neuzeit
INSTRUMENTS

Warp

Manual
Document version 1.07 - Firmware version 1.07
www.neuzeit-instruments.com

Content

Module overview

Technical data:

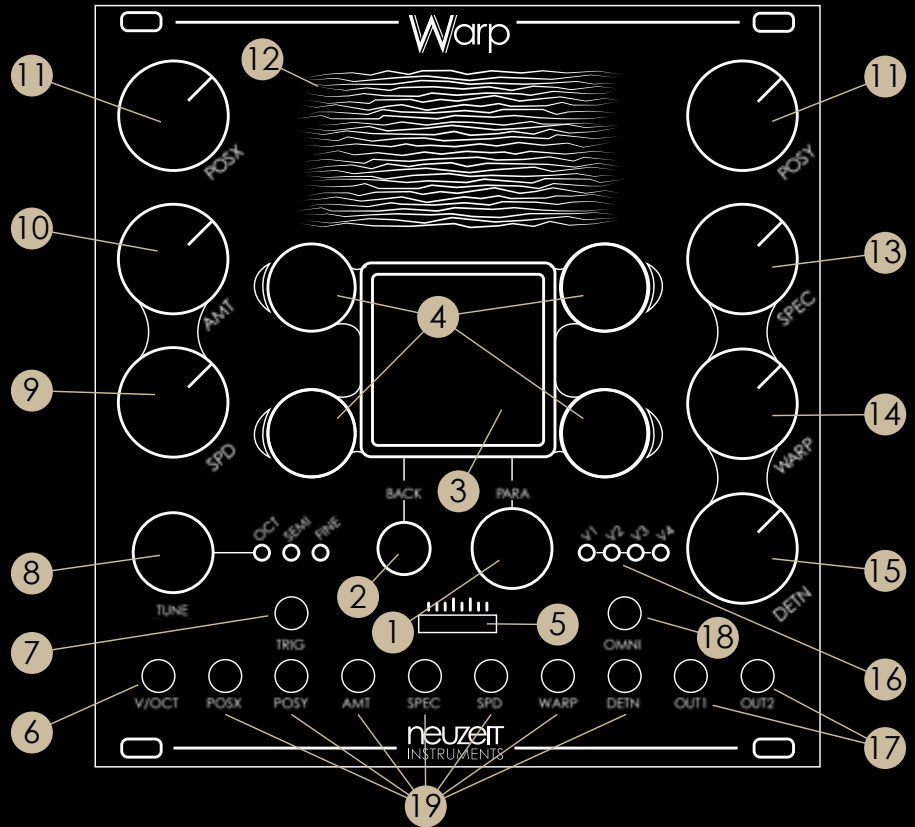|	
Power:	Eurorack, ±12V, GND 16-pin to 10-pin cable
Current:	+12V: 225 mA max - 12V: 25 mA + 5V: 0 mA
Width: Height:	24 HP = 121,5 mm 3 HE = 128,5 mm
WarpEx:	Connector on the back to connect the WarpEx expander
Inputs:	± 8V max, see below
Outputs:	± 10V max
Quality:	32 Bit internally, 24 Bit output @ 48kHz.

1) PARA   Encoder to navigate through the menu. Push to enter, turn to switch page.

2) BACK   Button to go back one menu level.

3) Display   OLED screen to display the menu.

4) Encoders   Four encoders to set the values in the menu, according to what the display shows. The display always tells the parameter name and the value. The LED next to the encoder gives additional orientation. When the LED is dark, the encoder has no effect.

5) SD-Card   Stores presets, GalaXYs, audio files for the GalaXY editor, wavetable exports.

6) V/Oct   CV input for pitch of all voices (± 8 Volts, 24 bits, up to high audio rate 24kHz)

7) TRIG   Gate input jack to trigger and retrigger envelopes and LFOs (0-5 Volts)

8) TUNE   Encoder to set the global tuning. Push toggles between octave, semitone and fine steps. Longpress resets tuning. The V1-V4 LEDs show the tuning offset while turning the encoder. Green LEDs indicate that tuning is back at ± 0.

9) SPD   Potentiometer to set the speed of the internal modulation sources globally, according to internal mapping.

10) AMT   Potentiometer to set the amount of the internal and external modulation sources globally, according to internal mapping.

11a) POSX
11b) POSY   Potentiometers to control the pickup position from where in the GalaXY the voices derive their harmonic spectra. Navigate in X- or Y-direction.

12) GalaXY   LED matrix that represents the GalaXY, a collection of harmonic spectra from which the voices pick their timbres.

13) SPEC   Potentiometer to control a spectral shape filter to dynamically change the harmonic spectrum gained from GalaXY. A wavetable is generated from the new spectrum.

| 14) WARP	Potentiometer to manipulate the wavetable generated from the harmonic spectrum. Warp effects are: Bend, Fold, Drive and Redux. The potentiometer can also control the cutoff frequencies of each voices' lowpass and highpass filters.
15) DETN:	Potentiometer to set the detuning and oscillator effects of the voices.
16) V1-V4:	LEDs that show the volume of each voice. Dark means the voice is silent, the brighter the louder the voice is. When the level starts to get close to analogue distortion at the output jacks, the color changes from blue to purple.
17) OUT1/2:	Audio output, channels 1 (left) and 2 (right). Resolution is 24 bits at 48kHz.
18) OMNI:	CV input that can be routed to any target in the modulation matrix. 24 bit resolution, 48 kHz. Expects voltages with a maximum amplitude of ± 5V.
19) Other CV inputs:	One CV input for each potentiometer. Expects ± 5V input level.

Content:

Warp module, one power cable 16-to-10 pin, four M3x6 screws, Micro-SD-card adaptor, USB-cable for firmware updates, printed Getting Started guide, stickers.

Installation and getting sound

1. Unpower your rack.

2. If you have a WarpEx expander, connect it with Warp using the small grey ribbon cable that was provided with WarpEx.

3. Connect to the power rail of your rack with the provided 16-10-pin ribbon cable to Warp's rear connector.

4. Mount Warp (and WarpEx) in the rack with screws.

5. Turn your rack on.

6. Connect the output OUT1 and OUT2 of Warp to your speakers.

7. Use the **PARA** encoder and the **BACK** button to navigate.
    Turn PARA: Scroll through menu pages
    Push PARA: Enter the selected menu
    Push BACK: Go back to the previous menu

8. As a start, scroll down to **Presets**, push PARA to enter, select **Load Preset** and select a preset from the file browser. We highly recommend to start with one of the **Basic Init Presets** if you are totally new to the module. Turn the potentiometers and listen how the sound changes.

    If you do not hear any sound:

    - Provide a trigger signal to Warp's TRIG input
    - Turn the potentiometers to their middle position
    - Unplug all cables except for TRIG and OUT, long-press the TUNE encoder to reset pitch.
    - Go to **Settings > Calibration V/Oct** and perform a calibration of the V/Oct inputs.

9. Explore the preset menus and turn the PARA encoder to explore all pages. By turning the four aluminum encoders next to the display, you can change the values. Some hints:

    - Explore the menus from bottom to top, start with Modulation and Voices, as these are easier to understand.
    - Pushing an encoder toggles its parameter between often used values
    - Read the manual and watch our videos on YouTube to unlock all knowledge :-)
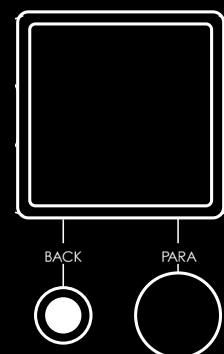
Simple menu navigation with PARA and BACK

The WarpEx expander

WarpEx is an expander module that adds **polyphony** and **MIDI** to Warp.

- 4-Voice polyphony
- MIDI input and MIDI Thru
- MPE compatibility (MIDI polyphonic expression)
- Dedicated trigger and V/Oct inputs for each voice
- Illuminated pushbutton to quickly toggle between the MIDI voice modes: Mono, Poly and MPE.

Technical data:

Power: Connected to Warp via grey bus cable on the back. Warp fully powers the expander and handles communication.

Width: 4 HP = 20,0 mm
Height: 3 HE = 128,5 mm

Inputs: ±8.0 Volts (V/OCT)
0.0 Volts to +5.0 Volts (TRIG and MIDI)
Overvoltage protection on all jacks.

Outputs: MIDI-Thru, 5V signal

1) TRIG   Gate inputs for Voices 1-4

2) V/Oct   CV input for pitch of voices 1-4 (± 8V, up to low audio rate ~100Hz)

3) MIDI In   Input Type-B for Midi signals. Use provided MIDI-to-DIN adapters.

4) MIDI Thru   Thru-Port Type-B of the incoming Midi signal

5) Button   Toggles between MIDI voice modes:

    - Red = Mono
    - Blue = Poly
    - Purple = MPE (Poly)
    - Long-Press = Reset virtual MIDI-CV cables to zero (needs Firmware v1.6+)

Content:
WarpEx module, connector cable to Warp, two MIDI DIN to MIDI-B converters, two M3x6 screws..

WarpEx is fully managed by the Warp master module. Even calibration and firmware updates are applied through Warp. Without WarpEx, Warp operates in Mono mode.

If you attach a new WarpEx for the first time, you will need to perform a new calibration as soon as WarpEx is connected. Simply navigate to **Settings > Calibration** where the display guides you through the calibration process.

The MIDI voice mode (Mono, Poly, MPE) is part of a preset, which means that loading a new preset will also change the MIDI voice mode. If you wish to always load presets with a dedicated MIDI voice mode setting, you can set the **WarpEx default** under **Settings > Global**.

When getting a new WarpEx, check if the WarpEx firmware matches Warp's master firmware. Therefore, navigate to **Settings > WarpEx Update** where the display tells you if an update is necessary. Warp's firmware always integrates a working firmware of WarpEx. Once you update Warp's firmware, a matching WarpEx firmware is already on board, but a separate WarpEx update via the menu may be necessary.
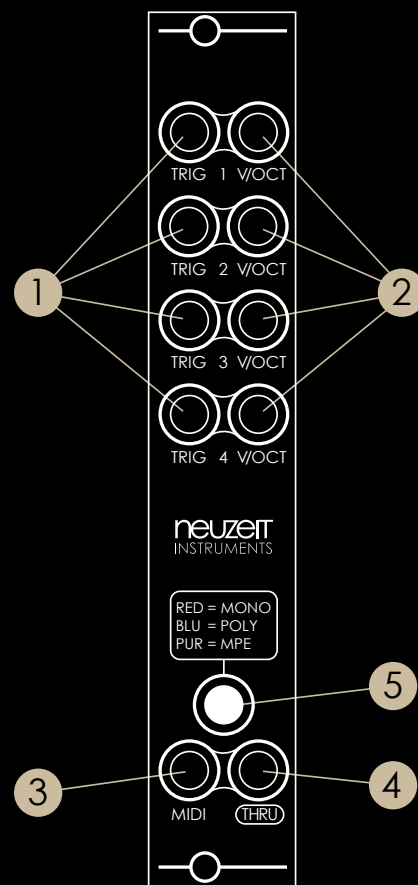
Audio engine

Warp has a unique audio engine that combines additive and wavetable synthesis in a new way. From beginning to end, the signal goes through several stations until it finally reaches Warp's output jacks. In the following, each station is described in detail.
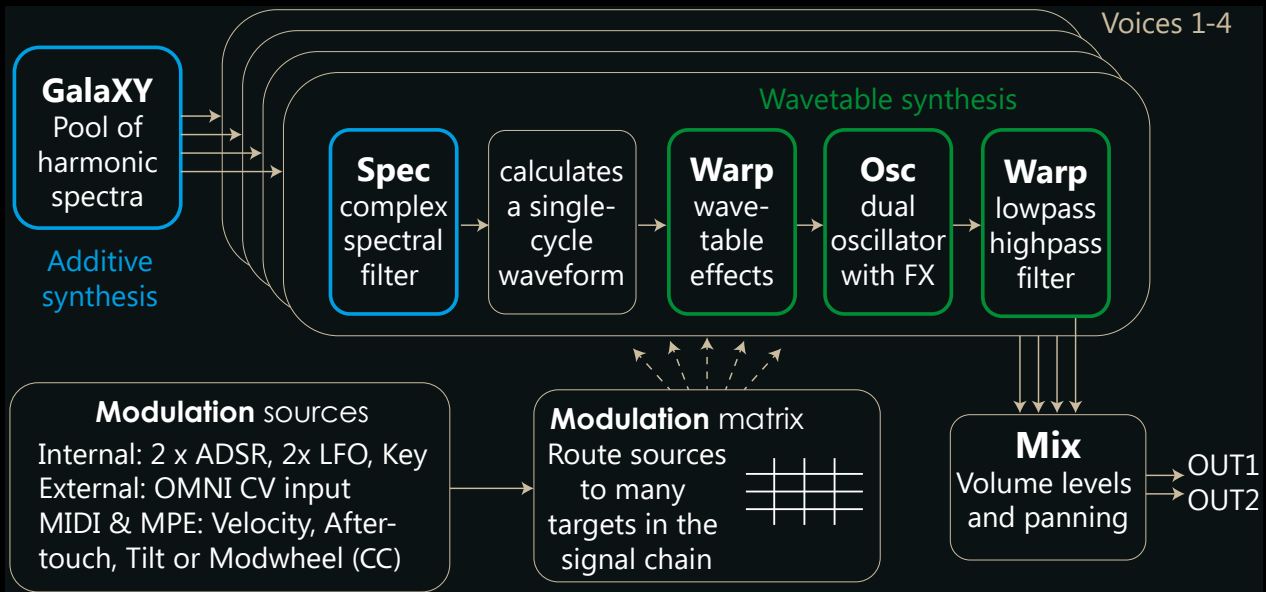
Playing Warp

Although Warp's engine is quite complex, Warp is still a playful synthesizer.
When using Warp in a performance context you can simply stick with the Presets, use the potentiometers and patch cables to play. No need to dig into any menu.
Most of the potentiometers not only control one but several parameters under the hood, also known as macro mapping. The **mapping** amount is set in the menu, but once set you can practically forget about it and focus on musical expression. By that, each potentiometer becomes a powerful control.

SPEC	**WARP**	**DETN**
The main control of Warp's additive synthesis. Can morph sounds from fat and broad to thin and glassy.	Controls cutoff frequencies but also waveform distortion. From calm and clean to edgy and noisy.	Detunes the oscillators and controls oscillator effects. Changes the sound from straight to quirky.

POSX & POSY	**AMT**	**SPD**
Determines the pickup position in the GalaXY. The timbre changes while moving across.	Controls the depth amount of the modulation sources. May affect each source with different strength.	A global control for the speed of the internal modulation sources, such as ADSR timing and LFO frequency.

There is also a CV input for each potentiometer, to add some modulation on top of the postition of the knob. The CV signal should be in a range from -5V to +5V. Negative voltages are the same as turning the pot to the left, positive voltages are like turning the pot to the right.
For the potentiometers, there are **no „catch-value"** functions as seen on many other Midi synthesizers. Instead, the position of the potentiometer always is the position the engine actually has, also known as „What you see is what you get".
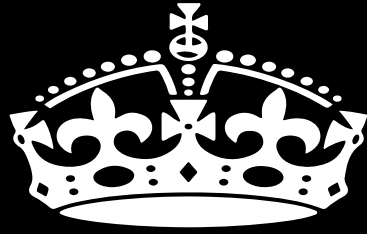
KEEP
CALM
AND
USE
PRESETS

... is a perfectly fine way to use Warp and have fun.
Warp's factory and artist presets are expressive enough to be used just like that.
To get started, try out different presets, play with the potentiometers, patch a few cables,
and don't worry too much about menu settings.

Warp is a deep module, so take your time until you feel ready
to dive into the exciting possibilities of this synth.

IMPORTANT:
Potentiometer values are not part of a preset, only internal menu values.
For all knobs, the value you see is the value the module has internally.
Because modular.

GalaXY

At the start of the signal chain, there is the GalaXY, which contains 512 harmonic spectra in an XY-grid of size 32 x 16. The GalaXY's harmonic spectra are the source from which all four voices get their initial timbre. Each voice picks its harmonic spectrum from one location on the GalaXY, shown by the module with a **blue LED at the XY-coordinate** of the pickup position. Warp always interpolates between spectra, so there is no clicking when the position changes.

As the GalaXY contains different harmonic spectra, the voice changes its sound when moving the pickup position across the GalaXY. There is no difference in X and Y direction, they are just two possible dimensions.

The pickup position is determined by the **POSX and POSY** potentiometers, their corresponding CV inputs and the modulation matrix.

Modulation matrix

POSX/POSY Potentiometers

POSX/POSY CV inputs
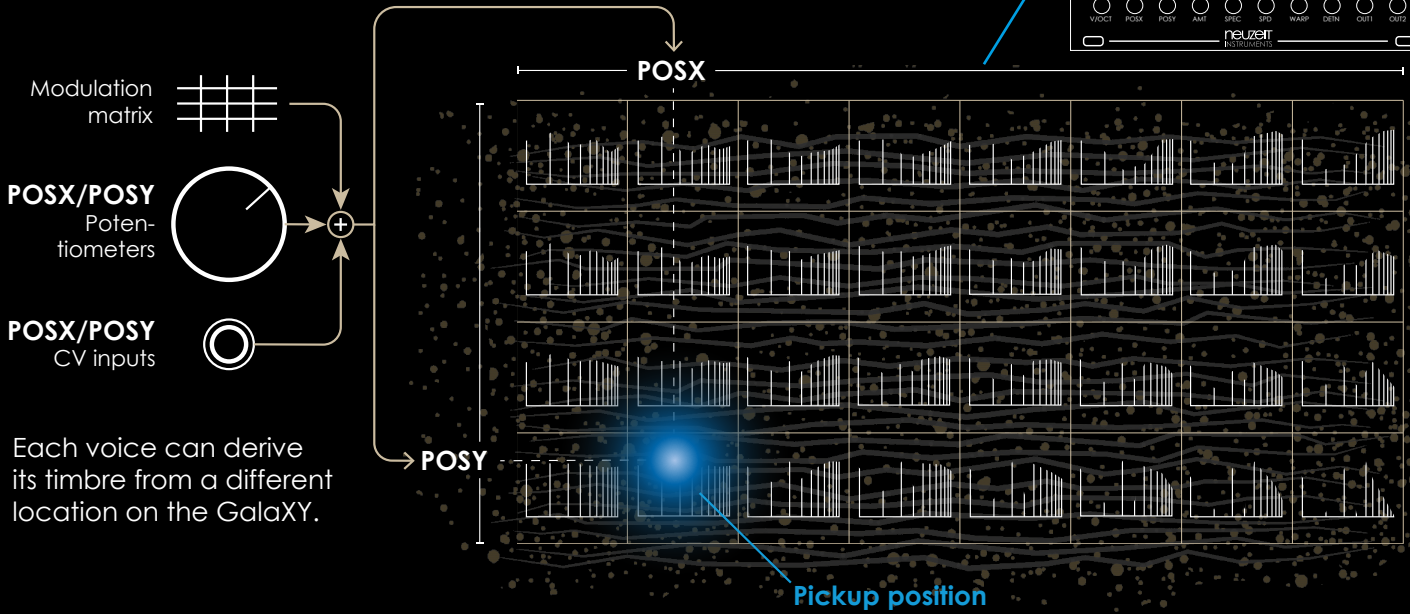
Each voice can derive its timbre from a different location on the GalaXY.

