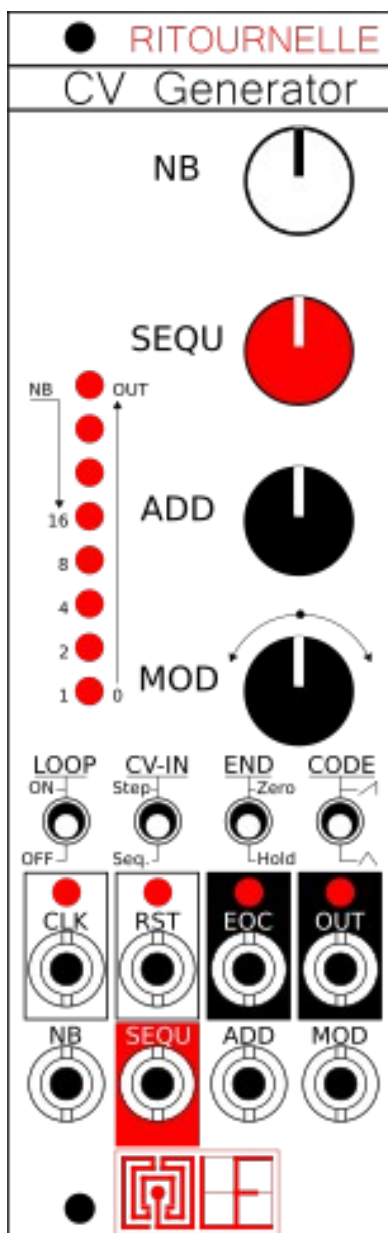


LARIX ELEKTRO

RITOURNELLE CV Generator

WHAT'S THAT THING ?

The **CV Generator** is intended to generate a sequence of CVs in the form of steps, to control any parameter of another module that needs it.
To do this, only 3 parameters are used to adjust the content of the sequence.



KNOBS :

NB : Number of steps. 1 to 16

SEQU: Sequence content.

ADD : Adds offset to the sequence.

Also modify the sequence content (see below).

MOD : 2 variations of the algorithm.

On the left and another on the right, and no MOD in the center.

SWITCHES :

LOOP : Enables automatic restart of the sequence after the last step.

CV-IN : Defines when CV IN are checked:

- At all steps, (Step)

- Or only at the first step. (Seq.)

END : Defines if the CV OUT

- Return to zero after the last step

- Stay unchanged. Useful for chaining modules.

CODE : Two algorithm flavors (see below).

JACKS I/O :

CLK : Clock IN. The sequence goes to the next step when receives a trig.

RST : Resets the sequence: will return to first step at the next CLK trig.

Allows replay the sequence in LOOP OFF.

EOC : End Of Cycle OUT.

Triggers at the same time as the last step.

Useful for syncing or chaining with others modules.

OUT : CV OUT.

The LED gives an idea of the value.

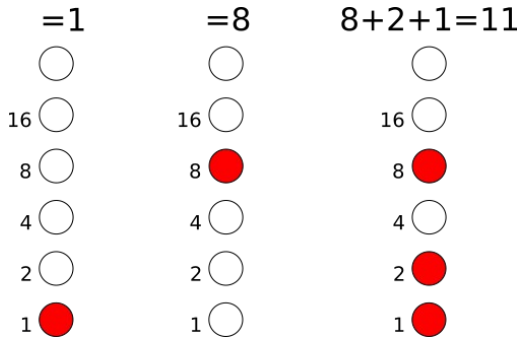
4 CV : CV in for the 4 parameters:

NB, SEQU, ADD, MOD.

LED Strip :

- When playing, indicates the value of CV OUT, Like a bargraph.
- When changing NB, indicates the number of step (in Binary mode) :

Thinking Binary: How works this Binary mode ?



At first: when only one LED is lit, the number is equal to the value shown next to it.

(1, 2 4, 8 or 16)

When there is more than one LED: simply add all the values.

