels it applies, according to mode selections.

Examples:

- The module is set to standard mode (see above) twin (see below) LFO mode: the knob labeled “1” affects the Frequency for both channels and its display reads “1&2. Frequency”, while the knob labeled “3” affects the waveform variation for both channels and its display reads “1&2. Wave. Var.”.
- The module is set to standard mode (see above) **SPLIT** (G) (see below) Drum generation mode: the knob labeled “1” affects the tone for the bass drum in channel 1 and its display reads “1. BD Tone”, while the knob labeled “3” affects the tone for the snare drum in channel 2 and its display reads “2. SD Tone”.
- The module is set to **EXPERT MODE** (C) (see above); channel 2 is selected, and its mode is Envelope: all knobs affect only this channel and, in this case, the knob labeled “1” affects the envelope’s attack, its display reads “2. Attack”, and the knob labeled “3” affects the envelope’s sustain, it’s display reads “2. Sustain”.

F, J: manual triggers for channel 1 and 2, respectively.

G. SPLIT MODE: this button switches standard mode (see above) between twin and split modes. When **SPLIT MODE** is enabled this button glows red. It is disabled in **EXPERT MODE** (see above).

When the module is set to twin mode (**SPLIT MODE** red light is off) both red knobs and both blue knobs affect different parameters for both channels of the currently selected mode. The LEDs beside the knobs glow purple to show both channels are combined. In this mode you get more control over every parameter but less granularity between channels.

When the module is set to **SPLIT MODE** the button glows red, the red knobs affect parameters for channel 1 while the blue knobs affect parameters for channel 2. The LEDs next to the red knobs glow red to indicate those knobs affect channel 1 and the LEDs next to the blue knobs glow blue to convey those knobs affect channel 2. In this mode you get more granularity over channel parameters at the expense of less control over individual parameters. For complete control… use **EXPERT MODE**!

Inputs and outputs

1. **Trigger 1 input:** receives trigger signals for channel 1.
2. **Trigger 2 input:** receives trigger signals for channel 2.
3. **Channel 1 output:** emits channel 1 signals.
4. **Channel 2 output:** emits channel 2 signals.

The context menu

Apices offers the standard VCV Rack standard context menu with one addition:

- **Knob pickup (snap):** when using **EXPERT mode** and switching between the two channels the knobs immediately affect the parameters of the newly selected channel with their current positions. To prevent this and make the knobs affect the parameters of the newly selected channel only after they have been moved to their previous value within that channel enable this menu option (disabled by default).

Module modes

The OLED displays always show what the knobs affect in your selected configuration.

Whenever a trigger is mentioned below it refers to either a trigger from the jack input or a button press.

Modes are presented as they are displayed on the matrix display.

ENVELOPE

Your classic envelope generator. Triggers start and hold the envelope.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Attack	Ch. 1 Attack
Knob 2	Ch. 1 & 2 Decay	Ch. 1 Decay
Knob 3	Ch. 1 & 2 Sustain	Ch. 2 Attack
Knob 4	Ch. 1 & 2 Release	Ch. 2 Decay

LFO

A low-frequency oscillator for your all modulation needs. Triggers reset the waveform cycle.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Frequency	Ch. 1 Frequency
Knob 2	Ch. 1 & 2 Waveform, from left to right: • Sine • Linear slope • Square • Steps • Random	Ch. 1 Waveform
Knob 3	Ch. 1 & 2 Waveform variation: • Sine: wavefolder • Slope: Ascending / Triangle / Descending balance • Square: pulse-width • Steps: number of steps • Random: interpolation method	Ch. 2 Frequency
Knob 4	Ch. 1 & 2 Phase on restart	Ch. 2 Waveform

TAP LFO

A pair of low-frequency oscillators with tap tempo. Triggers set the period of the LFO oscillations. Apices can learn irregular trigger sequences.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Amplitude	Ch. 1 Waveform
Knob 2	Ch. 1 & 2 Waveform	Ch. 1 Waveform variation
Knob 3	Ch. 1 & 2 Waveform variation	Ch. 2 Waveform
Knob 4	Ch. 1 & 2 Phase on restart	Ch. 2 Waveform variation

DRUM GENERAT

A bass and snare drum generator. Triggers start the drum sounds.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Base frequency	Ch. 1 Tone
Knob 2	Ch. 1 & 2 Frequency modulation ("Punch" for BD, "Tone" for SD)	Ch. 1 Decay
Knob 3	Ch. 1 & 2 High-frequency content	Ch. 2 Tone

	("Tone" for BD, "Snappiness" for SD)	
Knob 4	Ch. 1 & 2 Decay	Ch. 2 Snappy

SEQUENCER

Just what it says on the tin.

In **TWIN** and **EXPERT** modes the module is a 4 step mini-sequencer with each knob controlling a step. **Channel 1** is clocked by **Trigger 1** and reset by **Trigger 2**; **Channel 2** is clocked by **Trigger 2**.

In **SPLIT** mode the module is a dual 2 step mini-sequencer. No reset is available and each channel has its own clock controlled by its respective trigger.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Step 1	Ch. 1 Step 1
Knob 2	Ch. 1 & 2 Step 2	Ch. 1 Step 2
Knob 3	Ch. 1 & 2 Step 3	Ch. 2 Step 1
Knob 4	Ch. 1 & 2 Step 4	Ch. 2 Step 2

TRG. SHAPE

Trigger delayer / shaper. A trigger starts a trigger/gate sequence as configured by the knobs.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Pre-delay	Ch. 1 Delay
Knob 2	Ch. 1 & 2 Gate duration	Ch. 1 Number of repeats
Knob 3	Ch. 1 & 2 Delay	Ch. 2 Delay
Knob 4	Ch. 1 & 2 Number of repeats	Ch. 2 Number of repeats

TRG. RANDOM

Trigger stream randomizer. Delay! Repeat! Burst! Get surprised! A trigger has a chance to start a burst of triggers as configured by the knobs.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Probability of accepting incoming triggers	Ch. 1 Acceptance/regeneration probability
Knob 2	Ch. 1 & 2 Probability of regenerating triggers after the delay	Ch. 1 Delay
Knob 3	Ch. 1 & 2 Delay time	Ch. 2 Acceptance/regeneration

		probability
Knob 4	Ch. 1 & 2 Jitter	Ch. 2 Delay

DIGI. DRUMS■

Synthesized FM drums! Synthesized FM drums! Get your FM drums here! A trigger starts the drum sound.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Frequency	Ch. 1 BD presets morphing
Knob 2	Ch. 1 & 2 FM intensity	Ch. 1 BD presets variations
Knob 3	Ch. 1 & 2 FM and AM envelope decay time[1]	Ch. 2 SD presets morphing
Knob 4	Ch. 1 & 2 Color. At 12 o'clock, no modification is applied to the oscillator signal. Turn right to increase the amount of noise (for snares). Turn left to increase the amount of distortion (for 909 style kicks).	Ch. 2 SD presets variations

NUMBER STAT&

Number station. A mode reminiscent of one of those mysterious number stations, it simulates a noisy AM receiver.

A trigger in **Trigger 1** generates one of several digital tones in **Channel 1**.

A trigger in **Trigger 2** generates a voice that speaks one of several different numbers in **Channel 2.**

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Frequency	Ch. 1 Frequency
Knob 2	Ch. 1 & 2 Variation probability	Ch. 1 Variation probability
Knob 3	Ch. 1 & 2 Noise	Ch. 2 Frequency
Knob 4	Ch. 1 & 2 Distortion	Ch. 2 Variation probability

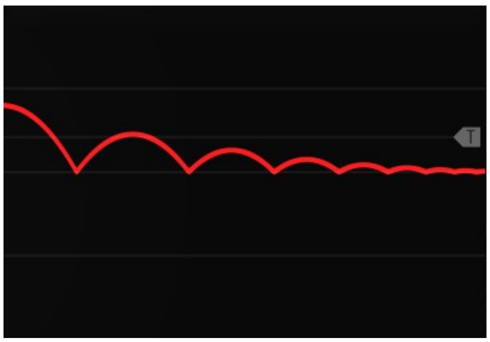
1 The FM envelope has a shorter decay than the AM envelope, but the two values are tied to this parameter.

BOUNCE BALL@

Bouncing ball mode. This envelope generator produces signals not unlike bouncing a ball in a basketball court.

Experiment with the parameters and an oscilloscope to get a feel (and visual representation) of how the different parameters affect the envelope.

A trigger throws the ball.



	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Gravity	Ch. 1 Gravity
Knob 2	Ch. 1 & 2 Bounce	Ch. 1 Bounce
Knob 3	Ch. 1 & 2 Amplitude	Ch. 2 Gravity
Knob 4	Ch. 1 & 2 Velocity	Ch. 2 Bounce

Parameters

- **Gravity:** how fast the ball drops to the ground: the further clockwise the knob is, the floatier the ball gets.
- **Bounce:** how much potential energy the ball keeps when falling to the ground. Setting the knob to high clockwise values can make your ball bounce forever (paired with a high gravity this can also make your ball bounce really high!).
- **Amplitude:** how much force is applied to the initial ball throw. The further the knob is counterclockwise the lower the ball starts when triggered. A fully counterclockwise knob means the ball doesn't get off the ground at all.
- **Velocity:** how much the ball travels forward initially. Lower, counterclockwise values, produce envelopes with an initial sharper peak.

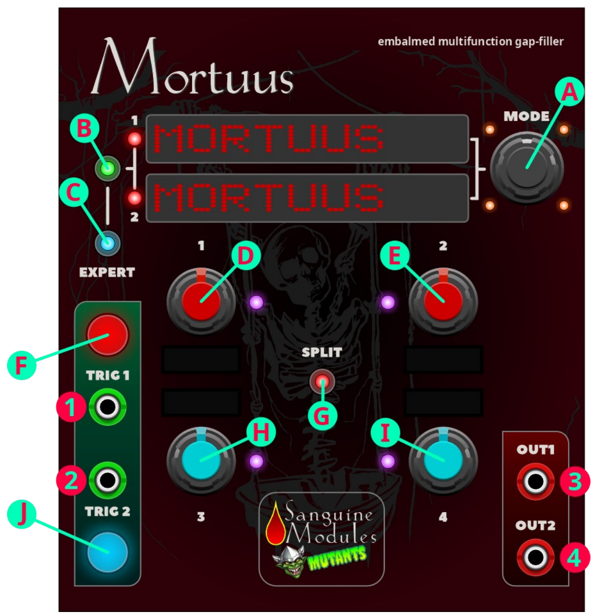
Mortuus – Embalmed multifunction gap filler

A reworked two-channel multi-mode trigger processor, envelope generator, LFO and noise maker with 25 different modes. This complex module puts a multitude of functions right on your fingertips. We hope this module can envelope your musical desires!

Based on the Dead Man's Catch firmware for Mutable Instruments' Peaks and the Cymbal patch for the alternative firmware.

This manual documents the changes Mortuus presents when stacked against the basic Apices module; for basic operating instructions and descriptions of the modes already present in Apices consult its manual.

The changes



- New algorithms have been added:
  - Double attack envelope.
  - Repeating attack envelope.
  - Looping envelope.
  - Randomized AD envelope.
  - Frequency modulated LFO.

    - Random frequency modulated LFO.
    - Varying wave shape LFO.
    - Random varying wave shape LFO.
    - Phase-locked loop oscillator.
    - Mod sequencer.
    - Turing machine.
    - Bytebeats.[2]
    - Cymbal.[3]
    - Randomized bass & snare drums.
    - Randomized hi-hat.
- The hi-hat is no longer available at the right extreme of the snare drum knobs: it has its own function now.

The module controls remain the same, and their letter or number reference has not been changed in the diagram above, if you need a refresher on their basic functions, check the manual for Apices.

A list of all the modes, old and new; their display name; a description of their parameters, and how the knobs alter them follows.

Mode list

Original hardware basic modes have no extra markings in the display; original hardware “secret” modes are marked with “■”; original hardware “Easter-egg” modes are marked with “&”, and Dead Man’s Catch firmware (and variants) modes are marked with “#”.

The modes are presented in the order they are selected by the **Mode** knob (A).

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2 Many of these equations may not produce the result you expect!
In order to prevent the module from crashing VCV Rack some of them had to be modified to prevent divisions by zero.

