GEODESICS

A modular collection for VCV Rack by Pyer & Marc Boulé

User Manual–version 1.0.0

GEODESICS

BLACKHOLES
gravitational attenumixset

TORUS
multimixer

ENTROPIA
thermodynamic microstate sequencer

PULSARS
neutron powered morphing

ENERGY
ringmod oscillator

IONS
atomic dual cv sequencer

FATE
event modifier

BRANES
colliding sample and hold

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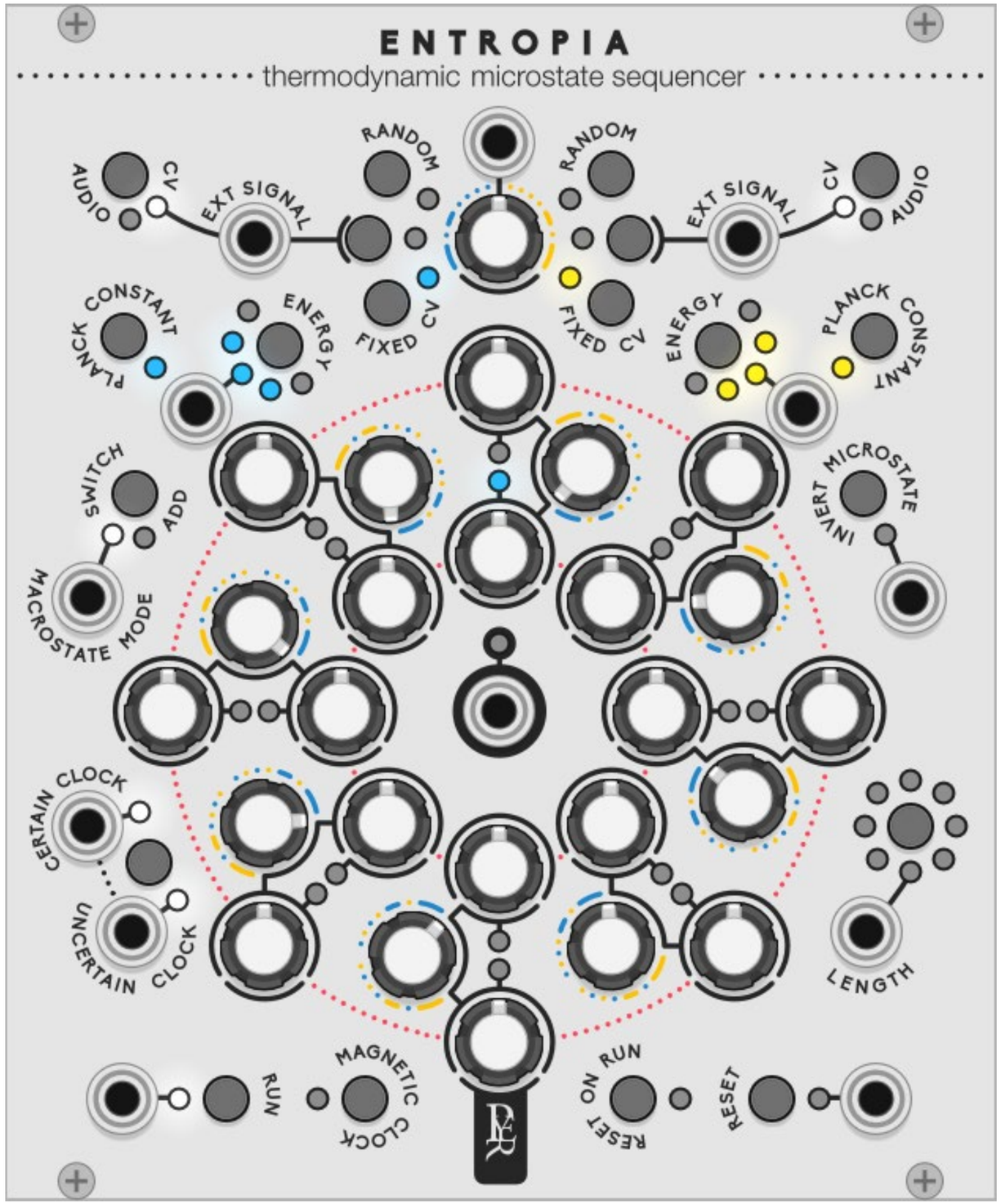


