Vi

THE VIRTUAL RECREATION OF A DREAM

USER MANUAL

Version 2026



powered by

electronic music components

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2. Please download and install the iLok License Manager (also available here: https://www.ilok.com/)

I. INTRODUCTION

WHO IS SCHMIDT? (”SH-MITT“)

In an ideal world, Schmidt is the synthesizer you have always been dreaming of. Well, anyway, this is the synthesizer Mr. Stefan Smith, err, Schmidt – the creator of Schmidt – has always dreamed of. And – again in an ideal world – you and Mr. Schmidt are sharing the same dream (in terms of synthesizers, of course). However, your new Schmidt synthesizer is a very personal and very special affair. It is the vision of an engineer dedicated to sound, conceived and perfected in close collaboration with musicians and music producers alike, brought to live in the most uncompromising way imaginable. Now this dream has finally come true and is right here in front of you within an arm‘s reach – congratulations if this arm is yours! Of course, Mr Schmidt and everybody else who has had the pleasure of having been involved in turning this dream into reality, would like to say a big „Thank you!“ to you. We all hope that your new Schmidt synthesizer will serve you as a creative, inspirational musical instrument for many years to come.

SCHMIDT‘S SKILLS

Schmidt‘s sound generation engine features virtually everything that subtractive synthesis is endowed with – and even more so: The Oscillator section offers functions to shape very complex sounds with that probably have never been available in the analog domain thus far. The powerful filter section Schmidt offers is like a fully programmable modular synthesizer system. You have plenty of modulation routings that excel even your wildest dreams – and rest assured, we know that synthesizer players like you tend to have really wild dreams. Sometimes, you even get up late at night to tweak some controls, don‘t you? See, this is how well we know you!

USER MANUAL CONVENTIONS

In this manual we use some format conventions, hoping to make things a lot clearer. You will find the following formats:

- **Cutoff** represents a physical control on Schmidt‘s panel you are asked to work on.
- ***Space*** represents a parameter name.
- ***ON*** represents a parameter value/state that is indicated either by a lit LED or as data readout on



Represents some important note. It is so important we do not even know as yet what it is. Further reading seems thus recommended!

Sometimes you will be asked to perform a certain sequence of steps. Such a sequence looks e.g. like this:



1 - Select **Ramp** = ”***CLK***” on both LFOs.
2 - Select any waveshape (”**LFO MODE**”) on LFO VCF 1. This setting, in combination with the LFO 1 Rate setting, determines the waveshape that modulates VCF 1.
3 - Select desired waveshape of LFO VCF 2. This setting, in combination with the LFO 2 Rate setting, determines the waveshape that modulates VCF 2.
4 - Hit **Ramp** in LFO VCF 2 again. The „**Special**“ LED lights up and indicates that both LFOs are now running in sync.
5 - Alter **Mode** (waveshape), **Rate** and **Time** settings of both LFOs as you please.

We tried to keep this user manual as compact as possible. That‘s why we deliberately avoided descriptions of synthesizer basics. If you are new to synthesizer technology and sound generation in general, we advise you to go on a quest for some secondary literature that you can find on the web or in specialist magazines, like e.g. Keyboard Magazin or Sound On Sound. Always a good read are classic books like those written by Allen Strange, Devarahi, Beaver & Krause, or others.

II.

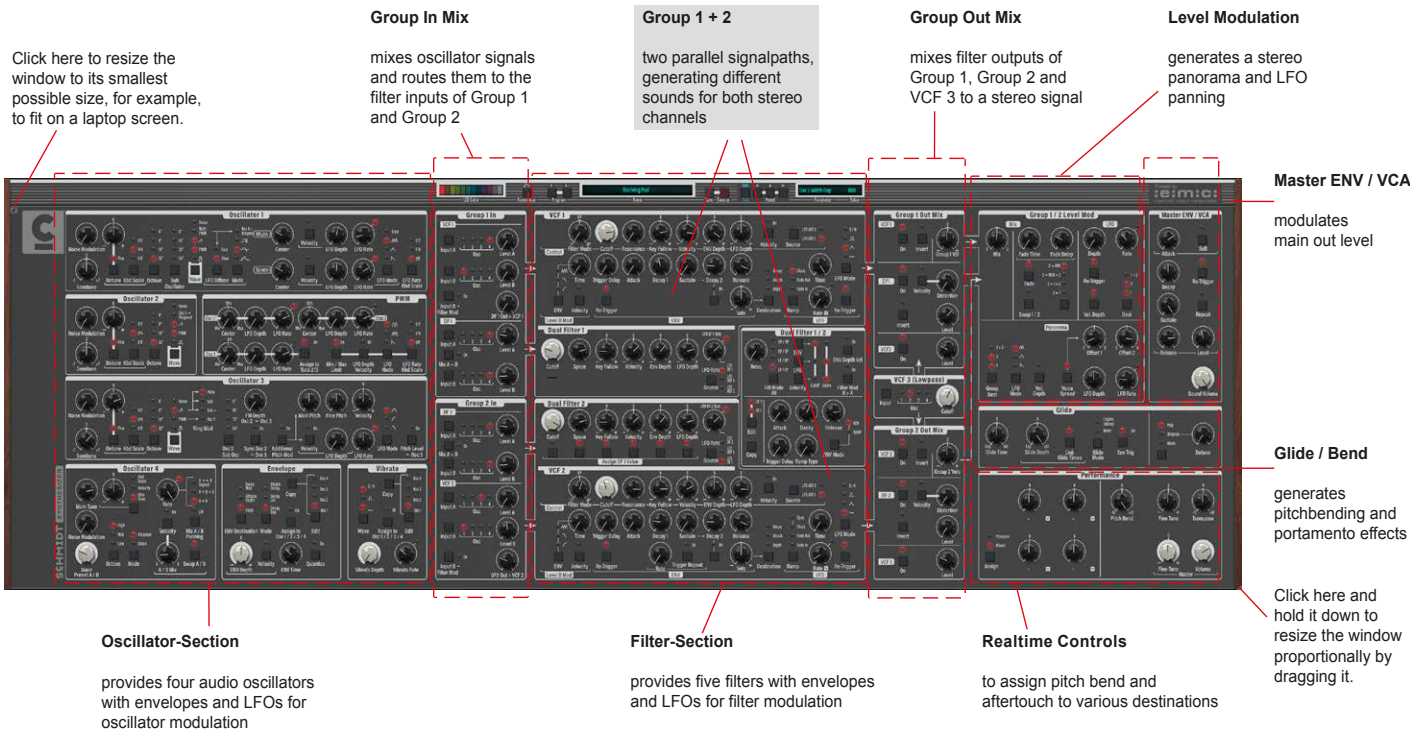
FUNCTION OVERVIEW

FUNCTION OVERVIEW

Now that you have got a vague idea of how impressive Schmidt can sound, you might be curious to learn more about its inner secrets. In this section, you will – step by step – find out about Schmidt's features and what is going on under the hood of your new mighty synthesizer.

FRONTPANEL LAYOUT

On the **frontpanel**, you will find all the sections spread out in front of you from left to right, according to the signal path. About 95% of the sound generation functions can be accessed without using the LCD and menus. That means, even though it is quite a complex beast, Schmidt is pretty intuitive to work on once you are familiar with the way its functions are organized and accessed.



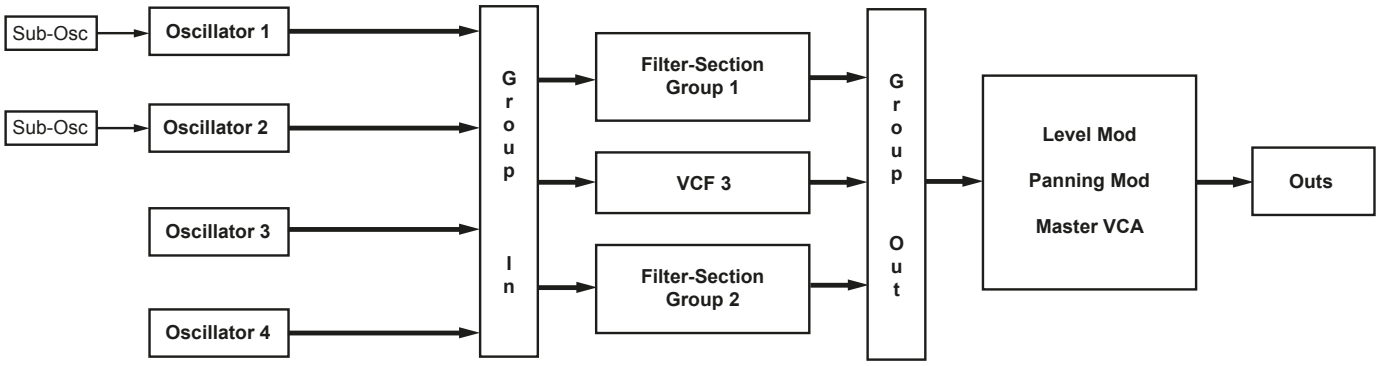
(Please click on the diagram labelling)

For the Schmidt Vi, we have two display options.
A three-panel view, showing the left, middle, and right sides of the panel.
And a full-view option, ideal for large desktop monitors.
Click "Full" for a full view of the panel. Or click one of the three "Panel" buttons for the left, center, or right panel.

In the three-panel view, you can swipe back and forth between the individual sections with the mouse or press the corresponding buttons located between the two displays at the top of each panel.

If a panel doesn't fit entirely on the screen, please click the rectangle to the left of the "C" logo at the top left corner of the panel. The smallest possible view will then be displayed. You can then adjust the size by dragging the lower-right corner of the window.
Of course, you can also change the screen resolution on your computer.

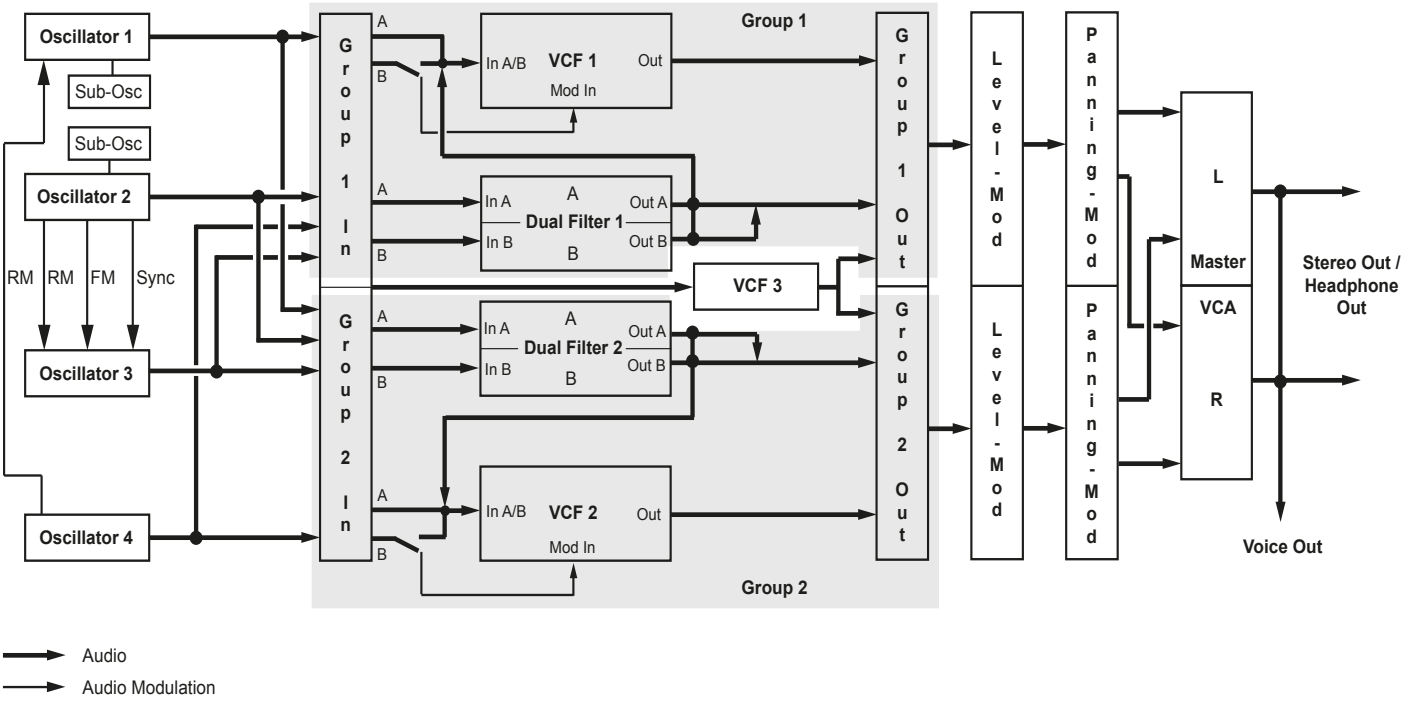
SIGNALPATH



(Please click into the diagram)

