

GEODESICS

A modular collection for VCV rack by Pyer & Marc Boulé



What's new? – version 1.0.0

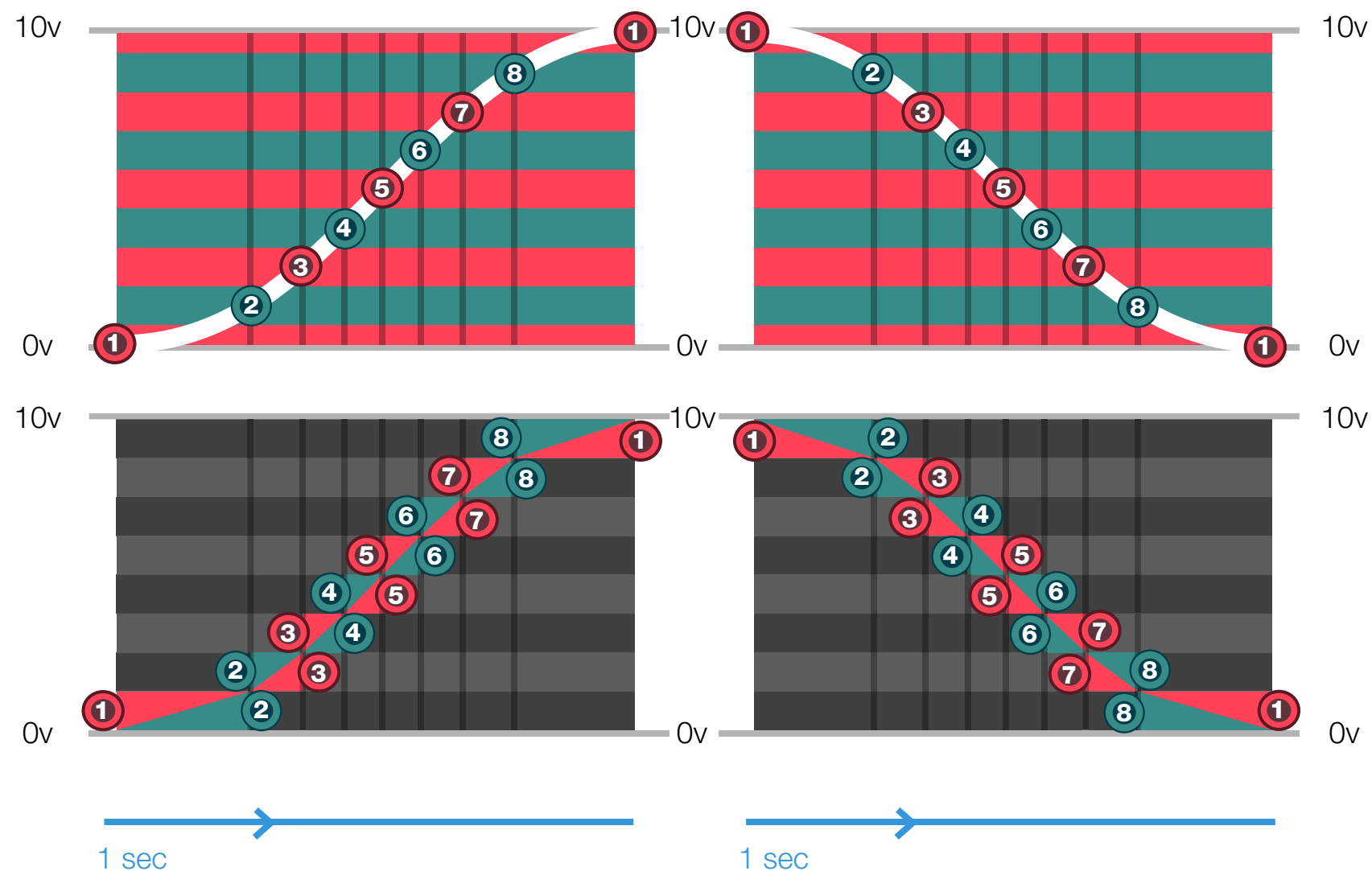
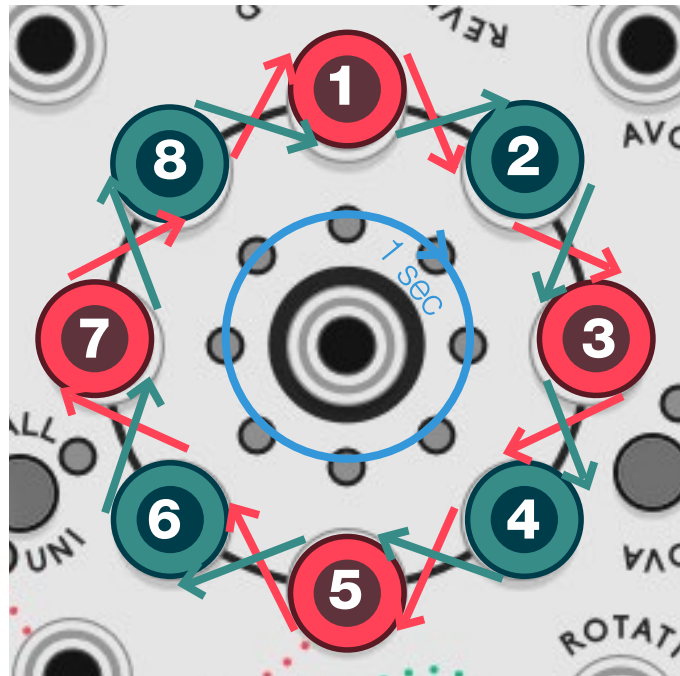
T O T H E R E A D E R

Notes on who is concerned...

This file is only intended to anyone who already read the manual of the previous version. It gathers all the changes that you need to know.

There is no point to read this if you are a new user, or if you haven't read the manual of the previous version. You would be then encouraged to read the complete manual of the current version.

Thanks.



PULSARS

neutrons powered rotating crossfader

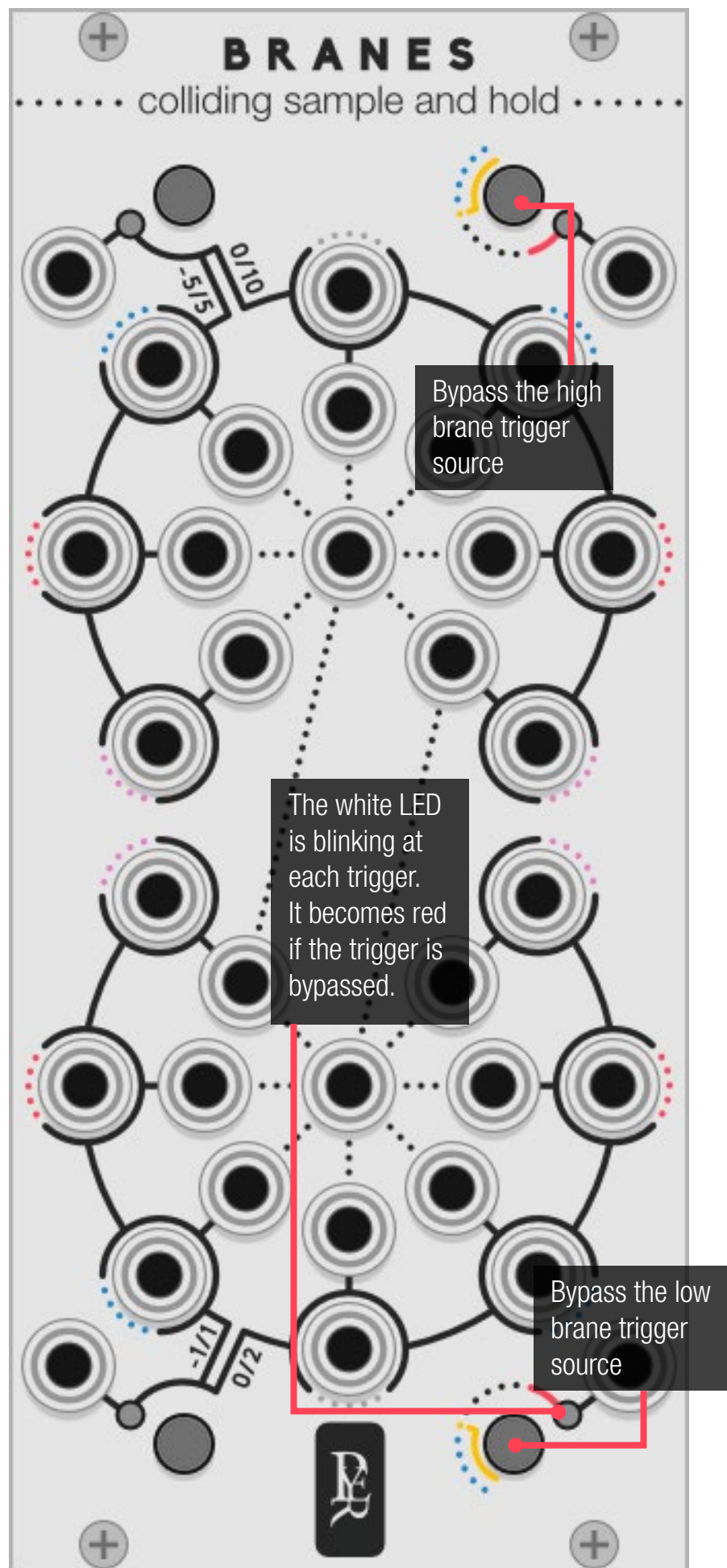
All mode

While the uni and bi mode are using the rotation signal to orchestrate a fade between each of the 8 sources, the mode “all” manages a scan trough all the sources in a single circle.

On its way from zero to 10V, the rotation signal will scan every connected jacks from 1 to 8.

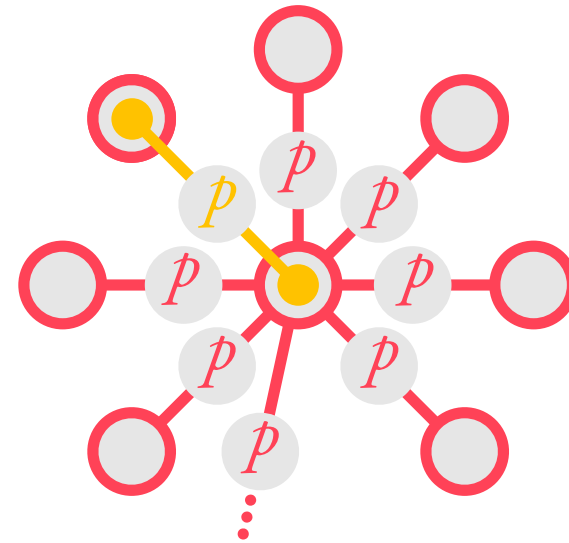
Once the rotation signal has reached 10 V, the cycle get inverted and continue it way from jack 1 to 8 as it goes down from 10 to 0V to avoid a back and forward effect and makes a true infinite cycling.

This mode is compatible with the reverse space time, cosmic void and supernova features. The all mode can be usefull in 8 to 1 out for complex wavetable scanning effect. The 1 to 8 out can be used for octophonic rotating effect.



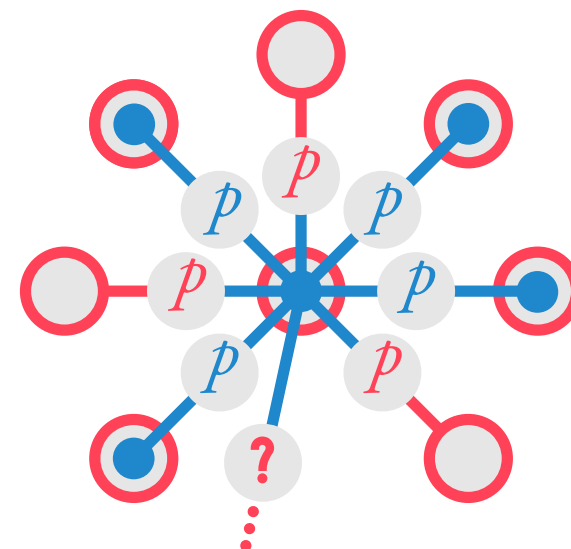
Yellow mode

The trigger can only be in one place, but the place can't be defined with certitude.



Blue mode

The trigger can be at several places at the same time, but it can't be known with certitude.



The vibrations button

When the trigger source connected, the vibration button lights on: the brane starts to vibrate and to sample the signals on every trigger. When the vibrations are bypassed, every output will send the unsampled source input or noise.

This is useful to switch between the original signal and the quantised one.

It can also be used to momentary bypass one of the two triggers of the colliding outputs.

Young Slits mode

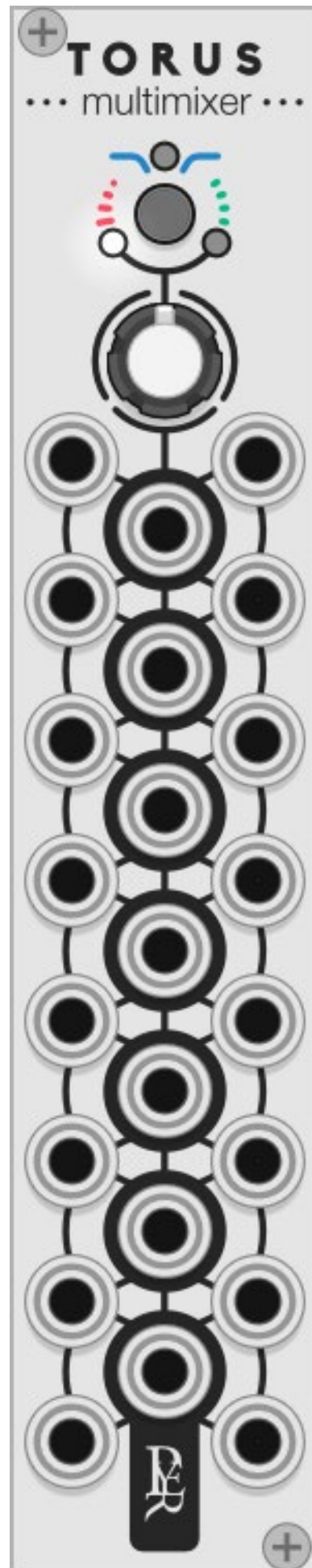
This mode can be accessed by holding the button for 2 seconds. Holding it again will leave the mode. It can also be reached through the right-click menu. The trigger input toggles the state between yellow and blue.

This mode is inspired by a famous experiment by Thomas Young, who shot electrons through a surface with two slits, to see how they would pass through.

In this mode, the integrated SH sections may or may not receive the trigger. In addition to generating randomness, Branes can now decide whether it will generate it or not. It can be useful for less systematic modulation, but also for complex polyphonic melodies (quantizer needed of course).

In the Yellow mode, only one connected output at the time will receive a trigger, the other ones will hold their own previous values. At each new trigger, every output has the same probability to be selected to receive the trigger. This mode has no effect when just one output is connected.

In the Blue mode, every output has its own 50% chance to receive a trigger or not. The ones that won't receive their trigger will hold their own previous values.