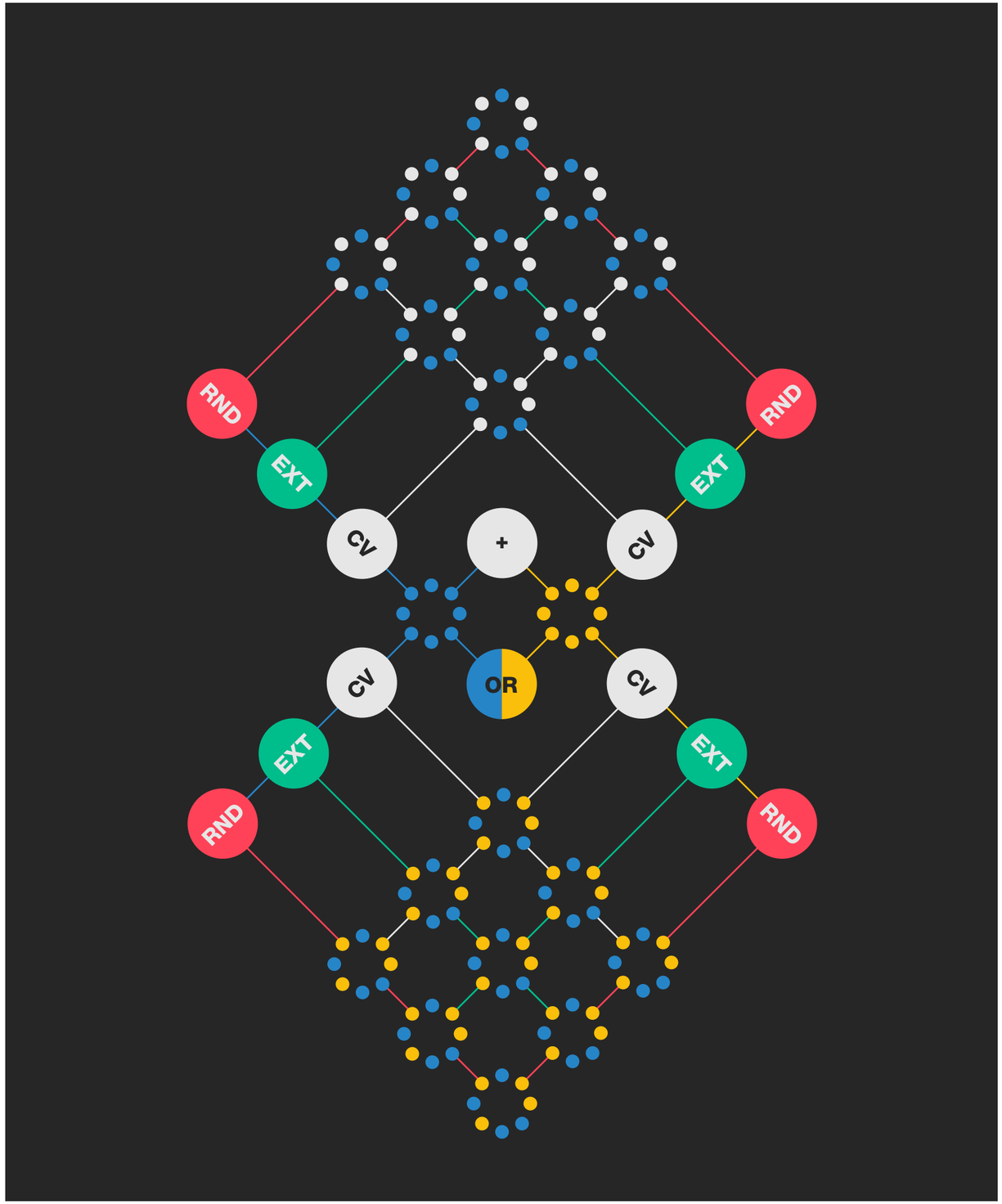
ENTROPIA

thermodynamic microstate sequencer

Entropy is a measure of disorder in a system: many microstates of atoms that create a rich and complex macrostate.

ENTROPIA is an 8-step sequencer with two values per step, and a probability to play one of the two values. Both values can be a defined sequence of voltages, a range controlled random source, or an external source.

While the controls might be intimidating, this manual will present the module in 3 concepts: the two sequences, the way they blend, and their nature to be chosen by the user.



ENTROPIA

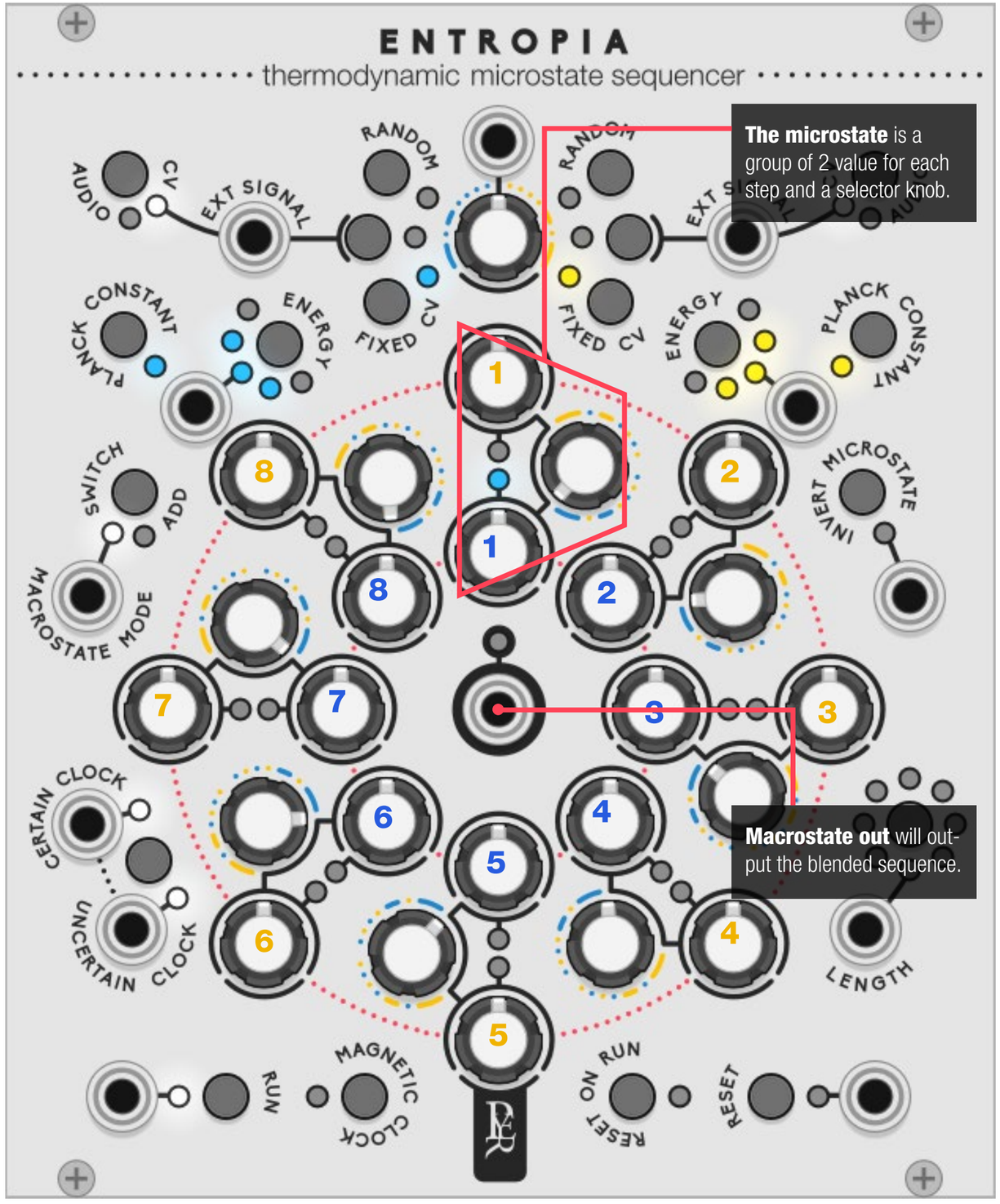
thermodynamic microstate sequencer

While the controls might be intimidating, this manual will present the module in 3 concepts:

The 2 sequences
- Blue
- Yellow

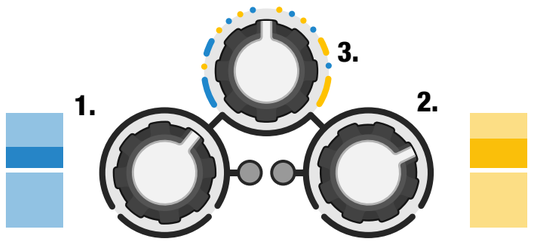
The 2 modes to blend them together
- Switch (OR)
- Add (+)

The 3 sources for each sequence
- Fixed CV
- External
- Random

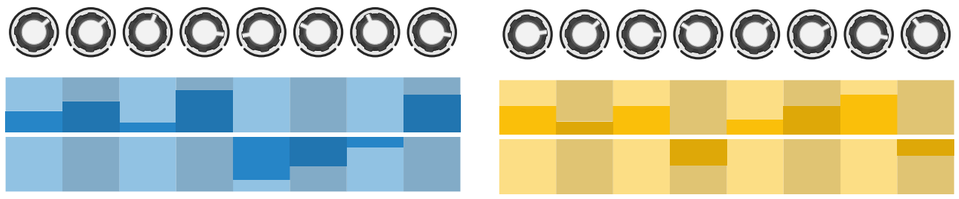


Microstate and macrostate: the two sequences

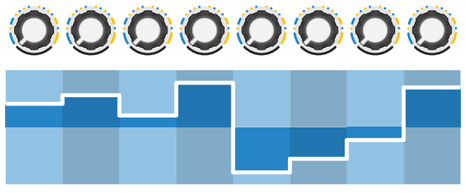
Each step of the sequencer is a **microstate:** a group of 3 knobs:
1. The blue state – primary (inner circle sequence)
2. The yellow state – secondary (outer circle sequence)
3. The probabilistic state selector



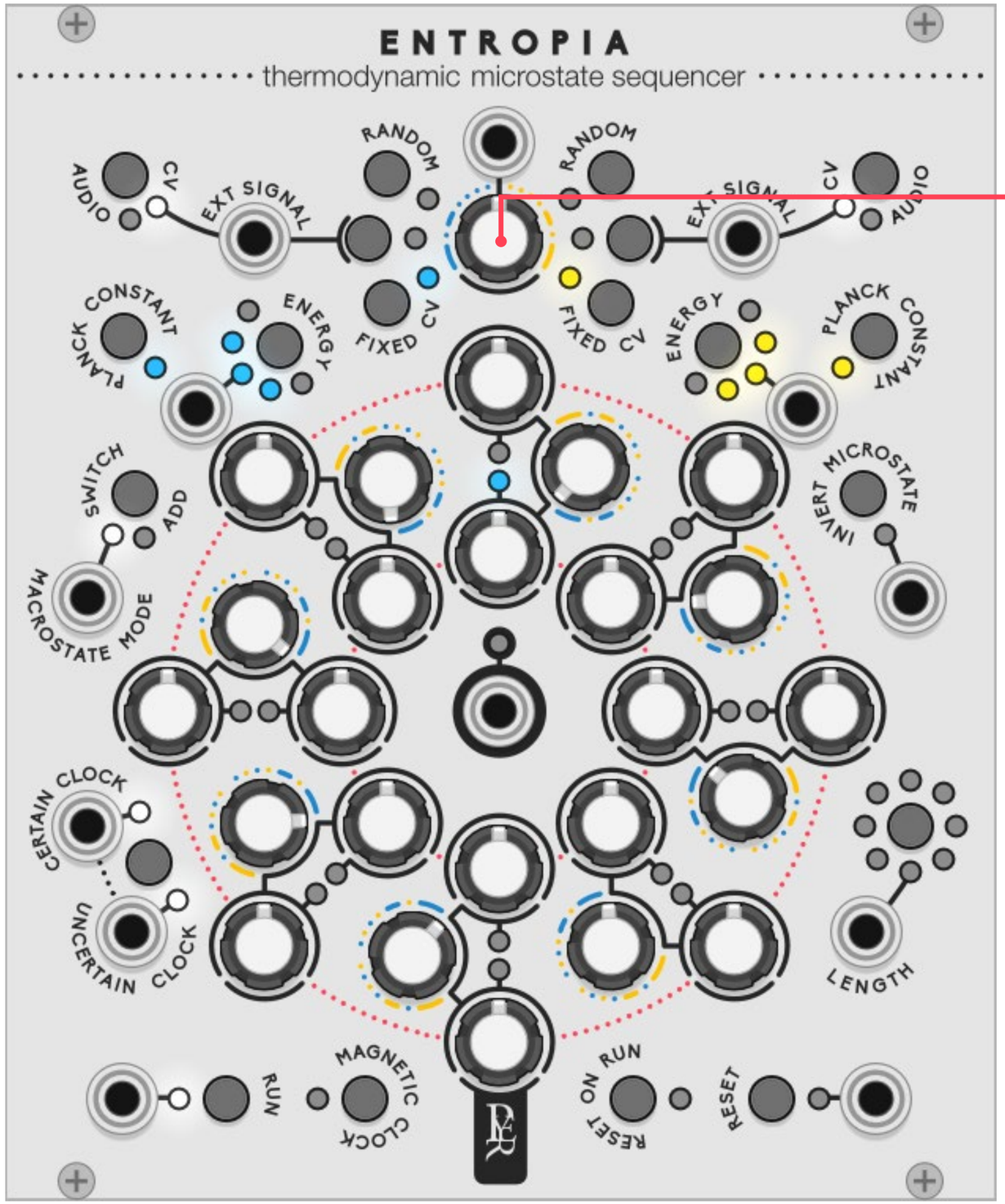
All the blue knobs and the yellow knobs determine a **blue and a yellow sequence**. The position of the state selector will define the probability to play the blue value, or the yellow one. The resulting sequence is the **macrostate.**