3 Not available in the official Dead Man’s Catch firmware.

MODE	Display
Envelope	ENVELOPE
LFO	LFO
Tap LFO	TAP LFO
Drum generator	DRUM GENERAT
Double attack envelope	D. ATK. ENV#
Repeating attack envelope	R. ATK. ENV#
Looping envelope	LOOPING ENV#
Randomized AD envelope	RANDOM ENV#
Bouncing ball	BOUNCE BALL#
Frequency modulated LFO	FM LFO#
Random frequency modulated LFO	RND. FM LFO#
Varying wave shape LFO	V. WAVE LFO#
Random Varying wave shape LFO	R.V.W. LFO#
Phase-locked loop oscillator	P.L.O#
Sequencer	SEQUENCER■
Mod Sequencer	MOD SEQ.#
Trigger delay/shaper	TRG. SHAPE■
Trigger stream randomizer	TRG. RANDOM■
Turing machine	TURING#
Bytebeats	BYTE BEATS#
Digital drum synth	DIGI. DRUMS■
Cymbal	CYMBAL#
Randomized bass and snare drum generators	RANDOM DRUM#
Randomized hi-hat	RAND. HIHAT#
Number station	NUMBER STAT&

Module modes

Only modes new to Mortuus are explained here, for an explanation of modes already present in Apices consult its manual.

The modes are presented as they appear in the display so parameters can be consulted quickly.

Whenever a trigger is mentioned below it refers to either a trigger from the jack input or a button press.

A lot of insight can be obtained by looking at the output of the modes through an oscilloscope.

D. ATK. ENV#

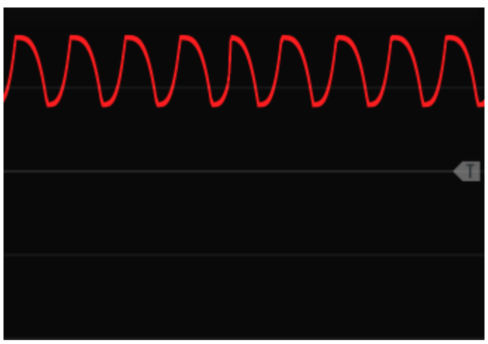
An ADSAR (Attack-Decay-Sustain-Attack-Release) envelope: the attack stage is engaged when the gate signal rises and also when the gate signal falls.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Attack	Ch. 1 Attack
Knob 2	Ch. 1 & 2 Decay	Ch. 1 Decay
Knob 3	Ch. 1 & 2 Sustain	Ch. 2 Attack
Knob 4	Ch. 1 & 2 Release	Ch. 2 Decay

R. ATK. ENV#

This mode repeats the Attack-Decay phases whenever the Decay phase reaches the sustain level and the gate is high.

This produces a series of peaks like in the image below, obtained using short Attack and Decay phases:



The Sustain parameter controls when a new Attack phase begins.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Attack	Ch. 1 Attack
Knob 2	Ch. 1 & 2 Decay	Ch. 1 Decay
Knob 3	Ch. 1 & 2 Sustain	Ch. 2 Attack
Knob 4	Ch. 1 & 2 Release	Ch. 2 Decay

LOOPING ENV#

This mode implements an ADR envelope that repeats itself indefinitely whenever the Release phase completes. There is no Sustain phase; the Sustain control sets the inflection point between the Decay and Release phases.

In this mode, triggers reset the cycle back to the start of the Attack phase.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Attack	Ch. 1 Attack
Knob 2	Ch. 1 & 2 Decay	Ch. 1 Decay
Knob 3	Ch. 1 & 2 Sustain	Ch. 2 Attack
Knob 4	Ch. 1 & 2 Release	Ch. 2 Decay

RANDOM ENV#

This mode implements an AD envelope with random variations in amplitude (at the peak of the Attack phase) and Decay time.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Attack	Ch. 1 Attack
Knob 2	Ch. 1 & 2 Decay	Ch. 1 Decay
Knob 3	Ch. 1 & 2 Amplitude variation	Ch. 2 Attack
Knob 4	Ch. 1 & 2 Decay time variation	Ch. 2 Decay

FM LFO#

This mode's presents an LFO that can be frequency modulated by an internal foldable sine wave.

Frequency modulation parameters set in **TWIN** or **EXPERT** modes continue applying in **SPLIT** mode.

Triggers reset the phase of both the LFO and its internal modulator.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 LFO base frequency	Ch. 1 LFO base frequency
Knob 2	Ch. 1 & 2 LFO wave form preset Left to right: • Sine • Triangle • Sawtooth • Square • Stepped triangle • Random/noise	Ch. 1 LFO wave form preset
Knob 3	Ch. 1 & 2 LFO FM frequency	Ch. 2 LFO base frequency
Knob 4	Ch. 1 & 2 FM depth • CCW pure sine wave modulation • CW folded sine wave modulation	Ch. 2 LFO wave form preset

RND. FM LFO#

This mode is mostly the same as **FM LFO#**; but random values are used to modulate the LFO instead of a sine wave. The LFO wave form presets are the same.

	Knobs	
	TWIN & **EXPERT**	**SPLIT**
Knob 1	Ch. 1 & 2 LFO base frequency	Ch. 1 LFO base frequency
Knob 2	Ch. 1 & 2 LFO wave form preset	Ch. 1 LFO wave form preset
Knob 3	Ch. 1 & 2 LFO FM frequency (random sampling rate)	Ch. 2 LFO base frequency
Knob 4	Ch. 1 & 2 FM depth • CCW: linear random values interpolation • CW cosine interpolation of random values	Ch. 2 LFO wave form preset

V. WAVE LFO#

This LFO can be modulated by an internal wave shaper, it also offers different wave forms than those of the standard and FM LFOs.

Frequency modulation parameters set in **TWIN** or **EXPERT** modes continue applying in **SPLIT** mode.

Triggers reset the phase of both the LFO and its internal modulator.

	Knobs	
	TWIN & **EXPERT**	**SPLIT**
Knob 1	Ch. 1 & 2 LFO base frequency	Ch. 1 LFO base frequency
Knob 2	Ch. 1 & 2 LFO wave form preset • Folded sine • Power-folded sine • Overdriven sine • Triangle/sawtooth/ramp • Square (with pulse-width set table)	Ch. 1 LFO wave form preset
Knob 3	Ch. 1 & 2 Wave shaper frequency	Ch. 2 LFO base frequency
Knob 4	Ch. 1 & 2 Wave shaper depth	Ch. 2 LFO wave form preset

R.V.W. LFO#

This mode is functionally identical to the **V. WAVE LFO#** mode described above; but for one important difference: random values are used to modulate the wave shape instead of a sine wave.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 LFO base frequency	Ch. 1 LFO base frequency
Knob 2	Ch. 1 & 2 LFO wave form preset	Ch. 1 LFO wave form preset
Knob 3	Ch. 1 & 2 Wave shaper frequency (sampling rate)	Ch. 2 LFO base frequency
Knob 4	Ch. 1 & 2 Wave shaper depth • CCW: linear random values interpolation • CW cosine interpolation of random values	Ch. 2 LFO wave form preset

P.L.O#

This mode requires an external oscillator connected to the **TRIG 1** (F) or **TRIG 2** (J) inputs.

When a signal is connected to either or both of the inputs, Mortuus will try to follow the signal(s) present in the input(s). The channels work independently. Since the input ports are used for the tracked signal, triggers *will not* reset phase in this mode.

This mode works best with clean, regular, unfiltered wave forms.

This mode tracks the frequency; but not the phase of the input signals.

An audible “slew” can be heard when changing notes as Mortuus tracks frequencies. It’s similar to what portamento does on a Moog or Roland System 100.

The parameters set in **TWIN** or **EXPERT** modes continue applying in **SPLIT** mode.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Frequency divider/multiplier • CCW Lower octaves (up to 4 octaves below the input signal) • CW Increase octaves (up to 3 octaves above the input signal)	Ch. 1 Frequency divider/multiplier
Knob 2	Ch. 1 & 2 LFO wave form preset • Folded sine • Power-folded sine • Overdriven sine • Triangle/sawtooth/ramp	Ch. 1 LFO wave form preset

	• Square (with pulse-width set table)	
Knob 3	Ch. 1 & 2 Wave shaper frequency	Ch. 2 Frequency divider/multiplier
Knob 4	Ch. 1 & 2 Wave shaper depth	Ch. 2 LFO wave form preset

MOD SEQ.#

This mode is quite similar to the original **SEQUENCER■** mode; but it offers 8 steps instead of 4.

Steps 5 to 8 are the complements of steps 1 to 4; for example if step 2 is set to 4V; step 6 will be -4V.

Clock and reset work the same as in Apices' **SEQUENCER■** mode: in **TWIN** and **EXPERT** modes **TRIG 1** (F) clocks channel 1 and **TRIG 2** (J) resets channel 1 and clocks channel 2; in **SPLIT** mode there is no reset and each channel is clocked independently.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Voltage for steps 1/5	Ch. 1 Voltage for steps 1/3
Knob 2	Ch. 1 & 2 Voltage for steps 2/6	Ch. 1 Voltage for steps 2/4
Knob 3	Ch. 1 & 2 Voltage for steps 3/7	Ch. 2 Voltage for steps 1/3
Knob 4	Ch. 1 & 2 Voltage for steps 4/8	Ch. 2 Voltage for steps 2/4

TURING#

While the implementation present in Mortuus is not exactly the same as the original, it is still useful to be familiar with Tom Whitell's explanation of the Turing Machine.

Independent Turing Machines are available in each of Mortuus' channels.

Triggers on **TRIG 1** (F) advance the shift register for the channel 1 Turing Machine that outputs voltage on **OUT 1** (3); triggers on **TRIG 2** (J) advance the shift register for the Turing Machine in channel 2 and its voltage is output in **OUT 2** (4).

The mode retains parameters set in **TWIN** or **EXPERT** modes when operating in **SPLIT** mode.

A few key concepts:

- Probability

  The chance that a bit in the LSB (Least Significant Bit) portion of the shift register will be flipped.

  The further the knob controlling this parameter is to the left, the lower the probability.

The knob at the rightmost position sets the probability to 1: every bit is flipped on every step; this doubles the sequence length to a maximum of 64 steps.

Low probabilities tend to be the sweet spot.

- Span

  The range of voltages the Turing Machine will output: from 0 to 0 volts by setting the corresponding knob all the way to the left to 0 to 5 volts by setting the control to its rightmost position.

  Voltage is not quantized.

- Length

  The length of the shift register adjusted in 4 bit steps: 8 bits at the leftmost position of the appropriate knob to 32 bits when it is turned all the way to the right.

  Length controls how many steps are taken before the pattern loops.

- Clock division

  Controls how many triggers are required for the shift register to advance.

  When the knob is turned all the way to the left a ratio of 1:1 is set: every trigger advances the register; when it is set completely clockwise a ratio of 8:1 is imposed: 8 triggers are required for the shift register to advance one step.

	Knobs	
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Probability	Ch. 1 Probability
Knob 2	Ch. 1 & 2 Span	Ch. 1 Span
Knob 3	Ch. 1 & 2 Length	Ch. 2 Probability
Knob 4	Ch. 1 & 2 Clock division	Ch. 2 Span

BYTE BEATS#

This mode provides eight different “bytebeats” equations[4].

Information on bytebeats can be found here; attribution and links for the equations can be found in the source code for this module (in deadman_bytebeats.cc).

The knobs in this mode are inter-dependant.

---

4 All but equations 1-3 are altered from the original hardware firmware so VCV Rack doesn’t crash with divisions by zero; equation 6 ended up so mangled it can be used, mostly, as a weird LFO.
If you want to fix them, drop me a line: just finding and copying the originals won’t do: the problem stems mostly for trying to make them interact with the module knobs instead of having a bunch of static (and quiet considering the voltage standards...) boring set of predefined mathematical operations.

Knobs		
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 “Pitch”	Ch. 1 “Pitch”
Knob 2	Ch. 1 & 2 Parameter 0	Ch. 1 Parameter 0
Knob 3	Ch. 1 & 2 Parameter 1	Ch. 2 “Pitch”
Knob 4	Ch. 1 & 2 Equation select	Ch. 2 Parameter 0

CYMBAL#

A hi-hat modification with different parameters.

Knobs		
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Pitch	Ch. 1 Noise cross-fade
Knob 2	Ch. 1 & 2 Clipping level	Ch. 1 Decay
Knob 3	Ch. 1 & 2 Noise cross-fade	Ch. 2 Noise cross-fade
Knob 4	Ch. 1 & 2 Decay	Ch. 2 Decay

RANDOM DRUM#

This mode is similar to the regular **DRUM GENERAT**; but it offers controls to set random sound variations when advancing beats.

