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1 WELCOME

Thank you for your interest about the OPLA. I tried to make a pocket synthesizer, economical in terms of space but also for your budget.

It is an open source project.

2 INSTALL YOUR OPLA

You can power you OPLA with the 5VDC of the Micro USB Port.

On the front plate a text « USB Power » indicates the good USB port.

Do not forget to check is the sd card is well inserted.



Concerning the power it is not recommended to power the OPLA with a computer USB Port et record the outputs in the same time

Please use this kind of power plug:



To connect an external Keyboard use the back Midi In port (DIN 5 points).



Then connect your headphone or audio system to the Audio out connector.

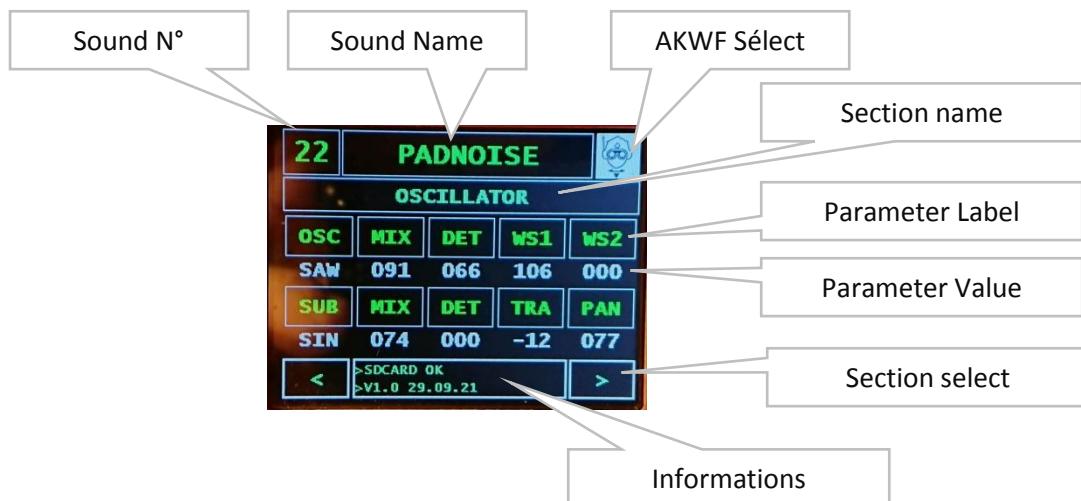


3 USER INTERFACE

3.1 Overview

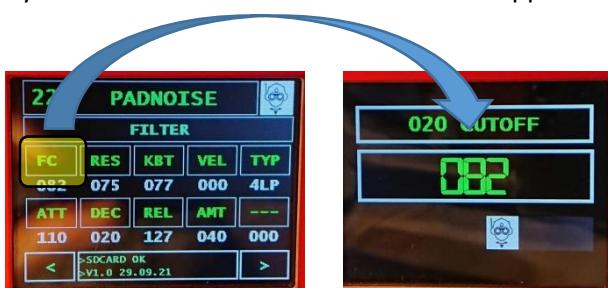
At startup after the home screen you will see this different information.

- On the upper of the screen the number and the name of the current sound.
- On the same line when you push on the little Robot you can select the AKWF waveforms
- Under, the section name: Oscillator, Filter, LFO....
- Two séries of 5 parameters
 - When you click on the Labels you can modify the parameter.
 - The parameter values are show under the labels
- Some navigation Arrow for the sections < et >
- Between the Arrow an information zone.



3.2 Parameter modification

When you click on a label a second screen will appear.

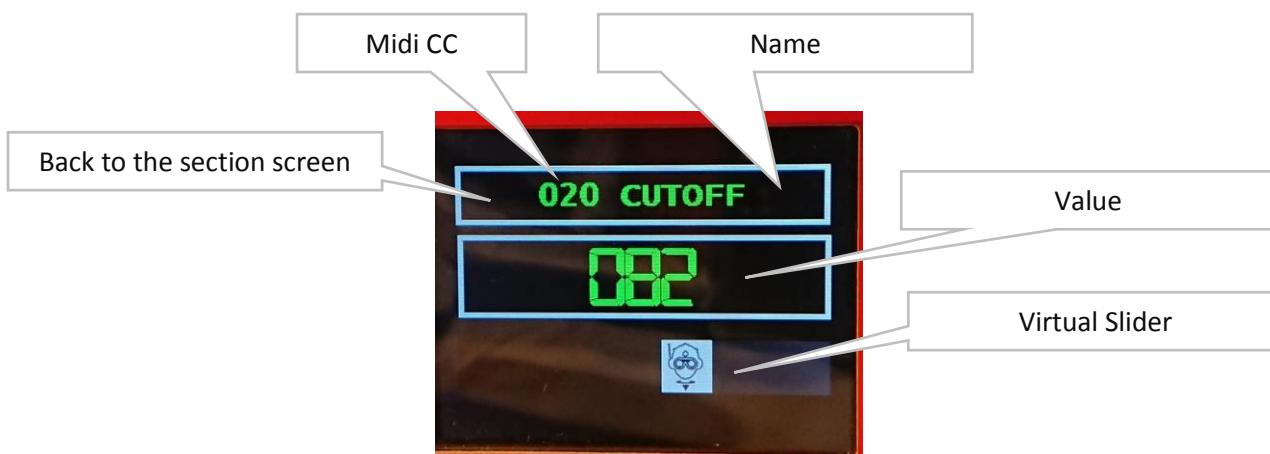


On this screen :

- Midi Control change Number
- Name of the Parameter
- Value of the Parameter
- Virtual slider to modify the value

If you click on the MIDI CC + Name of the parameter line you will return to the previous screen.