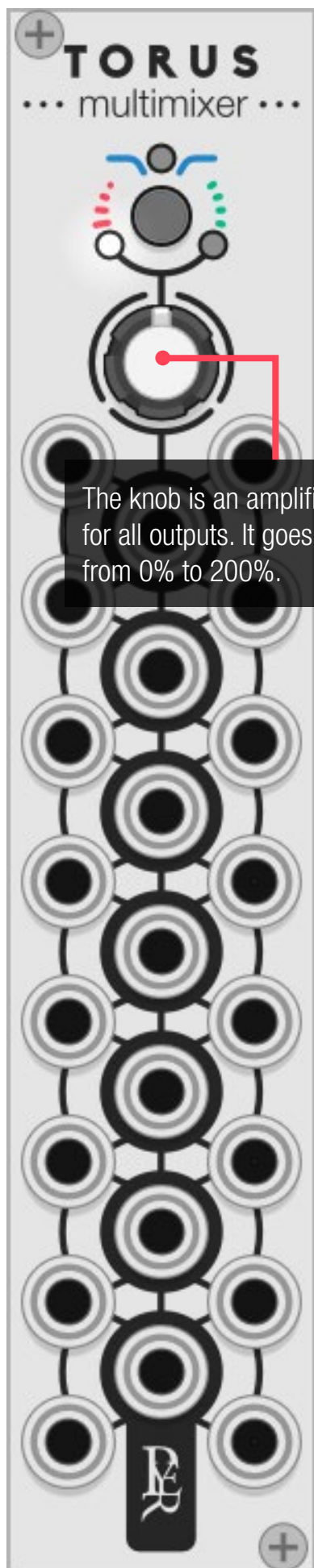
TORUS

bi-dimensional multimixer

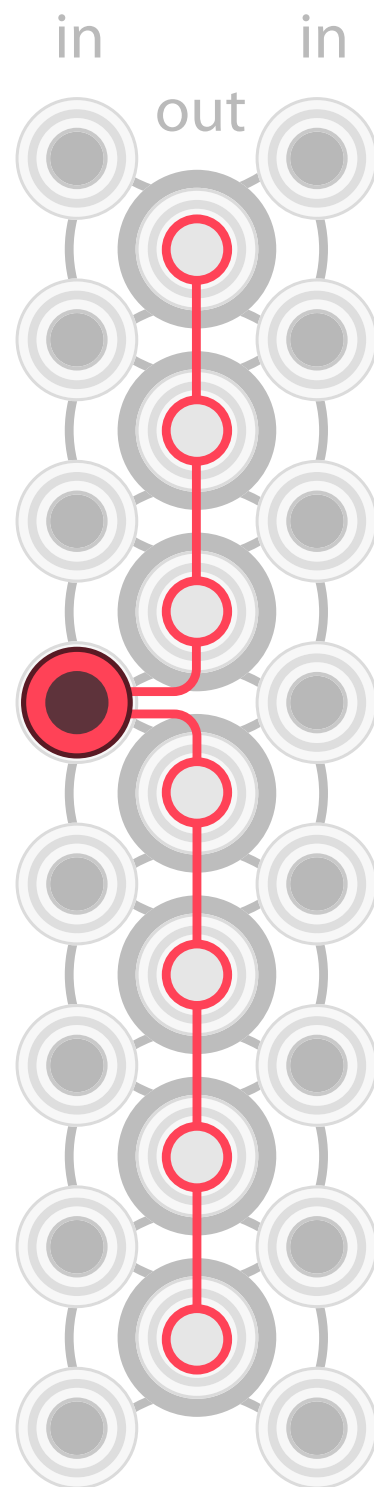
A torus is a 2-dimensional surface closed on itself. Some believe it could be the shape of the universe.

TORUS mixes and attenuates the incoming signal in different ways depending on the distance between the input and output jack.

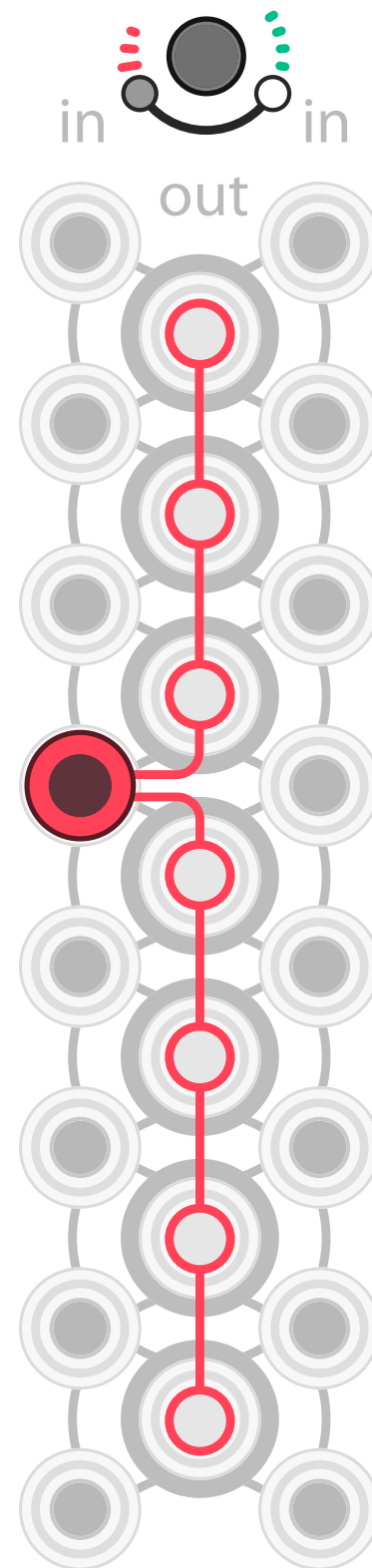
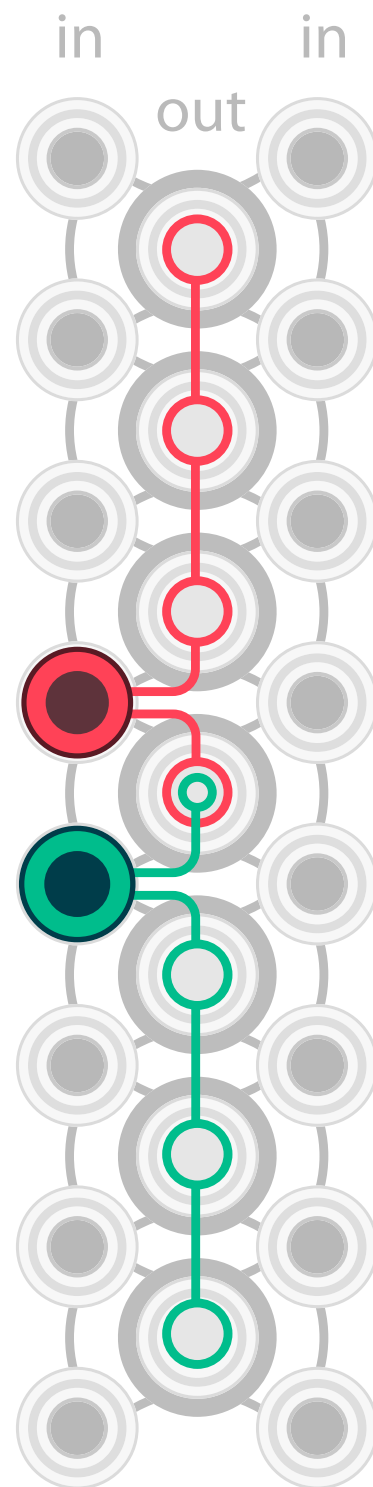
Torus is a small module that can be many things: up to 6 4-channel adjustable mixers, 3 multipliers, 7 unity mixes with 4 channels, 7 attenuators ... and all at the same time.



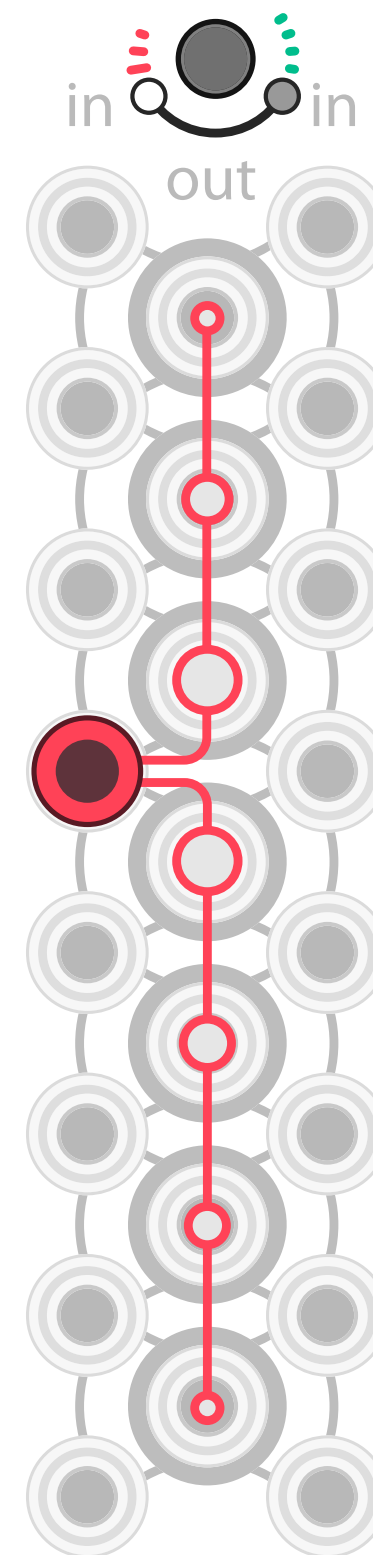
The knob is an amplifier for all outputs. It goes from 0% to 200%.



Torus works over a simple concept: the incoming signals are spread and mixed over the different outputs. Each output jack will produce a different mix depending on the proximity of the input jacks.

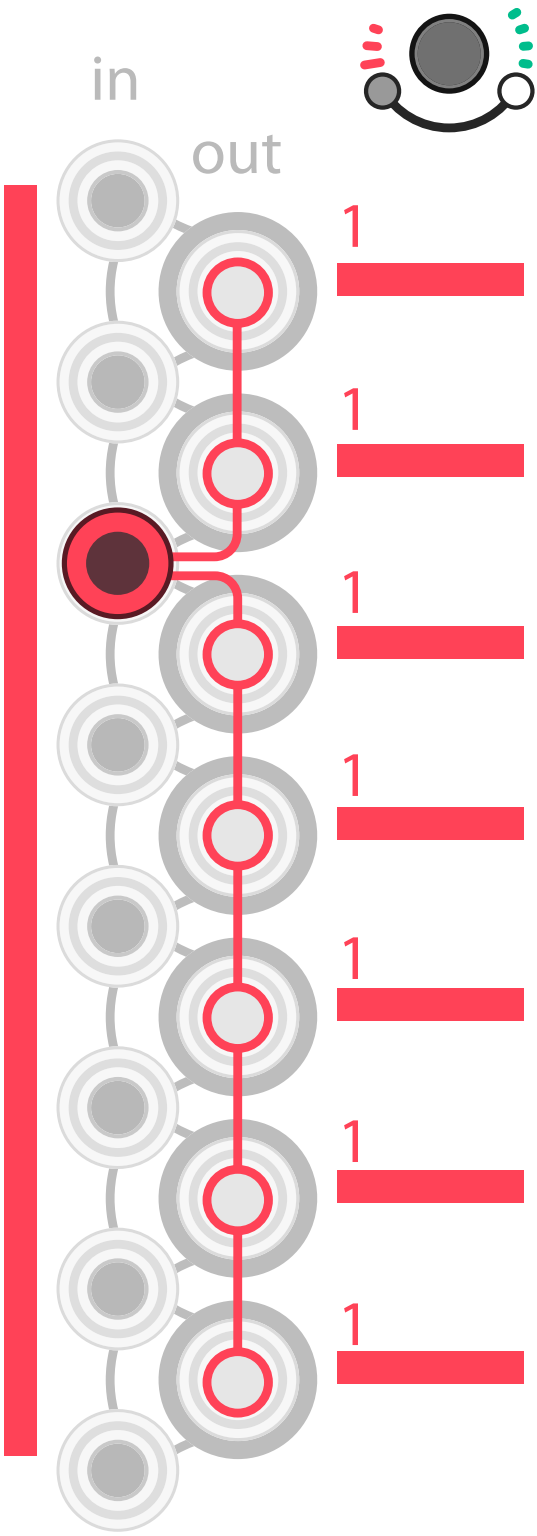


Constant mode gives back 100% of the original signal on each output. When mixed, the two signals are added together.

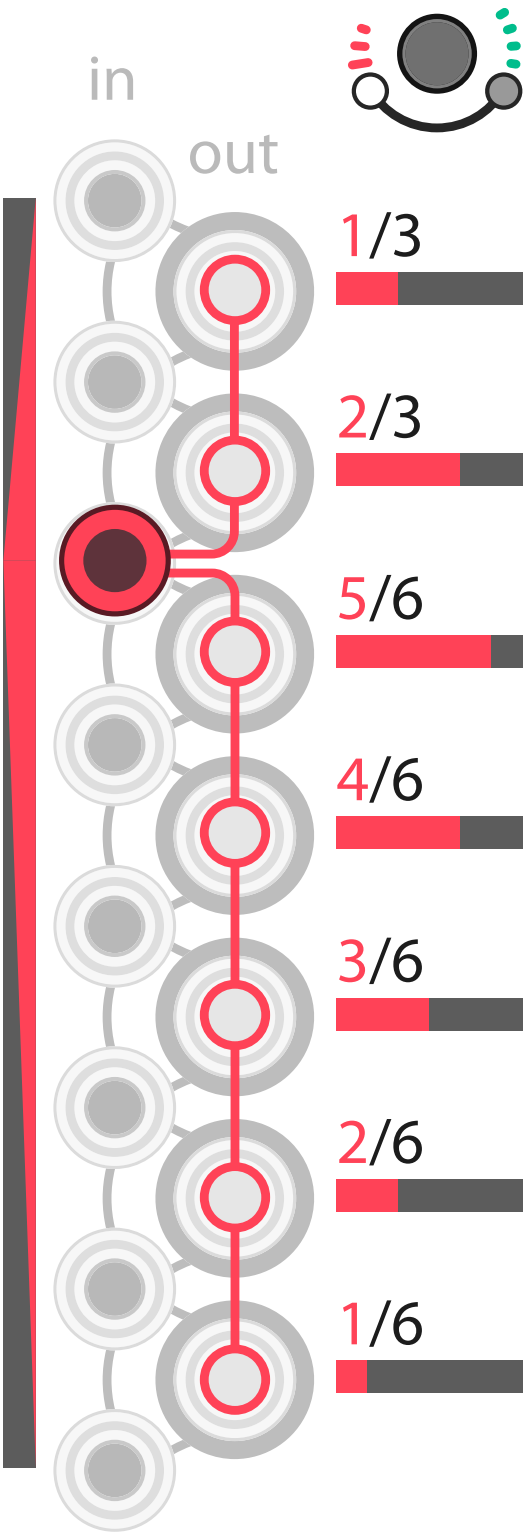


Decay mode: the level of the original signal gets faded away along the outputs. When mixed, the two signals are cross-fading together with different blends depending on the proximity of each input.

