Odin 2
Synthesizer Plugin

Manual
for version 2.3.0

TheWaveWarden

www.thewavewarden.com

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Chapter 0 Contents

Chapter 1 Introduction

1.1 Install

You can download Odin 2 from `https://www.thewavewarden.com/odin2`. Make sure to download the correct installer for your platform.

Windows:
The install wizard will guide you through the process on Windows systems.

MacOS:
The install wizard gives you the option to install either the VST3 or AudioUnit plugins. Installing the AudioUnit version is only recommended for users of Apples Digital Audio Workstation "Logic".

GNU/Linux
For GNU/Linux based systems you have two options: Debian based operating systems (Debian, Ubuntu, Mint and many more) can use the convenient Debian packages (.deb file) to install Odin. Other distributions have to use the manual installer. Open the README.txt file in the zip for further installation instructions in that case. All installers will install the VST3 version, als well as the LV2 version of Odin2.

> Please note that **Odin 2 is not available as a 32Bit plugin** due to build complications.
> Furthermore, **Odin 2 is not available as a VST2 plugin** due to the ended licensing on behalf of Steinberg Media Technologies.

Adding Odin 2 to a Track

Odin 2 can be added to your track like any other VST3, AudioUnit or LV2 plugin. For details on how to add the plugin in your Digital Audio Workstation, refer to its manual.

1.2 Odin 2: A Mighty God

Odin 2 is a mighty kick-ass semimodular subtractive synthesizer plugin, which is **made for you with love**. Oh, also, it is

Freeware.

Don't let anybody tell you otherwise.

The design approach of Odin 2 lets you choose from a large variety of modules, which can be mixed and matched for virtually endless sonic capabilities. Three Oscillators, three Filters, a dedicated Distortion, four onboard FX, four Envelopes, four LFOs ... the list continues: Modulate tons of parameters with the big-ass Modulation Matrix, use the Arpeggiator and Step Sequencer to generate rhythms and musical ideas, theres Unison, a XY-Pad, you can draw your oscillator waves, or maybe your spectra?

This text is supposed to fit on one page, so I can't really talk about everything Odin 2 has to offer,

but

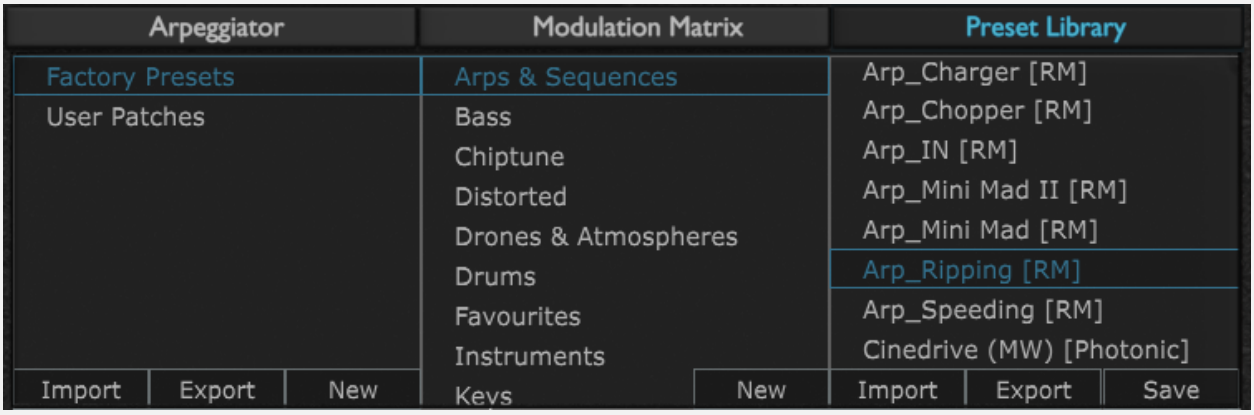
The sonic capabilities of Odin 2 will keep you happy for years to come, so dig right into it and get started!

1.3 Panel Overview

- **A**: The three oscillator slots. See Chapter 2.
- **B**: The three filter slots. See Chapter 3.
- **C**: The amplifier module. See Chapter 4.1.
- **D**: The distortion module. See Chapter 4.2.
- **E**: The FX section: See Chapter 5.
- **F**: The four ADSR Envelopes. See Chapter 6.1
- **G**: The four Low Frequency Oscillators (LFOs). See Chapter 6.2
- **H**: The global controls See Chapter 9
- **I**: The XY-pad section. See Section 6.3
- **J**: The modulation matrix . This space can also be occupied by the Arpeggiator (Chapter 8) and Preset Browser (Section 1.4).

1.4 Saving and Loading Presets

So you just downloaded the synth and want to see what is it capable of or stumbled upon a cool sound which you want to save for later. Both of these are done in the **Preset Library**:



The Preset Browser occupies the same space in the GUI as the Modulation Matrix and the Arpeggiator. If you can't locate the module in the lower right corner of the GUI, press the "Preset Library" button above the modulation matrix:

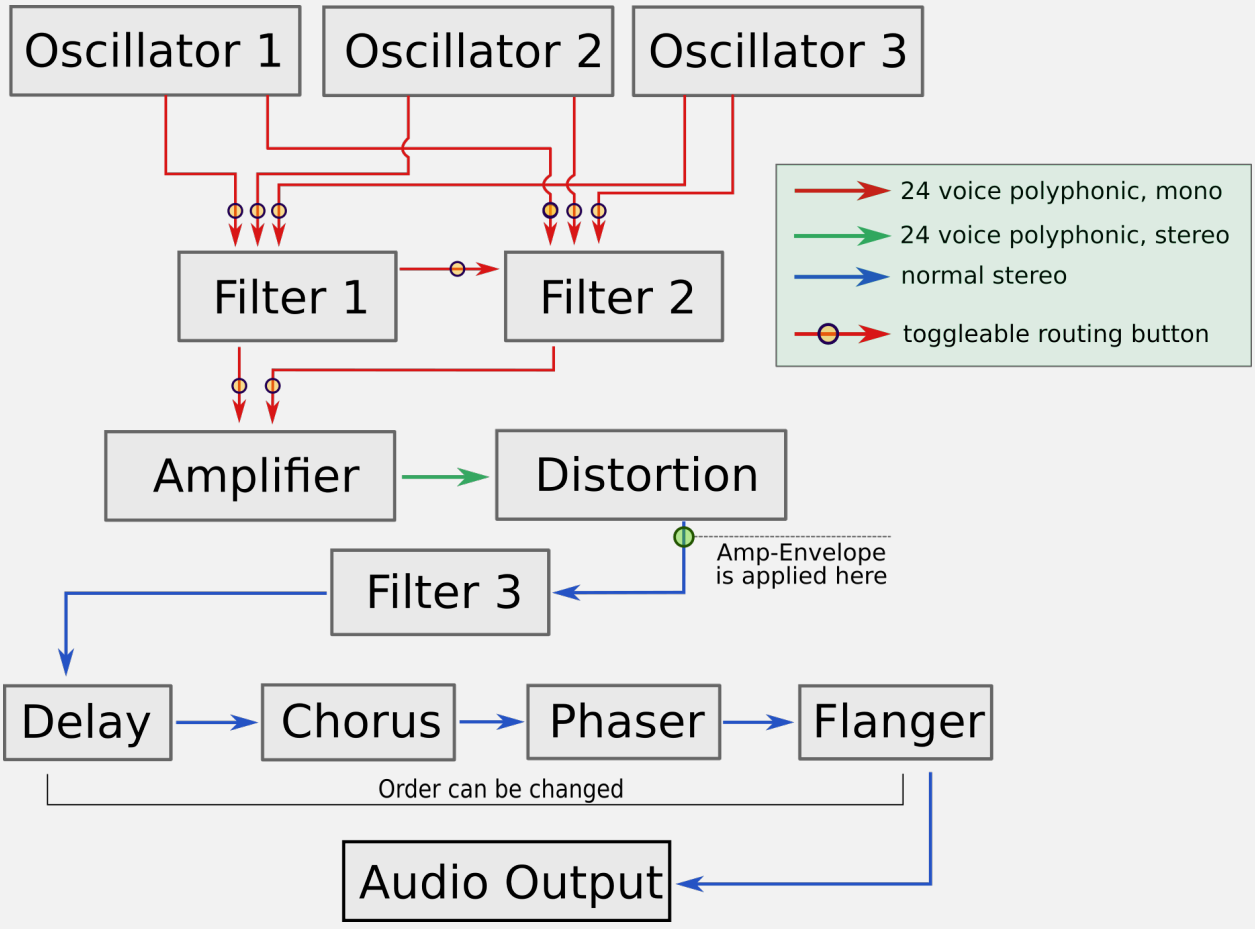
The preset browser is divided into the "Soundbank Selection" (left), the "Category Selection" (mid) and the "Patch Selection" (right).

Loading Presets:
To load a preset, navigate to the desired soundbank and category and click on a preset.

Saving Presets:
To save a preset, navigate to the desired soundbank and category and click the "Save" button in the bottom right corner of the module. A text field will appear, where you can input a name for the preset. Pressing the enter-key or "Save" again will save the preset to the current category.

1.5 Routing

Here's an overview of the internal signal flow inside Odin 2:



The routing buttons are located here on the GUI:

Filter Input Modulatable: ✗ Automatable: ✓

The buttons 1, 2 and 3 toggle the input of Oscillator 1, 2 and 3 into the Filter module. The button F1 is only available on Filter 2 and toggles the input of Filter 1 into Filter 2.

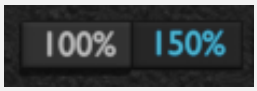
Filter Output Modulatable: ✗ Automatable: ✓

These buttons toggle the output of the respective Filter modules into the Amplifier module.

Per default, Odin 2 is set to **serial processing**: All oscillators are routed into Filter 1, which is routed into Filter 2, which is routed into the Amplifier.
To use **parallel processing**, enable "Filter 1 Output", Disable "Filter 2 Input F1" and input only the desired Oscillators into each Filter module.

1.6 Scaling the Interface

Odin 2 offers the possibility to scale the GUI to 100% (800px × 614px) or 150% (1200px × 921px). To do so, use the selector in the top right corner of the interface:



1.7 Help Inside the Plugin

Maybe the most important feature to know in Odin 2 is the **tooltip button**:

It is located in the top right corner of the GUI. When activated, you can **hover over any parameter in the synth** and it will show you a tooltip, briefly describing its functionality.

Chapter 2 Oscillators

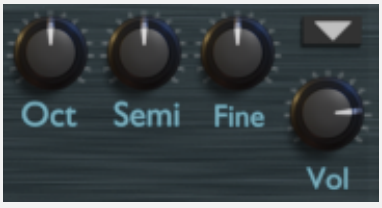
Three oscillators form the basis of sound generation in Odin 2. You can choose from a wide variety of different modules, which are capable of a wide palette of sounds, even without any further processing. Initially, Odin 2 starts out with an Analog Osc in slot 1 and none in slot 2 & 3.

Osc Type Modulatable: ✗ Automatable: ✗

You can change the module being used with the small dropdown button on the top-right of the osc-module:

2.1 Common Parameters

There are some controls which are common to most oscillator modules:



Osc Octave

Modulatable: ✓ Automatable: ✓

Detunes the oscillator in whole octaves.