POSX

POSY

Pickup position

Load GalaXY

Load a GalaXY from the SD-card's folder /GALAXIES. Use the PARA encoder and the BACK button to navigate through the browser.

Top left (push)
Playback the selected GalaXY audio file to preview the expected sound characteristics.

Top left (turn)
Change the playback volume

PARA (turn)
Select option

PARA (push)
Enter

```
Load GalaXY
Load GalaXY of preset
Save GalaXY
⊠Additive (Pick XY ⊕)
⊠Additive (Snippet)
⊠Place Wavetable
Export as Wavetable
```

```
⬐PLAY  ⏱ -12.0 dB
>Init with sines
>Init with basic shapes
Bells 1
Bells 2
Bells 3
Bells 4
Bells 5 Formant
```
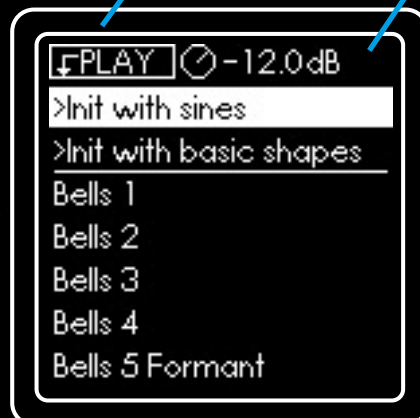
PARA (turn)
Select folder or preset

PARA (push)
Enter folder or load preset

BACK (push)
Return

In the Load GalaXY browser menu, the first two elements are special:

Init with sines

Initializes each overtone spectrum in the GalaXY with a basic sine wave. This is like a blank canvas and a good start for glassy sounds with sparse spectra, self-drawn with the editors.

Init with basic shapes

Creates a smooth transition between Sine wave, Sawtooth, Pulse and Triangle-like overtone spectra. A great start for sound design focussed on time domain operations in Warp section and the Oscillator effects.

Load GalaXY of preset

Same as Load GalaXY, but from the folder /PRESETS. In this case, all the preset parameters are ignored and the module stays as it is, only the GalaXY content changes.

Save GalaXY

Enter this menu to save the GalaXY to the SD-card's /GALAXIES folder. You can either create a new GalaXY or overwrite an existing one. The new name can be set on the following page.
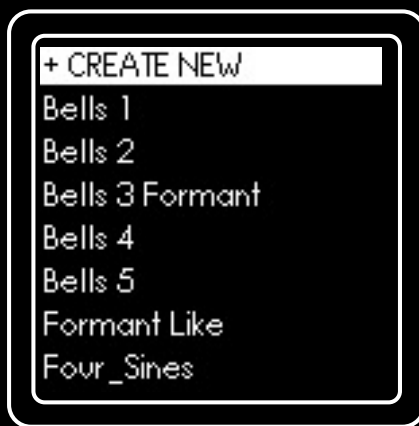
Top left (push)
Delete one letter.

Top left (long press):
Longpress: Delete whole name.

Bottom left/right (turn) and PARA (turn)
Change the selected letter

Bottom left/right (push)
Add the selected letter at the cursor position

Top right (turn)
Change the cursor position

Top right (push)
Add the selected letter

PARA (push)
Save the GalaXY file in the GALAXIES folder

Note:

A GalaXY file is a regular wav file which contains the GalaXY's content transformed into wavetables. It also contains some additional metadata so that Warp recognizes it as a GalaXY file. The filename also contains the suffix „_glx" which is simply a hint that this file comes from Warp. More info can be found at the end of this manual.

You can use the GalaXY file in any software or hardware that can play back wav files. To use the GalaXY in a wavetable synth however, we recommend to use the dedicated Wavetable Export function, described later in this document.

Additive (Pick XY)

This editor is the most direct way to edit the GalaXY. It allows you to pick an existing spectrum/waveform, then shape its individual harmonics and place it again at the same or at a new location on the GalaXY.

1. Pick a GalaXY spectrum as a starting point

First, you need to select a spot in the GalaXY from where you pick up an overtone spectrum. Use the **top left and right encoders** to change the pickup position, also shown by the LEDs.

From now on, **you will hear a raw preview** of the GalaXY content from the pickup position. All Spec, Warp and Oscillator FX are temporarily turned off, so you only hear what the selected harmonic spectrum/waveform really sounds like. However, the pitch is still whatever you feed into V/Oct or the MIDI input of WarpEx.

Once you selected a pickup position, **push the PARA encoder** to enter the next editor screen.

The preview shows the waveform that results from the harmonic spectrum at the GalaXY's pickup position. Picking an overtone spectrum is basically the same as picking a waveform.

2. Position and edit - create a new waveform and place it in the GalaXY

Now, the selected harmonic spectrum can be edited and, if necessary, placed in a different location. You can **change the page** of the editor by **turning the PARA** encoder.

Setting the drop position

On the first page you can select a position in the GalaXY where you want to place the overtone spectrum. Normally you will want to change the overtone spectrum on the next pages and give it a new timbre before placing it again. However, you can also simply change the location and place the selected overtone spectrum as is. In this case, you have simply copied a spectrum and pasted it in a different location.

The WdtX and WdtY parameters determine the width in X and Y direction of how far the overtone spectrum will blend into the existing GalaXY content. Use the unlocked preview mode to travel across the GalaXY with the XY potentiometers and make sure you get a nice transition.
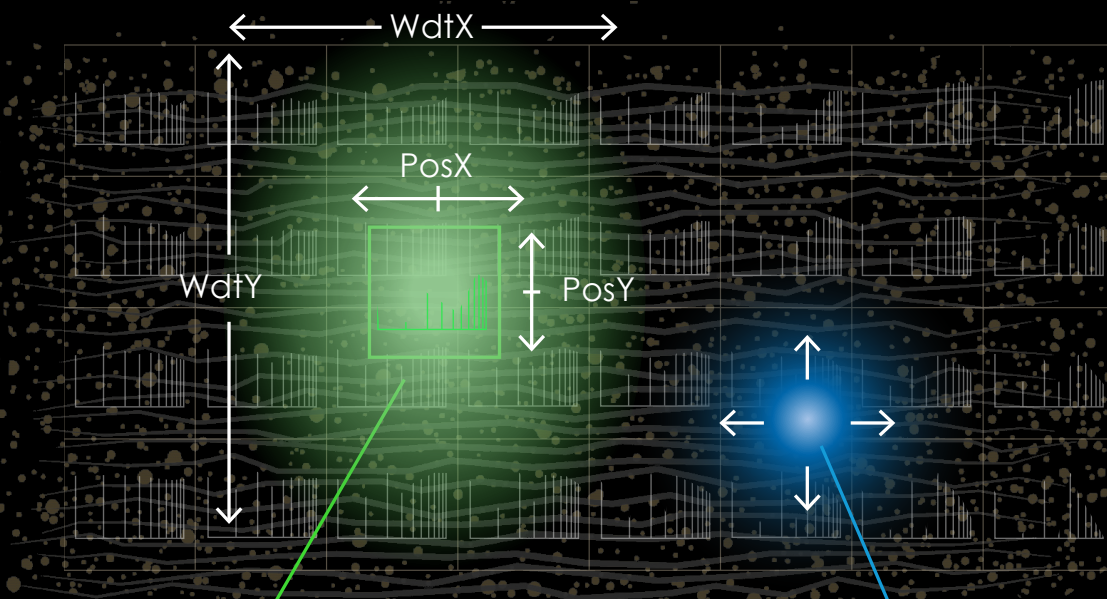
Green LEDs: Location of the new overtone spectrum

Move with encoders:

position by *PosX/Y*,
width by *WdtX/Y*.

Blue LEDs: Pickup position for preview

Unlocked: Move with *POSX/Y pots*

Locked:　　Same position as
　　　　　　PosX/Y encoders

There is a lock symbol on the top right. **Push the top right encoder** to toggle between locked and unlocked preview mode.

Locked: What you hear is the preview of the picked overtone spectrum.

Unlocked: What you hear is the GalaXY at the blue LED-dot. Change the position with the POSX and POSY potentiometers. In unlocked mode, you can manually travel across the GalaXY with the potentiometers. This feature enables you to make sure you get a nice transition from the existing GalaXY content to the new content you are editing.

Top left (turn)
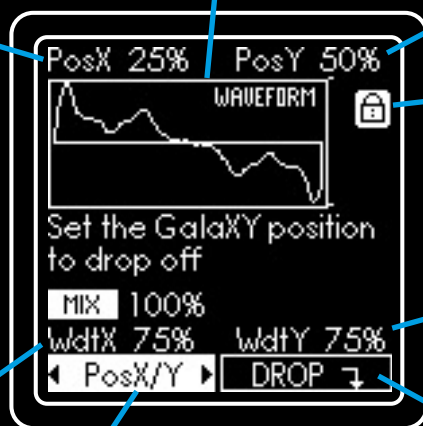The X-coordinate where the new overtone spectrum is to be placed.

Bottom left (push)
Toggle between WdtX and Mix.

Bottom left (turn)
WdtX: Width in X direction how far the new spectrum reaches into the already existing GalaXY.
Mix: The volume mix of the GalaXY's existing content and the new overtone spectrum.

The preview of the resulting one-cycle waveform.

PARA (turn right):
Go to the painting view

Top right (turn)
The Y-coordinate where the new overtone spectrum is to be placed.

Top right (push)
Toggle Locked and Unlocked preview position
(see description above)

Bottom right (turn)
WdtY: Width in Y direction how far the new spectrum reaches into the already existing GalaXY

PARA (push)
Bake the edited spectrum into the GalaXY and exit.

Painting harmonics

Turn the **PARA encoder to the right** to get to the painting view. Here, you can freely draw up to 128 harmonics into the overtone spectrum and thereby create a unique waveform. You can draw single harmonics or a whole set of harmonics at once. Several selectors allow to pick specific harmonics out of the selected range to quickly obtain sonically relevant results. Turning the PARA encoder lets you switch between the selectors.

Top left (turn)
Weighting that is applied to the harmonics in the selected range

Preview of the resulting one-cycle waveform

The harmonic spectrum that leads to the waveform

Bottom left (turn)
Sets the n-th overtone from where the edit range starts
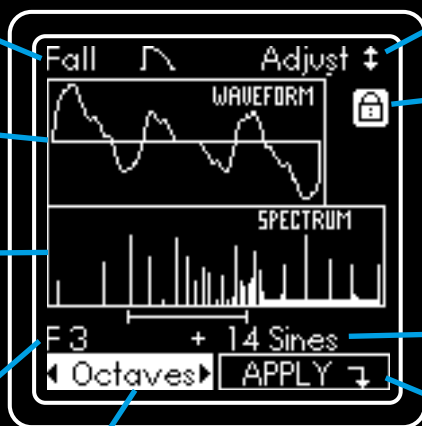
PARA (turn)
Switch the overtone selector (see next page)

Top right (turn)
Enhance or lower the selected harmonics

Top right (push)
Toggle Locked and Unlocked preview position
(see description above)

Bottom right (turn)
Set the width of the edit range.

PARA (push)
Bake the edited spectrum into the GalaXY and exit.

Selectors

Turn the PARA encoder to choose one of the following overtone selectors. When turning the top right encoder (Adjust parameter) only the harmonics that fit the selector are altered.

All
This selector simply allows all harmonics in the range.

Non-Zero
Picks all harmonics that are not zero. Use this to enhance the volume of the already present harmonics. Opposed to the ALL selector, when a harmonic is already zero, this selector will not alter it. This keeps the sound shape of the already present harmonics.

Octaves
Picks the first harmonic and all its higher octave harmonics.
For example, when the first harmonic is F3, this selector will also pick F6, F12, F24, F48 and so on.

Odd
Picks all harmonics with odd numbers and zero, such as F1, F3, F5, F7, and so on.
When all odd harmonics are set to 100% and all even ones are set to zero, it results in a square wave.

Even
Picks all harmonics with even numbers, such as F2, F4, F6, F8, and so on.
When all even harmonics are set to 100% and all odd ones are set to zero, it results in a sawtooth waveform with two cycles (one octave higher than F1).

2x, 3x, 5x, 7x
With the range starting at F1, this selector picks F1 and the upper harmonics like noted below. If the range starts at a higher harmonic, the same selection is met but shifted by the lower end of the range.
2x: F1, F2, F4, F8, F16, and so on
3x: F1, F3, F6, F12, F24, and so on
5x: F1, F5, F10, F20, F40, and so on
7x: F1, F7, F14, F28, F56, and so on

Primes
With the range starting at F1, this selector picks all overtones which are prime numbers. These are F1, F2, F3, F5, F7, F11, F13, and so on. If the range starts at a higher harmonic, the same selection is met but shifted by the lower end of the range.
Prime number harmonics sound atonic.

Weighting

Turn the **upper left encoder** to select a weighting function. When lowering the harmonic's volumes, higher harmonics are affected differently than lower harmonics in the selected range. However, when enhancing the volumes, all harmonics are treated equally. That way it is easy to create rising or falling shapes in the harmonic spectra.
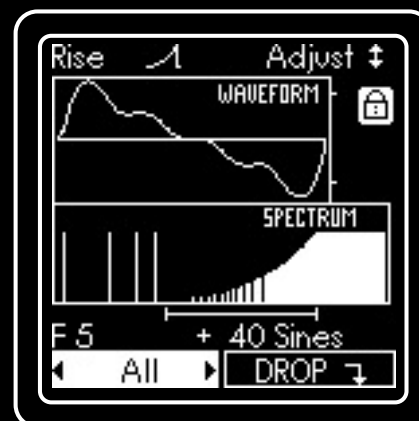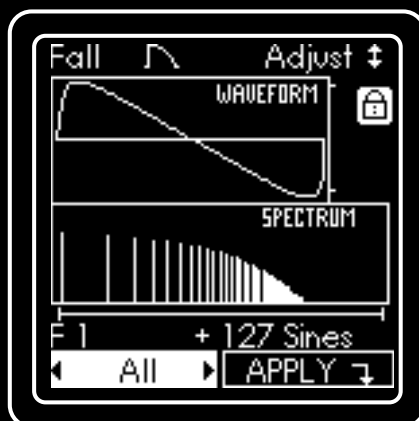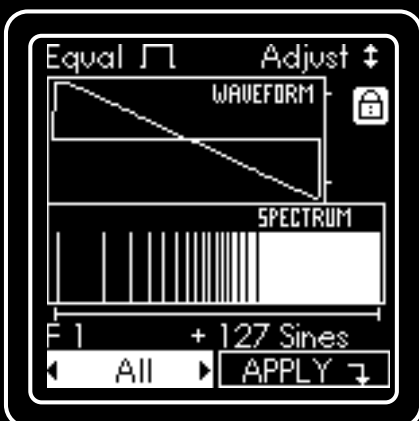
✏️ Additive (Snippet)

This editor is similar to the Pick XY editor, but instead of picking an existing spectrum from the GalaXY we start with grabbing a small snippet of an audio file. Warp interpretes the snipped as a one-cycle waveform and calculates its overtone spectrum as the basis to start the editor.

When you have a sample of a note of an instrument with a rather simple waveform, such as a piano, you can try to capture the instrument's timbre by selecting one cycle of the instrument's waveform. The actual sound color of an instrument involves far more than just a single cycle, but it is a nice starting point and a fun way to get complex harmonic spectra quickly. Also try the /Experimental subfolders' content on the SD card.

```
⬆PLAY   ⏲ -12.0dB
↩ ..
Add Bell (1024)
Add Synth5 Icar..(1024)
Add Synth7 (1024)
Bell PD Bend1 (1024)
Bell PD Double (1024)
Bell PD PWM1 (1024)
```

1. Select a file

First, select a file from the SD-card's /AUDIO folder shown in the browser window. Use the top left encoder to listen to the audio file first, similar to *Load GalaXY*. Once you selected a file, **push the PARA encoder** to enter the editor.

2. Cut out the snippet

What you **hear now is a raw preview of the snippet you selected**, used as a wavetable oscillator without any impact of the Spec and Warp sections or Oscillator effects. Also, Trigger inputs and modulation are turned off. However, the pitch is still whatever you feed into V/Oct or the MIDI input of WarpEx.

Use the start position and the length parameter to change the snippet. Focus on how round or edgy the selected waveform looks. Try to find a snippet that sounds interesting as an addition to your existing GalaXY. Use the lock symbol and the POSX/Y potentiometers to hear if it fits into the GalaXY you already have. Enabling Snap mode and then changing start and length will make the snippet snap to zero-crossings. This results in less high frequency content.

The selected audio snippet waveform

Markers of the selected snippet

The waveform of the audio file in full length

Bottom left (turn)
The position from where the snippet starts

Bottom left (push)
Toggle between fine and coarse

Top right (turn)
Enable Snap: Now, when changing start or length, it snaps to the next zero-crossing.

Top right (push)
Toggle Locked and Unlocked preview position
(see description before)

Bottom right (turn)
Set the length of the snippet in samples. Many of Warp's on-board audio files are wavetable files where 1024 samples correspond to one cycle. But also different lenghts can sound interesting, trust your ears.

```
AUDIO FILE              Free
SNIPPET
                          🔒


FINE Start    Length
0.332 sec    1024 smpl
  Snippet        PICK ⤵
```

PARA (push)
Pick and proceed to the painting view

The display shows the actual waveform of the file, but the output waveform might look different on an oscilloscope, as Warp needs to process the snippet in order to use it as a potential source for the GalaXY. Anyways, the sound is very close to what the raw samples waveform would actually sound like.

3. Edit the harmonic spectrum

Once you selected the desired snippet, **push the PARA encoder** in order to proceed with further editing. From here, it is the same just like the Pick XY editor.
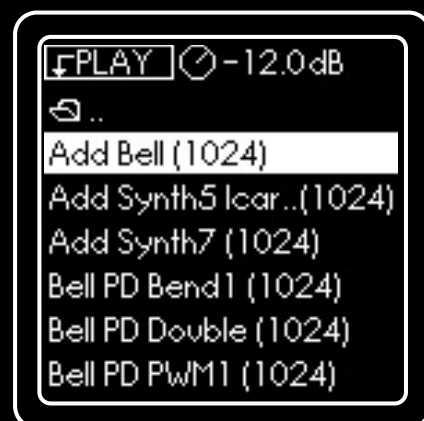
📝 Place Wavetable

This function lets you place 32 overtone spectra on the GalaXY at once. An audiofile is the source from which the 32 spectra are derived. It is a nice way to quickly fill the GalaXY with new content.

1. Select a file

First, select a file from the SD-card's /AUDIO folder shown in the browser window. You can use the top left encoder to listen to the audio file first, similar to Load GalaXY.

