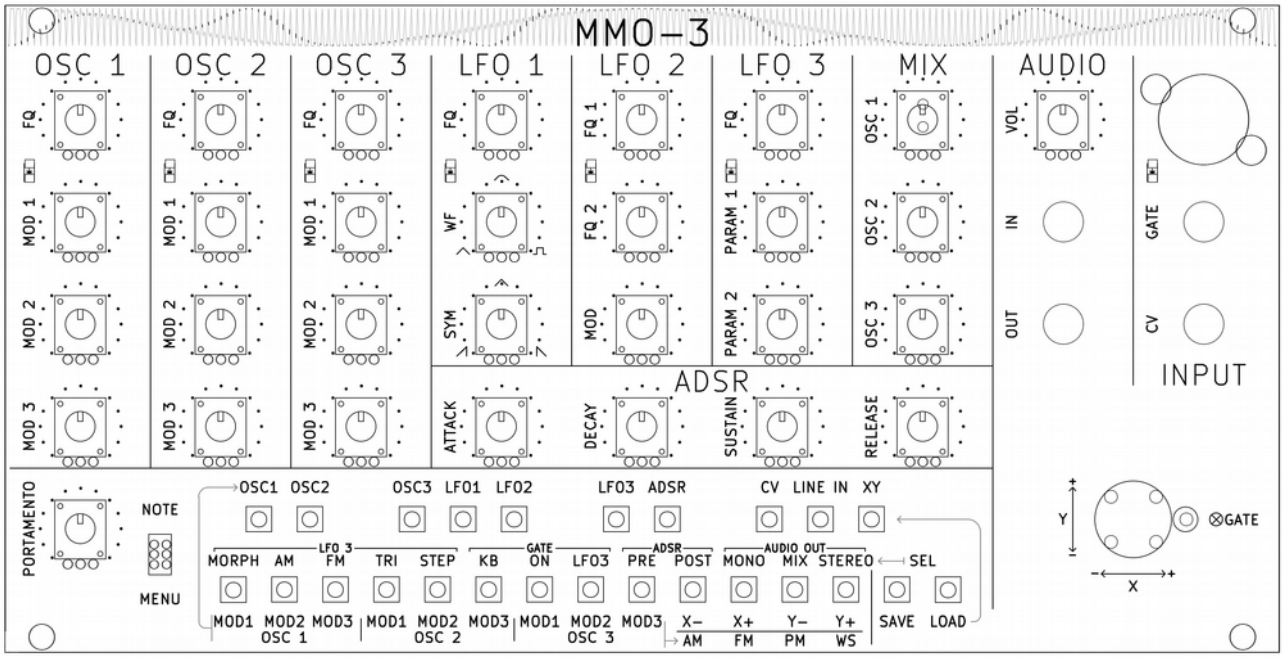
MMO-3 User Documentation

nozoid.com/mmo-3

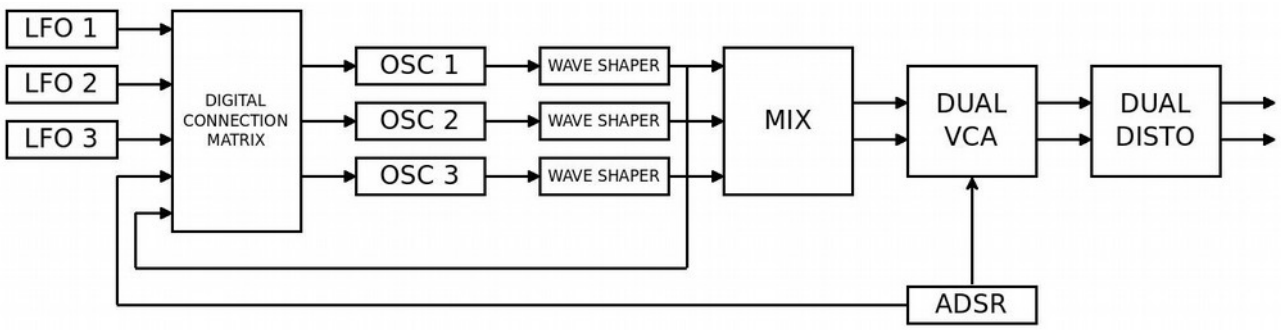


MMO-3 is a digital, semi-modular, monophonic but stereo synthesizer. Built around various types of modulation synthesis, this synthesizer is mostly dedicated to atonal sound generation. From fat drones, glitchy electronic patterns to percussive noise, the MMO-3 offers rich and complex timbre control.

Overview

Unlike most FM synthesizers, the MMO-3 is not limited to a specific modulation routing. All 3 oscillators can be modulated by all other oscillators or LFOs. Modulation parameters are accessible thanks to 9 knobs for an accurate and continuous adjustment of the timbre. Moreover, it's not only a Frequency Modulation synthesizer : it also offers Phase Modulation, Amplitude Modulation and a custom Wave Shaper modulation where an oscillator amplitude can be amplified prior to a wave-shaper in order to add harmonics without frequency variation. Also, a joystick allows for easy control of modulations, for a fast and expressive manipulation of the sound.