Minimal configuration:



- A clock generator, or a LFO, or any signal into the **CLK** input.
 - Any other module that need a CV stepped by the **CLK** input.
- The module don't works alown, it needs at least one signal into the **CLK** input to play the sequence.

Technical specifications:

+12V : 40mA max. (depend on how much LED are lit)
 -12V : 8mA
 (5V is not used)
 8HP, 35mm deep (Approx.) with PSU connector

Installation:

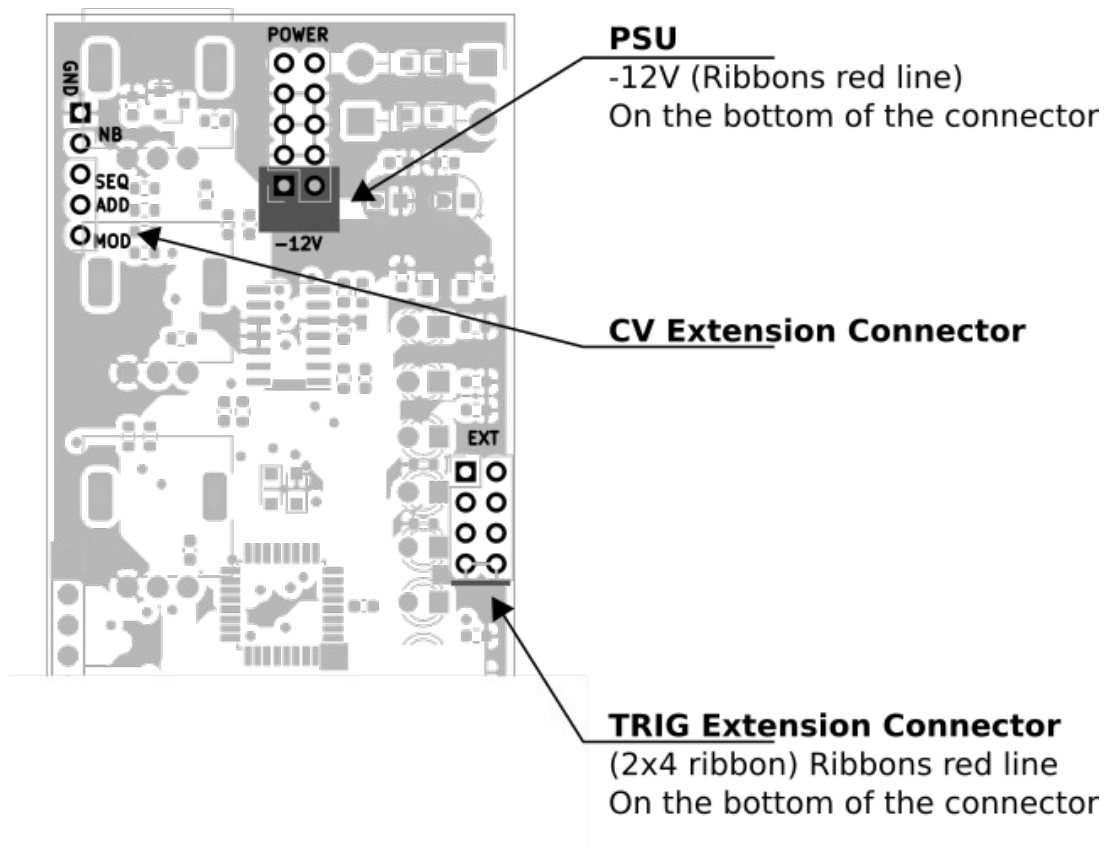
At first, ensure that there is enough power to supply the module.

Beware of the orientation: the red strip on the ribbon cable should match the white line on the module, and on the PSU board (-12V).

Connect the PSU ribbon into the PSU connector, the small connector (2x5 pin) into the module, and the large one (2x8 pin) into the PSU Board.