Once you selected a file, push the PARA encoder to enter the editor. The editor screen lets you select and preview the audio content that will be split into 32 equally spaced frames from which the overtone spectra are derived.

```
⌐PLAY ⏱ -12.0dB
↵ ..
Add Bell (1024)
Add Synth5 Icar..(1024)
Add Synth7 (1024)
Bell PD Bend1 (1024)
Bell PD Double (1024)
Bell PD PWM1 (1024)
```

2. Select the source audio

From now on, **what you hear is a raw preview** of the GalaXY without any impact of the Spec and Warp sections or Oscillator effects. Also, Trigger inputs and modulation are turned off. However, the pitch is still whatever you feed into V/Oct or the MIDI input of WarpEx.

In the new window, there is also a lock symbol on the top right. Push the top right encoder to toggle between locked and unlocked preview mode.

Locked: What you hear is the preview of the selected frame (1-32). Change the preview frame by turning the top right encoder.

Unlocked: What you hear is the GalaXY at the pickup-position (where the blue LED-dot is). Change the position with the POSX and POSY potentiometers. In unlocked mode, you can manually travel across the GalaXY with the potentiometers. This feature enables you to make sure you get a nice transition from the existing GalaXY content to the new content which we are about to place.

Top left (turn)
The length of each frame in audio samples.
If it is a wavetable file, you get good results using the length of the wavetable which is 1024 for Warp's factory files.

Top left (push)
Toggle between Fine and coarse.
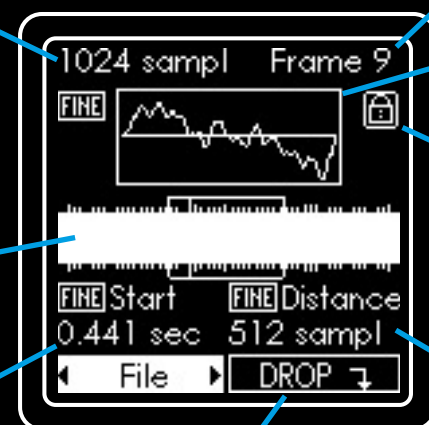Coarse changes in powers of two.

The waveform of the full audio file.
The rectangle shows the section that is split into 32 frames.

Bottom left (turn)
Start of the section that is split into the 32 frames.

Bottom left/right (push)
Toggle fine and coarse.

PARA (turn)
Switch the selected page

```
1024 sampl    Frame 9
FINE  ╱╲╱╲           🔒


FINE Start     FINE Distance
0.441 sec   512 sampl
◄    File    ►   DROP ↴
```

Top right (turn)
The frame number shown in the preview window.

The preview window, shows the audio content of the selected frame.

Top right (push)
Toggle Locked and Unlocked (see description above)

Bottom right (turn)
The distance between each frame in samples, which also determines the overall length of the section that is imported.

It is recommended to use wavetable audio files, commonly used in wavetable synths, where every 128, 256, ... , 4096 samples correspond to one wavetable. These kind of files give the smoothest transitions from frame to frame. Warp ships with plenty of such files on its SD-card, but own files can also be uploaded. Supported formats: wav, 16 or 24 Bit, sample rate 44,1 to 96 kHz, mono or stereo.
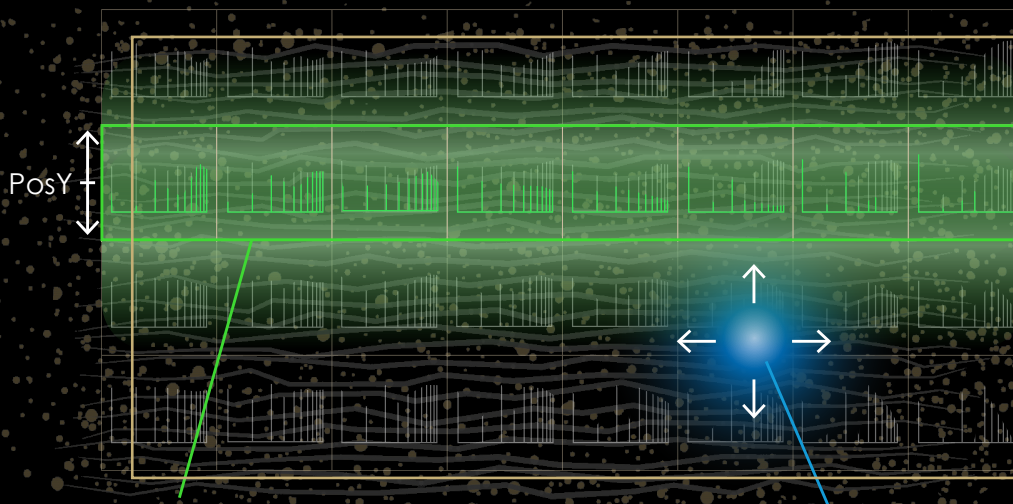
PosY

Green LEDs: Location of the new overtone spectra

Move with *PosY*, bottom right encoder.

Blue LEDs: Pickup position for preview

Unlocked: Move with *POSX/Y pots*

Locked: Move with *Frame 1-32*, top right encoder.

Actually, GalaXY has 32 x 16 overtone spectra. For simplicity, only 8x4 are drawn on the left.
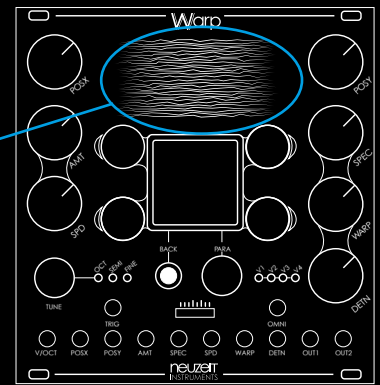
3. Place the new overtone spectra on in the GalaXY

In order to go to the next page, **turn the PARA encoder** to the right.

The new audio spectra are always placed as one row and go all the way from the GalaXY's left to its right end. However, you can change where the new audio spectra are placed on the Y-axis, using the **PosY parameter.** 0% means, the new content is placed at the bottom of the GalaXY, 100% means it is placed at the top.

The **WdtY parameter** sets how far the new overtone spectra fade into the existing GalaXY content. When set to the minimum value, the green line becomes thinner and you get a very abrupt transition when moving in the Y-direction. When you increase the value, the line becomes wider and it results in a smooth transition.

With the **Mix parameter**, you can set how much the new overtone spectra replace the GalaXY's existing content. 100% Mix means, that at the green line's position, the new overtone spectra fully replace the existing GalaXY content. 50% means that the new overtone spectra are mixed 50:50 with the existing content.

When done, **push the PARA encoder** to place the new overtone spectra on the GalaXY.

Top left (turn)
When placing the audiofile overtone spectra: The volume mix of the GalaXY's existing content and the new overtone spectra.

Top right:
Preview and toggle lock, same function as before.

Mix 100%   Frame 9

WdtY 50%   PosY 20%
◄ Position ►   DROP ⌐

Bottom right (turn)
The Y-Position where the new overtone spectra are placed on the GalaXY.
0% = bottom of the GalaXY
100% = top of the GalaXY

Bottom left (turn)
Impact width, how far the new overtone spectra blend into the neighboring overtone spectra in Y-direction.
50% = half the GalaXY's height.
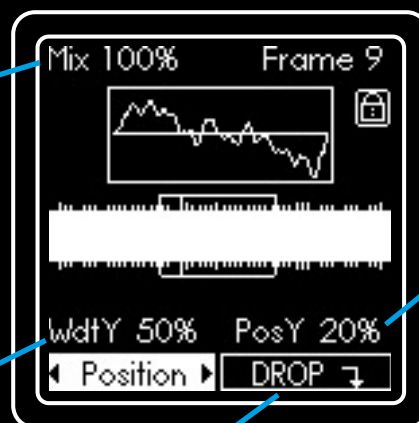
PARA (push)
Bake the new overtone spectra into the existing GalaXY.

Understanding harmonic spectra

Harmonic spectra are transformed into one-cycle waveforms later in Warp's signal chain. It is useful to have a basic understanding of how a harmonic spectrum translates from frequency domain (harmonic spectrum) into time domain (wavetable).

Each of the GalaXY's spectra contains 128 spectral lines. Each line translates into a sine wave in the waveform. If a spectrum contains several lines, the waveform is the sum of the sine waves. The length of a line determines the amplitude of the corresponding sine wave.
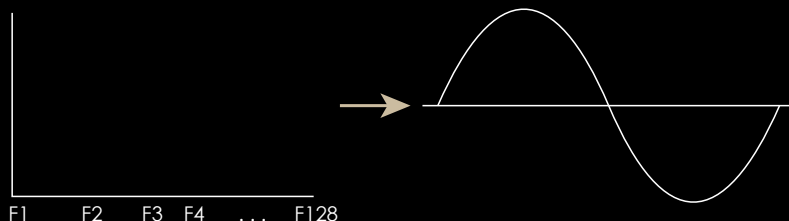
By using 128 lines in the spectrum, Warp adds up 128 sine waves which can result in a quite complex waveform.

Each line's sine wave has a different frequency. The very first line, labelled F1, corresponds to a one cycle sine wave in the wavetable.

The second line corresponds to a sine-wave with twice the frequency of F1, which means two cycles of a sine wave in the wavetable.
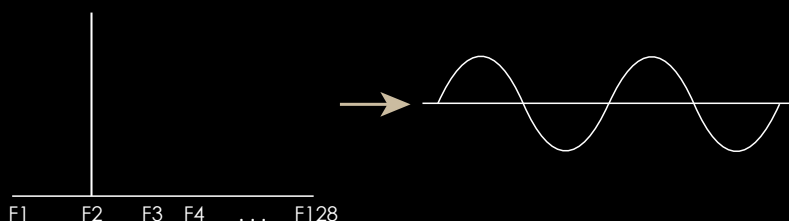
If both, the first and second line are present, the sine waves of F1 and F2 are summed up, which results in the wave-table on the right.
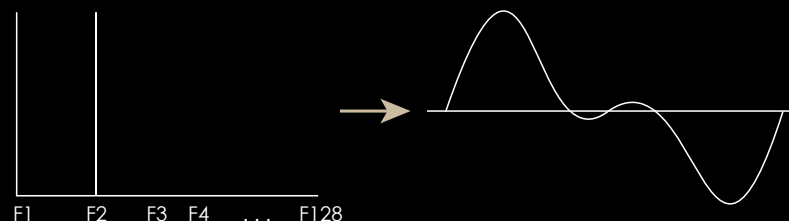
The figure on the right shows how the first four lines add up to a wavetable that starts to look like a sawtooth. F3's frequency is 3 times F1 and F4 is 4 times F1.
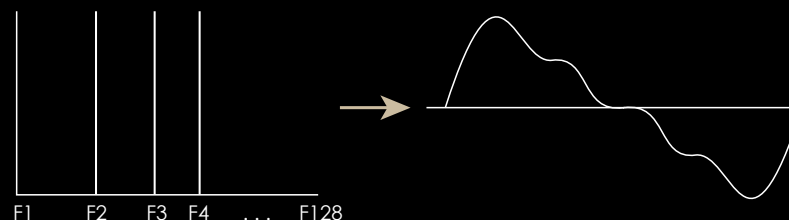
Actually, when we add all 128 sine waves together, what we get is a quite good approximation of a sawtooth. This is due to the nature of F2,3,4... being multiples of the base frequency F1.
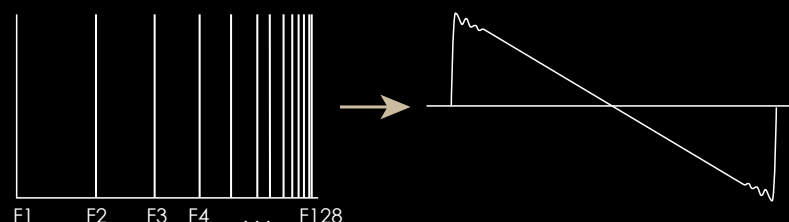
When we only use the odd numbered harmonics F1, F3, F5, etc we end up with a square wave.
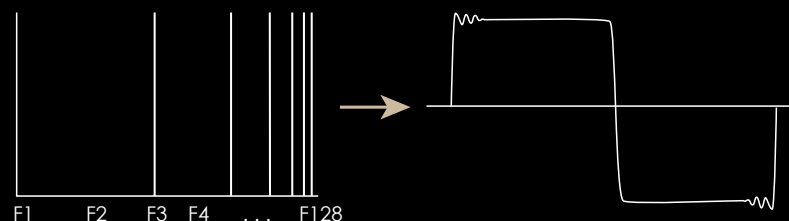
If we use different line lengths, we also change the amplitudes of the sine waves. Their sum results in a more complex waveform.
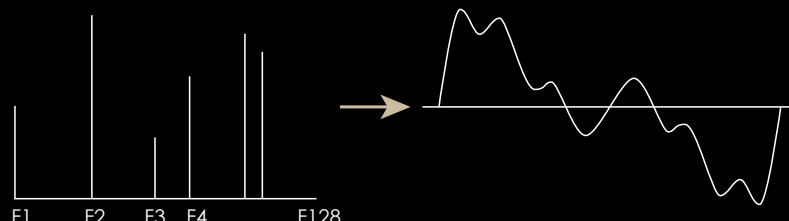
Export as Wavetable

This feature enables you to export Warp's GalaXY as a wavetable file, compatible with virtually any other wavetable synthesizer. The diverse export settings cater to the needs of most wavetable synthesizers.

The export function effectively transforms Warp's GalaXY editors into a potent wavetable generation tool. In practical terms, a wavetable file contains a sequence of single-cycle waveforms, written one after another in an audio file. Common wavetable lengths include 256, 512, 1024, 2048, 4096, or other powers of two. To ensure seamless transitions, each waveform within a wavetable should commence and conclude with an amplitude of 0. Notably, Warp's audio engine is meticulously designed to consistently meet this prerequisite, ensuring the creation of click-free wavetables.

Top left (turn)
Set the export audio format:
.wav file, mono
16 or 24 bit
44.1 kHz, 48 kHz,
88.2 kHz, 96 kHz

Top right (turn)
Set a virtual path that the export function follows across the GalaXY. Along the path, the waveforms are collected.

Bottom right (turn)
Set the number of waveforms to be written one after another in the waveteble file.

Bottom left (turn)
The number of samples per waveform. Check the requirement of your target synth

PARA (push)
Generate the wavetable file and store it in the /EXPORTS folder on the SD-card

While conventional wavetable synthesizers typically choose oscillator waveforms from a linear series of waveforms, Warp stands apart by navigating the GalaXY in two dimensions. To derive a one-dimensional wavetable file from the GalaXY's two-dimensional space, a specific path must be designated for Warp's export function to follow.

During the export, Warp imitates using the POSX and POSY potentiometers to move along the designated path across the GalaXY. As it advances, Warp captures the specified number of harmonic spectra. It then calculates their corresponding waveforms, and writes them into the export file.

Spec

After Warp's audio engine retreives a harmonic spectrum from the GalaXY, a dynamically changeable complex filter shape is applied. This processing stage is called the Spec section. The spectral filter significantly enhances variability of the timbre prior to Warp's calculation of the oscillators' wavetables. This is a basic illustration of how the filter impacts the harmonic spectrum:

F1   F2   F3 F4   . . .   F128

The incoming overtone spectrum from GalaXY

The complex filter shape cuts some of the overtones

The resulting harmonic spectrum
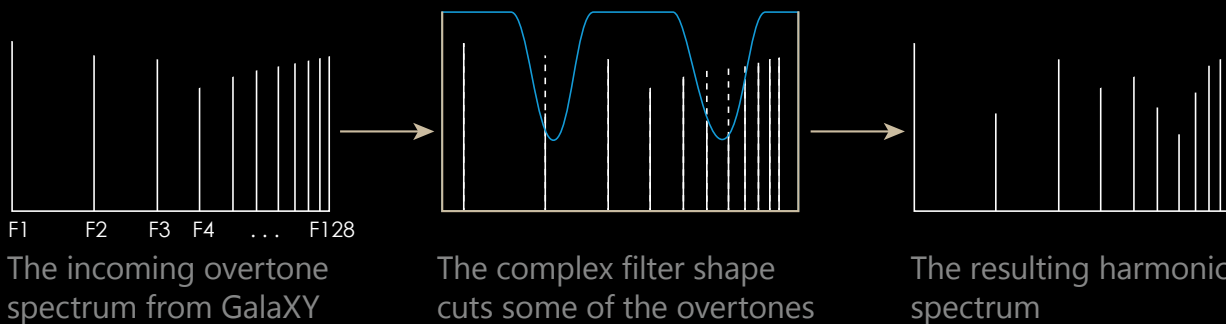
Key parameters include the filter's shape and depth. The display consistently presents the dynamic real-time state of the filter shape, adjusting accordingly with modulation.

The filter shapes only subtract harmonics, which can reduce volume. Use the Gain parameter to counter potential-related volume loss due to filtering.

Top left (turn)
Change the selected filter shape.

X-axis: Frequency
Y-axis: Filter amplitude

Bottom left (turn)
Adjusts the filter depth. Overtones are muted entirely where the filter curve falls below the bottom line.
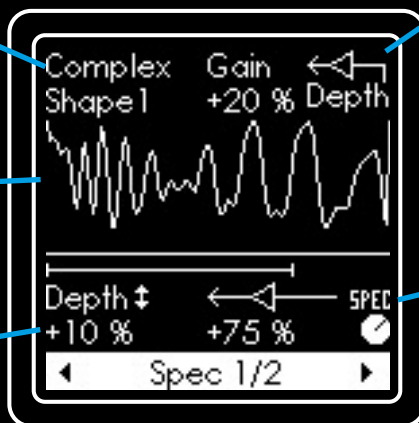
PARA (turn right)
Go to the next page

Complex   Gain   ←⊣
Shape1   +20 % Depth

Depth ↕   ←⊣———— SPEC
+10 %   +75 %   ◉
◀   Spec 1/2   ▶

Top right (turn)
Adjust the amplitude gain in relation to the filter depth. This helps counter volume loss caused by increasing filter depth.

Caution: High values can lead to loud output.

Bottom right (turn)
Determines the contribution of the SPEC potentiometer to the filter depth.

All encoders (push)
Toggles between typical parameter values.

The SPEC potentiometer can impact three parameters at once. On the first page of the Spec section, you can determine how much the SPEC potentiometer's position adds on top of the filter depth. Be aware, that the depth parameter can also be altered via CV input and internal modulation.

Modulation matrix

Map amount 0-100%

SPEC Poten- tiometer

SPEC CV input

Parameters
- Filter shape type
- Filter spectrum depth
- Filter spectrum zoom
- Filter as generator amount
- Depth to gain compensation

Rotate the PARA encoder to the right to access the second page of the Spec section.

The Generate parameter converts the filter into an overtone generator. This can be useful when the GalaXY's content is sparsely populated with harmonics. In such cases, where the number of filterable harmonics is limited, the Spec filter's audio impact remains small. However, by turning the filter into a harmonics generator, the Spec section introduces harmonics aligned with the curve's shape instead of cutting off harmonics. This substantially enhances sound variety and potential of the Spec section.

Top left (turn)
When this parameter is set to 100%, the Spec stage functions as a generator rather than a filter, producing overtones that match the filter shape. Any value between 0% and 100% blends between acting as a filter and acting as a generator.

Top right (turn)
Determines the contribution of the SPEC potentiometer to the Generate parameter

All encoders (push)
Toggles between typical parameter values.