Feature



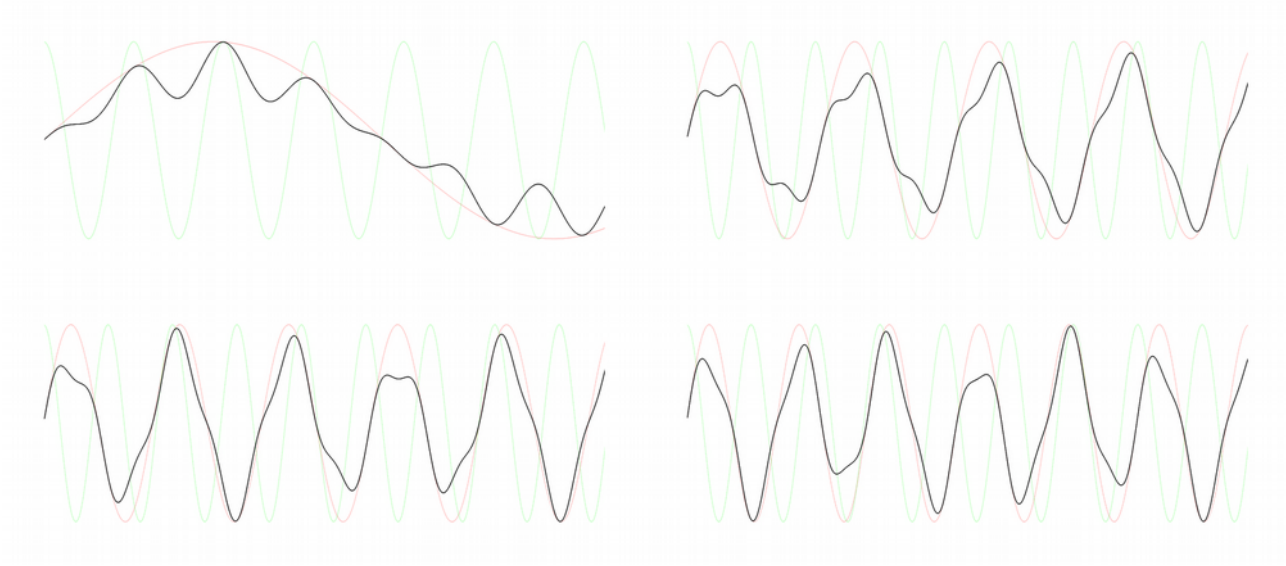
This is the audio path wired inside the synthesizer. Modulation CV are routed to modulation fader in a digital matrix. You will not be short of cable anymore, and you can even save your patch!

Module description

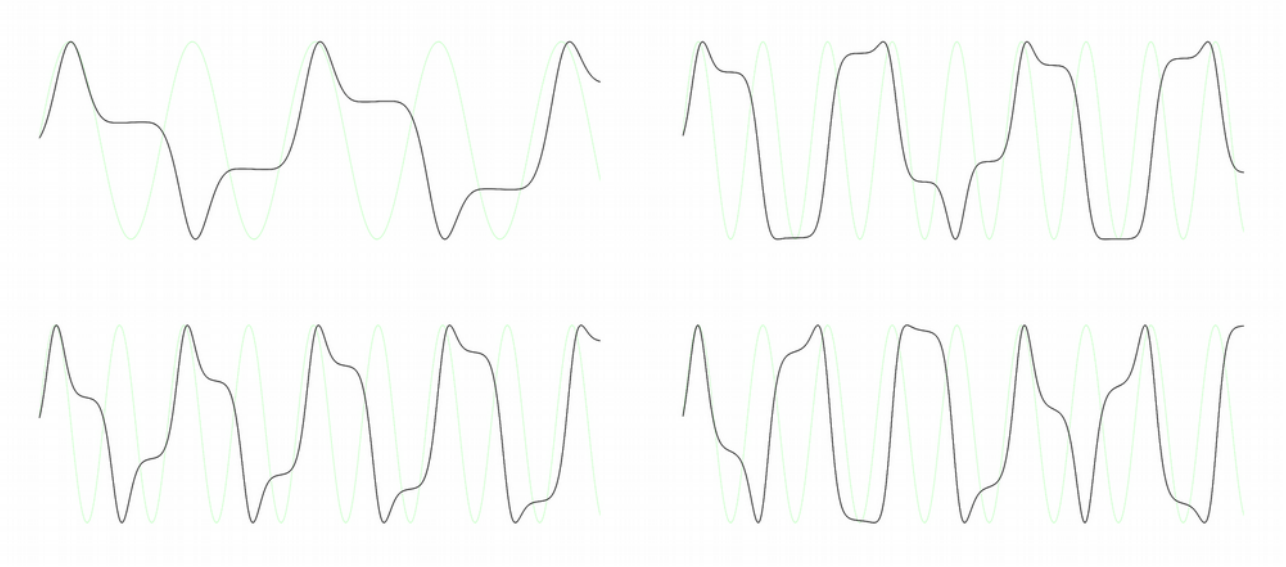
OSC 1, OSC 2 and OSC 3

The 3 oscillators are identical. They generates sinusoidal waveform, that can be distorted thanks to 4 different kinds of modulation. The amplitude, frequency, phase or waveform of each oscillator can can be modulated thanks to any modulation source.

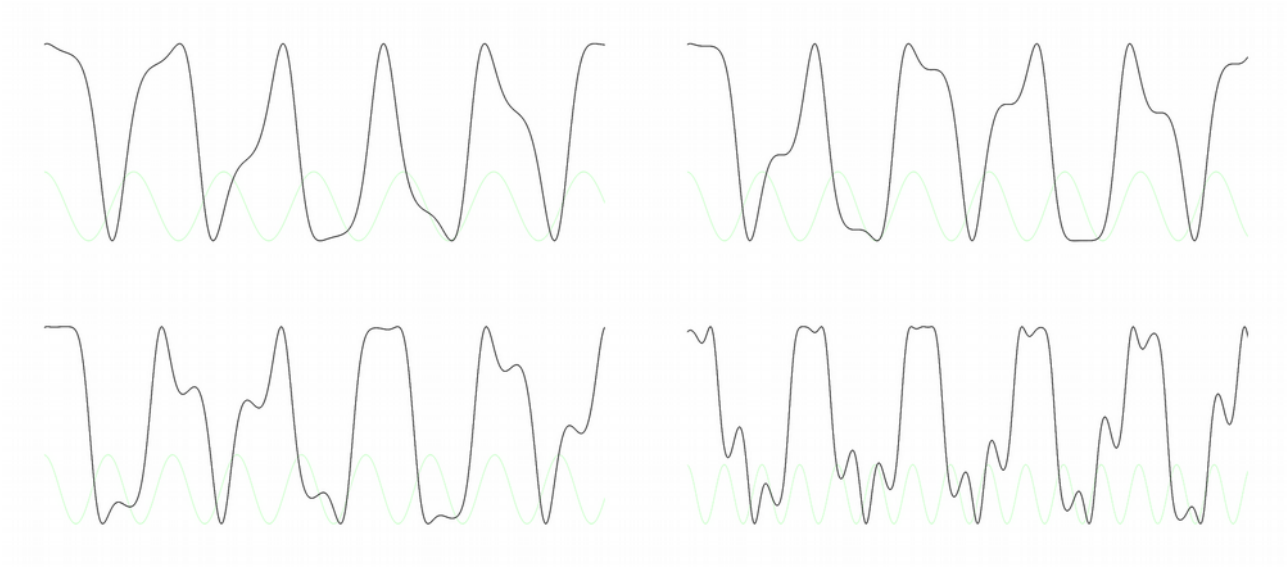
AM waveform example :



