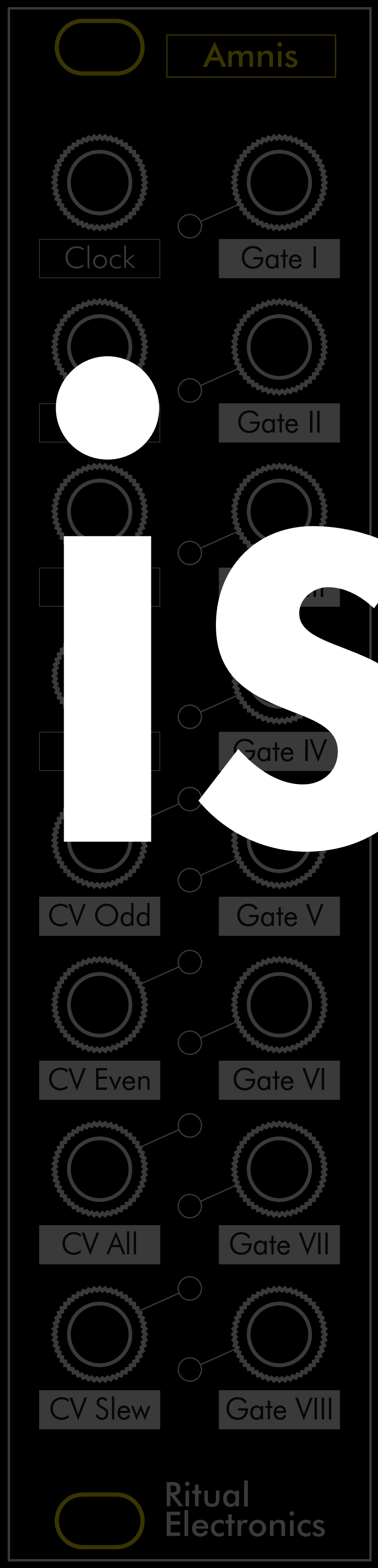
Amnis

Ritual Electronics



Summary

Thank you for purchasing Ritual Electronics Amnis.

Your module has been assembled with care in our studio in Marseille, France.

You can find your module on Modulargrid:
https://www.modulargrid.net/e/ritual-electronics-amnis

For any remarks and informations, contact us at:
contact@ritualelectronics.com

For video demos and patch ideas check:
https://www.instagram.com/ritualelectronics/

Limited warranty

Ritual Electronics warrants this product to be free of defects in materials or construction for a period of one year from the date of purchase.

Malfunction resulting from wrong power supply voltages, backwards or reversed eurorack bus board cable connection, abuse of the product or any other causes determined by Ritual Electronics to be the fault of the user are not covered by this warranty, and normal service rates will apply.

During the warranty period, any defective products will be repaired or replaced, at the option of Ritual Electronics, on a return-to-Ritual Electronics basis with the customer paying the transit cost to Ritual Electronics. The return of your module is on us.

Ritual Electronics implies and accepts no responsibility for harm to person or apparatus caused through operation of this product.

Installation

Always turn your eurorack case off before plugging or unplugging a module. Please pay attention to the way you connect the bus board cable. Align the red line on the cable with the "RED" text on the module.

Do not touch any electrical terminals when attaching any Eurorack bus board cable.

Amnis uses a 10-pin cable for power. The bigger 16-pin connector is used for expansions. **See next page.**

Ritual Electronics Amnis requires:

- 85mA on +12V (maximum recorded draw)
- 10mA on -12V
- 0mA on +5V

You will need 6HP of free space in your Eurorack case to install Amnis. The module is 35mm deep.

Overview

Amnis is a shift register with a few tricks up its sleeves. It can be used as a generative sequencer for gates and CV, as a tunable digital noise source, as a random gate and CV generator, as the center of a chaotic system and more.

It needs two input signals to start doing its thing. A Clock and some Data. Data can be pretty much any signals. Both inputs are comparator-based.
From these two signals Amnis will generate 8 gate outputs, always on the clock. From these gate outputs, it will generate 3 staircase CVs and a slewed CV. With 8 gates and 4 CV outputs it can be the heart of any patch.

Amnis has an XOR input for linear feedback. A shift register with linear feedback is the core of the Rungler, the chaotic core in Rob Hordijk's Benjolin and Blippoo Box. With Amnis you can recreate these type of behaviors with any oscillators you have on hands. As it is fully patchable, you can use the XOR for way more.

Amnis is compatible with the Turing Machine expanders thanks to its expansion port at the back.

Amnis controls

Clock Input
Clocks the shift register
Comparator-based input

Reset Input
Empties the shift register when high
Comparator-based input, followed by a gate to trigger converter

Data Input
Feeds values to the shift register
Comparator-based input

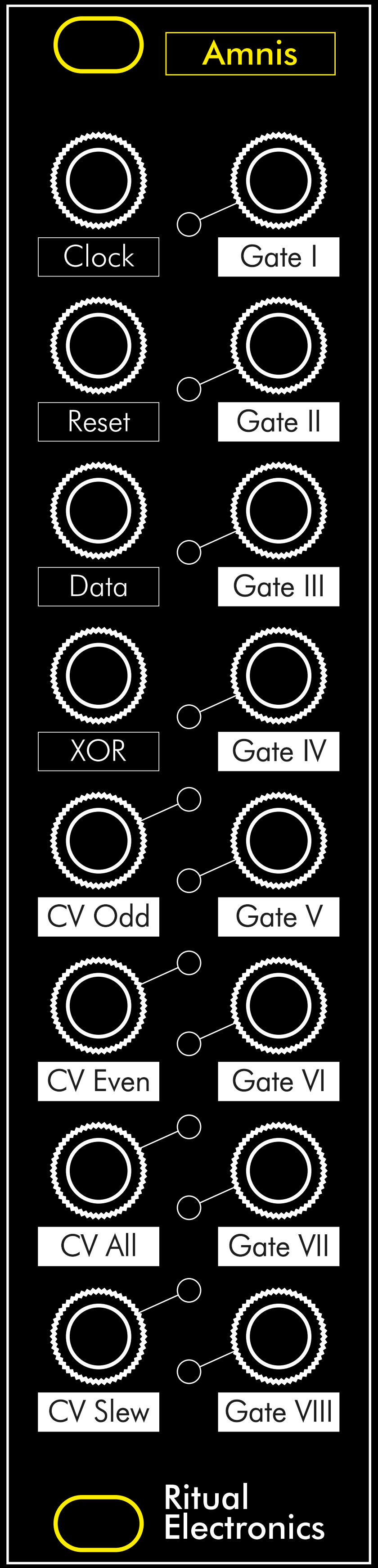
XOR Input
Second input of a dual input XOR gate fed by the Data input
Comparator-based input

CV Odd
Staircase CV output resulting of all odd gate outputs into an R-2R network
0-5V range

CV Even
Staircase CV output resulting of all even gate outputs into an R-2R network
0-5V range

CV All
Staircase CV output resulting of all gate outputs into an R-2R network
0-5V range

CV Slew
Smooth CV output derived from the CV all output
Approx. 0-5V range



Gate Outputs
Individual gate outputs for each bit of the shift register
0-8V range