Osc Semitones

Modulatable: ✓ Automatable: ✓

Detunes the oscillator in semitones.

Osc Finetune

Modulatable: ✓ Automatable: ✓

Detunes the oscillator in cents.

Osc Volume

Modulatable: ✓ Automatable: ✓

Regulates the volume of this oscillator in deciBels. Can be used to shut the oscillator entirely. Modulating this parameter from the modulation matrix with -100 will always shut the sound. Modulating this parameter with $+100$ will raise the sound to 0dB if the current value is smaller than -12dB. If it is bigger than -12dB, it will modulate to +12dB from the current value.

Osc Reset (Rst)

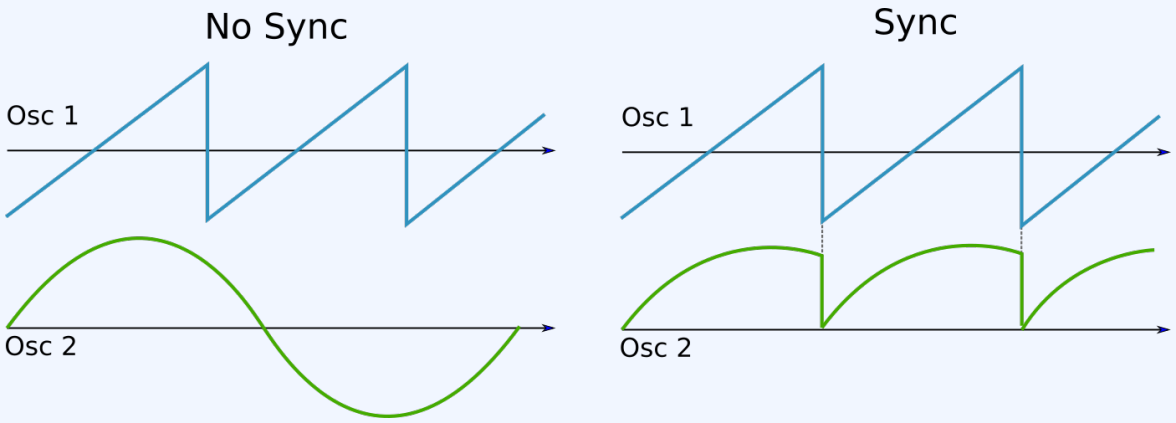
Modulatable: ✗ Automatable: ✓

Resets the waveform to its initial position each time a key is pressed. This is useful to get more consistent sounding notes, for example for tight basslines. If this is turned off, the wave will continue where it ended on the last note.

Osc Sync

Modulatable: ✗ Automatable: ✓

This parameter is only available for Osc 2 & 3. Activating sync will sync this osc to Osc 1. That means each time Osc 1 completes a cycle, this osc is reset to its initial position. The pitch of the oscillator is thereby controlled by Osc 1. This can introduce lots of harmonics, even for soft waveforms like the sine wave.



Internally, any osc with activated sync will use 3x oversampling to prevent aliasing on the hard resets. Additionally, any osc with enabled sync uses a DC-blocking filter to remove constant offsets in the wave.

2.2 Analog Osc

The analog osc aims to emulate the sound of classic analog synthesis. The first obvious choice you have is the waveform:

Analog Waveform

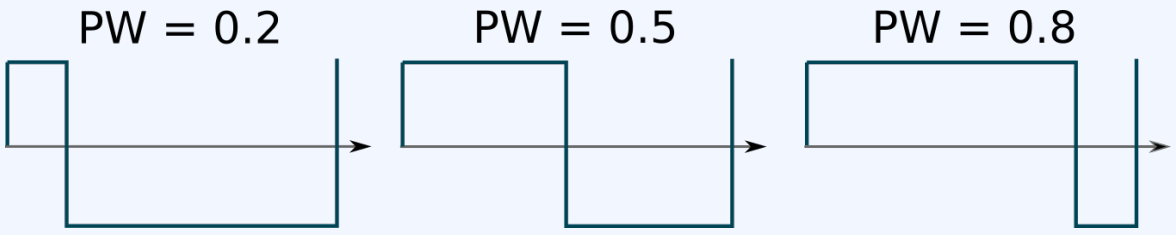
Modulatable: ✗ Automatable: ✓

Sawtooth:
The classic sawtooth wave. It is very rich in harmonics and forms an excellent starting point for a wide variety of sounds. This particular Sawtooth emulates the way analog synthesizers generate saw-waves. The result is a (phase-corrected) ”fat-saw”. This variant doesn’t rise linearly as the icon would suggest, but in a slight curve, providing a different tonal character.
Pulse Wave:
The pulse wave has a thinner sound than the sawtooth, sometimes giving the impression of a ”hollow” sound body being emulated. The pulse still has a lot of harmonics, making it a common alternative to the sawtooth. The width of the pulse can be adjusted, see the next parameter **Pulse Width**.
Triangle:
The triangle wave is much gentler than the saw and pulse waves. It still has a lot of harmonics present though. This wave is well suited for flute like sounds.
Sine:
The purest of all waveforms. The sine wave (by its very definition) has no harmonics at all. The resulting sound is very easy on the ears.

Pulse Width (PW)

Modulatable: ✓ Automatable: ✓

This parameter has no effect if the waveform selected is not a pulse. It shifts the duty cycle of the pulse wave, making it stay longer in the lower section for higher values.



The pulse width control can not be used to shut the sound completely ($PW = 0$ or $PW = 1$), but that can be achieved when modulating via the modulation matrix .

Drift Modulatable: ✗ Automatable: ✓

Analog oscillators tend to not be stable in their frequency. Drift emulates this behavior by randomly shifting the pitch up and down just a little bit over time. For a single osc, the effect is not very apparent, but becomes clear once two oscillators are used.

2.3 Wavetable Osc

The Wavetable Osc allows you to create evolving sounds, which feature more than one waveform. Each of the 35 selectable wavetables consists of four waves itself. You can sweep through these easily by hand or with pre-setup modulation.

Wavetable Modulatable: ✗ Automatable: ✗

Selects which wavetable to be used. A wide variety of sounds is available, starting with analog waveforms, human voice like sounds, additive waves, waveforms taken from instruments and many, many more.

Wavetable Position Modulatable: ✓ Automatable: ✓

Fades through the four waves in the selected wavetable. A value of 0 will give the first wave, 0.333 the second, 0.666 the third and 1 the last wave.

Modulation

Modulatable: ✗ Automatable: ✗

Selects a modulation source, which can be used to modulate the Wavetable Position. Modulation Envelope and LFO1 are selectable. Please note that arbitrary modulation sources can be selected when working with the modulation matrix . This slot is merely for a fast and convenient way to set up modulation.

Amount

Modulatable: ✗ Automatable: ✓

Sets the amount of modulation being used to modify the Wavetable Position. Positive and negative values are possible.

2.4 Multi Osc

The Multi Osc is four oscillators disguised as one. These can be arbitrarily detuned and can even use different waveforms, which results in a thicc, rich sound.

Detune

Modulatable: ✓ Automatable: ✓

Detunes the four sub-oscillators against each other. The detune values are calculated to avoid beating (random phase-cancellation).

Wavetable

Modulatable: ✗ Automatable: ✗

The same as in Wavetable Osc: Selects which wavetable to be used. A wide variety of sounds is available, starting with analog waveforms, human voice like sounds, additive waves, waveforms taken from instruments and many, many more.

Wavetable Position

Modulatable: ✓ Automatable: ✓

The same as in Wavetable Osc: Fades through the four waves in the selected wavetable. A value of 0 will give the first wave, 0.333 the second, 0.666 the third and 1 the last wave.

Wavetable Spread

Modulatable: ✓ Automatable: ✓

Spreads the four sub-oscillators over the wavetable: The first sub-osc wavetable position will be shifted to the left, the last will be shifted to the right. These shifts happen around the value chosen by Wavetable Position.

2.5 Vector Osc

The Vector Osc gives even more options for evolving sounds than the Wavetable Osc. Four freely definable waves can be interpolated in a very intuitive graphic way via an XY-pad.

A, B, C & D Modulatable: ✗ Automatable: ✗

Select the waves to be used. Each of the four letters mark one corner of the XY-pad, as the graphic suggests. Virtually any waveform from the entire synthesizer can be chosen for any of the corners. This also includes any of the drawable waveforms (see Draw Oscillators).
When selecting Draw Osc 1, 2 & 3, the waves you have drawn in osc slots 1, 2 and & 3 respectively are used.

X & Y Modulatable: ✓ Automatable: ✓

Moves the handle over the XY pad. Each of the corners represent the waveform chosen from the A, B, C and D drop down menus. Moving closer to a corner will make the sound more closely relate the waveform of that corner. When being in a corner, the resulting waveform is purely the one selected for that corner. Uses bilinear interpolation to fade through the four tables.

2.6 Chiptune Osc

The Chiptune Osc is an easy way to get nostalgic for your childhood. It aims to emulate the sound of yesteryear while emulating the processing capabilities of a 4-Bit sound chip, like it was used in the Nintendo Entertainment System NES or original Nintendo GameBoy. It also features a simple arpeggiator, with two or three steps being selectable. Whilst being able to produce harmonic sounds, it also features a dedicated chiptune noise module.

Waveform

Modulatable: ✗ Automatable: ✗

Lets you select from a variety of waveforms, like you would typically find on the sound chips of yesteryear. Available are a bunch of pulse waves, a triangle, saw and sine variant. All of these waves are limited to a 4Bit resolution (16 steps) on the Y-axis. On top of these, you can select any of the ChipDraw waves.
To clarify: ChipDraw 1, 2 & 3 refer to the waves you have drawn in osc slots 1, 2 and & 3 respectively. You need to apply changes in the ChipDraw Oscs for the change to take effect (see ChipDraw Osc).

Arpeggiator

Modulatable: ✗ Automatable: ✓

Turns on an internal arpeggiator module, which makes the oscillator jump over predefined semitone values. See the next parameters for specifics.

Arp 1, 2 & 3

Modulatable: ✗ Automatable: ✓

Select the semitones to be played by the arpeggiator module. For the third step to be used, the next parameter Step 3 needs to be active.

Step 3

Modulatable: ✗ Automatable: ✓

Enables the third step in the arpeggiator. When Step 3 is not active, the arpeggiator will only loop between the first two steps.

Speed

Modulatable: ✓ Automatable: ✓

Sets the speed of the arpeggiator in Hz.

Noise

Modulatable: ✗ Automatable: ✓

Enabling Noise will change stop the output of the selected waveform. Instead, the oscillator will generate a random value to be output each time a cycle is complete. This creates a classic noise effect like it was used on early game consoles. Internally, 3x oversampling is used to remove aliasing on the jumps between values. Note that this noise is dependent on the note being played and has a perceived pitch. It is also possible to use the noise module while the Chiptune arpeggiator is enabled.

2.7 FM Osc

The FM Osc is a convenient way to set up Frequency Modulation, or FM. The basic idea behind FM is that you have two oscillators: The carrier and the modulator. The modulator is solely used as a modulation source for the frequency of the carrier. The carrier is the oscillator you will actually hear. While you can set up FM via the modulation matrix as well, the FM osc is the easy way to do it. The theory behind FM is very well documented in other literature, for example on Wikipedia.
FM will usually produce a metallic, bell-like sound.