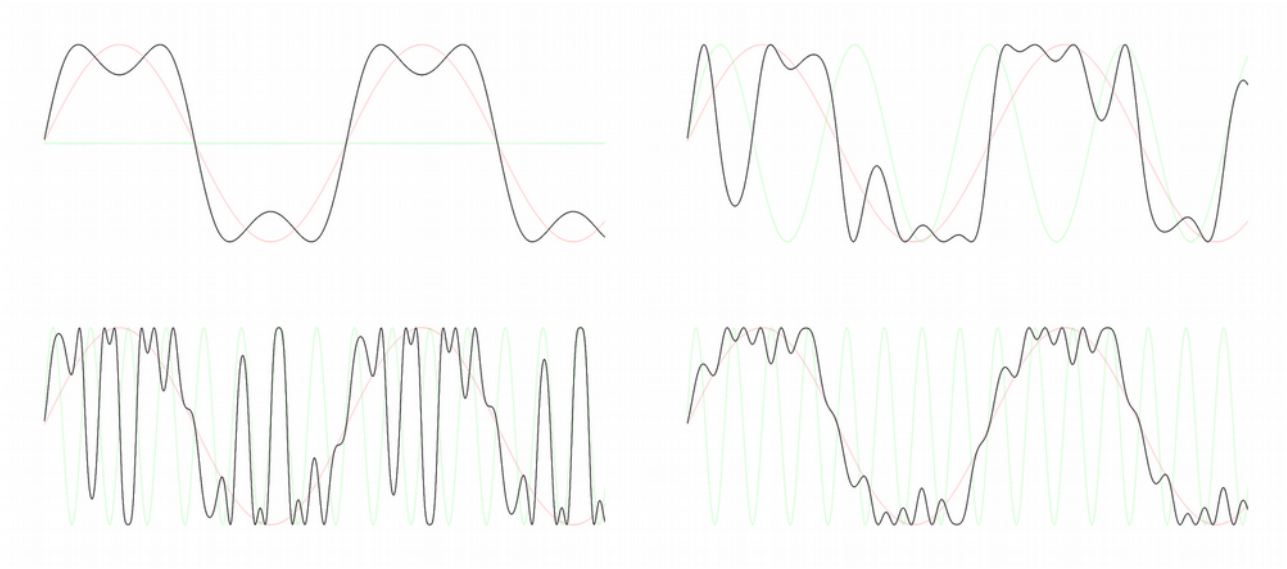
FM waveform example :



PM waveform example :



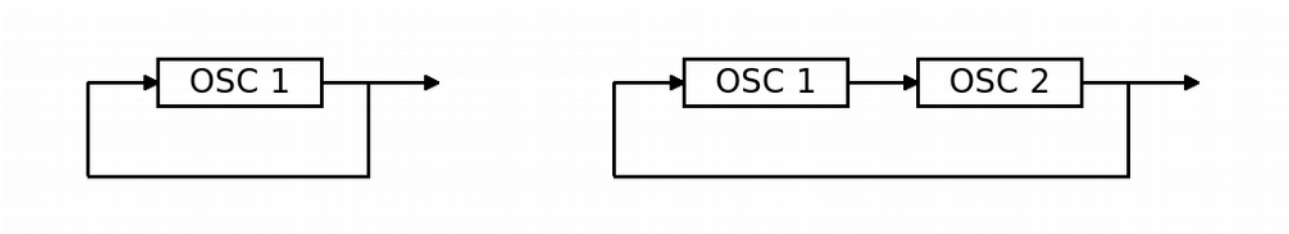
WS waveform example :



Since an oscillator admit 3 modulation faders, one can use 3 different modulation source with 3 different modulation type, to generate very complex waveform.

Auto modulation and feedback loop

Using the modulation matrix, it's possible to create auto-modulation, or feedback loop.



In association with phase modulation, auto-modulation creates digital instabilities resulting in high pitch noise.

Using a more complex modulation routing admitting a feedback loop, the phase modulation or the wave shaper modulation could generate unexpected glitchy results.

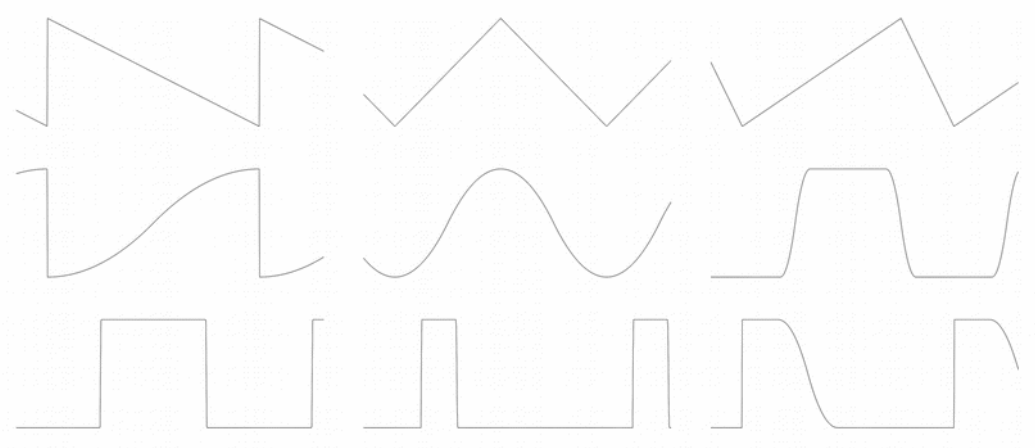
LFOs

The MMO-3 has 3 different LFO. All this LFO can generate frequency from 0.01Hz (100s) to about 100Hz.