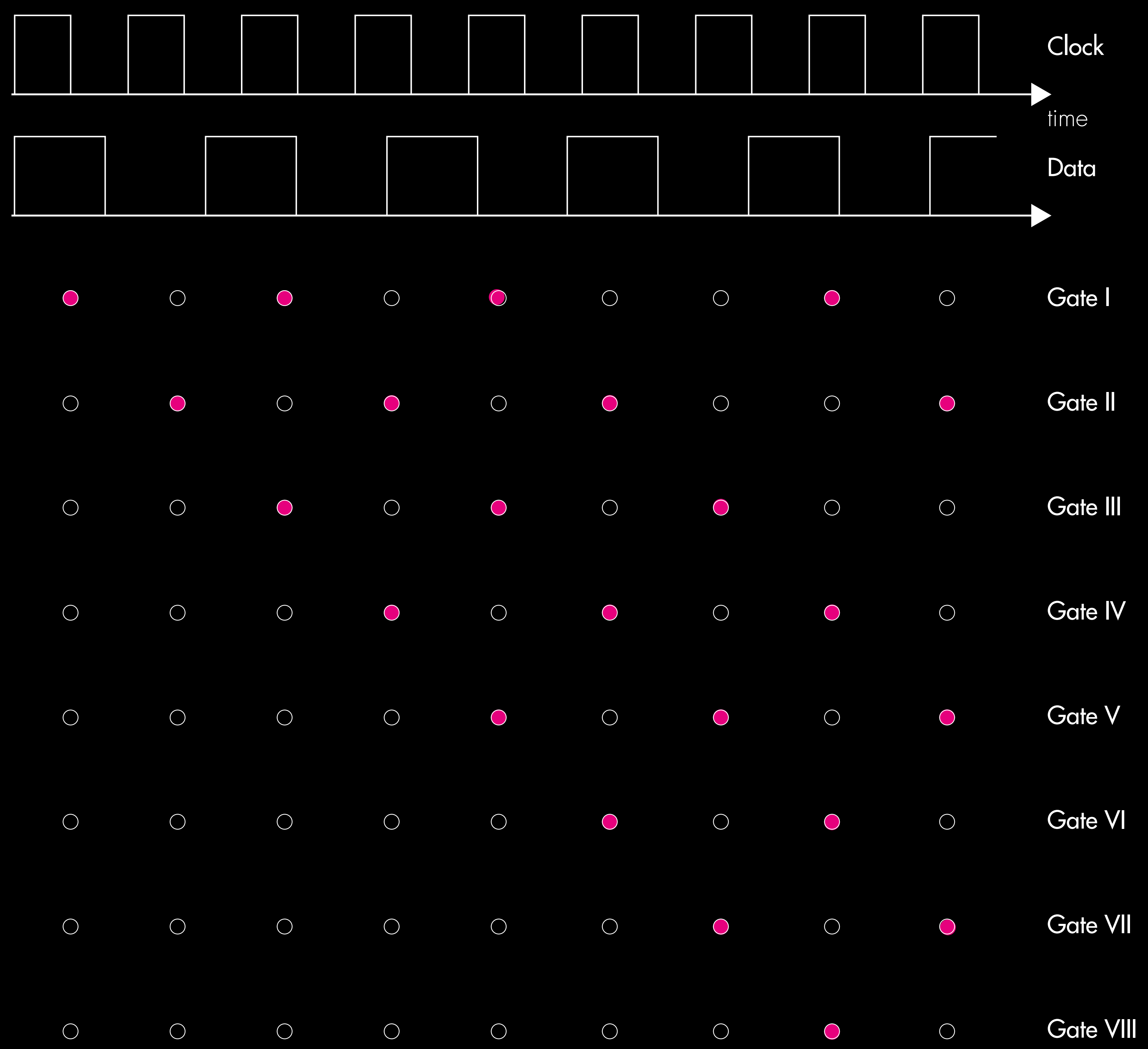
Shift Registers

Digital shift registers were not created to be musical devices. You can find a lot of them in computer and digital devices were they can have a variety of purposes. Despite being very simple it is as versatile when used as part of a sound making system.

On each clock tick, the shift register reads the Data input. If the Data input is High (signal above 2.5V) the shift register will output a gate on Gate I output. If the Data input is Low (signal below 2.5V) the shift register won't output a gate.
On the next clock tick, this process starts again. The Data is analyzed and the result is outputed on Gate I. At the same time the previous result gets shifted to the next Gate output.
When the information reaches Gate VIII, it drops out of the shift register and gets forgotten forever.

The Wikipedia article is not bad and worth reading if you want to have a deeper understanding:
https://en.wikipedia.org/wiki/Shift_register

Do not mix up Shift Register and Analog Shift Register! The latter is very different and while being very interesting in a musical context, it is not what Amnis is. Amnis is a digital shift register, it reads gates and outputs gates.