Waveform

Modulatable: ✗ Automatable: ✗

Both carrier and modulator can be assigned a waveform. This will be the actual waveform that the sub-osc is using. Virtually any waveform from the entire synthesizer can be chosen. This also includes any of the (see Draw Oscillators).
When selecting Draw Osc 1, 2 & 3, the waves you have drawn in osc slots 1, 2 and & 3 respectively are used.

Ratio Modulatable: ✓ Automatable: ✗

The numbers above/below the waveform describe the base-frequency relation modulator and carrier have to one another. The frequency of the modulator will always be

$$f_{mod} = f_{car} \frac{Ratio_{mod}}{Ratio_{car}} \tag{2.1}$$

So for example using the values $Ratio_{mod} = 2$ and $Ratio_{mod} = 1$ will put the modulator one octave (double the frequency) above the carrier. The base freq of the carrier is the pitch played for the note.
Using fractions which are not reducible to "simple" fractions, like $\frac{11}{7}$ will yield wilder results than "simple" ones like $\frac{1}{2}$.
Note that modulating these values from the modulation matrix , allows for fractions which are non-rational (continuous modulation).

FM Modulatable: ✓ Automatable: ✓

This is where the magic happens: The FM amount controls how deep the modulator modulates the frequency of the carrier. A value of zero will show no modulation at all, so the carrier is playing like a normal osc. When increasing the amount, the sound gets more and more metallic. The range of this parameter can be extended over its natural range via the modulation matrix .

2.8 PM Osc

PM or Phase Modulation, is closely related to FM or Frequency Modulation. Like the FM Osc, it features a modulator and a carrier oscillator, but this time the modulator

modulates the phase of the carrier. When only using sine-waves, the frequency contents generated by FM and PM are indistinguishable.

Waveform Modulatable: ✗ Automatable: ✗

Both carrier and modulator can be assigned a waveform. This will be the actual waveform that the sub-osc is using. Virtually any waveform from the entire synthesizer can be chosen. This also includes any of the (see Draw Oscillators).
When selecting Draw Osc 1, 2 & 3, the waves you have drawn in osc slots 1, 2 and & 3 respectively are used.

Ratio Modulatable: ✓ Automatable: ✗

The numbers above/below the waveform describe the base-frequency relation modulator and carrier have to one another. The frequency of the modulator will always be

$$f_{mod} = f_{car} \frac{Ratio_{mod}}{Ratio_{car}} \tag{2.2}$$

So for example using the values $Ratio_{mod} = 2$ and $Ratio_{mod} = 1$ will put the modulator one octave (double the frequency) above the carrier. The base freq of the carrier is the pitch played for the note.
Using fractions which are not reducible to "simple" fractions, like $\frac{11}{7}$ will yield wilder results than "simple" ones like $\frac{1}{2}$.
Note that modulating these values from the modulation matrix , allows for fractions which are non-rational (continuous modulation).

PM Modulatable: ✓ Automatable: ✓

The PM amount controls how deep the modulator modulates the phase of the carrier. A value of zero will show no modulation at all, so the carrier is playing like a normal osc. The range of this parameter can be extended over its natural range via the modulation matrix .

2.9 Noise Osc

The Noise Osc provides a source of noise in Odin 2. The initial noise generation produces white noise. The noise can be further preprocessed by the included lowpass and highpass filters.

Highpass Modulatable: ✓ Automatable: ✓

Sets the cutoff frequency for the included highpass filter. The filter is a first order (6dB / Oct) virtual analog highpass filter.

Lowpass Modulatable: ✓ Automatable: ✓

Sets the cutoff frequency for the included lowpass filter. The filter is a first order (6dB / Oct) virtual analog lowpass filter.

2.10 WaveDraw Osc

The WaveDraw Osc lets you experiment with waveforms by letting you draw them yourself.

> The changes you make to the waveform will have no effect until you press the apply button on the bottom-right of the oscillator. If this button is red, then there are still unapplied changes to the waveform.

The drawn waveform is sampled using 200 discrete steps. When you press the apply button, the waveform is processed into the spectral domain to create a usable wavetable.

2.11 ChipDraw Osc

The ChipDraw Osc lets you draw a custom ChipDraw waveform. It resembles the capabilities of the ”custom waveform” on an Nintendo Entertainment System (NES) sound system. The waveform consists of 32 steps in horizontal direction, which can be offset to 16 values (4Bit) in vertical direction.

> The changes you make to the waveform will have no effect until you press the apply button on the bottom-right of the oscillator. If this button is red, then there are still unapplied changes to the waveform.

When you press the apply button, the waveform is processed into the spectral domain to create a usable wavetable.

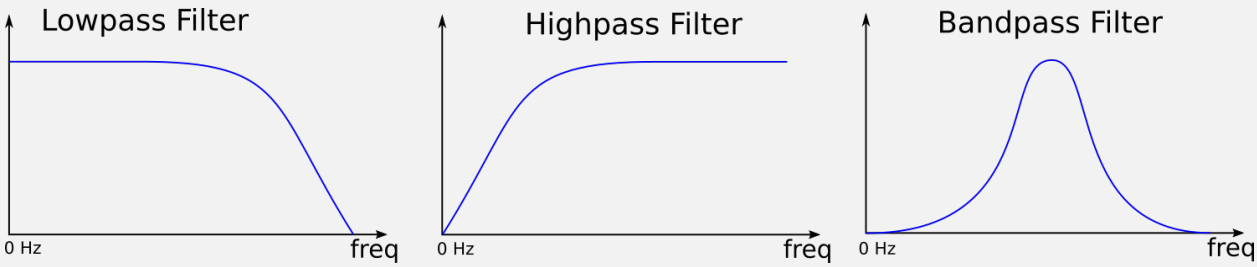
2.12 SpecDraw Osc

The SpecDraw Osc opens the sonic capabilities with some **additive synthesis**. Unlike subtractive synthesis, where you filter frequencies from harmonically rich waves, additive synthesis lets you build a sound by stacking up individual harmonics. The n-th harmonic is a sine wave which has n-times the frequency of the base note. The SpecDraw Osc lets you draw the amplitude of these sine waves. The left-most bar represents the fundamental. In the initial state, only this bar ist present, resulting in an overall sine wave osc. As you bring more overtones, the sound gets richer. Additive synthesis is capable of creating timbres which are not possible with subtractive synthesis.

> The changes you make to the waveform will have no effect until you press the apply button on the bottom-right of the oscillator. If this button is red, then there are still unapplied changes to the waveform.

Chapter 3 Filters

Signal filters are one of the basic tools to shape your sound in subtractive synthesis. While the oscillators in Odin 2 are already capable of a wide array of sounds, unprocessed oscillators usually sound very sharp and not pleasing to the ears. So what is a filter? A filter selectively removes frequencies from the spectrum, usually with some dials for the user to control the roll-off. Filters can be characterized by their frequency response, which tells us which frequencies are being attenuated or boosted:



Odin 2 has three slots for filters which can be filled with a extensive selection of modules to shape your sound. A wide array of high quality virtual analog filter emulations is available, which emulate various analog filter circuits from synthesizer history.
TODO poly vs stereo.

Filter Type Modulatable: ✗ Automatable: ✗

To change the filter module, use the dropdown to the top-right of the filter module:

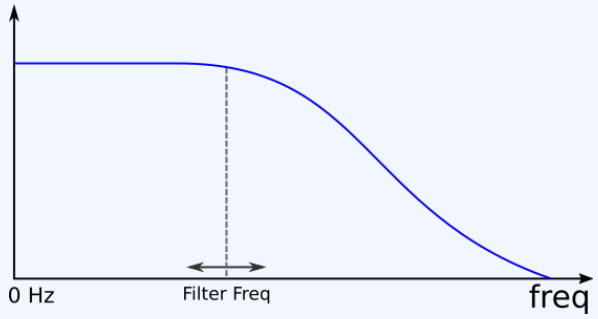
3.1 Common Controls

Some of the controls are shared among most filter modules:

Filter Frequency

Modulatable: ✓ Automatable: ✓

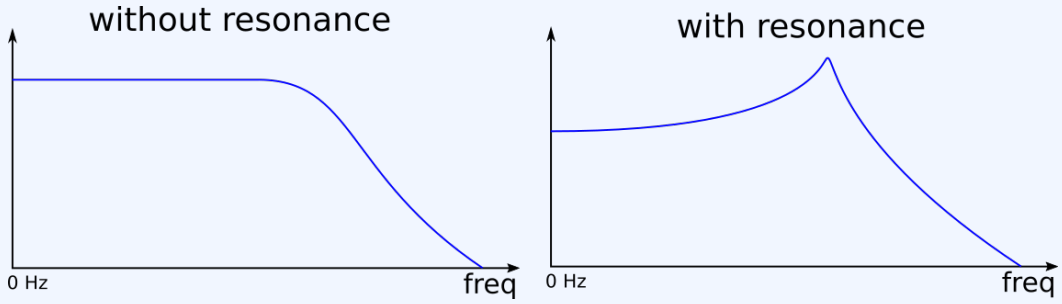
Controls the cutoff point of the filter. The frequency value marks the point where the frequency is attenuated by 3dB.



Filter Resonance

Modulatable: ✓ Automatable: ✓

Increasing resonance creates a peak in the spectrum at the position of the filter cutoff.



Note also that the frequencies which were previously unaffected by the filter are being attenuated by the resonance parameter.
None of the filters in Odin 2 are capable of self-oscillation for the sake of your ears and speakers.

Filter Velocity (Vel)

Modulatable: ✓ Automatable: ✓

Adds velocity from MIDI-Notes to the filter frequency. This allows for expressive play, as harder key-hits move the filter freq up. Note that the value is added on top of the current value, so to achieve a similar resulting timbre, you might need to lower the filter frequency accordingly.

Filter Envelope (Env)

Modulatable: ✓ Automatable: ✓

Controls the amount of Filter Envelope which is applied to the filter frequency. To see how the Filter Envelope itself is operated, see section 6.1.

Filter Keyboard (Kbd)

Modulatable: ✓ Automatable: ✓

Controls how much the MIDI-note is put on top of the filter frequency. Increasing this value makes the filter open up more for higher notes. This allows for more consistent notes across the keyboard, since higher notes might need higher filter freqs as well. Note that the value is added on top of the current value, so to achieve a similar resulting timbre, you might need to lower the filter frequency accordingly.

Filter Gain

Modulatable: ✓ Automatable: ✓

Regulates the volume of this filter in deciBels. Can be used to shut the filter entirely. Modulating this parameter from the modulation matrix with -100 will always shut the sound. Modulating this parameter with $+100$ will raise the sound to 0dB if the current value is smaller than -12dB. If it is bigger than -12dB, it will modulate to +12dB from the current value.

Filter Saturation Modulatable: ✓ Automatable: ✓

Introduces a slight distortion by shaping the signal with a hyperbolic tangent function. Depending on the filter module being used, the saturation stage is in a different position of the signal loop, yielding different results.