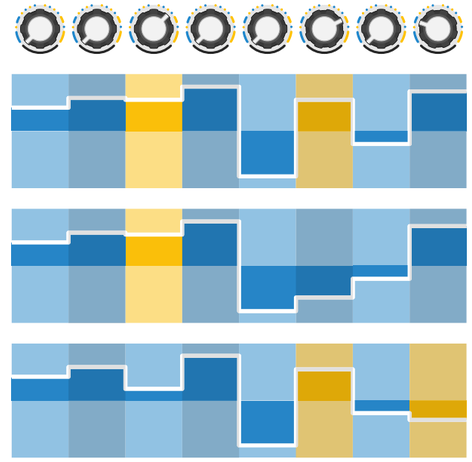
- All selectors set to full blue will only play the blue sequence, same case for yellow settings.



- Some selectors set to full blue and others set to full yellow will mix the sequence in a determined way.

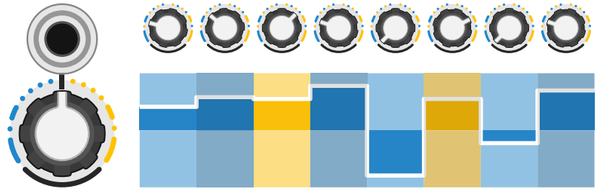


- In between value will create some probabilistic choices for each step.

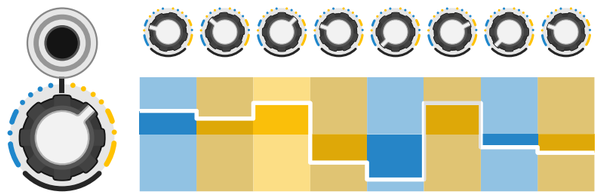


The probabilities for each step can be controlled all together by the **knob on the top**, which will add an offset to each knob. This knob is CV controllable with a –5V to +5V range.

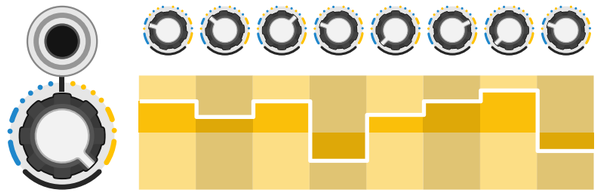
- When the offset knob is centred, it does not affect the knobs.



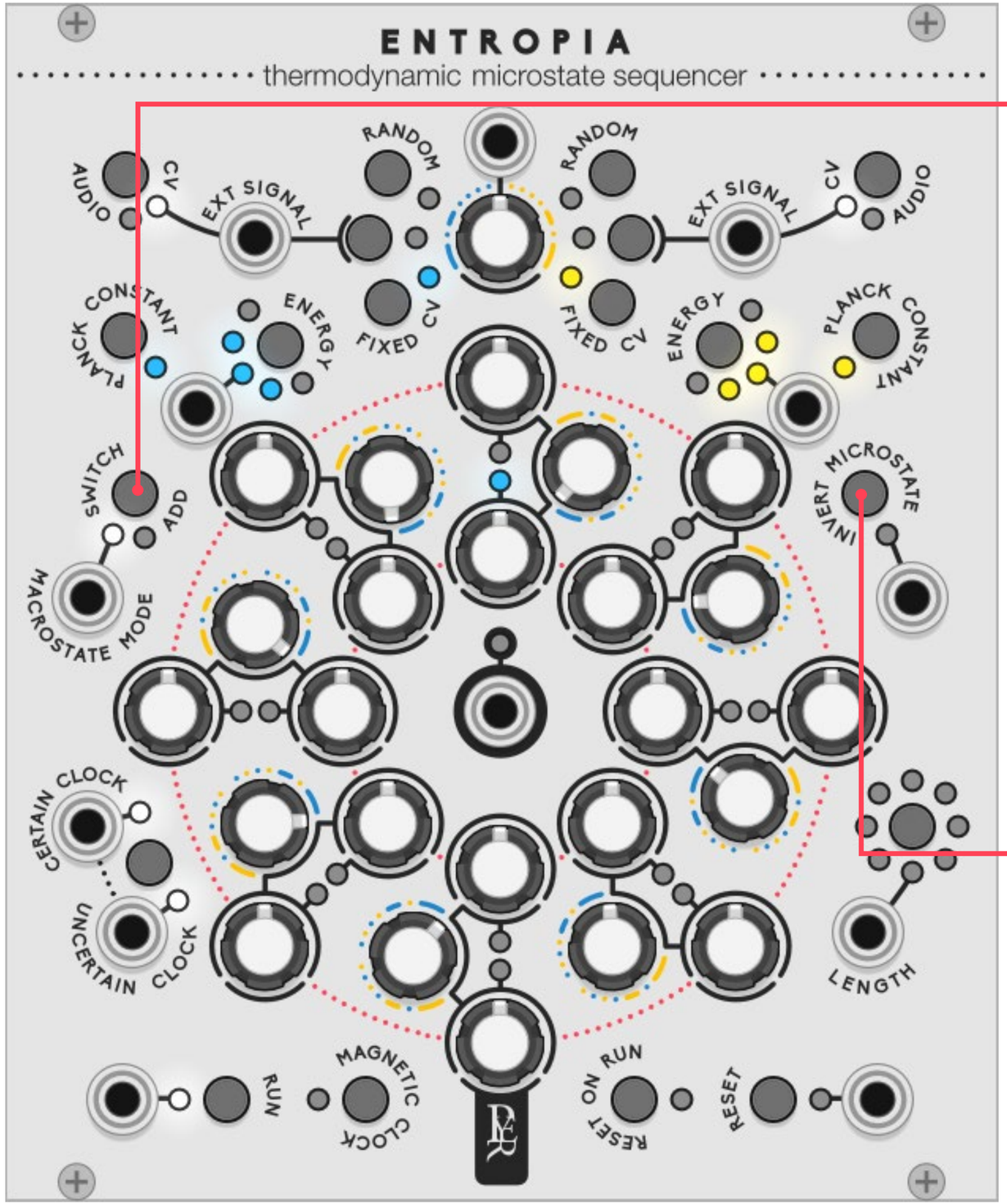
- When the offset knob is turned in the yellow direction, it adds an offset to the yellow direction for every step.