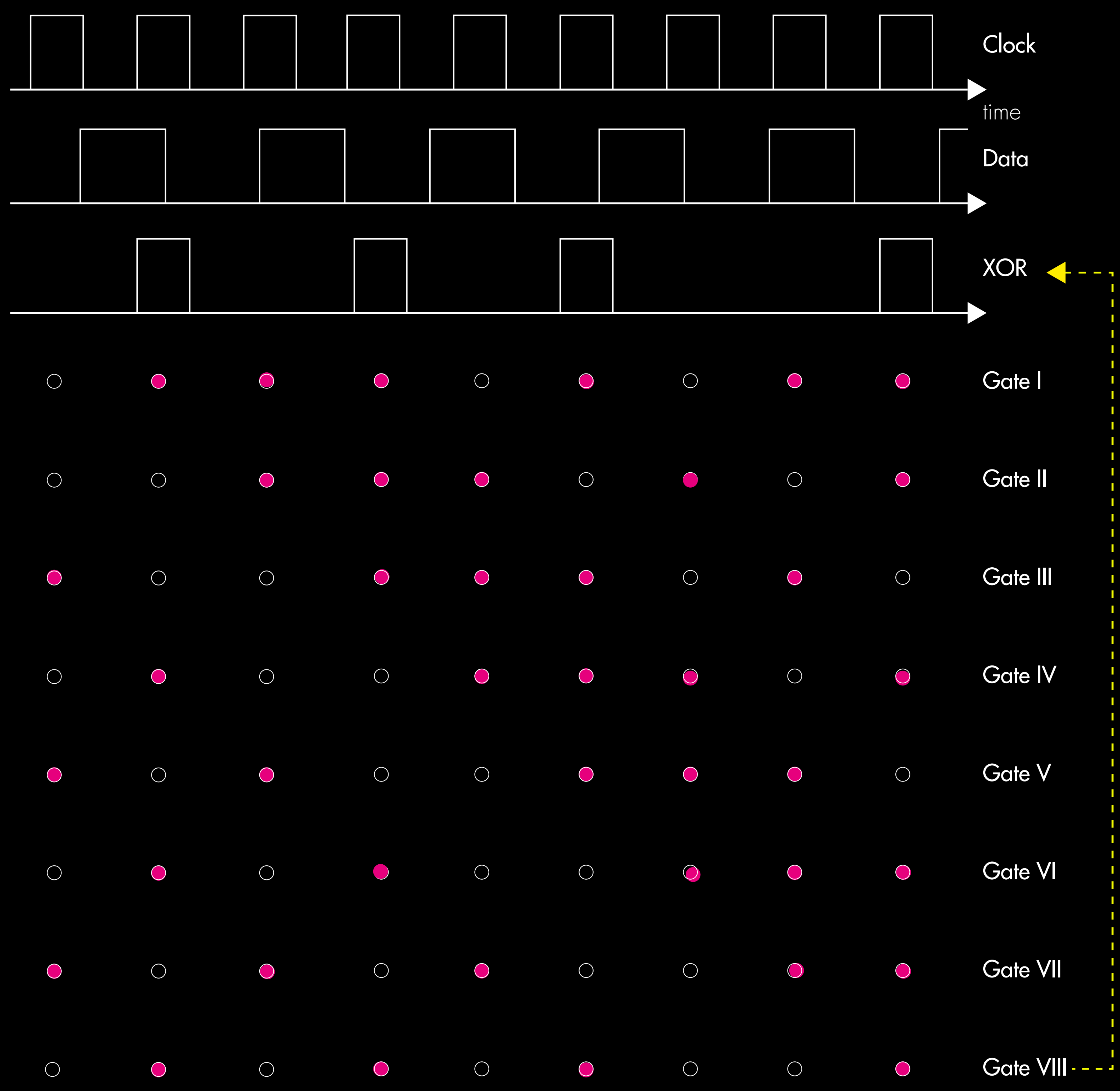
Linear Feedback Shift Registers

When coupled with a logic gate, shift registers can turn into LFSRs or Linear Feeback Shift Registers. With the use of feedback the shift register can be used to generate pseudo-random sequences, digital noise and more.

By connecting a Gate Output to the XOR Input of Amnis, we create a feedback loop which influences the result of the Data analysis. The Data signal will be XORed against the the XOR Input. Note that external signals can be used in the XOR Input.

A quick look at the Wikipedia article may confuse you some more: https://en.wikipedia.org/wiki/Linear-feedback_shift_register

In a musical context this means you can spice up the sequences you get from the “classic” shift register. You won’t get long non repeating random sequeces with Amnis’ setup but using Gate VIII in the XOR input you get a reasonnable amount of randomness. By patching some more you can go very random though. See the patch examples later.



Clock

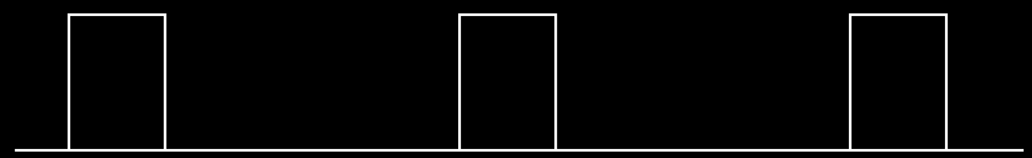
The Clock system in Amnis deserves a bit of explanation as it is a crucial element of the shift register in a musical context.

The Clock and Data inputs need to be precisely aligned to work as expected. If the Data signal is received after the rising edge of the clock, it won't result in a High value at Gate I.

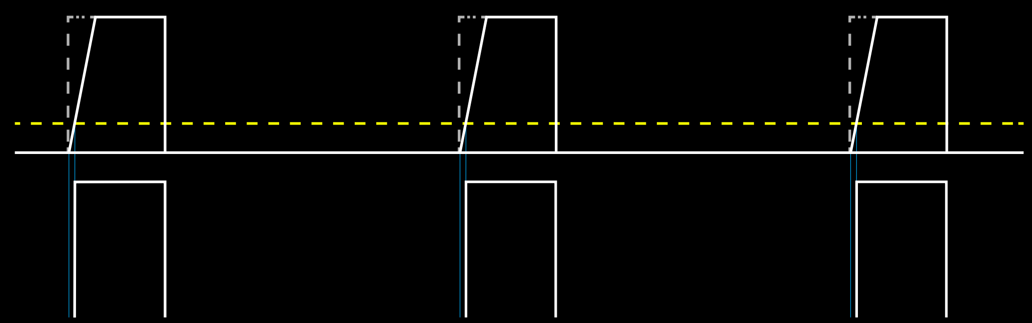
When Amnis Data source and the Clock originate from the same digital source a problem can arise. The digital nature of some sequencers for example means the signal they output may have small timing differences between them. The shift register does not like this.

Amnis has a Clock delay built in to compensate for this phenomenon. The trimmer on the bottom PCB is used to shift the Clock forward in time. This way you can align the Clock and the Data signals.

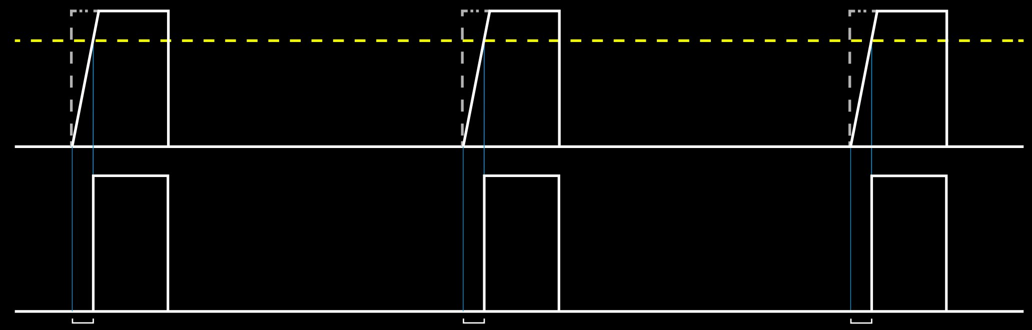
If you don't plan on using Amnis this way, leave the trimmer at 0 (fully CCW) as the delay compensation reduces the maximum speed of the clock.



Let's take a steady clock, 25% duty cycle. Let's say we need to delay it just a bit to align with the Data signal



As you move the threshold trimmer the beat will be delayed in time



The more you increase the threshold the more delayed your clock will be.

Reset

The Reset Input can be used to create shorter sequences or to empty the shift register bits

As all other inputs the Reset Input can be driven with any signals thanks to its bult-in comparator.
It also features a gate to trigger convertor. This way only the rising edge of the signal is used to reset instead of pausing the shift register for the length of the received gate.

Data

Data is a vague name for an input but we could not find better. First, it shows the digital nature of the shift register. Second, it does not specify the type of expected signal... as it can be any!

It can be any signal but it will eventually end up being a gate. The Data Input goes straight into a comparator. Its threshold is set to 2.5V.

If the Data signal you use is correlated to the Clock Input, you'll have more or less repetitive behaviors. If the Data signal is free running, completely desynchronized, you'll end up with an evolving behavior.

For more control over the Data, use an external comparator before the Data Input! As the Shift Register cares only about gates, a voltage controlled comparator (as our own Répression) to vary the gate size is a must for more control and variations.

XOR

As described earlier, the XOR Input is used to turn the shift register in a Linear Feedback Shift Register. Musically, it allows multiple things.

The most straight forward is to add randomness or variations to the shift register.

It can also be used to loop the register. For an 8-step loop, plug Gate VIII to the XOR Input, disconnect the Data cable when you like a sequence. Amnis will repeat itself. See patch examples for a detailed explanation.

If you have other logic modules in your system you can try combining them with the Gate Outputs to allow longer pseudo random sequences.
If you feed Amnis a single Gate in the Data input and XOR together Gates IV, V, VI & VIII you will have a 255 steps random sequence a.k.a. the longest pseudo random sequece you can obtain with an 8-bit linear feedback shift register.