LFO 1

The LFO 1 is a shape morphing LFO : you can adjust the shape of the waveform using faders instead of switches. This allows to continuously change from a rising saw, to a triangle and then to a slope down. Or stop halfway between sinus and square.

Here are few waveform generated by this LFO :

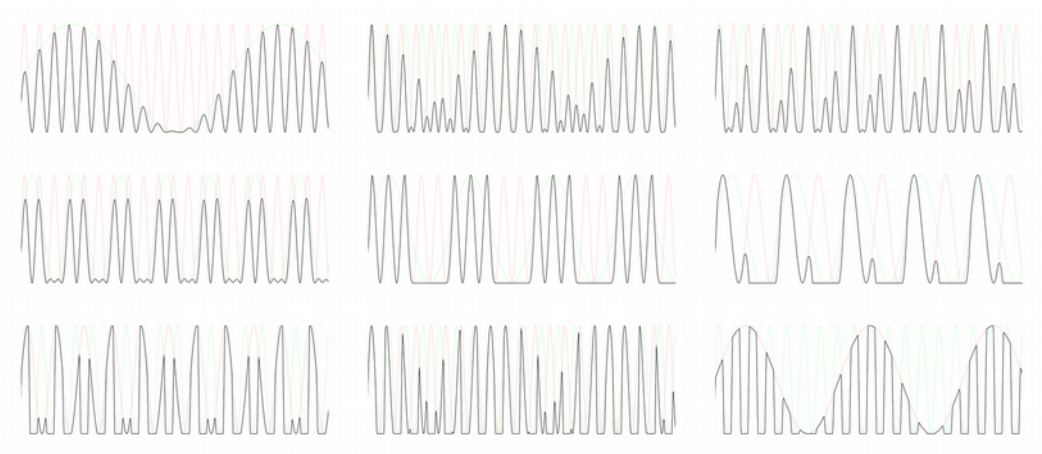


The waveform (WF) fader controls the shape of the transition. It changes from a straight ramp (like in triangle or saw), to a sudden change of value (like in a square), passing through a sinusoid shape.

The other fader (SYM) adjusts the symmetry of the output, i.e the ratio between rise/fall times. It passes from a rising saw to a triangle and then a falling saw.

LFO 2

LFO 2 generates a complex waveform using amplitude modulation of 2 sinusoids. Here are few waveform generate by this LFO :

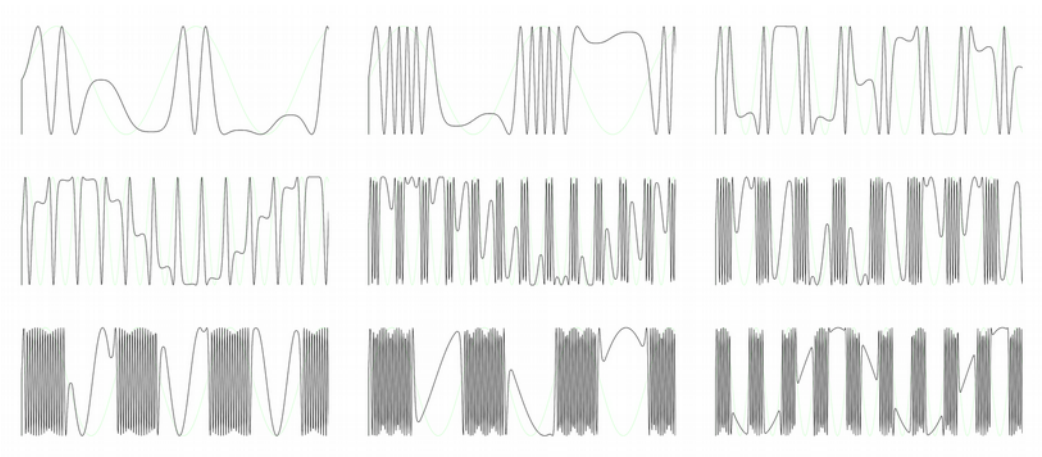


The FQ1 fader control the frequency of the 1st sinusoid. The FQ2 fader control the frequency of the 2nd sinusoid. The MOD fader controls the modulation amount of the 1st sinusoid by the 2nd. When MOD is at 0%, this LFO output only the 1st sinusoid. At 50% the output is the 1st sinusoid multiply by the 2nd. At 100%, 2nd sinusoid is amplify and crop to became a square before modulating the 1st sinusoid.

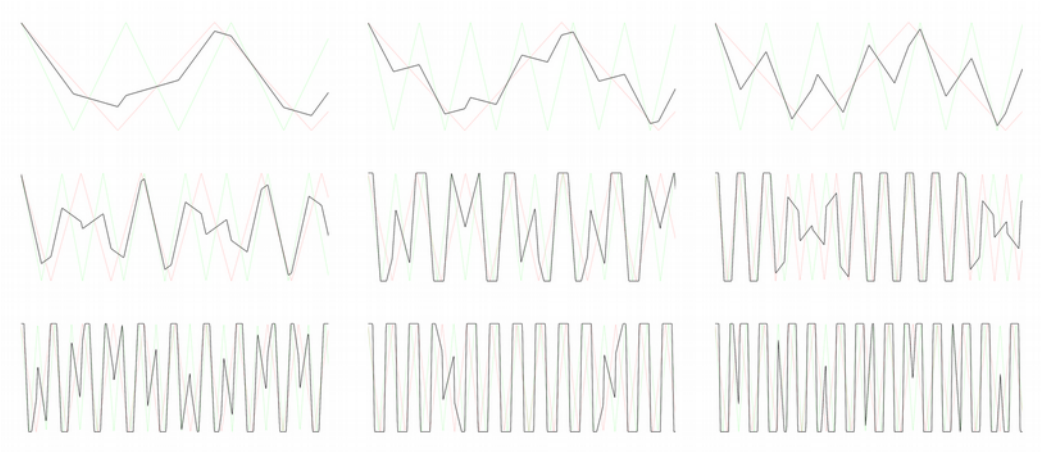
LFO 3

The LFO 3 Can be configure to generate 5 different waveform type.

