

ENDLESS PROCESSOR

MANUAL
V1.3



INTRODUCTION

ENDLESS PROCESSOR is a dual-channel infinite sound sustainer machine.

Put your favorite instruments, unique timbres, or field recordings - virtually any sound - and make it last forever.

It is not a looper in the usual sense - Endless Processor resynthesizes your sounds to create a perfect clickless stream while preserving the timbral and tonal character of the original.

Endless Processor always listens to audio input and keeps a most recent history. Experiment with sustaining little bits of a sample

or make a massive wall of sound with the ability to select how much memorized audio to process.

Stack your sounds (or move between them) to create harmonies, textures, or drones with 5 layers per channel.

Each layer can be re-processed or cleared while keeping other ones in place. Set fade-in and fade-out time to quickly or gradually introduce a new layer or remove the existing one.

Additional controls will help you to adjust or shape a channel volume (think built-in VCA).

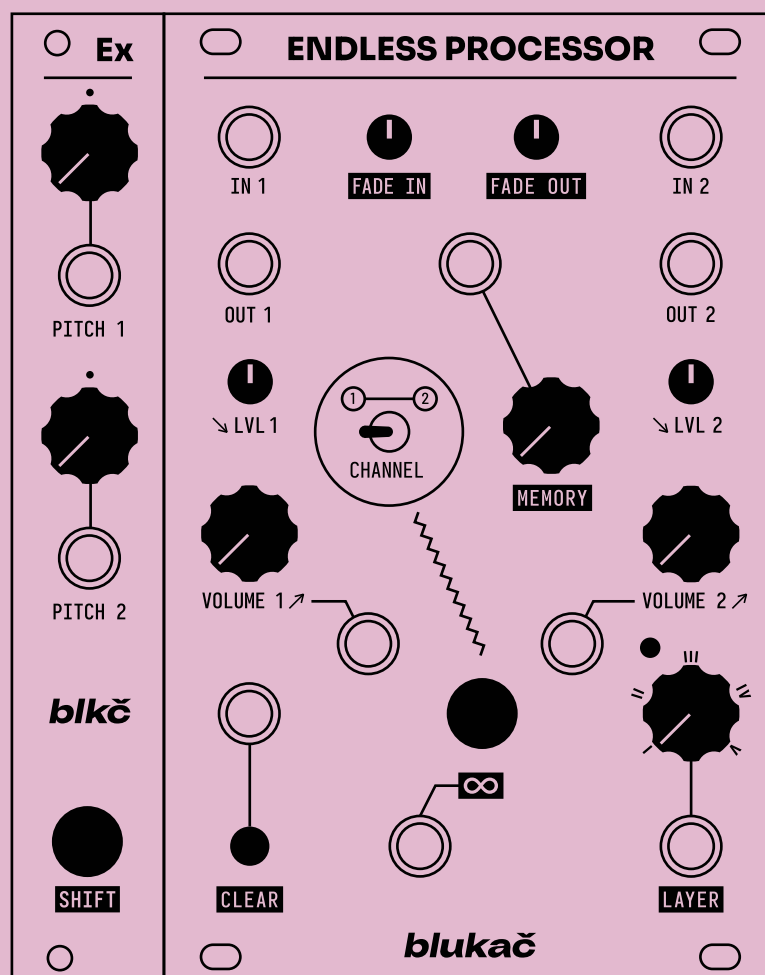
SPECIFICATION

Size: 16HP (+4HP WITH EX)