3.2 Lowpass, Bandpass, Highpass

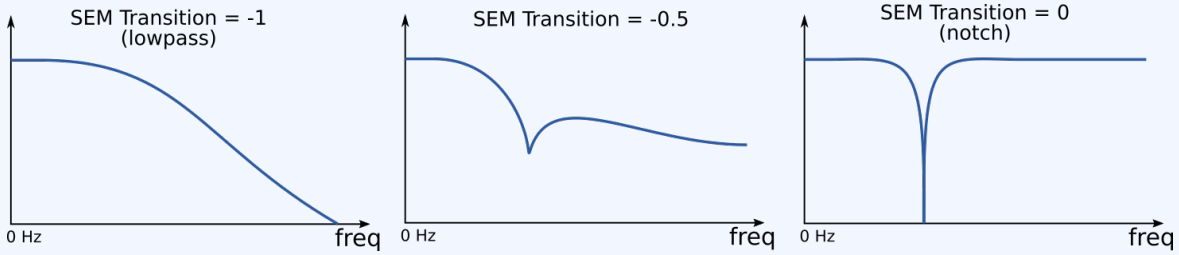
The staples of sound-design in Odin 2. These filters are virtual analog emulations of a certain, famous **ladder filter** which has had a big impact in the history of synthesizers. Each of these filters is available in a 12dB/Oct and a 24dB/Oct variant. These values determine the slope of the filter roll-off. The 24dB/Oct variants filter more frequencies than the 12dB/Oct counterparts.

3.3 SEM-12

Another emulation of a classic synthesizer filter. This filter has the specialty of being able to shift between a lowpass and a highpass filter, with a notch-filter in between. The filter slope of this filter is 12dB/Oct.

SEM Transition Modulatable: ✓ Automatable: ✓

Fades from a lowpass filter over a notch filter to a highpass filter. This allows for special filter variants which still leave some of the frequencies that were filtered before.



3.4 Diode Ladder

The Diode Ladder is a virtual analog emulation of another classic analog synthesizer filter. Its analog pendant was originally developed to work around a patent on the well established ladder filter. While still being 24dB/Oct, the characteristic of this filter is said to be more aggressive and wild compared to the classic ladder, especially when invoking resonance.

3.5 KRG-35 LP / HP

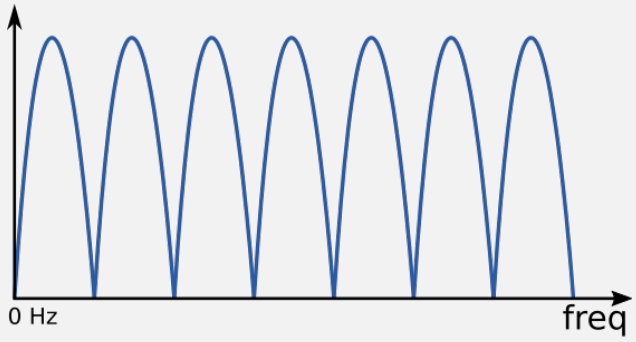
Yet another virtual analog emulation of one of the legendary analog filters of the past. This filter comes in a lowpass and highpass variant. Cranking up the resonance on these filters reveals a dirty, aggressive sound. Note that while the filters are named KRG-35, their slope is 12dB/Oct.

3.6 Comb Filter

A comb filter is essentially a tuned delay module. The input signal fed into a delay-line, which echos the sound back after a set amount of time. The delay time is the inverse of the filter frequency:

$$t_{delay} = \frac{1}{f_{freq}} \tag{3.1}$$

The frequency response of this filter usually resembles the shape of a hair-comb, hence the name.



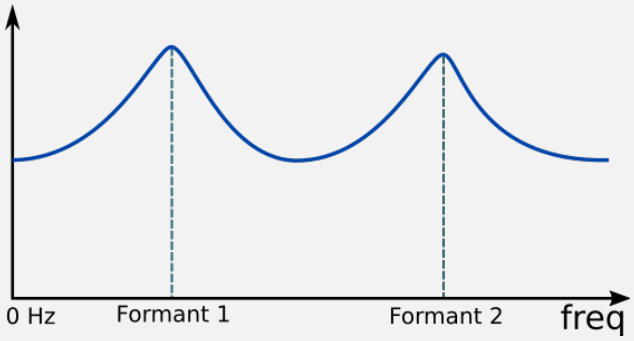
The resonance parameter for the Comb Filter controls how much of the delayed signal is fed back into the delay line again, creating a feedback loop.
Comb filters can sound from subtle to metallic. When automating or modulating the frequency with high resonance values, a psychedelic smearing effect can be produced.

Comb Polarity (+/-) Modulatable: ✗ Automatable: ✓

Controls whether the insertion of the signal into the delay line is positive (+) or inverted (-). This changes the frequency behaviour. Inverted operation tends to eliminate deep frequencies.

3.7 Formant Filter

The Formant Filter tries to emulate vowels as they are produced in human speech. A tone is perceived as a vowel if two characteristic frequencies are dominant. These are called formants. The Formant Filter emulates this by using a combination of two resonator filters, which increase the frequencies around the two formants.



The Formant Filter allows you to choose two vowels and freely move the formant peaks between the according formant peaks.

Vowel 1 & 2 Modulatable: ✗ Automatable: ✗

Select the vowels to the left and right of the transition. Selectable vowels are: A, E, I, O, U, Ä, Ö, Ü

Formant Transition Modulatable: ✓ Automatable: ✓

Transition between the two selected vowels. The transition is not a simple interpolation of the two vowel sounds, but actually moves the resonant formant peaks in the spectrum from one vowel to the next.
The parameters Filter Velocity and Filter Envelope are applied to this parameter for the formant filter.

3.8 Ring Modulator

The ring modulator is an oscillator disguised as a filter. The function of this module is to multiply the input signal with an internal sine-oscillator. This is formerly known as amplitude modulation.

RingMod Freq Modulatable: ✓ Automatable: ✓

Controls the frequency of the internal oscillator.

RingMod Amount Modulatable: ✓ Automatable: ✓

Controls the amount of ringmod to be applied. This interpolates between the input signal and the processed signal, effectively working like a Dry/Wet control.

Chapter 4 Amplifier & Distortion

The Amplifier and Distortion sections form the only parts in the signal flow in Odin 2 which are both polyphonic and stereo.

4.1 Amplifier

The amplifier section plays an important gain-staging role in Odin 2. The sound can be boosted or attenuated, as well as panned.

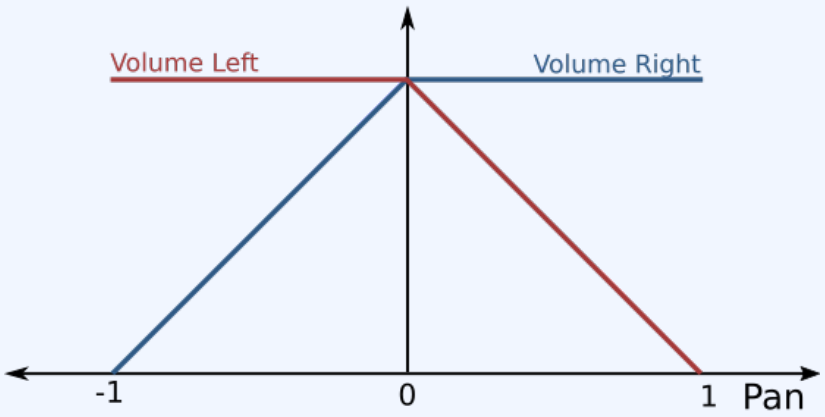
Amp Gain Modulatable: ✓ Automatable: ✓

Changes the volume in in deciBels. Can be used to shut the sound entirely. Modulating this parameter from the modulation matrix with -100 will always shut the sound. Modulating this parameter with $+100$ will raise the sound to 0dB if the current value is smaller than -12dB. If it is bigger than -12dB, it will modulate to +12dB from the current value.

Amp Pan

Modulatable: ✓ Automatable: ✓

Pan or Panorama can be used to move the sound over the stereo field. The default value of zero will leave the sound centered. Moving the pan towards -1 will attenuate the right stereo channel, moving towards 1 does the same for the left channel.



Amp Velocity

Modulatable: ✗ Automatable: ✓

Makes the Amplifier gain sensible to the MIDI-Velocity. This allows for expressive play, where harder notes produce louder sounds. Increasing this value lowers the default gain of the amp, such that a MIDI-note with maximum velocity (127) will bring the level back to its previous level.

Please note that the Amp Envelope is not applied between the Amplifier and Distortion section, like the routing would suggest. The Amp Envelope is applied **after the Distortion section**.

4.2 Distortion

The Distortion module is capable of distorting the sound by various characteristic distortion functions. All the distortion types used in this section are threshold based: Once the wave surpasses a predefined value (in positive or negative direction), the processing will apply. Internally, 3x oversampling is used to prevent aliasing from the sharp cuts made to the waveform.

Distortion On

Modulatable: ✗ Automatable: ✓

Turns the Distortion module on or off.

Boost

Modulatable: ✓ Automatable: ✓

Boosts the gain of the incoming wave, making it surpass the internal threshold easier.

Distortion DryWet

Modulatable: ✓ Automatable: ✓

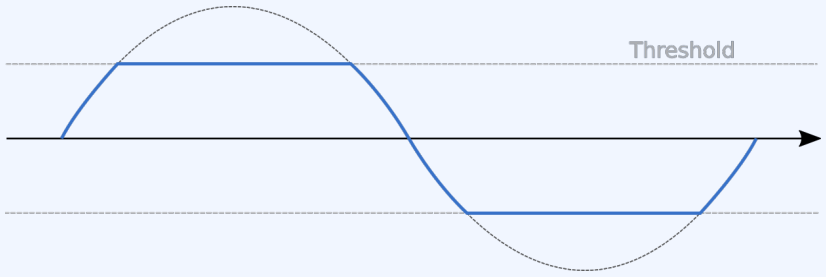
Interpolates the processed and unprocessed signals, thereby controlling the amount of distortion applied to the sound.

Distortion Algorithm

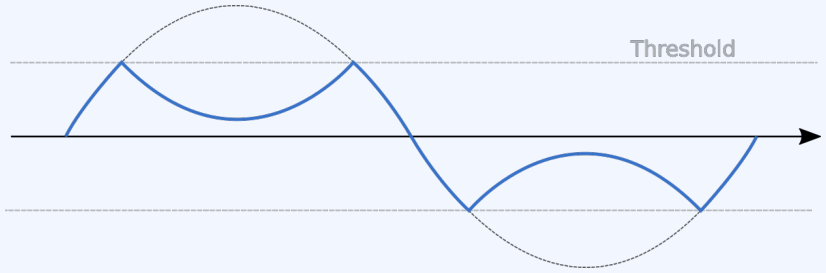
Modulatable: ✗ Automatable: ✗

Selects which distortion algorithm is used. The options are:

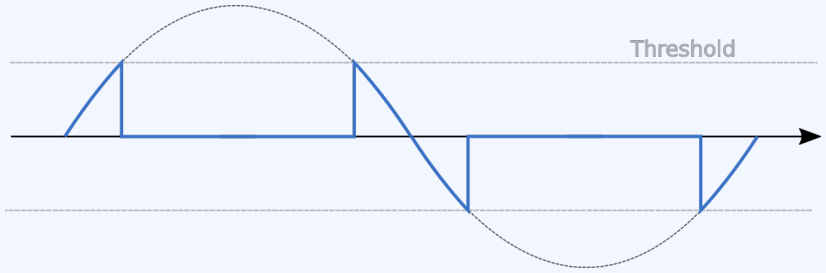
Clamp: Clamps the signal once it surpasses the threshold.