After a certain time the return is automatic



If an external device controls the MIDI CC, the reception will automatically switch to this screen with the good section.

3.3 Select a sound – Save and Load

To select a sound click on the sound number

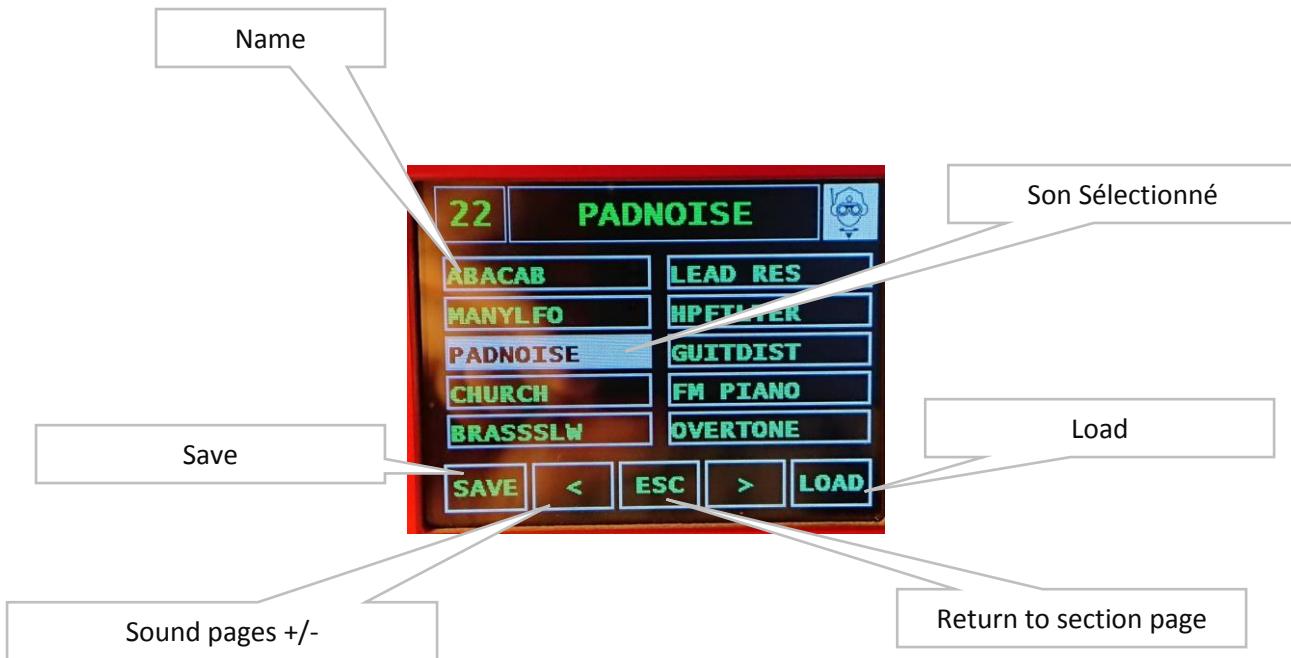
With the new Multi pages screen select your new sound.

You have 10 pages of 10 Sound



So Select the page then the sound and press load or save.

HANSY SYNTH – 2021



Of course you can select the sound with a midi program change.

3.4 Name a sound

To name a sound click on the name of the sound, then type the new name



4 SOUND SYNTHESIS

4.1 Introduction

The OPLA use a Virtual Analog Synthesis.

The architecture is near an Analog Synthesizer.

So it VCO+VCF+VCA+EG+LFO

Now we will explain the different synthesis sections.

4.2 The Oscillators

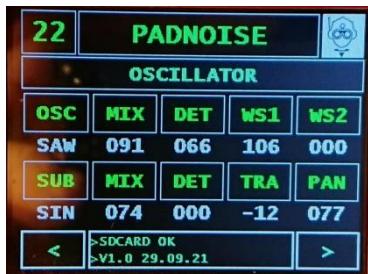
The Oscillator is a waveform read at different speed.

The Oscillator gives the “primary color” of the sound.

In the OPLA you have 3 Oscillators and a noise generator.

For the two first Oscillators it is the same waveform and you can detune the OSC1/OSC2 to have a bigger sound.

The third one can be detuning but also transpose. It is the SUB OSC



- OSC Select waveform Sin/Saw/Square/Pulse/Tri/Noise/Not/AKWF
- MIX OSC1/OSC2 Volume 0-127
- DET Detune OSC1/OSC 0-127
- WS1 Wave shaping 1 (change the waveform) 0-127
- WS2 Wave shaping 2 (change the waveform) 0-127
- SUB Select the SUB waveform Sin/Saw/Square/Pulse/Tri/Noise/Not
- MIX SUB Volume 0-127
- DET SUB Detune 0-127
- TRA SUB Transpose semitone -24 to +12
- PAN Change pan between the notes 0-127

4.2.1 Oscillators AKWF

To have a better waveform choice the OPLA use the AKWF waves.