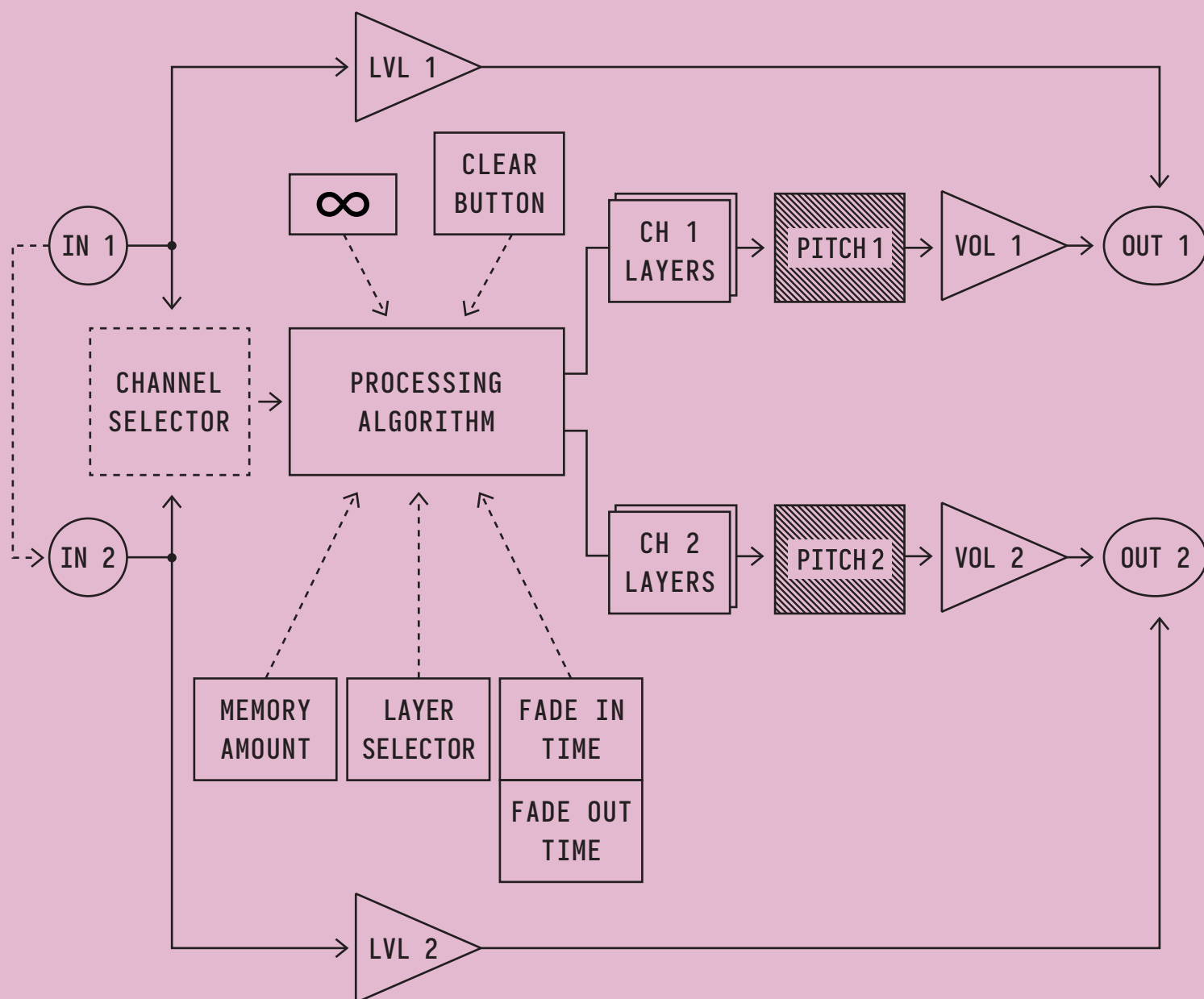
Depth: 25mm (45mm with expansion board installed)

Power consumption: +12V 125 mA / -12V 10 mA

Audio quality: 48kHz/24bit



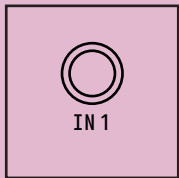
SIGNAL FLOW



— Control over the pitch is only available if Ex expander is connected

Starting from the hardware revision 1.3 (see the back of the module) IN 1 is normalized to IN 2 - if a cable is not plugged into IN 2, signal from the IN 1 will be used instead.