Knobs		
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Pitch	Ch. 1 Bass drum pitch
Knob 2	Ch. 1 & 2 Tone/decay time	Ch. 1 Bass drum tone/decay
Knob 3	Ch. 1 & 2 Pitch randomization	Ch. 2 Snare drum pitch
Knob 4	Ch. 1 & 2 Amplitude randomization	Ch. 2 Snare drum decay/”snap”

RAND. HIHAT#

A separate mode to implement the hi-hats that used to be to the “right” of the snare drums in Apices: they are no longer available in **DRUM GENERAT** mode if using Mortuus.

The hi-hats are no longer running at twice the sample rate, so they sound different.

The hi-hat in channel 1 is assumed to be closed and the one in channel 2 is deemed open; whether the settings reflect that is up to you; but keep in mind that they are meant to function in tandem: if trigger’s are received on both channel 1 and 2, channel 2 will inhibit channel 1 and only channel 2 will play. This is useful for sequences with accent outputs.

Knobs		
	TWIN & EXPERT	**SPLIT**
Knob 1	Ch. 1 & 2 Pitch	Ch. 1 Pitch
Knob 2	Ch. 1 & 2 Decay	Ch. 1 Decay

Knob 3	Ch. 1 & 2 Pitch randomization	Ch. 2 Pitch
Knob 4	Ch. 1 & 2 Decay randomization	Ch. 2 Decay

Mutants Blank – Rack sleekerizer

It’s not Mutable or Audible; but who doesn’t want a lovely goblin sitting on their Rack along with the Mutants logo?

Makes your Rack look sleek.

Mutants don’t control, like Machete don’t text.

Bypassing the module turns its lights off.

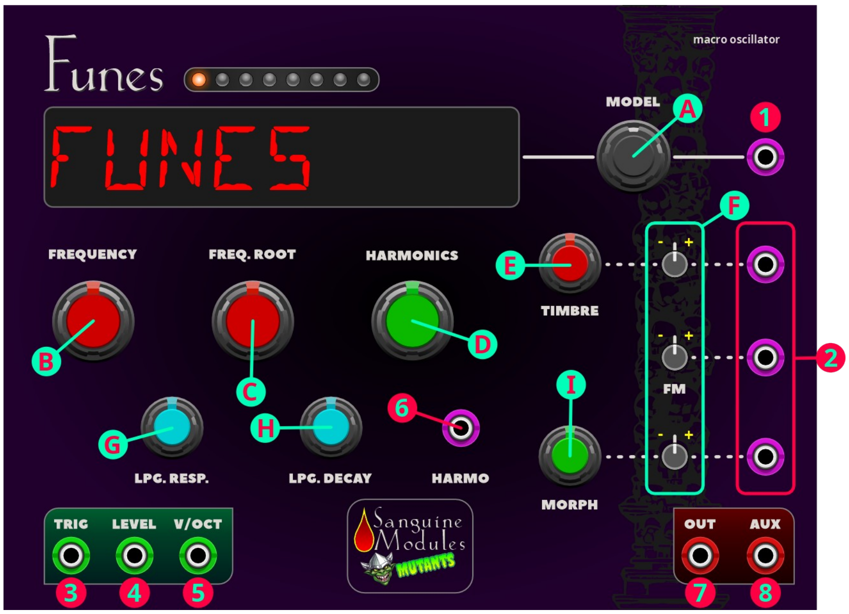
Funes – Macro oscillator

Featuring twenty four synthesis models that range from filtered classic wave shapes to synthetic hi-hats, Funes is a polyphonic macro oscillator that caters to your every musical need.

Funes is based on Mutable Instruments' well known macro oscillator "Plaits", with the last released firmware: 1.2.

This manual covers basic operation; but a lot of enjoyment comes from experimentation and discovery. Have fun!

The Controls



Knobs

A. **MODEL:** twist it back and forth to select the synthesis model. The available models are separated in three banks of eight.

   Each of the LEDs at the top represent one of the models and reflect both the selected model and the bank it's contained in using one of three colors.

   The model banks are separated as follows: pitched (green LEDs), noise/percussive (red LEDs) and new synthesis (orange LEDs). The character display uses an eight letter code to present your selection.

The available synthesis models are:

Model #	Model	Display	LEDs color	Note[5]
1	Classic wave shapes with filter.	FLTRWAVE	Orange	C0
2	Phase distortion and modulation	PHASDIST	Orange	C#0
3	6-operator FM 1	6 OP.FM1	Orange	D0
4	6-operator FM 2	6 OP.FM2	Orange	D#0
5	6-operator FM 3	6 OP.FM3	Orange	E0
6	Wave terrain synthesis	WAVETRRN	Orange	F0
7	String machine emulation	STRGMACH	Orange	F#0
8	Chiptune	CHIPTUNE	Orange	G0
9	Pair of classic waveforms	DUALWAVE	Green	G#0
10	Waveshaping oscillator	WAVESHAP	Green	A0
11	Two operator FM	2 OP.FM	Green	A#0
12	Granular formant oscillator	GRANFORM	Green	B0
13	Harmonic oscillator	HARMONIC	Green	C1
14	Wavetable oscillator	WAVETABL	Green	C#1
15	Chords	CHORDS	Green	D1
16	Vowel and speech synthesis	VOWLSPCH	Green	D#1
17	Granular cloud	GR.CLOUD	Red	E1
18	Filtered noise	FLT.NOIS	Red	F1
19	Particle noise	PRT.NOIS	Red	F#1
20	Inharmonic string modeling	STG.MODL	Red	G1
21	Modal resonator	MODALRES	Red	G#1
22	Analog bass drum	BASSDRUM	Red	A1
23	Analog snare drum	SNARDRUM	Red	A#1
24	Analog hi-hat	HI-HAT	Red	B1

Synthesis models can also be selected directly using the context menu (see below).

Depending on the selected model, the module controls change different parameters.

For a more in depth explanation of the specific models and how the controls behave when they are selected, please refer to the Module Modes section.

B. **FREQUENCY** (coarse): its range can be adjusted using the “Frequency mode” item in the context menu. By default it is eight octaves (C0-C8). It also offers “Octaves” and “LFO” modes.

C. **FREQUENCY ROOT:** when “Octaves” is selected as the “Frequency mode” this knob controls the root note.

D. **HARMONICS:** model dependent tone control. In general it controls the frequency spread in the tone.

5 Only available when “C0 model modulation” is checked in the context menu.

E. **TIMBRE:** model dependent tone control. In general it controls the “darkness” of the tone.

F. **Attenuverters** for the **TIMBRE**, **FM** and **MORPH** CV inputs. When the **TRIGGER** (3) input is patched and the corresponding CV is left unpatched, the attenuverters adjust the modulation amount from the internal decaying envelope generator. So… be warned, if you disconnect a CV input and the **TRIGGER** (3) patched, any attenuverter value other than “0” will allow the internal envelope to take over.

G. **LOW PASS GATE RESPONSE:** controls the response of the internal low pass gate from VCFA (counter clockwise) to VCA (clockwise).

H. **LOW PASS GATE DECAY:** adjusts the ringing time of the internal low pass gate and the decay time of the internal envelope.

I. **MORPH:** model dependent tone control. In general it controls lateral timbral variations.

Inputs and outputs

1. **MODEL selection CV:** this input has two modes of operation that depend on your context menu selection:

    - **C0 model modulation (monophonic)** unchecked (default): when the input is patched, two or more LEDs (depending on polyphony) light up. The blinking LED indicates the central value (the selected model) while the steady LEDs indicate the currently active one for each polyphonic channel. The input voltage functions as an offset to the currently selected central value: negative voltages decrease it and positive voltages increase it. This behavior is the closest to the original “Plaits” with the addition of polyphony.

    - **C0 model modulation (monophonic)** checked: when the input is patched, the notes C0 to B1 select the current model. Selection is absolute and not influenced by the manually selected model.

    In both modes the display updates, by default, to reflect the currently active model for the first, if polyphonic, or only channel connected to the input. This behavior can be disabled in the context menu (see below).

2. **CV Inputs** for the **TIMBRE**, **FM** and **MORPH** parameters.

3. **TRIGGER:** serves four different purposes:

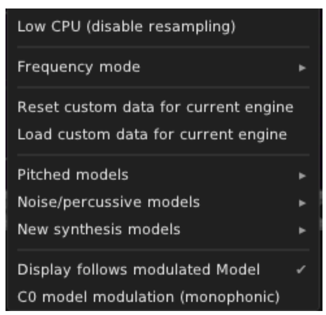
    - Triggers the internal decaying envelope generator.

    - Excites the physical and percussive models.

    - If the **LEVEL** input (4) is not patched, it strikes the internal low-pass gate.
    - Samples and holds the value of the **MODEL CV input** (1).

4. **LEVEL:** opens the internal low pass gate; it also acts as an accent control when triggering physical or percussive models.
5. **V/Oct:** controls the fundamental frequency of the produced sound, from -3 to +7 octaves relative to the root note set by the **FREQUENCY** (B) knob.
6. **CV Input** for the **HARMONICS** (D) parameter.
7. **OUT:** main output signal (model dependent).
8. **AUX:** carries a variant or by-product dependent on the **OUT** (7) output signal (model dependent).

The context menu



The Funes context menu offers the standard VCV Rack standard context menu with several additions:

- **Low CPU (disable resampling):** if your computer is struggling enabling this will save some CPU at the expense of sound quality.
- **Frequency mode:** sets the mode for the **FREQUENCY** (B) knob.
- **Reset custom data for the current engine:** some of the models in the “New synthesis models” bank allow the use of custom data. This menu option clears it and loads the built-in default.
- **Load custom data for current engine:** loads custom data for one of the following models:
    - 6-operator FM models.
    - Wave terrain synthesis.

- Wavetable synthesis.

  Data must be prepared as a .bin file using the editor available here:

  https://github.com/tobiza/Plaits-Editor/tree/8190119e5c0e06b495e46eef62d8ed5ce874b53b

  In order to use the editor you need to download the code and run it locally in your web browser (tested with Firefox).

- **Pitched models, Noise/percussive models and New synthesis models:** the items in the sub-menus directly select specific synthesis models.
- **Display follows modulated model:** when enabled, the LED display changes to reflect the model currently selected by the voltage present in the **MODEL CV input** (1). If you want the display to only reflect the model selected using the knob or don't like the effect, disable this option. Enabled by default.
- **C0 model modulation (monophonic):** when enabled, the selected model is changed by sending note voltage values to the **MODEL** CV input. Selection is absolute. This disables the default Plaits-like behavior and is monophonic only. Disabled by default.

Module Modes

The modes are presented with the name that appears on the display to make finding parameters easier.

FLTRWAVE

Classic wave shapes with filter.

Controls Knobs	
HARMONICS	Resonance and filter character: • CCW: gentle 24dB/octave • CW: harsh 12dB/octave
TIMBRE	Filter cutoff
MORPH	Waveform and sub level
Outputs	
OUT	LP output
AUX	12dB/octave HP output

PHASDIST

Phase distortion and modulation.

Controls Knobs	
HARMONICS	Distortion frequency
TIMBRE	Distortion amount
MORPH	Distortion asymmetry
Outputs	
OUT	Synchronized carrier (phase distortion)
AUX	Free running carrier (phase modulation)

6 OP.FM1, 6 OP.FM2, 6 OP.FM3

2 voice, 6 operator fm synthesizer. 3 models with banks of 32 presets each.

Controls Knobs	
HARMONICS	Preset selection
TIMBRE	Modulators level
MORPH	Envelope and modulation stretching / time travel.
Inputs	
TRIGGER	The two voices play alternatively when a trigger is received. If **TRIGGER** is not patched, a single voice plays as a drone and **MORPH** allows time travel along envelopes and modulations.
LEVEL	Velocity control (loudness or timbre, depending on preset).
Outputs	
OUT	Synchronized carrier (phase distortion)
AUX	Free running carrier (phase modulation)

WAVETRRN

Wave terrain synthesis. Use 2D maps as sound! Continuous interpolation between eight terrains.

Controls Knobs	
HARMONICS	Terrain
TIMBRE	Path radius
MORPH	Path offset
Outputs	
OUT	Direct terrain height (z axis)
AUX	Terrain height as phase distortion (sin(y+z))

STRGMACH

String machine emulation with stereo filter and chorus.

Controls Knobs	
HARMONICS	Chord
TIMBRE	Chorus/filter amount
MORPH	Waveform
Outputs	
OUT	Voices 1&3 predominantly
AUX	Voices 2&4 predominantly

CHIPTUNE

Four variable square voices or arpeggios.

