MMO-4 User Documentation

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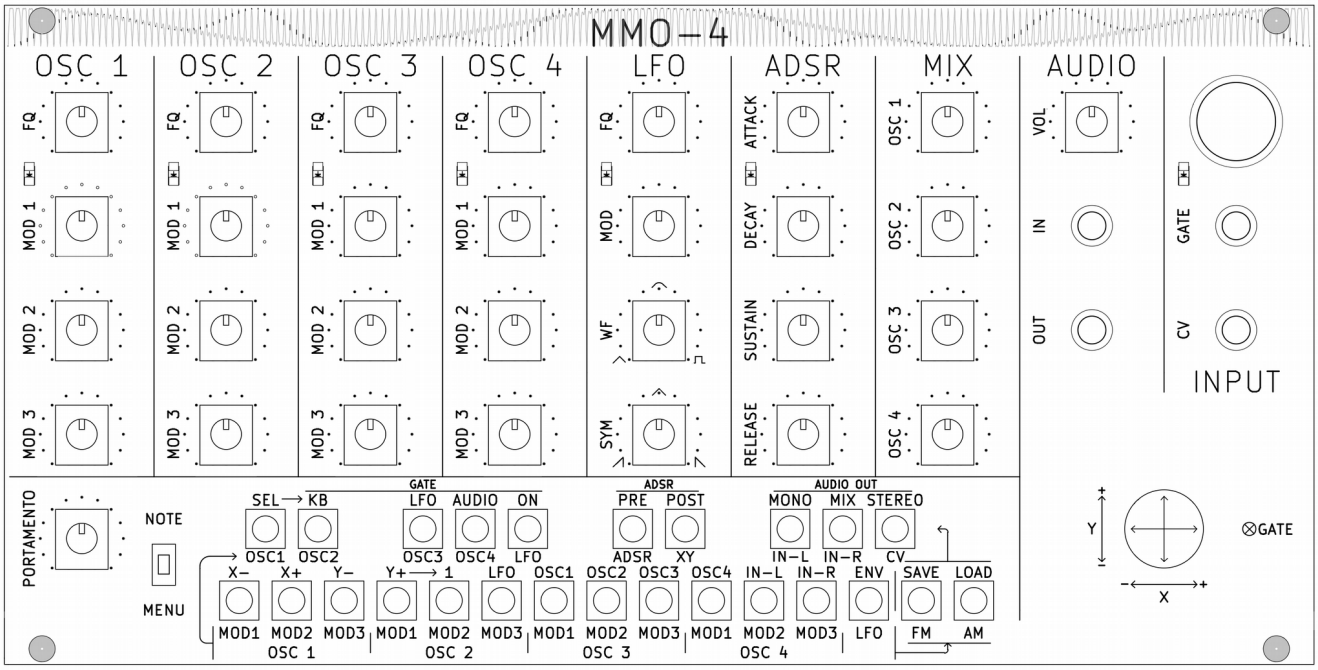
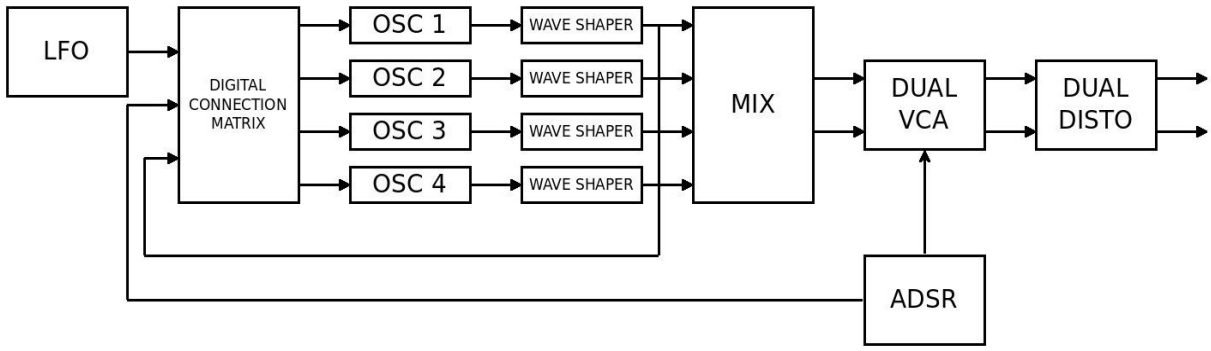