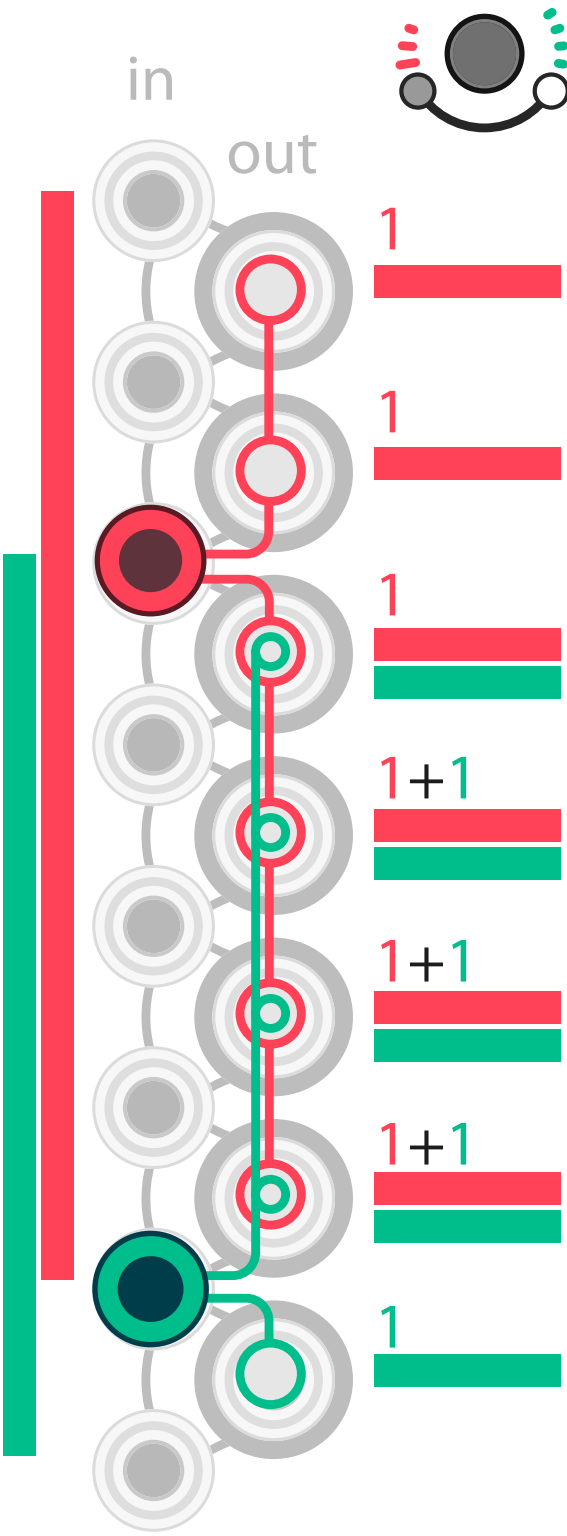
As there are a lot of jacks in Torus, it might be easier to split it in two parts for a better understanding.



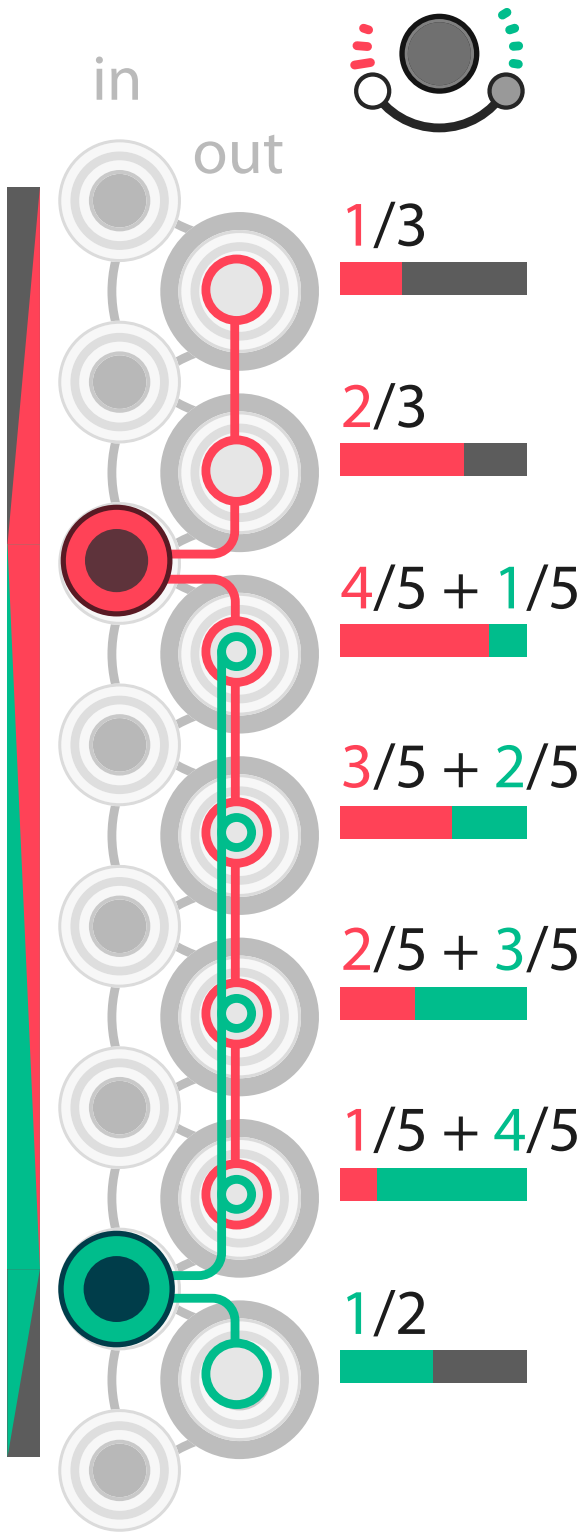
Constant mode: Multiplier



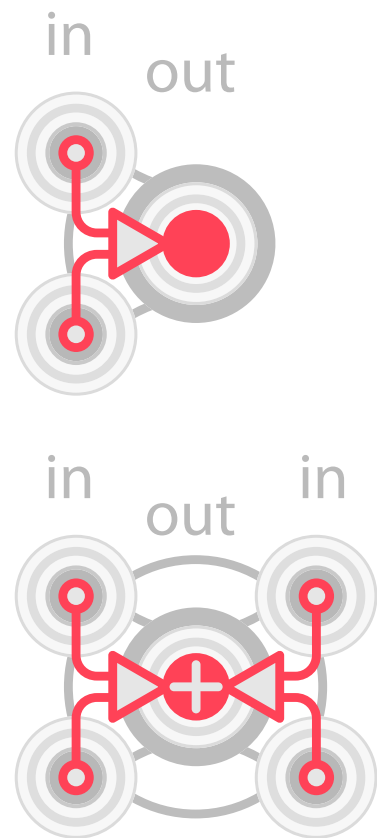
Decay mode: attenuator



Constant mode: Unity adder

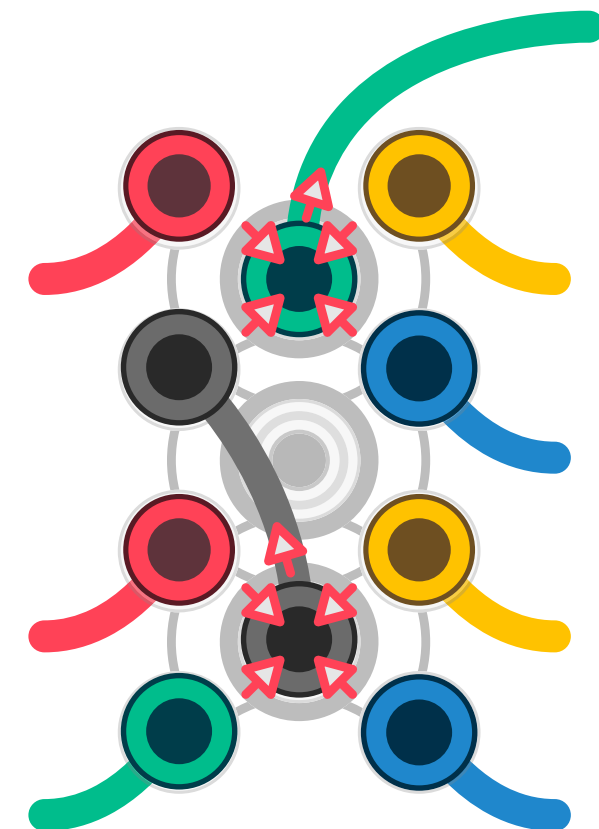
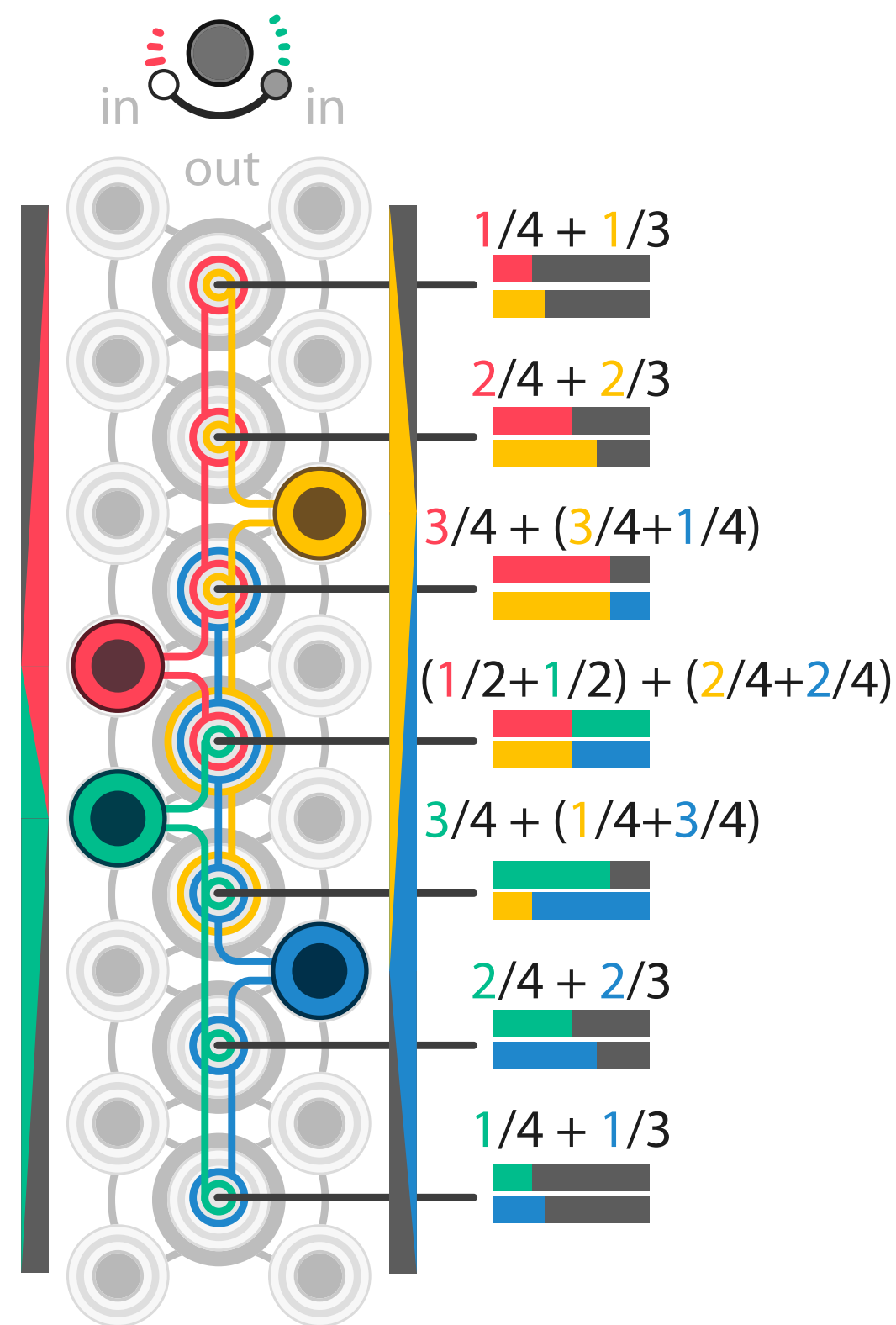
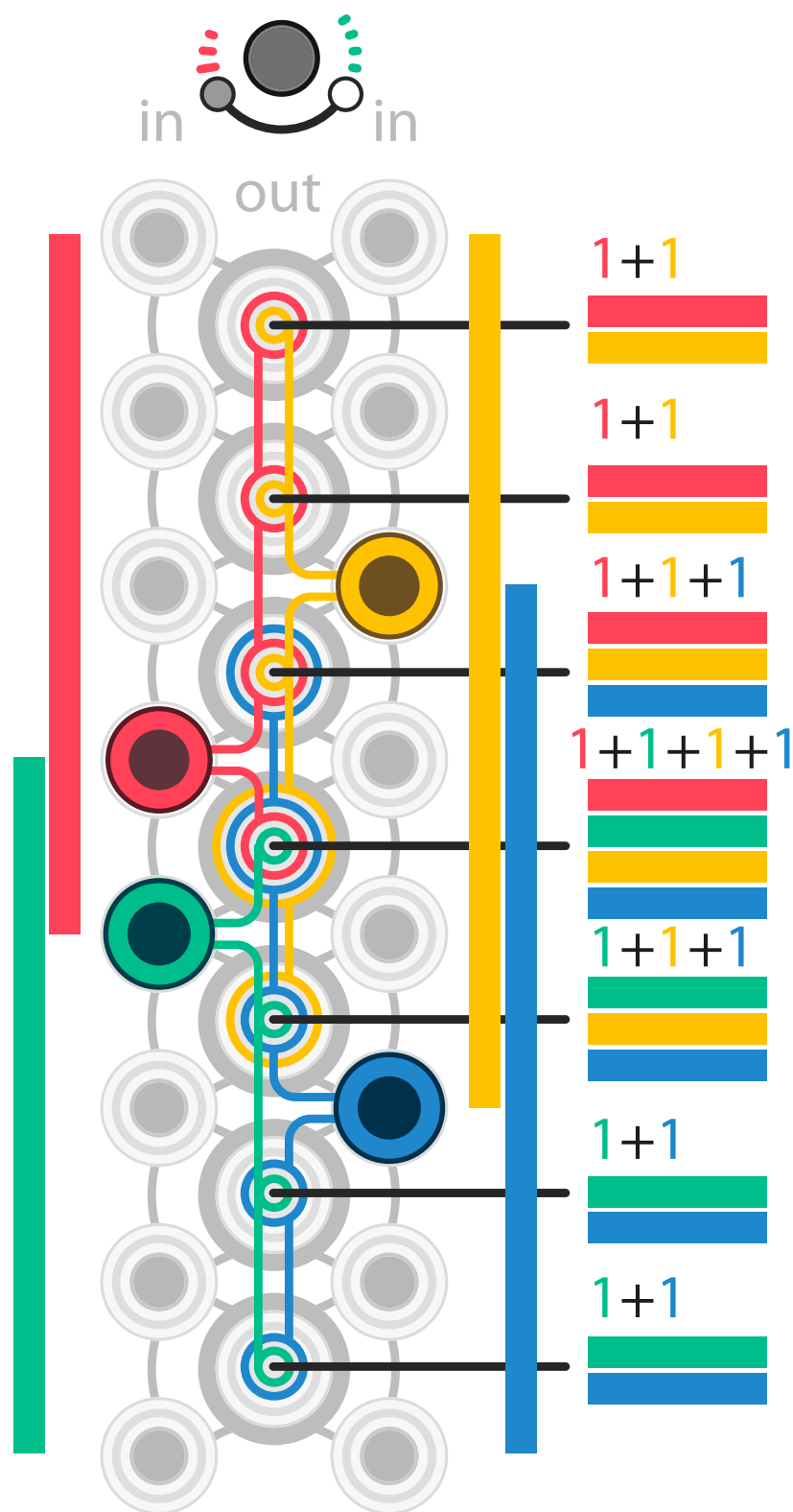


Decay mode: Cross fader



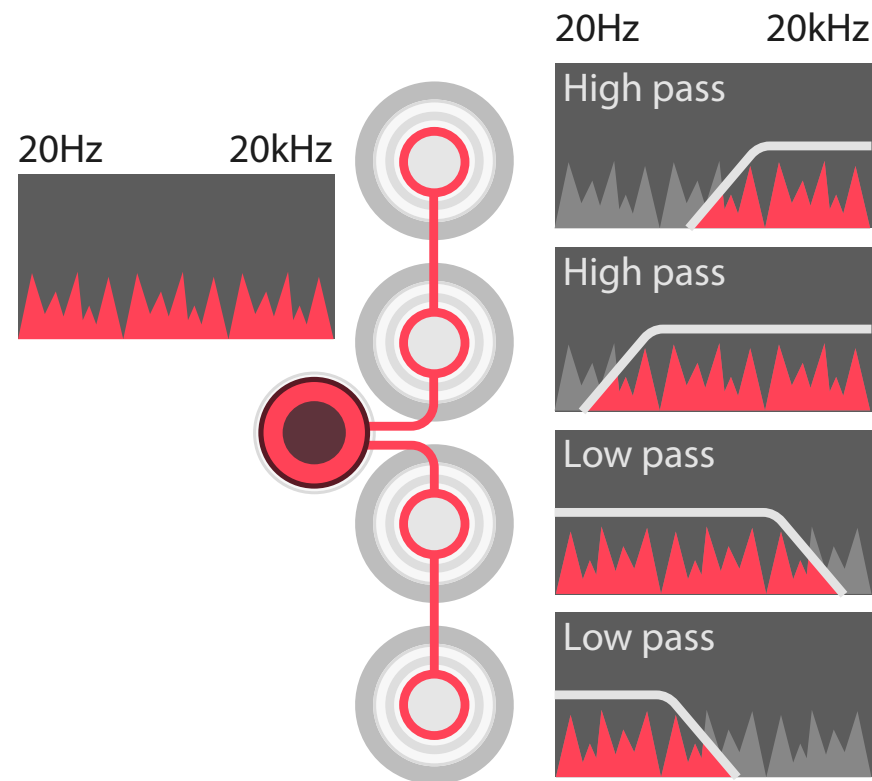
To complete the Torus, another set of input is also connected to the output system.