This library is split in different bank and in each bank you can have up to 100 waveforms. So you have the choice between **4000 waveforms**.

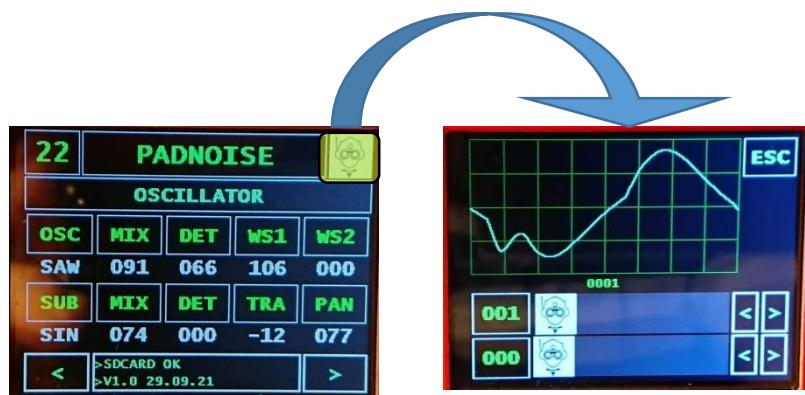
For more information go to the web site

[AKWF WEB SITE](#)

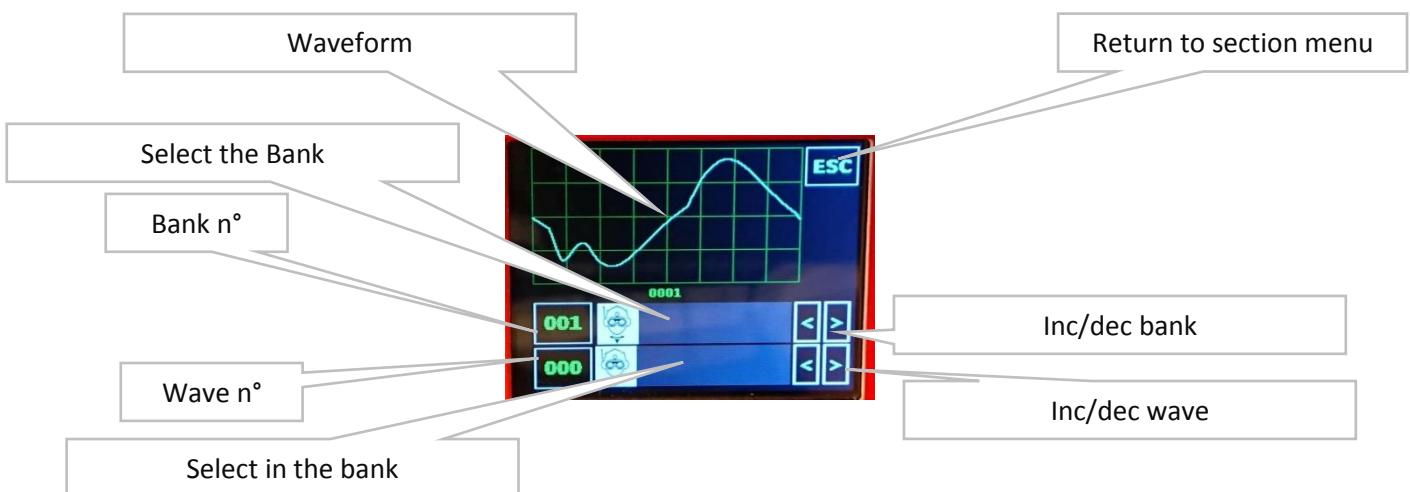
This Library Is open source. So for each OPLA some money will go to the creator of this library.

Of course you can also give something.

To select an AKWF waveform first select the waveform AKWF for the OSC1/OSC2 then click on the little robot.



*Sorry for the image the selection is not AKWF



Just try, explore and listen the different waveforms.

TABLEAU AKWF WAVEFORMS

Name	Nb	Name	Nb	Name	Nb	Name	Nb
0000	100	0001	100	0002	100	0003	100
0004	100	0005	100	0006	100	0007	100
0008	100	0009	100	0010	100	0011	100
0012	100	0013	100	0014	100	0015	100
0016	100	0017	100	0018	100	0019	110
Aguitare	38	altosax	26	birds	14	bitreduce	40
Blended	73	perfectwave	04	Saw	50	Saw Bright	10
Saw Gap	42	Saw Round	52	Sine	12	Square	10
Square R	52	Triangle	25	C604	32	Cello	19
Clarinet	25	Clavinet	33	D Bass	69	Distorded	45
E Bass	70	E Guitare	22	E Organ	127	E Piano	73
Flute	17	FM Synth	122	Granular	44	H Draw	50
H Voice	104	Linear	85	Oboe	13	OSC Chip	12
Overtone	44	Piano	30	Pluck	9	Raw	36
SIN Harmo	16	Snippets	47	String Box	6	Symetric	17
Theremin	26	Game	128	Game Basic	64	Violin	14

4.2.2 Wave Shapping

For now only the WS1 is present in the OPLA.

It is a way to modify the wave with a simply way to generate a new waveform.

The WS1 is different for each basic waveform.

Sinus Read at different speed. Sinus to the octave or the quint.