This is a preliminary documentation

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, OSC 3 and OSC 4

This are 4 sinusoidal oscillator. Each of this oscillators can be distorted thanks to 2 different modulations type and admit 3 different (selectable) modulation sources.
Each modulation fader can be assign to modulate the carrier using FM (Frequency Modulation), or AM (a custom Amplitude Modulation algorithm).
-The FM allow to modulate the carrier according to the modulator. This result in frequency mixing between the 2 oscillator.
-The AM modulation change the amplitude of the signal that is then wrapped in the waveshaper . This modulation create harmonics of the source without changing it's fundamental frequency.

It is possible to create cross modulation (OSC 1 → OSC 2 and OSC 2 → OSC 1) for more complexity and impressible signal generation.
It is also possible to create auto-modulation (OSC 1 → OSC 1), but in this configuration the modulation algorithm (both AM or FM) have been tuned in order to create more interesting result.

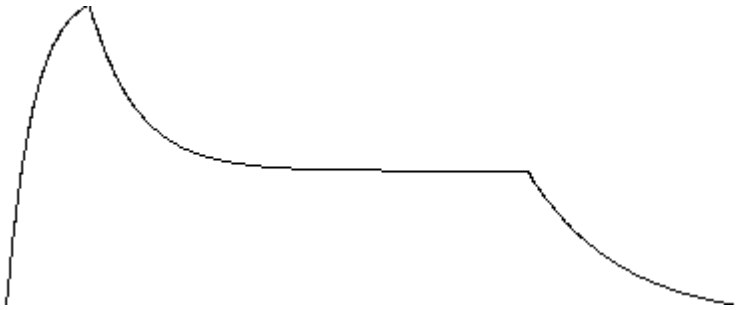
LFO

This LFO offer a unique feature : you can adjust the shape of the CV using faders, not switch. This allows to continuously change from a rising saw, to a triangle and then to a slop down. Or stop halfway between sinus and square.
The waveform (WF) fader control the shape of the transition. It change from a straight ramp

(like in triangle or saw), to a jump (link in a square), passing throw a sinusoid shape.
The other fader (SYM) adjust the symmetry of the output, i.e the ratio between rise/fall time. This fader allow to pass from a rising saw to a triangle and then a falling saw.
The frequency range of this LFO is very slow : it can shift from about 100s for very slow sound evolution to about 20Hz.
This LFO also admit a modulation fader in order to generate complex waveform. This modulation act like the oscillators modulation. You can choose the modulation source, modulation algorithm, and the fader adjust the modulation amplitude.
Like the oscillators, the LFO modulation have been tuned to give interesting result when acting in auto-modulation (selecting the LFO as the LFO modulator).

ADSR

This is a standard analog type ADSR :



Attack, Decay and Release time, as well as sustain amplitude can be adjusted with 4 faders.
The ADSR is triggered by a GATE signal.
Depending on the configuration, the GATE signal can come from :

- The Keyboard
- A MIDI note
- The LFO (when it's signal is high)
- The audio in (when the amplitude is high)

in "ON" mode, the ADSR is not used by the VCA. The audio signal is amplified by the VCA, but the ADSR can still be trigged by a note to generate modulation data.

MIX

The MIX fader allow to adjust the amplitude of the 4 oscillators.
Depending on the audio out option, this mix can be :

- Mono : The signal is the same on the Left and Right out channel.
- Mix : OSC 1 is louder on the Left channel, OSC 2 and 3 are centered, OSC 4 is louder on the right channel.
- Stereo : The OSC 1 and 2 are routed to the Left channel, 3 and 4 to the right channel.

VCA

The dual VCA is connected to amplify the MIX outputs thanks to the ADSR signal.

This audio signal is then routed to a dual distortion in order to add harmonics to the signal.