Above you see a brief overview of Schmidt's signal path: Four OSCILLATORS (two of them with additional Sub Oscillator) send their signals into a routing matrix which is called GROUP IN. Here, each Oscillator signal is routed into the filter section which provides three parallel signal paths. Filter Section Group 1 and 2 are identical and pretty complex in themselves. They can shape two entirely different timbres out of the incoming Oscillator signals. The third filter section VCF 3 is an add-on to fatten up things a bit more. In the GROUP OUT section, the three signals are mixed down into a stereo sum which is fed into the Level and Panning Modulation section, and finally into the master VCA. This one controls the master volume before the final stereo signal is sent to the outputs. Whew!

Using our trusty old magnifying glass, we will go much deeper into detail soon. We will follow the signalpath from left to right:



(Please click into the diagram)

Let's have a look at the **Oscillator section** first (left handed):

- Oscillator 1 and 2 (each with Sub Oscillators) feed their signals into Group In 1 and/or Group In 2.
- Oscillator 3 and 4 also feed their respective signals into Group In 1 and/or Group In 2.
- Oscillator 2 can modulate Oscillator 3 (frequency modulation and ring modulation) and can be hard-synced to it as well for even more timbral variety.
- Oscillator 4 is ring-modulated with Oscillator 1.

Each Oscillator is equipped with more or less complex modulation routings (essentially frequency/pitch and pulse-width) with their own dedicated modulation sources.

You will soon get an idea why, even on Oscillator level, Schmidt is capable of creating very complex timbres that go way beyond conventional analog synthesizers.

The next section of the signal path is split into two parallel **groups** that will generate two different timbres at the same time:
Each group comprises the input router (**Group In**) and two filters. The **VCF** is a more or less old-fashioned four-pole filter (24 dB) that can morph between its different filter response characteristics.
The **Dual Filter (DF)** is merely a pair of two filters that can be combined with each other to produce a variety of different response characteristics. VCF and Dual Filter each have a different character and ensure a maximum of tonal and timbral flexibility.

Group In 1 sends each Oscillator signal into the **VCF** and/or one or both inputs (A/B) of the **Dual Filter**. Apart from that, the output of the Dual Filter can be fed back into VCF 1. Input B of the VCF can be used to control the cut-off frequency. Mind-boggling? Not really. Take a minute or two to recapitulate the signal path up to this point. Group In 2 works the same way. In addition to that, all Oscillator signals can as well be routed to **VCF 3** which is a traditional low-pass filter.

The **Group Out** sums the output signals of all filter outputs into a single signal which is now modulated in terms of level and pan position. You can have two different sounds in parallel at this point. They can be panned / cross-faded by the Panning Mod section. The **Master VCA** generates a final, global volume envelope and the signals are routed to the various outputs. Please take another minute to recapitulate the second half of the signal path. It is easier than you might believe at first sight.

On the **front panel**, you will find all the sections spread out in front of you from left to right, according to the signal path. About 95% of the sound generation functions can be accessed without using the LCD and menus. That means, even though it is quite a complex beast, Schmidt is pretty intuitive to work on once you are familiar with the way its functions are organized and accessed.

III.

PROGRAMMING SOUNDS

PROGRAMMING SOUNDS

In this following chapter, we will dig even deeper and find out about the inner secrets of each section. You will learn everything about all functions and how to use them. Please read carefully and enjoy while you are at it.

OSCILLATOR SECTION

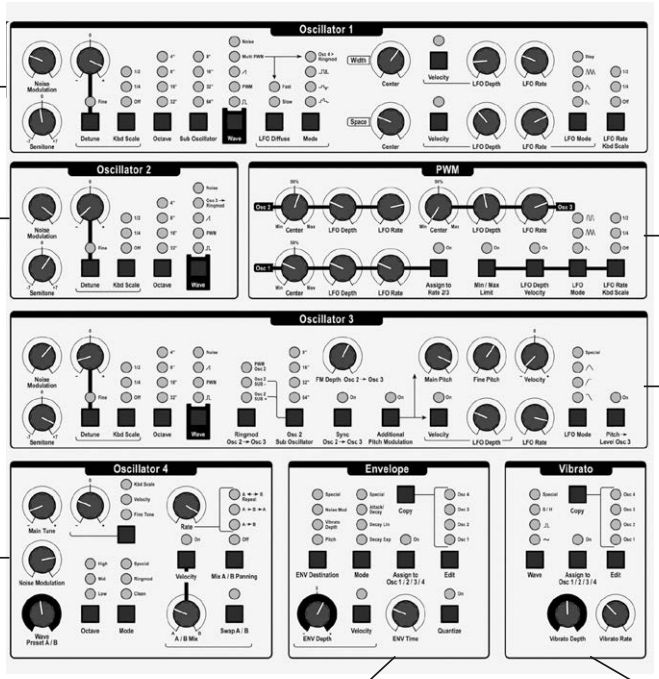
Schmidt‘s Oscillator section is definitely outstanding (we are a bit proud of that, as you may have noticed already). You will find lots and lots of routing and modulation options that yield very impressive and complex sounds even on oscillator level. The main assets of Schmidt‘s sound generation are ring and pulse-width modulation – with some pretty weird details that might be new even to you! By the way, the Oscillators are truly analog with digital control to ensure most precise tuning, tracking, and modulation.

By taking a look at the Oscillator section, you will find one thing that is common of all of Schmidt‘s modules: Each section (oscillators, filters, panning, VCA) has its own dedicated modulation source (envelopes, LFOs etc.). That is why you will not find a modulation matrix but lots of modulation sources directly placed within the sound generating / shaping modules which helps immediacy a lot in our humble opinion.

The Oscillator section features four Oscillators, each with a different scope of functions. Here you will find all modulation routings and sources relevant to the Oscillator as well.

Oscillator 1
with Sub-Oscillator and two LFOs for (Multi)-PWM

Oscillator 2
with Sub-Oszillator (located in Osc. 3)



PWM
three LFOs for PWM of Osc 1, 2 and 3

Oscillator 3
with dedicated pitch-LFO

Oscillator 4
with LFO for waveform mix

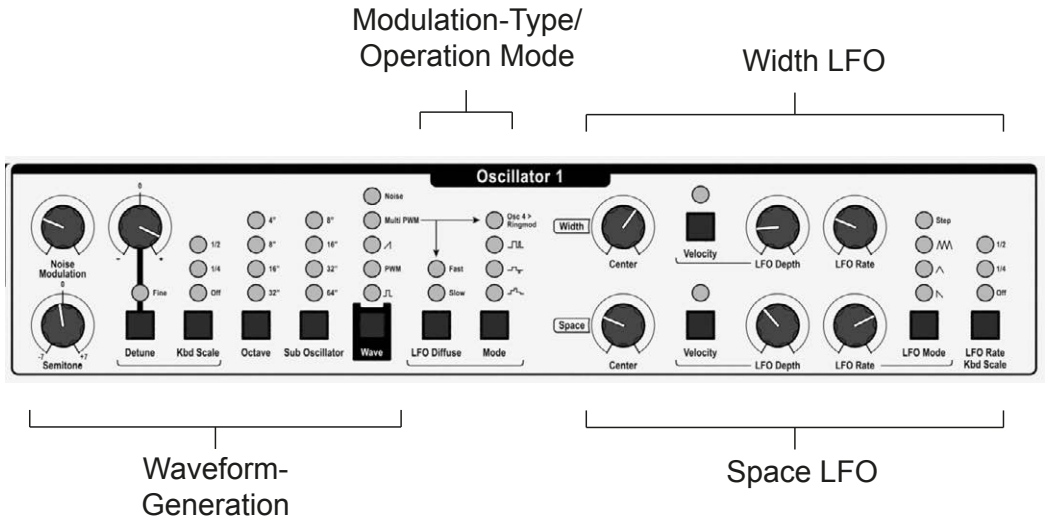
Envelope
four AD-envelopes for pitch-modulation (Osc. 1-4) resp. vibrato

Vibrato
four LFOs for pitch modulation (Osc. 1-4)

First, we will check out the functions of each oscillator separately. With the next step we will learn about interaction (modulation) between the various modules.

OSCILLATOR 1

Oscillator 1 has some pretty nifty tricks up his sleeve to produce complex timbres. We call it Multi PWM. Its function is pretty unique and rather complex, so please indulge yourself some time for careful study.



Waveform Generation and Modulation Type / Operation Mode controls:

- **Noise Modulation**: Pitch of Oscillator 1 is modulated by a noise signal. Controls modulation depth.

- **Semitone**: Detunes Oscillator 1 up or down by seven semitones.

- **Detune**: Detunes Oscillator 1 up or down by one semitone, respectively 10 cent up / down (if **Fine** key is pressed).

- **Kbd Scale**: Alters the ***Detune*** depending on the played note on the keyboard. Reference point is key A3:
  1/2: Two octaves below A3 quadruples Detune; two octaves above A3 quarters Detune.
  1/4: Two octaves below A3 doubles Detune; two octaves above A3 halves Detune.
  OFF: Detune is independent of the played note on the keyboard.

The ***Kdb Scale*** function is useful to control the beat frequency between the oscillators more precise for lower and higher note ranges.

- **Octave**: Octave setting of Oscillator 1.

- **Sub Oscillator**: Octave setting of Sub Oscillator 1 (square wave).
  No LED active: Sub Oscillator is not active.

Please note: The octave setting of the Sub Oscillator is independent of the main Oscillator, i. e. the Sub Oscillator can have a higher setting than the main Oscillator.
If main and Sub Oscillator have the same octave setting, the output signal can be almost inaudible due to phase and frequency cancellation.