- When the offset knob is fully turned to yellow, every step will play the yellow value, no matter what the knob position is.



Slowly sweeping this knob from blue to yellow will gradually transform one sequence into another. The LED of each step will blink in their colour if they are selected when played. Ultimately, the led linked to the output will continuously light up in the colour of the selected value being played.



The Modes

Macrostate switch/add: The default mode for the sequence to blend together is switch: it will select one of the two values for each step, but another mode offers the possibility to add the two values instead of switching them. In this case, the blue sequence is considered as the default sequence, and the yellow is the added value (or subtracted if yellow is negative voltage).

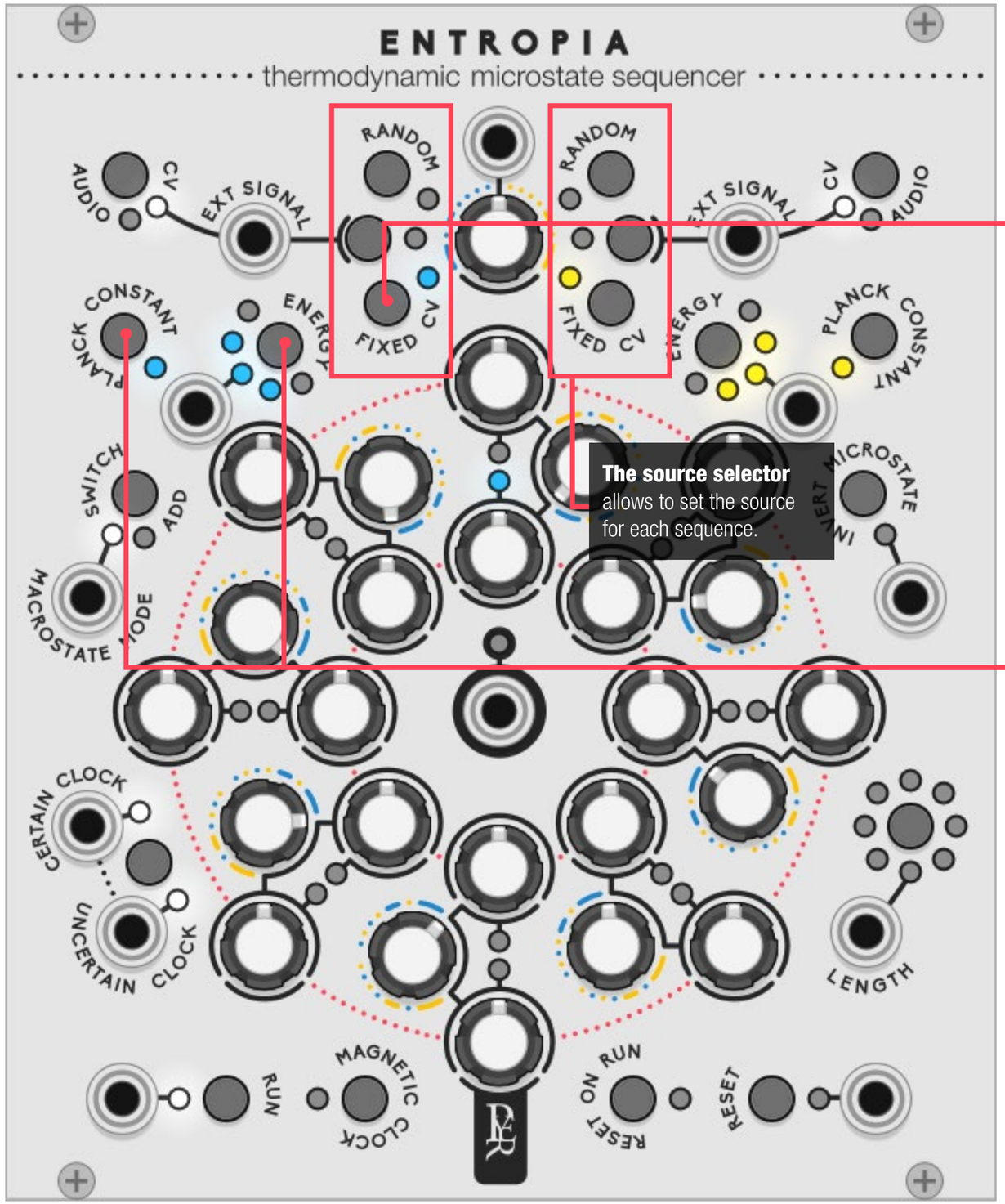
When the yellow value is selected, the output sends the addition of the blue and yellow value. This allows to affect the original sequence instead of replacing it.

Switch mode

Add mode

Invert microstate: will switch the selected value with the other one. It is active when the sequencer is not running, for composition purposes along with the magnetic clock to monitor each value.

It can also be used while running as a manual intervention, or with a trigger source, faster than the clock to add rhythm and tremolo effect in the sequence.



The 3 sources for each sequence

Each sequence can output CV signals as expected, but they also can have different roles. The nature of each sequence (the blue and the yellow one) can be defined separately.

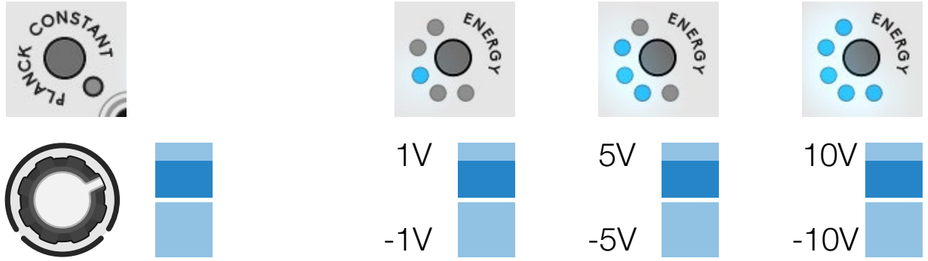
Fixed CV

Each knob defines a fixed voltage value as most sequencers works.