Fold: Folds the wave over once it surpasses the threshold. If the folded wave hits the threshold on the other side, it will be folded again (and so on). Produces more harmonic content than the Clamp algorithm.



Zero: Pulls the wave to zero once it surpasses the threshold. The strongest of the available distortion algorithms.



Chapter 5 FX

Odin 2 comes with four internal FX modules: **Delay, Chorus, Phaser** and **Flanger**.

The buttons on top of the FX modules serve multiple purposes:

Clicking the corresponding name of the module reveals the corresponding module. The buttons below the module name are used to turn enable or disable the module. You can also **change the order of the modules**, by drag'n'dropping their name handles to the left or right.

FX On Modulatable: ✗ Automatable: ✓

Use the buttons below the module name to turn the FX module on or off. All modules can be used at the same time.

FX Order

Modulatable: ✗ Automatable: ✗

Drag'n'drop the FX module handles to change the order of the FX. The algorithms are calculated in series from left to right.

5.1 Delay

A delay is a module capable of producing an 'echo' effect: The signal is fed into a delay-line, which outputs the signal again after a set amount of time again. The output of the delay line can also be fed back in, allowing a chain of attenuating echos. By controlling the delay time and feeback parameters, a wide variety of effects can be achieved. The Delay module in Odin 2 goes a step further and offers several additional features.

Delay Time

Modulatable: ✓ Automatable: ✓

Controls the time the delay line takes to output the sound again. Depending on the parameter "Delay Sync", this is either a dial for continuous values in Hz, or a custom selector to sync the time to the beat. This selector allows for arbitrary fractions of the current host BPM, for example 5/16th notes:

Delay Feedback

Modulatable: ✓ Automatable: ✓

Controls how much of the output of the delay line is fed back in again. If feedback is zero, only one echo will be audible. If feedback is one, an infinite series of exact copies of sound will be output. Everything inbetween makes for slowly attenuating echos.

Delay Sync

Modulatable: ✗ Automatable: ✓

Controls whether the Delay Time is set by a knob in Hz or via the sync-time selector, syncing it to the host BPM.

Delay PingPong

Modulatable: ✗ Automatable: ✓

Enabling PingPong will make the left and right stereo delay lines crossfeed: The output of the left line is fed into the right line and vice versa.
The initial input into the delay lines is mixed down to a mono signal and then fed into the left delay line only. The dry signal remains in the center of the stereo field.

Delay Highpass (HP)

Modulatable: ✓ Automatable: ✓

The processed signal in the Delay module is filtered through a 6dB/Oct high-pass filter. The Delay Highpass parameter controls the cutoff of this internal filter. This is great for removing the muddiness that deep frequencies can produce in a delay module.
Note that the highpass filter is not applied inside, but after the feedback loop, i.e. consecutive echos do not get filtered further more as they are processed again.

Ducking

Modulatable: ✗ Automatable: ✓

Ducking attenuates the output of the delayed signal if an input signal is present. This is great for decluttering sections where the delayed signal interferes with the unprocessed signal.

Unlike the other FX modules, the Delay features a separate Dry and Wet control to allow for easier adjustments of processed and unprocessed signals individually.

Delay Dry Modulatable: ✓ Automatable: ✓

Controls how much unprocessed signal is output by the Delay.

Delay Wet Modulatable: ✓ Automatable: ✓

Controls how much processed signal is output by the Delay.

5.2 Chorus

The Chorus module is a delay based effect capable of thickening sounds. The generated sound resembles that of a slightly detuned ensemble, hence the name chorus. Internally, the Chorus module uses a delay line, which is read from at two diferent positions. The delay times are modulated by an internal Low Frequency Oscillator (LFO). This slightly detunes the result resulting in the Chorus sound. The LFOs for the left and right channel are phase-offset by 90° to spread the sound in the stereo field.

Chorus Rate Modulatable: ✓ Automatable: ✓

Controls the speed of the internal LFO. Depending on the parameter ”Chorus Sync”, this is either a dial for continuous values in Hz, or a custom selector to sync the time to the beat. This selector allows for arbitrary fractions of the current host BPM, for example 5/16th notes:

Chorus Sync Modulatable: ✗ Automatable: ✓

Controls whether the Chorus Rate is set by a knob in Hz or via the sync-time selector, syncing it to the host BPM.

Chorus Modulation Modulatable: ✓ Automatable: ✓

Controls how much the internal LFO modulates the two delay times. Exaggerates the detune effect.

Chorus Feedback Modulatable: ✓ Automatable: ✓

Controls how much of the output of the delay line is fed back in again. Pronounces the effect of the Chorus a bit more.

Chorus DryWet Modulatable: ✓ Automatable: ✓

Interpolates the processed and unprocessed signals, thereby controlling the strength of the effect.

5.3 Phaser

The phaser module introduces movement to the sound by applying a subtle ”windy” character. The internal structure consists of a series of allpass filters: These filters do not alter the amplitude like the filters from Chapter 3, but only shifts the phase of some frequencies. By adding the phase-shifted signal back onto the original signal, some of

the frequencies get boosted, attenuated or eliminated entirely via phase-cancellation. The characteristic of the allpass-filters is continuously modulated by an internal Low Frequency Oscillator (LFO), which makes for the movemnet in the sound. The LFOs for the left and right channel are phase-offset by 90° to spread the sound in the stereo field.

Phaser Rate

Modulatable: ✓ Automatable: ✓

Controls the speed of the internal LFO. Depending on the parameter "Phaser Sync", this is either a dial for continuous values in Hz, or a custom selector to sync the time to the beat. This selector allows for arbitrary fractions of the current host BPM, for example 5/16th notes:

Phaser Sync

Modulatable: ✗ Automatable: ✓

Controls whether the Phaser Rate is set by a knob in Hz or via the sync-time selector, syncing it to the host BPM.

Phaser Modulation

Modulatable: ✓ Automatable: ✓

Controls how much the internal LFO modulates the internal allpass filters.

Phaser Feedback

Modulatable: ✓ Automatable: ✓

An extra feedback stage, which feeds the output signal into the input again.

Phaser Freq

Modulatable: ✓ Automatable: ✓

Shifts the base frequency of the internal allpass filters, thereby altering the characteristic of the effect.

Phaser DryWet Modulatable: ✓ Automatable: ✓

Controls how much of the phase-shifted signal is added to the input signal, thereby controling the strength of the effect.

5.4 Flanger

A Flanger is a modulated comb filter. The signal is fed into a delay line and mixed with the input signal after a small echo. The timing of this effect is modulated by an internal Low Frequency Oscillator (LFO). Additionally, the output of the delay line can be fed in again via the Feedback parameter, to allow for a continuous stream of echoes. The delay times for Comb Filters and Flangers is very short, usually below 50ms.

Flanger Rate Modulatable: ✓ Automatable: ✓

Controls the speed of the internal LFO. Depending on the parameter ”Flanger Sync”, this is either a dial for continuous values in Hz, or a custom selector to sync the time to the beat. This selector allows for arbitrary fractions of the current host BPM, for example 5/16th notes:

Flanger Sync Modulatable: ✗ Automatable: ✓

Controls whether the Flanger Rate is set by a knob in Hz or via the sync-time selector, syncing it to the host BPM.

Flanger Modulation Modulatable: ✓ Automatable: ✓

Controls how much the internal LFO modulates the delay time.

Flanger Feedback Modulatable: ✓ Automatable: ✓

Controls how much of the output of the delay line is fed back in again. Creates a metallic smearing effect for big values. This parameter can be positive or negative allowing for positive and negative comb operation.

Flanger DryWet Modulatable: ✓ Automatable: ✓

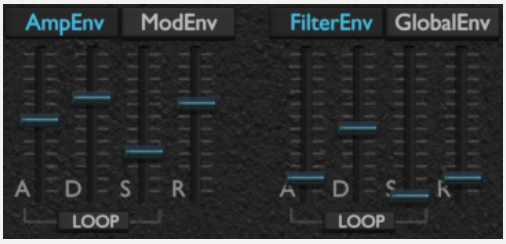
Interpolates the processed and unprocessed signals, thereby controlling the strength of the effect.

Chapter 6 Modulators

The previous chapters wrote about the audio generators and manipulators. This section will take a look at some useful modules which are used to modulate parameters within Odin 2.
Some of the modulators have hardwired functionalities in the synthesizer. However, the true potential of these (and the entire synth, really) lies in applying modulation from the modulation matrix .

6.1 ADSR Envelopes

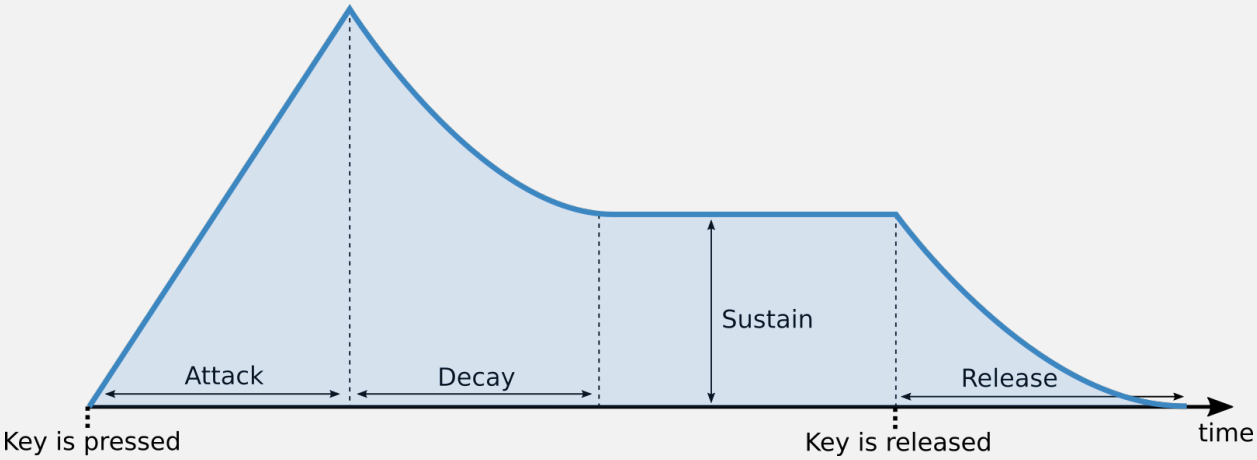
An ADSR Envelope provides a handy way of setting up a wide variety of curves like they can be observed in the timbre changes of physical instruments. ADSR Envelopes follow two basic signals: MIDI note-on and MIDI note-off. Depending on these, a curve is produced based on the four parameters **Attack, Decay, Sustain** and **Release**.
Odin 2 provides four of these Envelopes:



The **Amp Envelope** is hardwired to control the volume curve of the voice. This effect is not applied in the actual Amplifier module, but after the Distortion section (see the routing graphic in Section 1.5). Note that the Amp Envelope can still be used as a freely assignable modulation source in the modulation matrix . This Envelope is calculated for each voice independently.
The **Filter Envelope** is hardwired to modulate the frequencies of the various Filter modules in Odin 2. For this to take effect, the parameter "Filter Env" (see Section 3) has

to be enabled. The modulation by this envelope can be in either positive or negative direction. This Envelope is calculated for each voice independently.
The **Mod Envelope** is a freely assignable modulation source. This Envelope is calculated for each voice independently.
The **Global Envelope** is different from the other three Envelopes in that it exists only once for all voices. This can come in handy when you want the modulation not to diverge between voices.
To switch between the different Envelope modules, use their handles on top of the section:

Two envelopes are paired to occupy the same space. To access the currently not visible Envelope, simply click on its name.
The following graphic shows the structure of an ADSR envelope:



Attack

Modulatable: ✓ Automatable: ✓

The Attack determines the time the Envelope takes from the start to the first peak.
When playing the synth in Legato mode (see Section 9.1), the attack section will start from the last value the Envelope from the previous voice produced. No matter the start height, the slope of the Attack will always be the same as if it started from zero.
Using really short Attack times can introduce clicks into the sound, so it is advisable to have at least some attack for most situations.
Note that unlike the Decay and Release sections, the Attack follows a linear curvature.