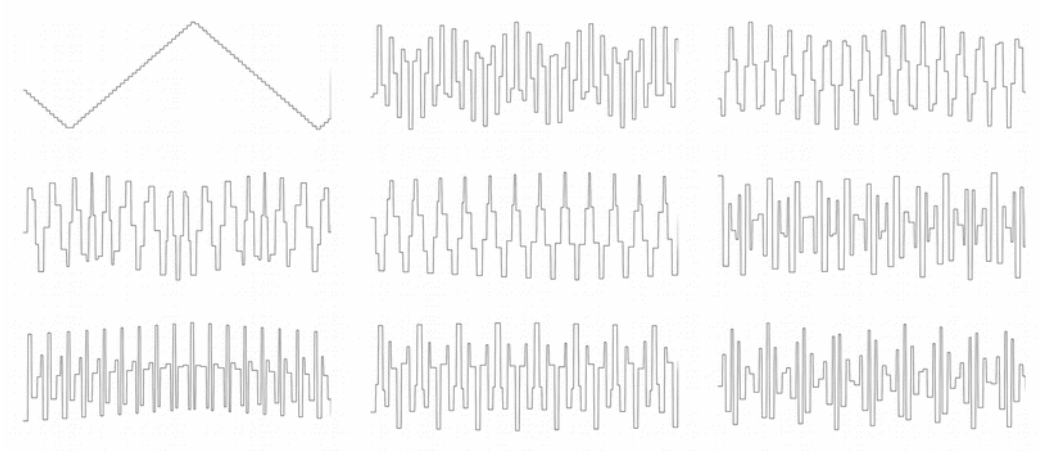
- MORPH : a shape morphing LFO similar to LFO 1.
- AM : an Amplitude Modulation LFO similar to LFO 2.
- FM : This LFO is similar to the AM LFO, but with a FM modulation between the 2 sinusoids. The 2nd sinusoid modulate the frequency of the 1st sinusoid regarding the MOD fader position.
  Here are few waveform generated by this LFO :



- TRI : this LFO mix 2 triangular waveform. The FQ fader control the frequency of the 1st triangle waveform. The PARAM 1 fader control the frequency of the 2nd triangle waveform. The PARAM 2 fader mix the 2 triangular waveform.



- STEP : This LFO generate steps. The FQ fader control the frequency of the steps. The PARAM 1 fader control the variation between every steps. The PARAM 2 fader modulate the time of the steps.



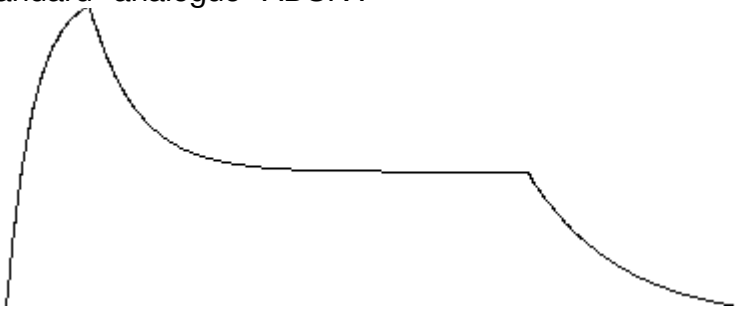
Joystick

The joystick allows to mix 4 modulation signals to create a new modulation. For every direction (UP, Down, Left, Right), a modulation source is selected. The joystick mixes these 4 modulations depending on its position. The output can be used like any other modulation.

In order to use the joystick, you have to :
- set the modulation it mixes in it's 4 directions
- assign the joystick to a modulation fader (you may also change the modulation type)
- increase this modulation fader in order to change the joystick influence
- move the joystick...

ADSR

This is a standard “analogue” ADSR :



Attack, Decay and Release time, as well as Sustain amplitude can all be adjusted with faders.
The ADSR controls the sound amplitude, but is also used as a modulation signal. It can be controlled in different ways depending on the GATE option :

- In GATE “KB” mode, the ADSR can be triggered by the keyboard, but also with the external GATE CV, or by pushing in the joystick switch.
- Using the GATE “ON” mode, the ADSR is still triggered with this signals, but the VCA is controlled with a constant signal. The ADSR is only used in the modulation matrix.
- In “LFO3” mode, the ADSR is only triggered when the LFO3 is positive.

MIX

The 3 MIX faders allow independent adjustments of the oscillators amplitude. The MIX have 3 options for stereo balance :

- MONO
  all 3 oscillators are mixed in the same way on both right and left channel
- MIX
  the oscillator 1 is louder in the left channel, the oscillator 3 is louder in the right channel, the oscillator 2 is in the center.
- STEREO
  the oscillator 1 is only in the left channel, the 3 is only on the right, and the 2 is in the center.

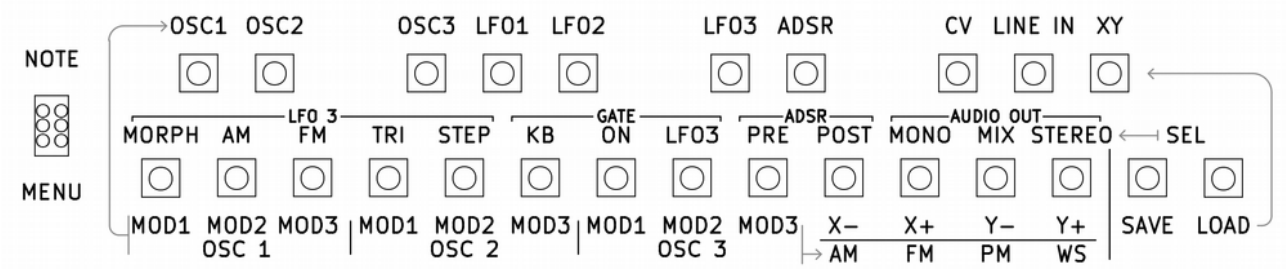
The MIX output passes through a distortion, generating harmonics depending on the MIX amplitude.

VCA

The dual VCA is controlled by the ADSR. Its position in the audio chain can be changed to be before or after the distortion, thanks to the ADSR “PRE” or “POST” option.