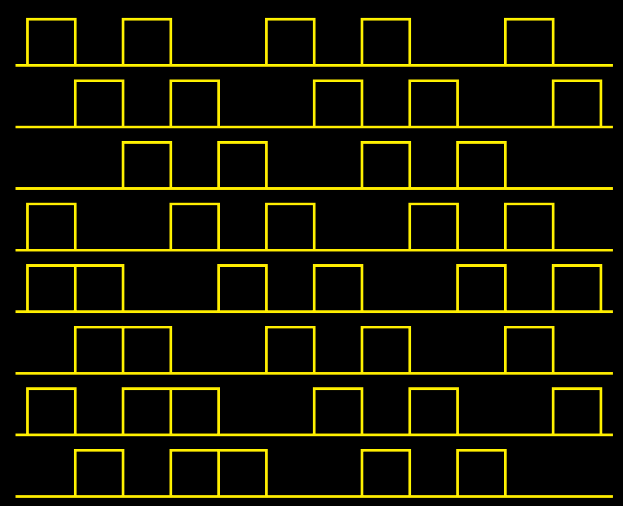
A [Data]	B [XOR]	Out [Gate I]
0	0	**0**
1	0	**1**
0	1	**1**
1	1	**0**

XOR logic truth table
(0 = Gate Low, 1 = Gate High)

If a gate is present at both the Data input and the XOR input, the result will be inverted

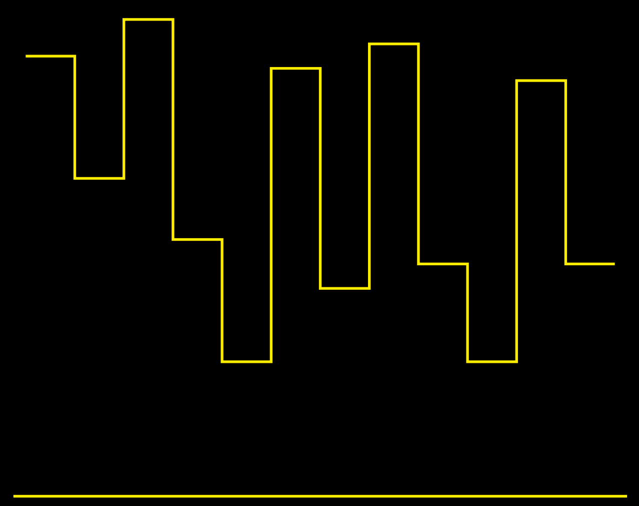
Outputs

Amnis has three type of outputs. 8 Gate outputs, 3 staircase CV outputs and 1 smooth CV output.



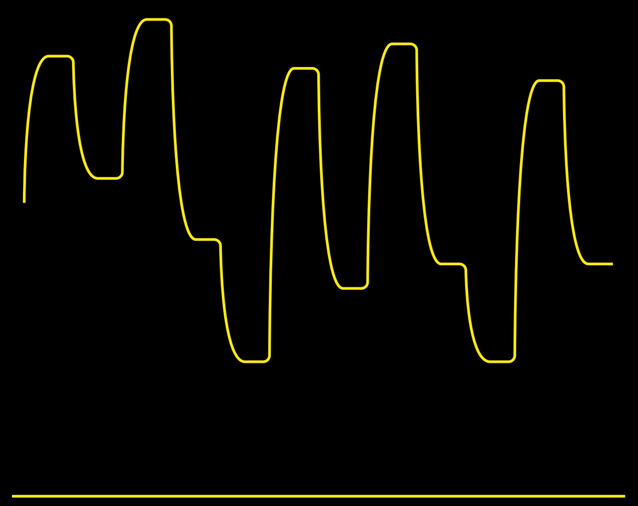
Gate Outputs

They correspond to each bit of the register (bit 0 = Gate I, bit 1 = Gate II, ..., bit 7 = Gate VIII)
They are 8V gates with a duty cycle of 50% of the Clock



Staircase CV Outputs

The different CV outputs are mixed together using the R-2R principle.
The first output uses the 4 odd bits in a R-2R
The second output uses the 4 even bits in a second R-2R
The third output uses all the outputs in a 8-bit R-2R network.



Slewed CV Outputs

To add even more versatility to Amnis we turned the All Output into a smooth CV by sending it to a slew limiter. It softens the edges of the staircase for a Slewed CV Output.
Note that the slewing is speed dependent. Different clock speed will lead to different degrees of smoothness.

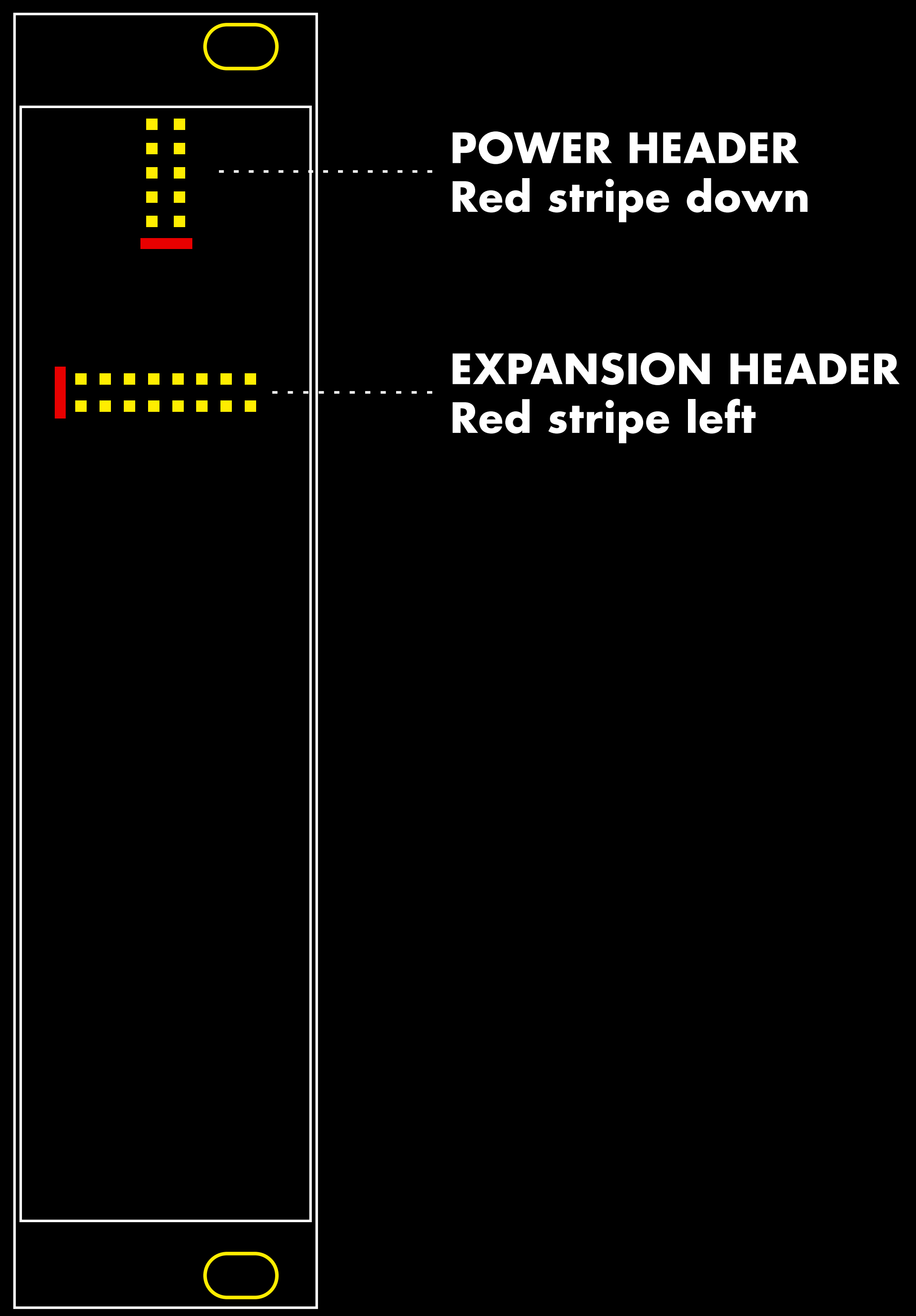
Expansion

Amnis is compatible with the Music Thing Modular Turing Machine expanders. It acts as the Master (replaces the Turing Machine).