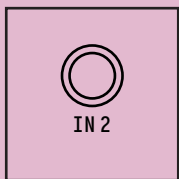
PANEL CONTROLS / INPUTS & OUTPUTS



IN 1

Audio input of Channel 1. If patched, audio is always propagated to the processing algorithm. It can be monitored in case you need to hear the input or mix it with processed layers (see LVL 1).

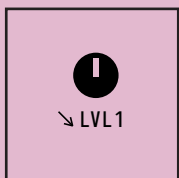
Expected input level: -5V/+5V (tolerates the negative and positive rail voltages of your power supply, usually +- 12V).



IN 2

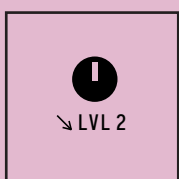
Audio input of Channel 2. If patched, audio is always propagated to the processing algorithm. It can be monitored in case you need to hear the input or mix it with processed layers (see LVL 2)

Expected input level: -5V/+5V (tolerates the negative and positive rail voltages of your power supply, usually +- 12V).



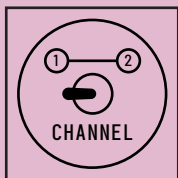
LVL 1

This knob allows you to monitor the IN 1 signal. Turning it starting from a fully counterclockwise position, you will hear audio coming from OUT 1.



LVL 2

This knob allows you to monitor the IN 2 signal. Turning it starting from a fully counterclockwise position, you will hear audio coming from OUT 2.



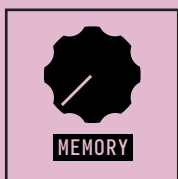
CHANNEL

Channel selector switch. Since Endless Processor is a dual-channel module, some controls are shared between channels and are not duplicated.

When it is in the left position, Channel 1 is selected.
The right position selects channel 2 correspondingly.

Controls that are shared between channels:
INFINITY, CLEAR, MEMORY, LAYER, FADE IN, FADE OUT.
Interaction with them will only affect the currently selected channel.

TIP: To be easier to memorize and navigate, titles of shared controls are highlighted on the panel.



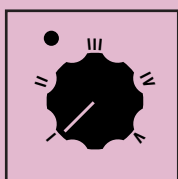
MEMORY

This control determines how much recorded audio will be processed and sustained. You can select only a tiny portion of the input signal or a big chunk. This affects the result drastically and is a big field for experimentation.

For example, a small amount is useful to sustain the character of your instrument, like holding a single note or a chord, while a larger amount could freeze the sequence or chord progression.

Memory range is from 100 ms up to 3 seconds.

Expected CV input levels: -5V/+5V



LAYER

This control is a layer selector.

There are 5 layers per channel. Sustaining a new sound will put it in a buffer of a currently selected layer.

While turning the knob the led will blink indicating the new layer has been selected.

Depending on which mode is active, Endless Processor acts differently (see ALTERNATIVE MODES section about mode activation):

Stacked layer mode

In stacked (default) mode all calculated levels are mixed and sent to output together. The LAYER knob will act only as a selector of a layer you are going to operate.

Separate layer mode

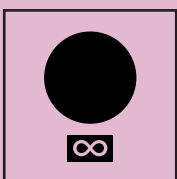
When in separate layer mode, it defines which single layer will be sent to the output.

After moving to a new layer, the fade-out process of the previous one will be started, and after the fade-out is finished the newly selected layer will be faded in (with respect to current FADE IN and FADE OUT controls).

While fading between layers you can still engage the sustaining or clearing, opening many performance possibilities.

TIP: if the fade-out time is long, while the fade-out process the choice of any next layer is possible, not only the following one. For example, if you are on layer III, while the fade out you can select layer I, II, IV, or V. You can even change your mind and select layer III back, so it will be faded in again.

Expected CV input level: -5V/+5V



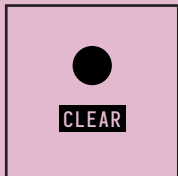
INFINITY

This button is dedicated to engaging the sustaining process.

When some layer is selected and is empty, the sustained sound will be put into the layer's buffer and then fade in.

If the layer is non-empty, the old one will fade out first, and then the new one will fade in (also see FADE IN and FADE OUT).