Saw Morphing between saw and sinus Wave= $(1-WS1)*Saw+WS1*Sine$ WS1 0.0 a 1.0

Tri Morphing between Tri and saw Wavet= $(1-WS1)*Tri+WS1*Saw$ WS1 0.0 a 1.0

Square Pwm set, pulse wide modulation

Pulse Set the slope of the pulse to have a sort of pulsed saw

Noise Morphing between noise and saw Wave= $(1-WS1)*Noise+WS1*Saw$ WS1 0.0 a 1.0

Silence Nothing

AKWF Morphing between AKWF and sinus Wave= $(1-WS1)*Saw+WS1*Sine$ WS1 0.0 a 1.0

4.2.3 Oscillators Volume

You can change the different volume with the two MIX parameters.

4.2.4 Detuning OSC 1-2 and 3

For a bigger sound you can detune all the OSC

OSC1 and OSC2 are detune with a different value.

The OSC3 too

For example for an A at 440Hertz we can have:

OSC1 444 Hertz

OSC2 438 Hertz

OSC3 222 Hertz for a transposition at -12 semitones

4.2.5 Transpose OSC3

This value goes to -24 semitones to +12 semitones so -2 to +1 Octave.

4.2.6 Pan Change

Pan change has no link with the Oscillators.

For example 3 notes C M G

With a pan at 64 you have the same pan for each note

	C	E	G
Left	50%	50%	50%
Right	50%	50%	50%

For a 0 value

	C	E	G
Left	100%	0%	100%
Right	0%	100%	0%

For a 127 Value

	C	E	G
Left	0%	100%	0%
Right	100%	0%	100%

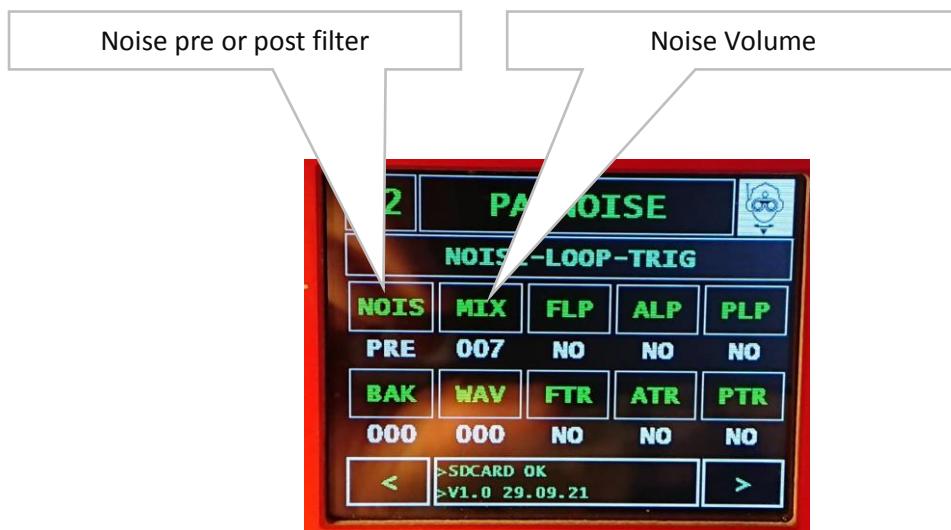
Of course you can select all the value between 0 and 127

So you have a way to expand the pan of your sound.

4.3 Noise and Loop/Trig Envelopes

In addition to oscillators it is possible to integrate a quantity of white noise.

This white noise can be inserted before or after the filter.



BAK and WAV show the bank and wave for the AKWF

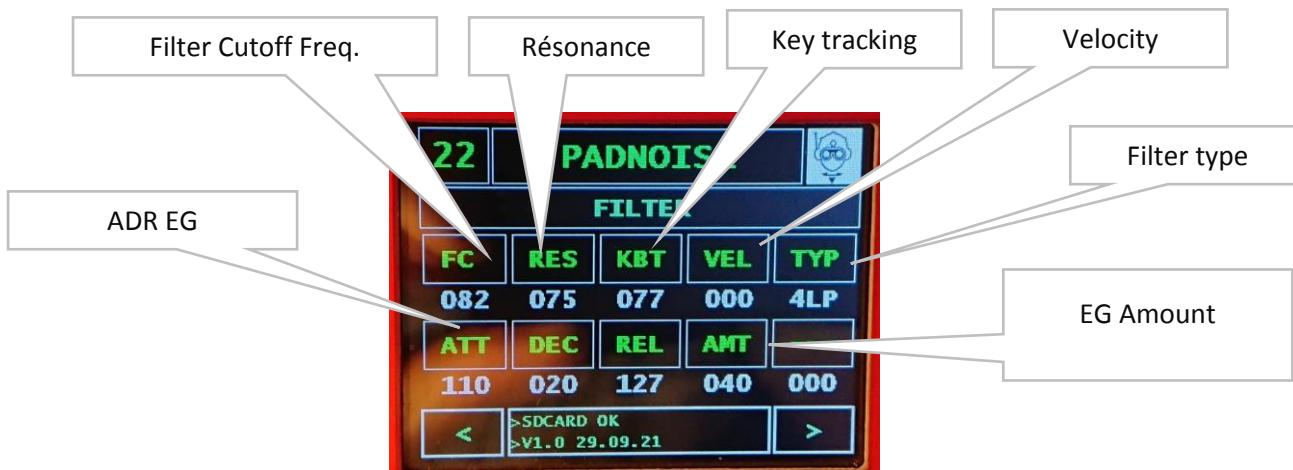
FLP/ALP/PLP et FTR/ATR/PTR will be explain later

4.4 The Filter

- It is a Digital filter
- You can select a 4 pôles or 2 pôles
- It is resonant
- It is multi mode :
 - Low pass LP
 - High pass HP
 - Band pass BP
 - Notch NP

Following the diffèrent modes polyphonic, paraphonic or mono. The number of filter will be 4 or 1.