Bottom left (turn)
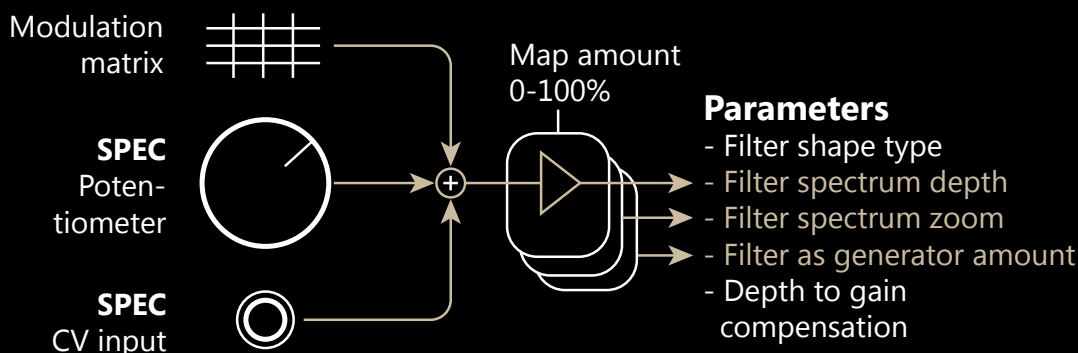Only a selection of the filter shape is used. The selection width is shown by the bar length below the filter shape.
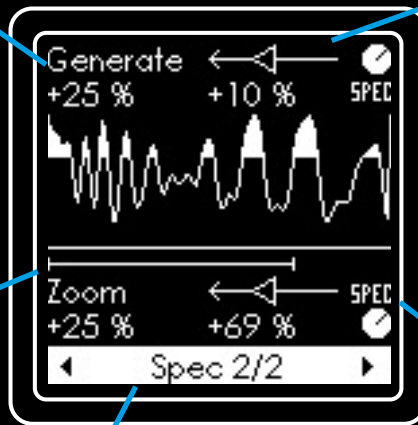
PARA (turn left)
Go to the previous page

Bottom right (turn)
Determines the contribution of the SPEC potentiometer to the filter zoom.

If the Zoom parameter at the bottom of the page is set to a value smaller than 100%, only the first section of the filter shape is used. The bar below the filter shape shows the area that is applied across the ingoing 128 harmonics spectrum.

The impact of the SPEC potentiometer to the Zoom value can also be set.

Zoom parameter:
Only this portion of the filter curve is used and applied on the overtones F1 to F128.
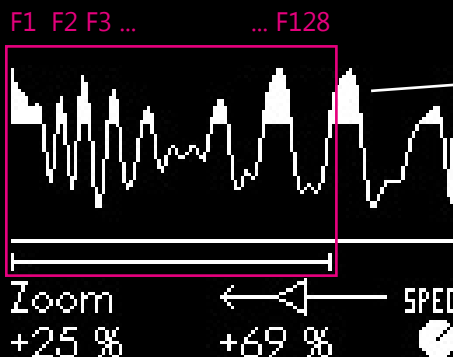
Generate parameter:
The higher the value, the more white filling is drawn below the filter curve.

Listening tutorial - Understanding the Spec Section

The following is a quick tutorial to learn and understand each parameter of the Spec section.

Remember that in the signal path following the Spec section, the sound is also affected by the Warp section and the Oscillator effects. The influence of the Spec section on the output signal can therefore be more or less audible, depending on how much the subsequent stages further change the sound. Specific sound design tactics can be found in the corresponding chapter later in this manual.

To learn about the Spec section, follow these steps:

1. Load the preset „Basic Init" > „01 OscFx Detune".
2. Remove all patch cables except OUT 1/2
3. enter the Modulation menu, turn the PARA encoder one step to the right and turn the Drone parameter of the volume envelope to 100%, so that you get a constant output.
4. Long-Press the TUNE encoder to reset the pitch setting and select Mono Mode on the WarpEx.
5. Turn the AMT potentiometer all the way to the left to completely disable internal modulation.
6. Turn the WARP potentiometer to the center position to open the filters. The Warp effects are disabled in this preset anyway.
7. Turn the DETN potentiometer to the left to disable the Oscillator FX
8. Move the XY pickup position of the GalaXY to the lower right corner by turning POSX to the right and POSY to the left. In the bottom right corner of the GalaXY, all the harmonics of the spectrum are set to 100%, so we get a lot of harmonics to filter in the Spec section.
9. Enter the Spec menu and observe how moving the SPEC potentiometer affects the filter curve and the resulting sound.
10. Try how different settings of the Depth parameter and the SPEC→Depth mapping affect the filter's impact when turning the SPEC potentiometer.
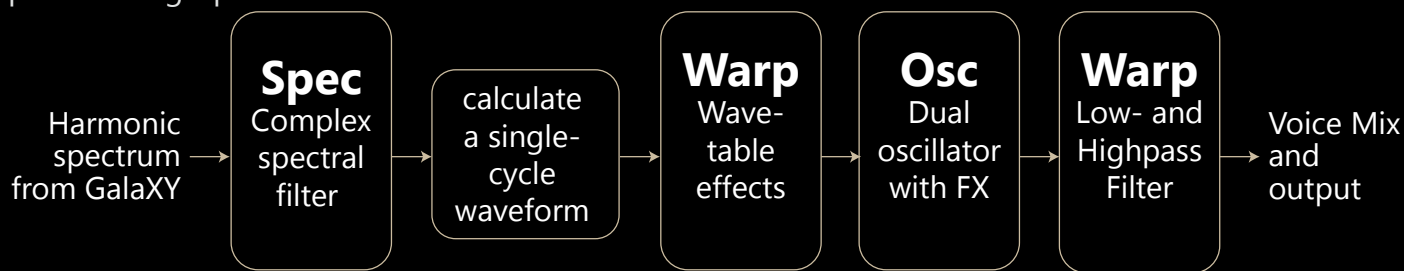11. You may realize a volume drop the more filter depth you have. Compensate that drop by turning the Depth→Gain mapping higher. Be careful: Too high values may result in distortion and high output voltages (up to ±10V).
12. Go to the second page and try different positive and negative values of the SPEC→Zoom mapping. Listen how turning the SPEC potentiometer changes the sound now.
13. Also experiment with different filter shapes. Finally, go back to the „Comb Octaves" shape from the beginning.
14. Now, turn both the POSX and POSY to the left, so the GalaXY's XY position is in the bottom left corner. Here, only the very first harmonic is present, resulting in a pure sine wave.
15. You will notice that turning the SPEC potentiometer now has no effect on the timbre. Since there is only one harmonic, there is no other input for the filter to affect. This means that for a GalaXY that contains spectra with only a few harmonics, the complex filter is not of much use.
16. However, we can turn Warp's filter into a harmonics generator with the Generate parameter on the second page. The Generate parameter artificially feeds harmonics to the filter's input, no matter what spectrum is picked up from the GalaXY. To clearly hear the Generate parameter's effect, you should first set Depth to 0% and the SPEC→Depth mapping to 100%.
17. Now, turn the SPEC potentiometer to the left so that the filter has no depth and turn up the Generate parameter. Listen how the module adds 128 harmonics and increases their volume.
18. Slowly turn the SPEC potentiometer to the right, listen how the filter depth increases and thereby cuts away harmonics. The important thing is, that now the harmonics do not come from the GalaXY, but are sent to the filter's input by the Generate parameter.
19. Experiment with different filter shapes, GalaXY positiona and all the parameters.
20. The important lesson here is: Try to find a Spec filter that matches your GalaXY content. If your GalaXY has sparse spectra, you can use the filter as a harmonics generator to add more variance.

Warp

After the Spec section, the harmonic spectrum is converted into a waveform that serves as a source for the oscillators. The resulting waveform is processed by the effects of the Warp section, then the oscillators use the resulting waveform as a wavetable and their sound is post-processed with low-pass and high-pass.

Harmonic spectrum from GalaXY → **Spec** Complex spectral filter → calculate a single-cycle waveform → **Warp** Wave-table effects → **Osc** Dual oscillator with FX → **Warp** Low- and Highpass Filter → Voice Mix and output

Note:

The Warp section includes both the waveform effects before the oscillators and the filters after the oscillators. This may seem counterintuitive in terms of signal flow, but it makes perfect musical sense.

Transform into a single-cycle waveform

Harmonic spectrum

Bend
Distorts the waveform in time domain by compressing the waveform to one side. Sounds like a PWM oscillator.

Drive
Analogue distortion emulation with soft clipping.

Fold
Above and below an adjustable amplitude threshold the waveform is folded back.

Redux
Introduces steps in the Y-axis, sounds like digital bitreduction.

Low- & Highpass Filter
with resonance, 12 or 24 dB/Oct

Osc Dual oscillators with FX →

10.0 Hz   22 kHz

Mix and output

- 21 -

With the WARP potentiometer and the CV input up to 6 parameters can be controlled simultaneously under the hood. Here the waveform effects fit well together with the filter, because the generated distortions can be compensated again by filtering and leads to musically characterful sounds.

Map amount
0-100%

Modulation matrix

WARP
Poten-
tiometer

WARP
CV input

Parameters
- Bend FX
- Fold FX
- Drive FX
- Redux FX
- Filter cutoff lowpass
- Filter cutoff highpass
- Filter resonance
- Filter slope
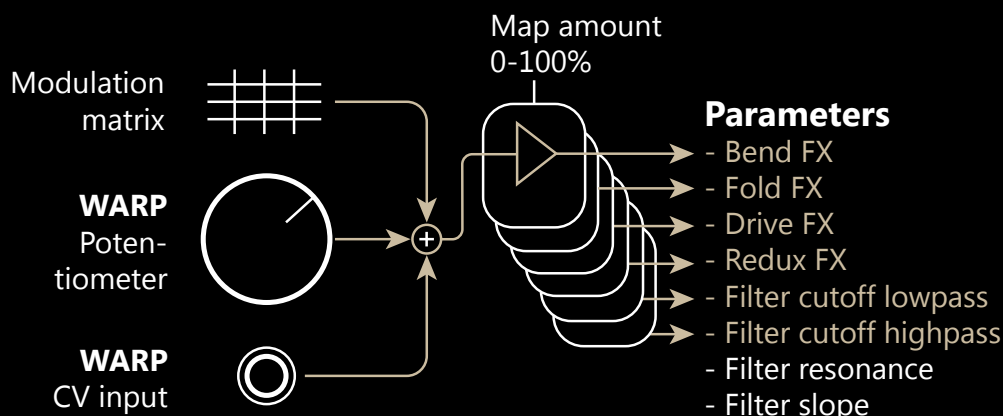
On the first and second page of the Warp section, you can set the lowpass and highpass filters.

Top left (turn)
Set the base filter frequency
Top left (push)
Toggle between fine and coarse

The shape of the lowpass and highpass filter.
X-axis = frequency
Vertical lines: resonance

Top right (turn)
The filter's resonance

LPF FINE   Reso
74.0Hz   + 45%

WARP   Type
+100%   LPF 24dB
◄ Filter Lowpass ►

HPF FINE   Reso
25.2Hz   + 10%

WARP   Type
+20 %   HPF 12dB
◄ Filter Highpass ►

Bottom left (turn)
Determines the contribution of the WARP potentiometer to the cutoff frequency

Bottom right (turn)
Select between 12 dB/Oct and 24 dB/Oct filter slopes.

PARA (turn)
Go to the next/previous page
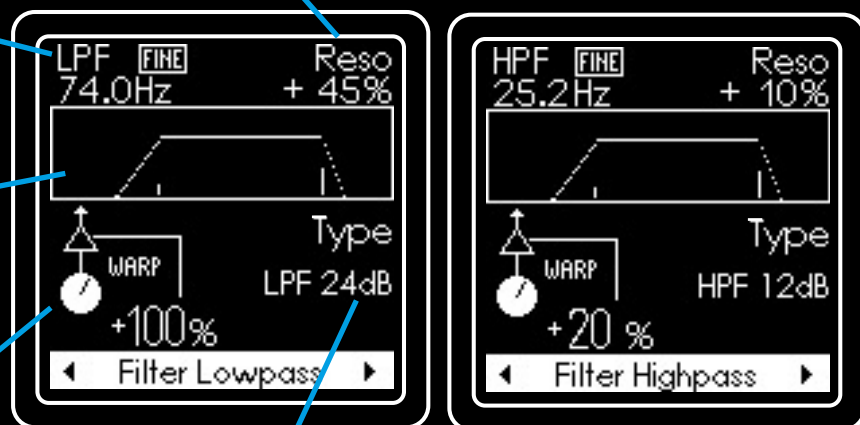
The filters can not go into self-resonance, but still achieve high amplification at the cutoff frequency. Be careful though: High resonance values can lead to loud output and high voltages at the OUT1/2 jacks (up to ± 10V).

Note:
Build a bandpass filter by setting the lowpass filter frequency a little higher than the highpass filter. If you set the frequency of the highpass filter higher than the lowpass filter, nothing can pass through and the sound is silenced.

On the next pages you can set the Warp effects that operate on the waveform: Bend, Fold, Drive and Redux.

The upper encoder sets the default value of the effect. The lower encoder sets the impact of the WARP potentiometer. The white line inside the faders always shows the actual values the effect currently has. This value is determined by the default setting (where the triangle is on the fader) and the modulation coming from the WARP potentiometer, the WARP CV input and the modulation matrix.

Top left and right (turn)
Set the default setting of the effect depth

Bottom left and right (turn)
Determines the contribution of the WARP potentiometer to the corresponding effect

All encoders (push)
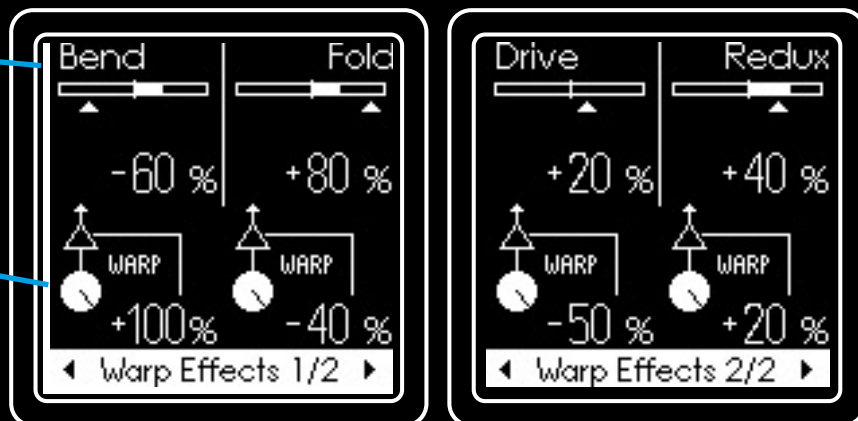Toggle between typical parameter values.

PARA (turn) Go to the next/previous page

Understanding default and mapping value

Let's break down how the default value, the WARP potentiometer mapping and the actual effect depth act together as a powerful tool for sound morphing.
In this example, we set a negative default value of -60% and make the WARP potentiometer add 100% on top of that default value.

• While the WARP potentiometer is between 0% and 60%, the effect stays off.

• As soon as you turn the potentiometer above 60% the effect becomes audible.

• Turn the potentiometer to 100% all the way to the right and the effect will end up at 40%, shown by the white part inside the display fader.

With this setting, only when you turn up the WARP potentiometer above 60%, the effect becomes present. You could combine this with the lowpass filter cutoff, so moving the potentiometer from left to right opens the filter, but only above 60% the effect adds some additional distortion.

You can use another kind of setting to make use of the left half of the potentiometer range. Therefore, set the default effect value to +20% and the WARP potentiometer mapping to -50%.

• When the WARP potentiometer is all the way to the right at 100%, the effect is off, as from the default value 20%, due to the potentiometer's position 50% are deducted.

• Turn the potentiometer to the left until you you see a small white line appear inside the display fader. This is when the effect starts to become audible.

• When you turn the WARP potentiometer all the way to the left, you end up at the effect's default value of 20%.

This way, the potentiometer adds more effect the further you turn it to the left side.

In combination with the previous example, you get the first effect when turning the potentiometer to the right half and the second effect when the potentiometer is in the left half.

Listening tutorial - Understanding the Warp Section

The following is a quick tutorial to learn and understand each effect of the Warp section by listening.

Remember that the sound of the Warp section also depends on the signal generation before, which is the GalaXY and the Spec section. Specific sound design tactics can be found in the corresponding chapter later in this manual.

To learn about the Warp section, follow these steps:

1. Load the preset „Basic Init" > „01 OscFx Detune".
2. Remove all patch cables except OUT 1/2
3. enter the Modulation menu, turn the PARA encoder one step to the right and turn the Drone parameter of the volume envelope to 100%, so that you get a constant output.
4. Long-Press the TUNE encoder to reset the pitch setting and select Mono Mode on the WarpEx.
5. Turn the AMT potentiometer all the way to the left to completely disable internal modulation.
6. Turn the SPEC potentiometer to the left position to disable the complex filter.
7. Turn the DETN potentiometer to the left to disable the Oscillator FX
8. Move the XY pickup position of the GalaXY to the lower left corner by turning both POSX and POSY to the left. In the bottom right corner of the GalaXY, all the harmonics of the spectrum are set to 100% which results in a sawtooth waveform as the input to the Warp section.
9. Enter the Warp menu and observe how moving the WARP potentiometer affects the filter cutoff frequencies. In this preset, the Warp effects are all turned off.
10. Try how different settings of the cutoff parameters of both low- and highpass filter and the WARP→Cutoff mapping. Also try different Reso values and filter slopes.
11. Once you got a feeling for the filter, reset the WARP→Cutoff mapping and the Reso value to 0% for both filters, set the lowpass cutoff to its maximum value and the highpass cutoff to its minimum. Now, you should hear the sawtooth wave going through unaffected.
12. Switch to the next pages and increase the effect depth of the first effect (Bend) with the upper left encoder.
13. Move the POSX and POSY potentiometers around to change the incoming signal. This morphs between a sawtooth wave (bottom right), a square wave (top right), a triangle-like wave (top left) and a sine wave (bottom left). Listen how the effect sounds for different input signals.
14. Reset the effect depth and increase the depth of the next effect. Again, move the POSX and POSY potentiometers and listen. Repeat this for all of the effects, one by one.
15. Introduce some WARP→Effect mappings and try different effect combinations by turning the WARP potentiometer
16. Also try the example from the previous page: Left half of the potentiometer sets one effect, middle position is no effect and right side is another effect.
17. When you feel that one effect becomes too harsh sounding, use the filter pages and set the WARP→Cutoff mapping so that unwanted frequencies are cut off when turning the WARP potentiometer.

Osc & Mix

Warp has two oscillators per voice. The two oscillators of one voice always share the same waveform. Each voice can however have a different waveform, depending on its XY position in the GalaXY and several other factors such as different modulation settings of the Spec and Warp section's parameters.

Enter the Osc & Mix menu to make all settings regarding the voices and their parameters.

The first page of the menu and Voice selection is **only available in Mono mode** (when the WarpEx button is red or when you are using Warp without WarpEx as a standalone device).
In Poly or MPE mode, all four voices share the same parameters as Voice 1. When designing a new preset in Mono mode, keep in mind that **only the sound of Voice 1 is used in Poly and MPE mode** and therefore should be your most important voice. You can also see Voices 2-4 as a bonus you get when using Mono mode.
In Poly and MPE mode, the parameters of the first page are not available for editing, but internally treated as follows: XY offset to 0%, voice pitch to ±0, level to -6dB.