The ADSR mode (PRE / POST) allow to swap the distortion and the VCA in the audio routing order.

A master volume is also available.

Other functionalities

Joystick

A joystick (XY) can mix 4 different modulation sources. The XY output of this joystick can then be used as an oscillator modulation source.

Digital patching matrix

Connection between module are made via a digital matrix.
The Matrix allows to connect any CV to any modulation fader.
the CVs are :

- OSC 1 out
- OSC 2 out
- OSC 3 out
- OSC 4 out
- LFO
- ADSR
- XY (joystick)
- Audio IN Left signal
- Audio IN Right signal
- EXTERNAL CV (or MIDI pitch Bend)

The modulation Faders are :

- OSC 1 MOD 1, 2 and 3
- OSC 2 MOD 1, 2 and 3
- OSC 3 MOD 1, 2 and 3
- OSC 4 MOD 1, 2 and 3
- LFO

Audio In

The 3.5 mm stereo jack input allow to connect any line level sound source.

This signal can be used as a modulation signal for the oscillators, or the joystick.
When the « audio » is selected as a Gate mode, a GATE is trigger when the audio left signal is loud.

External CV

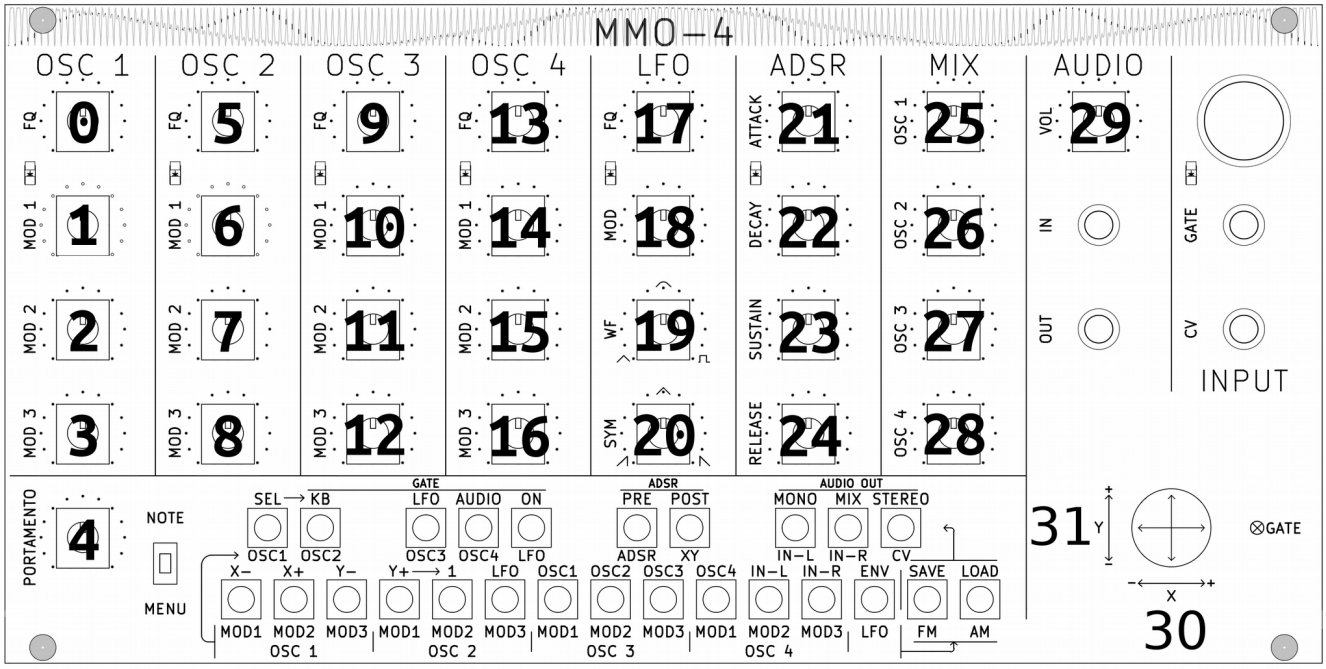
1 analog input (-6v/6V) and an external GATE IN (0/5V) are available using 3.5 mono jack, compatible with most modular setup.