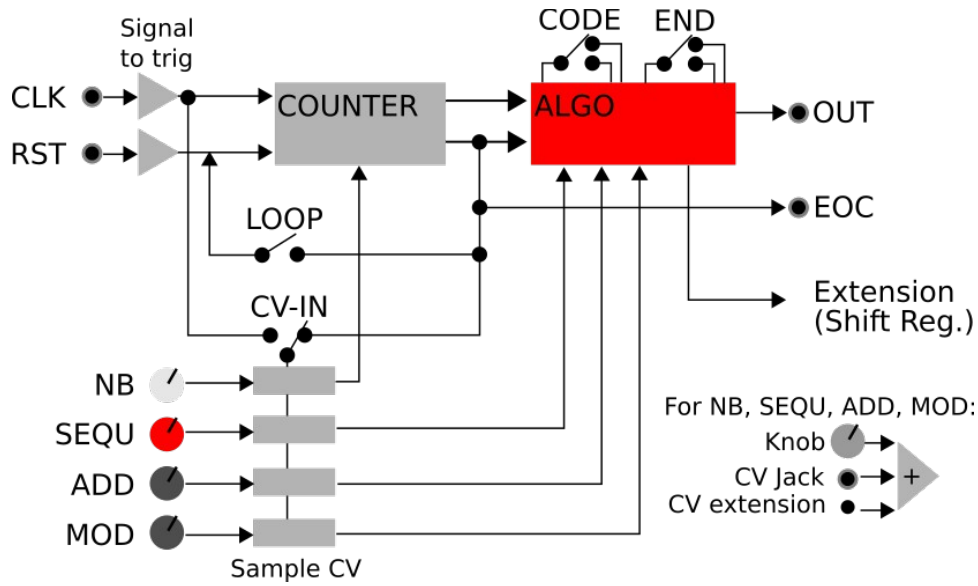
It is better to have a **well-insulated box** because parasites can be added to the signal of the modules. If you are not familiar with electronics, prefer commercial boxes. This is especially true for power supplies: a poorly designed power supply can damage the modules.

To avoid various problems, electromagnetic, but not only, **complete the empty spaces with blind front panels** (Blank panels).



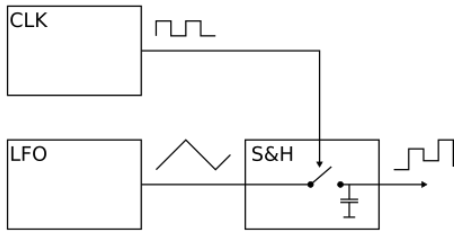
For more informations about the use of the TRIG Extension Connector, and the CV Extension Connector: see below.

Technical explanation

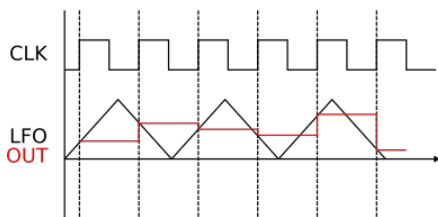


The basis: Sample and Hold (S&H).

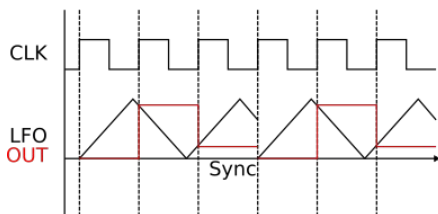
S&H circuit



CLK, LFO and resulting Output



LFO synced all 3 CLK steps.



The idea of this module comes from the well-known use of an S&H with an LFO and a clock signal:

Depending on the ratio between the frequency of the LFO and the clock that controls the S&H, we end up with a sequence of values.

Then, by synchronizing the LFO with the clock, for example by initializing the LFO all the 'n' steps, then we end up with a sequence that loops all the 'n' steps. It's an easy way to generate a complex sequence with few parameters!

Problems arise when changing the overall tempo for example. To keep the same sequence, it is necessary to vary together the frequency of the clock and the LFO. Similarly, you need an LFO that is as stable as possible, because for some settings, a small variation in frequency radically changes the sequence.

The **CV Generator** is inspired by this principle by removing all the disadvantages. This makes it a sequence generator with predictable content.