Top left (turn)
Set the volume of the voice. Keep the most dominant voices in a range between -8 dB and ±0 dB. It is rarely necessary to go higher than 0 dB.

Top left (push)
MUTE   Mute the voice
MUTE   Unmute the voice

Bottom left and right (turn)
Set an offset from where the voice picks up its spectrum in the GalaXY.

Bottom left and right (push)
Toggle between often used values.
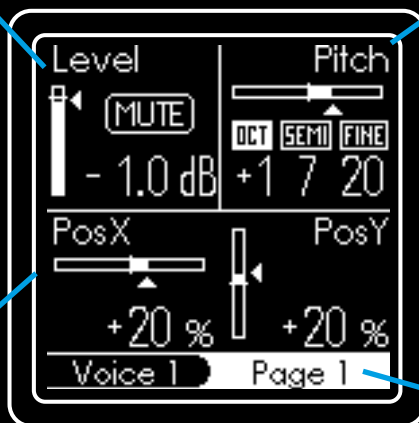
Top right (turn)
Change the pitch of the voice.

Top right (push)
Toggle between octave, semitone and fine pitch (cents)

Top right (long-press)
Reset the pitch to zero.

PARA (turn)
Switch page or select the voice

PARA (push)
Toggle between page selection and voice selection mode
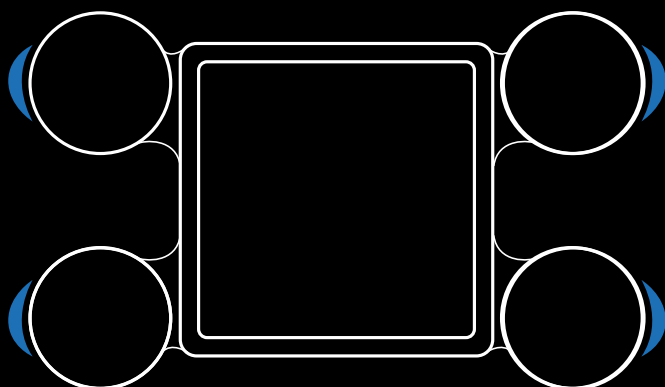
Page selection mode: The encoder LEDs are blue. Turning PARA changes the menu page.
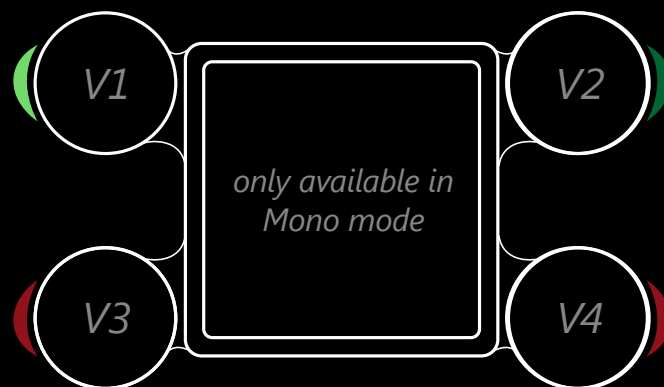
Voice selection: The encoder LEDs are green or red. Turning PARA changes the selected voice.

Green = Voice is on (unmuted)
Red   = Voice is off (muted)
Bright green or red = The currently selected voice.

On the next page you can set how oscillator 2 (Osc2) behaves in relation to oscillator 1 (Osc1).

The Osc Mix parameter is a crossfader that blends between Osc1 and Osc2. At the middle position, both Osc have a value of -3dB (equal loudness curve). On the left only Osc1 is audible while on the right only Osc2 can be heard.

The pitch of Osc2 can be set in relation to Osc1. Both Osc Mix and Osc2 pitch can be mapped to the DETN potentiometer.

Top left (turn)
Set the mix between Osc1 and Osc2.

Top left (push)
Toggle between often used values.

Bottom left (turn)
Determines the contribution of the DETN potentiometer to the oscillator mix

Bottom left (push)
Toggle between often used values.

Pitch offset of Osc2 in relation to Osc1

Top right (turn)
Change the pitch

Top right (push)
Toggle between octave, semitone and fine pitch (cents)

Top right (long-press)
Reset the pitch to zero.

Bottom right (turn)
Determines the contribution of the DETN potentiometer to the Osc2 pitch.
±100% = ± 1 Octave

Bottom right (push)
Toggle between often used values.

PARA (turn)
Switch page or select the voice

PARA (push)
Toggle between page selection and voice selection mode

On the next page you can choose from several oscillator effects (Osc FX), set their parameter and how the DETN potentiometer affects it. Also, the panning of the voice can be set here.

Top left (turn)
Select the type of Oscillator effect (Osc FX). This determines, how Osc1 and Osc2 interact with each other.

Bottom left (turn)
The output panning of the corresponding voice.
Left = OUT1
Right = OUT2
You can also see OUT1/2 not as stereo but as two mono outputs each voice can be routed to.

Bottom left (push)
Reset to zero

The Oscillator effect parameter. Depending on the selected effect this parameter has a different function.

Top right (turn)
Change the parameter.

Top right (push)
Reset to zero.

Bottom right (turn)
Determines the contribution of the DETN potentiometer to the Osc FX

Bottom right (push)
Toggle between often used values.

PARA (turn)
Switch page or select the voice

PARA (push)
Toggle between page selection and voice selection mode

Osc FX

Turn the top left encoder to choose from several oscillator effects. This selects from different modes how the two oscillators interact with each other. The top right encoder sets an effect parameter.

Lin Detune

OSC1 ↗
OSC2 ↘

While the Osc FX parameter is set to 0%, both oscillators have the same pitch. When you increase the value, Osc1 starts to increase its frequency by a few Hertz, while Osc2 decreases its frequency by the same number of Hertz. What makes this special is that both oscillators change their frequency by the same Hertz value, rather than by the same interval (e.g. plus minus a semitone). This is called linear detuning and ensures that the resulting beat frequencies remain the same over the entire pitch range of the voice.

Sync

OSC1 ⟋
OSC2 ⋀

In this mode, the phase of Osc2 is synchronized to the phase of Osc1. This means that every time Osc1 restarts its waveform cycle (many times per second), Osc2 also restarts its cycle. The Osc FX parameter determines how far the pitch of Osc2 is above that of Osc1, since this effect is only audible when both oscillators are at a different frequency. The Osc FX parameter ranges from 0 to +48 semitones.

The Sync effect is familiar from retro analog synthesizers where it is usually used with pulse and sawtooth waveforms. Its sound is often described as razor sharp, which comes from the fact that normally at the end of Osc1's waveform cycle, Osc2's amplitude is reset to zero, resulting in hard edges in the waveform. However, since Warp's sound character is strongly characterized by round and glassy sounding waveforms, we have developed our own variant of the hard sync algorithm, which sounds much softer compared to the classic technique.

AM Ring

OSC1 ⋀
OSC2 ⋀

The AM Ring effect stands for amplitude modulation, also known as ring modulation. The Osc FX parameter sets the modulation depth.

The amplitude of Osc1's output is used as a multiplication factor for Osc2's waveform while Osc1's waveform stays the same. Also for this effect, it makes sense that Osc2's frequency is different from Osc1. Both higher and lower frequencies can sound interesting.

FM

OSC1 ∿
OSC2 ⋀

The FM effect stands for frequency modulation. The Osc FX parameter determines the modulation depth.

Osc1 serves as the modulation signal for the frequency of Osc2. As a special feature, however, the output of Osc1 is not used directly. Instead, Osc1 is pretended to have a sine waveform, which is then used as the modulation jellyfish. Osc2, however, retains its waveform. The sound result would always be very harsh without this modification, but can now be tuned quite finely. The sound of the FM effect depends heavily on Osc2's waveform and its relative pitch to Osc1.

Phase Dist

OSC1 ⋀
OSC2 ∿

The Phase Dist effect uses Osc1's output as a modulation source for Osc2's oscillator phase. The FX parameter determines the modulation depth.

Osc2's waveform is swapped with a sine wave while Osc1's waveform stays the same. The effect sounds not too different from FM, but can become quite noisy.

Noise

OSC1 ∿
OSC2 ⊓⊔

With the noise effect, Osc2 becomes a white noise source. The FX parameter controls a lowpass-/highpass filter to shape the noise frequency spectrum. The Osc2 pitch has no effect here.

When Osc FX is at its middle position (50%) Osc2's output us white noise. Turning Osc FX below 50% fades in a lowpass filter and turning it above 50% makes it a highpass filter.

On the last page of the manu you can make some settings that apply to all voices at the same time.

Top left (turn)
Activating the Auto Reset Phase ensures that Osc2 will drift back towards Osc1's phase if the oscillators have exactly the same frequency. As long as Osc1 and 2 have different pitch this setting has no effect.

Top right (turn)
Set the range of the pitch bend wheel of your MIDI keyboard in semitones

Top right (push)
Reset to default

Bottom right (turn)
Set a glide value, also known as portamento. When changing the note pitch the voice needs some time to reach the new value. The higher the value, the longer it takes.

```
Osc Auto | Pitchbend
Reset    |      MIDI
Phase    |      ▲
OFF  ON  | ±12 semi
─────────────────────
         |     Glide
         |      ▲
         |   +27 %
         Page 4
```

PARA (turn)
Switch page

Bottom right (push)
Reset to default.

On the last page, Warp offers some Voice actions to quickly perform some tasks like copy-and-paste or setting a voice to default values.

All encoders (turn)

Select the desired action:

- Reset to defaults
- Copy from Voice 1
- Copy from Voice 2
- Copy from Voice 3
- Copy from Voice 4
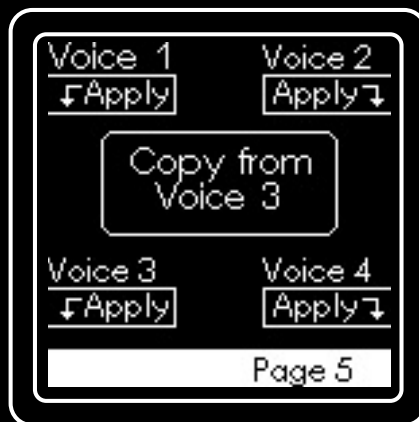
Top left (push)
Apply the action to Voice 1

Top right (push)
Apply the action to Voice 2

Bottom left (push)
Apply the action to Voice 3

Bottom right (push)
Apply the action to Voice 4

```
Voice 1        Voice 2
↳Apply         Apply↴
    ┌──────────┐
    │ Copy from │
    │  Voice 3  │
    └──────────┘
Voice 3        Voice 4
↳Apply         Apply↴
         Page 5
```

PARA (turn)
Switch page

Different voice modes Mono, Poly and MPE

As a standalone device, Warp is a monophonic synth voice which means it can only receive one pitch (V/OCT) and one gate (TRIG) input at a time. If you own the WarpEx expander, you can also use Warp as a polyphonic and MPE synth voice. The following table gives an overview of what changes, regarding voices and oscillators.

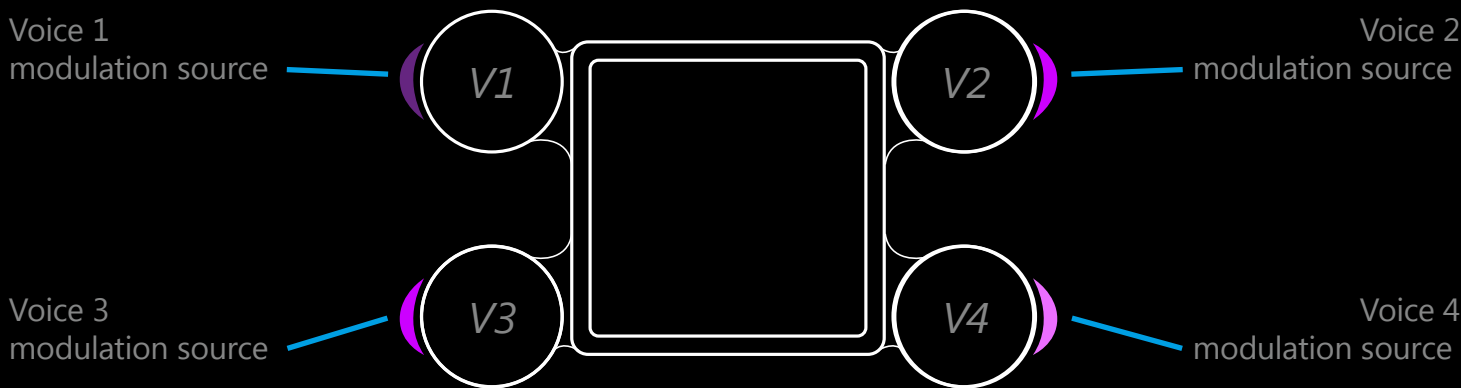| **Mono**	**Poly and MPE**
Each voice can have different parameters.	Each voice has the same parameters as Voice 1.
All voices follow the same pitch, with the fundamental set by the V/Oct input. However, each voice can have a different pitch offset.	Each voice can have a different pitch, which is determined by the voice's V/Oct input on WarpEx and the incoming MIDI notes. The V/Oct of the main module still affects all 4 voices.
Each voice has its own envelopes, LFOs and filters. However, they share the same parameters. A MIDI note input always triggers all voices' envelopes, but WarpEx' voice-specific TRIG inputs only trigger the corresponding voice.	Each voice has its own envelopes, LFOs and filters, same as Mono mode. But a new MIDI note input only triggers one voice, according to the voice allocation.
Each voice can have a different XY position offset in the GalaXY by default. They can also move independently due to modulation.	All voices share the same XY position in the GalaXY, but can move individually due to modulation.
Each voice can have a different mapping in the modulation matrix, but individual parameters or the entire voice mapping can also be linked to Voice 1 (Master).	All voices are treated like Voice 1 and therefore have the same mapping as Voice 1 in the modulation matrix.
WarpEx' MIDI input receives on the master channel only. If you hold a key down and play a second one, the new note replaces the old one.	Poly: WarpEx' MIDI input receives on the master channel only. Voice allocation by „Note stealing". MPE: MIDI is received on the MPE channels, voice allocation handled by the MPE keyboard.

Modulation

Warp has very extensive internal and external modulation capabilities. A large modulation matrix with 8 modulation sources and 19 destinations for each of the 4 voices (= 608 possibilities) is the heart of every sound Warp produces.

To keep the powerful modulation possibilities manageable for humans, Warp has two potentiometers that serve as macro controls for speed and modulation level. They can be flexibly routed to various parameters of the internal envelopes and LFOs and the modulation portion of any internal and external source.

These are the available modulation sources:

ENV1   ADSR envelope internally hardwired to the voices' volumes
ENV2   ADSR envelope that can be flexibly routed to all internal destinations
LFO1 & 2   Two individual LFOs that can be flexibly routed to all internal destinations
OMNI   The OMNI CV input that can be flexibly routed to all internal destinations
KEY   The key a voice is currently playing, translated into a modulation source
VELO   MIDI Note-On Velocity, can be flexibly routed to all internal destinations
TILT   MIDI CC value for Tilt in MPE, also ModWheel is common. Can be any CC number.
AFTR   MIDI aftertouch, per-voice aftertouch in MPE mode.

The encoder LED's brightness changes according to the absolute value of the modulation source. For easier orientation, each source has a different color, too (here: pink = ENV2).
In Poly and MPE mode or due to modulation, there can be different modulation values per voice as each voice has their own envelopes and LFOs.

ENV1 (volume)

This envelope is a standard ADSR that has a fixed routing to the volume of the voices. On the first page of the Modulation menu you can set the default Attack, Decay, Sustain and Release parameters.

Top left (turn)
Attack time default

Top right (turn)
Decay time default

Bottom left (turn)
Sustain value

Bottom right (turn)
Release time default

All encoders (push)
Toggle between typical parameter values.

PARA (turn)
Switch page

On the second page, the influence of the SPD parameter on the timing of Attack, Decay and Release can be set. A negative value makes the time shorter the further to the left you turn the SPEC potentiometer, a positive value makes it longer.

Bottom left (turn)
The drone value sets a constant minimum volume. This causes the voice to have a output and turns the module from a synth voice to an oscillator module.

PARA (turn)
Switch page
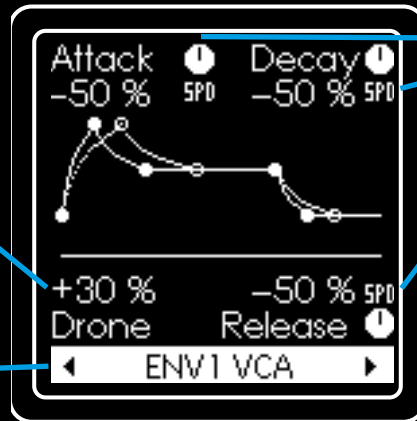
Top right and left (turn)
Bottom right (turn)
Determines the contribution of the SPD potentiometer to the length of Attack, Decay and Release

All encoders (push)
Toggles between typical parameter values.

Curve with filled dots: ADSR modified by the SPD potentiometer and SPD CV input.
Curve with circles: ADSR default without SPD potentiometer and modulation.

On the second page, there is one special feature that only ENV1 has, namely the Drone parameter. It sets a minimum output of the ADSR. If you set the Drone parameter to a value greater than 0%, Warp will never silence the voices. This feature lets you turn Warp from a synth voice module into an oscillator module with constant volume output.

All presets that are shipped with Warp and that are officially available on our website have the Drone parameter set to 0% and intend to be used in the context of a synth voice. If you prefer to always use Warp as an oscillator, go to *Settings > Global* and turn oscillator mode on. This ensures that every time you load a preset the Drone parameter is set to a fixed value that can also be set here.

The third page lets you determine the shape of each segment of the ADSR individually. You can transition smoothly from parabolic to linear to inverted parabolic ADSR shapes.
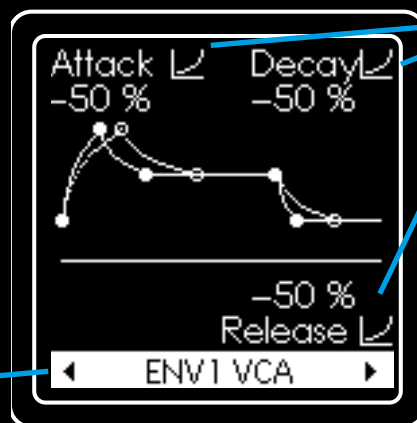
Top right and left (turn)
Bottom right (turn)
Determines the shape of the ADSR segments

All encoders (push)
Toggles between typical parameter values.

PARA (turn)
Switch page

ENV2 (all purpose)

ENV2 is almost similar to ENV1. Differences are that ENV2 does not have the Drone parameter but therefore it can loop. **Loop Mode** can be enabled on the third page of ENV2. The envelope then turns from an ADSR into an Attack-Hold-Release envelope which means the envelope keeps its maximum value for a defined time. A TRIG input will reset the envelope and restart its loop (phase and value). ENV2's amplitude is internally interpreted as a **unipolar modulation source** that ranges from 0.0 to +5.0 Volts.