After the oscillators the filter allows to attenuate, filter, or amplify certain harmonics of the spectrum.



4.4.1 Filter frequency and resonance

The cutoff frequency determine the frequency at with the higher frequency are attenuate;, for a Low pass filter for example.

The resonance amplify and set in resonance the filter around the cutoff frequency. The résonance Is typical on many old vintage synthétiser.

4.4.2 Filter type

The different filter types available are:

4LP/4HP/4BP/4NP/2LP/2HP/2BP/2NP

4.4.3 Keyboard tracking and velocity

The cutoff frequency can be different between different notes.

For example in a piano the higher notes are brighter. If you set the KBT on a value > 64 the higher note are brighter but of course you can set this parameter to a value < 64

4.4.4 EG ADR for the filter

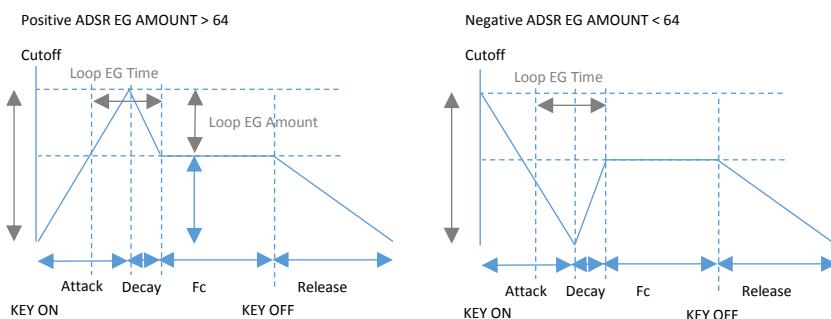
The ADSR EG is in the Filter section

It is a bi polar EG type ADSR: Attack Decay Sustain release. Here the sustain is the Filter frequency.

For better results with an amount >64 you must set the filter frequency to a low value and for an amount <64 a high filter frequency.

Now you just have to set the different time parameters for the Attack/Decay and Release section.

Here the sustain is the Cutoff frequency

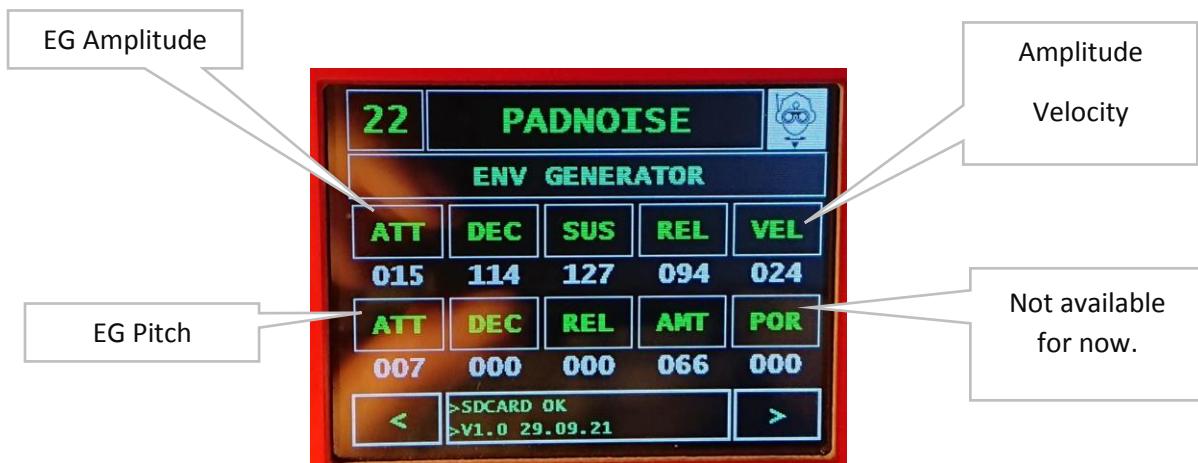


4.5 Envelopes + Loop + Trig

The filter section has its own envelope, but there are two more envelopes.