Please be very careful with the header connection. Many Turing Machine expanders are not protected against reverse voltages.

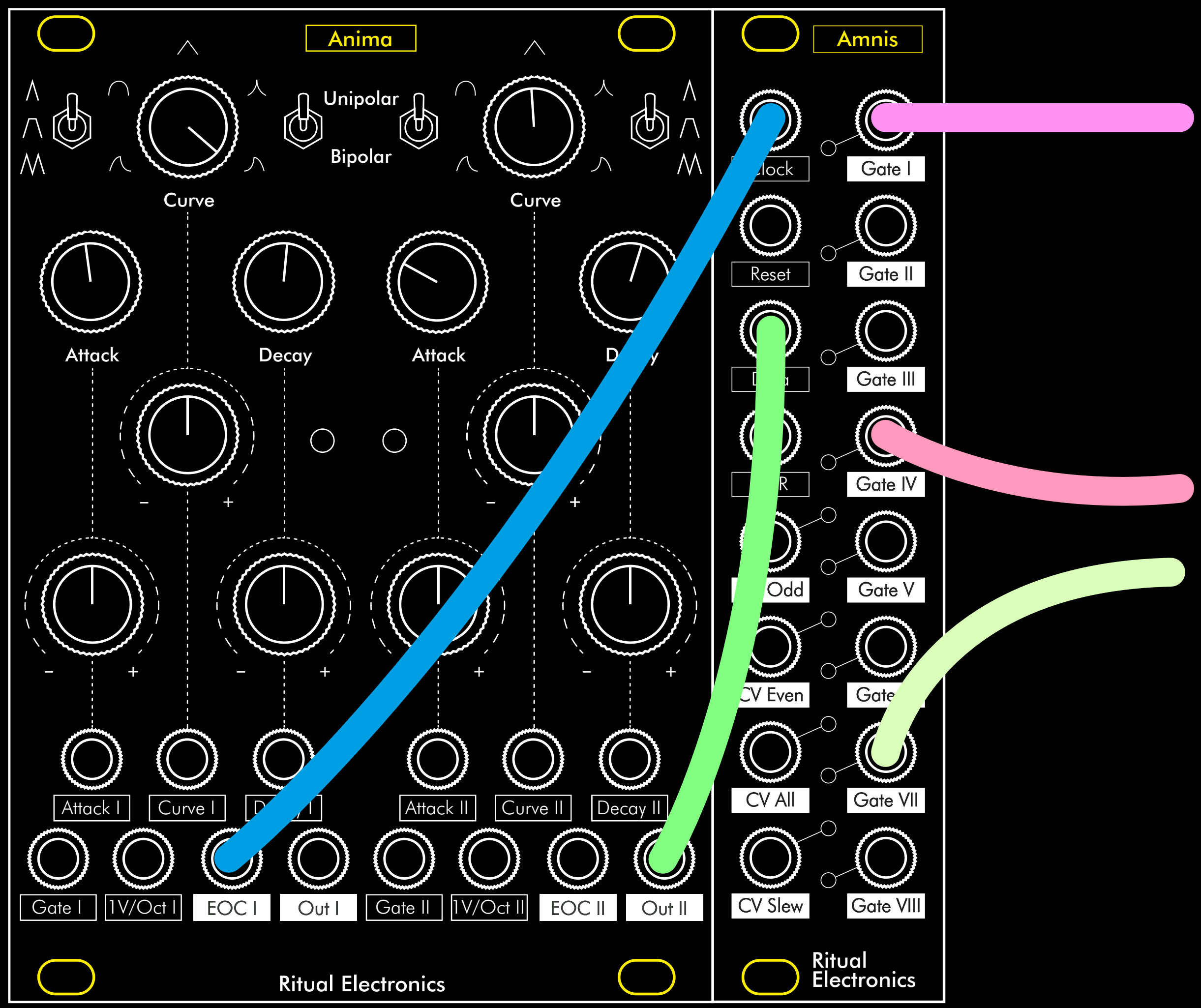
The iconic Music Thing Modular Turing Machine and Amnis are both based around a shift register. Even though two very different modules, someone at Superbooth asked if I could make Amnis compatible with the expander systems… And I did, which is great to expand Amnis' abilities.

Some of the expanders are very useful, such as the simple Music Thing Volts, the great Mystic Circuits Leaves or the very blinken lightsy Schreibmaschine Modular Brainiac and Binary.