The ENV2 settings look a little different when **Loop mode** is active:

Top left (turn)
Attack time default
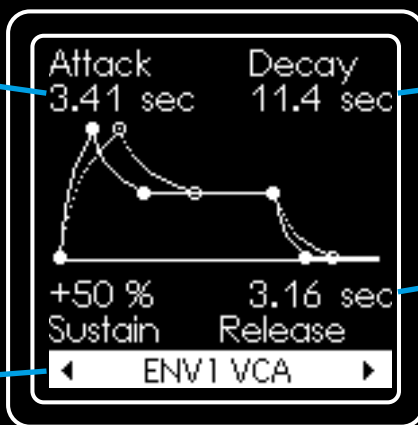
Top right (turn)
Hold time default,
same as Decay value in
normal mode

Bottom right (turn)
Release time default

All encoders (push)
Toggle between typical
parameter values.

PARA (turn)
Switch page

```
Attack        Decay
3.41 sec      11.4 sec




+50 %         3.16 sec
Sustain       Release
 ◄    ENV1 VCA    ►
```

Also for ENV2 in loop mode the influence of the SPD potentiometer on the timing can be adjusted. The sum of the attack, hold and release times determines the clock frequency of the envelope.

Top right and left (turn)
Bottom right (turn)
Determines the contribution
of the SPD potentiometer to
the length of
Attack, Hold and Release

All encoders (push)
Toggles between typical
parameter values.

PARA (turn)
Switch page
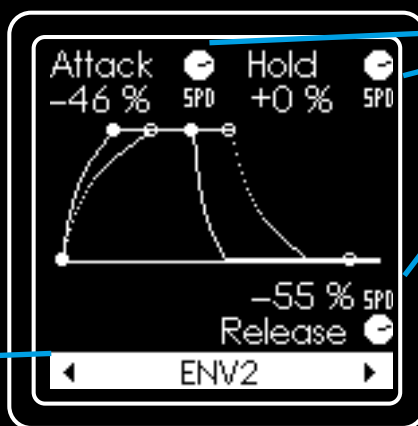
```
Attack  ⊝    Hold   ⊝
-46 %  SPD   +0 %   SPD




            -55 % SPD
            Release ⊝
 ◄    ENV2    ►
```

For attack and release, the shape can be set from parabolic to linear to inverted parabolic. The lower left value switches ENV2 between normal mode and loop mode.

Top left (turn)
Attack time default

Bottom left (turn)
Switch between
normal and
loop mode

PARA (turn)
Switch page
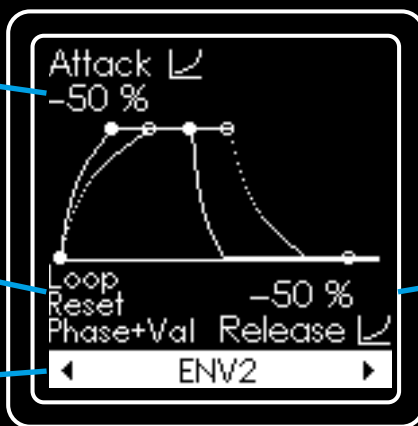
Bottom right (turn)
Release time default

All encoders (push)
Toggle between typical
parameter values.

```
Attack ⌁
-50 %




Loop
Reset       -50 %
Phase+Val  Release ⌁
 ◄    ENV2    ►
```

The SPD potentiometer and CV input affect the three timing parameters of the ADSR. This lets you change the ADSR shape drastically with only one potentiometer and makes it a very perfomance oriented tool.

Map amount
+-100%

SPD
Poten-
tiometer

SPD
CV input

ENV Parameters
- Attack time
- Decay time
- Release time
- Sustain level

- Attack curve
- Decay curve
- Release curve
- Drone (ENV1 only)
- Loop   (ENV2 only)

- 32 -
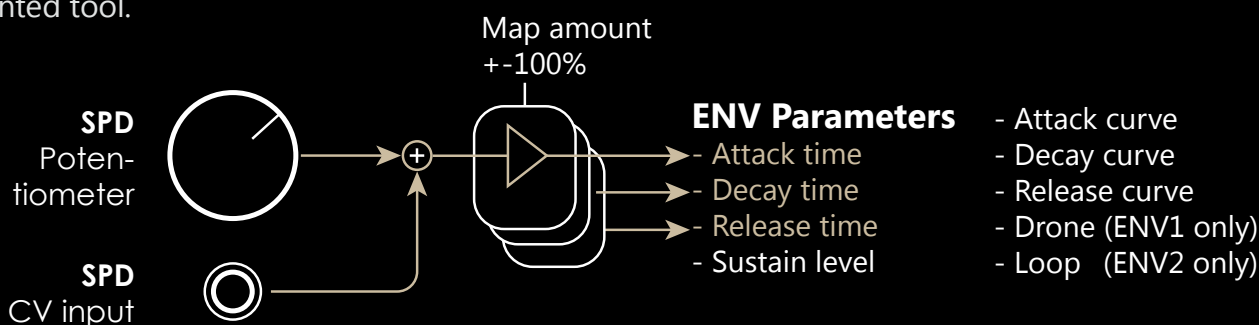
LFO1 and LFO2

Warp has two internal LFOs which are identical and can be used as flexible modulation sources. The LFO frequency ranges from 0.02 Hz to 60 Hz.

Top left (turn)
The default frequency of the LFO

Bottom left (turn)
Determines the contribution of the SPD potentiometer to the LFO frequency

PARA (turn)
Switch page
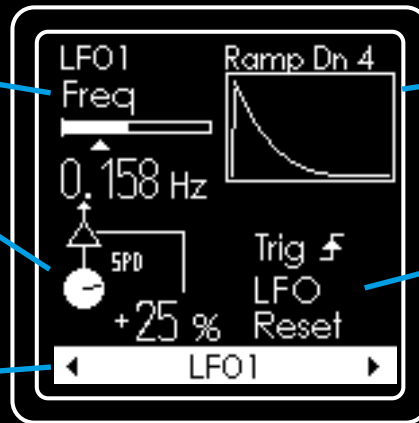
Top right (turn)
Select theLFO shape

Bottom right (turn)
Set LFO trigger type and single-shot or cyclic mode

All encoders (push)
Toggle between typical parameter values.

LFO1
Freq
Ramp Dn 4
0.158 Hz
SPD
Trig
LFO
Reset
+25 %
◄ LFO1 ►

There are three different Trig settings available:

Ignore Trig	The LFO loops, triggers are ignored.
Trig LFO Reset	The LFO loops, a rising edge at TRIG input restarts the LFO.
Trig Single Shot	Only a rising edge at TRIG input lets the LFO runs its cycle one time.

These are the available Waveforms.
Bipolar, interpreted as ± 5.0 Volts:

Off   Sine   Cosine   Tri   Square   Random   Rand. Slew

Spiral 4   Spiral 5   Spiral 6   Spiral 7   Spiral 8   Spiral 12   Spiral 16   Spiral 32
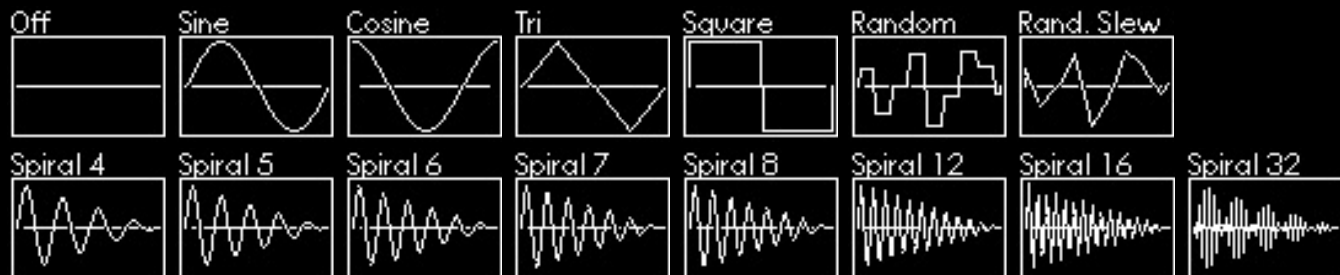
Unipolar, interpreted as 0.0 to +5.0 Volts:

Ramp Up   Ramp Up 2   Ramp Up 4   Ramp Up 8   Ramp Down   Ramp Dn 2   Ramp Dn 4   Ramp Dn 8

The SPD potentiometer and CV input not only affect the ENV1 and ENV2 timing but also the LFO frequency which makes it a powerful hands-on control to switch the whole sound of the module from slow to fast at the instance of a knob turn.

Also, the LFO1 and LFO2 frequencies are available as a modulation target in the matrix.

Modulation matrix

Map amount +-100%

SPD Poten- tiometer

SPD CV input

LFO Parameters
- Frequency
- Waveform
- Trigger modes: Loop and reset on trig input, one-shot LFO on trig.
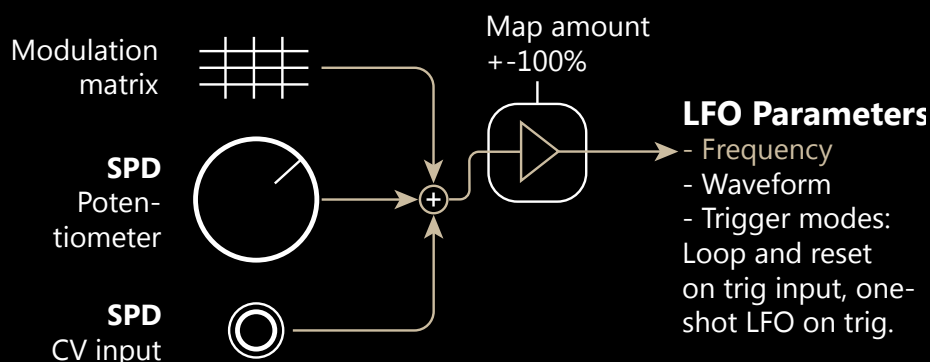
OMNI

On Warp's frontpanel there is a CV input called OMNI that can be used as a variable modulation source.

On the hardware side, Warp treats the OMNI CV like an audio signal with a high resolution 24 Bits 48kHz Analogue-to-digital converter. The OMNI input is part of Warp's auto-calibration circuit and accepts voltages up to ±8.0 Volts, but is best used with ± 5.0 Volt signals.

If you patch an external LFO to the OMNI input that swings between ± 5 Volts, it corresponds to the same amplitude as one of Warp's internal LFOs.

Although the OMNI input technically „understands" modulation frequencies up to 24 kHz and there-fore the full audio range, not all of Warp's modulation targets can treat signals of such high rates.

However, oscillator pitch, volume, panning and some of the Warp effects do accept high audio rate modulation which is kind of special on a digital synth and allows frequency and amplitude modulation close to an analogue oscillator. The other modulation targets can still use modulation frequencies up tolower audio range (~60Hz max recommended), which is more than enough for „musically valuable" sounds.

Check out the table of the modulation targets later in the manual for details.

KEY

This is a modulation source that is determined by the pitch of a voice. When you play a synthesizer with a keyboard, the value of the KEY modulation source is determined by the key you press on the keyboard. A high key results in a high value for the KEY modulation source.

Since Warp does not have a keyboard built in, but provides a variety of inputs to set the pitch of a voice, the internal KEY signal is calculated as the sum of the following values:

- V/OCT CV input of the main module
- V/OCT CV input of WarpEx
- MIDI note input
- Global tuning set by the TUNE encoder (long-press to reset)

The higher the note a voice plays, the higher the key signal. The KEY signal follows one volt per octave scaling. An example:

Change the pitch of a voice by ± 5.0 volts and use the KEY signal as a modulation source. The same result could be achieved if you connect an external LFO with ± 5.0 volts to the OMNI input and use that as modulation source.

With no V/OCT CV input, no MIDI, and global tuning set to zero, the KEY signal is also zero. If you change the pitch by +1 octave, Warp interprets KEY as a + 1.0 volt modulation source. If you lower the pitch by - 1.0 volt, Warp interprets KEY as a modulation source with - 1.0 volts.

Note:

Warp's filter cutoff frequencies also track Volt per Octave. Set KEY→LPF or KEY→HPF to +100 in the modulation matrix and the cutoff frequency will follow the pitch of the voice.
Another typical use for KEY is to attenuate a voice's volume depending on the pitch. Sometimes, high notes seem to be too loud. Set a negative value in the KEY→Vol entry of the modulation matrix to make high notes quieter.

VELO

This modulation source requires MIDI input and therefore is only available with the WarpEx expander.

When playing a MIDI note, the protocol also transmits the strength how hard the key of a keyboard was pressed. When using a sequencer instead of a keyboard, usually the velocity can be set per note. Warp uses the Note-On Velocity, which means the VELO value changes only that moment a new MIDI note is played.

In the MIDI protocol, the velocity value ranges from 0 to 127. Warp internally translates this into a unipolar modulation source that ranges from 0 to +5.0 Volts.

TILT

This modulation source requires MIDI input and therefore is only available with the WarpEx expander. It translates a CC message into a unipolar modulation source. CC stands for Control Change in MIDI and is mostly used to transmit fader positions along the actual note data.

The TILT modulation source is especially intended to be used with an MPE keyboard. By „tilting" the key and moving your finger up and down the key's surface, an MPE keyboard sends a corresponding CC message that can be used by Warp to change its timbre while you press the key.

If you do not have an MPE keyboard, you could typically use the keyboard's Mod Wheel or any other fader as input for the TILT parameter.

Go to **Settings > WarpEx MIDI > Page 2** where you can set the CC identifier you want to use for TILT.

In the MIDI protocol, CC values range from 0 to 127. Warp internally translates this into a unipolar modulation source that ranges from 0 to +5.0 Volts.

AFTR

This modulation source requires MIDI input and therefore is only available with the WarpEx expander. It translates aftertouch messages into a unipolar modulation source. Some MIDI keyboards can measure the force the player applies on a key while holding it down.

The AFTR modulation source is especially intended to be used with an MPE keyboard. It uses the Per-Key aftertouch message but also adds the global aftertouch data if it is transmitted. MPE keyboards may handle aftertouch differently, but as long as you do not press down more than 4 keys at the same time you should only receive per-key after touch which is routed to the voice linked to the key. We found that some MPE keyboards send global aftertouch on the master MIDI channel when a fifth key is pressed. Warp adds the global aftertouch on top, as the MPE specification requires to make use of it.

If you do not have an MPE keyboard, aftertouch is transmitted as a global parameter that counts for all keys at once. Usually, keyboards take the aftertouch value of the key you press down the most.

In the MIDI protocol, aftertouch values range from 0 to 127. Warp internally translates this into a unipolar modulation source that ranges from 0 to +5.0 Volts.

Note:
If you feel that Warp reacts a little „nervous" to TILT, AFTR or MIDI pitchbend, you can set a slew rate for incoming MIDI messages in **Settings > WarpEx MIDI > Page 2**. Some MIDI controllers tend to send steppy data due to sensitive sensors. Applying a slew rate makes the incoming data smooth and can help obtain a playable interface.

Modulation Amplitudes

Warp has a dedicated potentiometer labelled AMP that can change the modulation amplitude of the described modulation sources individually.

ENV1

ENV2

A brief overview of the modulation sources.
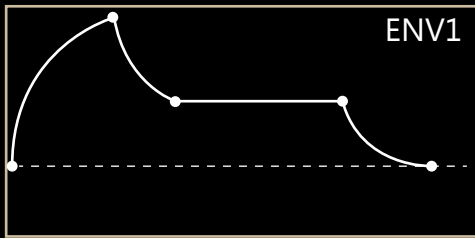
ADSR, fixed routing to volume, post-filter.

ADSR, can be routed to all targets in modulation matrix.

LFO1

LFO2
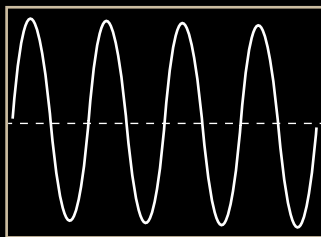
OMNI
CV input, flexible routing in modulation matrix
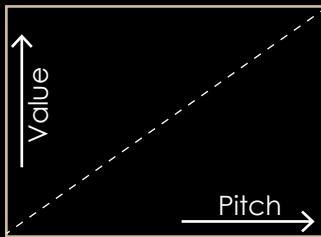
KEY
The voice's current pitch

Value

Pitch
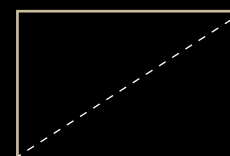
*VELO
MIDI note velocity
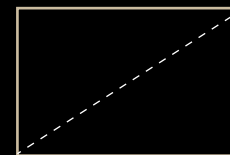
*TILT
Any MIDI CC, usually MPE Tilt or ModWheel
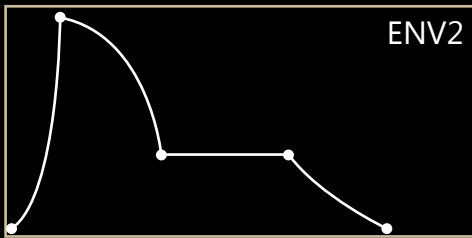
*AFTR
MIDI Aftertouch

Both LFOs are identical.
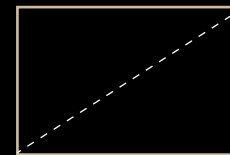
On the next two pages you can set the mapping value how much the AMT potentiometer reduces the impact of each modulation source.

All encoders (turn)
Determine the mapping value how much the AMT potentiometer impacts the modulation source amount.

All encoders (push)
Toggle between typical values.

PARA (turn)
Go to the next/previous page

ENV2 ← ● OMNI ←
40% AMT 0% AMT
LFO1 ← ● LFO2 ←
50% AMT 100% AMT
◄ Mod Source Amp ►

ENV2 ← ● OMNI ←
40% AMT 0% AMT
LFO1 ← ● LFO2 ←
50% AMT 100% AMT
◄ Mod Source Amp ►

Example scenario

	AMT all left	AMT all right
Mapping value 0%	Modulation source 100% amplitude	Modulation source 100% amplitude
Mapping value 40%	Modulation source 60% amplitude	Modulation source 100% amplitude
Mapping value 100%	Modulation source 0% amplitude	Modulation source 100% amplitude

On the next page, the mapping of the AMT potentiometer on the KEY and MIDI specific modulation sources VELO, TILT and AFTR. They are visualized as linear curves, as for all of these sources their input is linearly translated into the internal modulation value.

All encoders (turn)
Determine the mapping value how much the AMT potentiometer impacts the modulation source amount.

All encoders (push)
Toggle between typical values.

PARA (turn)
Go to the next/previous page
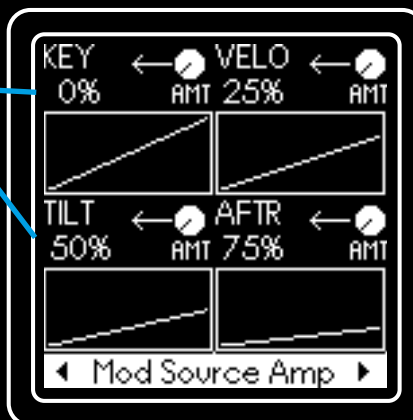
Modulation matrix

One of Warp's most powerful features is its modulation matrix. Here, internal and external sources can be routed to many of Warp's internal parameters.