A unipolar EG for the Amplitude of the sound

A bipolar EG for the pitch



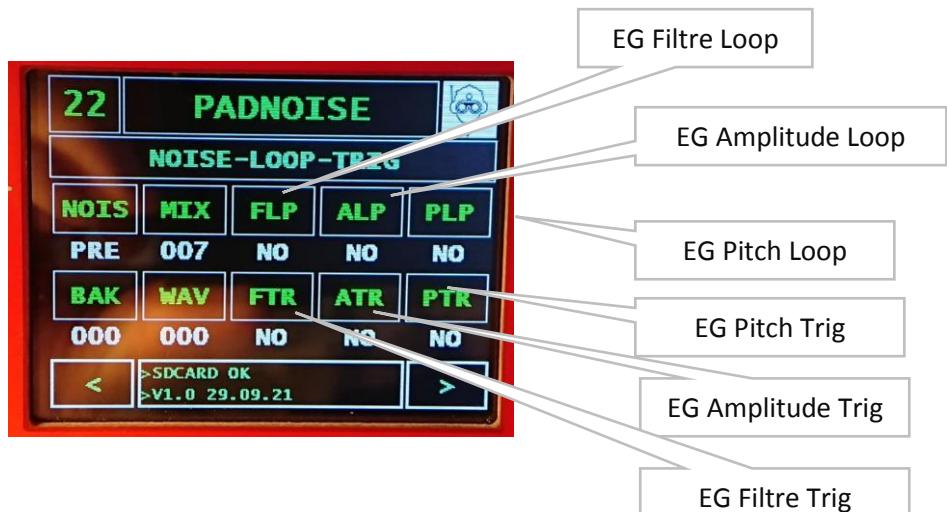
With the pitch EG you can approach an effect like glide or portamento.

These three EG are loopable.

4.5.1 EG Loop

With an EG set to loop you have something like an LFO but now it is a Polyphonic LFO.

This new LFO is also faster.



4.5.2 EG and Trig

These three parameters are useful if you use some paraphonic or mono sounds.

In some monophonic synthesizers the filter EG is trig on the first note and you must wait all key off if you want to trig again the EG.

With these parameters you can select if you want to trig the EG only on the first note or for each notes.

4.6 LFO Low frequency Oscillators

The OPLA had 2 LFO. And you can set the destinations.



LFO WAVEFORMS AVAILABLES: Sine/Tri/Saw/Inverse Saw/Square/S&H/Noise/Not

LFO Destinations: Amplitude/Cutoff Frequency/Pitch/Noise/Pan/Wave shaping1/LFO Speed/LFO Amplitude/Reverb pan/Delay pan/Reverb volume/Delay volume.

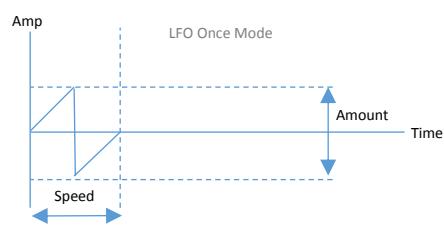
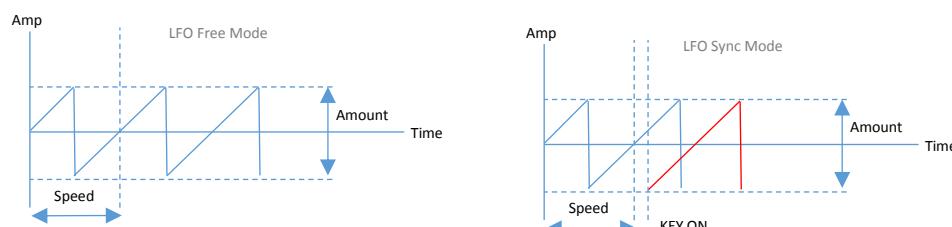
LFO Synchro: Free/Sync/One Shoot

For the Sync:

Free The LFO follow its own cycle.

Sync The LFO is retrig at the first note.

Once The LFO is trig in the first note and is stopped after one cycle.



4.7 FX

L'OPLA had two digital effects.

- A Reverb
- A Delay

In polyphonic mode only the reverb is available.

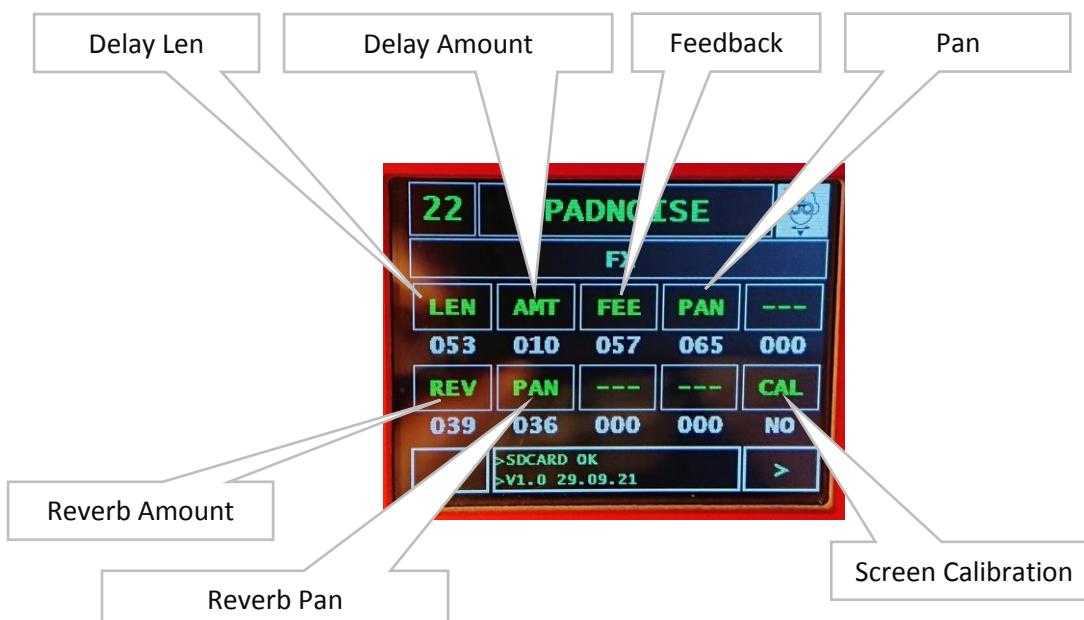
For the reverb you have two parameters.