A master volume is also available.

Keyboard



When the toggle is on NOTE, this is a 2 octaves keyboard controlling the frequencies/gate of the VCOs. The portamento filters the frequency change of the keyboard.

When toggle is on MENU, the keyboard is used to patch the matrix and to edit options.

Digital patching matrix

Modulation connections are made via a digital matrix. The Matrix allows to connect any CV to any modulation fader.
Control Voltages are :

- OSC 1
- OSC 2
- OSC 3
- LFO 1
- LFO 2
- LFO 3
- ADSR
- Audio In (left or right)
- EXTERNAL CV 1 (or MIDI pitch Bend)
- Joystick (XY)

Modulation faders are :

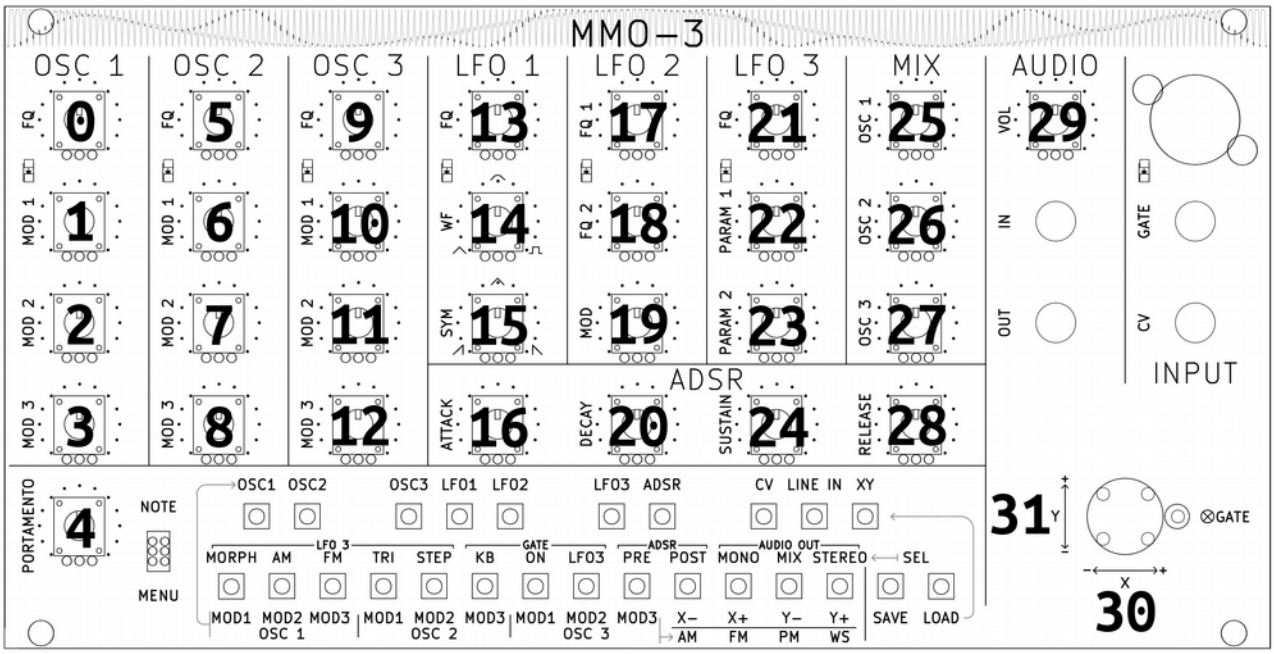
- OSC 1 MOD 1
- OSC 1 MOD 2
- OSC 1 MOD 3
- OSC 2 MOD 1
- OSC 2 MOD 2
- OSC 2 MOD 3
- OSC 3 MOD 1
- OSC 3 MOD 2
- OSC 3 MOD 3
- Joystick X-
- Joystick X+
- Joystick Y-
- Joystick Y+

MIDI

You can also control your synthesizer with a MIDI cable : using a keyboard to play notes, or the pitch bend to control the sound. You can also connect an external sequencer, a computer etc. The midi data used are :

- Note On / Note Off
- Pitch bend : when sending Pitch bend value, the CV IN is disconnected from the analog input and connected to this midi data.
- Program change from 1 to 10 – channel 1 : load one of the memory.
- Control Change (1CC – 7 bits / 2CC – 14 bits) : control all faders in midi. Midi data is added to fader value to control the corresponding parameter. For 14 bits MIDI, use CC N for MSB, and CC N+32 for LSB. Always send MSB after the LSB.

Here is a map of MIDI CC number :



Audio in

The audio in signal can be used in 2 different ways.

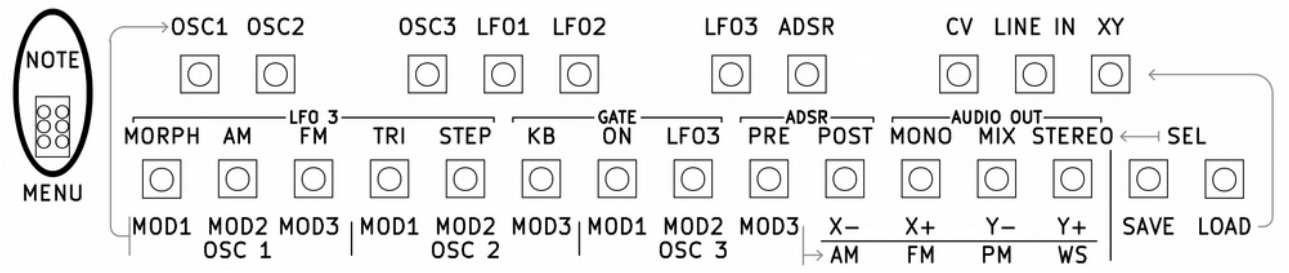
- An envelop follower connected to the left input can generate gate signals in order to easily synchronize the MMO-3 to an other sound machine.
- The audio signal can be used as a modulation source for the oscillators or the joystick. the “AUDIO IN” modulation source is in fact 2 sources : the left and right signals. When the audio in is selected to control the oscillator 1, joystick X- or Y- : the left channel is used. The right channel is used to modulate the oscillator 3, joystick X+ and Y+. The left and right average is used to modulate oscillator 2.