The principle of a modulation matrix is simple: select a modulation source and a modulation destination, and specify how much the source modulates the destination.

Each modulation target corresponds to one parameter in the menu, see the list on the next pages. When you are in the menu of the parameter, the display will provide visual feedback about the actual value the parameter has.

Top left (turn)
Change the row index.
Select the target destination.

Top left (push)
Opens a layover menu that gives additional options to import modulation settings from existing presets, clear all values, copy from Voice 1.
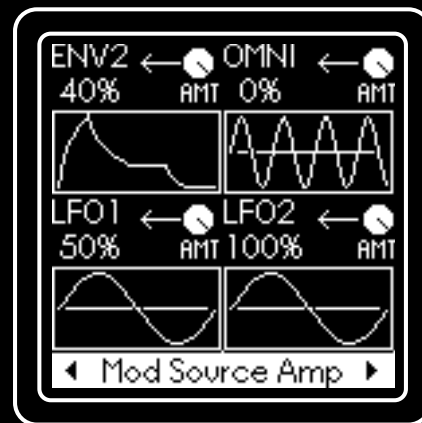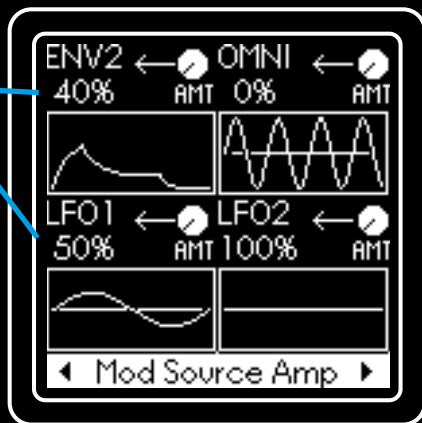
Top right (turn)
Change the column index.
Select the modulation source.

Bottom right (turn)
Increase or decrease the modulation value

Bottom right (push)
Reset the value to 0

PARA (turn)
Switch page. Modulation matrices of Voices 2-4 are only accessible in Mono mode.

Note:
All values in the modulation matrix are in %. A value of 100% means that the source is able to modulate the target parameter over its entire range. Setting a value of -100% means that the value of the parameter becomes negative when the value of the source becomes positive and also covers the whole range. Modulation values of ±200% are possible. If the sum of all modulations exceeds the range of the parameter, the parameter will not go beyond it.

In the modulation matrix menu, the two bottom encoder LED's brightness reacts to the level of the selected modulation source (here: ENV2 = pink). Use this as an indicator to see what the selected modulation source is doing or to check if Warp receives a signal (OMNI, KEY, VELO, TILT, AFTR).

```
⊕Target ↕        Source ↔
          ENV2  LF01  LF02
LPF   +85   0     0
HPF    0    0     0
POSX   0   +25    0
POSY   0    0     0
VOL  +50    0     0
PAN    0    0     0
                Value ↕
◀ VOICE 1 (MASTER) ▶
```

Lights up when modulation source is negative

Lights up when modulation source is positive

Voices 2-4 modulation matrix

When in Mono mode, Voices 2, 3, and 4 can have their own modulation settings. Turn the PARA encoder to the right to get there. You can only access their pages when in Mono mode, otherwise all voices behave like Voice 1 in Poly and MPE mode..

It is also possible to link single values to Voice 1 or just link the entire page of a voice to Voice 1.

Top left (turn)
Change the row index.
Select the target destination.

Top left (push)
Open layover menu.

Top right (turn)
Change the column index.
Select the modulation source.

```
⊕Target ↕        Source ↔
          KEY  ＊VELO ＊TILT
BEND   0    0     0
FOLD   0   +19    0
DRIV +100   0     0
REDX   0    0    [🔗]
LF01   0    0     0
LF02   0    0     0
🔗 Link to V1   Value ↕
◀ VOICE 2 ▶   LINK ⤵
```

Bottom left (push)
Link the selected parameter to Voice 1.
A linked value is indicated by the chain symbol 🔗

PARA (turn)
Switch page

PARA (push)
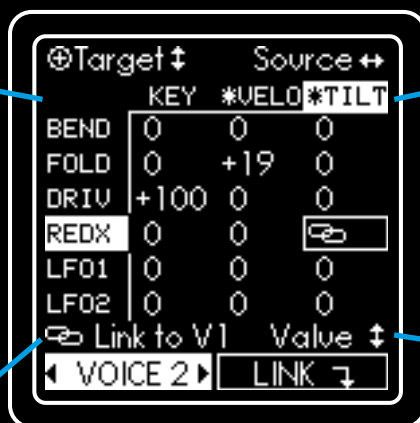Link and unlink the whole page with Voice 1

Bottom right (turn)
Increase or decrease the modulation value

Bottom right (push)
Reset the value to 0

```
⊕

Voice 2 modulation
linked to voice 1

◀ VOICE 2 ▶  UNLINK ⤵
```

By pressing the top left encoder an overlay screen is shown.
Use the PARA encoder to select an option:

- Copy the modulation of Voice 1 to the currently selected voice
- Clear all entries of the currently selected voice = setting them all to zero
- Copy the selected voice's modulation matrix from another preset by navigationg through the browser

```
✛  Mod from preset...
>Copy from Voice 1
>Link from Voice 1
>Clear
⤺ 01 Init
⤺ 02 Factory Presets
⤺ 03 User
─────────────────
VOICE 2    Load ⤸
```

PARA (turn)
Select an option or navigate through the browser

PARA (push)
Load the modulation settings
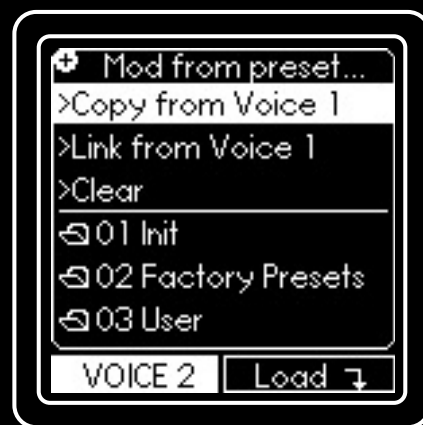
BACK (push)
Leave without doing anything

Modulation target capabilities

Short name	Full parameter name	max. theoretical modulation rate	max. recommended modulation rate
LPF	Lowpass filter cutoff frequency	188 Hz	60 Hz
HPF	Highpass filter cutoff frequency	188 Hz	60 Hz
POSX	X-position offset in GalaXY	188 Hz	60 Hz
POSY	Y-position offset in GalaXY	188 Hz	60 Hz
VOL	Voice volume level	24000 Hz	8000 Hz
PAN	Voice panning OUT1/2	24000 Hz	8000 Hz
PITCH	Voice pitch	24000 Hz	8000 Hz
PITC2	Osc2 pitch offset	24000 Hz	8000 Hz
MIX	Osc1 and Osc2 volume mix	188 Hz (Noise FX) 24000Hz (all others)	60 Hz (Noise FX) 8000 Hz (all others)
DEPTH	Spec filter Depth	188 Hz	60 Hz
ZOOM	Spec filter Zoom	188 Hz	60 Hz
GENR	Spec filter Harmonics Generator	188 Hz	60 Hz
BEND	Warp effect depth Bend	24000 Hz	8000 Hz
FOLD	Warp effect depth Fold	24000 Hz	8000 Hz
DRIV	Warp effect depth Drive	24000 Hz	8000 Hz
REDX	Warp effect depth Redux	188 Hz	60 Hz
LFO1	LFO1 Frequency	188 Hz	60 Hz
LFO2	LFO2 Frequency	188 Hz	60 Hz

CV input		max. theoretical modulation rate	max. recommended modulation rate
V/OCT		24000 Hz (Warp) 188 Hz (WarpEx)	8000 Hz (Warp) 60 Hz (WarpEx)
TRIG		188 Hz (Both)	60 Hz (Both)
OMNI		24000 Hz	8000 Hz
All other CV inputs		188 Hz	60 Hz

Settings

There are some settings that affect the whole module and are general instead of belonging to a particular preset. Enter the Settings menu and use the PARA encoder to select from several subgroups.

Global

Oscillator-Mode

Warp is designed as a synthesizer voice, which means that it needs an external input to produce sound: a signal at the TRIG input or a note from the MIDI input is required for ENV1 to run (ENV1 is always routed to the volume level of the voices). When ENV1 is idle, the voices remain muted and the module outputs no sound.

However, if you want to use Warp as an oscillator in your Eurorack setup, you may want a constant output level, even without TRIG input. This is why there is a parameter in ENV1 called Drone that lets you set a minimum volume.

Most presets that come with Warp are configured as synth voice presets with the Drone parameter set to 0%. When you activate Oscillator mode, Warp overrides the Drone parameter with a fixed value that can also be set here.

WarpEx default

Every preset also saves the voice mode (Mono, Poly or MPE) it is intended to be used with. This means, when loading another preset, the voice mode could change.

If you want to keep the voice mode the same, you can set your desired choice here.

Output Gain

This is a general output gain that is applied to Warp's OUT1 and OUT2 jacks (± 12.0 dB) in order to meet your receiving device's voltage level expectations. Warp's outputs are physically able to deliver voltages up to ± 10.0V without distortion. For the factory presets, the output level is usually in a range of ±2.5 to ±5.0 Volts, which meets the Eurorack specification where a maximum of ±5V is common.

If you feed into a line-level system you may want to set the output gain lower, as line-level usually expects a level of ± 1.0 Volts.

Practically all Eurorack modules can handle up to ±10V. However, we cannot guarantee that a (poorly designed) device will not be damaged by Warp's output signal, as we have no influence on the design of other modules. However, Warp's output stage is proven Eurorack circuitry and has been implemented in hundreds of other modules the same way.

Top left (turn or push)
Oscillator-Mode On/Off
When loading a new preset, the Drone parameter of ENV1 is set to the value on the right.

Top right (turn)
Determines the value that the Drone parameter is automatically set to when loading a new preset if Oscillator-mode is ON.

Bottom left (turn)
Set a global output gain

Bottom left (push)
Reset to zero

Bottom right (turn)
Set the default voice mode that is applied when loading a new preset.

Oscillator Mode
(Load preset sets ENV1
Drone to default level)
OFF ON Drone 75%
Output Gain
+ 0.0dB
WarpEx default
Like preset
◀ Global 1/2 ▶

Quantization

Warp can quantize incoming V/Oct voltages to exact semitones. Useful for oldschool analogue sequencers. This is a global setting, not related to presets.

Screensaver

Enjoy the lightshow.
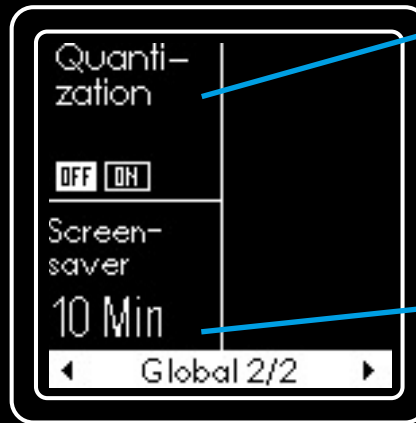
Top left (turn)
Enable or disable semitone quantization of the incoming pitch CVs.

Bottom left (turn)
Sets the time after which Warp's screensaver turns on. Quit the screensaver by pushing BACK or turning an encoder.

LED Brightness

Adjust the brightness of the LEDs.

Any encoder (turn)
Modify the brightness

PARA (push)
Keep the new brightness value

BACK (push)
Return without changing the brightness

Calibration V/Oct and OMNI

This performs an auto-calibration of the V/Oct and the OMNI input. Warp has a high-precision voltage source on board and creates its own internal test signals to calibrate itself. If a WarpEx is connected, its V/Oct inputs are also calibrated by Warp.

Every Warp ships pre-calibrated. However, there might be situations where a new calibration might be necessary:

- You connect a WarpEx for the first time
- You hit calibrate but you had some patch cables attached
- You removed the CALI.dat file from the SD-card
- You are using the CALI.dat file of another Warp unit
- The V/Oct tracking seems to be incorrect

To perform a calibration, the screen gives you instructions of what to do:

1. Connect WarpEx if you have one (turn your rack off first)
2. Remove all patch cables from Warp and WarpEx
3. Push PARA to start auto-calibration and wait for a few seconds

PARA (push)
Start the calibration (~10 sec)

BACK (push)
Return without calibration

If you made a calibration and Warp still does not track properly it is very possible that the sending device is not very precise or that the WarpEx connector cable is not properly connected.

WarpEx MIDI

On the first page you can make some basic MIDI settings for the WarpEx Expander.

MIDI Ch Master

The MIDI channel on which Warp receives data in Mono and Poly mode.
This is also the Master channel in MPE mode.

```
┌─────────────┬─────────────┐
│ MIDI Ch     │ MIDI Ch     │
│ Master      │ MPE         │
│ CH1         │ CH2-5       │
├─────────────┼─────────────┤
│ Voice       │ MIDI        │
│ Mode        │ Legato      │
│ Mono        │ Off         │
├─────────────┴─────────────┤
│ ◀   WarpEx MIDI 1/3    ▶  │
└───────────────────────────┘
```

MIDI Ch MPE

Determines four consecutive MIDI channels on which Warp receives the data of the voices in MPE mode. Voice 1 listens on the lowest of the four channels, and Voice 4 listens on the highest. The MPE controller is responsible for assigning the voices. Configure your MPE controller to use only 4 voices. When you press a fifth note, MPE controllers normally send the „overflow" aftertouch and tilt data to the master channel. These are also considered by Warp.

MPE either uses a so called lower zone or an upper zone chanel configuration.

Lower zone: **Master CH1   and   MPE CH2-5   (standard configuration)**
Upper zone: Master CH16   and   MPE CH12-15

However, it is possible to choose Warp's configuration off the standard, as we have seen very free implementations on various MPE controllers and want to keep Warp open to more exotic MIDI configurations.

Voice Mode

Mono, Poly or MPE mode. Same as pushing the button on the WarpEx expander. If WarpEx is not connected, voice mode is Mono.

MIDI Legato

Only relevant in Mono mode. Play a long note, and while the note is still playing, play a second note.

Legato Off: When playing the second note, the envelopes and LFOs are triggered.
Legato On: When playing the second note, the new trigger is suppressed, only the pitch changes.

MIDI CC Tilt / Mod

The MIDI CC number 0 to 127 on which Warp listens for MPE Tilt or Mod Wheel data.

Slew

Some controllers send steppy MIDI data of pitchbend, Tilt / Mod and aftertouch. By setting a slew rate > 0% Warp internally smoothes the incoming data before using it. This makes some controllers more playable when otherwise Warp would react a little „nervous" on incoming data.

```
┌─────────────┬─────────────┐
│ MIDI CC     │ Slew        │
│ Tilt / Mod  │ Pitch Bend  │
│ 74          │ 50 %        │
├─────────────┼─────────────┤
│ Slew        │ Slew        │
│ Tilt / Mod  │ Aftertouch  │
│ 50 %        │ 50 %        │
├─────────────┴─────────────┤
│ ◀   WarpEx MIDI 2/3    ▶  │
└───────────────────────────┘
```

MIDI CC control

All of Warp's parameters can be remotely set by sending MIDI CC messages.

In this menu, you can activate or deactivate this kind of remote control. Warp listens to CC messages on the MIDI master channel set on the first page.

CC stands for „continuous controller" and is the kind of message that is typically sent by a slider or potentiometer of a MIDI controller. A CC message consists of a CC number (CC#) and a parameter value. Each of Warp's parameters is hard-linked to one CC number that can be looked up in the table on the next page.

If Warp receives a MIDI CC message with a CC number that is also specified for Tilt, then Tilt has priority and the mapping of the CC table is ignored.

In order to use Tilt and CC simultaneously, you need to set your Tilt CC to a value that is not used by Warp's mapping (CC numbers 0, 1, 6, 32, 38, 98, 99, 125, 126, 127), and also make sure that your sending device uses the same CC#.

Top left encoder (turn or push)
Set MIDI CC control mode
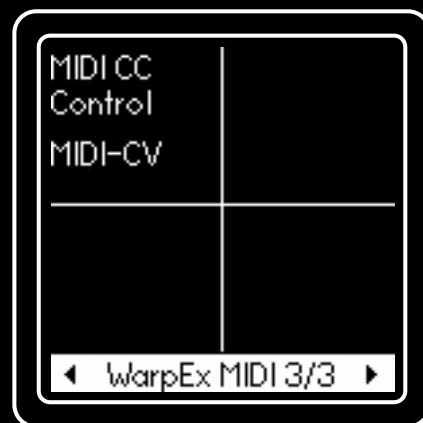
PARA (turn)
Go to previous page

Off	All CC messages are ignored
Parameters	CC messages control menu parameters, corresponding to the table on the next page.
MIDI-CV	CC messages are interpreted as additional unipolar CV inputs for the seven potentiometers of Warp, corresponding to the table below. This way, you can alter the potentiometer positions the same way as with a 0-5V control voltage plugged into the corresponding jack.
Para + M.CV	Enables Parameter mode and MIDI-CV mode at the same time. Some CC# are used in both modes (ENV shapes), but MIDI-CV has priority.

WarpEx MIDI CC Table (MIDI-CV)

CC#	MIDI-CV potentiometer
90	SPEC
91	WARP
92	DETN
102	POSX
103	POSY
104	AMT
105	SPD

Note:

If you stop sending CC messages, the CVs are virtually „stuck" at the last received value. To „pull out" the virtual MIDI-CV cables and reset the MIDI-CV values to zero, simply **long-press the button on WarpEx** for >1 second.

WarpEx MIDI CC Table (Parameters)

Each parameter of Warp's menu can be changed by sending MIDI control messages to Warp on the WarpEx MIDI channel. Activate CC control in *Settings > **WarpEx MIDI 3/3***.