MIDI

You can also control your synthesizer with a MIDI cable : using a keyboard to play notes, or the pitch bend or modulation wheel to modulate the sound. Connect an external sequencer, a computer etc. The informations used are :

- Note on / note off, channel 1
- pitch bend : When receiving a pitch bend information, the CV input is disconnected from the analog input and connected to this midi data. This data are received only from channel 1.
- Program change (from 1 to 10, on Channel 1) load one of the memory.
- You can also control all fader in midi. Midi data are added to fader value to control the corresponding parameter. All MIDI data can be send using 7 bits (1 CC), or 14 bits (using 2 CC). This CC should be send on MIDI Channel 2.

Here is a map of MIDI CC number :



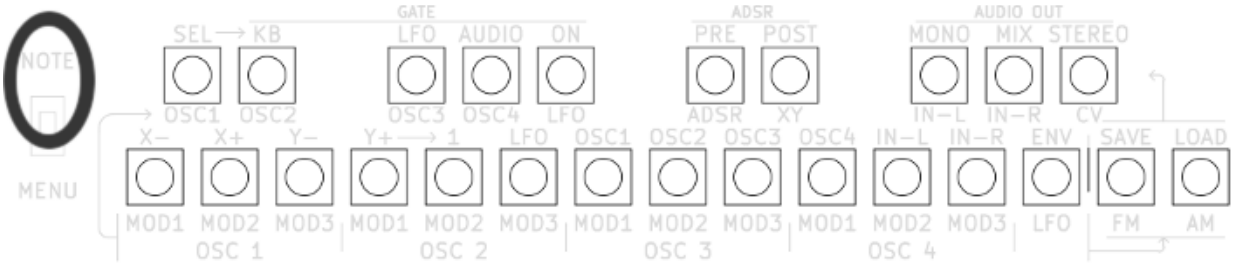
For 14 bit MIDI, use CC x (MSB) and CC x+32 (LSB), always send MSB after the LSB.

Keyboard

This is a 2 octaves keyboard. The portamento filter the frequency control of the keyboard. Thanks to a switch, the keyboard is also used to control the menu in order to edit all OCS options.

How to use the key as a midi keyboard?

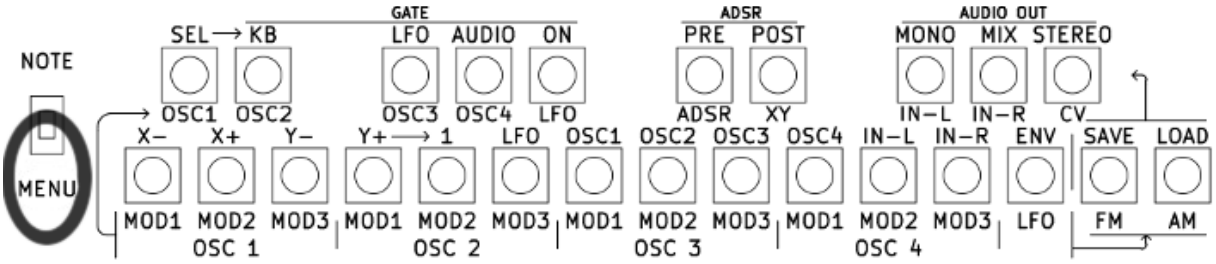
Switch the toggle to NOTE.



How to use the menu?

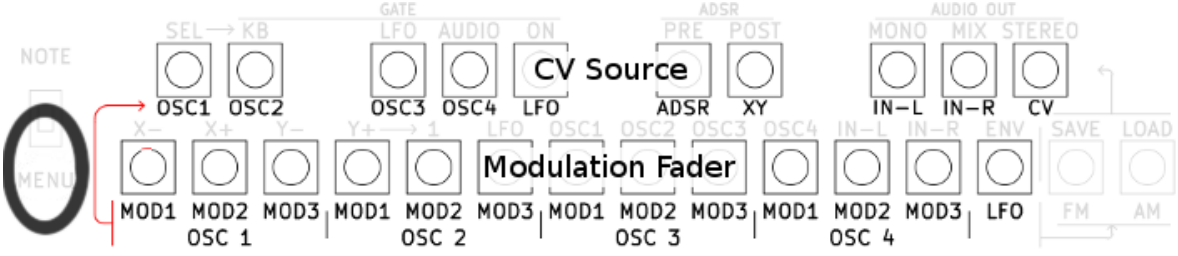
Switch the toggle to MENU.