Expected CV trigger input level: 0 - 5V (upper voltage limit is a positive rail voltage, typically +12V)



CLEAR

This button is dedicated to clearing the currently selected layer.

When the layer is not empty, after pressing the button its audio will fade out (also see FADE OUT) and the led will blink.

If you press and hold this button for 3 seconds, all other layers of the currently selected channel will also be cleared and will fade out at once.

Expected CV trigger input level: 0 - 5V (upper voltage limit is a positive rail voltage, typically +12V)



FADE IN

This knob will set the time it takes for newly sustained sound to fade in.

The time range is from 10 ms up to 5 seconds.



FADE OUT

This knob will set the time it takes for old sustained sound to fade out (after the new layer is calculated or the existing layer is cleared).

The time range is from 10 ms up to 5 seconds.



VOLUME 1

This controls the volume of the mix of all layers of Chanel 1 - basically a built-in VCA.

Turning a knob without a CV source will open VCA, with maximum volume in the clockwise position.

When the CV source is patched, the value of the knob is added to the CV value.

You can turn the knob fully counter-clockwise to modulate the volume only by CV.

Expected CV input level: -5V/+5V



VOLUME 2

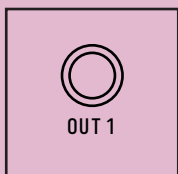
This controls the volume of the mix of all layers of Channel 2 - basically a built-in VCA.

Turning a knob without a CV source will open VCA, with maximum volume in the clockwise position.

When the CV source is patched, the value of the knob is added to the CV value.

You can turn the knob fully counter-clockwise to modulate the volume only by CV.

Expected CV input level: -5V/+5V



OUT 1

This is the main audio output of Channel 1.

The signal of the built-in VCA set by the VOLUME 1 is mixed with the input monitor signal set by LVL 1.

Output level: -5V/+5V



OUT 2

This is the main audio output of Channel 2.

The signal of the built-in VCA set by the VOLUME 2 is mixed with the input monitor signal set by LVL 2.

Output level: -5V/+5V



ALTERNATIVE MODES

There is the ability to change the default Endless Processor behavior by entering the alternative modes.

Note:

- All layers will be cleared when changing the modes.
- The selected choice will be preserved between power cycles.

STACKED/SEPARATE LAYER MODE

You can move between layers separately (**Separate Layer Mode**) instead of stacking them (**Stacked Layer Mode**).

To enable **Separate Layer Mode**: turn the “Layer” knob to “V” (fully clockwise) and hold the “Clear” button for 10 seconds. Led will blink several times indicating the alternative mode is enabled.

To enable **Stacked Layer Mode**: turn the “Layer” to “I” (fully counter-clockwise) and hold the “Clear” button for 10 seconds. Led will blink several times indicating the default mode is enabled.

See the LAYER control section for more information about the behavior of each mode.

CHANNEL SELECTION GATE VIA CLEAR INPUT

You can re-purpose the CLEAR trigger input as a gate to select the channel via CV.

To enable: select “Channel” switch to “2” and hold the “Clear” button for 10 seconds. Led will blink several times indicating the alternative mode is enabled.

To disable: select “Channel” switch to “1” and hold the “Clear” button for 10 seconds. Led will blink several times indicating the default mode is enabled.

When enabled:

- In case the Channel switch is selected to “1”: 0 volts means Channel 1, high voltage - Channel 2.
- In case the Channel switch is selected to “2”: 0 volts means Channel 2, high voltage - Channel 1.



ENDLESS PROCESSOR (EX)PANDER KIT

Expander kit expands possibilities for Endless Processor, allowing pitch control per channel and save/recall to/from SD card.

EXPANDER INSTALLATION PROCESS

Endless Processor Expander Kit contains:

- Endless Processor Ex module
- Expansion PCB for the Endless Processor
- Cable to connect Ex module to the expansion PCB

Installation steps:

1. Turn off your Eurorack power, disconnect, and take out Endless Processor from the Eurorack case.

2. On the back of the Endless Processor, you will find the orange DSP board (see photo below). Carefully extract it from the mount.