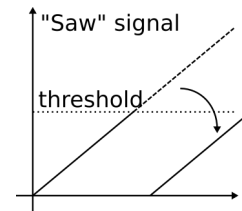
Parameters: Deeper explanation

NB defines the number of steps, and **SEQ** actually defines the value that is incremented with each step.

When the signal exceeds the maximum value, we subtract the maximum accepted value.

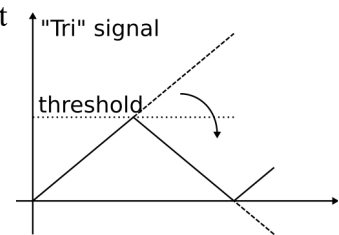
This gives a kind of « virtual LFO » with a saw waveform.

The **ADD** parameter sets the initial value. at low **SEQ** values, this gives a transposition effect, but at higher **SEQ** values, so when the sequence becomes complicated, the **ADD** completely changes the content.



The **MOD** parameter adds variety to the sequence, with 2 different algorithms depending on whether you turn right or left, knowing that in the middle, only the basic algorithm is used.

To simplify the operation of these 2 "flavors", it's like complicating the signal of the virtual LFO.



Finally, the **CODE** switch also images this virtual LFO, as if we were changing the waveform: **SAW** or **TRI**.

Try at a low value of **SEQ**, and with a maximum number of steps: you will find the selected waveform.

Th others switches:

The **LOOP** switch does not require more precision, it allows to have precise control of the action of the sequence. if you don't want it to be played all the time or not, for example.

Associated with the **END** Switch, it is possible to decide what happens when the sequence has reached its last Step: at the step following the last Step, does the **OUT** remain unchanged, or return to zero? If you want to chain several modules, it is better to go back to zero, it avoids the addition of a module to switch between CVs: here a simple unit mixer is enough.

CV-IN allows you to define when CVs are taken into account:

Either the CV values are read every step, this implies that the sequence can be changed every step, or at each cycle.

After many tests, it appeared that according to the needs, the 2 cases are useful.

This module is designed to be "deterministic", that is to say that there is no randomness, and that by replacing the parameters in the same place, you will find the same sequence.

But it is possible to add randomness: by applying random CVs to CV entries, quite simply.

Depending on the setting of the **CV-IN** switch, this randomness is found either at each step or at each cycle.

You can even turn the module into an S&H by choosing **NB** at minimal, and entering a signal into **ADD** !

At each step, the module will read (sampled) the CV **ADD** input and send it as output.

EXTENSIONS:

CV Extension Connector:

This is the 5 PINS connector.

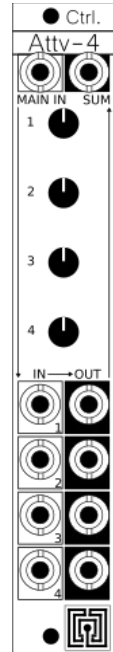
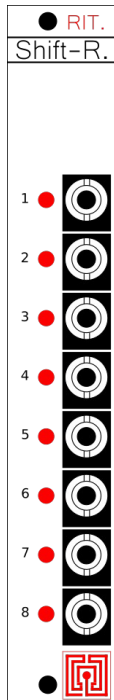
Each of these pin is directly connected to the corresponding parameter input. It acts as one more CV input. You can connect the AttV-4 module to refine the amount of CV.

The **AttV-4** is a 4 chanel Attenuverters. Each of its outputs are also available at the back of the module.

The wires to connect each together are provided with the **AttV-4**.

The fifth pin is the ground. This pin is not necessary, but in case of, it means that the ground is available here.

For DIY, if you need to isolate the wires, you can connect the ground here.



TRIG Extension Connector (2x4 ribbon):

Connect here the **SHIFT-R** module to transform the CV value into 8 Trigs generator.

This is an easy way to transform the **CV Generator** into a polyphonic trig generator.