Controls Knobs	
HARMONICS	Chord
TIMBRE	Arpeggio type or chord inversion
TIMBRE attenuverter	Envelope shape
MORPH	PW/Sync
Inputs	
TRIGGER	Arpeggiator clock
Outputs	
OUT	Square wave voices
AUX	NES triangle voice

DUALWAVE

Virtual-analog synthesis of classic waveforms.

Controls Knobs	
HARMONICS	Detuning between the two waves
TIMBRE	Variable square: from narrow pulse (CCW) to full square (12 o'clock) to hardsync formants (CW)[6]
MORPH	Variable saw: from triangle (CCW) to saw (12 o'clock) with an increasingly wide notch (Nodi's CSAW).[7]
Outputs	
OUT	Main signal
AUX	Sum of two hard sync'ed waveforms: shape is controlled by

6 A narrow pulse results in silence.
7 A wide notch results in silence.

	MORPH and detuned by **HARMONICS**

WAVESHAP

An asymmetric triangle processed by a wave shaper and a wave folder.

Controls Knobs	
HARMONICS	Wave shaping waveform
TIMBRE	Wave folder amount
MORPH	Waveform asymmetry
Outputs	
OUT	Main signal
AUX	Variant with different wave folder curve

2 OP.FM

Two sine oscillators modulating each other’s phase.

Controls Knobs	
HARMONICS	Frequency ratio
TIMBRE	Modulation index
MORPH	Feedback. Operator 2 modulates its own phase (past 12 o’clock: rough) or operator 1’s phase (before 12 o’clock: chaotic)
Outputs	
OUT	Main signal
AUX	Sub-oscillator

GRANFORM

A simulation of formants and filtered wave forms through the multiplication, addition and synchronization of sine wave segments.

Controls Knobs	
HARMONICS	Frequency ratio between formants 1 and 2
TIMBRE	Formant frequency
MORPH	Formant width and shape. Controls the shape of the window by which a sum of two synchronized sine oscillators is multiplied.
Outputs	
OUT	Main signal
AUX	Simulation of filtered wave forms by windowed sine waves. **HARMONICS** controls the filter type (peaking, LP, BP, HP).

HARMONIC

An additive mixture of harmonically related sines.

Controls Knobs	
HARMONICS	Frequency ratio between formants 1 and 2
TIMBRE	Formant frequency
MORPH	Formant width and shape. Controls the shape of the window by which a sum of two synchronized sine oscillators is multiplied.
Outputs	
OUT	Main signal
AUX	Simulation of filtered wave forms by windowed sine waves. **HARMONICS** controls the filter type (peaking, LP, BP, HP).

WAVETABL

Four banks of 8x8 wave forms, accessible by row and column. With or without interpolation.

Controls Knobs	
HARMONICS	Bank selection. The first 4 are interpolated banks (CCW); the next 4 are the same banks, in reverse order, without interpolation (CW). • Bank A: harmonically poor waveforms from additive synthesis (sine harmonics, drawbar organ wave forms) • Bank B: harmonically rich wave forms from formant synthesis or wave shaping • Bank C: wave tables from the Shruti-1 / Ambika, sampled from classic wave table or ROM playback synthesizers. • Bank D: a semi-random permutation of wave forms from the other 3 banks.
TIMBRE	Row index. Waves are sorted by spectral brightness in banks A-C
MORPH	Column index
Outputs	
OUT	Main signal
AUX	Low-fi (5 bit) output

CHORDS

Four note chords played by virtual analogue oscillators (emulating a stack of harmonically related square or saw tooth wave forms generated by vintage string & organ machines), or wave table oscillators.

Controls Knobs	

HARMONICS	Chord type. From left to right: • Octave • 5 • sus4 • m • m7 • m9 • m11 • 69 • M9 • M7 • M
TIMBRE	Chord inversions and transpositions
MORPH	Wave form. The first half of the knob goes through a selection of string machine like raw wave forms; the second half scans a small wave table with 16 wave forms.
Outputs	
OUT	Main signal
AUX	Root note of the chord

VOWLSPCH

A bunch of speech synthesis algorithms.

Controls **Knobs**	
HARMONICS	Crossfades between formant filtering, SAM and LPC vowels, then goes through several banks of LPC words.
TIMBRE	Species selection, from Daleks to chipmunks. This parameter shifts the formants up or down independently of the pitch, or underclocks/overclocks the emulated LPC chip (compensating to maintain pitch)
MORPH	Phoneme or word segment selection. When **HARMONICS** is past 11 o'clock, a list of words can be scanned by turning this knob or sending CV to its input
FM Attenuverter	Word intonation
MORPH Attenuverter	Word speed
INPUTS	
TRIGGER	Utter word
Outputs	
OUT	Main signal
AUX	Unfiltered vocal chords signal

GR.CLOUD

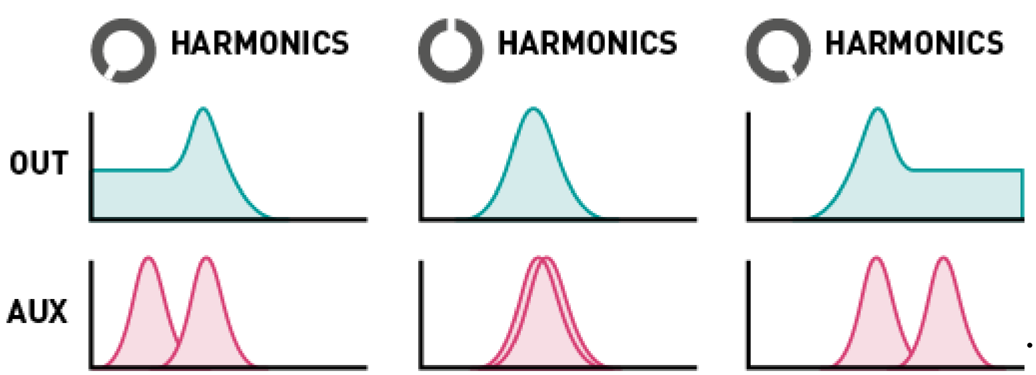
A swarm of 8 enveloped saw tooth waves.

Controls Knobs	
HARMONICS	Pitch randomization
TIMBRE	Grain density
MORPH	Grain duration and overlap. When fully CW, the grains merge into each other resulting in a stack of eight randomly frequency modulated wave forms
Outputs	
OUT	Main signal
AUX	Variant with sine wave oscillators

FLT.NOIS

Variable clock white noise processed by a resonant filter.

Controls Knobs	
FREQUENCY	Filter cutoff frequency
HARMONICS	Filter response: from LP to BP to HP
TIMBRE	Clock frequency
MORPH	Filter resonance
Inputs	
V/OCT	Filter cutoff frequency
Outputs	
OUT	Main signal
AUX	Variant with two band-pass filters. Their separation is controlled by the **HARMONICS** knob.



PRT.NOIS

Dust noise processed by networks of all-pass or band-pass filters.

Controls Knobs	
HARMONICS	Amount of frequency randomization
TIMBRE	Particle density
MORPH	Filter type: • Reverberating all-pass network before 12 o'clock • Increasingly resonant band-pass filters past 12 o'clock
Outputs	
OUT	Main signal
AUX	Raw dust noise

STG.MODL & MODALRES‡

A mini Rings[8]; please refer to the Rings manual at https://pichenettes.github.io/mutable-instruments-documentation/modules/rings/manual/ for more information about inharmonic string synthesis and modal resonators.

Controls Knobs	
HARMONICS	Amount of inharmonicity or material selection
TIMBRE	Excitation brightness and dust density
MORPH	Decay time (energy absorption)
Inputs	
TRIGGER	Excite the string or resonator. When this input is patched the string is excited by a short burst of filtered white noise or by a low-pass filtered click. When this input is not patched the string or resonator is excited by particle noise.
Outputs	
OUT	Main signal
AUX	Raw exciter signal

BASSDRUM‡

Analog bass drum. Behavioral simulation of the circuits from classic drum machines.

‡ This mode uses its own decay envelope and filter. The internal LPG is disabled for it. A **TRIGGER** input triggers the signal; but doesn't strike the LPG. When the **TRIGGER** input is patched, the **LEVEL** input works as an accent control.

8 The processor in the original hardware module is not as powerful as Rings', so this module is limited to 3 voices of polyphony in inharmonic string modeling mode, and 1 voice of polyphony with 24 partials in modal resonator mode. This module does not let you control the position of the excitation, which is set to 25% of the length of the string/bar/tube.

Controls Knobs	
HARMONICS	Attack sharpness and amount of overdrive
TIMBRE	Brightness
MORPH	Decay time
Inputs	
TRIGGER	When this input is not patched a continuous tone is produced.
Outputs	
OUT	Bridget T-network excited by shaped pulse
AUX	Frequency modulated triangle VCO turned into a sine with a pair of diodes, shaped by dirty VCA.

SNARDRUM‡

Analog snare drum. Like a marching band!

Controls Knobs	
HARMONICS	Balance of the harmonic and noisy components
TIMBRE	Balance between the different modes of the drum
MORPH	Decay time
Outputs	
OUT	Bridget T-networks, one for each mode of the shell, excited by a nicely shaped pulse, and some band filtered noise
AUX	Frequency modulated pair of sine VCOs, mixed with high pass filtered noise.

HI-HAT‡

Analog hi-hat. Metallic counter-point

Controls Knobs	
HARMONICS	Balance of metallic and filtered noise
TIMBRE	High-pass filter cutoff
MORPH	Decay time
Outputs	
OUT	6 square oscillators generating a harsh, metallic tone mixed with clock noise; sent to a high-pass filter and, finally, through a dirty transistor VCA.

‡ This mode uses its own decay envelope and filter. The internal LPG is disabled for it. A **TRIGGER** input triggers the signal; but doesn't strike the LPG. When the **TRIGGER** input is patched, the **LEVEL** input works as an accent control.

AUX	3 pairs of square oscillators ring modulating each other, sent through a clean, linear VCA.

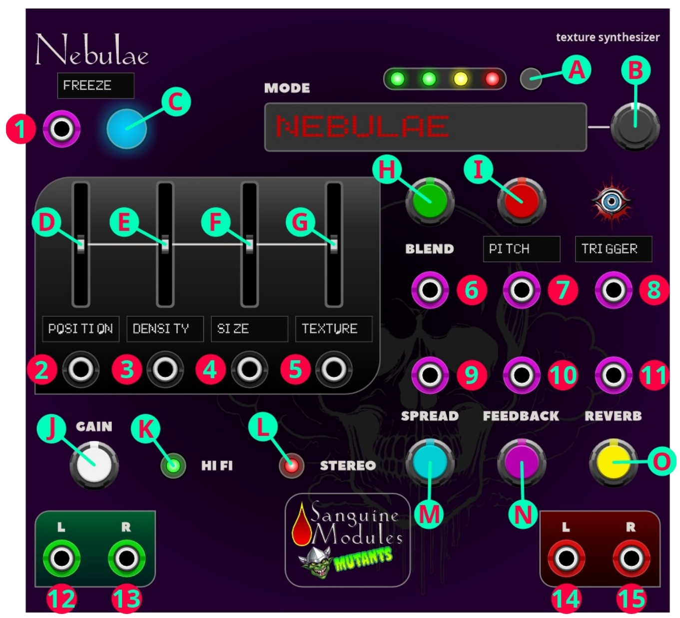
Nebulae – Texture synthesizer

An audio processor that combines multiple overlapping, delayed, transposed and enveloped sound fragments (grains) from a recording buffer.

Generate thick textures in real time from incoming audio signals.

Based on Mutable Instruments’ Clouds[9] and the Monsoon version of the hardware with standard firmware.

The Controls



Knobs and buttons

A. **LED MODE**: this button cycles between the different LED display modes:

- Input: a VU meter for the input signal.
- Output: a VU meter for the output signal.
- Modulation values: the LEDs reflect the value of the parameter knobs using different colors and intensities.

---

9 The ability to save audio buffers present in hardware is not available in Nebulae. Want to fix that? Drop me a line.

LED colors go from off for the minimum knob value to green, yellow and finally red for the maximum knob value.

The LEDs represent, from left to right the following knobs:

- Blend
- Spread
- Feedback
- Reverb

B. **MODE**: twist the knob around to select a mode for the module.

The selected mode is displayed on the matrix display to the left of the knob.

Modes can also be selected using the context menu.

MODE	Display
Granular mode	GRANULAR
Pitch shifter/time stretcher	STRETCH
Looping delay	LOOPING DLY
Spectral processor	SPECTRAL

Mode descriptions; an explanation of their parameters, and how the controls affect them are described in the Module modes section.