The result of left and right structure is added in each output.



As always, self-patching is full of solutions.

By patching a group of 4 channels to another input, sub-mixes can be created to achieve up to 13 channel mix in one module.



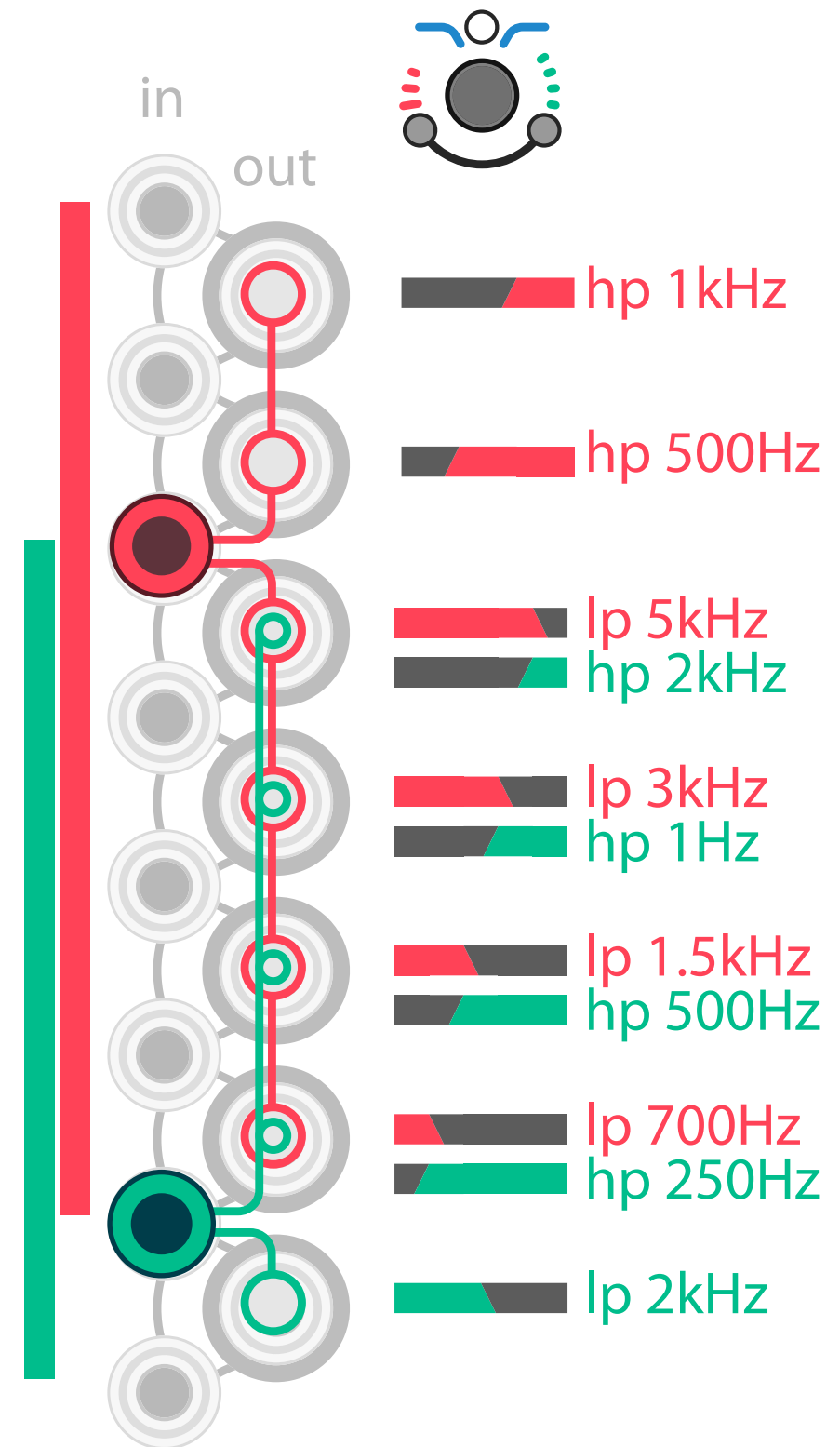
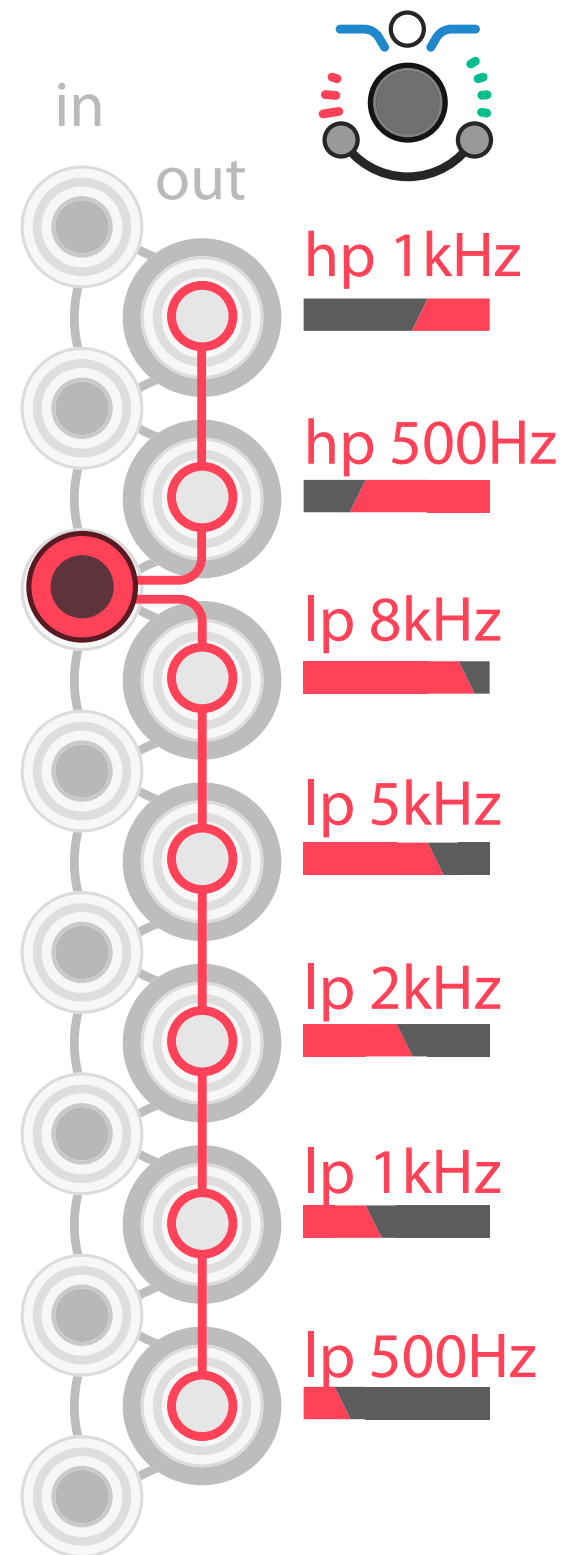
Low/High pass mode

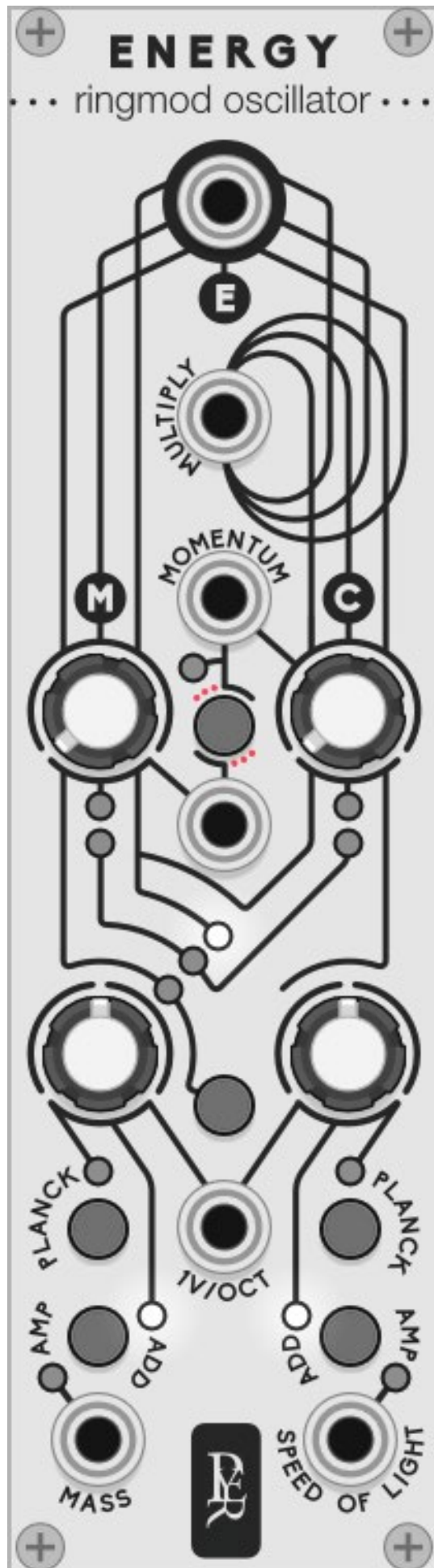
Torus has a third mode that can be useful for mixing purposes.

For an incoming signal, any lower output will apply a 6db low pass, and any upper output will apply a 6db high pass.

The more distanced output will have a shorter passing range.

Unlike the other modes, the passing frequencies are not chosen on mathematical ratios, but on an arbitrary way, inspired by some hardware equalisers sweet spots.





ENERGY

relativistic ring modulation oscillator

How would the most meaningful equation of modern physics sound? If a small amount of mass can be turned into an incredibly big amount of energy, two simple sine waves can create unexpected tones with rich harmonic content.

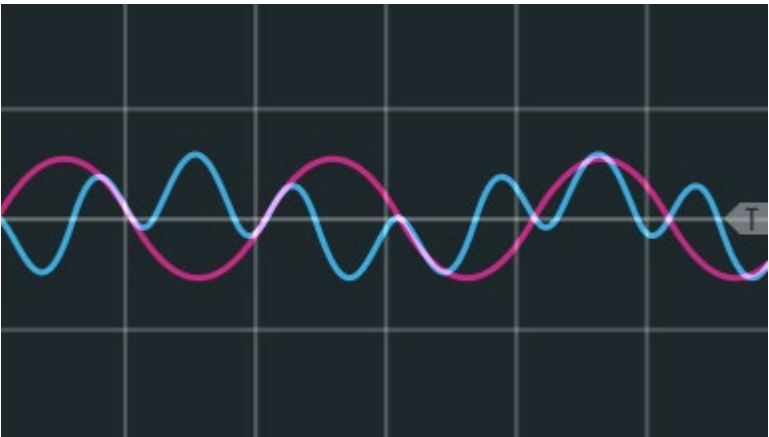
ENERGY is a digital oscillator/synth voice that focuses on ring modulation synthesis. Two sines are multiplied according to Einstein/Poincaré's famous equation. It is capable of meditative drones, organ tones, extreme noises, and low modulations.

Ring mod synthesis.



Ring modulation

modulating the amplitude of a signal from 100% to -100% (phase inversion). This modulation is usually controlled by an audio rate signal. The two signals are multiplied.



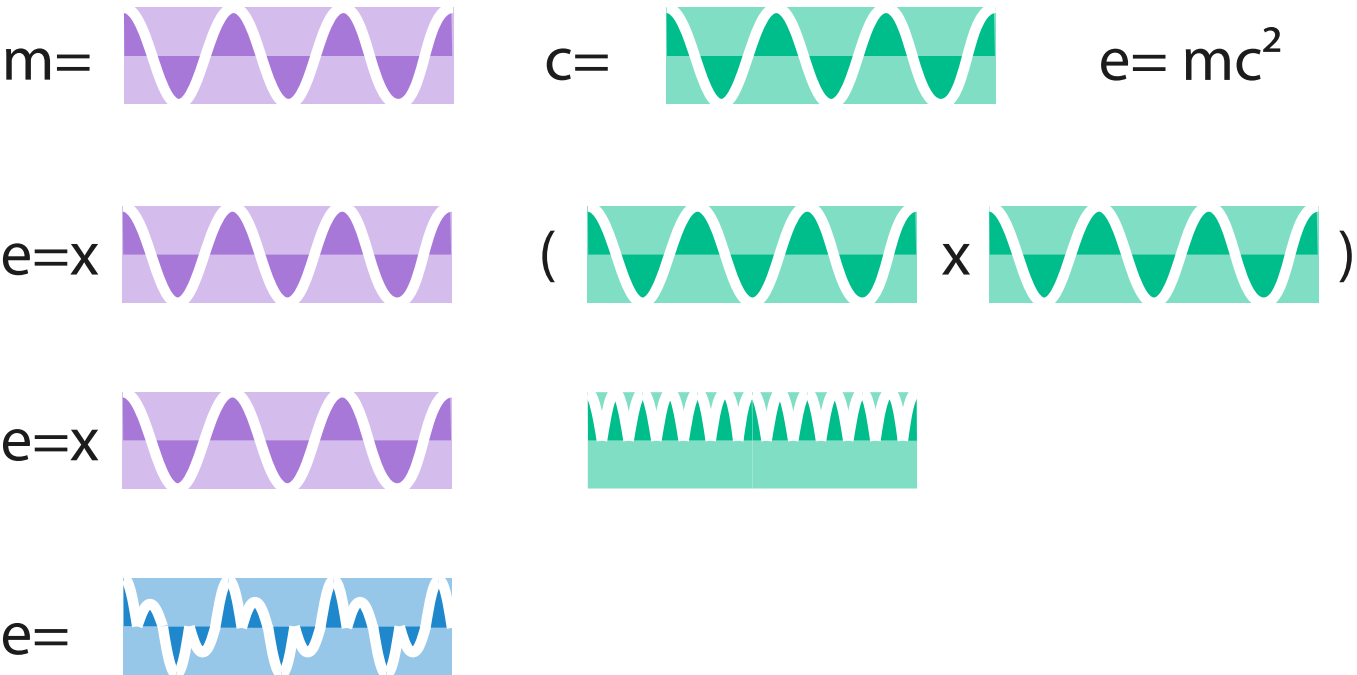
Ring mod synthesis

Creating a complex sound by modifying the volume of a pure sine wave might be counter-intuitive but, as often, audio rate is full of surprise.

The modulator will carve its own wave shape into the processed sine. The result can be pleasant to the ear if the two frequencies are set in harmonic ratios. Breaking this harmony by just a little bit can create some very experimental tones.