All options are available using 2 keys combination.

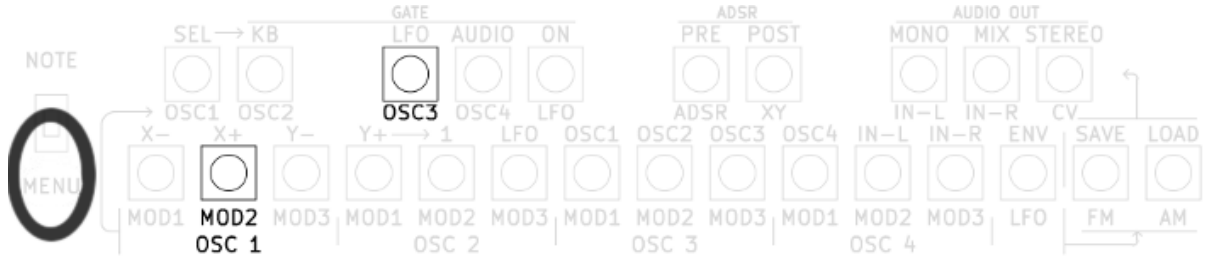


How to change the patching matrix?

Press in the same time the modulation fader key to assign and the modulation source key (CV source)



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



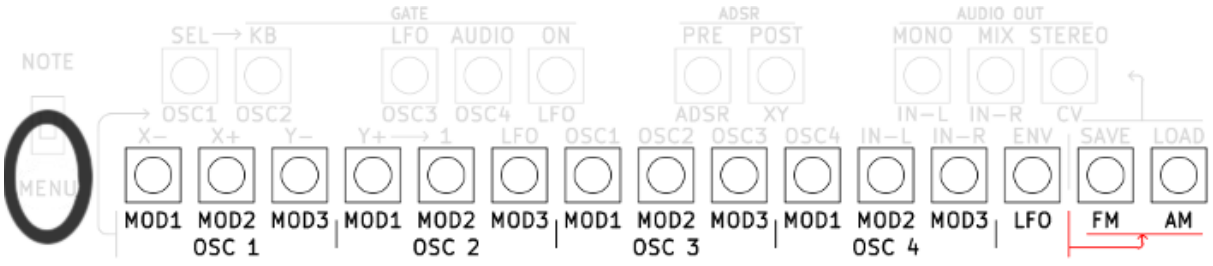
How to know what modulation source is assign to a modulation fader?

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 OSC 4 → OSC 4
- LED LFO → LFO
- LED ADSR → ADSR
- all LED except LED OSC 1 → XY (joystick)
- all LED except LED OSC2 → audio in Left
- all LED except LED OSC3 → audio in Right
- all LED except LED OSC4 → CV in (or pitch bend)

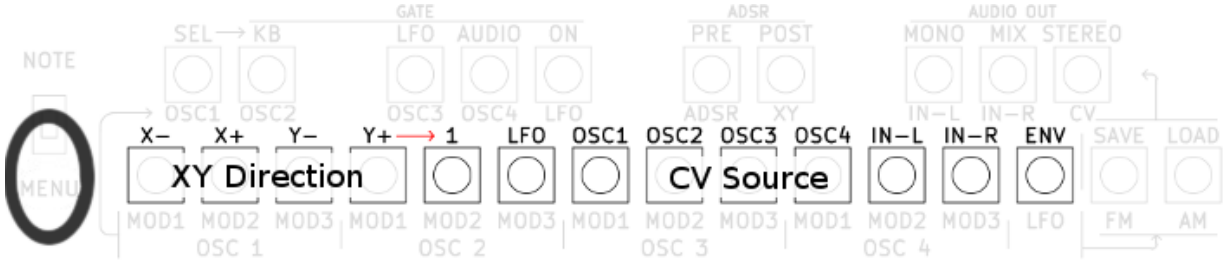
How to change modulation type?