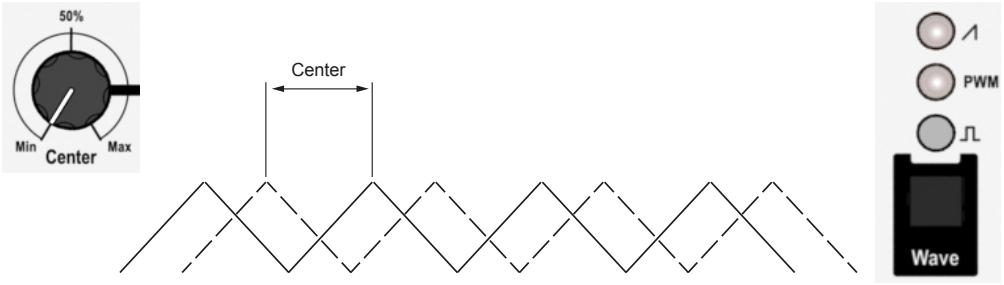
- **Wave**: Waveform / modulation type of Oscillator 1. Please refer to the following chart for all available settings:

Wave key setting	Waveform	Modulation Type	Modulation Source
R	Square	Pitch	Vibrato LFO, Noise
PWM	Pulse Pulse	Pitch Pulse Width	Vibrato LFO, Noise PWM LFO 1
S	Sawtooth	Pitch	Vibrato LFO, Noise
S + PWM (see note below)	Two phase-shifted saw-tooth waveforms	Pitch Phase Modulation	Vibrato LFO, Noise PWM LFO 1

Wave key setting	Waveform	Modulation Type	Modulation Source
MULTI PWM (see note below)	Complex Wave	Pitch Waveform-Mod (depending on **Mode** setting)	Vibrato LFO, Noise Width/Space LFOs
MULTI PWM + PWM	Complex Wave with PWM	Pitch Waveform-Mod (depending on **Mode** setting) Above + Pulse Width	Vibrato LFO, Noise Width/Space LFOs PWM LFO 1
NOISE	Slightly coloured noise	none	none

S + PWM

When ***S*** and ***PWM*** are enabled, the Oscillators (Osc 1 as well as 2 and 3) produce two sawtooth waves that are phase-modulated – that means, their respective peaks are shifted against each other. The shift amount is determined by the **Center** parameter which can be modulated by the PWM LFO.

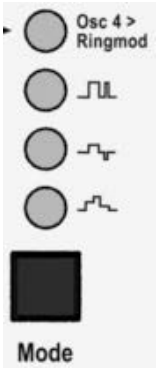


Multi PWM

When ***MULTI PWM*** is enabled, the remaining controls of the Oscillator 1 section become active. But now it is about time to clear up what is meant by ”Multi PWM”:
In Multi PWM mode, Oscillator 1 generates four pulse-waves in parallel that are combined in various ways to produce complex waveforms. There are several parameters with which to control the shape of the resulting waveform:

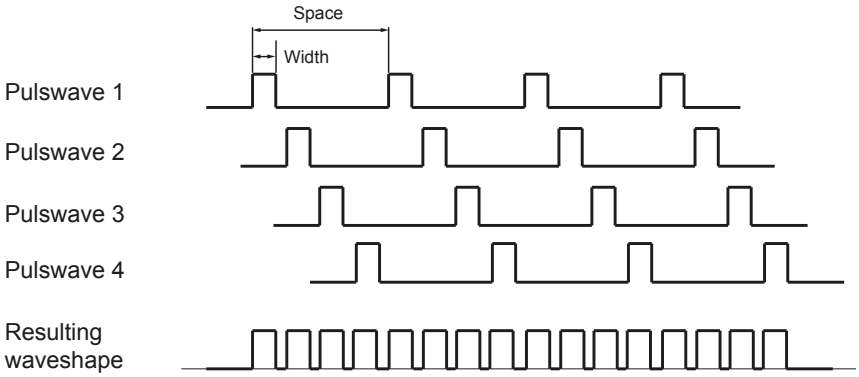
- **Space / Width**: ***Space*** and ***Width*** determine the ratio between peaks and troughs of the four pulse-waves. Depending on this ratio, the resulting waveform takes on different shapes. Please refer to the upper section of the figure on page 20. These two parameters can be controlled independently by two dedicated LFOs.

- **Mode**: Beyond that, modes ***1*** to ***3*** determine the way how the four pulse-waves are combined. As a result, each mode again produces different waveshapes. Please refer to the lower section of the figure on page 20.



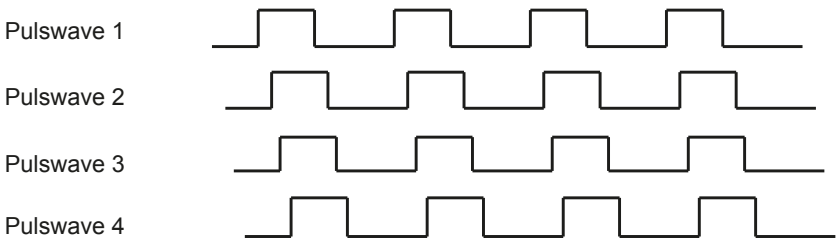
In mode ***4 (OSC 4 > RINGMOD)***, the resulting waveform that is produced by the process of mode 3 is additionally ring-modulated by Oscillator 4.

The figure on the following page shows all available modes and their operation.

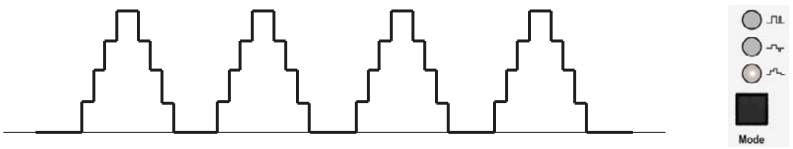


Space value significantly higher as **Width** value
=> the four source waveshapes do not overlap

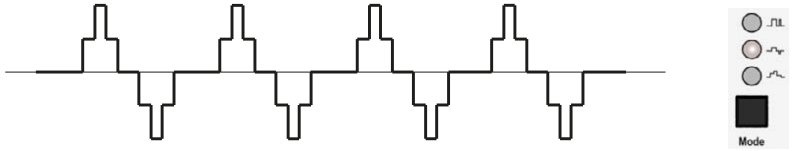
No cancellations / amplification in resulting waveshape



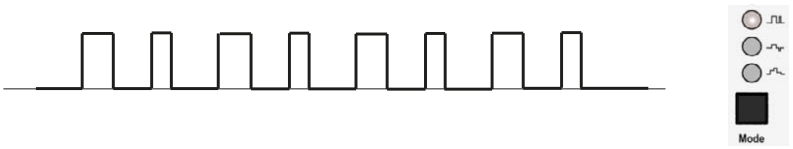
Altered ratio between **Space** value and **Width** value
=> the four source waveshapes partially overlap



Mode 1:
1 + 2 + 3 + 4



Mode 2:
1 + 2 – 3 – 4



Mode 3:
Cancellations and constant level

Mode key setting	Modulation Type	Modulation Source
MODE 1	Pitch Waveform-Modulation	Vibrato LFO, Noise PWM LFO 1
MODE 2	Pitch Waveform-Modulation	Vibrato LFO, Noise PWM LFO 1
MODE 3	Pitch Waveform-Modulation	Vibrato LFO, Noise PWM LFO 1
MODE 4	Pitch Waveform-Modulation Waveform-Mod (Ringmodulation)	Vibrato LFO, Noise PWM LFO 1 Oscillator 4

LFO Controls Oscillator 1

The remaining controls belong to the Multi PWM Space and Width LFOs:

- **LFO Depth**: Modulation depth of ***Space*** / ***Width***.
- **Velocity**: Modulation depth depends on ***keyboard velocity***.
- **LFO Rate**: Modulation rate of ***Space*** / ***Width***.
- **LFO Mode**: Modulation waveform of both LFOs
  - ***STEP***: Space LFO produces Sample & Hold function (stepped waveform) while the S&H frequency is controlled by the ***Rate*** parameter of the Width LFO (**LFO Diffuse** has to be disabled!).
  - /\/\/\ : Continuous triangular wave
  - /\ : One-shot triangular wave
  - |\ : One-shot saw wave
- **LFO Diffuse**: Each of the four pulse waves are modulated with different intensity (only Space LFO).
- **LFO Rate Kbd Scale**: Scales the modulation speed (***LFO Rate)*** of the LFO across the keyboard. Reference point is key A3:
  - ***1/2***: Two octaves above A3 – quadruples LFO rate; two octaves below A3 quarters LFO rate.
  - ***1/4***: Two octaves above A3 – doubles LFO rate; two octaves below A3 halves LFO rate.
  - ***OFF***: Space / Width LFO rate is independent of played note position on the keyboard.

One important note on modulation depths:

Not only the current control setting of a parameter, but also the values of all other modulation depth controls are added to the final value of the resulting modulation depth. Please note that modulation depth usually has negative values as well. If the resulting modulation depth value exceeds the total parameter range, certain modulators can have little or no effect on the entire modulation. For example, if you set the Space control to 3 o'clock position and add a high LFO depth value, an additional second modulator (e.g. velocity) might produce no audible effect. Please refer to page 62. It shows the summed modulation depth values for the VCF1 cut-off.

Oscillator 1 modulation paths

To make things even clearer (we are not being sarcastic, mind you!), we will cast a look under the hood of Oscillator 1 and examine all signal and modulation inputs and outputs.
Have a look at OSC1 in the figure on the next page. From right to left, you can see all the different modulation inputs and their controls:

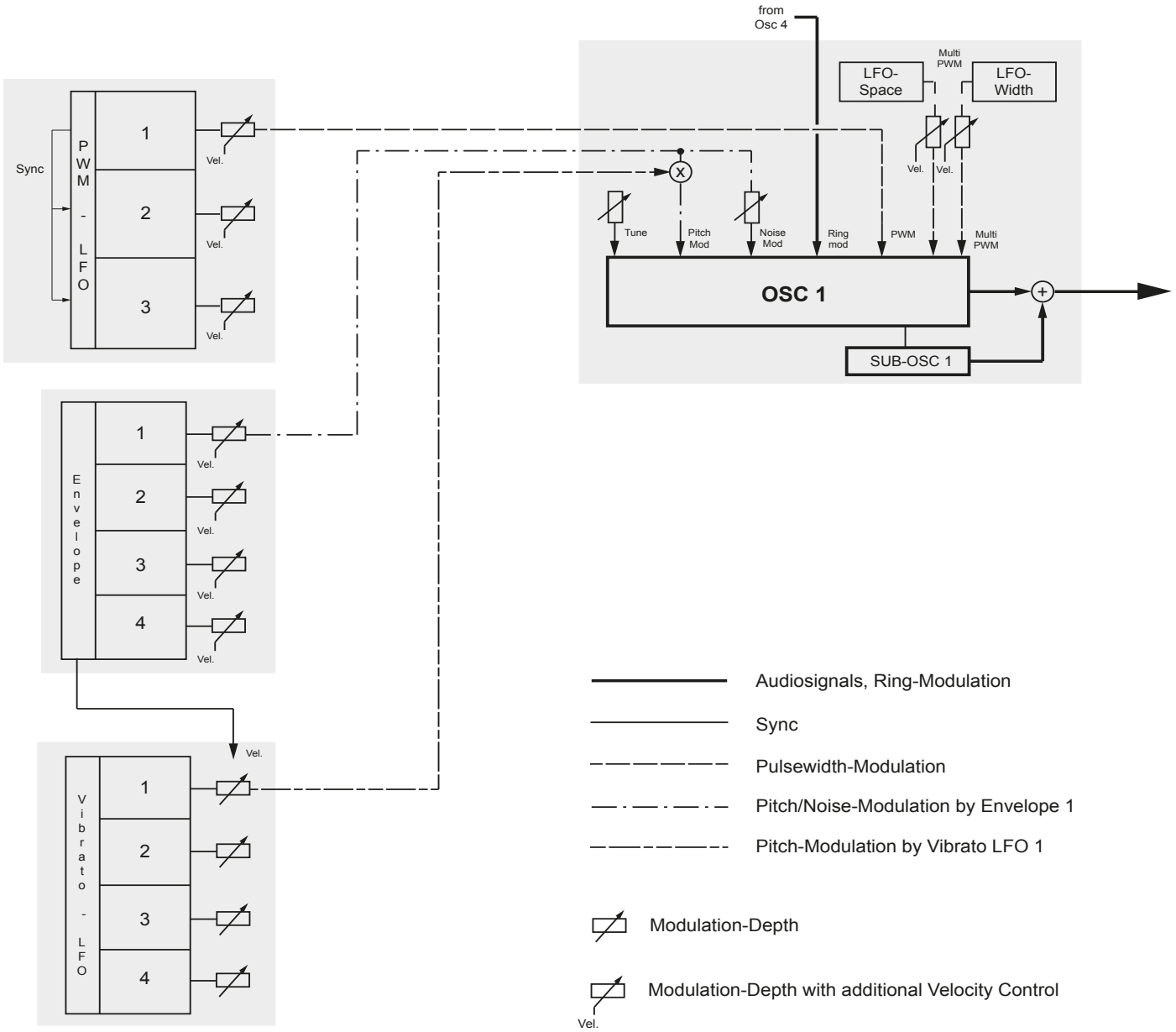
Inputs:

- Space and Width LFOs to control Multi PWM.
- The PWM input that is fed by the PWM LFO 1.
- The ring-modulation input that is fed by Oscillator 4.
- The noise modulation input with its amount control and its connection to the Oscillator envelope (more on this later).
- The pitch modulation input that is fed by the pitch envelope, the Vibrato LFO (more on this later) and the noise source.
- The Tuning and manual pitch controls.