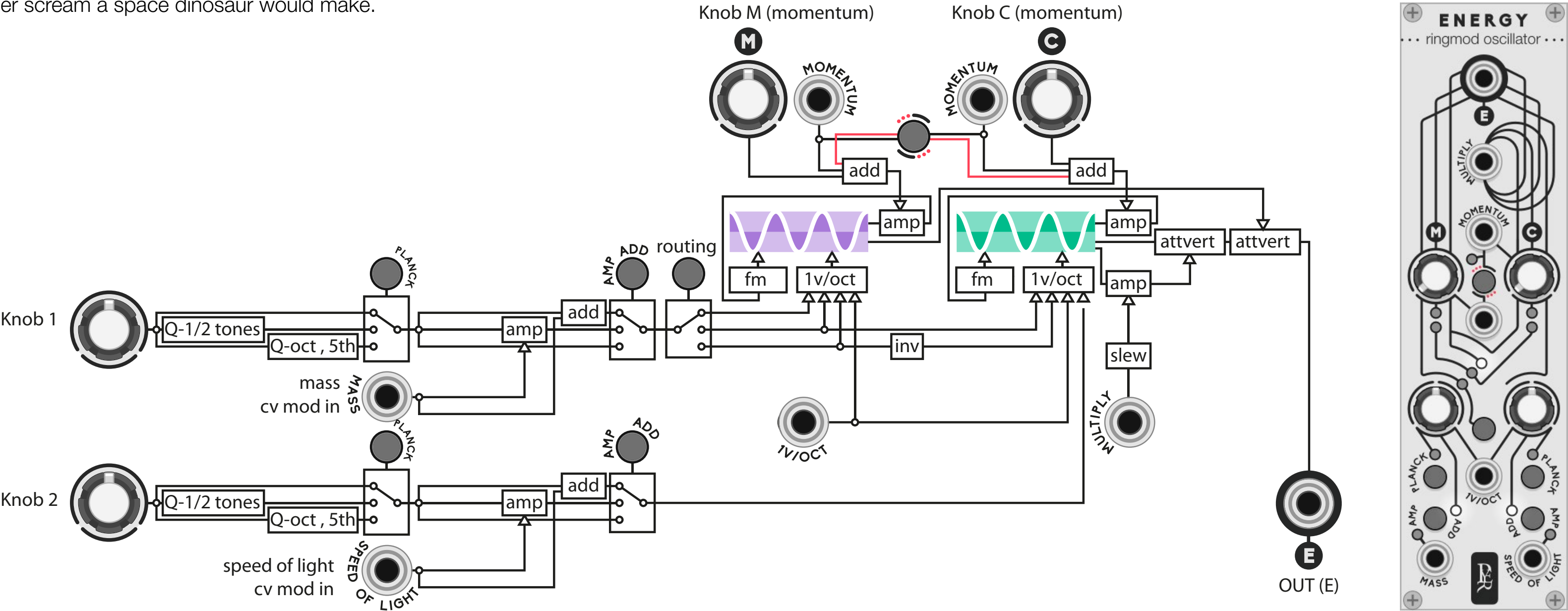
Ring mod synthesis in Energy

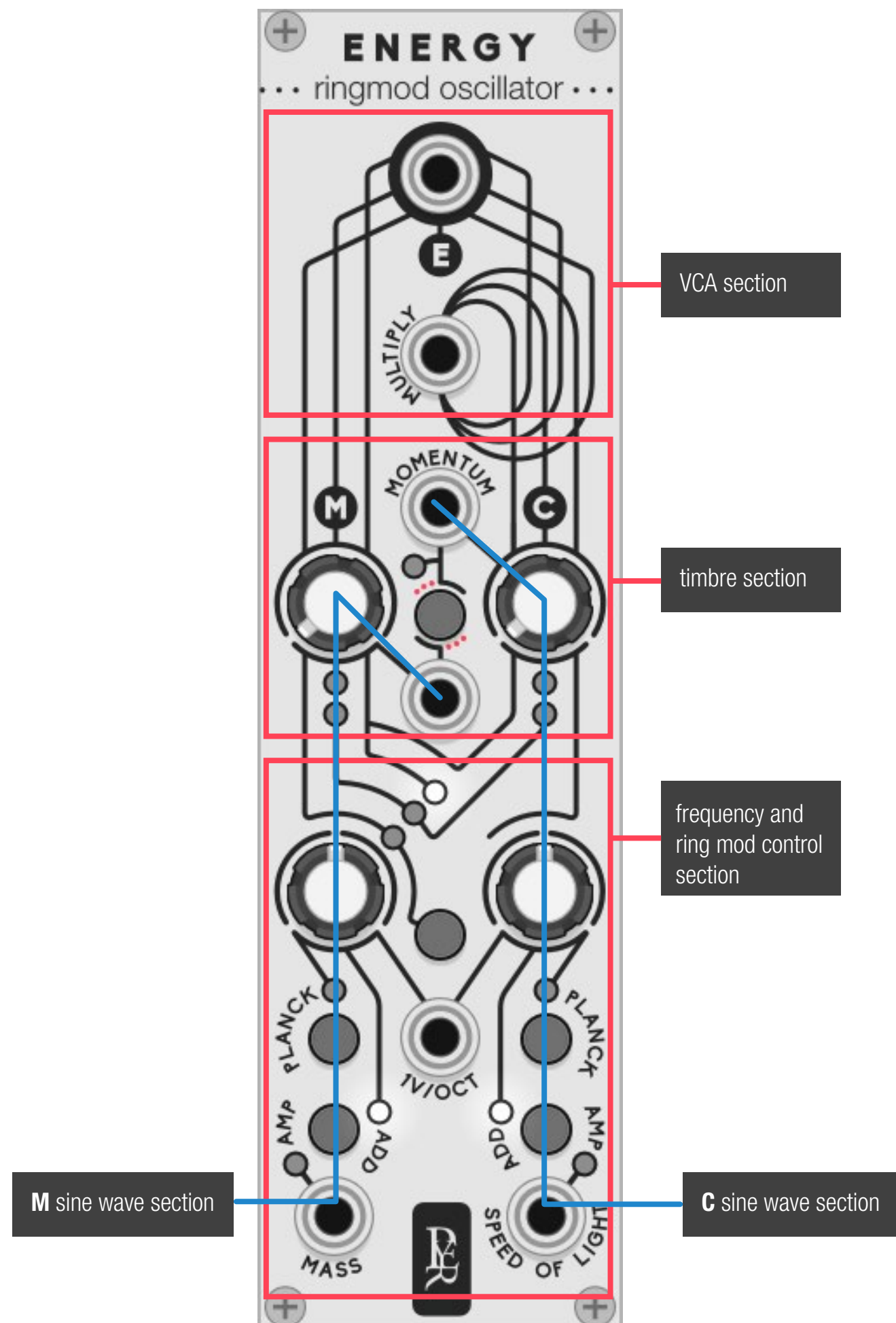
Energy is applying Einstein's equation to ring modulation synthesis: a first sine C (the speed of light) is multiplied by itself. The result is then multiplied by another sine M (the mass of an object) to match the equation $e=mc^2$. The frequency of M and C can be adjusted to explore different types of sounds.



Energy Architecture

Getting melodic results with ring modulation synthesis is complicated and works only with precise values. Therefore, the oscillator has some advanced modulation option that let the user choose to stay focused on harmonic ratios or go to unknown territories from subtle vibrations to whatever scream a space dinosaur would make.





Controls—in separated sections. More detail later.

VCA section

- **Multiply:** It acts as a VCA. It controls the amount of multiplication of the C sine by itself from 0 to 1 (0/10v input). When nothing is plugged to the input, the level is 1. The attenuation will follow the signal with a light slew on the fall to simulate the behaviour of a vactrol/opto vca so it can still sound natural if it receives raw pulses or triggers.
- **E:** oscillator output.

timbre section

- **M momentum knob (top left):** Introduce some FM feedback into M sinus for a metallic low pass effect
- **Momentum inputs:** CV input for the feedback of each sinus (add to knob position)
- **C momentum knob (top right):** Introduce some FM feedback into C sinus
- **Momentum cross mod:** negative CV will modulate the opposite momentum

Freq mod section

- **Mass CV input:** signal input to modulate the frequency of M sine (1v/octave)
- **Speed of light:** signal input to modulate the frequency of C sine (1v/octave)
- **Add/amp:** define how the mod signal will affect the frequency of each sinus
- **Planck:** define the quantisation for each knob
- **1v/Oct input:** signal input to control the frequency of both sines (1v/octave)
- **Knob 1 (bottom left):** controls the frequency of the M sin by default, but other routing options can be defined
- **Routing button:** defines the routing options for knob 1
- **Knob 2 (bottom right):** Knob 1: controls the frequency of the M sin

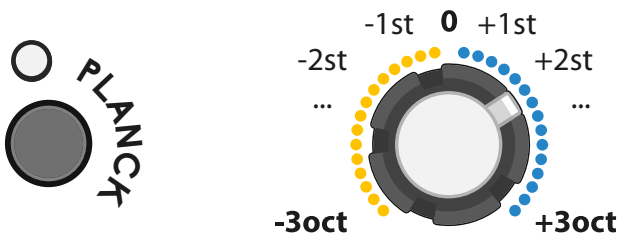
1. Frequency control section

Knob quantisation

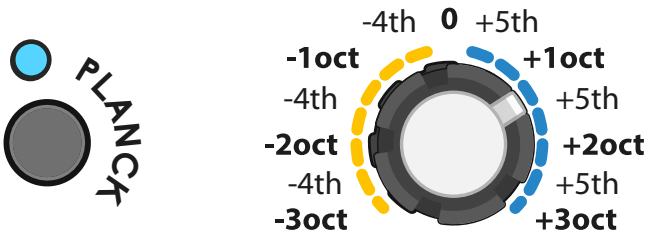
Ring modulation can be used to create extreme sound effects, but it can also sound nice when the sines are working in harmony. Therefore, there are different types of quantisation, from smooth to very harmonic ratios.



Off Smooth voltage



White LED Semitones

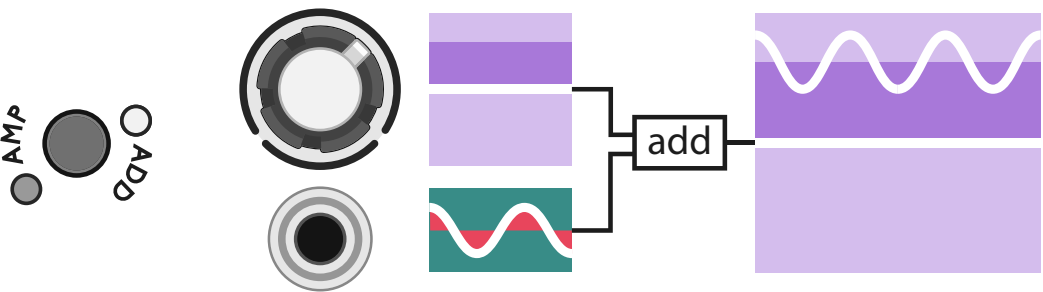


Blue LED Fifth and octaves

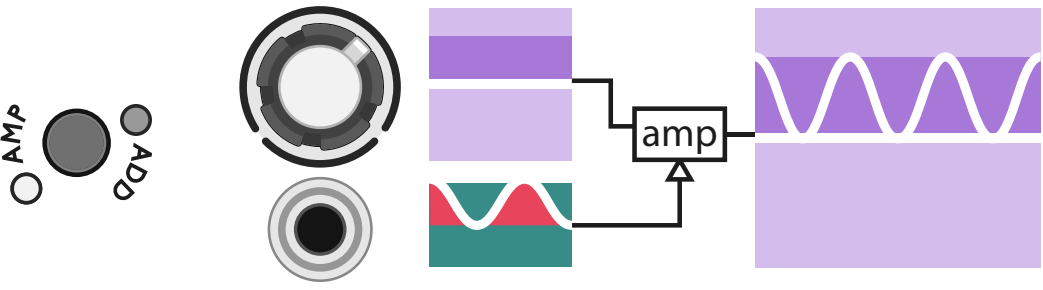
Mod types

Ring modulation techniques require a lot of precision. The frequency of each sine has a huge influence on the sound and introducing modulation might destroy it.

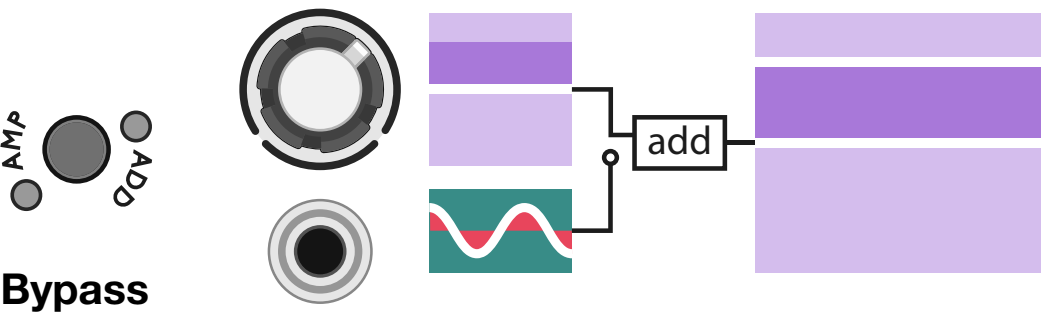
The mod type selector allows different ways to modulate the sound: starting from the knob position (add), or from zero to the knob position (amp).



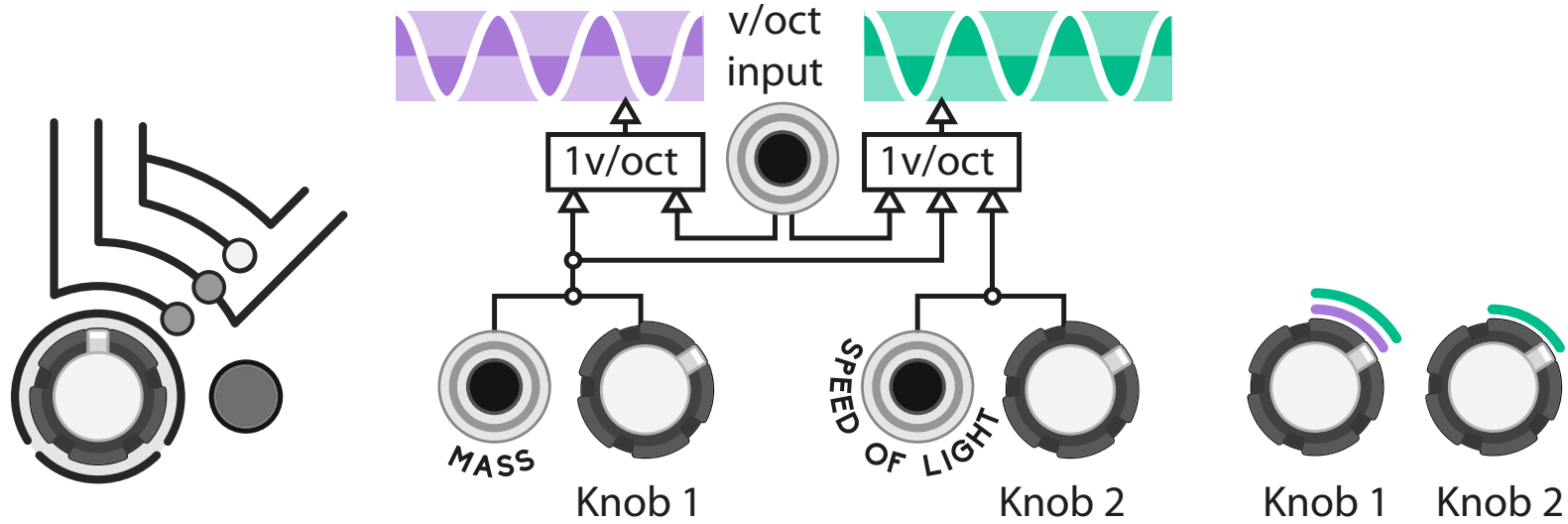
Add (-10V/+10v)



Amp (0/10v)