2.1. **Important!** Try not to touch the components on the board, and take caution from static electricity! If components are damaged due to improper handling, the DSP board may not function properly or be fully unfunctional, and this can not be covered as a warranty case!

3. Insert the expansion PCB into the module.

3.1. **Hint:** the connector orientation will lead you so it is not possible to insert it in the incorrect position.

4. Firmly insert the DSP board into the connectors on the back of the expansion PCB.

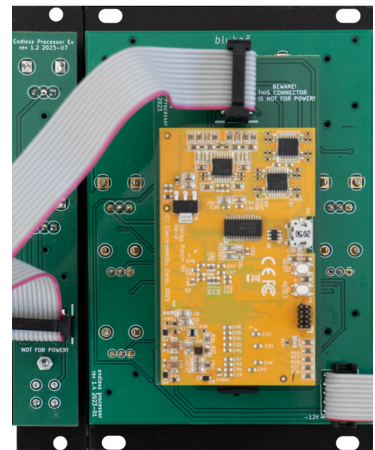
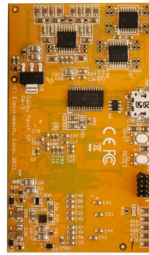
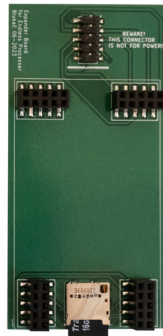
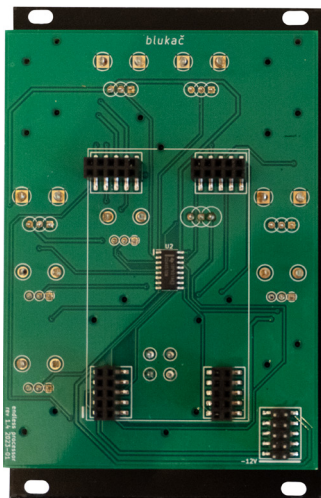
4.1. **Hint:** again, the connector orientation will lead you.

5. Connect the Ex module to the expansion PCB with the provided cable. The Ex module is only connected to the expansion PCB and does not require additional power connection.

5.1. Important! Carefully check the cable orientation - the line under the connector indicates the orientation of the red stripe on the cable.

5.2. Beware! Do not connect the expansion PCB or the Ex module directly to the power socket! It will lead to irreparable damage to the module and may damage other modules as well - improper installation will be not treated as a warranty case!

6. For the expander to be recognized by the Endless Processor, the minimum firmware version of v1.3 must be installed. The firmware can be obtained from the <https://blukac.com> website. Please refer to the Firmware Update section for the details on how to install the new firmware.



EXPANDER CONTROLS / INPUTS & OUTPUTS



PITCH 1

This control allows you to change the pitch of the sustained sounds of Channel 1. When the knob is around 12:00 (as indicated by the mark on the panel), the original pitch will be preserved. Moving clockwise from the center position, you can shift the sound up to 1 octave higher. Moving counterclockwise, you can shift the sound multiple octaves down to the full sound stop.

Note: the CV is not v/oct , and has the linear response (in contrast to exponential in v/oct). To tune the melodic sequence you should use the unquantized voltage source where you can tune each step to the desired pitch.

Expected CV input level: $-5V/+5V$. CV value is summed with the corresponding knob value.

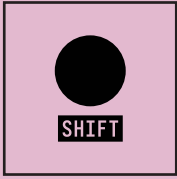


PITCH 2

This control allows you to change the pitch of the sustained sounds of Channel 2. When the knob is around 12:00 (as indicated by the mark on the panel), the original pitch will be preserved. Moving clockwise from the center position, you can shift the sound up to 1 octave higher. Moving counterclockwise, you can shift the sound multiple octaves down to the full sound stop.

Note: the CV is not v/oct , and has the linear response (in contrast to exponential in v/oct). To tune the melodic sequence you should use the unquantized voltage source where you can tune each step to the desired pitch.

Expected CV input level: -5V/+5V. CV value is summed with the corresponding knob value.