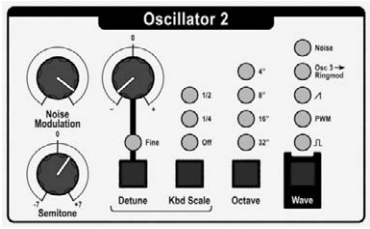
Outputs:

- The audio output with a mix of main- and sub oscillator signals.

The modulation sources in the left half of the image will be covered as soon as we managed the other oscillators.


from
Osc 4
LFO-
Space
Multi
PWM
LFO-
Width
Vel.
Vel.
Sync
PWM-LFO
1
2
3
Vel.
Vel.
Vel.
Tune
Pitch
Mod
Noise
Mod
Ring
mod
PWM
Multi
PWM
OSC 1
SUB-OSC 1
Envelope
1
2
3
4
Vel.
Vel.
Vel.
Vel.
Vibrato-LFO
1
2
3
4
Vel.
Audiosignals, Ring-Modulation
Sync
Pulsewidth-Modulation
Pitch/Noise-Modulation by Envelope 1
Pitch-Modulation by Vibrato LFO 1
Modulation-Depth
Modulation-Depth with additional Velocity Control
Vel.

OSCILLATOR 2



Oscillator 2 is much more basic. You will figure out pretty quickly. Oscillator 2 has a Sub Oscillator but for technical reasons, it is fully controlled from the panel section of Oscillator 3.

- **Noise Modulation**: Pitch of Oscillator 2 is modulated by a noise signal.
- **Semitone**: Detunes Oscillator 2 up or down by seven semitones.
- **Detune**: Detunes Oscillator 2 up or down by one semitone respectively 10 cent up / down (**Fine** key pressed).
- **Kbd Scale**: Alters the ***Detune*** depending on the played note on the keyboard. Reference point is key A3:
  1/2: Two octaves below A3 quadruples Detune; two octaves above A3 quarters Detune.
  1/4: Two octaves below A3 doubles Detune; two octaves above A3 halves Detune.
  OFF: Detune is independent of the played note on the keyboard.

The ***Kdb Scale*** function is useful to control the beat frequency of the oscillators more precise for lower and higher note ranges.

- **Octave**: Octave setting of Oscillator 2.
- **Wave**: Waveform / modulation type of Oscillator 2.

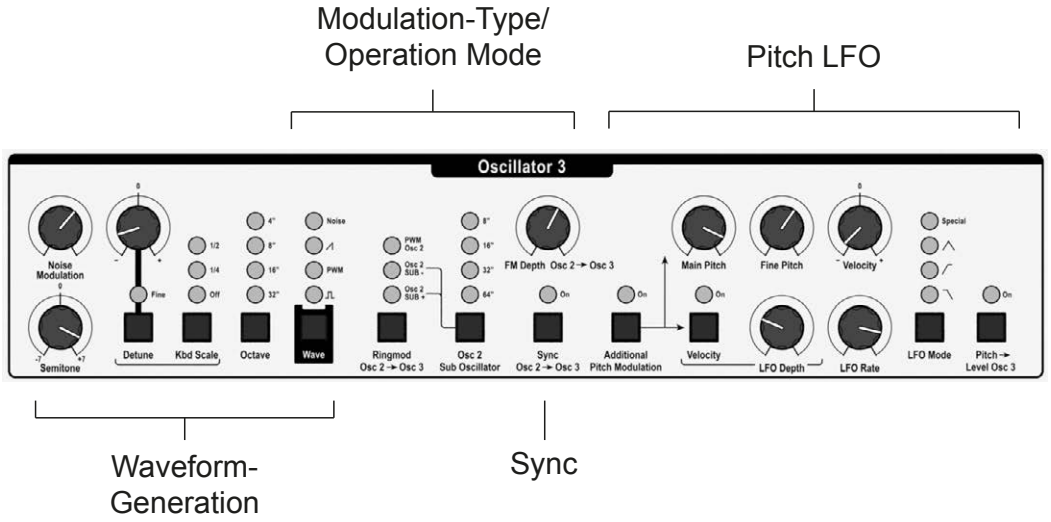
Wave key setting	Waveform	Modulation Type	Modulation Source
R	Square	Pitch	Vibrato LFO, Noise
PWM	Pulse Pulse	Pitch Pulse Width	Vibrato LFO, Noise PWM LFO 2
S	Sawtooth	Pitch	Vibrato LFO, Noise
S + PWM	Two phase-shifted sawtooth waves	Pitch Phase Modulation	Vibrato LFO, Noise PWM LFO 2
Osc 3 => Ringmod	Complex Wave Complex Wave	Pitch Ring Modulation	Vibrato LFO, Noise Oscillator 3
Noise	Slightly coloured noise	none	none

The phase modulation mode (S + PWM) is described in the Oscillator 1 section above.

The signal and modulation inputs of Oscillator 2 are closely related to Oscillator 3. That is why we will examine them when dealing with Oscillator 3.

OSCILLATOR 3

Oscillator 3 is somewhat special again. It has outstanding ring-modulation power and it is closely related to Oscillator 2. Take some time to explore it carefully.



- **Noise Modulation**: Pitch of Oscillator 3 is modulated by a noise signal.
- **Semitone**: Detunes Oscillator 3 up or down by seven semitones.
- **Detune**: Detunes Oscillator 3 up or down by one semitone resp. 10 cent up / down (**Fine** key pressed).
- **Kbd Scale**: Alters ***Detune*** independent of the note played on the keyboard. Reference point is key A3:
  1/2: Two octaves below A3 quadruples Detune; two octaves above A3 quarters Detune.
  1/4: Two octaves below A3 doubles Detune; two octaves above A3 halves Detune.
  OFF: Detune is independent of the played note on the keyboard.
- **Octave**: Octave setting of Oscillator 3.
- **FM Depth**: Intensity of frequency modulation by Oscillator 2 (exponential FM).
- **Wave**: Waveform / modulation type of Oscillator 3.

The following chart shows which waveforms are available within the available types of modulation. Please note that most of the different modulation types (pitch, FM, ringmod, PWM) are available at the same time.

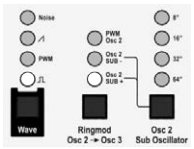
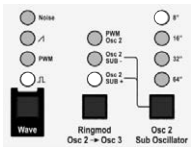
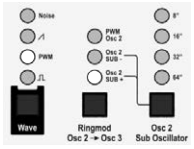
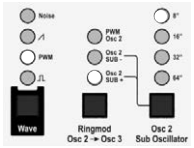
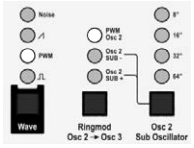
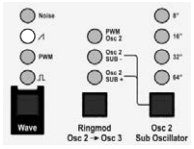
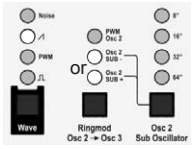
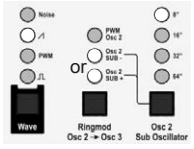
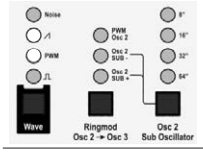
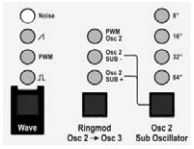
Wave key setting	Resulting Waveform	Modulation Type	Available Modulation Source
R	Square Complex Wave Complex Wave	Pitch FM Ringmod	Vibrato LFO 3, Noise, Pitch LFO Oscillator 2 Sub Oscillator 2
PWM	Pulse Pulse Complex Wave Complex Wave Complex Wave	Pitch Pulse Width FM Ringmod Ringmod + Pulse Width	Vibrato LFO 3, Noise, Pitch LFO PWM LFO 3 Oscillator 2 Sub Oscillator 2 Sub Oscillator 2, PWM LFO 3
S	Sawtooth Complex Wave Saw/Pulse Mix Complex Wave	Pitch FM Amplitude Modulation Ampl-Mod + Ringmod	Vibrato LFO 3, Noise, Pitch LFO Oscilliator 2 PWM LFO 3 PWM LFO 3, Sub Osc 2 (Phase +/–)
S + PWM	2 phase-shifted saw-waves Complex Wave	Pitch Phase Modulation FM	Vibrato LFO 3, Noise, Pitch LFO PWM LFO 3 Oscillator 2
Noise	Slightly coloured noise	none	none

Modulation Type / Operation Mode controls

- **Ringmod Osc2 => Osc3**: Selects the ring-modulation source (Osc 2 or Sub Osc 2) and enables / disables Sub Oscillator 2, depending on the setting of the "**Wave**" key.

- **Osc2 SubOsc**: Selects the octave range of the Sub Oscillator of Oscillator 2 or the octave range of the ringmod source respectively. No **LED** means Sub Oscillator is "***OFF***".

The following figure shows the interaction of the three function keys **Wave**, **Ringmod Osc2 –> Osc3** and **Osc2 SubOsc**.
The phase modulation mode (***S + PWM***) is described above in the Oscillator 1 section.

Button Setting	Result	
	Output Oscillator 3 / Modulation type	**Output Sub Oscillator 2**
	**Square Wave** No modulation	disabled
	**Ringmodulation** Sub Osc 2 modulates Osc 3 (Square)	Square Wave 32" - 4"
	**Modulated Pulse Wave** Osc 3 gets PWM from PWM LFO 3	disabled
	**PWM / Ringmodulation** Sub Osc 2 modulates Osc 3 (with PWM)	Square Wave 32" - 4"
	**PWM / Ringmodulation** Osc 2 (with PWM) modulates Osc 3 (with PWM)	disabled
	**Saw Wave** No modulation	disabled
	**Saw Wave mixed with slightly amplitude-modulated Square Wave** Modulation controlled by PWM LFO 3	disabled
	**As above with additional Ringmodulation by Sub Osc 2** Ampl. Modulation controlled by PWM LFO 3 Ringmod controlled by Osc 2	Square Wave 32" - 4"
	**Phase-modulated pair of Saw Waves** Modulation controlled by PWM LFO 3	disabled
	**Noise Signal** No modulation	disabled

- **Sync**: Synchronizes Oscillator 3 to Oscillator 2. Sounds particularly interesting when ring-modulation is enabled as well.
- **Additional Pitch Modulation**: Enables additional fiunctions to control the pitch of Oscillator 3 independently of the Vibrato LFO. You will find here another LFO as well as controls for coarse/fine pitch and velocity amount.
- **Main Pitch**: Shifts the pitch of Oscillator 3 up or down by approximately two octaves or sets the range of the Pitch LFO respectively.
- **Fine Pitch**: Fine adjustment of Main Pitch.
- **Velocity** (control): When turned up, keyboard velocity directly controls the pitch of Oscillator 3 with positive or negative amount. The entire Additional Pitch Modulation section is great for expressive ring-modulation and sync sounds.
- **LFO Depth**: Modulation Depth
- **Velocity** (key): LFO Depth is controlled by keyboard velocity.
- **LFO Rate**: Modulation speed
- **LFO Mode**:
  / : Continuous triangular waveform
  /I : One-shot rising slope
  I : One-shot falling slope
  SPECIAL: Space for future updates
- **Pitch => Level Osc 3**: Modulates the output level of Oscillator 3 according to the Pitch LFO settings.