C. **FREEZE**: this button stops audio buffer recording and lets you manipulate or use the audio in the buffer for different purposes, depending on the selected mode. Its current function is displayed in the OLED display above the button. When this parameter is enabled the button glows blue.

This parameter can be controlled by a gate in the corresponding input (1).

D. **PARAMETER 1**: this slider controls a parameter for the selected mode. The OLED display below it displays its current function.

This parameter can be modulated with CV using the appropriate CV input (2). The LED in the slider control shows the current CV value: green for positive voltages and red for negative ones.

E. **PARAMETER 2**: this slider controls a parameter for the selected mode. The OLED display below it displays its current function.

This parameter can be modulated with CV using its corresponding CV input (3). The LED in the slider control shows the current CV value with the same rules that govern **PARAMETER 1** (D).

F. **PARAMETER 3**: this slider controls a parameter for the selected mode. The OLED display below it displays its current function.

This parameter can be modulated with CV using its CV input (4). The LED in the slider control shows the current CV value with the same rules that govern **PARAMETER 1** (D).

G. **PARAMETER 4**: this slider controls a parameter for the selected mode. The OLED display below it displays its current function.

This parameter can be modulated with CV using its appropriate CV input (5). The LED in the slider control shows the current CV value with the same rules that govern **PARAMETER 1** (D).

H. **BLEND**: this knob controls the dry/wet balance of the signal.

When rotating the knob, the LEDs above the **MODE** display briefly show the current value for this and the **SPREAD**, **FEEDBACK** and **REVERB** knobs.

This parameter can be modulated using the appropriate CV input (6).

I. **PARAMETER 5**: this knob controls a parameter for the selected mode. The OLED display below it displays its current function.

This parameter can be modulated with CV using its appropriate CV input (7).

J. **GAIN**: controls input gain for the audio signal present in the **L** and **R** inputs (12 and 13). You can check the value using the LEDs above the display.

K. **HI FI**: Nebulae offers two different resolutions for buffer recording:

- 16-bit: the button glows green. This is the default.
- 8-bit: the button is off.

This setting, along with **STEREO** (L) impact the length and quality of the recording buffer.

RESOLUTION	CHANNELS	BUFFER LENGTH
16-bit	Stereo	1 second
16-bit	Mono	2 seconds
8-bit	Stereo	4 seconds
8-bit	Mono	8 seconds

Nebulae uses a particular flavor of µ-law companding that makes 8-bit resolution sound more like a cassette or a Fairlight: less hiss, more distortion.

L. **STEREO**: Nebulae offers two different channel modes for buffer recording:

- Stereo: the button glows red. This is the default mode.
- Mono: the button is off.

Buffer channels, along with **HI FI** (K) impact the length and quality of the recording buffer, consult the table for **HI FI** (K) to get the exact numbers.

M. **SPREAD**: controls the amount of random stereo panning of the wet signal.

When spinning the knob, the LEDs above the **MODE** display briefly show the current value for this and the **BLEND**, **FEEDBACK** and **REVERB** knobs.

This parameter can be modulated using its corresponding CV input (9).

N. **FEEDBACK**: controls the amount of feedback applied to the wet signal.

When turning the knob, the LEDs above the **MODE** display briefly show the current value for this and the **BLEND**, **SPREAD** and **REVERB** knobs.

This parameter can be modulated using its corresponding CV input (10).

O. **REVERB**: controls the amount of reverb applied to the wet signal.

When twisting the knob, the LEDs above the **MODE** display briefly show the current value for this and the **BLEND**, **SPREAD** and **FEEDBACK** knobs.

This parameter can be modulated using its corresponding CV input (11).

Inputs and outputs

1. **FREEZE** gate input.

2-5. CV inputs for parameters 1 through 4.

6-7. BLEND and **PARAMETER 5** CV inputs.

8. **TRIGGER**: input for the Trigger parameter; the result of sending a trigger to this input varies depending on the selected mode.

9-11. CV inputs for the **SPREAD**, **FEEDBACK** and **REVERB** parameters.

12. **LEFT** audio input.

13. **RIGHT** audio input, normalized to the left channel.

14. **LEFT** audio output.

15. **RIGHT** audio output.

The context menu

The Nebulae context menu, in addition to the standard VCV Rack menu, offers one addition:

- **Mode**: module modes can be selected directly using the context menu.

Module modes

The OLED displays always show what the knobs and inputs affect in your selected configuration.

Modes are presented as they are displayed on the matrix display.

GRANULAR

This is the default mode for the module.

Textures are created by playing back short overlapping segments of the audio present in the buffer (grains).

Parameter/Input	Display	Function	Usage
FREEZE (Button A and input 1)	Freeze	Freeze	When the parameter is enabled, the module stops recording to the buffer and granularization happens on the last seconds of audio present in the buffer. Since live audio is no longer available, the output signal is routed through delays and all-pass filters while feedback builds up. This gives the sound a reverb like nature.
PARAMETER 1 (D)	Position	Grain position	Selects which part of the recording buffer grains are played from. Set the slider below the center mark to travel back in time.
PARAMETER 2 (E)	Density	Grain density	When the slider is in the center no grains are generated; set the slider above the center mark and will be sown randomly; set it below and grains will be played at a constant rate.

			The closer to the extremes the slider is, the higher the grain overlap.
PARAMETER 3 (F)	Size	Grain size	Grain size in milliseconds.
PARAMETER 4 (G)	Texture	Grain texture	Morph between various grain shape envelopes: • Square (boxcar) • Triangle • Hann window Setting the slider about ¼ above the middle marker activates a diffuser that smears transients.
PARAMETER 5 (I)	Pitch	Grain pitch	Transposes grains from the base frequency present at the audio source.
TRIGGER (8)	Trigger	Trigger	Generates a single grain. Setting the **Density** slider at the middle marker and sending triggers to this input lets you control the module like a micro sample player.

STRETCH

Similar to **GRANULAR**; this mode uses two carefully spliced, overlapping grains synchronized with the most salient period of the sound.

Parameter/Input	Display	Function	Usage
Stutter (Button A and input 1)	Stutter	Stutter	When this parameter is enabled and a trigger is received in the **Trigger** input, a clock synchronized loop is created.
PARAMETER 1 (D)	Scrub	Scrub audio buffer	Modulating this parameter when **Stutter** is enabled scrubs through the audio buffer.
PARAMETER 2 (E)	Diffusion	Diffusion	Creates a granular diffusion effect based on all-pass filters.
PARAMETER 3 (F)	Overlap	Overlap	Controls the size of the overlapping windows used for pitch shifting and time stretching: from an extremely grainy "drilling" sound to smooth bits of loops.
PARAMETER 4 (G)	LP/HP	Low-pass/ high-pass filter	Just what the “Function” column says.
PARAMETER 5 (I)	Pitch	Grain pitch	Transposes grains from the base frequency present at the audio source.
TRIGGER (8)	Trigger	Trigger	When **Stutter** is disabled, a trigger here creates a stuttering effect; when it is enabled; a clock synchronized loop is created.

LOOPING DLY

In this mode audio is continuously played back from the buffer without any granularization.

Parameter/Input	Display	Function	Usage
FREEZE (Button A and input 1)	Stutter	Stutter	When this parameter is enabled, the content of the audio buffer is looped (stutter).
PARAMETER 1 (D)	Time / Start	Head position	Controls the delay (the distance between the playback and recording heads)
PARAMETER 2 (E)	Diffusion	Granular diffusion	Creates a granular diffusion effect based on all-pass filters.
PARAMETER 3 (F)	Overlap / Duratn	Overlapping window size	Controls the size of the overlapping windows used for pitch shifting. Set the slider at the top for a smooth result that might smear transients; set it at the bottom for a grainy sound.
PARAMETER 4 (G)	LP/HP	Low-pass/ high-pass filter	Filters!
PARAMETER 5 (I)	Pitch	Grain pitch	Transposes grains from the base frequency present at the audio source.
TRIGGER (8)	Time	Delay time	When **Stutter** is disabled, trigger pulses here set the delay time (as long as it is shorter than the recording buffer); when **Stutter** is enabled, a trigger here creates a clock synchronized stuttering loop.

SPECTRAL

In this mode, input signals are converted into "frames" of spectral data that are stored, transformed, recombined, and resynthesized as time domain signals.

Parameter/Input	Display	Function	Usage
FREEZE (Button A and input 1)	Freeze	Freeze	Works in concert with the **Buffer** slider to select the input or output audio buffer. 2 to 7 buffers are laid across the **Buffer** slider, depending on the **HI FI** and **STEREO** quality settings. When **Freeze** is disabled, the **Buffer** slider selects the buffer that receives audio; when Freeze is enabled, the

			Buffer slider selects the buffer from which output is produced. By recording different buffers you are, in effect, creating a “wave table” off F.F.T. Slices that can interpolate between them.
PARAMETER 1 (D)	Buffer	Buffer select	Selects the current buffer to record or output from, depending on the **Freeze** state.
PARAMETER 2 (E)	FFT Upd. / Merge	F.F.T. Update and merge	This parameter determines how the results of the analyzer are passed to the resynthesizer. Setting the slider below the center line increases the probability that a given F.F.T. Won’t be updated, causing a sort of partial freeze. Setting the slider above the center line adjacent analysis frames are increasingly merged together. At extreme settings random phase modulation is applied to smooth things out.
PARAMETER 3 (F)	Polynomial	Polynomial coefficients	The polynomial determines how frequencies are mapped between the analysis and synthesis buffers. Spectral shifting and spectral reversal are performed over the course of the slider.
PARAMETER 4 (G)	Quantize / Parts	Spectral quantizer / weak partial amplifier	Setting the slider below the middle line increasingly quantizes the amplitudes of spectral components. Setting the slider above the middle line the module increasingly attenuates the strongest partials and amplifies the weakest, resulting in a noise like spectrum.
PARAMETER 5 (I)	Transpose	Transpose	This parameter controls pitch-shifting.
TRIGGER (8)	Glitch	Glitch audio	Triggers in this input create different frequency domain glitches associated with corrupted audio files. The effect considers the pulse length of

the trigger (or gate…) input.

Etesia – Spliced texture synthesizer

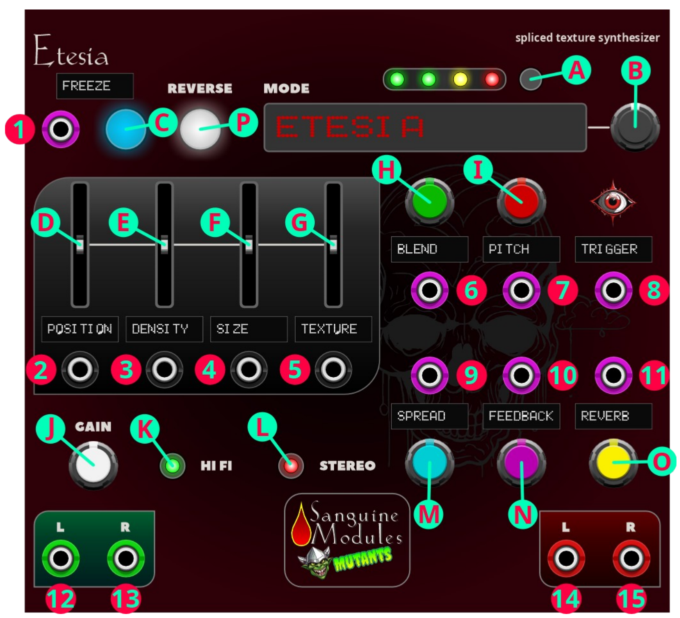
A reimagined audio processor, texture generator, reverberator and resonator.

Use your audio signals to generate thick textures; make them reverberate, or resonate at will.

Based on the Parasite firmware for Mutable Instruments' Clouds[10]; loaded in the Monsoon version of the hardware.

This manual documents the changes Etesia offers when compared with the Nebulae module; for basic operating instructions and descriptions of the modes already present in Nebulae consult its manual.

The changes



- Two new modes:
  - Oliverb
  - Resonestor
- More grain envelopes

10 The ability to save audio buffers present in hardware is not available in Etesia. Want to fix that? Drop me a line.

- Smaller grains available
- Asymmetrical grain envelopes
- Enhanced **Pitch shifter / time stretcher** and **Looping delay** modes
- **REVERSE** audio buffers for certain modes; this is controlled by the new button **REVERSE** (P). The button glows white when **REVERSE** is enabled and off when it is disabled. It is disabled by default.
- Some of the familiar modes produce different results due to the changes mentioned above and the fact that, internally, they use different tables.