Back of the module

Patch ideas



Patch #1 - Shift register 101

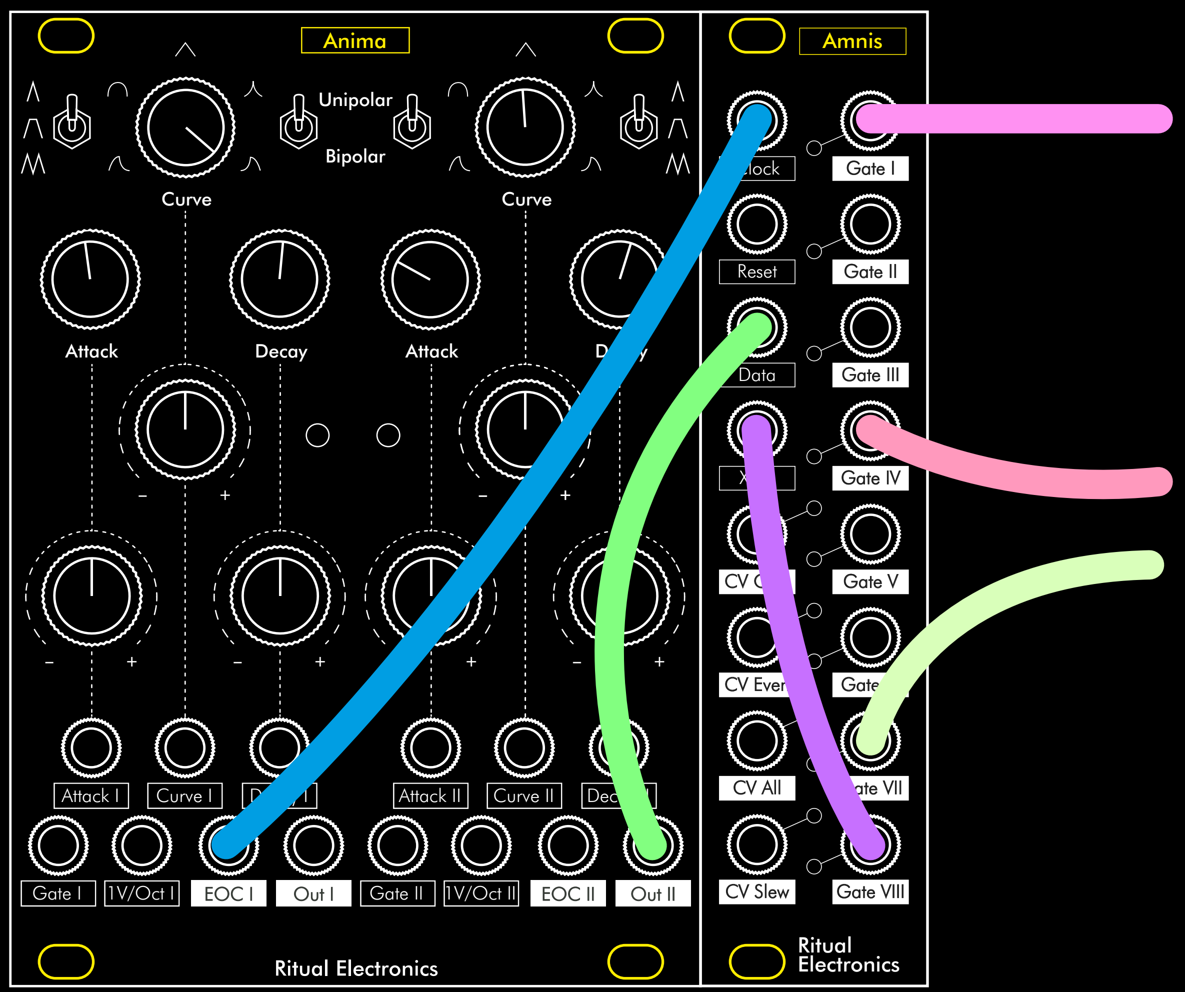
The most basic patch to get thing running. A clock in Clock in. Since the shift register only uses the rising edge of the clock, a trigger is enough. An LFO in the Data input will take you a long way already. With these 2 simple signals you already have 8 gate outputs and 4 CV outputs going.

Patch notes

Anima, Ch.1 Trigger Out ——— Amnis, Clock In
Anima, Ch. 2 Out ——— Amnis, Data In

For nearly repeating patterns, try to match the speed of the clock with the speed of the LFO. For evolving patterns chose unrelated speeds.
Using an LFO with control over the waveform let you dial in different patterns without varying the speed.

Patch ideas



Patch #2 - LFSR 101

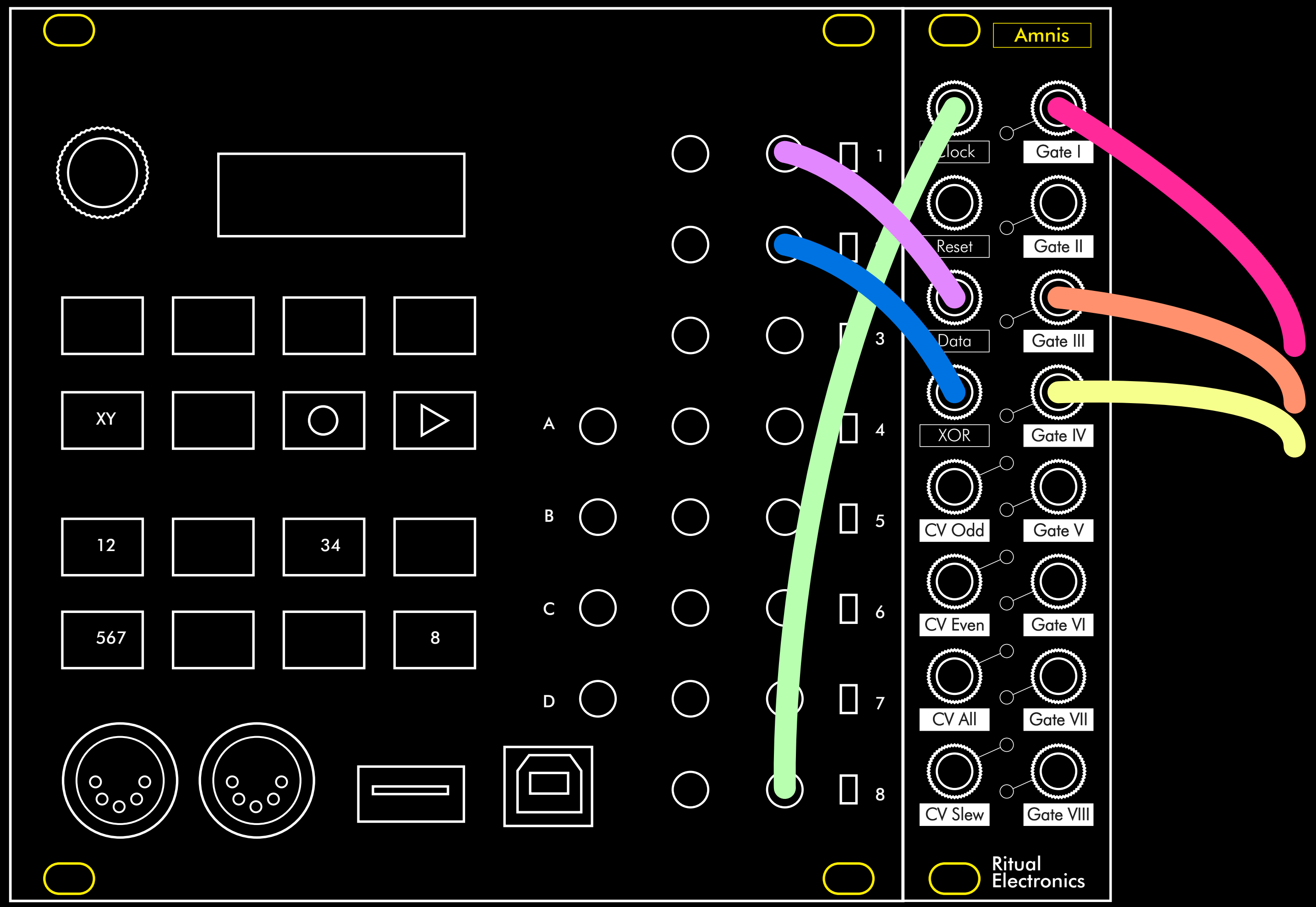
One more cable than the last patch and you got yourself an LFSR. By patching the last gate output to the XOR input, the outcome of the shift register will be influenced by the result of the last bit. See how it changes the gate sequences and CV outputs. Now try other gates and observe the different level of complexity/perceived randomness.

Patch notes

Anima, Ch.1 Trigger Out ——— Amnis, Clock In
Anima, Ch. 2 Out ——— Amnis, Data In
Amnis, Gate VIII ——— Amnis, XOR In

At this point stackcables may come in handy.