The value can be quantised to musical semi tones using the **Planck Constant** button, which refers to the smallest quantum of energy possible. The range of each knob can be defined with the **Energy** setting. This range will behave differently according to the Planck setting. The Fixed CV mode is the only one affected by the Planck/ Energy system.

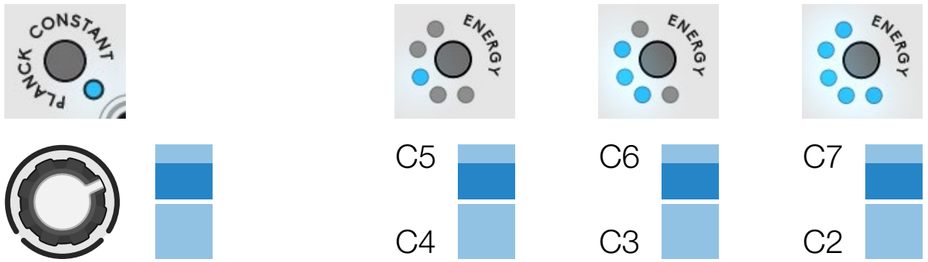
Planck Constant OFF

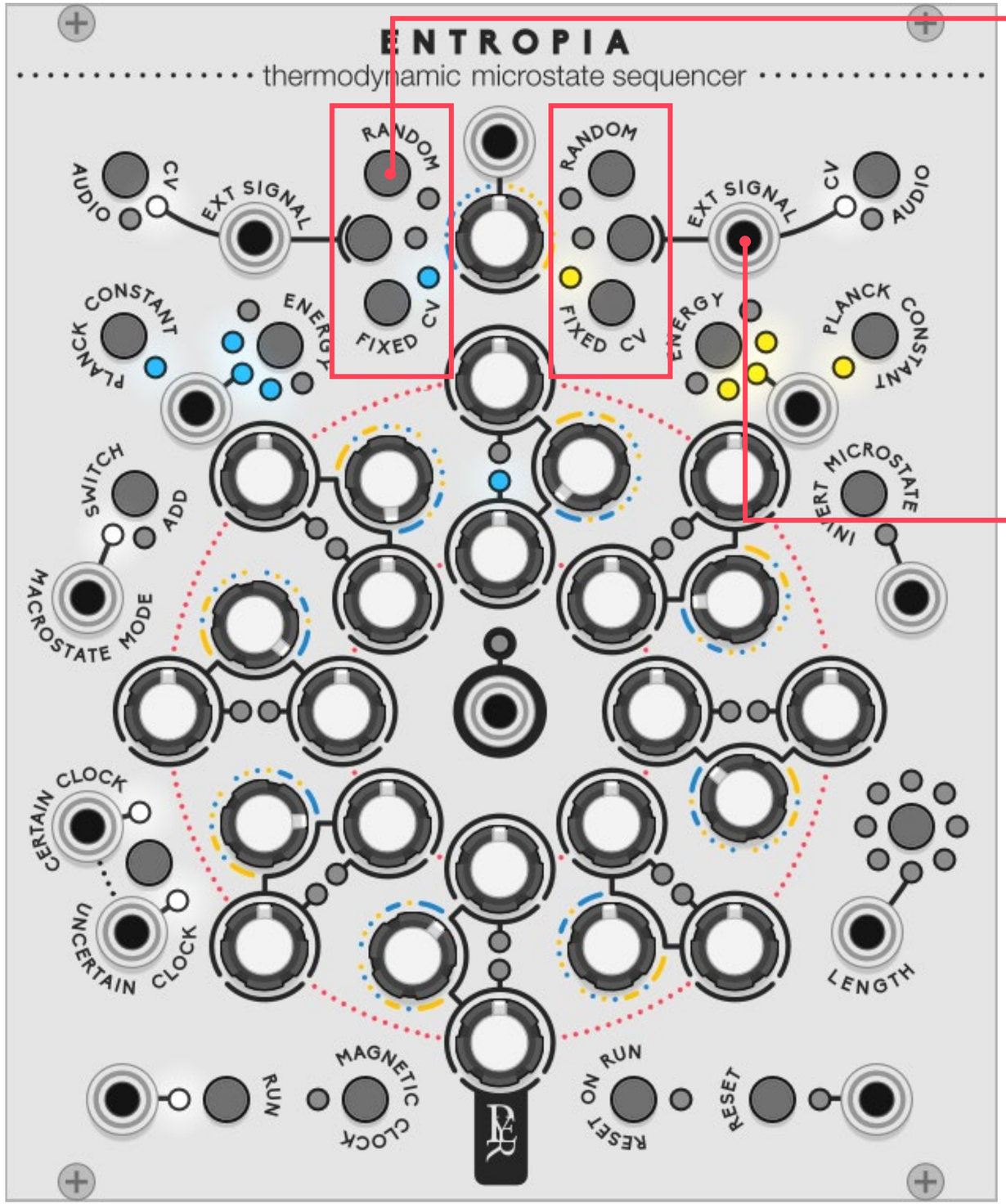
CV sequencer – smooth output



Planck Constant ON

V/Oct sequencer – 1/2 tone quantised output.

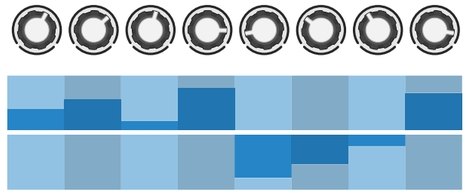




Random

The sequence can be entirely random, with an **internal random source** (0V to 5V) triggered at every clock beat. Each knob acts as an attenuverter for this random source. Extremes knob values will offer a wilder range of randomness (-5V to +5v). The behaviour of the knob is similar to a random sample and hold going through the attenuverter of BLACK HOLES

Knob sequence



Internal random source

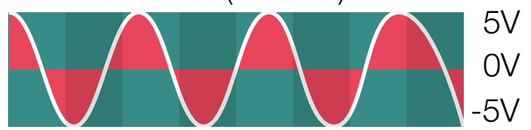
Output result

External signal

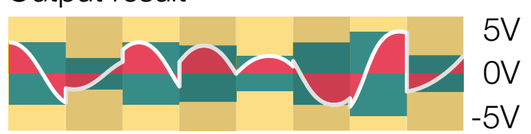
It can be **any CV or audio signal** going through the eternal signal input. The knob will act as an attenuverter for this signal with the same behaviour as BLACK HOLES. The external source can be another sequencer with preset or longer length, lfo signals, audio samples, … Anything synced with the clock of the sequencer will offer more structured result.