Module controls and context menu remain the same (with the addition of the **REVERSE** (P) button and new OLED screens for familiar knobs: they control different parameters in the new modes). Their letter or number reference has not been changed in the diagram above, if you need a refresher on their basic functions, check the manual for Nebulae.

A list of all the modes, old and new; their display name; a description of their parameters, and how the knobs alter them follows; pertinent changes are noted per mode.

Mode list

MODE	Display
Granular mode	GRANULAR
Pitch shifter/time stretcher	STRETCH
Looping delay	LOOPING DLY
Spectral processor	SPECTRAL
Oliverb	OLIVERB
Resonestor	RESONESTOR

Module modes

Modes are presented as they are displayed on the matrix display.

Updated or new parameters are indicated by a different background color in the tables below.

GRANULAR

This is the default mode for the module.

Textures are created by playing back short overlapping segments of the audio present in the buffer (grains).

Parameter/Input	Display	Function	Usage
FREEZE (Button A and input 1)	Freeze	Freeze	Same as in Nebulae.
PARAMETER 1 (D)	Position	Grain position	Same as in Nebulae.
PARAMETER 2 (E)	Density	Grain density	The response curve for this slider has been altered to access slowly sown grains more easily.
PARAMETER 3 (F)	Size	Grain size	Grain size in milliseconds. The range of the slider has been adjusted and can produce quite smaller grains: when the slider is at the bottom grains are barely hearable spikes; when the slider is at the top the maximum size is as it was in Nebulae.
PARAMETER 4 (G)	Texture	Grain texture	Morph between various grain shape envelopes, with new, asymmetric, ones: • Square • Ramp up • Ramp down • Triangle • Triangle with diffuser When the slider is at the lowest position, the square shape has particularly sharp edges and may click. This behavior is intended. If you don't want them, rise the slider a little.
PARAMETER 5 (I)	Pitch	Grain pitch	Same as in Nebulae.
TRIGGER (8)	Trigger	Trigger	Same as in Nebulae.
REVERSE (P)		Reverse playback	When this parameter is enabled, grains are played back in reverse.

STRETCH

Similar to **GRANULAR**; this mode uses two carefully spliced, overlapping grains synchronized with the most salient period of the sound.

Parameter/Input	Display	Function	Usage
Stutter (Button A and input 1)	Stutter	Stutter	Same as in Nebulae.
PARAMETER 1 (D)	Scrub	Scrub audio buffer	Modulating this parameter when **Stutter** is enabled scrubs through the audio buffer. When a clock is sent to **TRIGGER** (8)

			this slider becomes a clock divider/multiplier for the pre-delay: • Middle line position: the clock is used as is. • Above the middle line: clock is divided. • Below the middle line: clock is multiplied. Multiplication and division rates: • 1/16 • 3/32 • 1/8 • 3/16 • ¼ • 3/8 • ½ • ¾ • 1 • 3/2 • 2/1 • 3/1 • 4/1 • 6/1 • 8/1 • 12/1 Clock synchronization is more accurate when the **Overlap** slider is at the bottom position.
PARAMETER 2 (E)	Diffusion	Diffusion	Same as in Nebulae.
PARAMETER 3 (F)	Overlap	Overlap	Same as in Nebulae.
PARAMETER 4 (G)	LP/HP	Low-pass/ high-pass filter	Same as in Nebulae.
PARAMETER 5 (I)	Pitch	Grain pitch	Same as in Nebulae.
TRIGGER (8)	Trigger	Trigger	Same as in Nebulae.
SPREAD (M)	Spread	Spread	When **STEREO** (L) is disabled, this knob cross-fades between the left and right inputs. Needless to say, both inputs need to be connected for this to work. When **STEREO** (L) is enabled, this knob gradually swaps both output channels. When set at the rightmost position, it allows ping-pong delay

			effects: each time the sound is fed back the channels are reversed.

LOOPING DLY

In this mode audio is continuously played back from the buffer without any granularization.

Parameter/Input	Display	Function	Usage
FREEZE (Button A and input 1)	Stutter	Stutter	Same as in Nebulae.
PARAMETER 1 (D)	Time / Start	Head position	Controls the delay (the distance between the playback and recording heads). The slider has been tweaked to make obtaining very short delays easier. Delay time changes are faster.
PARAMETER 2 (E)	Diffusion	Granular diffusion	Same as in Nebulae.
PARAMETER 3 (F)	Overlap / Duratn	Overlapping window size	Controls the size of the overlapping windows used for pitch shifting. Set the slider at the top for a smooth result that might smear transients; set it at the bottom for a grainy sound. When **FREEZE** (A) is active and delay time is synchronized to an external clock, this slider controls the repeat time multiplication/division.
PARAMETER 4 (G)	LP/HP	Low-pass/ high-pass filter	Same as in Nebulae.
PARAMETER 5 (I)	Pitch	Grain pitch	Transposes grains from the base frequency present at the audio source. When the knob is at 0, pitch shifting is bypassed completely. This enhances delay quality.
TRIGGER (8)	Time	Delay time	Same as in Nebulae.
REVERSE (P)		Reverse	When **FREEZE** (A) and **REVERSE** (P) are enabled, the loop plays in reverse.

SPECTRAL

This mode has no parameter changes; but generated sounds are not the same as those produced by Nebulae due to this mode using different tables.

OLIVERB

This is a full-featured, CV controllable mode-less reverb.

This mode is mono in → stereo-out.

Parameter/Input	Display	Function	Usage
FREEZE (Button A and input 1)	Freeze	Freeze	When the parameter is enabled, the reverb is set to (near) infinite decay and the input is muted. No pitch shifting combined with a large **Size** (F) is the best way to use this.
PARAMETER 1 (D)	Pre-delay	Pre-delay	This controls the time it takes for the reverb to kick in after audio has been input (from 0 to about ½ second). When a clock is input at the **TRIGGER** (8) port, this slider becomes a clock divider/multiplier for the pre-delay: • Middle line position: the clock is used as is. • Above the middle line: clock is divided. • Below the middle line: clock is multiplied. Multiplication and division rates: • 1/16 • 3/32 • 1/8 • 3/16 • ¼ • 3/8 • ½ • ¾ • 1 • 3/2 • 2/1 • 3/1 • 4/1

			• 6/1 • 8/1 • 12/1
PARAMETER 2 (E)	Decay	Decay	The slider controls the reverb tail. When set near the top the signal is amplified and the reverb enters self oscillation.
PARAMETER 3 (F)	Size	Reverb size	The size of the emulated room: from a small resonator to a huge hall.
PARAMETER 4 (G)	Dampen LP-V Λ-HP	Reverb dampening	The slider controls reverb dampening: • From the bottom to the middle a low-pass filter is applied, simulating room absortion. • From the middle to the top a high pass filter is applied, this allows for unusual, crystalline effects.
PARAMETER 5 (H)	Dry/Wet	Dry/wet mix	Just what you expect from such a knob.
PARAMETER 6 (I)	Pitch	Pitch shift	When sound is fed back into the reverb, it can be pitch shifted up to -1 to +1 octaves, as controlled by this knob. When the knob is at 12 o’clock no pitch shifting is applied. Setting the knob to its rightmost position allows for shimmer effects. Size (F) has an effect on pitch shifting: the larger the room, the better the shift.
TRIGGER (8)	Clock	Clock	Clocks pre-delay time.
SPREAD (M)	Diffusion	Diffusion	Controls the amount of “smoothing” applied to the sound (via diffusers) each time it goes through the loop. The rightmost knob position produces a more dense, continuous sound; while the leftmost lets you hear the sound being repeated, like a multi-tap delay.
FEEDBACK (N)	Mod. Speed	Modulation speed	Each delay in the reverb can be individually modulated by 9 smoothed, random LFOs; this knob controls their speed; it ranges from ~1/100 Hz to ~100Hz. Modulation speed has no effect if the **Mod. Amount** (O) is set to 0.

REVERB (O)	Mod. Amount	Modulation amount	Controls the amount of modulation from the LFOs mentioned above to the delay time. Small modulations produce subtle choruses and ghost tones; large modulations random pitch shifts.

RESONESTOR

A dual voice, four part resonator with built-in capabilities for polyphonic Karplus-Strong plucked string synthesis.

When voices are switched parameter changes affect only the current voice: the last voice retains its parameters.

Parameter/Input	Display	Function	Usage
FREEZE (Button A and input 1)	Voice	Switch voice	When this parameter is enabled, the module switches the current voice and prevents further switches when triggers are received in the **TRIGGER** (8) port.
PARAMETER 1 (D)	Timbre	Timbre	Controls the timbre and duration of the noise burst. Below the middle line it will be longer and more dampened; above the middle line it will be shorter and higher in pitch. When set at the extremes the burst is inaudible: either too short or too dampened; this can be used to “mute” a voice.
PARAMETER 2 (E)	Decay	Decay	Decay time for the current voice. Setting the slider near the top makes decay infinite (you can play the voice like a traditional oscillator)
PARAMETER 3 (F)	Chord	Chord	Sets the chord for the current voice. The slider morphs gradually between the following: • Unison • Fat • Superfat • Fat power • Fat octave

			• Octaves • Power • Major • Major7 • Minor7 • Minor • Sus2 • Sus4 • Minor9 • Major9 • Minor11 • Major11 • Major11
PARAMETER 4 (G)	Filter LP-V Λ-BP	Filter	Controls the filter in the feedback loop of the resonator. When the slider is in the middle line no filtering is applied; below the middle line a low-pass with increasingly low cut-off frequencies is applied; above the middle line a band-pass filter at the frequency of the resonator, with increasingly high resonances, is applied.
PARAMETER 5 (H)	Distortion	Voice distortion	Randomly distorts the timbre of each of the voices. The leftmost position has the most modulation; but filters the noise out entirely, so there is no effect. The rightmost position leaves the noise unfiltered; but modulation is 0, so there is no effect. The juicy bits are found in between.
PARAMETER 6 (I)	Pitch	Voice pitch	Sets the base pitch for the current voice. At 12 o’clock pitch is A3 (220 Hz).
TRIGGER (8)	Burst	Burst	A trigger in this input switches the voice (if **FREEZE** (A) is disabled) and sends a short burst of noise to its resonator.
SPREAD (M)	Stereo	Stereo mix	Assigns each part and voice to an output (**L** (14) or **R** (15)).

			Setting the knob fully CCW sends each voice to a different output. At 12 o’clock voices are mixed equally for each output. Fully CW voice parts equally distributed to both outputs for a wide stereo effect.
FEEDBACK (N)	Harmonics	String harmonics	Simulates striking the harmonics on a string. Setting the knob at the leftmost position has no effect on the sound, at the rightmost position the 2nd harmonic will ring; at 12 o’clock the third, at 10 the fourth, etc.
REVERB (O)	Scatter	Scatter	Controls the random delay times before sound hits the resonator for the current voice. When used for string synthesis with a chord, this will give the impression that strings are being struck sloppily.

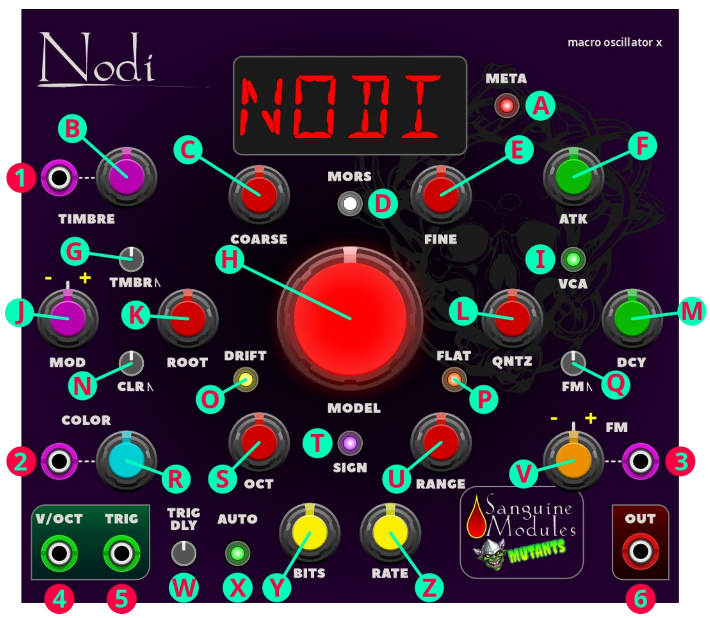
Nodi – Macro Oscillator X

A deep, powerful digital sound source featuring 47 synthesis models (and a fixed morse code generator). We hope this module can serve as your sonic army knife.

Nodi is based on Mutable Instruments' "Braids" module. The module includes the sub-oscillator modes from the 1.9 unreleased firmware.