- Volume
- Pan (Left to Right)

For the Delay

- Length
- Volume
- Feedback
- Pan (Left to Right).

In this screen you can also make a screen calibration



5 ARPEGIATOR

5.1 Mode for the Arpegiator :

If you play a C major C-E-G in this order E-G-C

Up	C-E-G-C-E-G
Down	G-E-C-G-E-C
Inc	C-E-G-G-E-C-C-E-G-G-E-C (the lower and upper note are repeat)
Exc	C-E-G-E-C-E-G-E-C
Random	C-G-E-E-C-G-E-G-C-G-E-G-G
Order	E-G-C-E-G-C-E-G-C
Up2	C-C-E-E-G-G-C-C-E-E-G-G
Down2	G-E-C-G-E-C-G-E-C

5.2 Speed and Div

You can select the speed and set the Div to 4/8/16/32

The speed of the arpegiator is 2 times faster from 4 if you select 8 and so on....

5.3 HOLD Mode

If the hold mode is on the arpegiator continue if you did not hit any Key

5.4 Gate and Swing

With the gate you can change the key off time and with the swing you change the time between two notes.

For a swing of 0 all the notes play at 100%

If the swing is different you can have 70% for the first note and 130 for the next one

6 SYSTEM AND MODULATORS

In the upper line you have :

The MODE

- Polyphonic 4 voices with one Filter and EG for each voices – No Delay Fx
- Paraphonic 4 voix avec une filtre pour toutes les voix. EG Pitch et AMP pour chaque voix.
- Monophonic 1 voice with 4*3 Oscillators, one filter, one EG for filter,amplitude, pitch, trig on each note or not.

PBR Pitch bend range

Configure the pitchbend range in semitone 0 to +12

SPE Spread

Set some static random variation between the voices.

In poly or para mode this parameter set an analog touch in the sound.

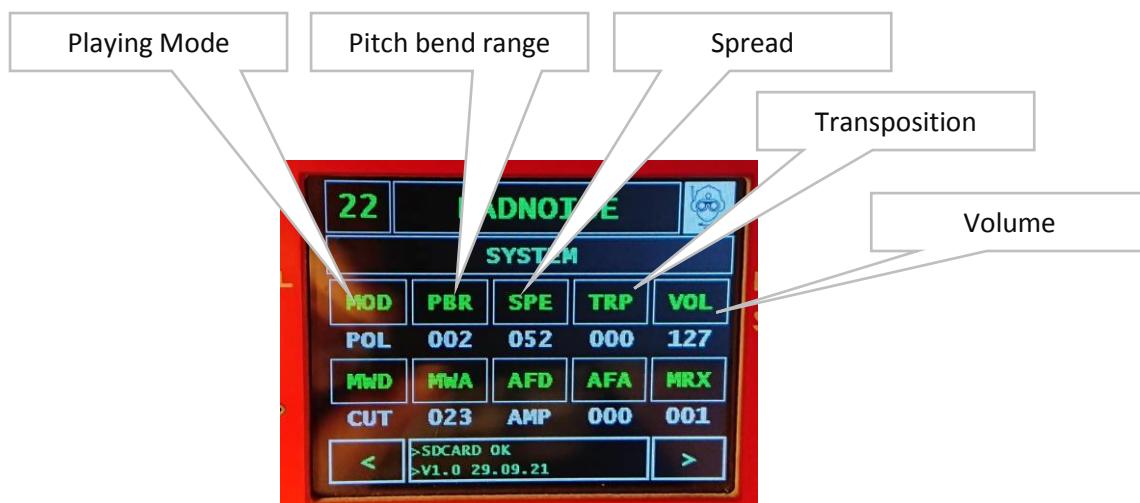
In Mono mode it is used to make some fatter sounds.