Oscillator 2/3 modulation paths

The figure on the next page shows the entire signal routing with inputs and outputs of Oscillators 2 and 3.

Oscillator 2 is quite simple – there are just three modulation inputs and one modulation output:

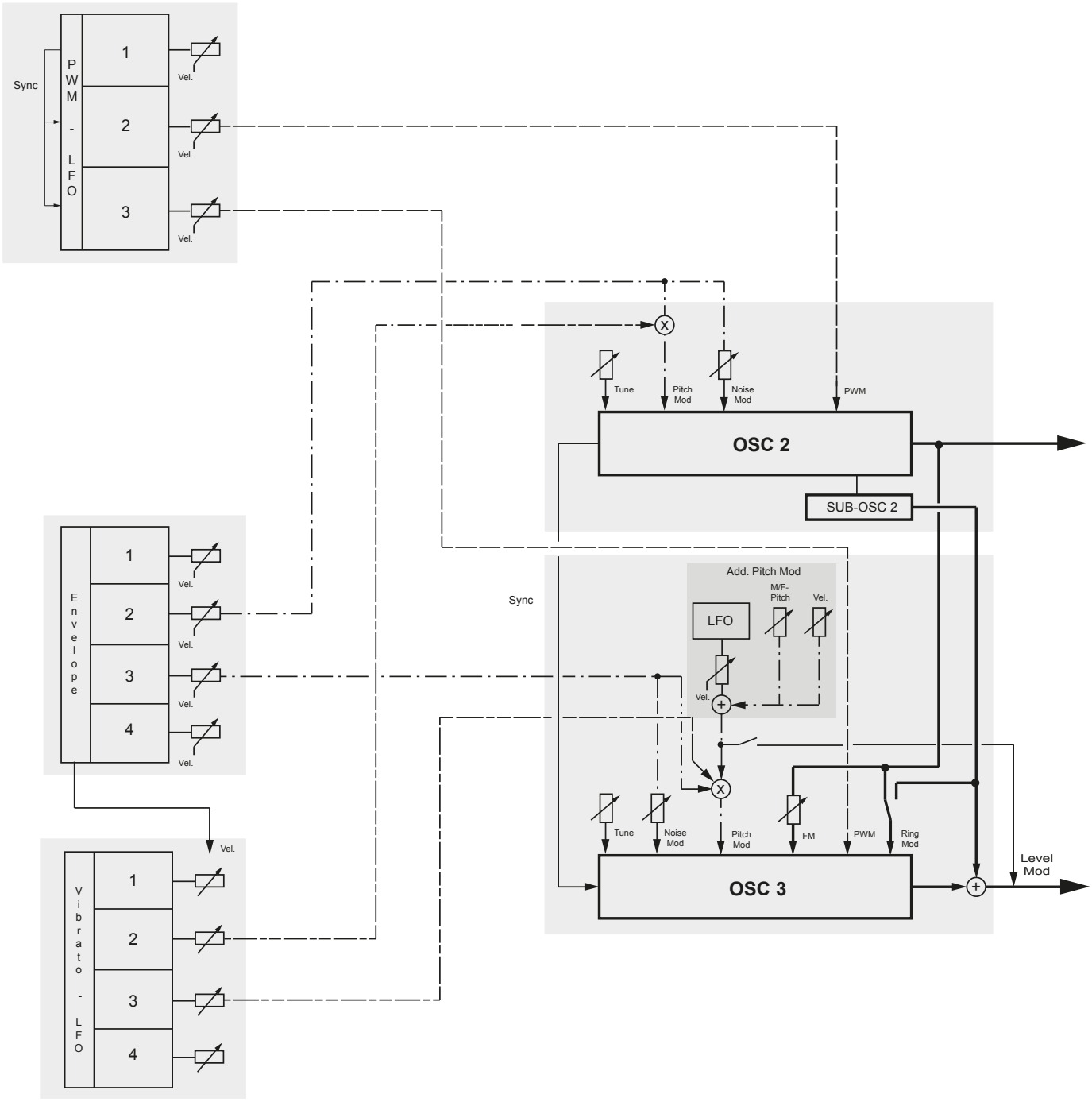
Inputs:
- The PWM input fed by PWM-LFO 2.
- The pitch modulation input fed by the pitch envelope, the Vibrato LFO and the noise source.
- The controls for Tuning and manual pitch control.

Outputs:
- Oscillator 2 sends a sync signal to Oscillator 3.

Oscillator 3 is a bit more mind-boggling. Let‘s check out all its modulation inputs:

- The ring-modulation input fed by Oscillator 2 or Sub Oscillator 2.
- The PWM input fed by PWM LFO 3.
- The FM input fed by Oscillator 2.
- The pitch modulation input that is fed by the pitch envelope, the Vibrato LFO, the noise source, and the „Additional Pitch Modulation“ with controls and LFO.
- The controls for Tuning and manual pitch control.
- The sync input fed by Oscillator 2.

The „Additional Pitch Modulation“ section can also control the output level of Oscillator 3.



Audiosignals (Ring-Modulation, FM)

Sync, Level-Modulation

Pulsewidth-Modulation

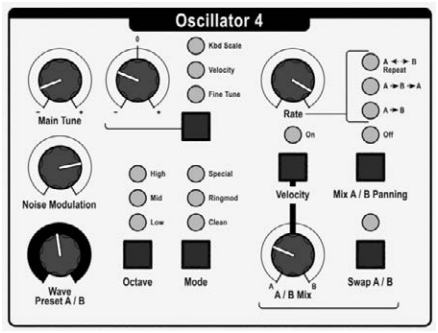
Pitch/Noise-Modulation by Envelope 2, 3

Pitch-Modulation by Vibrato LFO 2, 3

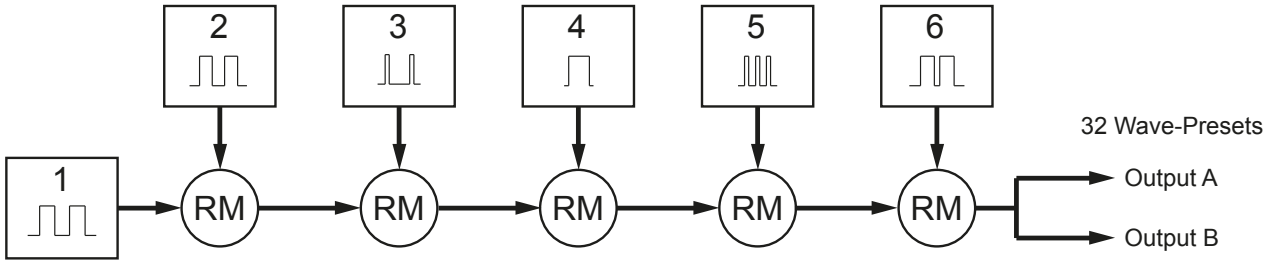
Modulation-Depth

Modulation-Depth with additional Velocity Control

OSCILLATOR 4

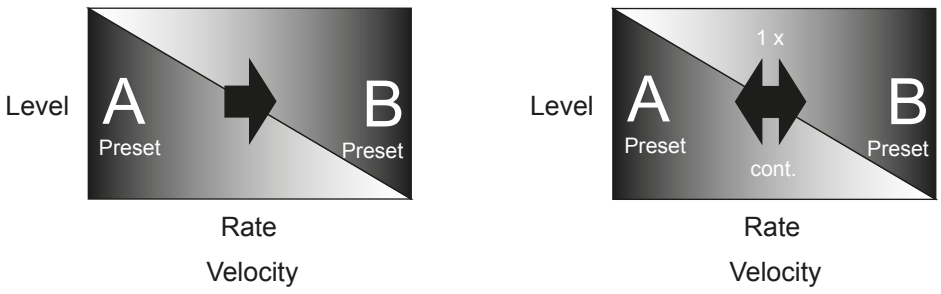


Yes, there actually is a fourth Oscillator! It is also quite special but a lot less complex than Oscillator 3. It is entirely based on ring-modulation and produces complex wave-forms.
Oscillator 4 features a chain of five ring modulators that are fed by six pulse-waves with different pulse-widths each. The product of Ringmod 1 is ring-modulated by the third pulse-wave and so on. Depending on the internal parameter settings, two groups of 32 wave presets each are generated.



Waveform Generation and Mod LFO controls

- **Noise Modulation**: Pitch of Oscillator 4 is modulated by a noise signal.
- **Main Tune**: Detunes Oscillator 4 up or down by one octave.
- **Fine Tune**: The control handles three functions depending on the key setting:
  FINE TUNE: Detunes Oscillator 4 up or down by about one semitone
  VELOCITY: Routes keyboard velocity to pitch with positive or negative amount.
  KBD SCALE: Determines keyboard / pitch scaling. In center position, each key produces the same pitch.
- **Octave**: Octave setting of Oscillator 4.
- **Mode**: Sets the ring-modulation algorithm:
  CLEAN: Produces harmonically related waveforms, resulting in a clean sound.
  RINGMOD: No harmonically related waveforms, resulting in a more noisy, dissonant or chiming sound.
- **A / B Mix**: Crossfades between two wave presets.
- **Swap A / B**: Switches both wave presets: A becomes B and B becomes A.



- **Velocity**: Puts wave preset morphing under velocity control.

- **Mix A / B Panning**: Enables a dedicated LFO to crossfade between the wave presets automatically.
  OFF: LFO disabled.
  A => B: Crossfades between presets A and B.
  A => B => A: Crossfades between presets A to B and back to A.
  A <=> A
  REPEAT: Continuous crossfade between A and B.