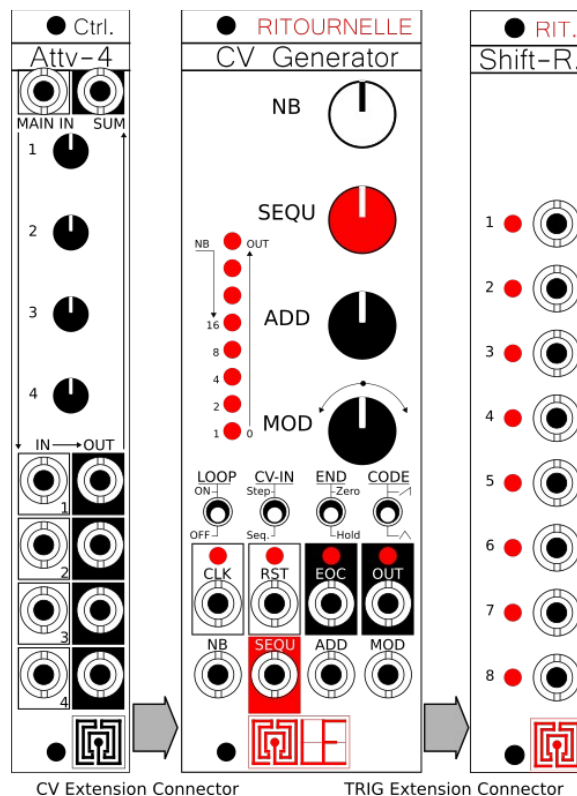
The idea is very simple: keeping the 8 bits that goes to the DAC (Digital to Analog Converter), ie. the CV value, and send them to individual outputs !

Insert the cable with the RED line on the bottom. The cable is provided with the **SHIFT R**. Module.

Only one column was soldered, to avoid confusion with PSU connector. The ribbon has 2 rows, you can insert any of the row.

WARNING: DO NOT CONNECT PSU CABLE HERE !

Even if the connector is protected, it can damage the module



Technical considerations:

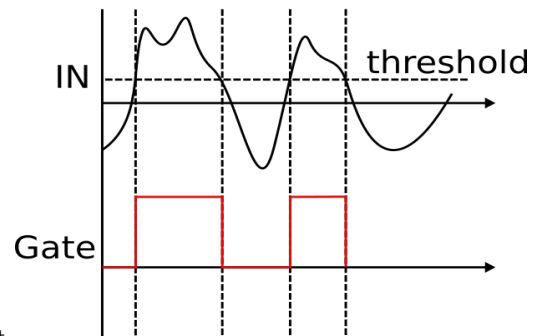
All Gate/Trig input (**CLK** and **RST**): Any signal accepted.

A Gate is generated each time the signal exceeds 0.85V (approx.).

(And falls down after decreasing under 0.85V too)

It means that you don't need a Clock signal: any will work.

It means that you can plug any signal on it.



Why 0.85V ? It's just to have a bit more than 0V, because it seems that some clock signals don't produce a perfect 0V...

CV OUT: 0 to 10V approx. 8bits resolution.

CV IN: 0 to 10V approx. 8bits resolution. (Clipped up and down)

Speed: 0Hz to approx. 80Hz. Depending on the **CLK** Input.

When the Clock frequency is too high, the module « forgets » some Clock trig.

As written above, the 4 parameters can be controlled by 3 signals:

- The corresponding Knob
- The corresponding CV input
- Another CV input at the back (see below: CV Extension Connector)

All 3 are mixed together.

Notes for the geeks:

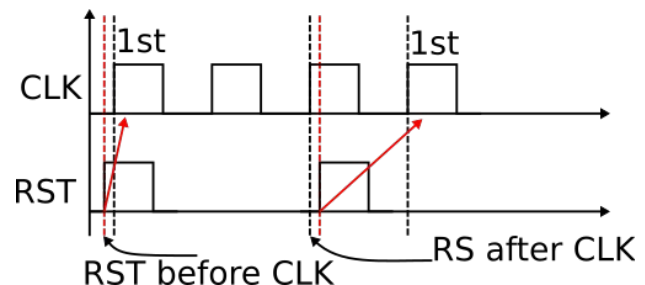
The sequencer sends a new value each time **CLK** in rise 0.85V, directly after receiving it to have the smallest latency.