TRP Transpose

Transpose the sound

VOL Volume

General volume of the sound



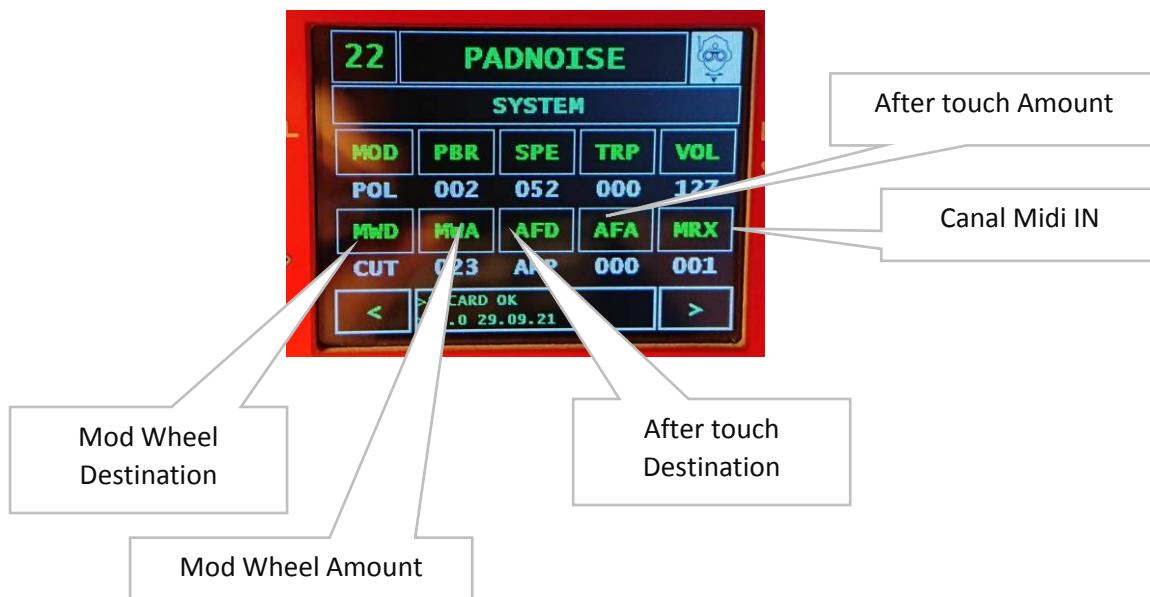
On the under line:

Two modulators : Mod Wheel and Aftertrouch

You can assign these modulators to::

- Amplitude
- Filter cutoff frequency
- Noise Level
- Pan
- Wave shaping1
- Wave shaping2 (non present the 10.10.21)
- LFO1 speed
- LFO1 amount
- LFO2 speed
- LFO2 Amount
- Midi CC (non present the 10.10.21)

With the last button you can set the Midi Channel



7 MISC

7.1.1 Information lines

In the section on the lower you can find some informations:

A start

- SD Card Detection . Without the card the OPLA do not work.
- Firmware version



7.1.2 Open source

Opla is an open source project.

The Kernel, the starting point of the OPLA is a Marcel licence project

[Github Marcel Licence](#)

AKWF waveform library

[Librairie AKWF](#)

OPLA Firmware

[Github logiciel OPLA](#)

OPLA other documentation

[Github autre OPLA](#)

7.1.3 MIDI CC LIST

MIDI_CC_WAVE1	10
MIDI_CC_OSCVOL	11
MIDI_CC_DETUNE	12
MIDI_CC_WS1	13
MIDI_CC_WS2	14
MIDI_CC_SUBOSC	15
MIDI_CC_SUBVOL	16
MIDI_CC_SUBDET	17
MIDI_CC_SUBTR	18
MIDI_CC_PANSPR	19
MIDI_CC_NTYPE	80
MIDI_CC_NOISE	81
MIDI_CC_82	82
MIDI_CC_83	83
MIDI_CC_84	84
MIDI_CC_BK	85
MIDI_CC_WA	86
MIDI_CC_87	87
MIDI_CC_88	88
MIDI_CC_89	89
MIDI_CC_CUTOFF	20
MIDI_CC_RES	21
MIDI_CC_FOLLOW	22
MIDI_CC_FVELO	23
MIDI_CC_FTYPE	24
MIDI_CC_FLT_A	25
MIDI_CC_FLT_D	26
MIDI_CC_FLT_R	27
MIDI_CC_FLT_Q	28
MIDI_CC_AMP_A	30
MIDI_CC_AMP_D	31
MIDI_CC_AMP_S	32

MIDI_CC_AMP_R	33
MIDI_CC_AMPVEL	34
MIDI_CC_PITC_A	35
MIDI_CC_PITC_D	36
MIDI_CC_PITC_R	37
MIDI_CC_PITC_Q	38
MIDI_CC_PORTA	39
MIDI_CC_DEL_LENGTH	50
MIDI_CC_DEL_LEVEL	51
MIDI_CC_DEL_FEEDBACK	52
MIDI_CC_DEL_PP	53
MIDI_CC_REVERB_LEVEL	55
MIDI_CC_REVERB_PAN	56
MIDI_CC_57	57
MIDI_CC_58	58
MIDI_CC_59	59
MIDI_CC_SOUND_MODE	60
MIDI_CC_PB_RANGE	61
MIDI_CC_SPREAD	62
MIDI_CC_OCTAVE	63
MIDI_CC_SVOLUME	64
MIDI_CC_MD_DEST	65
MIDI_CC_MD_AMT	66
MIDI_CC_AT_DEST	67
MIDI_CC_AT_AMT	68
MIDI_CC_MIDI_RX	69
MIDI_CC_LFO1_SPEED	70
MIDI_CC_LFO1_SHAPE	71
MIDI_CC_LFO1_DEST	72
MIDI_CC_LFO1_AMT	73
MIDI_CC_LFO1_SYNC	74
MIDI_CC_LFO2_SPEED	75
MIDI_CC_LFO2_SHAPE	76
MIDI_CC_LFO2_DEST	77

MIDI_CC_LFO2_AMT 78

MIDI_CC_LFO2_SYNC 79

MIDI_CC_ARP_ON 40

MIDI_CC_ARP_HLD 41

MIDI_CC_ARP_SPE 42

MIDI_CC_ARP_DIV 43

MIDI_CC_ARP_MOD 44

MIDI_CC_ARP_GAT 46

MIDI_CC_ARP_SWI 47