Basic operation is covered in this manual; but playing around and experimenting with the module is sure to be rewarding.

The Controls



Knobs and buttons

A. META: controls the Meta-Modulation option.

When this option is enabled, the button glows red and voltage applied to the **FM CV input** (3) selects the currently active synthesis model. The voltage acts as an offset from the model selected by the **MODEL** (H) knob: negative voltages select lower models and positive voltages select higher models.

Discontinuities may be heard when switching models.

The currently selected model always appears in the LED display at the top.

When this option is disabled, the button is off and the **FM CV input** (3) does Frequency modulation, as you expect.

Disabled by default.

B. **TIMBRE**: controls the main evolution and motion of the timbre.

C. **COARSE**: controls oscillator tuning in big steps. Its range is affected by the **RANGE** (U) knob.

D. **MORS**: enables and disables the Morse code easter egg from the original module.

When this mode is enabled, the button glows white and excerpt from Pynchon's *The Crying of Lot 49* is output as Morse code.

The excerpt is the following:

The Scope proved to be a haunt for electronics assembly people from Yoyodyne. The green neon sign outside ingeniously depicted the face of an oscilloscope tube, over which flowed an ever-changing dance of Lissajous figures. Today seemed to be payday, and everyone inside to be drunk already. Glared at all the way, Oedipa and Metzger found a table in back. A wizened bartender wearing shades materialized and Metzger ordered bourbon. Oedipa, checking the bar, grew nervous. There was this je ne sais quoi about the Scope crowd: they all wore glasses and stared at you, silent. Except for a couple-three nearer the door, who were engaged in a nose-picking contest, seeing how far they could flick it across the room. A sudden chorus of whoops and yibbles burst from a kind of juke box at the far end of the room. Everybody quit talking. The bartender tiptoed back, with the drinks. What's happening? Oedipa whispered. That's by Stockhausen.

TIMBRE (B) controls the symbol duration, and **COLOR** (R) adds some background noise.

When this mode is disabled the button is off.

Disabled by default.

E. **FINE**: controls oscillator tuning in small steps: -1 to +1 semitones.

F. **ATK**: controls the attack of the internal VCA AD envelope.[†]

G. **TMBR |**: controls the amount of modulation from the internal AD to the **TIMBRE** (B)[†]

H. **MODEL**: Rock the big knob back and forth to select the synthesis model.

The knob lights up in different colors depending on the selected model.

† **VCA** (I) mode must be enabled for the AD envelope to function.

The model’s abbreviation is shown in the LED display at the top of the module. The available models are the following:

Model #	Model	Display
1	Quirky sawtooth	CSAW
2	Triangle to saw	/\\-_
3	Sawtooth wave with dephasing	//-_
4	Wavefolded sine/triangle	FOLD
5	Buzz	uuuu
6	Square sub	SUB-
7	Saw sub	SUB/
8	Square sync	SYN-
9	Saw sync	SYN/
10	Triple saw	//x3
11	Triple square	-_x3
12	Triple triangle	/\\x3
13	Triple sine	SIx3
14	Triple ring mod	RING
15	Saw swarm	////
16	Saw comb	//uu
17	Circuit-bent toy	TOY*
18	Low-pass filtered waveform	ZLPF
19	Peak filtered waveform	ZPKF
20	Band-pass filtered waveform	ZBPF
21	High-pass filtered waveform	ZHPF
22	VOSIM formant	VOSM
23	Speech synthesis	VOWL
24	FOF speech synthesis	VFOF
25	12 sine harmonics	HARM
26	2-operator phase-modulation	FM
27	2-operator phase-modulation with feedback	FBFM
28	2-operator phase-modulation with chaotic feedback	WTFM
29	Plucked string	PLUK
30	Bowed string	BOWD
31	Blown reed	BLOW
32	Flute	FLUT
33	Bell	BELL
34	Drum	DRUM
35	Kick drum circuit simulation	KICK
36	Cymbal	CYMB
37	Snare	SNAR
38	Wavetable	WTBL
39	2D wavetable	WMAP
40	1D wavetable	WLIN
41	4-voice paraphonic 1D wavetable	WTx4

42	Filtered noise	NOIS
43	Twin peaks noise	TWNQ
44	Clocked noise	CLKN
45	Granular cloud	CLOU
46	Particle noise	PRTC
47	Digital modulation	QPSK
48	Paques morse code◊	49

Synthesis models can also be selected directly using the context menu (see below).

Depending on the selected model, the module controls change different parameters.

For a more in depth explanation of the specific models and how the controls behave when they are selected, please refer to the Module Modes section.

I. **VCA**: enables and disables the internal AD.

When it is enabled, the button glows green and the AD envelope (controlled by **ATK** (F) and **DCY** (M) affects incoming or auto-generated triggers.

When it is disabled, the button is off and **TRIG** (5) works as a sync/reset input.

Disabled by default.

J. **MOD**: controls the amount and polarity of modulation applied to the **TIMBRE** (B) parameter, from the **TIMBRE CV** input jack (1).

K. **ROOT**: selects the root note the quantizer builds scales upon. For the quantizer to function **QNTZ** (L) must be set to a value other than "OFF".

The default value is "C".

L. **QNTZ**: enables quantization for **V/OCT** jack incoming voltages.

Voltages can be quantized to semitones or one of several available scales.

The selected scale flashes briefly in the LED display.

The available scales are the following:

Scale	Display
Off	OFF
Semitones	SEMI
Ionian	IONI
Dorian	DORI
Phrygian	PHRY

◊ This mode is only selectable using the **MORS** (D) button.

Lydian	LYDI
Mixolydian	MIXO
Aeolian	AEOL
Locrian	LOCR
Blues major	BLU+
Blues minor	BLU-
Pentatonic major	PEN+
Pentatonic minor	PEN-
Folk	FOLK
Japanese	JAPA
Gamelan	GAME
Gypsy	GYPS
Arabian	ARAB
Flamenco	FLAM
Whole tone	WHOL
Pythagorean	PYTH
1_4_Eb	EB/4
1_4_E	E /4
1_4_Ea	EA/4
Bhairav	BHAI
Gunakri	GUNA
Marwa	MARW
Shree	SHRI
Purvi	PURV
Bilawal	BILA
Yaman	YAMA
Kafi	KAFI
Bhimpalasree	BHIM
Darbari	DARB
Rageshree	RAGE
Khamaj	KHAM
Mimal	MIMA
Parameshwari	PARA
Rangeshwari	RANG
Gangeshwari	GANG
Kameshwari	KAME
Pa__Kafi	PAKA
Natbhairav	NATB
M_Kauns	KAUN
Bairagi	BAIR

B_todi	BTOD
Chandradeep	CHAN
Kaushik_todi	KTOD
Jogeshwari	JOGE

The default value is “OFF”.

M. **DCY**: controls the decay of the internal AD envelope generator.†

N. **CLR |**: controls the amount of modulation from the internal AD to the **COLOR** (R).†

O. **DRIFT**: when this mode is enabled, the button glows yellow and the oscillators drift, as if they were poorly designed.

When this mode is disabled the button is off and oscillators play nice.

Disabled by default.

P. **FLAT**: when this mode is enabled, the button glows orange and oscillators suffer from lower and higher frequencies detuning, to recreate some of the tuning imperfections of VCOs.

When this mode is disabled oscillators are like rulers.

Disabled by default.

Q. **FM|**: controls the amount of modulation from the internal AD to the **FM** (V).†

R. **COLOR**: controls a second dimension of sound. The specifics for this knob vary from model to model, consult each model’s description for more details.

S. **OCT**: transposes notes by octave (-2 to +2).

Default value is “0”.

T. **SIGN**: when this mode is enabled, the button glows purple and grungy glitches and imperfections are applied to the output signal.

When disabled, the button is off and your signals are clean. This is the default value.

U. **RANGE**: chooses the range of the **COARSE** (C) knob.

The current selected range flashes briefly in the LED display.

The available ranges are:

† **VCA** (I) mode must be enabled for the AD envelope to function.

- **EXT-**: adjusts the range of the **COARSE** (C) knob +/- 4 octaves around the note received on the V/Oct input. A consequence of this is that when no frequency CV signal is sent to the module (i.e. 0V: a very low note!) The **COARSE** (C) knob will have a bias towards low frequencies, something not always desirable. This is the default range.
- **FREE**: adjusts the range of the **COARSE** (C) knob to +/- 4 octave centered around C3 (261.5 Hz). This is the recommended setting when the module is used with no external signal on the V/Oct CV input.
- **XTND**: (extended) provides a larger frequency range, but disables accurate V/Oct scaling as a side effect.
- **440**: locks the oscillator frequency to 440 Hz precisely.

  Helpful for tuning another VCO.
- **LFO**: turns the oscillator into an LFO.

V. **FM**: When Meta-Modulation is disabled, this knob is a frequency modulation attenuverter that controls the amount and polarity of modulation applied to the frequency from the **FM CV input** jack (3).

When Meta-Modulation is enabled, this knob is an attenuverter that controls the amount and polarity of modulation applied to **MODEL** selection from the **FM CV input** jack (3).

W. **TRIG DLY**: applies a delay between the moment when a trigger is received and a note is "struck" on the physical models.

X. **AUTO**: when this mode is enabled, the button glows green and changes in the **V/OCT** (4) input larger than a semitone generate a trigger. This allows, for example, to excite the physical models or the internal AD generator by a note sequencer without gate outputs.

When this mode is disabled, the button is off and changes in the **V/OCT** (4) input are ignored for triggering purposes. An external trigger source connected to the **TRIG** input (5) is required to produce sound in some models. This is the default.

Y. **BITS**: selects the bit-depth of the data sent to DAC.

Z. selects the refresh rate of the DAC.[11]

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11 Do note that VCV Rack sampling rate affects this.
A handful of complex models are rendered internally at 48kHz (instead of 96kHz); so the difference between 48kHz and 96kHz might be non-existent for them.
Some of the simpler models are, conversely, rendered internally at 192kHz or 384kHz to reduce aliasing.

Inputs and outputs

1. **TIMBRE CV**: control voltage input for the **TIMBRE** (B).

   A value of 0V corresponds to the minimum position of the knob and a value of +5V to its maximum.

   This CV is offset by the knob's current position.

2. **COLOR CV**: control voltage input for the **COLOR** (R).

   A value of 0V corresponds to the minimum position of the knob and a value of +5V to its maximum.

   This CV is offset by the knob's current position.

3. **FM CV**: CV input for frequency modulation.

   The scale and polarity of this signal is set by the **FM** (V) attenuverter.

4. **V/OCT**: 1V/Oct frequency CV input.

5. **TRIG**: Trigger input; serves three purposes:

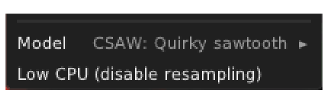
   a) Physical models need to be "excited" by an impulse on this input to produce a sound.

   b) The other models will treat triggers as reset signals, bringing the oscillators' phase to 0.

   c) This input can also be used to trigger an internal AD envelope applied to the parameters of your choice, to create sound animation and attacks without an external envelope module.

6. Signal output. Loudness of the output varies among the different synthesis models.

The context menu



I. **Model**: synthesis models (except for the Morse code "Easter egg" can be selected directly using the context menu instead of turning the knob.

II. **Low CPU**: if your computer struggles with this module, enabling this option can help (at the expense of sound quality).

Module modes

The modes are presented as they appear on the display to make finding parameters easier.

CSAW

Quirky saw. Inspired by a quirk/defect of the Yamaha CS80 saw tooth wave shape: a fixed-width “notch” after the raising edge.

Controls Knobs	
TIMBRE	Width of the notch
COLOR	Depth and polarity (good for phasing effects)

/\-_

Triangle to saw. Produces the classic waveform trajectory from triangle to saw tooth to square to pulse found in synthesizers such as the RSF Kobol or the Moog Voyager.

Controls Knobs	
TIMBRE	Sweep through the wave forms
COLOR	Morph through several tonal characters by increasingly removing the high-frequencies with a 1-pole filter, and recreating them with a wave shaper.

//-_

A blend of a saw tooth wave with dephasing control and a square wave with PWM.

Controls Knobs	
TIMBRE	Amount of dephasing or pulse width
COLOR	Morph the wave from saw tooth to square

FOLD

Sine and triangle oscillators sent through a wave folder.

Controls Knobs	
TIMBRE	Wave folder strength
COLOR	Balance between the sine and triangle waves

uuuu

A digital synthesis algorithm that generates a smooth sequence of wave forms.