Decay

Modulatable: ✓ Automatable: ✓

The Decay controls the time the Envelope will take to fall to the sustain value after the Attack reached its highest point. This curve will always start at the internal value one, and will always fall to the value specified by the Sustain parameter.
The Decay section follows an exponential falling curvature.

Sustain

Modulatable: ✓ Automatable: ✓

The Sustain determines the level that the Evelope will fall to after the Decay section. Note that the Sustain section will be active after Decay finished for as long as the MIDI-key is not released.

Release

Modulatable: ✓ Automatable: ✓

The Release controls the time the Envelope will take to fall to zero after the MIDI-key was released. No matter what stage is currently active, once the key is released, the Envelope will jump right to the Release section immediately. The starting point for the falling curve will always be the last value that the Envelope produced. A finished Release section of the Amp Envelope gives the synthesizer the signal to end processing for this voice.
The Release section follows an exponential falling curvature.

ADSR Loop

Modulatable: ✗ Automatable: ✓

The loop parameter gives the option to start the Attack section again after the Decay is finished, thereby creating an LFO-type modulation source.

6.2 Low Frequency Oscillators (LFOs)

A Low Frequency Oscillator (LFO) is an Oscillator module which operates at frequencies below the human hearing range. They are therefore not suited for audio signal generation, but play a crucial role in slowly modulating parameters over time in synthesizers. Like with all Oscillators in Odin 2, waveforms and operation speeds can be controlled. Odin 2 has four LFO modules: LFO1, 2 and 3 are available per voice. The fourth GlobalLFO exists only once for all voices. It can therefore be used to modulate all voices identically. The LFOs are also capable to act as a Sample & Hold module. See the parameter "LFO Waveform" for details on how to activate it.
To switch between the different LFO modules, use their handles on top of the section:

Two LFOs are paired to occupy the same space. To access the one currently not visible , simply click on its name.

LFO Freq

Modulatable: ✓ Automatable: ✓

Controls the speed of the oscillator. Depending on the parameter "LFO Sync", this is either a dial for continuous values in Hz, or a custom selector to sync the time to the beat. This selector allows for arbitrary fractions of the current host BPM, for example 3/16th notes:

Please note that a synced LFO does not keep track of the playback position of the DAW. The oscillator is still free-running, but the frequency is derived from host-BPM.

LFO Sync

Modulatable: ✗ Automatable: ✓

Controls whether the LFO Freq is set by a knob in Hz or via the sync-time selector, syncing it to the host BPM.

LFO Waveform

Modulatable: ✗ Automatable: ✗

Determines what waveform is used by the Oscillator. Available Waveforms are:

	A sine wave
	A falling sawtooth wave
	A triangle wave
	A pulse wave with pulse width 0.5
	A pulse wave with pulse width 0.25
	A pulse wave with pulse width 0.125
	A waveform with a sharp peak in the middle
	**Sample & Hold**: This is not a waveform, but sets the LFO to S&H operation. Each time a cycle is complete, a new bipolar random value is generated, which is held for the entire cycle.
	A pyramid shaped waveform with four discrete steps.
	A pyramid shaped waveform with six discrete steps
	A pyramid shaped waveform with eight discrete steps
	A pyramid shaped waveform with twelve discrete steps
	A stair shaped waveform with three discrete steps
	A stair shaped waveform with four discrete steps
	A stair shaped waveform with six discrete steps
	A stair shaped waveform with eight discrete steps
	A stair shaped waveform with twelve discrete steps
WD1	The waveform which was drawn in the WaveDraw Osc in slot 1 (See Section 2.10)
WD2	The waveform which was drawn in the WaveDraw Osc in slot 2 (See Section 2.10)
WD3	The waveform which was drawn in the WaveDraw Osc in slot 3 (See Section 2.10)

LFO Reset Modulatable: ✗ Automatable: ✓

Resets the LFO to the beginning of the wave on note start.

6.3 XY-Pad

The XY-Pad provides a convenient way to combine two independent modulation sources which can be intuitively modified with your mouse. Modulations set up with the XY-Pad often yield interesting and unpredicted sounds.

XY-Pad X Modulatable: ✓ Automatable: ✓

Controls the X-axis of the XY-Pad.

XY-Pad Y Modulatable: ✓ Automatable: ✓

Controls the Y-axis of the XY-Pad.

6.4 Modwheel & Pitch Bend

Modwheel and Pitch Bend provide two basic modulation sources which can be found on most MIDI keyboards.

Pitch Bend

Modulatable: ✗ Automatable: ✓

Pitch Bend allows you to easily transpose the sound of all Oscillators (See Chapter 2). The amount of transposition is controlled by the parameter ”Pitch Bend Range” in semitones. Default is +/- 12 semitones.
This control will automatically track all MIDI Pitch Bend messages send to Odin 2 and update accordingly.
You can use the Pitch Bend as a modulation source as well.

Pitchbend Range

Modulatable: ✗ Automatable: ✗

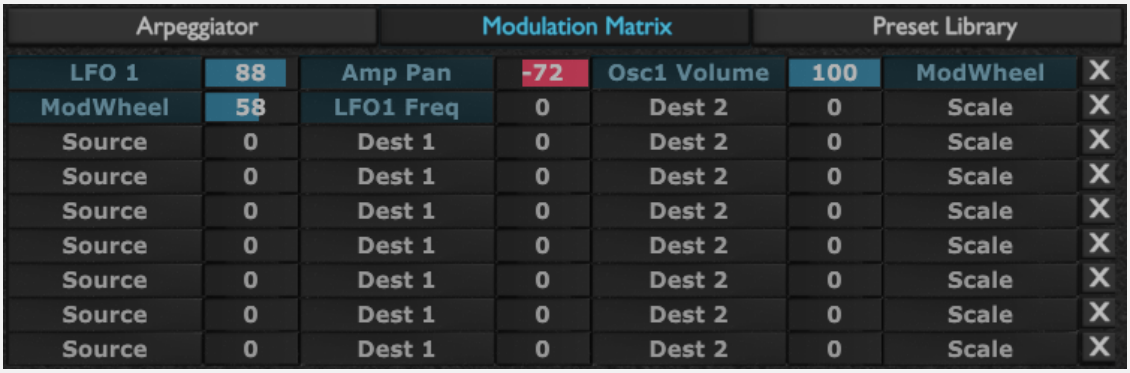
Controls how far Pitchbend modulates the pitch of the oscillators in either direction. Can be set to zero to use the Pitchbend as a pure modulation source for other parameters.

Modwheel

Modulatable: ✗ Automatable: ✓

A freely assignable modulation source, which is also found on most MIDI keyboards. It is therefore a very common modulation source for expressive play.
This control will automatically track all MIDI Modwheel messages (MIDI-CC 001) send to Odin 2 and update accordingly.

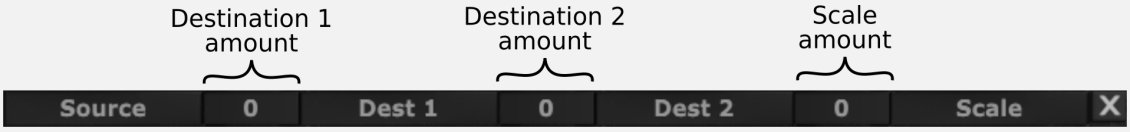
Chapter 7 Modulation Matrix



The modulation matrix is where the true power of Odin 2 lies. A large amount of parameters inside the synthesizer can be modulated by a large variety of modulators.

7.1 Basic Operation

It might look daunting at first with the amount of controls it has to offer, but in reality it is nine rows of the same controls:



Modulation Source Modulatable: ✗ Automatable: ✗

Sets up a source for the modulation. The source chosen in this slot will be controlling the parameter set by ”Destination 1” and ”Destination 2” by the amounts set by ”Destination 1 Amount” and ”Destination 2 Amount”.
For a list of available modulation sources, see Section 7.4.

Modulation Destination 1 Modulatable: ✗ Automatable: ✗

Sets up a destination for the modulation. The destination chosen in this slot will be controlled by the source set in ”Modulation Source” by the amount set by ”Destination 1 Amount”.
For a list of available modulation destinations, see Section 7.5.

Modulation Destination 2 Modulatable: ✗ Automatable: ✗

An independent second modulation destination with identical features to ”Modulation Destination 1”. Destinations 1 and 2 do not interfere with one another in any way.

Destination 1 Amount Modulatable: ✗ Automatable: ✗

Controls how much the Source modulates Destination 1. Can be positive or negative.

Destination 2 Amount Modulatable: ✗ Automatable: ✗

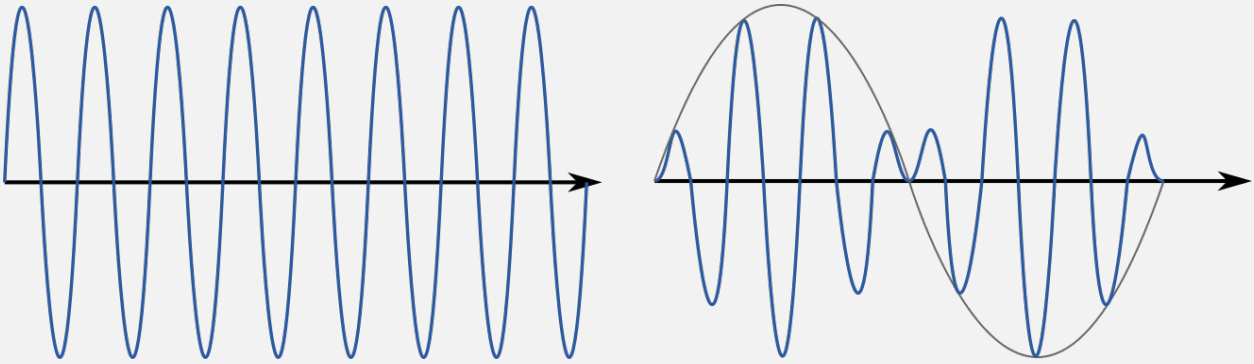
Controls how much the Source modulates Destination 2. Can be positive or negative.