CC#	Parameter	CC#	Parameter	CC#	Parameter
0	-	46	Pos Y Voice 1	93	ENV2 Attack
1	-	47	Pos Y Voice 2	94	ENV2 Decay
2	SPEC shape	48	Pos Y Voice 3	95	ENV2 Sustain
3	SPEC depth	49	Pos Y Voice 4	96	ENV2 Release
4	SPEC depth mapping	50	Osc Mix Voice 1	97	ENV2 Attack mapping
5	Glide	51	Osc Mix Voice 2	98	-
6	-	52	Osc Mix Voice 3	99	-
7	SPEC depth to gain	53	Osc Mix Voice 4	100	ENV2 Decay mapping
8	SPEC zoom	54	Osc Mix mapping Voice 1	101	ENV2 Release mapping
9	SPEC zoom mapping	55	Osc Mix mapping Voice 2	102	ENV2 Attack shape
10	SPEC generator	56	Osc Mix mapping Voice 3	103	ENV2 Decay shape
11	SPEC generator mapping	57	Osc Mix mapping Voice 4	104	ENV2 Release shape
12	WARP LPF resonance	58	Osc2 Tune semi Voice 1	105	ENV2 Loop
13	WARP LPF cutoff	59	Osc2 Tune semi Voice 2	106	LFO1 Frequency
14	WARP LPF cutoff mapping	60	Osc2 Tune semi Voice 3	107	LFO1 Freq mapping
15	WARP LPF slope	61	Osc2 Tune semi Voice 4	108	LFO1 Shape
16	WARP HPF resonance	62	Osc2 Tune mapping Voice 1	109	LFO2 Frequency
17	WARP HPF cutoff	63	Osc2 Tune mapping Voice 2	110	LFO2 Freq mapping
18	WARP HPF cutoff mapping	64	Osc2 Tune mapping Voice 3	111	LFO2 Shape
19	WARP HPF slope	65	Osc2 Tune mapping Voice 4	112	Amount ENV2
20	WARP FX bend	66	Osc FX type Voice 1	113	Amount LFO1
21	WARP FX bend mapping	67	Osc FX type Voice 2	114	Amount LFO2
22	WARP FX fold	68	Osc FX type Voice 3	115	Amount Omni
23	WARP FX fold mapping	69	Osc FX type Voice 4	116	Amount Key
24	WARP FX drive	70	Osc FX parameter Voice 1	117	Amount Velo
25	WARP FX drive mapping	71	Osc FX parameter Voice 2	118	Amount Tilt
26	WARP FX redux	72	Osc FX parameter Voice 3	119	Amount After Touch
27	WARP FX redux mapping	73	Osc FX parameter Voice 4	120	LFO1 Trigger
28	Mute Voice 1	74	Osc FX mapping Voice 1	121	LFO2 Trigger
29	Mute Voice 2	75	Osc FX mapping Voice 2	122	MIDI Pitchbend range
30	Mute Voice 3	76	Osc FX mapping Voice 3	123	MIDI Panic
31	Mute Voice 4	77	Osc FX mapping Voice 4	124	Osc Auto Reset
32	-	78	Pan Voice 1	125	-
33	Volume Voice 1	79	Pan Voice 2	126	-
34	Volume Voice 2	80	Pan Voice 3	127	-
35	Volume Voice 3	81	Pan Voice 4		
36	Volume Voice 4	82	ENV1 Attack		
37	Tune semitones Voice 1	83	ENV1 Decay		
38	-	84	ENV1 Sustain		
39	Tune semitones Voice 2	85	ENV1 Release		
40	Tune semitones Voice 3	86	ENV1 Drone		
41	Tune semitones Voice 4	87	ENV1 Attack mapping		
42	Pos X Voice 1	88	ENV1 Decay mapping		
43	Pos X Voice 2	89	ENV1 Release mapping		
44	Pos X Voice 3	90	ENV1 Attack shape		
45	Pos X Voice 4	91	ENV1 Decay shape		
		92	ENV1 Release shape		

WarpEx Update

It may be necessary in the future that with new firmwares of Warp, also a firmware update of WarpEx is required.

Warp will put the new firmware on WarpEx remotely. To check if a firmware update is required, enter the WarpEx Update menu and the display will tell you. Just push PARA to start the update (takes about 10 seconds).

If the update fails (due to power loss for example), just try again. If it still fails, check your WarpEx connection cable on the back.

PARA (push)
Perform the update

BACK (push)
Return without update

WarpEx already has the appropriate firmware v1

Update anyways?

Cancel   Update! ⊣

Presets

Warp has the ability to load and store presets from its SD-card. It ships with Factory presets and preset packs of selected artists.

Check our website from time to time for **new preset packs** and **artist featured content**:
www.neuzeit-instruments.com/warp

Parameters stored in a preset

GalaXY:	The preset always includes its own copy of a GalaXY.
Spec section:	All parameters
Warp section:	All parameters
Osc & Mix:	All parameters
Modulation:	All parameters, incl. modulation matrix
Settings > WarpEx MIDI:	Voice Mode, Legato

Parameters not stored in a preset

Potentiometer positions
Global tuning
Global settings

Warp remembers its temporary state when turning it off and on again. This includes all menu parameters, global tuning and calibration but also the harmonic spectra in the GalaXY.

Load Preset

Enter this menu to load a preset from the SD-card's /PRESETS folder.

The little arrow points to the last loaded preset

PARA (turn)	PARA (turn)	PARA (turn)
Select option	Select folder or preset	Select preset
PARA (push)	**PARA (push)**	**PARA (push)**
Enter	Enter folder	Enter folder or load preset
	BACK (push)	**BACK (push)**
	Return	Return
	Top right (push)	**Top left (push)**
	Enter Program Change menu	Go one folder back

Load Preset via MIDI Program Change

Warp makes it possible to load presets remotely via MIDI program change message (ProgChg). A ProgChg message contains a number between 1 and 128 that specifies which preset is to be loaded.

Warp allows an unlimited number of presets and also a flexible preset structure in folders on the SD card. It is therefore necessary to assign a program change number to the presets that are to be accessible via ProgChg.

First, turn the PARA encoder onto the desired preset in the Load Preset Browser. Then press the upper right encoder to enter the MIDI ProgChg menu and assign it to one of the 128 slots.

The slot number can be changed by turning the PARA encoder. Press the PARA encoder to insert the preset into the corresponding slot. This may overwrite an existing entry.

Existing entries can also be deleted directly by pressing the top left encoder.

Top left (push)
Clear the selected entry. This is an immediate change that can not be undone.

The new preset name we are about to add

PARA (turn)
Change the program change number's slot

PARA (push)
Save the selected preset into the slot and leave the menu

BACK (push)
Go back

Program change .csv file

Warp saves the assignment of preset to program change number in a .csv file in the SD card's root folder. This is basically a simple text file that can also be edited on the computer. A basic text editor or a spreadsheet program such as Excel or Libre Office Calc is suitable for this.

Note:

There is no need to ever edit this file on the computer, it is just an option. Warp writes a correct csv file automatically from the module.

The .csv file consists of a title line and one additional line per entry. An entry consists of the program change number between 1 and 128 without leading zeros, a comma, and then the path to the preset immediately following without spaces. An additional line is required for each entry. The numbers are expected in ascending order. Duplicates and numbers lower than the predecessor are ignored and deleted by Warp the next time the file is changed.
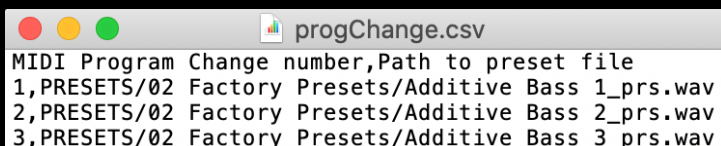
Example csv file in text editor

The same file in Excel.
File > Import > CSV-File > Use comma as delimiter

Save Preset

Enter this menu to save a pre-set to the SD-card's /PRESETS folder.

You can either create a new preset or overwrite an existing one. The new name can be set on the following page.

```
+ CREATE NEW
⇦ Basic
⇦ Bass
⇦ Boom
⇦ Glassy & Mallets
⇦ Lead
⇦ Pads
⇦ SpecialFX
```

We recommend to use the „User" folder for your own presets and keep the other preset pack folders as they are.

Top left (push)
Delete one letter.

Top left (long press):
Longpress: Delete whole name.

Bottom left/right (turn) and PARA (turn)
Change the selected letter

Bottom left/right (push)
Add the selected letter at the cursor position

```
DELETE ◀     CURSOR ↔

Preset_0001█

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
abcdefghijklm
nopqrstuvwxyz
0123456789[]~
_.-+&()

↕ MOVE         MOVE ↔
            SAVE ↵
```

Top right (turn)
Change the cursor position

Top right (push)
Add the selected letter

PARA (push)
Save the Preset file in the PRESETS folder

Rename Preset

Similar to Save Preset, but only the name of the preset file is changed.

Delete Preset

Same menu as Load Preset, but when you select a preset there is a security question if you really want to delete the preset.

PARA (push)
Deletes the file from the SD-card

BACK (push)
Goes back and leaves the file as it is.

```
Really delete?
RobotArp
```

About Warp's preset file format

Warp uses the .wav format for Preset and GalaXY files. The audio content contains the GalaXY whose harmonic spectra have been transformed into 32 x 16 = 512 wavetables and been written one after another into the file. All parameter data is written in the header of the file, using the iXML standard.

This means, that you can actually play Warp's preset files with a regular audio player or use it in the DAW of your choice.

To mark a file as a Preset or GalaXY file, Warp adds the suffix _prs.wav or _glx.wav to the filename. This naming convention is just intended for human readability. If Warp opens a Preset or GalaXY file it looks for the header. If the header is not present, an error message is displayed.

You are a developer, want to (third-)party hard and don't mind lame jokes? Send us an Email!
contact@neuzeit-instruments.com

Sound design - general tips and tricks

We would like to share a few tips for sound design with Warp.

- Start with a Basic preset if you want to have a clear canvas, or load another preset that you want to build upon.

- Overdoing the Warp and Osc FX can make the GalaXY and Spec content irrelevant.

- Parameters and effects' default position should be considered 0% rather than some middle value. Adding a little bit of everything just results in a muddy undefined sound. Decide wisely, if a certain parameter or effect really contributes to your sound design.

- It sure helps to have a vague idea of the sound you want to create. Depending on that, you should either focus more on GalaXY and Spec or on Warp and Osc FX.

- Focus on GalaXY and Spec for sounds that could be classified as one of these: Glassy, digital, thin, detailled, wavetable-morphed. GalaXY and Spec are responsible for Warp's additive synthesis part and can do things beyond everything that is possible with classic analogue synths. You would not necessarily need to use Warp's filters, and be careful with Warp's distortion effects and the Osc FX as they can easily „destroy" a carefully designed GalaXY and Spec filter.

- Focus on Warp and Osc FX for sounds that could be classified as one of these: Rough, fat, distorted, screaming, analogue, AM/FM/PM. Consider choosing „Init with basic shapes" as a starting point for the GalaXY where the four corners correspond to the overtone spectra of Sine, Triangle, Square and Sawtooth waveforms.

- Make sure that all potentiometers have musical expression. In a performance oriented setup you may want to leave Warp's menu diving aside and only use the potentiometers and CV inputs for control. In the menu, consider both, the menu value of a parameter and its potentiometer mapping and make sure the whole potentiometer range is expressive.

- We recommend to follow our Spec and Warp listening tutorials earlier in this manual to fully understand each parameter.

- Design your sound with no CV modulation patched to the module and just use the potentiometers. Consider patching as part of the performance, but a preset should also work without patch cables.

- When designing a monophonic sound (or without WarpEx), use Voice 1 as the most prominent one. When switching to Poly or MPE mode, Voices 2-4 are treated as clones of Voice 1.

- When designing a polyphonic or MPE sound (requires WarpEx), you only have access to Voice 1. But you could also try the sound in Mono mode for non-WarpEx users. To preserve the timbre in a Mono setup, you could simply mute Voices 2-4 or use them to add a subtle sub-base one octave below, or just build a chord. Consider Voices 2-4 as a bonus you get in exchange for being restricted to Mono.

- Although you may not have it patched, give the OMNI input some routing in the modulation matrix. Filter cutoff, Spec zoom or Warp effects are a good blind guess.

- Save your preset in the „User" folder, do not mix up with the other folders.

Performing a firmware update

Warp is a digital module, which means that new functions may be available in the future, which can be loaded onto the module through a firmware update.

The „brain" of Warp is a separate microcontroller board, called „Teensy", which is placed inside the module. The Teensy has a USB port to connect Warp to a computer for a firmware update.

You will need:
- A micro USB cable (provided with the module)
- A computer (Windows, Mac or Linux)
- Something flat non-conductive, e.g. the provided Micro-SD card adaptor.

Step 1

Download the latest Warp firmware file (.ehex) from the link on our website:
www.neuzeit-instruments.com/warp

Step 2

Download the Teensy Loader application for your computer's operating system (Windows, Mac or Linux): **https://www.pjrc.com/teensy/loader.html**
Install and open the application.

Step 3

Turn off your rack, but leave Warp connected to the power bus. Unscrew Warp from your rack and hold it in one hand so you can reach its backside while it is still connected to the power bus board.
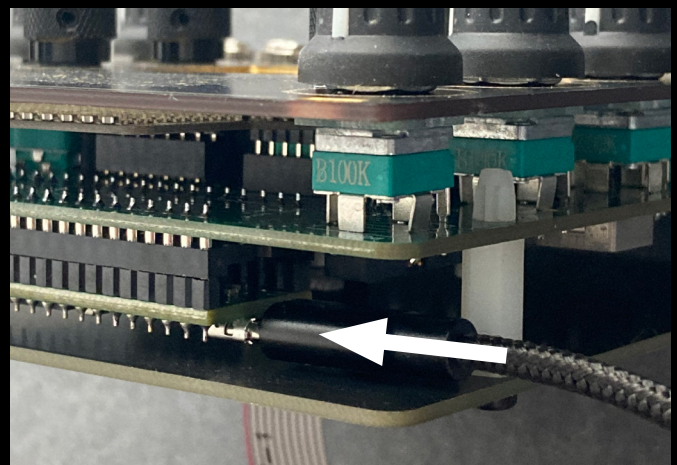
Step 4

Plug the micro USB cable into the Teensy board in side Warp. Then lay Warp back on the rails of your rack (but do not tighten the screws) with the cable sticking out the side of Warp. The Micro-USB jack is accessible as shown in the picture.

USB port orientation
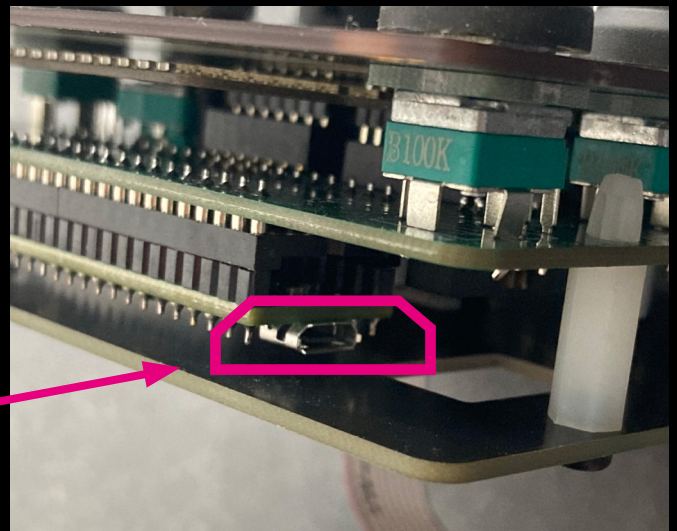
Step 5

Turn on your rack.

Step 6

Drag and drop the previously downloaded Warp firmware file onto the surface of the Teensy Loader application. Alternatively, use the „open HEX file" button.

Step 7

In the Teensy Loader application, enable the „Auto" button. This will allow the application to automatically detect all Teensy boards connected via USB when the upload button on the Teensy board is pressed.
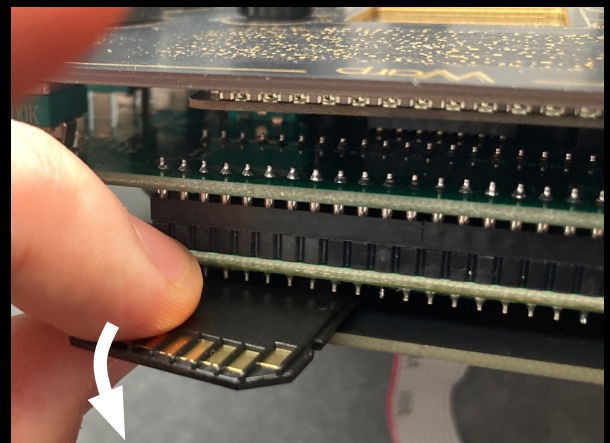

Step 8

Now take Warp back out of the rack with one hand, take the SD-card adaptor in the other hand and use it to press a small button on the Teensy board that is accessible through the back of Warp.
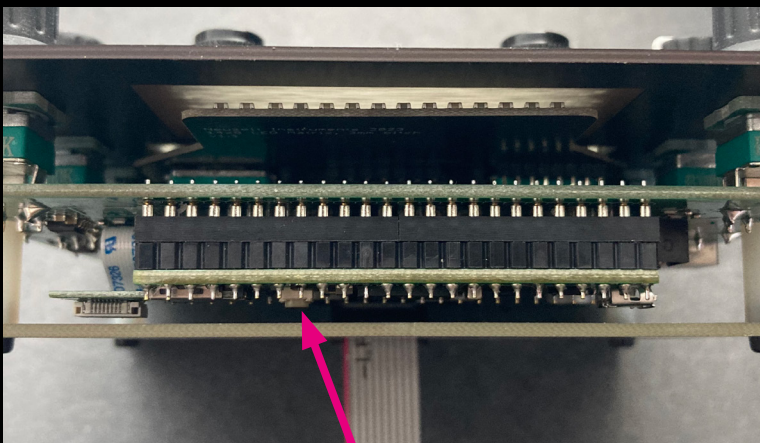
The small white button you need to press

Push down to press the button

The Teensy loader application should automatically detect the Teensy and upload the new firmware. This should only take a few seconds. You can see a progress bar on the application screen.

Step 9

Turn off your rack and disconnect the USB cable from Warp.
Warp might not produce any sound with the new firmware until you turn the rack off and on again.

Step 10

Mount Warp into your rack, tighten the screws and turn the rack back on.
Warp's loading screen will display the new firmware version.

Firmware update troubleshooting

Problem: Warp's Teensy board is not recognized by the Teensy Loader application.

Possible solution: Some USB cables are not able to transmit data if they only contain the wires for charging voltage, but not for data transfer. Use the USB cable shipped with Warp or another Micro USB cable that is capable of data transmission.

Problem: The Teensy Loader application throws an error message

Reason: This happens when you push the button a second time during the upload, or if the USB connection gets lost.

Solution: Just repeat the update until it succeeds. You can not destroy your module due to a failed firmware update.

If anything goes wrong, please send an email to
contact@neuzeit-instruments.com
and we will provide you with further guidance.

Safety Instructions

Please follow the instructions below as this is the only way to ensure proper operation of the module and to protect Neuzeit Instruments' warranty.

Water is deadly to most electrical equipment unless it is made water-proof. This Neuzeit Instruments module is not intended for use in a damp or wet environment. Do not allow liquids or other conductive substances to enter the module. If this does occur, the module must be immediately unplugged, dried, inspected and cleaned by a qualified technician.
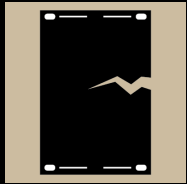
Transport the device carefully, never drop or overturn it. The warranty does not apply to modules with visible damage.

Do not expose the module to temperatures above +50° C or below -20° C. If you have transported the module at extremely low temperatures, let it stand at room temperature for one hour before plugging it in.

The module may only be shipped in its original packaging. Any module sent for return, exchange and/or warranty repair must be in its original packaging. Please retain the original packaging and technical documentation.

This device complies with EU directives and is RoHS compliant manufactured without the use of lead, mercury, cadmium and chromium. Nevertheless, this device is hazardous waste and disposal in household waste is not recommended.

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If you have any questions, please feel free to contact us via email at
contact@neuzeit-instruments.com

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