- **Rate**: LFO frequency



*When continous crossfading is active (**A <=> A**) the Rate control works reversely: The maximum modulationspeed is fully left position.*

Oscillator 4 modulation paths

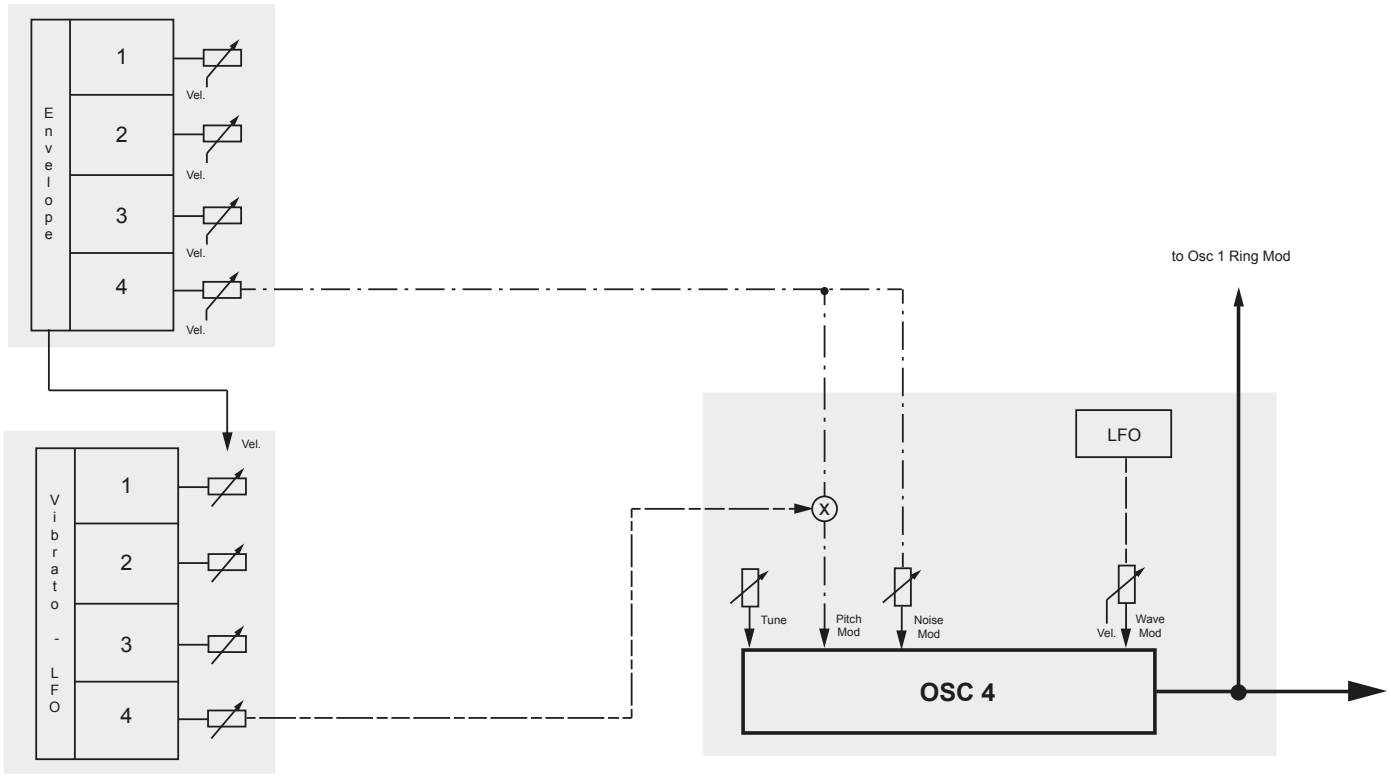
The following figure shows the entire signal routing with inputs and outputs of Oscillator 4.

Inputs:

- The wave crossfade / mod input fed by the internal LFO.
- The pitch modulation input that is fed by the pitch envelope, the Vibrato LFO, and the noise source.
- The Tuning controls for manual pitch control.

Outputs:

- The audio output is split and used as ring modulation source for Oscillator 1.



Audiosignals, Ring-Modulation

Pitch/Noise-Modulation by Envelope 4

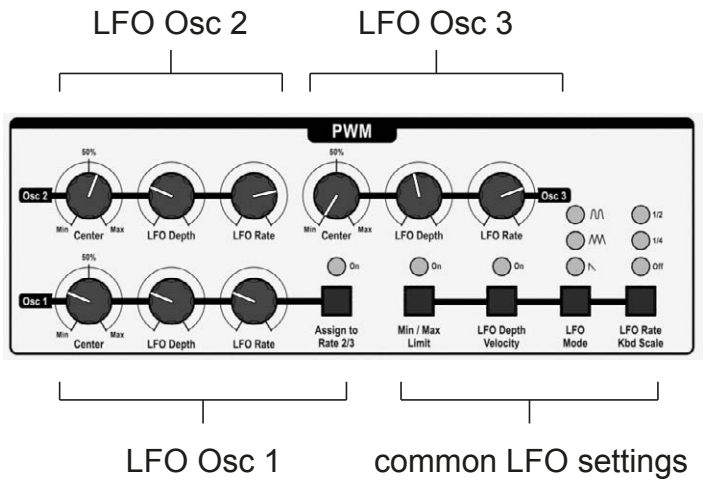
Pitch-Modulation by Vibrato LFO 4

Waveform-Modulation

Modulation-Depth

Modulation-Depth with additional Velocity Control

PWM LFOS



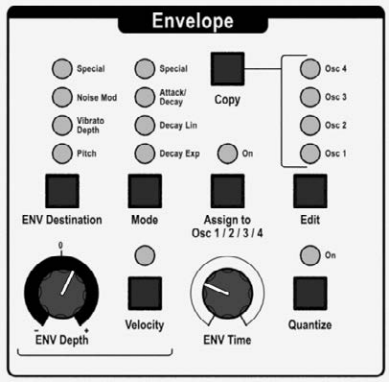
These three LFOs are used to control pulse-width modulation (PWM) of Oscillators 1, 2, and 3. They are all designed identically. The parameters controlled by a knob can be adjusted individually, the key functions are the same for all three LFOs.

- **Center**: Pulse-width of pulse waveform or phase shift amount of saw waves respectively (please refer to description of Oscillator 1).
- **LFO Depth**: Modulation depth.
- **LFO Rate**: Modulation frequency.
- **Assign to Rate 2/3**: Assigns rate setting of LFO 1 to LFOs 2 and 3.
- **Min/Max Limit**: Limits LFO modulation depth in order to prevent signal cancellation when pulse-width goes beyond a certain level.
- **LFO Depth Velocity**: Adds keyboard velocity to LFO Depth value.
- **LFO Mode**: Modulation waveform:
  : Continuous sine wave
  /\/\ : Continuous triangular wave
  |\ : One shot sawtooth wave
- **LFO Rate Kbd Scale**: Scales the modulation speed (***LFO Rate***) of the PWM LFO across the keyboard. Reference point is key A3:
  1/2: Two octaves above A3 quadruples LFO rate; two octaves below A3 quarters the LFO rate.
  1/4: Two octaves above A3 doubles LFO rate; two octaves below A3 halves LFO rate.
  OFF: PWM LFO rate is independent of played note position on the keyboard.

VIBRATO ENVELOPES AND LFOS IN THE OSCILLATOR SECTION

The Oscillator section features some more modulation sources to generate dynamic pitch modulation. For this purpose you will find a set of four LFOs (one for each Oscillator) and another set of four envelope generators (again one for each Oscillator). That is truly generous.

Envelopes



These four identical envelope generators directly govern the respective pitch of the Oscillators. Also, they provide dynamic control over assigned parameters like Vibrato Depth and Noise Modulation intensity. A simple example of application would be vibrato fading in and out. Each Oscillator can be controlled by its dedicated envelope. The envelopes can be programmed individually or globally. All four envelopes share the same set of controls.

- **ENV Destination**: Selects the destination parameter:
  PITCH: Oscillator pitch
  VIBRATO DEPTH: Modulation depth of the corresponding Vibrato LFO (e.g. ENV 1 controls Vibrato LFO 1).
  NOISE MOD: Modulation depth of Noise Modulation.
  SPECIAL: Space for future updates

- **Mode**: Determines the shape of the envelope:
  DECAY EXP: Exponential response
  DECAY LIN: Linear response
  ATTACK/ DECAY: Rising and falling envelope
  SPECIAL: Space for future updates

- **ENV Depth**: Determines modulation depth:
  - No pitch / vibrato / noise modulation in center position.
  - When turned clockwise, the pitch rises or the vibrato / noise modulation intensity fades in respectively.
  - When turned counter-clockwise, the pitch lowers or the vibrato / noise modulation intensity fades out respectively.

- **Velocity**: Includes keyboard velocity into ***ENV Depth*** values.

- **ENV Time**: Controls the duration of the envelope cycle or shortens and/or extends modulation fade in/out respectively.

- **Quantize**: Provides a stepped progression of pitch rise / fall. Only active when ***ENV Destination*** „***PITCH***“ is enabled.

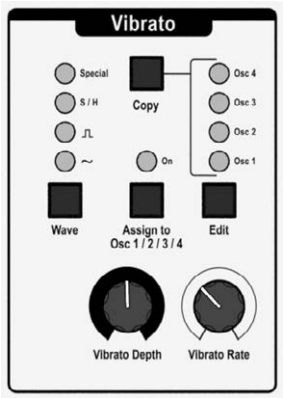
- **Edit**: Selects envelope to be edited.

- **Copy**: Copies settings from one envelope to another:
  1 - Select e.g. envelope 1 by hitting **Edit** key.
  2 - Adjust settings for envelope 1.
  3 - Hit **Copy** key. ***OSC 2***, ***OSC 3*** and ***OSC 4*** LEDs will start flashing.
  4 - Hit **Edit** again to select envelope that is to have the settings of envelope 1. Its LED keeps flashing.
  5 - Hit **Copy** again to perform copy procedure.
  6 - Repeat 3 - 5 to copy envelope 1 settings to other envelopes.

- **Assign to Osc 1/2/3/4**: If set to "***ON***", this function temporarily applies settings of a selected envelope to all other envelopes (has to be disabled when using the ***Copy*** function / selecting envelopes!).

Settings return to programmed values as soon as Assign is disabled. This way it is easy to e.g. temporarily sweep the respective pitch of all three Oscillators globally and return to their programmed individual settings by just hitting the **Assign** key once.

Vibrato LFOs



These four identical LFOs govern the pitch of the four Oscillators. Each Oscillator can be controlled by its dedicated LFO. The LFOs can be programmed individually or globally. All four LFOs share the same set of controls.

- **Wave**: Vibrato LFO waveform
  ∿ : Sine wave
  ⊓ : Square wave
  S/H: Stepped random wave
  ∿+S/H: Smooth random wave (both LEDs ***ON***)
  Special: Space for future updates

- **Vibrato Depth**: Modulation depth.

- **Vibrato Rate**: Modulation frequency.

- **Edit**: Selects LFO to be edited.

- **Copy**: 
  Copies settings from one LFO to another:
  1 - Select e.g. ***LFO 1*** using the **Edit** key.
  2 - Adjust settings for LFO 1.
  3 - Hit **Copy** key. ***OSC 2***, ***OSC 3*** and ***OSC 4*** LEDs will start flashing.
  4 - Hit **Edit** again to select LFO that is to have the settings of LFO 1. Its LED keeps flashing.
  5 - Hit **Copy** again to perform copy procedure.
  6 - Repeat 3 - 5 to copy LFO 1 settings to other LFOs.

Assign to Osc. 1/2/3/4: If set to "***ON***", this function temporarily applies settings of the selected LFO to all other LFOs.

Settings return to programmed values as soon as **Assign** is disabled. This way it is easy to e.g. temporarily alter the rate of all four LFOs globally at the same time and return to their programmed individual settings by just hitting the **Assign** key once.