Patch ideas



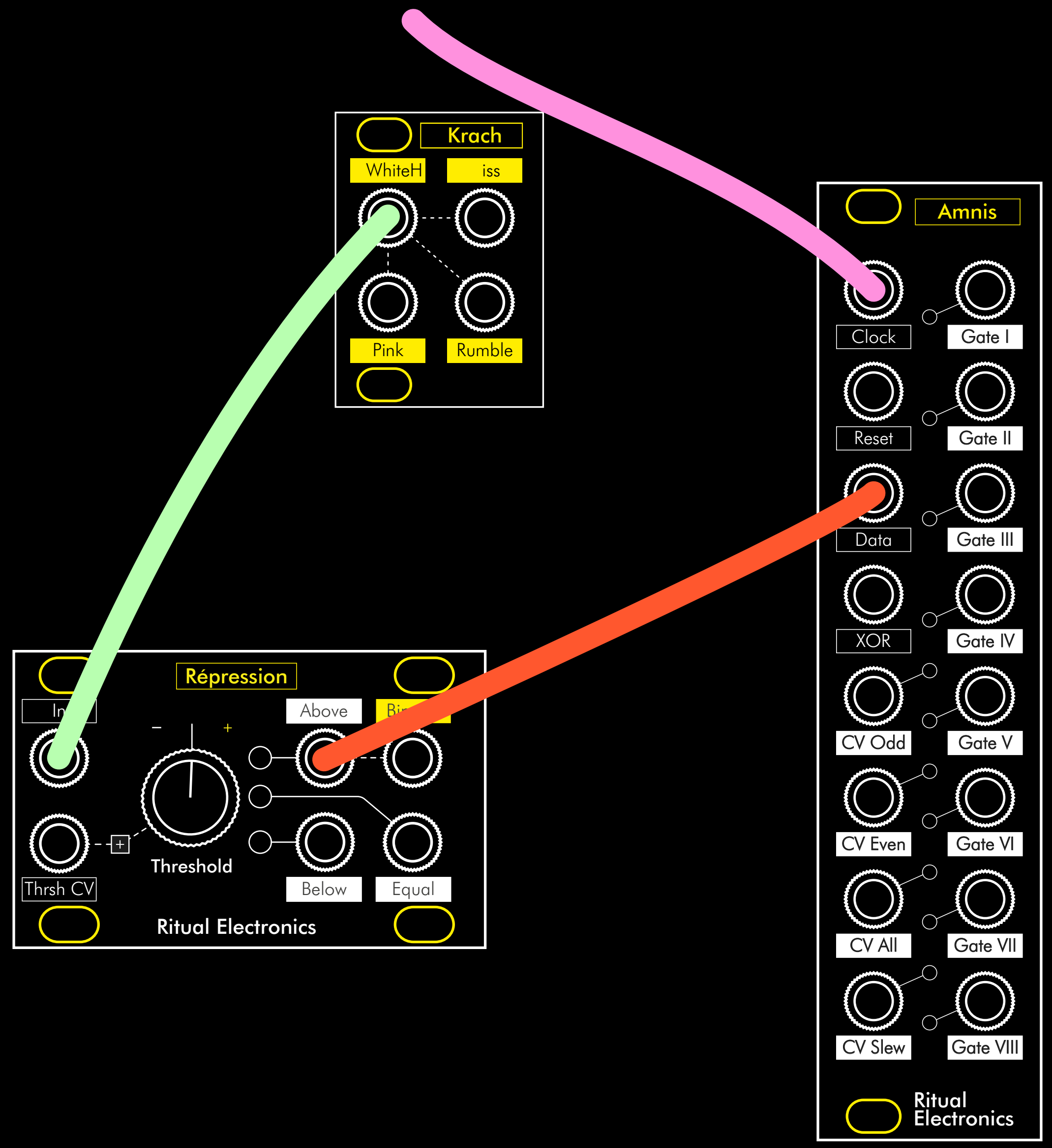
Patch #3 - Gate sequencer expander

Amnis is useful to create more sequences out of existing sequences. Since the clock does not have to be stable in order for the module to operate, put a first gate sequence in the Clock In. Put a second gate sequence in Data. You'll have 8 related patterns at the gate outs.
Use a third sequence in the XOR input to see even more changes or use one of Amnis' gate for linear feedback.

Patch notes

Gate sequencer, Ch.1 Gate Out ——— Amnis, Clock In
Gate sequencer, Ch. 2 Gate Out ——— Amnis, Data In
Gate sequencer, Ch. 3 Gate Out ——— Amnis, XOR In

Small changes in the initial sequences can have huge impact on the resulting sequences!



Patch #4 - True Clocked Random Generator

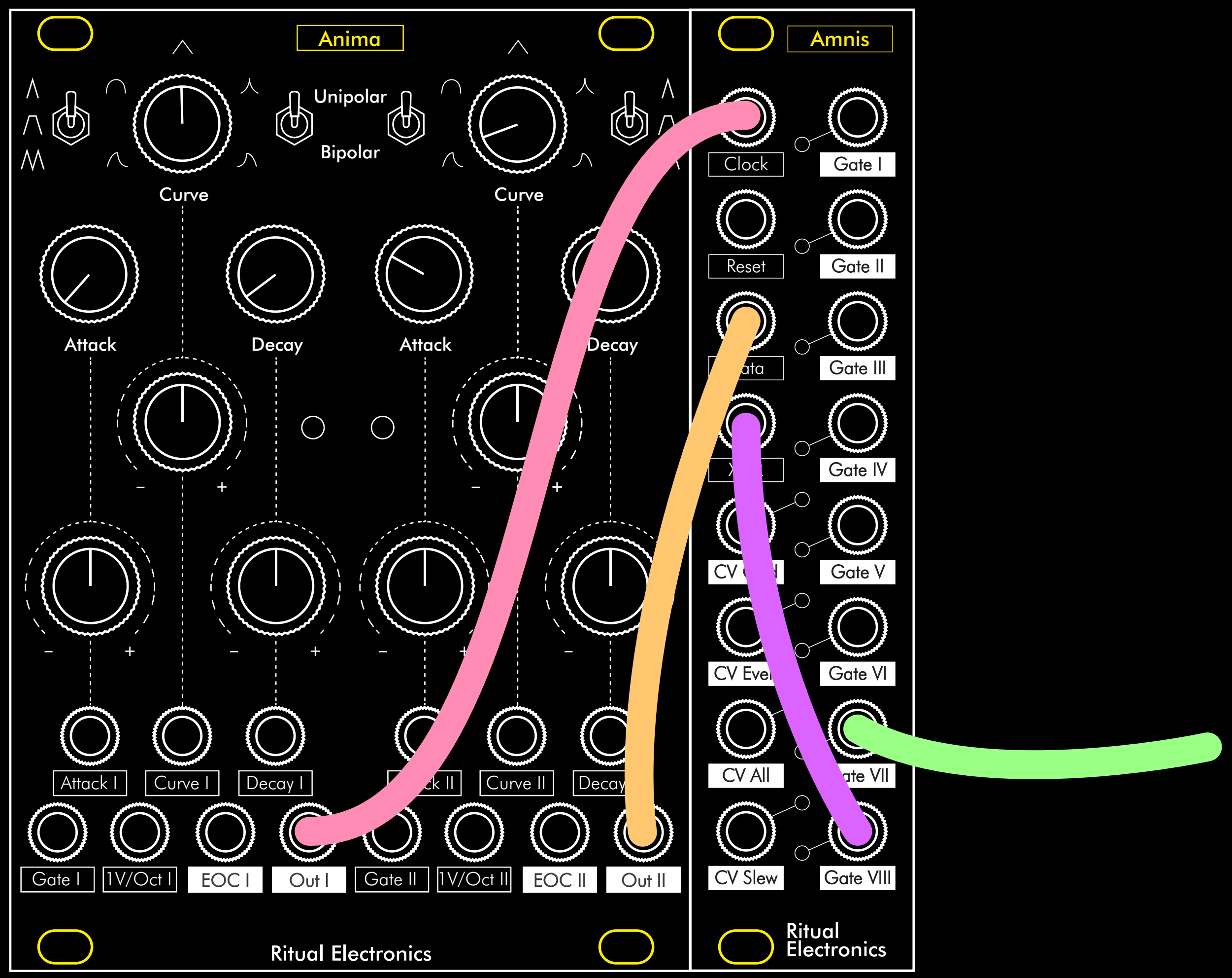
White Noise is real random in the analog world. Use it as a source for real random, but clocked gates.
Use a comparator between the noise source and Amnis to vary the density of the gates (the lower the threshold the more gates will fire).