External CV

1 analog input (-6v/6V) and an external GATE IN (0/5V) are available using 3.5 mono jacks, compatible with most modular setups.

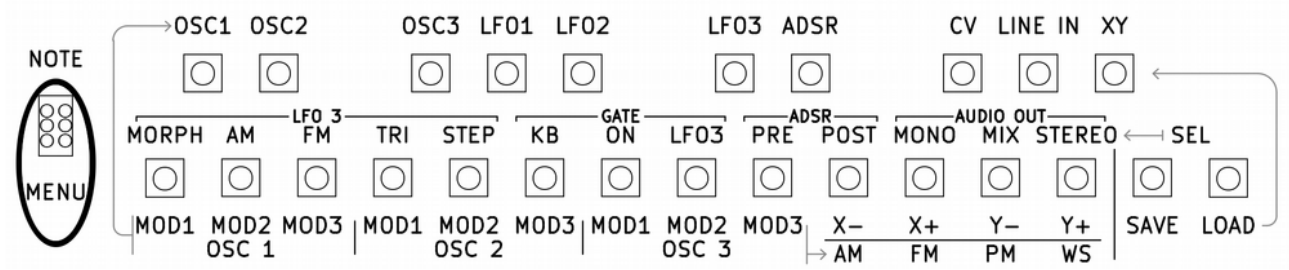
How to use the key as a midi keyboard?

Switch the toggle to NOTE.



How to use the menu?

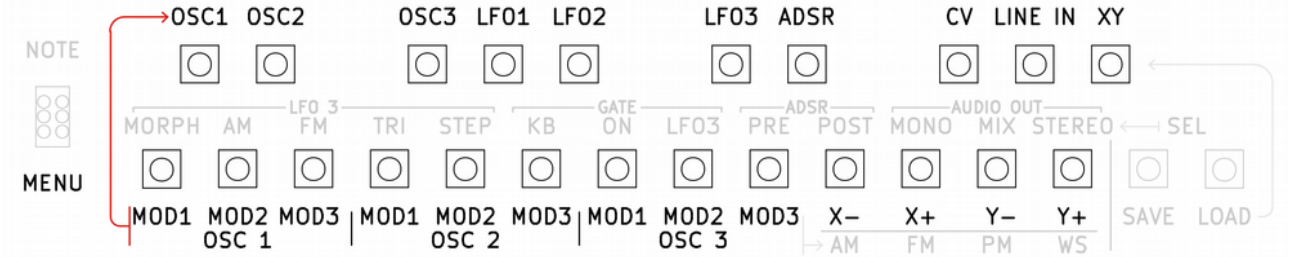
Switch the toggle to MENU.



All options are available using 2 keys combination.

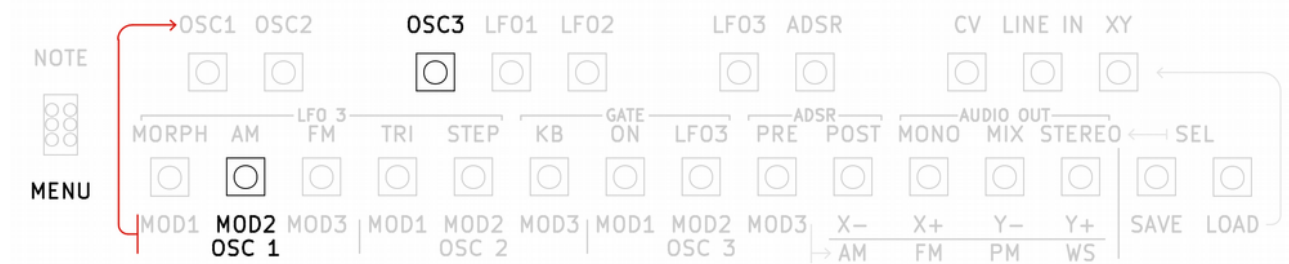
How to change the patching matrix?

Press in the same time the “modulation fader” key to assign and the “modulation source” key



This allow to change the oscillator modulation source, as well as the modulation mixed by the joystick in it’s 4 direction (X-, X+, Y-, Y+).

For example, to assign OSC 3 as the oscillator 1 modulation 2 fader, you have to press on the same time this 2 key :



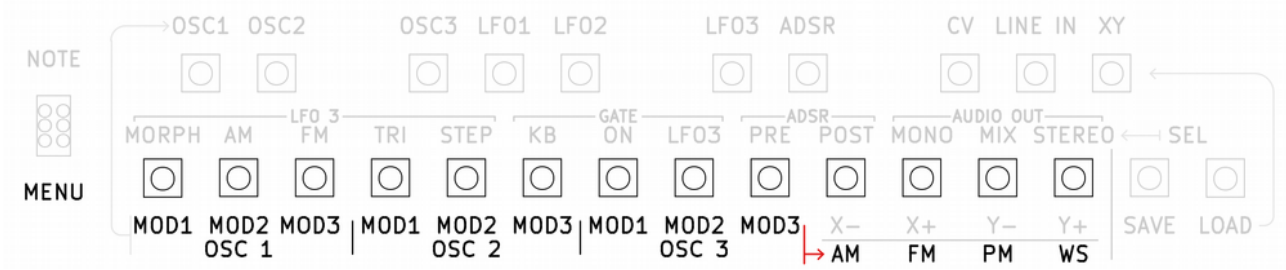
How to know what modulation source is assigned to a modulation fader?

When holding a modulation fader key, the led show the current assignation.

- LED OSC 1 → OSC 1
- LED OSC 2 → OSC 2
- LED OSC 3 → OSC 3
- LED LFO 1 → LFO 1
- LED LFO 2 → LFO 2
- LED LFO 3 → LFO 3
- all this 6 LED except LED OSC 1 → ADSR
- all this 6 LED except LED OSC 2 → External CV in
- all this 6 LED except LED OSC 3 → audio in Left or Right
- all this 6 LED except LED LFO 1 → XY (joystick)

How to change modulation type?