Knob sequence

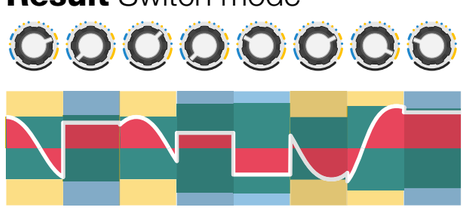
External source (ex: LFO)



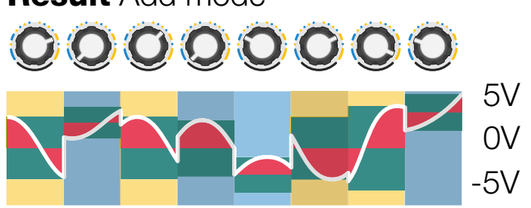
Output result

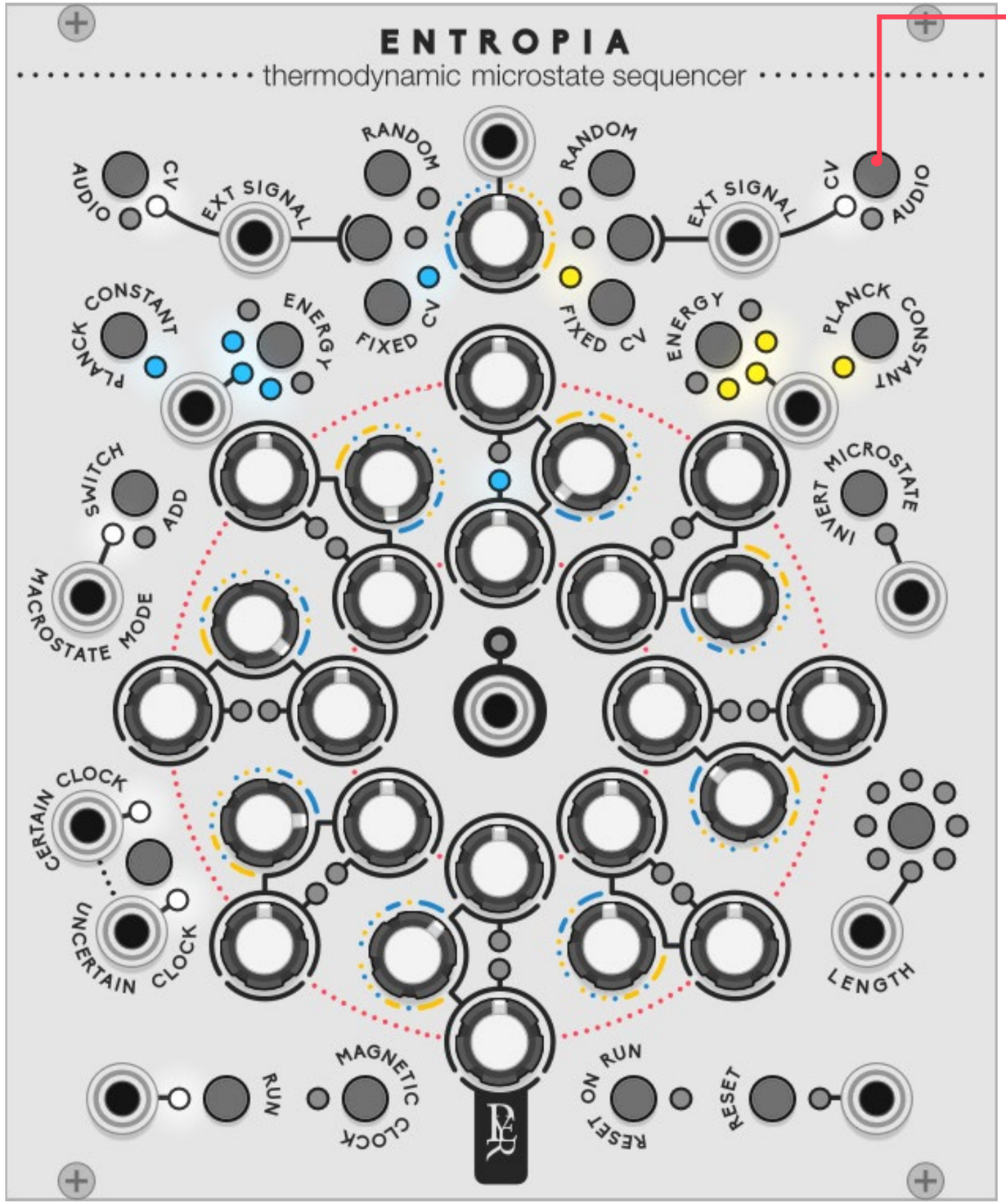


Result Switch mode



Result Add mode

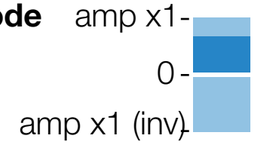




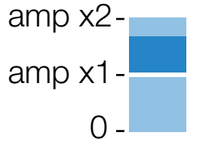
External audio mode

The external input is compatible with CV and audio. Each material will work in both modes, but the audio mode will add a light crossfade between each step to avoid unwanted pop and clicks. The audio mode will also change the knobs behaviour: they will become amplifiers instead of attenuverter.