*Please note: when using the **Copy** function or selecting an envelope, **Assign to Osc. 1/2/3/4** has to be disabled!*



*Please note: if you want to generate a steady vibrato, the parameter **ENV Destination** in the adjacent Envelope section has to be set to **PITCH** (please refer to the previous paragraph on page 29).*

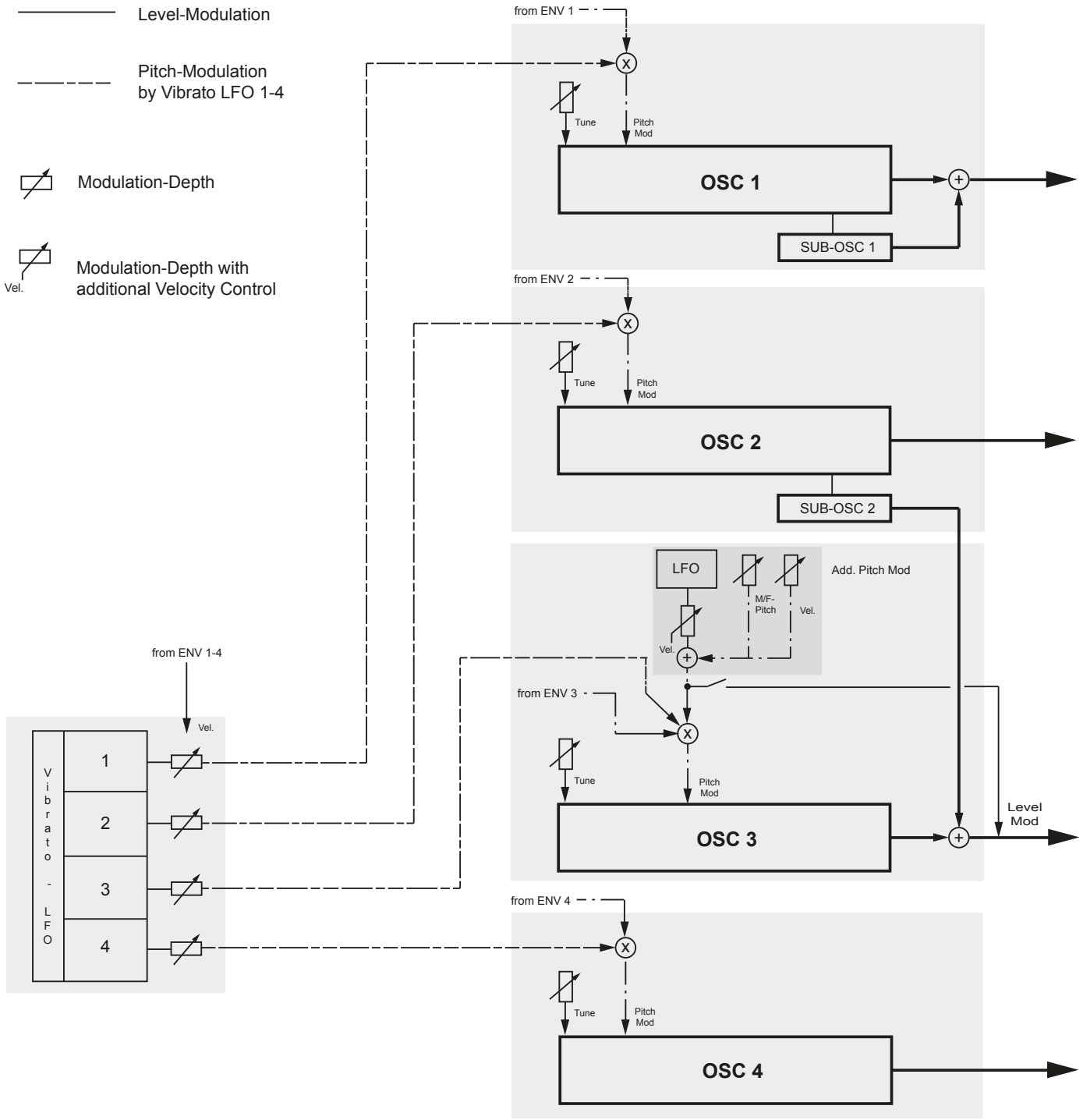
To obtain a permanent vibrato, please make sure that Vibrato Depth in the adjacent Envelope-Section is disabled. In addition, turn the ENV Depth control into a position ≠ zero.

OSCILLATOR MODULATION AND INTERACTION

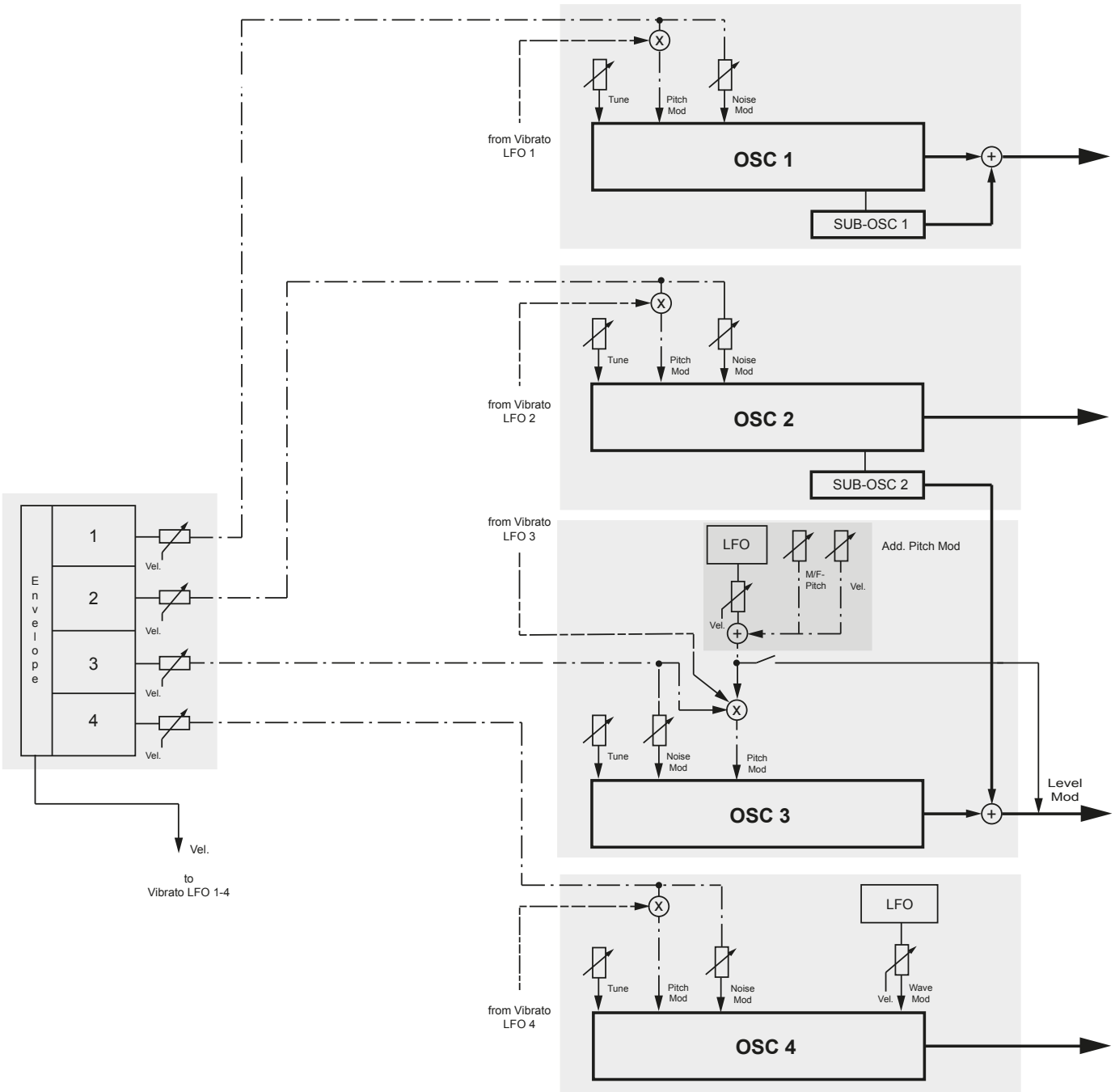
Congratulations, you have just managed all the controls of Schmidt‘s mightily powerful Oscillator section. In order to recap and deepen your knowledge, we will now have a look at the entire Oscillator section and find out about how all the different modulation paths are connected to the four Oscillators and their modifiers. You can use the following illustrations in combination with your recently gained knowledge of the Oscillator functions.

Pitch Modulation

The following figure shows the pitch modulation paths of all four Oscillators except the Oscillator envelopes.



Here you will see the pitch modulation paths of all four Oscillators with envelopes but without the Vibrato LFOs.



Level-Modulation

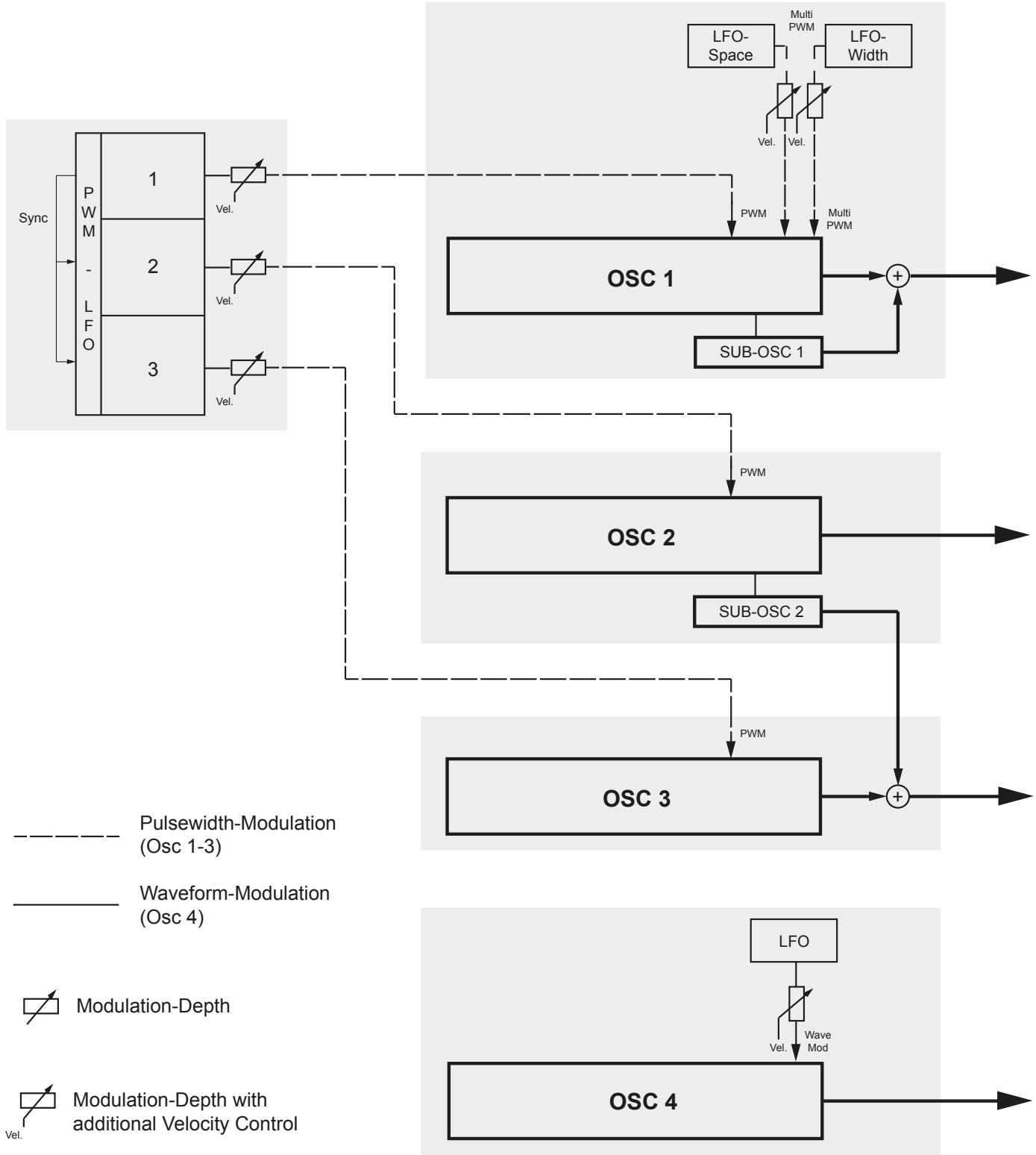
Pitch/Noise-Modulation by Envelope 1-4

Modulation-Depth

Modulation-Depth with additional Velocity Control

Pulse Width Modulation

This figure shows the interaction between the Oscillators and their PWM modifiers or the waveform modulation LFO of Oscillator 4 respectively.