Controls Knobs	
TIMBRE	Transition from sine wave to Dirac comb
COLOR	Detuning amount of the two blended wave shapes

SUB-

Square sub-oscillator.

Controls Knobs	
TIMBRE	Pulse width
COLOR	Steppiness

SUB/

Saw tooth sub-oscillator

Controls Knobs	
TIMBRE	Morph teeth
COLOR	Oscillator phase

SYN-, SYN/

Synthesis of the classic 2-oscillator hard-sync patches, with both oscillators emitting square or saw waves.

Controls Knobs	
TIMBRE	Interval between master and slave
COLOR	Oscillator balance

//x3, -_x3, /\x3, SIx3

Three saw tooth (or square, triangle, sine) oscillators that can be individually tuned.

Controls Knobs	
TIMBRE	Frequency of the third oscillator relative to the first. Quantized to musical intervals.
COLOR	Frequency of the second oscillator relative to the first. Quantized to musical intervals.

RING

Three sine wave oscillators ring-modulated together and colored by a wave shaper.

Controls Knobs	
TIMBRE	Frequency of the second sine wave relative to the first
COLOR	Frequency of the third sine wave relative to the first

////

A swarm of 7 saw tooth waves.

Controls Knobs	
TIMBRE	Saw tooth detuning
COLOR	High pass filter

//uu

Generate a saw tooth wave form and send it to a comb filter (tuned delay line).

Controls Knobs	
TIMBRE	Transposition of the delay line frequency
COLOR	Feedback amount and polarity

*TOY**

Traverse a space of timbres typical of circuit-bent electronic musical toys.

Controls Knobs	
TIMBRE	Toy’s clock rate
COLOR	Glitches or short-circuits on a converter or memory chip's data lines

ZLPF, ZPKF, ZBPF, ZHPF

Synthesize in the time-domain the response of a low-pass, peaking, band-pass or high-pass filter excited by classic analog wave forms. Rather.

This model aims at building the filtered wave shape from scratch.

The technique has been used in the Casio CZ or the Roland D series, but is extended here to cover different filter types and wave shapes.

Controls Knobs	
TIMBRE	Filter’s cutoff frequency
COLOR	Modifiy the wave shape: from saw to square to triangle.

VOSM

A combination of 3 oscillators arranged in a ring-modulation/hardsync patch to emulate formant synthesis. A technique named VOSIM and described by Kaegi and Tempelaars.

Controls Knobs	
TIMBRE	Relative frequencies of the 2 formants
COLOR	Relative frequencies of the 2 formants

VOWL, VFOF

Vowel sounds synthesizer.

VOWL recreates early computer speech synthesis.

VFOF is a simplified version of Rodet's FOF synthesis technique.

Controls Knobs	
TIMBRE	Vowel morphing between a, e, i, o, u
COLOR	Shifts the formants frequency

HARM

Additive synthesis by summing 12 sine harmonics.

Controls Knobs	
TIMBRE	Central frequency
COLOR	Distribution of the amplitudes of each of the harmonics around the central frequency

FM, FBFM, WTFM

Three different versions of 2-operator phase-modulation synthesis.

FM is a well-behaved implementation.

FBFM uses feedback from the carrier to itself to produce harsher tones.

WTFM uses two feedback paths, from carrier to modulator and carrier to itself to achieve droning, unstable tones.

Controls Knobs	
TIMBRE	Modulation amount
COLOR	Relative frequency interval between modulator and carrier

PLUK‡

Raw plucked string synthesis.

Controls Knobs	
TIMBRE	Damping
COLOR	Plucking position

BOWD‡

Bowed string modeling.

Controls Knobs	
TIMBRE	Friction level
COLOR	Bowing position

BLOW, FLUT

Reed or flute instrument model.

Controls Knobs	
TIMBRE	Air pressure
COLOR	Instrument geometry

BELL‡

Risset additive synthesis model to recreate the tone of a bell.

Controls Knobs	
TIMBRE	Sound dampening
COLOR	Sound inharmonicity

DRUM‡

A variant of the **BELL** model the uses different parameters (partials frequencies and amplitudes) to generate a sound reminiscent of a metallic drum.

‡ This mode needs to be excited by a trigger.

Controls Knobs	
TIMBRE	Dampening
COLOR	Brightness

KICK‡

Simulation of the TR-808 bass drum circuit.

Controls Knobs	
TIMBRE	Decay time
COLOR	Brightness

CYMB

Raw material for cymbal sound synthesis.

Controls Knobs	
TIMBRE	Band-pass filter cutoff
COLOR	Balance between droning sum of square waves and noise

SNAR‡

A simulation of the TR-808 snare drum circuit.

Controls Knobs	
TIMBRE	Balance between the two resonator modes ("tone")
COLOR	Amount of noise ("snappy")

WTBL

Classic implementation of wave table synthesis.

Controls Knobs	
TIMBRE	Sweep the wave table
COLOR	Select a wave table (20 available). Wave forms are interpolated when traveling through the same wave table; but not when switching among different ones

‡ This mode needs to be excited by a trigger.

WMAP

Two dimensional 16x16 wave table with 256 wave forms. Similar sounding waves forms are laid out adjacent to each other. X and Y are smoothly interpolated when scanning.

Controls Knobs	
TIMBRE	Scan the table in the X direction
COLOR	Scan the table in the Y direction

WLIN

One dimensional scanning through every Nodi wave table.

Controls Knobs	
TIMBRE	Move through the waves
COLOR	Interpolation method: • 7 o’clock: no interpolation • 10 o’clock: interpolate between samples but not waves • 12 o’clock: always interpolate Beyond 12 o’clock interpolation is applied between waves; but playback resolution decreases.

WTx4

Four voice variant of **WLIN**.

Controls Knobs	
TIMBRE	Morph through a small selection of 16 waves
COLOR	Select the harmonic structure between the 4 voices, from a predefined set of chords. At 7 o’clock all voices play the same note with a variable amount of detuning.

NOIS

Noise through a state variable filter.

Controls Knobs	
TIMBRE	Filter resonance
COLOR	Cross-fade between the low-pass and high-pass outputs of the filter

TWNQ

A "Twin Peaks" model that generates white noise and processes it with two band-pass filters (resonators). Both filters track the main frequency.

Controls Knobs	
TIMBRE	Q factor of the filters
COLOR	Filter spacing

CLKN

Generate random samples at a given rate determined by the main pitch control.

Controls Knobs	
TIMBRE	Periodicity of the generator (up to a 2 sample cycle)
COLOR	Quantization level (from 2 to 32 distinct values)

CLOU, PRTC

Granular synthesis models that create natural textures by mixing short grains of windowed sine waves (**CLOU**) or short decaying "pings" (**PRTC**).

Controls Knobs	
TIMBRE	Density and overlap of the grains
COLOR	Grain frequency randomization

QPSK

Generate, in the audio frequency range, the kind of modulated signals used in digital telecommunication systems.

A 16-byte synchronization frame is sent on every trigger or every 256 data bytes.

Controls Knobs	
TIMBRE	Bit-rate
COLOR	Sets an 8-bit value which is modulated into the carrier using QPSK modulation.

49

This “Easter egg” mode is described in depth in the **MORS** (D) section of the **Knobs and buttons** chapter.

Contextus – Resurgent Macro Oscillator X

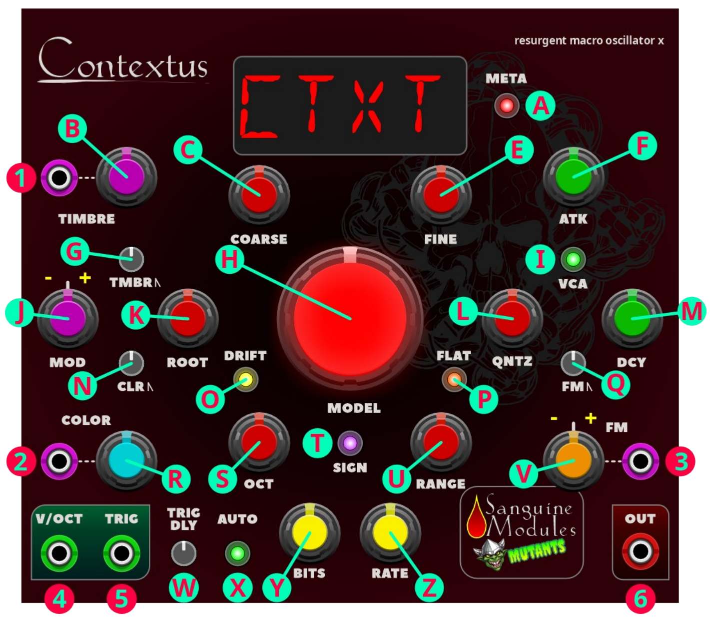
A remixed digital sound source featuring 57 synthesis models.

Contextus is based on the Renaissance firmware for the Mutable Instruments "Braids" module.

This manual documents the changes Contextus offers when compared to the basic Nodi module; for basic operating instructions and descriptions of the modes already present in the base Nodi module consult its manual in the appropriate section.

We hope this module grants you some really tasty and fat sounds!

The changes



- New algorithms have been added:
  - The Commodore 64 "Software Automated Mouth" (SAM) robotic text-to-speech algorithm.
  - Five diatonic chord algorithms.
  - Five "chord stack" algorithms.
- A few things have been removed:
  - The "Easter egg" Morse code is gone, along with the "MORS" button on the face plate.

    - QPSK algorithm.
- An algorithm was replaced:
    - WTx4 has been replaced with the WTCH, an algorithm that offers more features.
- Contextus differs from the hardware firmware in the following way:
    - The option to reverse the encoder knob is inaccessible: we wired the encoder properly.

The module controls and menus remain the same, and their letter or number reference has not been changed in the diagram above, if you need a refresher on their basic functions, check the manual for Nodi.

A description of the new synthesis modes and the parameters the knobs alter for them follows.

New module modes

The modes are presented as they appear on the display to make finding parameters easier.

SAM1, SAM2

The classic Commodore 64 robotic voice ready to be used in your rack!

Each SAM model contains 16 different words and is similar to a granular sampler.

A **TRIG** (5) makes SAM play the selected word starting at the current grain. In this case, the **V/OCT** (4) controls both the speed and pitch of the output.

The selected word can be scrubbed with the **TIMBRE** (B) knob. This way an envelope can control the speed without altering the pitch.

SAM1 and **SAM2** differ only in their word lists.

Controls Knobs	
TIMBRE	Scrub through the selected word; a fully CCW knob plays the first grain of the word while a fully CW knob plays the last
COLOR	Change the selected word

\\CH, -_CH, ΛCH, SICH, WTCH

Play diatonic chords using different wave forms (saw, square, triangle, sine and wave table).

When the quantizer (**QNTZ** (L) is disabled, this mode behaves like the WTx4 mode in the base Nodi module; but when it is enabled in one of the diatonic modes (dorian, eolian, etc.)

The chords stay in key and pick the correct major, minor or extension based on the selected scale and root note.

Controls Knobs	
TIMBRE	This parameter controls different aspects depending on the selected waveform: • **\\CH**: detuning between the 2 saw waves that make up each note • **-_CH**: pulse width of the square wave. • **/\CH, SICH**: the amount of wave folding to apply to each oscillator before summing • **WTCH**: morph between a small set of wave table entries. The wave table is the same as in the original WTx4 mode
COLOR	The function of this knob depends on the state of the quantizer: • Disabled: blend between 16 predefined chords • Enabled: control chord extensions

\\x6, -_x6, /\x6, SIx6, WTx6

6 oscillators starting at the **V/OCT** input (4), spaced evenly across the currently selected quantizer scale.

Controls Knobs	
TIMBRE	This parameter controls different aspects depending on the selected waveform: • **\\x6**: detuning between the 2 saw waves that make up each note • **-_x6**: pulse width of the square wave. • **/\x6, x6**: the amount of wave folding to apply to each oscillator before summing • **WTx6**: morph between a small set of wave table entries. The wave table is the same as in the original WTx4 mode
COLOR	The function of this knob depends on the state of the quantizer: • Disabled: control the space (in semitones) between the 6 oscillators • Enabled: control the number of scale steps between oscillators

Acknowledgments & thanks

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Christy Marx for making me laugh, to this day, whenever I look at the Conquests of Camelot manual cover (and, in turn, inspiring the cover for this one).

Contact

Found a bug? Have a suggestion? A fix?

Please use the issues section at

https://github.com/Bloodbat/SanguineMutants/

Disclaimer

Slight discrepancies between the images on the package, this manual and the final plugin are possible and should not affect functionality in any way.

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