You can use the X-Buttons to the right of each row to instantaneously clear the entire modulation row.

7.2 Modulation Scaling

An advanced feature of the modulation matrix in Odin 2 is the ”Modulation Scale” option. You can scale the modulation that was set up with the parameters above by another modulation source. The value of the source chosen for scale now controls the modulation depth. This way you can essentially modulate the modulation itself. A common use case for this includes scaling with the Modwheel: The set up modulation now can be controlled by the keyboard player by moving the Modwheel up and down.

Consider the following graphic: On the left side, an LFO is set up to modulate a parameter. On the right side, the modulation is scaled by another, slower moving LFO:



We can see how the actual modulation curve gets more complex instantaneously.

Modulation Scale Modulatable: ✗ Automatable: ✗

Select which modulation source is used to scale the modulations. Note that the scaling applies to Destination 1 and Destination 2 in the same way.
For a list of available modulation sources, see Section 7.4.

Scale Amount Modulatable: ✗ Automatable: ✗

Determines the amount of scaling applied to the modulation. Using a scale amount of 100 is equivalent of multiplying the "Source" and "Scale" values together. For values between 0 and 100, linear interpolation logic applies between the raw modulation and and the multiplied values. For values below zero, the scaling source is inverted.

7.3 Mono & Poly Modulation

Some of the modulation sources and destinations inside Odin 2 are polyphonic (i.e. exist once per voice), while others are monophonic (exist once per plugin instance). The following table summarizes the behavior when setting up poly/mono source and destination combos:

	Mono Destination	**Poly Destination**
Mono Source	single modulation source and destination	a single source modulates all destinations
Poly Source	only the most most recent voice modulates the destination	each voice is modulated independently

A similar logic applies when dealing with poly/mono modulation scaling.

To see which modulations are poly or mono, refer to the tables in Section 7.4 and Section 7.5.

7.4 Modulation Sources

This list provides an overview over all modulation sources available in Odin 2:
Note that all unipolar sources operate in the range [0, 1], and all bipolar sources in the range [-1, 1].

Source	**Mono /Poly**	**Polarity**	**Description**
Oscillator 1	Poly	Bipolar	The output of the Oscillator module that is currently in slot 1.
Oscillator 2	Poly	Bipolar	The output of the Oscillator module that is currently in slot 2.
Oscillator 3	Poly	Bipolar	The output of the Oscillator module that is currently in slot 3.
Filter 1 Out	Poly	Bipolar	The output of the Filter module that is currently in slot 1. If no Filter is present, the bypassed signal is used.
Filter 2 Out	Poly	Bipolar	The output of the Filter module that is currently in slot 2. If no Filter is present, the bypassed signal is used.
Amp Envelope	Poly	Unipolar	The Amplifier Envelope.
Filter Envelope	Poly	Unipolar	The Filter Envelope.
Mod Envelope	Poly	Unipolar	The Modulation Envelope.
Global Envelope	Mono	Unipolar	The Global Envelope.
LFO 1	Poly	Bipolar	The output of LFO 1.

LFO 2	Poly	Bipolar	The output of LFO 2.
LFO 3	Poly	Bipolar	The output of LFO 3.
Global LFO	Mono	Bipolar	The output of the Global LFO.
X	Mono	Unipolar	The X-coordinate of the XY-Pad.
Y	Mono	Unipolar	The Y-coordinate of the XY-Pad.
Modwheel	Mono	Unipolar	The position of the Modwheel.
PitchBend	Mono	Bipolar	The position of the PitchBend wheel.
MIDI Note	Poly	Unipolar	The index of the MIDI note-on event, scaled from 0 (note: 0, C-2) to 1 (note: 127, G8).
MIDI Velocity	Poly	Unipolar	The velocity of the MIDI note-on event, scaled from 0 (vel: 0) to 1 (vel: 127).
Channel Pressure	Mono	Unipolar	Often referred to as ”Mono Aftertouch”. A pressure value applied to the keyboard after pressing a key, scaled from 0 (CP: 0) to 1 (CP: 127).
Unison Index	Poly	Bipolar	A unique value for each voice in a unison voice cluster. The value is the one that is used to spread the voices over the stereo field.
Arp Mod 1	Poly	Bipolar	The upper row of modulation parameters from the Arpeggiator module. This value is distributed to the voice that is triggered by that sequence step.
Arp Mod 2	Poly	Bipolar	The lower row of modulation parameters from the Arpeggiator module. This value is distributed to the voice that is triggered by that sequence step.
Sustain Pedal	Mono	Unipolar	The pedal that is commonly used on (digital) pianos to avoid releasing keys.
Soft Pedal	Mono	Unipolar	The pedal that is commonly used on (digital) pianos to attenuate the volume of keys.
Random	Poly	Bipolar	A random value that is generated every time a new voice is triggered
Constant	Mono	Unipolar	A constant value of 1

7.5 Modulation Destinations

This is an overview of all available modulation destinations in Odin 2. The column "Range" describes the amount of modulation that is applied if you use a "Constant" source and modulate by an amount of +100 or -100. Note that most destinations have internal logical limits for their modulation ranges. For example, the "Amplifier Pan" can not get out of the range [-1, 1].

Destination	Mono/ Poly	Description	Range
Oscillator Common			
Osc Pitch Exp	Poly	Exponential modulation of the oscillator pitch	**+100**: Two octaves up **-100**: Two octaves down
Osc Pitch Lin	Poly	Linear modulation of the oscillator pitch	**+100**: Adds two times the current frequency **-100**: Subtracts two times the current frequency, making the oscillator run backwards.
Osc Volume	Poly	Modulates the volume of the oscillator	**+100**: If the volume is below -12dB, then modulation is up to 0dB. If the volume is above -12dB, then modulation is 12dB up from that point. **-100**: Modulates to $-\infty$dB.
Analog Osc			
Pulse Width	Poly	Modulates the pulse width of the pulse wave. Unlike the control knob, this can be used to achieve a pulse-width of 0% or 100% (no sound) and beyond.	**+100**: Increase duty cycle by 100% **-100**: Decrease duty cycle by 100%
Wavetable / Multi Osc			
Osc Position	Poly	Modulates the position used for interpolating between the four subtables.	**+100**: Move once through the entire table. **-100**: Move once through the entire table backwards.
Multi Osc			
Osc Detune	Poly	Modulates the detuning of the sub-oscillators.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.

Osc Spread	Poly	Modulates the spreading of the sub-oscillators across the wavetable.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Vector Osc			
Osc X	Poly	Modulate the X position of the vector pad.	**+100**: Move the handle the width of the pad to the right. **-100**: Move the handle the width of the pad to the left.
Osc Y	Poly	Modulate the Y position of the vector pad.	**+100**: Move the handle the height of the pad up. **-100**: Move the handle the height of the pad down.
Chiptune Osc			
Osc Arp Speed	Poly	Modulates the speed of the arpeggiator in the chiptune osc exponentially.	**+100**: Increase the speed by a factor of 4. **-100**: Decrease the speed by a factor of $1/4$.
FM and PhaseMod Oscs			
Osc FM amount	Poly	Modulates the amount of frequency modulation between carrier and modulator oscs.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Osc PM amount	Poly	Modulates the amount of phase modulation between carrier and modulator oscs.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Modulator Ratio	Poly	Modulates the ratio used for the modulator (see Section 2.7). Unlike the controls, this can be used to generate irrational fractions.	**+100**: Increases the current ratio by a factor of four. **-100**: Decrease the current ratio by a factor of $1/4$.
Carrier Ratio	Poly	Modulates the ratio used for the carrier (see Section 2.7). Unlike the controls, this can be used to generate irrational fractions.	**+100**: Increases the current ratio by a factor of four. **-100**: Decrease the current ratio by a factor of $1/4$.
Noise Osc			
Osc LP Frequency	Poly	Modulates the frequency of the lowpass filter in the noise osc exponentially.	**+100**: Modulates the frequency 64 semitones up (factor 40.317). **-100**: Modulates the frequency 64 semitones down (factor 0.0248).

Osc HP Frequency	Poly	Modulates the frequency of the highpass filter in the noise osc exponentially.	**+100**: Modulates the frequency 64 semitones up (factor 40.317). **-100**: Modulates the frequency 64 semitones down (factor 0.0248).
Filter Common			
Filter Frequency	Poly	Modulates the filter frequency exponentially.	**+100**: Modulates the frequency 64 semitones up (factor 40.317). **-100**: Modulates the frequency 64 semitones down (factor 0.0248).
Filter Resonance	Poly	Modulates the resonance of the filter.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Filter Gain	Poly	Modulates the volume of the filter.	**+100**: If the current gain is below -12dB, then modulation is up to 0dB. If the gain is above -12dB, then modulation is 12dB up from that point. **-100**: Modulates to $-\infty$dB.
Filter Env Amount	Poly	Modulates how much envelope is applied to the filter.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Filter Vel Amount	Poly	Modulates the velocity sensitivity of the filter.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Filter Kbd Amount	Poly	Modulates the keyboard sensitivity of the filter.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Filter Saturation	Poly	Modulates the saturation of the filter.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
SEM-12 Filter			
Filter SEM Transition	Poly	Modulates the filter characteristic transition from lowpass over notch to highpass.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Formant Filter			

Filter Formant Transition	Poly	Modulates the transition from the left vowel to the right.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Amplifier			
Amplifier Gain	Poly	Modulates the gain in the Amplifier module.	**+100**: If the current gain is below -12dB, then modulation is up to 0dB. If the gain is above -12dB, then modulation is 12dB up from that point. **-100**: Modulates to $-\infty$dB.
Amplifier Pan	Poly	Modulates the position of the sound in the stereo field.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Distortion			
Distortion Boost	Poly	Modulates the input boost of the distortion module.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Distortion DryWet	Poly	Modulates the relation of unprocessed and processed signal in the Distortion module.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
ADSR Envelopes			
Env Attack	Poly	Modulates the attack time of the Envelope exponentially and linearly. This parameter is Mono for the Global Env.	**+100**: Scales the current time by a factor of 8 and then adds 0.3 seconds. **-100**: Scales the current time by a factor of $1/8$ and then subtracts 0.3 seconds.
Env Decay	Poly	Modulates the decay time of the Envelope exponentially and linearly. This parameter is Mono for the Global Env.	**+100**: Scales the current time by a factor of 8 and then adds 0.3 seconds. **-100**: Scales the current time by a factor of $1/8$ and then subtracts 0.3 seconds.
Env Sustain	Poly	Modulates the sustain value of the Envelope.	**+100**: Same as moving the control slider +1. **-100**: Same as moving the control slider -1.
Env Release	Poly	Modulates the release time of the Envelope exponentially and linearly. This parameter is Mono for the Global Env.	**+100**: Scales the current time by a factor of 8 and then adds 0.3 seconds. **-100**: Scales the current time by a factor of $1/8$ and then subtracts 0.3 seconds.