CV mode



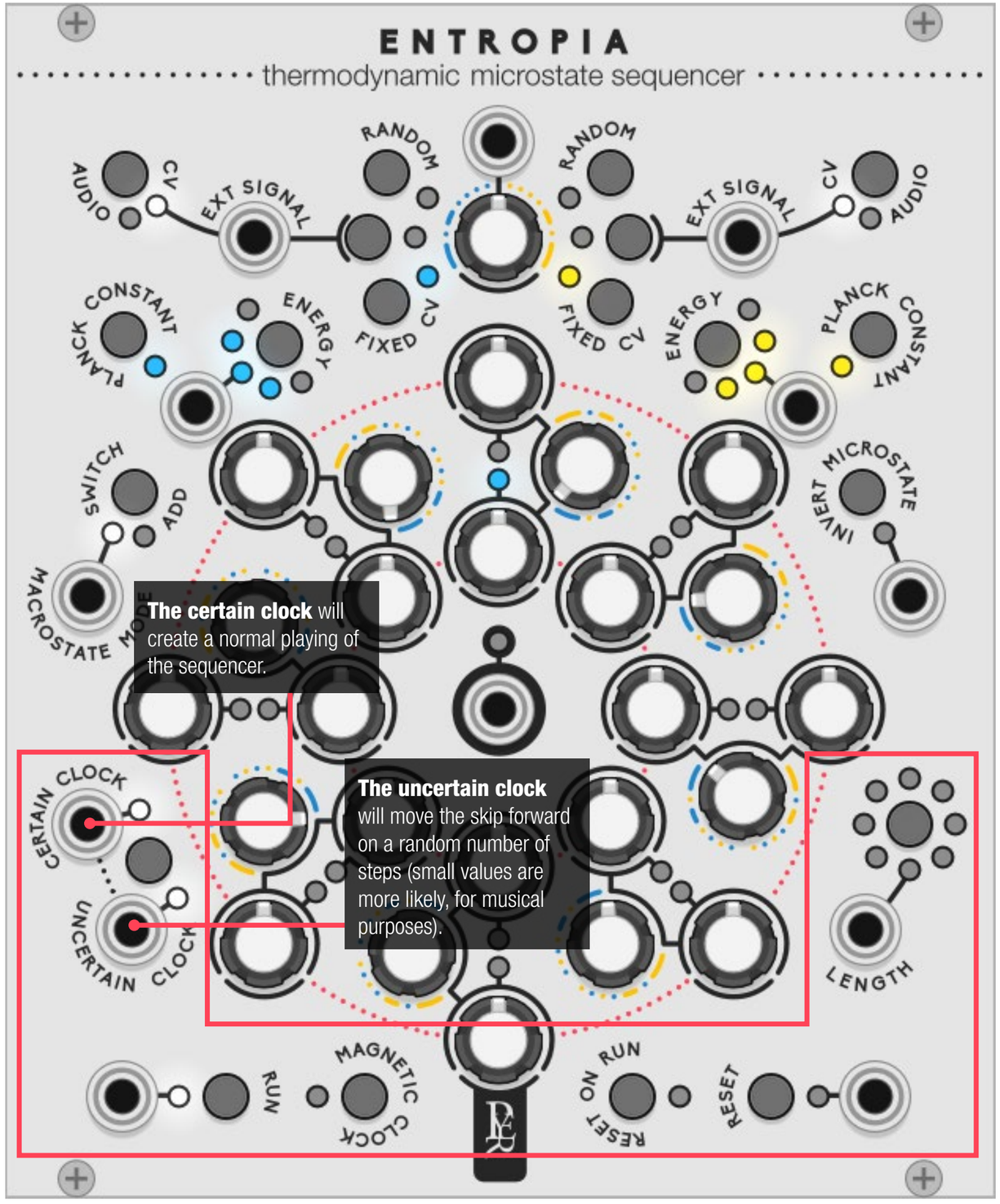
Audio mode



With 3 sources for both sequences and two blend modes there are 18 different ways to use the sequencer.

Some notable examples would be:

- **CV** switch **CV**
  Blending or replacing two sequences, transforming one sequence into another.
- **CV** switch **RANDOM**
  introducing chaos into a determined sequence up to complete random
- **CV** add **RANDOM**
  with small random range, a determined CV sequence can be perturbed for light being out of tune or hitting the next note in the scale instead of the determined one.
- **EXT** add **RANDOM**
  With external receiving another sequencer with clock sync to ENTROPIA, to add a bit of randomness to your favourite sequencer. The external sequence circle needs to be turned fully clockwise to respect the initial received value.
- **EXT** switch **EXT**:
  With each external receiving two different sequencers with clock sync to ENTROPIA, more advanced modules with preset of very long sequence length can be mixed together. Blue and yellow knobs need to be turned fully clockwise to respect the initial received value.
- **EXT** switch **EXT**:
  With two LFO signals (one slow and one fast), this will create a complex LFO signal with an amplitude defined for each step.



- **EXT** switch **EXT**:
  With two audio samples or complete sequenced synth voices. The sound can be step gated with the amp control for each knob, and then switched or mixed together.

Performance control

The bottom controls are the classic commands: play, reset, and reset on run. **The length button** will kill steps. Each push will turn an additional led to red and won't play the matching step. This can be controlled by a 0 to10V input.

The Two clock inputs

There is no internal clock in ENTROPIA, it needs to be fed by a pulse signal. The certain clock will create a normal playing of the sequencer.

According to Heisenberg, Uncertainty principle means that there is no way to know with certitude both the speed and the position of a particle at the same time. Any pulse received in the uncertain clock input will result in a random jump of steps. The selector will bypass the clocks. Both clocks can be fed at the same time to combine a controlled ratio of chaos and order.

The magnetic clock will excite the electrons in an alternative way: It's a manual clock. It is active when the experiment is not running, to monitor and set the CV value step by step. Combined with the **state switch button**, it will allow to edit every value at will. It is also active when the experiment is running, to interact with the sequence manually, adding a bit of human mess.

A good start...

Here is the most basic way to use the sequencer and start having fun!

- Have the two sequences in fixed CV mode.
- Edit the blue and yellow value with magnetic clock and state switch.
- Turn the general knob to blue.
- Run the sequencer.
- While running, turn slowly the knob to yellow and listen the metamorphose of your sequence from the blue one to the yellow one.

GEODESICS

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**, **Ghalebor, 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-BlqLl9rBcncUTFm2Lk-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

Coded and released by Marc Boulé – Concept and visuals by Pierre Collard