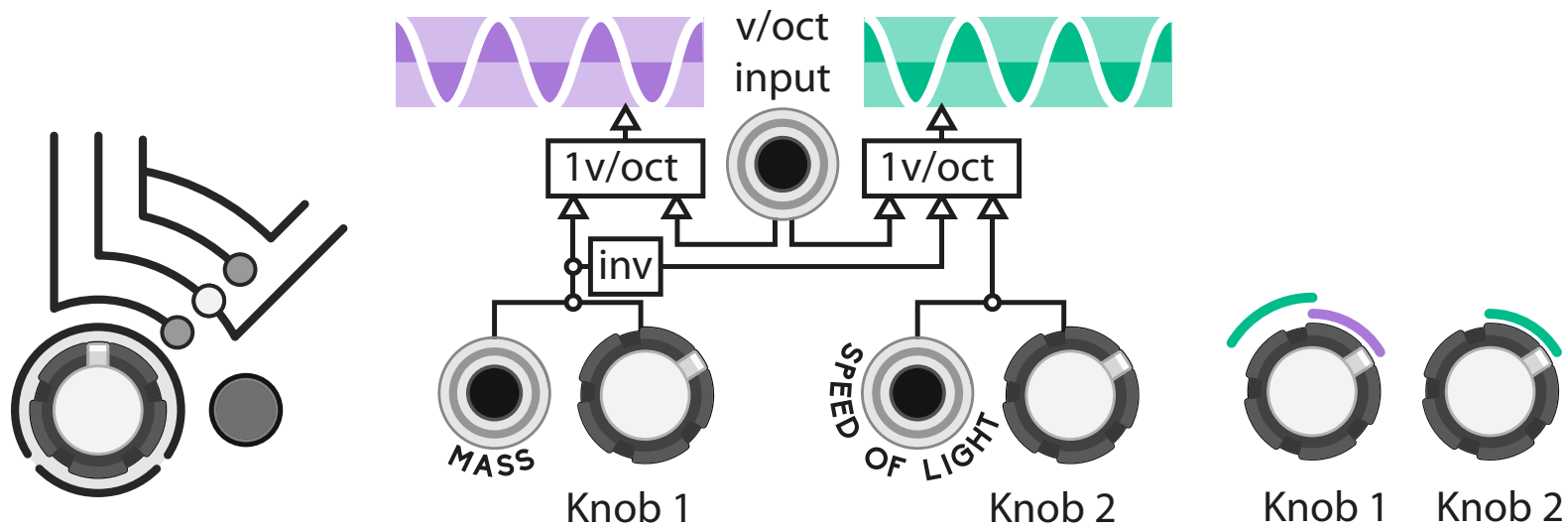
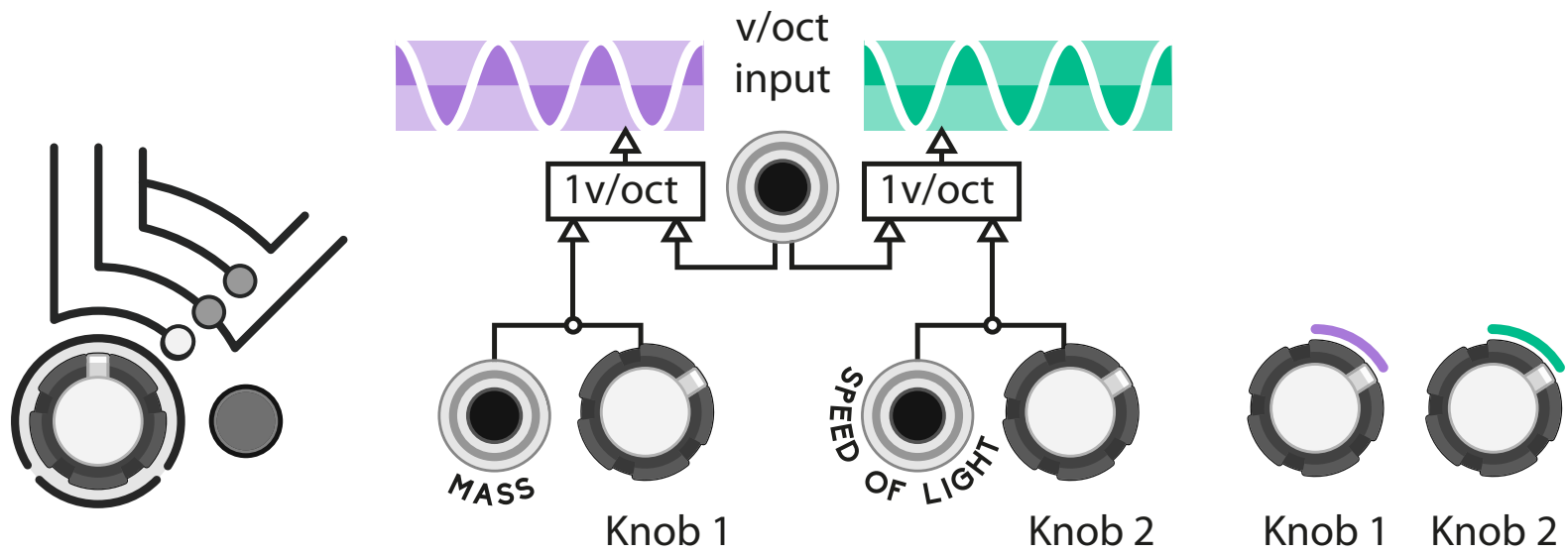


Bypass

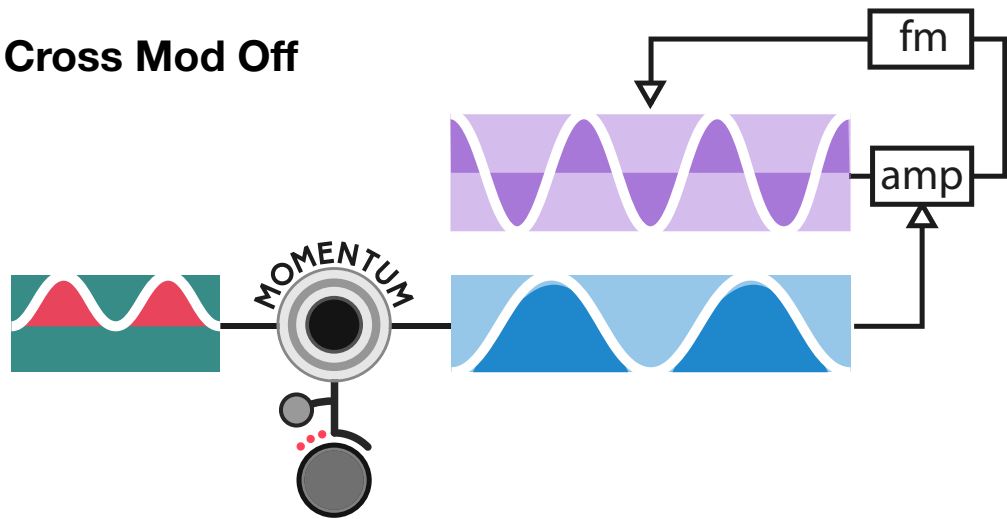


Routing

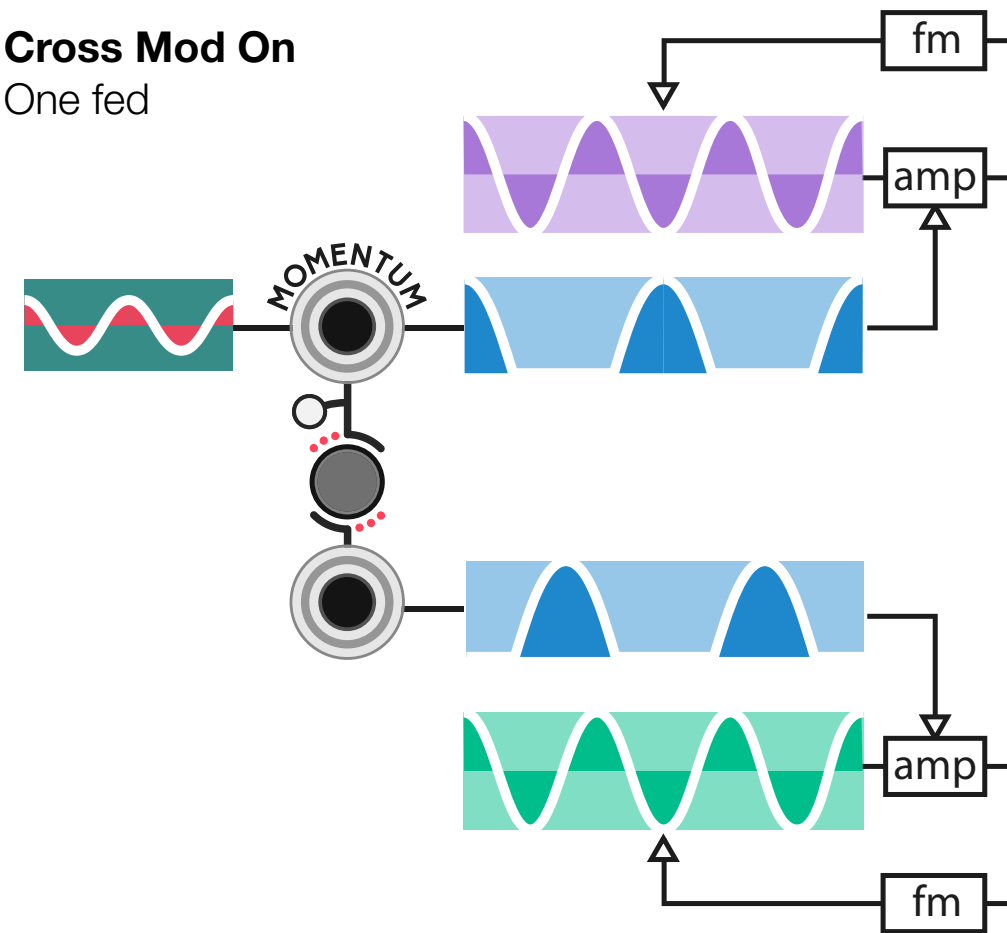
The Mass knob and CV input are modulating the M sine by default, but it can also affect the C sine in different ways. In any routing option, the C sine can always be modulated by its own knob and CV input.



Cross Mod Off



Cross Mod On
One fed



2. Timbre section

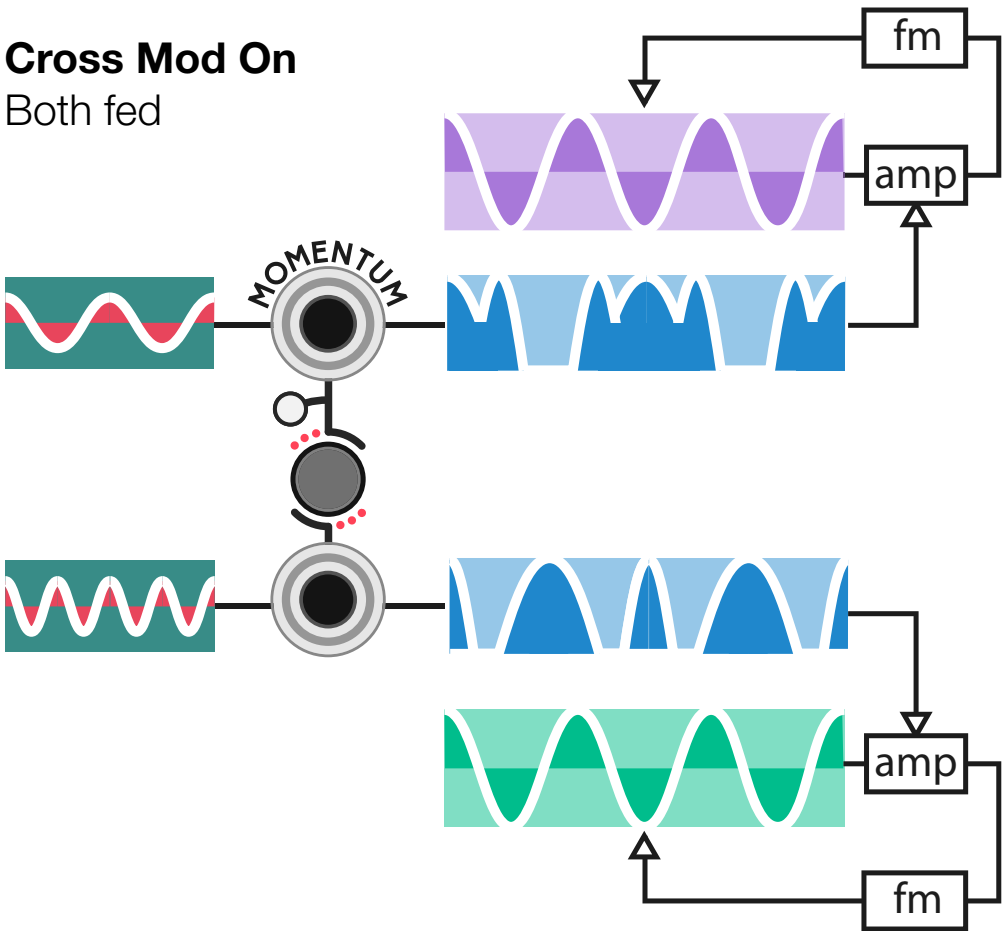
FM Feedback

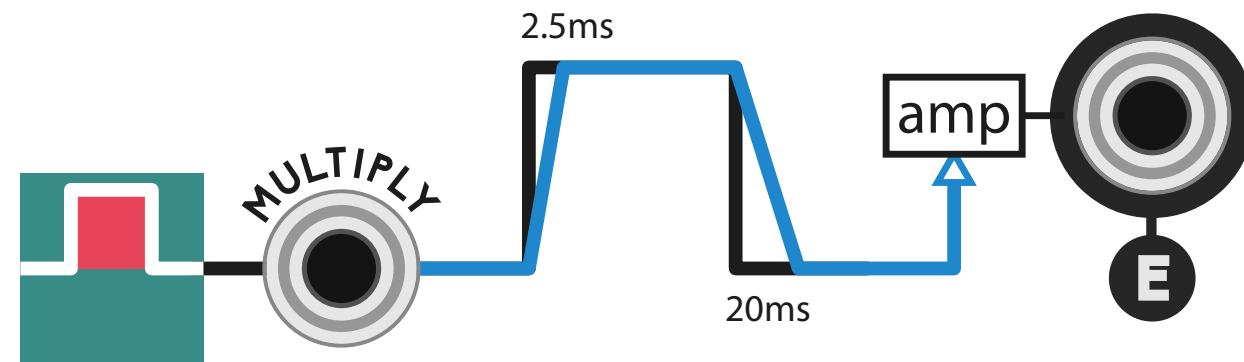
Energy also use basic FM processing resulting in a sine to saw filtering effect. Each sine can be separately self modulated to have its harmonics stand out.

Cross modulation mode

The amount of feedback can be CV controlled as expected, but when the alterative mode is turned on, any negative signal received will modulate the other sine. It allows to modulate both sine with a single bipolar signal.