LFOs			
LFO Freq	Poly	Modulates the frequency of the LFO exponentially. This parameter is Mono for the Global LFO.	**+100**: Increases current frequency by 4 octaves (factor 16). **-100**: Decreases current frequency by 4 octaves (factor 0.0625).
Delay			
Delay Time	Mono	Modulates the delay time exponentially.	**+100**: Increases the current time by a factor of 3. **-100**: Decreases the current time by a factor of $1/3$.
Delay Feedback	Mono	Modulates the feedback of the delay line.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Delay HP Freq	Mono	Modulates the frequency of the highpass filter in the Delay module exponentially.	**+100**: Modulates the frequency 64 semitones up (factor 40.317). **-100**: Modulates the frequency 64 semitones down (factor 0.0248).
Delay Dry	Mono	Modulates the output of unprocessed signal from the Delay module.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Delay Wet	Mono	Modulates the output of processed signal from the Delay module.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Phaser			
Phaser Rate	Mono	Modulates the speed of the internal LFO exponentially.	**+100**: Increases the speed by a factor of 4. **-100**: Decreases the speed by a factor of $1/4$.
Phaser Amount	Mono	Modulates the depth of frequency modulation by the LFO in the Phaser.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Phaser Freq	Mono	Modulates the base frequency of the internal allpass filters linearly.	**+100**: Moves the frequency up 2000Hz. **-100**: Moves the frequency down 2000Hz.
Phaser Feedback	Mono	Modulates the internal feedback of the Phaser module.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.

Phaser Drywet	Mono	Modulates the ratio of processed and unprocess signals output by the Phaser module.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Chorus			
Chorus Rate	Mono	Modulates the speed of the internal LFO exponentially.	**+100**: Increases the speed by a factor of 4. **-100**: Decreases the speed by a factor of $1/4$.
Chorus Amount	Mono	Modulates the depth of frequency modulation by the LFO in the Chorus.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Chorus Feedback	Mono	Modulates the feedback of the internal delay line.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Chorus Drywet	Mono	Modulates the ratio of processed and unprocess signals output by the Chorus module.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Flanger			
Flanger Rate	Mono	Modulates the speed of the internal LFO exponentially.	**+100**: Increases the speed by a factor of 4. **-100**: Decreases the speed by a factor of $1/4$.
Flanger Amount	Mono	Modulates the depth of frequency modulation by the LFO in the Flanger.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Flanger Feedback	Mono	Modulates the feedback of the internal delay line.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Flanger Drywet	Mono	Modulates the ratio of processed and unprocess signals output by the Flanger module.	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Arpeggiator			
Arp Speed	Mono	Modulates the speed of the Arpeggiator module exponentially	**+100**: Doubles the speed. **-100**: Halves the speed.
Arp Gate	Mono	Modulates the gate time in the Arpeggiator module.	**+100**: Adds 100% gate time. **-100**: Subtracts 100% gate time.

XY-Pad			
XY-Pad X	Mono	Modulates X coordinate of the XY-Pad in the synth (see Section 6.3).	**+100**: Like moving the handle once across the pad to the right. **-100**: Like moving the handle once across the pad to the left.
XY-Pad Y	Mono	Modulates Y coordinate of the XY-Pad in the synth (see Section 6.3).	**+100**: Like moving the handle once across the pad upwards. **-100**: Like moving the handle once across the pad downwards.
Global			
Glide	Mono	Modulates the Glide parameter in the synth (see Section 9.3).	**+100**: Same as moving the control knob by a value of +1. **-100**: Same as moving the control knob by a value of -1.
Master	Mono	Modulates the master gain of the synthesizer.	**+100**: If the current master gain is below -12dB, then modulation is up to 0dB. If the master gain is above -12dB, then modulation is 12dB up from that point. **-100**: Modulates to $-\infty$dB.

Chapter 8 Arpeggiator & Step Sequencer

The Arpeggiator & Step Sequencer is a tool which is able to automatically play complex rhytmic sequences from a given set of input notes. Activating this module overrides the notes you're inputting into the synthesizer and generates note sequences itself.

> The Arpeggiator & Step Sequencer occupies the same space in the GUI as the modulation matrix and the Preset Library. If you can't locate the module in the lower right corner of the GUI, press the "Arpeggiator" button above the modulation matrix:
>
> 
>

The basic operation of this module is to listen for the inputs you play on the keyboard and play them over a set of octaves. You can control various parameters, like the amount of octaves, the direction of the arpeggio, gate length, which notes to omit and many more.

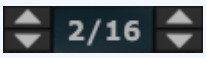
Arpeggiator On

Modulatable: ✗ Automatable: ✓

Turns the Arpeggiator & Step Sequencer module on or off.

Arpeggiator Step Time

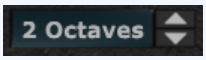
Modulatable: ✓ Automatable: ✗



Controls the time one step takes, synced to the host BPM. The image above represents a length of 2/16th or 1/8th note. This parameter can be modulated in the modulation matrix to achieve non-synced values.

Arpeggiator Octaves

Modulatable: ✗ Automatable: ✗



Controls over how many octaves the arpeggio will be played. For a pure Step Sequencer style operation, set this value to 1.

Arpeggiator Gate Length

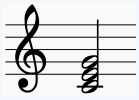
Modulatable: ✓ Automatable: ✗

Controls how long a note is played, before a note-off signal is sent to the synthesizer. The times are represented in percent of the current step time. If the gate length is bigger than 100%, each step will overlap into the next step.

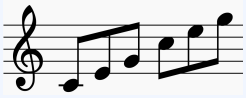
Arpeggiator Direction

Modulatable: ✗ Automatable: ✗

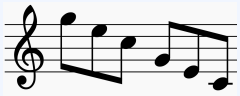
Determines the play style of the arpeggiator. The resulting notes for the various directions will be displayed here for ”Arpeggiator Octaves” set to 2, Speed of 1/16 and a C-major chord as an input:



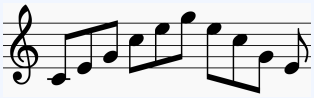
Direction: Up



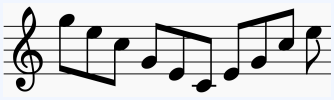
Direction: Down



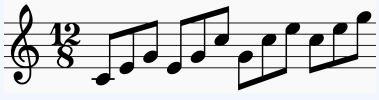
Direction: Up Down



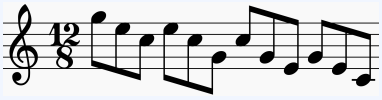
Direction: Down Up



Direction: Crawl Up

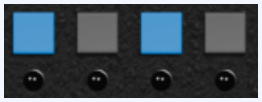


Direction: Crawl Down



Step Active

Modulatable: ✗ Automatable: ✗



Turns a step in the sequence on or off. This can be used to easily create rhytmic patterns.

Arpeggiator Steps

Modulatable: ✗ Automatable: ✗

Limits the number of steps to be played before the sequence wraps around.
To clarify: ”Sequence” here does not mean the note-pattern created by the arpeggiator. Rather it means the rhythmic pattern created by enabling or disabling steps with the ”Step Active” buttons. You can tell the current sequence size by the amount of LEDs which are displayed on the bottom of the module. If the sequence has ended, it will either start over, or stop, depending on the parameter ”One-Shot”.

Arpeggiator One-Shot

Modulatable: ✗ Automatable: ✓

Enables one-shot mode: In one-shot mode, the sequence is stopped after playing through it once.
To clarify: ”Sequence” here does not mean the note-pattern created by the arpeggiator, but the sequence length as set by the parameter ”Arpeggiator Steps”. You can tell the current sequence size by the amount of LEDs which are displayed on the bottom of the module.

Arpeggiator Modulation 1

Modulatable: ✗ Automatable: ✓

A set of freely definable modulation values. This value will be transmitted to the note that is triggered from this step in the sequence, and can be used in the modulation matrix via the modulation source "Arp Mod 1".
This can be used to bring movement into the sequence by modulating sound parameters as the sequence progresses.

The second row of knobs in the Arpeggiator & Step Sequencer can be toggled to either be "Arpeggiator Modulation 2" or "Arpeggiator Transpose" by the button to the left:

Both functionalities will be available at the same time, but only one set of knobs is visible.

Arpeggiator Modulation 2

Modulatable: ✗ Automatable: ✓

A set of freely definable modulation values. This value will be transmitted to the note that is triggered from this step in the sequence, and can be used in the modulation matrix via the modulation source "Arp Mod 2".
This can be used to bring movement into the sequence by modulating sound parameters as the sequence progresses.

Make sure the button to the left of the second row is set to "Mod 2" and not "Transp" to access these parameters.

Arpeggiator Transpose

Modulatable: ✗ Automatable: ✓

Transposes the corresponding step in the sequence in semitones.
When used with a ”Arp Octaves” set to one and only one key played, this can be used to create custom note sequences.

Make sure the button to the left of the second row is set to ”Transp” and not ”Mod” to access these parameters.

Chapter 9 Global Settings

9.1 Polyphonic / Legato

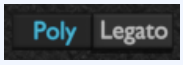
Odin 2 is capable of two play modes: **polyphonic** or **legato**.

In the default polyphonic mode, you can play up to 24 voices. When you reached the voice limit, the oldest note that is not still held down will be stolen and used as the new voice.

In legato mode, you have only one voice to play with. This can be very useful if you don't want notes to overlap, for example in a lead or bass type of sound. In legato mode, the envelopes perform a "soft reset". Instead of starting the attack from zero, the last value output by the envelope will be used as the start of the attack section. This way, clicky noises can be avoided for example in the Amp Envelope.

The switch for the play modes can be found in the top-right corner of the GUI.

Poly / Legato Modulatable: ✗ Automatable: ✓



Toggles between polyphonic and legato play modes.

9.2 Unison

The Unison feature makes it possible to trigger a stack of voices together instead of a single voice. These voices can be slightly detuned and spread over the stereo field, to generate a much wider, bigger sound. While detune and width parameters are available as dedicated controls, you can modulate any parameter for each unison voice independently with the modulation destination ”Unison Index” (see Section 7.5).

The controls for Unison can be found in the top-left corner of the GUI.

Since the implementation of Unison in Odin 2 literally triggers multiple voices, using high Unison counts uses lots of CPU time. Use it with care, if you run into performance issues, you can always bounce the track to audio in your DAW.

Unison Count Modulatable: ✗ Automatable: ✗

Determines how many voices are triggered when you press a button.
Try to keep the Unison Count low if you’re experiencing performance issues.

Unison Detune Modulatable: ✗ Automatable: ✓

Controls the amount of detune for the voices in the unison stack.

Unison Width Modulatable: ✗ Automatable: ✓

Controls the stereo spread of the voices in the unison stack. Having this value at zero will put all voices in the center of the stereo field. Having the value at one puts the first voices hard-left and the last on hard-right. The voices inbetween are spread linearly inbetween

9.3 Glide and Master

The last two remaining parameters, Glide and Master are located in the bottom left corner of the GUI.

Glide Modulatable: ✓ Automatable: ✓

Makes the pitch of newly triggered voices glide from the frequency of the last note to the frequency of the current note. The glide curve is exponential.

Master Modulatable: ✓ Automatable: ✓

Controls the output gain of the synthesizer.