Press simultaneously the modulation fader key and the FM or AM key :



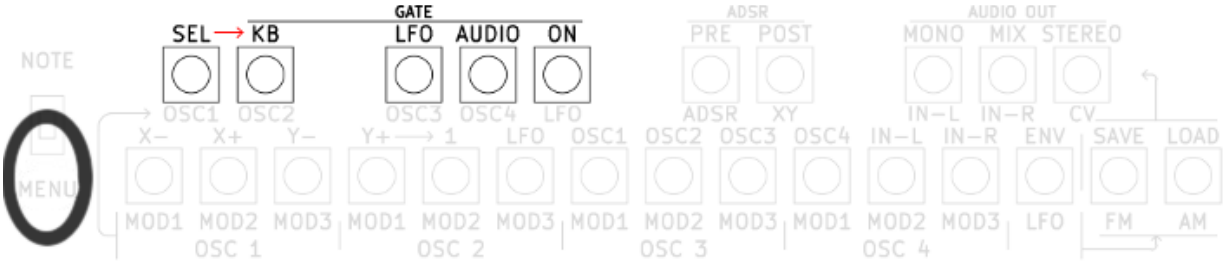
How to change the joystick modulation source?

Press simultaneously a XY direction key (X+, X-, Y+, Y-), and a modulation source key (CV source).



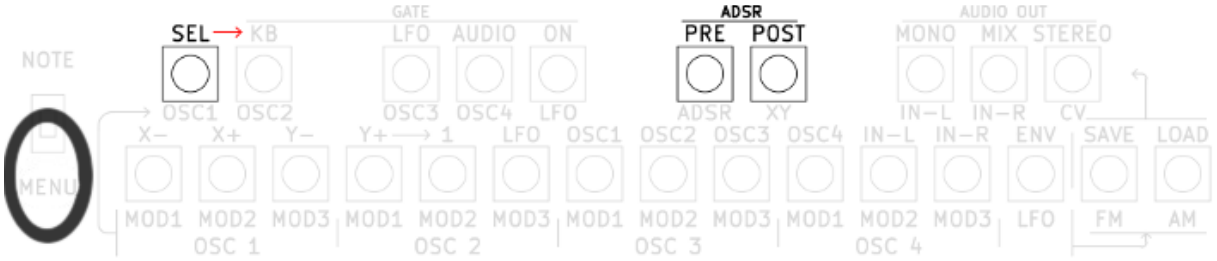
How to change the GATE source?

Press one of the gate key and the SEL key :



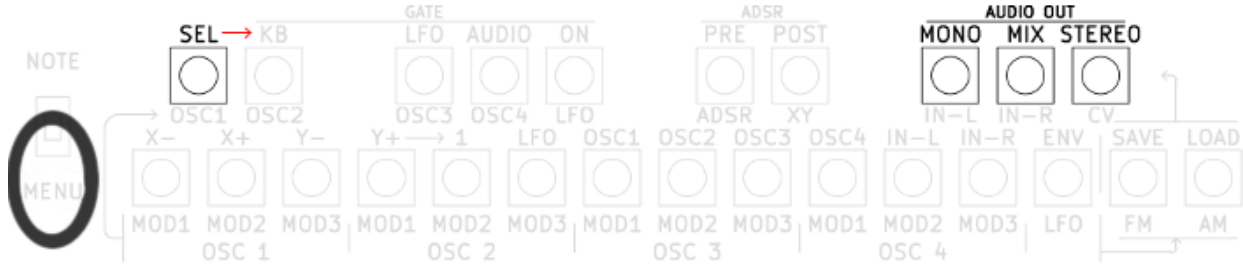
How to change the ADSR position?

Press one of the ADSR key and the SEL key :



How to change the audio out mode?

Press one of the audio out key and the SEL key :



How to Load / save configuration?

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