Cross Mod On
Both fed



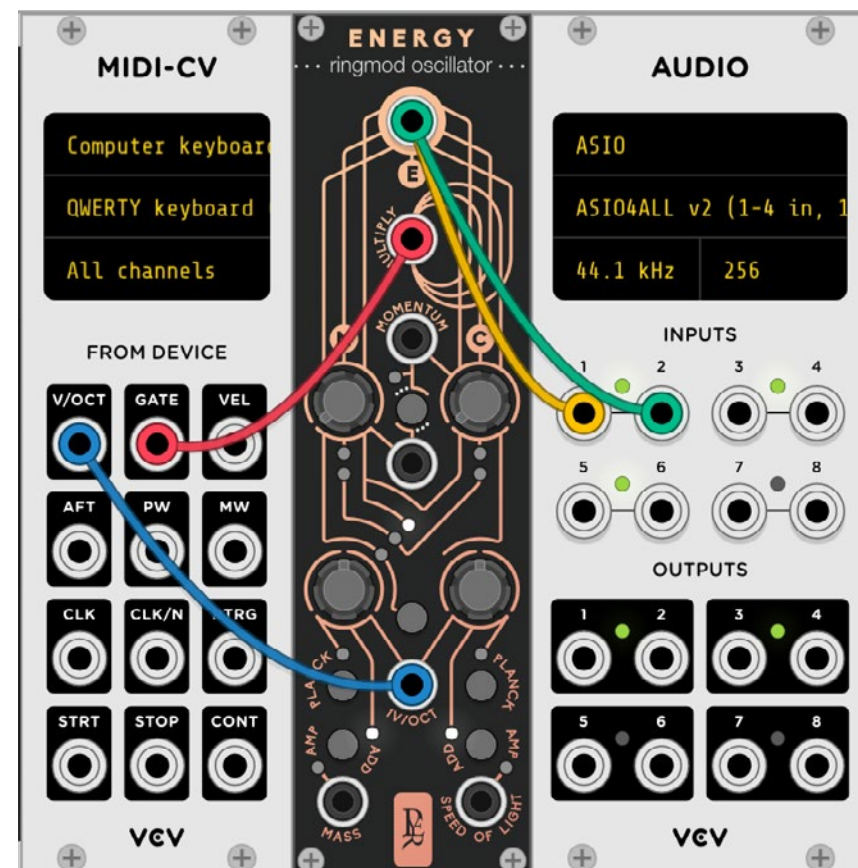


3. Output section

VCA with vactrol style curve response

Multiply input CV input controls the amounts on multiplication, and acts as a VCA. It is inspired (not modelled) by the vactrol controlled VCAs, using a short slew limiting that won't audibly modify an envelope signal, but will turn a raw gate into a usable and musical vca with an extremely short attack (2.5 ms) and decay (20ms).

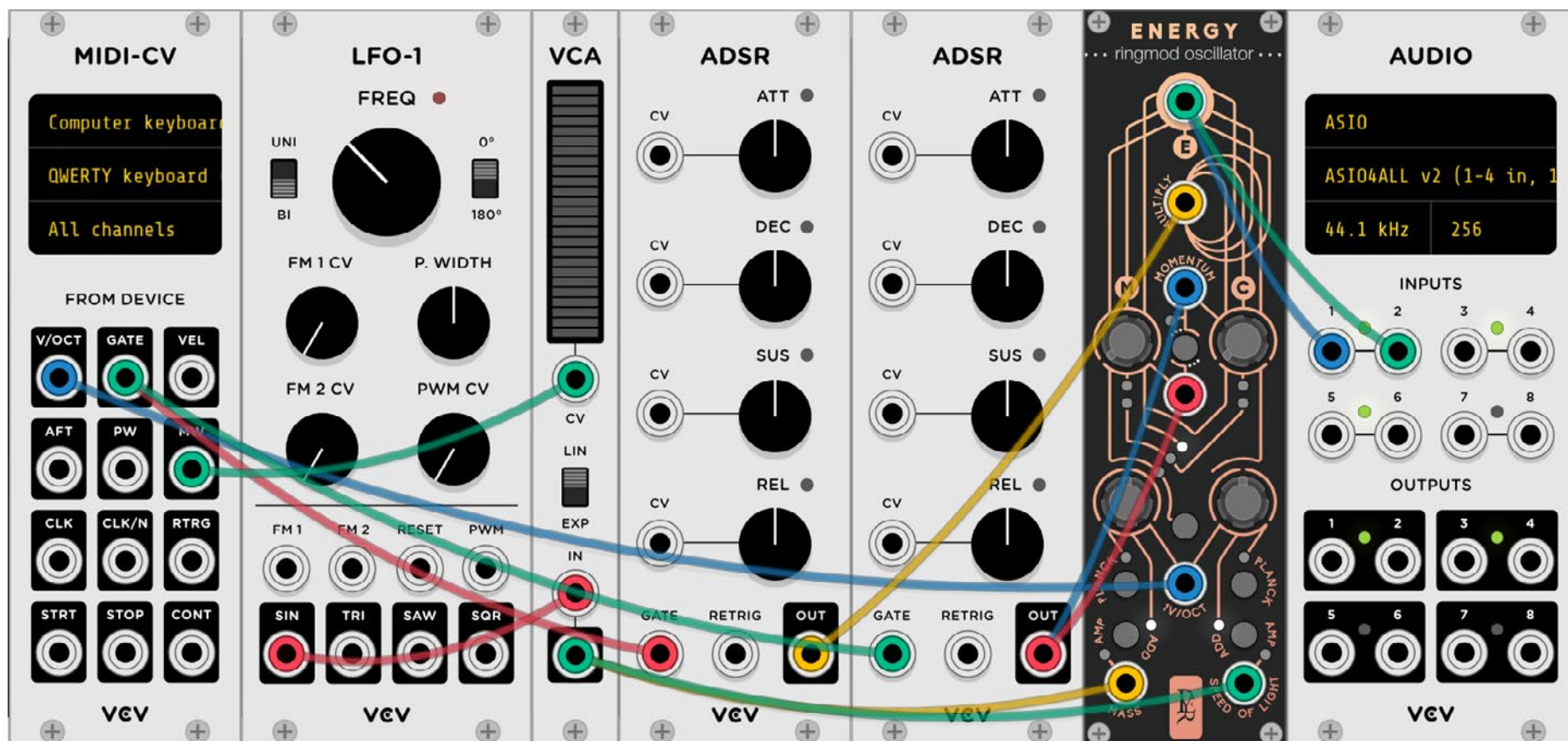
Patch ideas



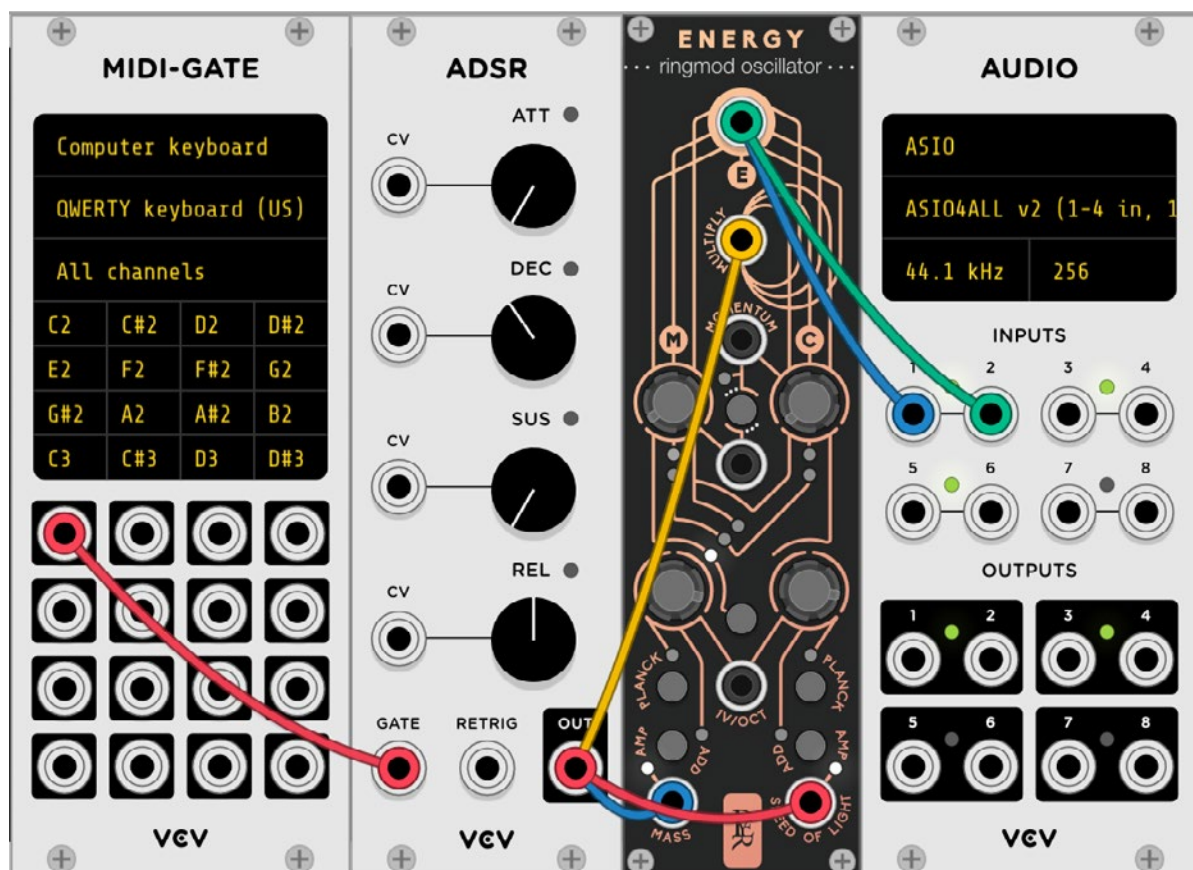
Minimal synth voice: a gate input can be directly connected to the multiply input, thanks to the soft slew limiter.



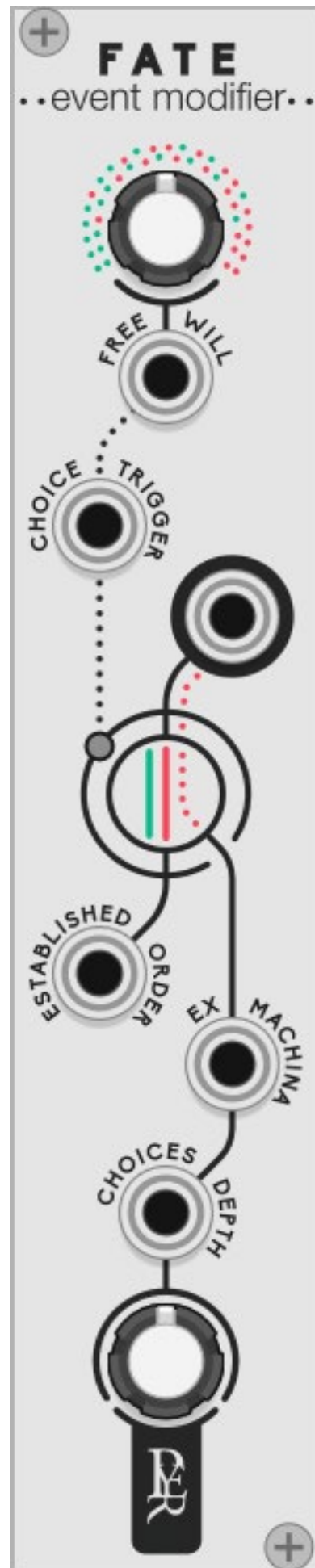
Dual Filter: a bipolar lfo will alternate each momentum harmonic.



Classic mono synth: with a filter envelope, a vca envelope and a fm lfo



Percussion: in amp mode, fall from the knob position to the centre point, for a decay from aggressive to soft tone.

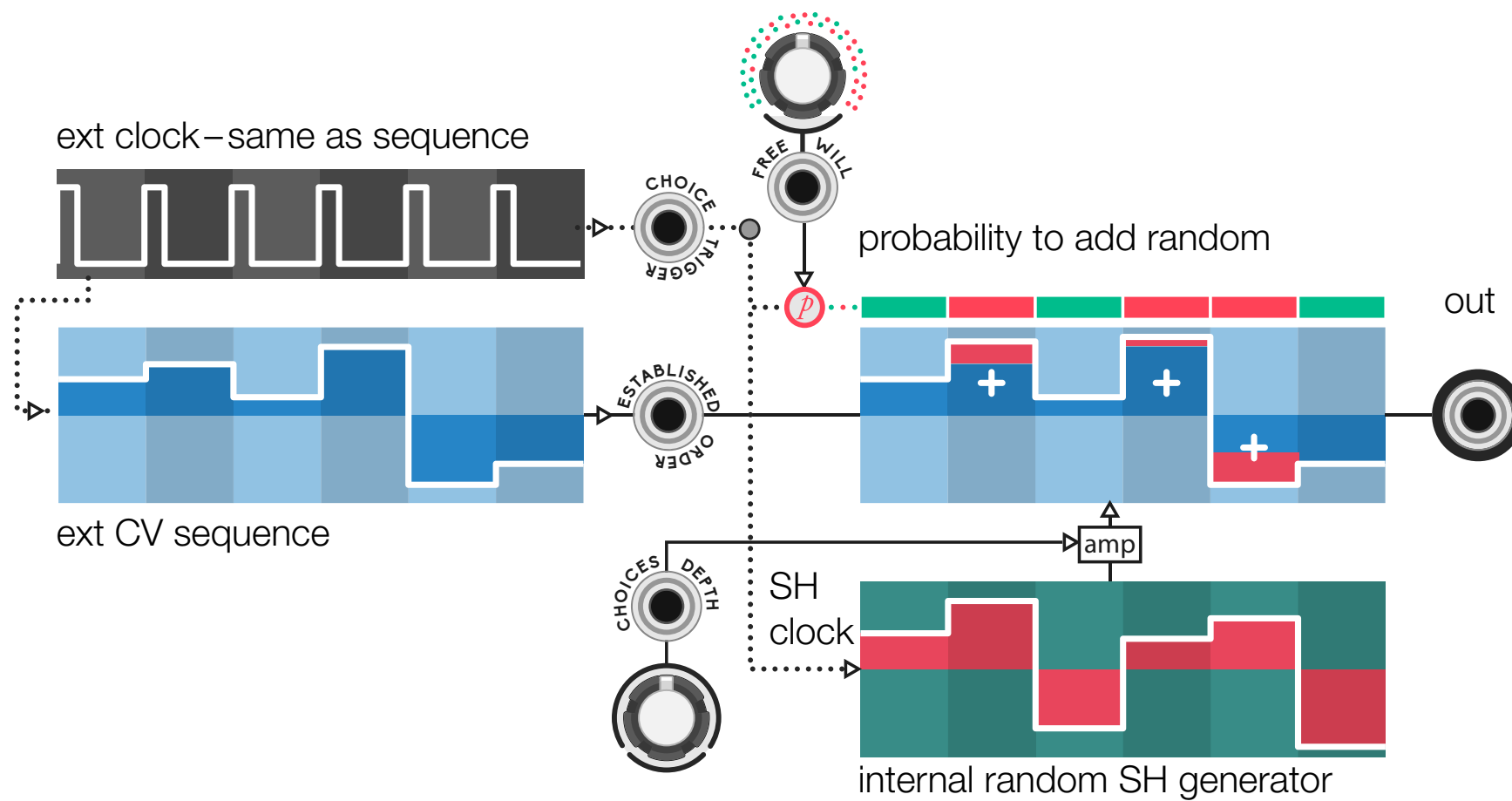
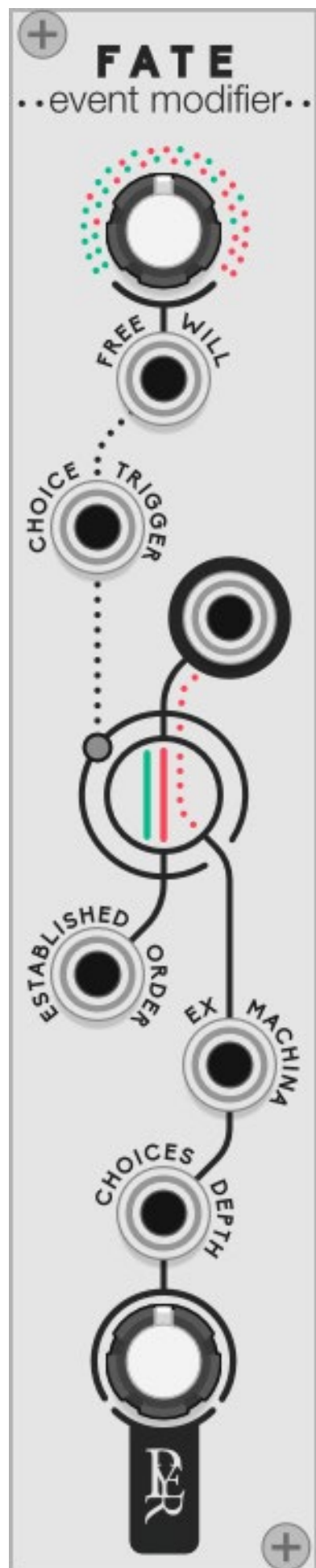


FATE

non-deterministic event modifier

Is there such thing as free will? While Scientists and philosophers are debating the question, Geodesics proposes FATE, an event modifier that will bring any sequencer to life by making its own musical choices.