The value itself is calculated at the descending front of the **CLK**.

This way, it also allow **CV** to be more stable and predictable:

If you want to change the **CV** values at some points, and synchronize this **CV** change with your sequence, you may have some problems with events sequencing.

A diagram is better than a long text:



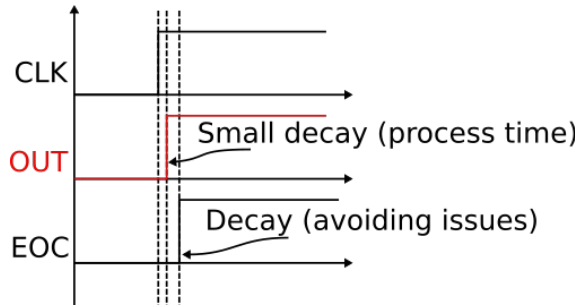
To help some issues, the **CLK** signal takes precedence over **RST**. It means that when receiving at the same time a **CLK** and a **RST** trig, the module will firstly send the step before initializing the sequence.

To resume, just think that your **change will be effective to the next step**.

The **RST** signal re-calculate everything, this time at the rising front.

Another tip:

The Gate duration of the EOC output follows the duration of the CLK signal.

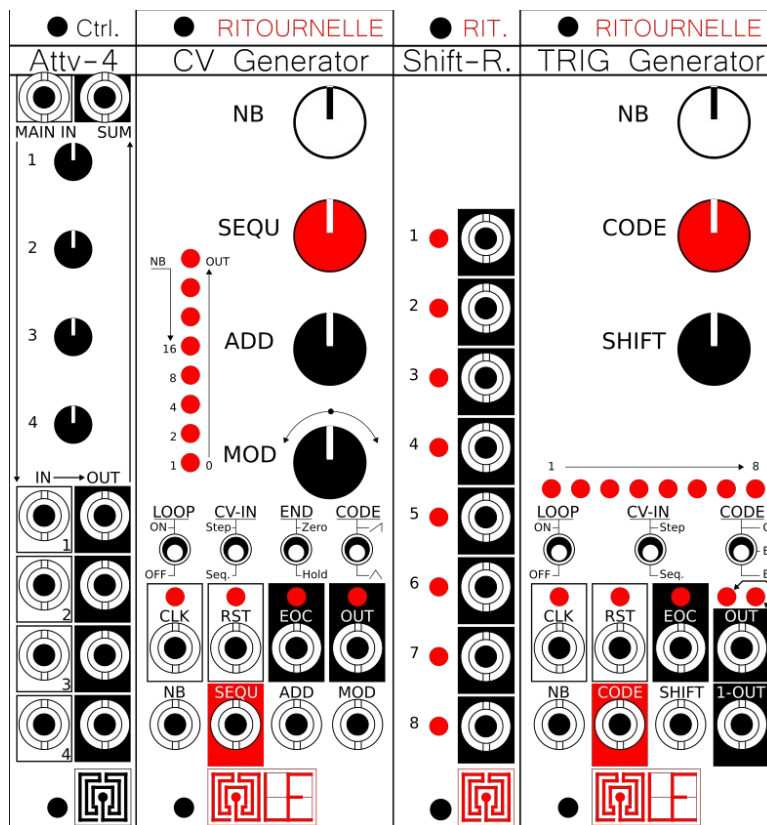


One more tip:

The EOC is sent a bit after the last CV. According to the previous explanation, this very small time decay will help to the use of the EOC signal.

FULL RANGE MODULES :

- CV Generator : CV sequence generator.
- TRIG Generator : TRIG sequence generator.
- Attv-4 : 4 attenuverter / Mixer / Dispatcher. Extension for other modules.
- Shift-R : Adds 8 Trig to the CV Generator.



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