Press simultaneously the modulation fader key and one of the modulation type : AM, FM, PM or WS :

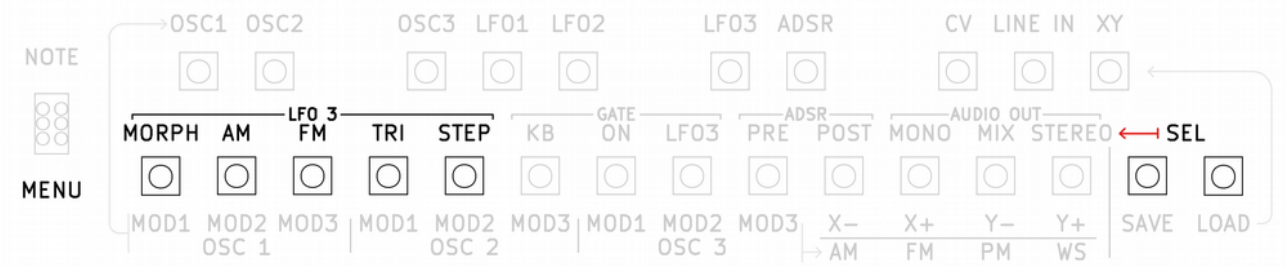


How to know what modulation type is used ?

When holding a modulation fader key, the rightmost led show the current assignation :
off : AM / quick blick : FM / long blink : PM / on : WS

How to change the LFO 3 type?

Press one of the SEL key and the desired LFO 3 key :



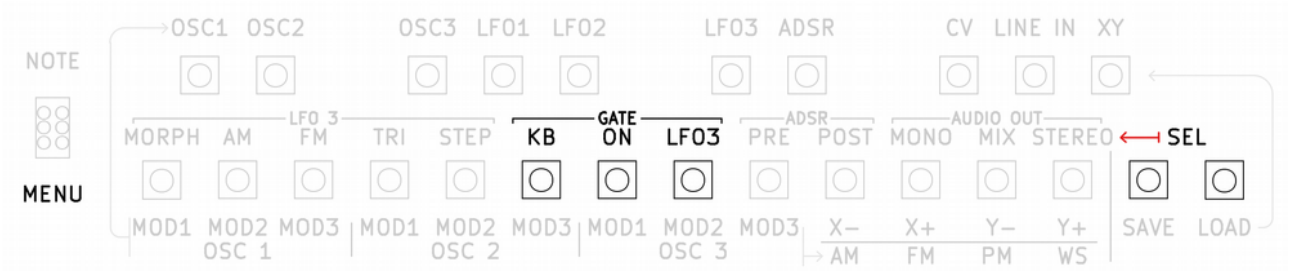
How to know what waveforms is used by LFO 3 ?

Press one of the SEL key : the 3 OSC led shows the current LFO 3 settings :

- all 3 led off : MORPH
- only OSC 3 Led on : AM
- only OSC 2 Led on : FM
- only OSC 1 Led on : TRI
- all 3 led on : STEP

How to change the GATE source?

Press one of the SEL key and the desired GATE key :



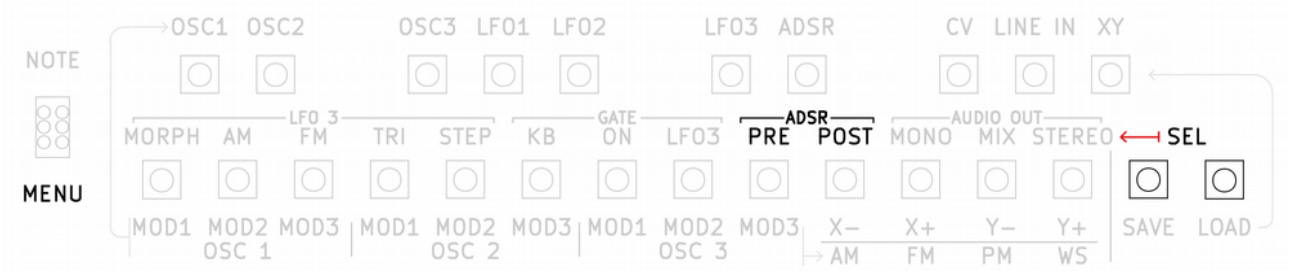
How to know what is current GATE source?

Press one of the SEL key : the LFO 1 led shows the current GATE settings :

- off : KB
- 50% : ON
- on : LFO3

How to change the ADSR position?

Press one of the SEL key and the desired ADSR key :



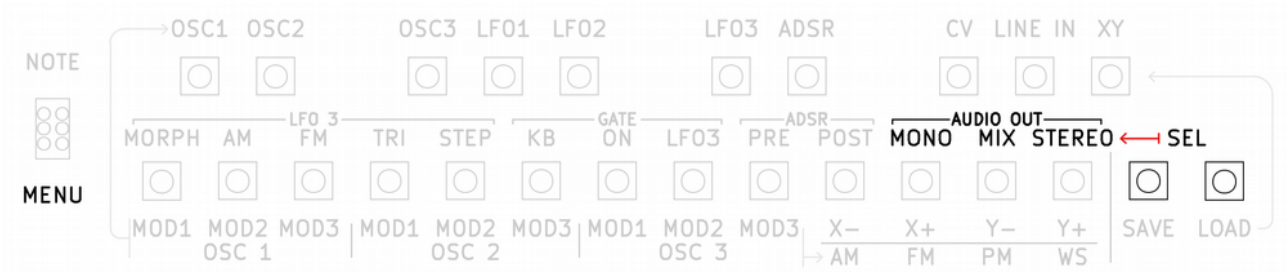
How to know the current ADSR position?

Press one of the SEL key : the LFO 2 led shows the current GATE settings :

- off : PRE
- on : POST

How to change the Audio Out mode?

Press one of the SEL key and the desired AUDIO OUT key :



How to know the current Audio Out mode?

Press one of the SEL key : the LFO 3 led shows the current Audio Out settings :

- off : MONO
- 50% : MIX
- on : STEREO

How to load / save configuration?

Press simultaneously one of the LOAD or SAVE key and one key from the top row