FATE will alter any CV sequence by adding a specific amount of randomness at some chosen points. It can also replace some notes by another external sequence, or do both at the same time.

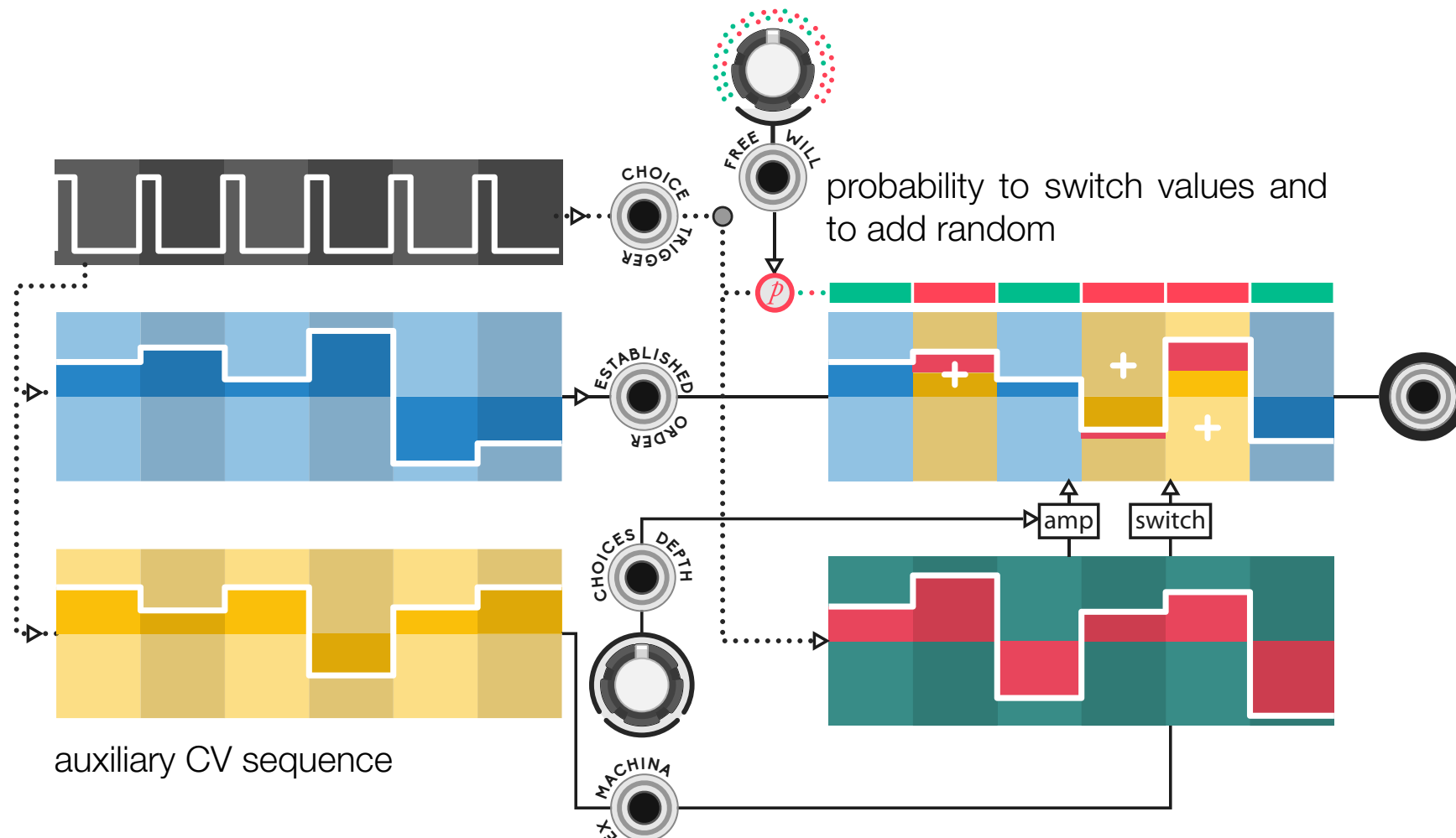


Main Concept

If you are familiar with Geodesics **Entropia**, this module will be easy to use. It can be considered as a module that can turn any sequencer into entropia. It can also be seen as a Bernoulli gate, but for CV.

Probabilistic random adder

Fate is made to receive a CV sequence (**established order**), and will leave it unaffected on default settings. When Fate receives a clock signal (**event trigger**), it can decide to add randomness s on some steps. The added randomness has a controllable range (**choice depth**). Whether the randomness will be added or not is set by a probability from zero to 100 (**free will**). A new probability is calculated at each event trigger.

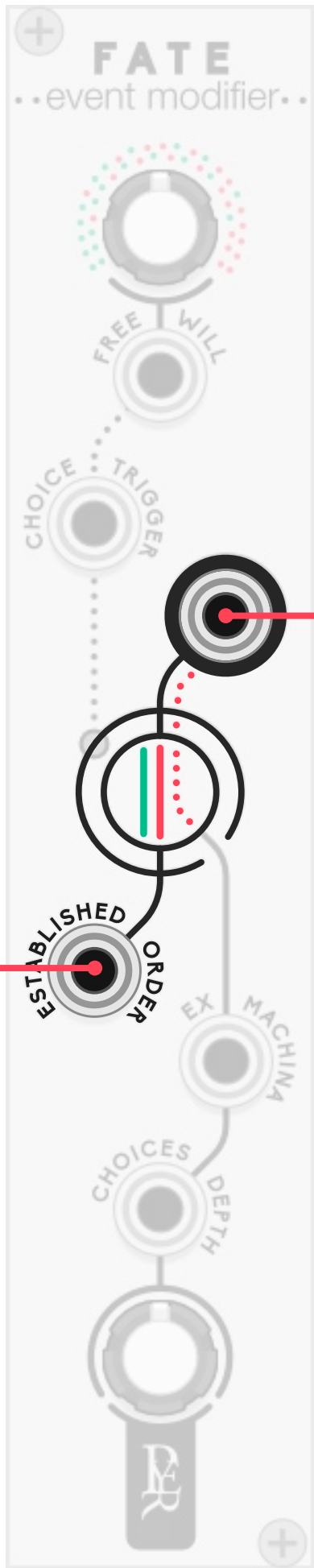


Probabilistic A/B switch

When an external signal is connected (**ex machina**), Fate will then act as a probabilistic switcher, but the random generator can still be added to the external signal for more surprises.

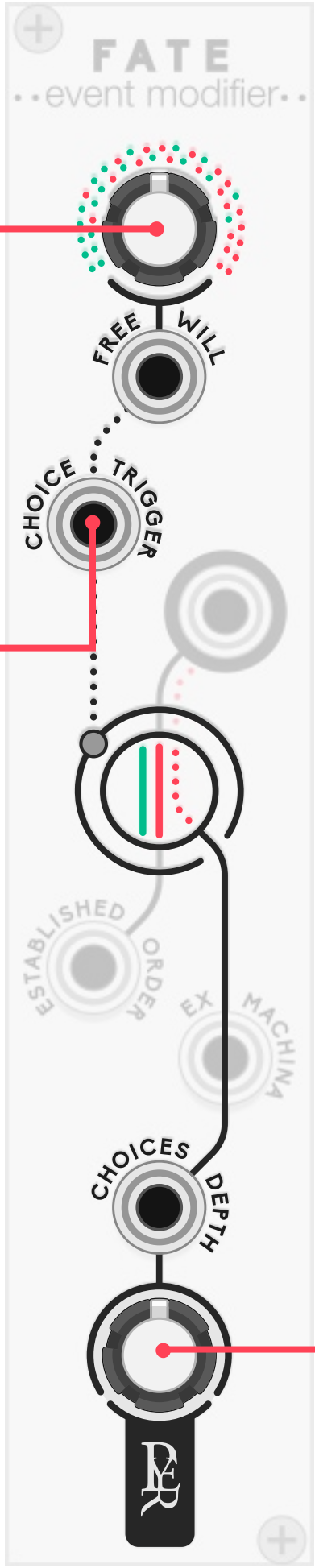
Established order:
The things as they are planned to be: the input signal, usually a CV sequence, but it works with any CV signal (lfo, env, ...).

Output: the altered signal, a complex blend in between what is planned and what is not.



Free will: controls how often the fate will alter the established order. It sets the probability for unplanned events to happen.

Event trigger: for each trigger received, a probability is set for something unplanned to happen. In most cases it would be the sequencer's clock, or any gate synced to the input signal.



Ex machina: a deus ex-machina is an external character that will allow the author to modify the end of his story.

Ex machina is an auxiliary input. When a signal is connected, FATE becomes a probabilistic A/B switch that will replace some notes of the original sequence by the auxiliary.

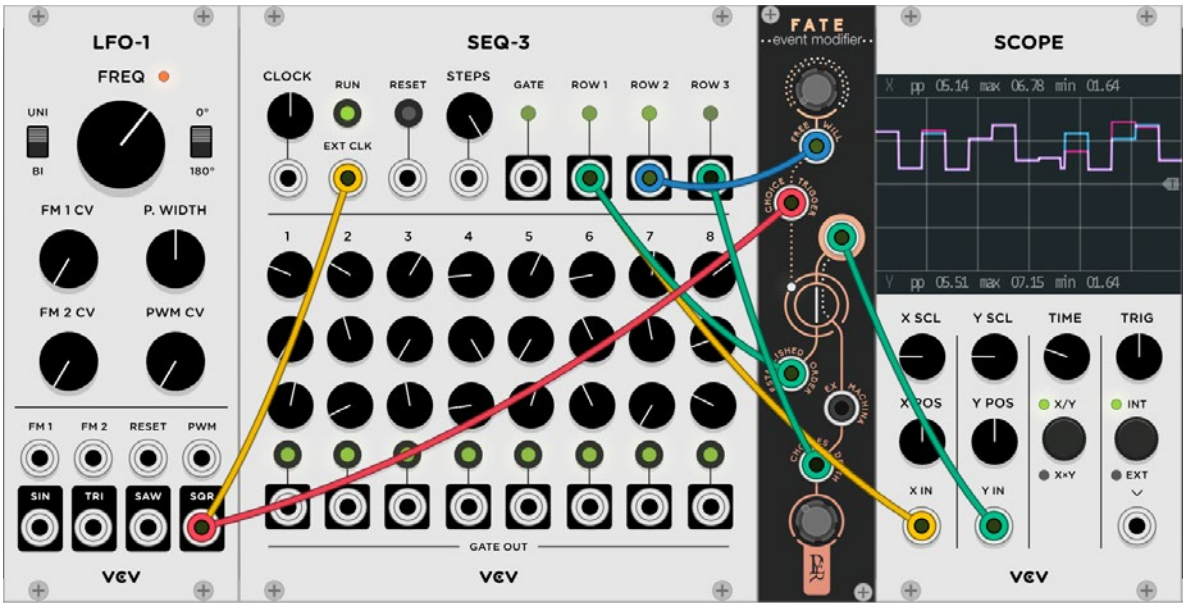
The internal random generator is still being added to the aux signal. The Choice depth needs to be set to zero use FATE as a classic sequential A/B switch.

Choices depth: controls the strength of the free will. It attenuates the internal random generator.

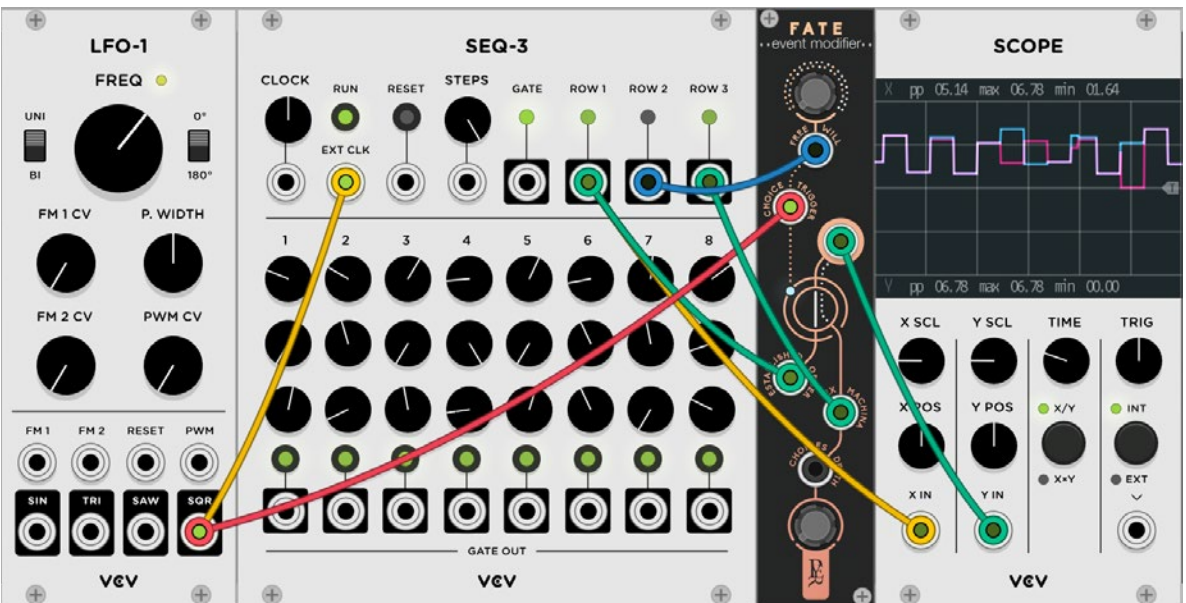




As a random
adder



As a probabilistic
switch



As an entropy sequencer
add mode (multichannel)

Patch ideas

As a complex LFO



As an entropy sequencer
switch mode (multichannel)



G E O D E S I C S

A modular collection for VCV Rack by Pyer & Marc Boulé

Geodesics has been created in July 2018 by **Pierre Collard** (industrial and graphic designer based in Brussels) and **Marc Boulé** (developer and creator of Impromptu Modular based in Montréal).

Just like many projects within VCV Rack, Geodesics is also a community effort and it would not have been possible without the help of many users, composers and developers participating one way or another to enhance the quality of the project.

Among them we would like to address a special thank to those who helped us in the beta testing phases, who made tutorials, who proposed their help in any way and those who brought the collection to life with some great pieces of music: **Omri Cohen, Georg Carlson, Xavier Belmont, Steve Baker, Marc Demers, Adi Quinn, Ben De Groot, Latif Karoumi, Espen Storo, Synthikat, Dave Phillis, Carbonic Acid, Martin Luders, Ghaleb, Stephen Askew, Lars Bjerregaard, Richard Squires, Lorenzo Fornaciari, Adi Quinn, NO rchestra, Poxbox23 and Ananda Bhishma.**

Geodesics links

www.pyer.be/geodesics
vcvrack.com/plugins.html#Geodesics
github.com/MarcBoule/Geodesics

Creations from composers using Geodesics:

<https://www.youtube.com/playlist?list=PLEh-5QLxa-BlqLI9rBcncUTFm2Lk-ZMgvZ>

Tutorials on Geodesics by Omri Cohen:

https://www.youtube.com/playlist?list=PLEh-5QLxa-Blr4dsurkkwUehFsNI7T_Jv-

Marc's work links

github.com/MarcBoule/ImpromptuModular

Pierre's work links

www.pyer.be