SHIFT BUTTON

When pressed, this button changes the behavior of some of the controls on the Endless Processor.

SHIFT + CLEAR

Loads currently selected bank from the microSD card (if the card is inserted and the bank has been previously saved).

SHIFT + INFINITY

Saves sustained sounds from both channels to the currently selected bank to the microSD card (if the card is inserted).

SHIFT + LAYER

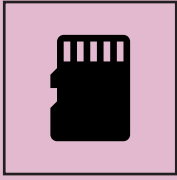
When the shift is pressed, turning the Layer knob selects the sound bank (from 1 to 5).

To load the specific bank: while shift is pressed dial the Layer to the corresponding bank number (LED will blink twice on each bank change), and press the CLEAR button.

To save sounds to the specific bank: while shift is pressed dial the Layer to the corresponding bank number (LED will blink twice on each bank change), and press the INFINITY button.

Hint: to prevent layer jump/change upon the Shift button depress, you should dial the Layer knob back to the desired position after you save or load the bank, and then depress the button.





MICROSD CARD

Your microSD card must be formatted to the FAT32 file system to be recognized and functional.

Expander can also work without the microSD card, so it is not mandatory to have it inserted, so features that are not related to it will still work.

SOUND EXTRACTION WEB TOOL

With the help of our web tool, you can upload the sound banks saved on the SD card and extract clickless loops of each layer in WAV format.

You can then import these loops into your DAW or hardware sampler to build your composition on top of the captured sounds.

The tool with instructions can be found here:

https://blukac.com/ep_web_tool/

FIRMWARE UPDATE

THINGS REQUIRED FOR THE FIRMWARE UPDATE:

1. Endless Processor connected to standard Eurorack power.
2. Micro-USB cable.
3. Computer with the Chrome browser (others may also be supported).

STEPS:

1. Download the .zip file with the latest firmware at <https://blukac.com/>.
2. Extract the file with the .bin extension.
3. Power module with the Eurorack power.
4. Connect the micro-USB cable to the orange DSP board (Daisy) on the back of the module.

Advice: some micro-USB cables that you may have around may be only for charging and can not transfer the data. In case Daisy is not recognized by your system please try a different cable first, most likely it will resolve the issue.

5. Open the <https://electro-smith.github.io/Programmer/> page with your browser.
6. Press and hold the "Boot" button on the DSP board, and while holding press the "Reset" button, then release the "Boot" button.
7. Press the "Connect" button and select "DFU in FS Mode" from the list in the popup.
8. Find the "Or select a file from your computer" section, and press "Choose file".
9. Find the extracted .bin file from the (2) and select it.



10. After the file is selected, press the "Program" button in the "Programming section" and wait until the flashing process is finished.

Note: Some Windows users may need to update the driver to Daisy to be recognized by the system. Please follow the instructions in this link to fix this problem:

[https://github.com/electro-smith/DaisyWiki/wiki/Using-Zadig-to-Reset-USB-Driver-\(Windows-Only\)](https://github.com/electro-smith/DaisyWiki/wiki/Using-Zadig-to-Reset-USB-Driver-(Windows-Only))

11. Disconnect the micro-USB cable from the DSP board.

12. Endless Processor is now updated and ready to use.

FIRMWARE CHANGELOG

Firmware version	Notes
v1.3	<ul style="list-style-type: none">• Added support for the Ex expander module• Volume CV response is greatly improved. Now with fast signals AM modulation effects are possible.
v1.2	<ul style="list-style-type: none">• Added ability to move between layers separately instead of stacking them• Added ability to re-purpose the CLEAR trigger input as a gate to select the channel via CV• Improved response of the knobs and CV• Fixed issue with clearing while re-processing which led to volume drop.• The speed of processing is improved.• Minimum fade-in and fade-out times are increased from 10ms to 50ms to handle unwanted digital artifacts when fast modulation is engaged in separate layer mode.
v1.1	<ul style="list-style-type: none">• Fixed issue with redundant fade-in after layer is cleared• Minor improvements