Patch notes

Gate sequencer, Ch.1 Gate Out ——— Amnis, Clock In
Gate sequencer, Ch. 2 Gate Out ——— Amnis, Data In
Gate sequencer, Ch. 3 Gate Out ——— Amnis, XOR In

Go full on crazy random with noise outputs as Clock, Data and XOR! Or don't.

Patch ideas



Patch #5 - Digital Noise & 1bit arpeggios

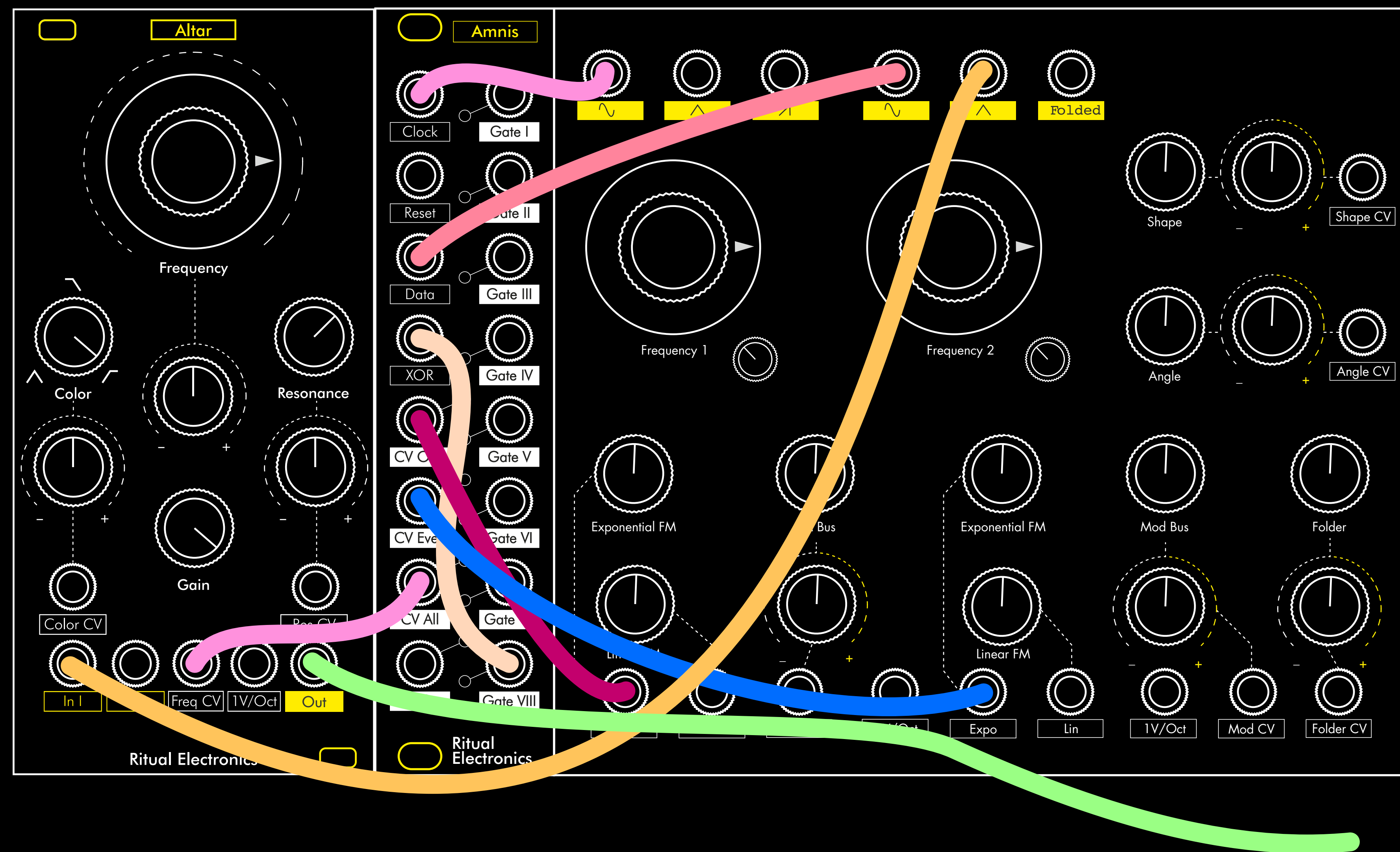
Another approach to Amnis and noise is to see it as a digital noise generator. It is the first patch with Amnis running at audio rate. Use an audio rate oscillator Clock, another oscillator in Data, patch Gate VIII in XOR and take your audio output from one of the gates.
As you slow down the Data oscillator from audio rate to LFO you will enter arpeggios and 1bit computer glory.

Patch notes

Oscillator I, Out ——— Amnis, Clock In
Oscillator II, Out —— Amnis, Data In
Amnis, Gate VIII ——— Amnis, XOR In
Amnis, Gate n ——— Output

Try different gate outputs for different sounds.
Use the Clock oscillator to tune your noise.
This patch is great at doing claps and cymbals!

Patch ideas



Patch #6 - Rungler

A chaotic principle theorized by Rob Hordijk (thank you for all the inspiration, RIP master) which uses the LFSR principle in a feedback loop with two oscillators.
Add in a beautifully wet filter and you have yourself a Benjolin.
A lot of fun can be had by rungling everything. Pick your favorite dual oscillator, your favorite filter and rungle away.
This small patch will get you there but if you have a comparator and a S&H on hand you can get closer to the original Blippoo Box flavor. See OG flow chart here

Patch notes

Oscillator I, Out ——— Amnis, Clock In
Oscillator II, Out ——— Amnis, Data In
Oscillator I, Out ——— Oscillator II, FM In
Oscillator II, Out ——— Oscillator I, FM In
Oscillator I, Out ——— Filter, In
Amnis, CV Odd Out ——— Oscillator I, FM In
Amnis, CV Even Out ——— Oscillator II, FM In
Amnis, CV All ——— Filter, FM In
Amnis, Gate VIII Out ——— Amnis, XOR In

Patch ideas

Patch #7 - Ecosystem

Amnis is a great module to be the heart of a living and breathing patch. As all our modules it loves to be in feedback paths, and it adores to be self patched. You can get it to control everything and to have everything control it in return. Turning knobs will define boundaries to your patch, you can then watch it unfold.

The previous Rungler patch is usually where we start for the ecosystem type. Add comparators, clock dividers and logic. Feedback all kind of controls back into Amnis. Move one knob and everything moves...