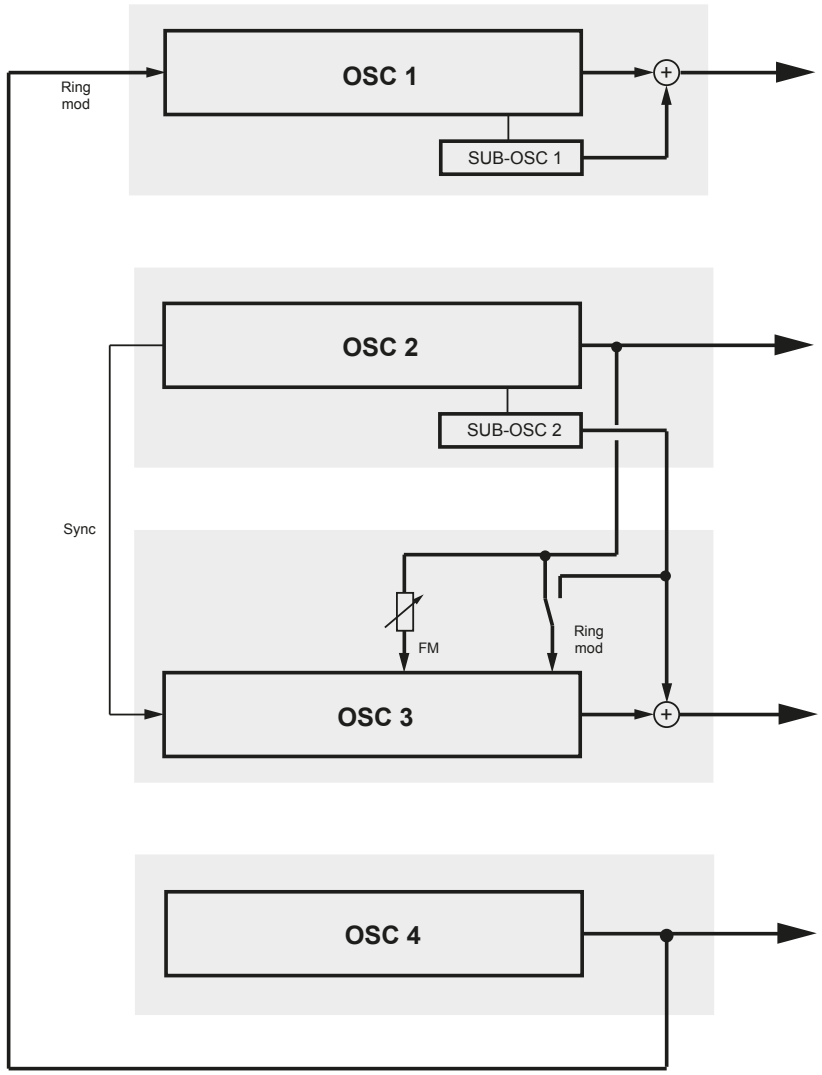
Ringmodulation, FM and Sync

Here you will see the signal routing of the audio modulation paths (FM and ring-modulation) as well as the sync connection.

Audiosignals (Ring-Mod, FM)

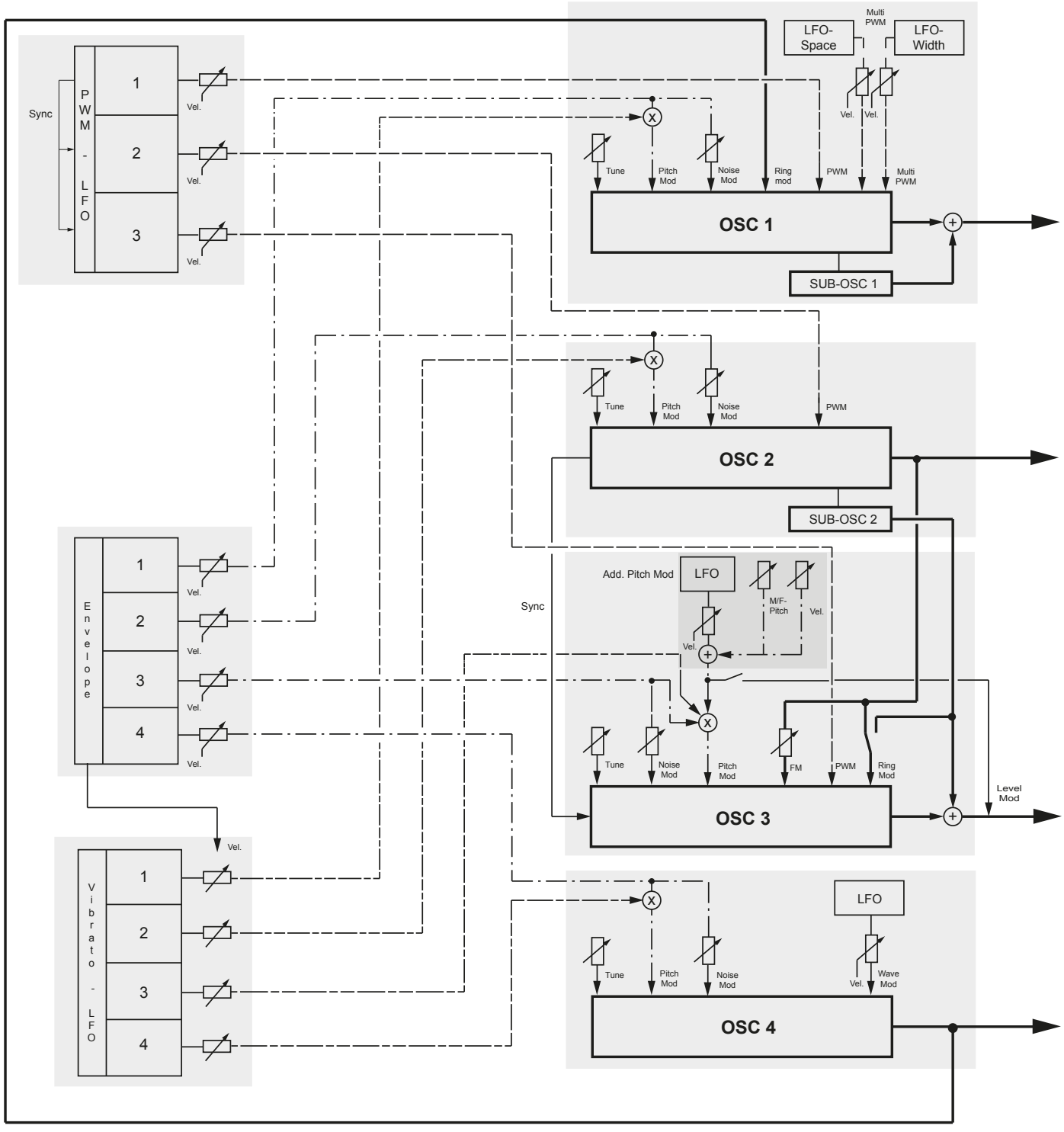
Sync

Modulation-Depth



Complete Oscillator modulation routing

Finally, you can have a look at the complete Oscillator modulation routing. Please note that all these modulations can be used all at once if so desired. You have got the entire scope at your fingertips, from the purest and most beautiful timbres to absolute sonic mayhem – please feel free to experiment.



Audiosignals (Ring-Modulation, FM)

Sync, Level-Modulation

Pulsewidth-Modulation

Pitch/Noise-Modulation by Envelope 1-4

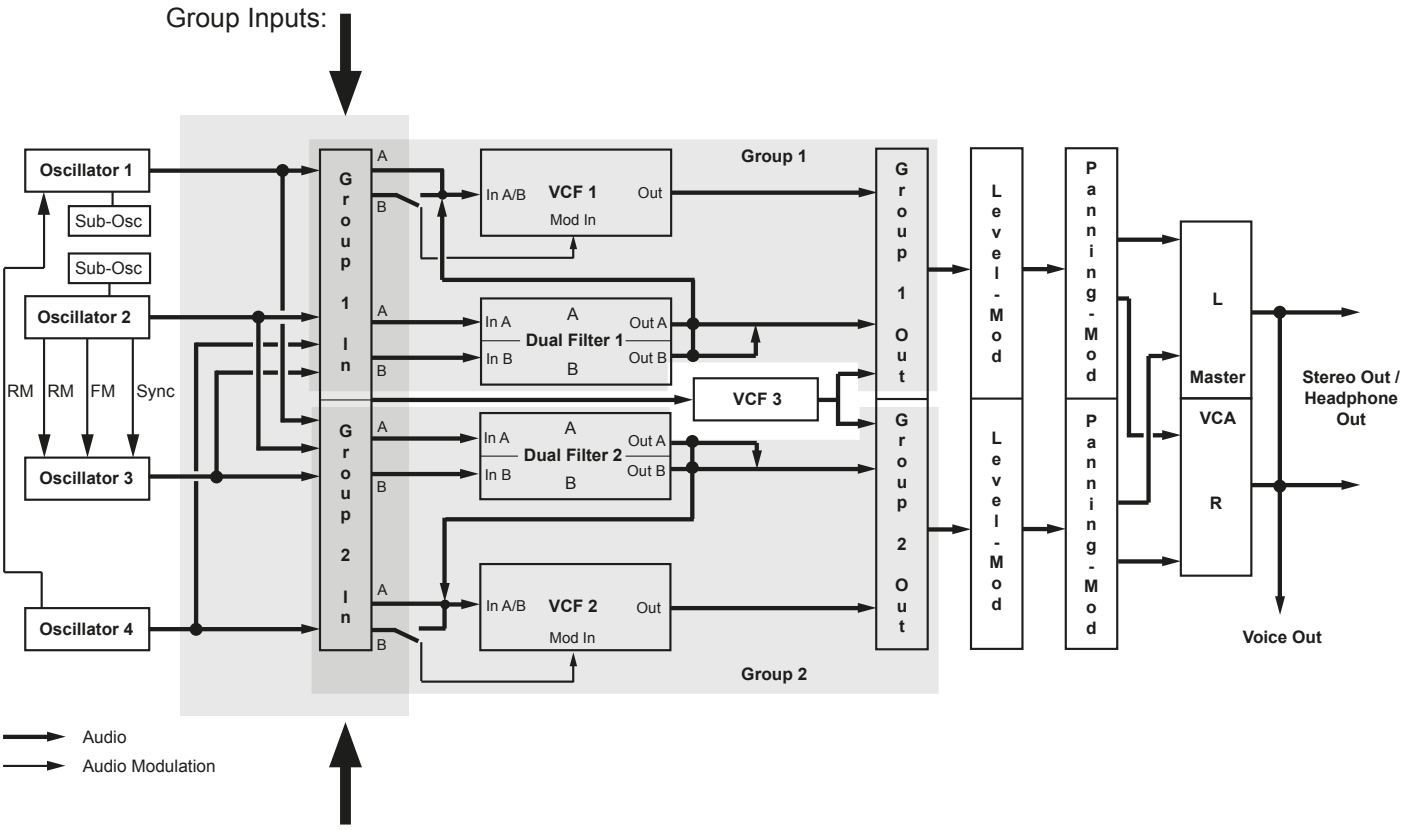
Pitch-Modulation by Vibrato LFO 1-4

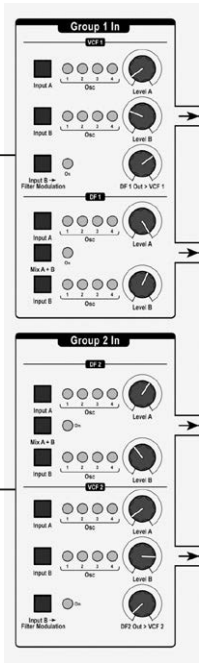
Modulation-Depth

Modulation-Depth with additional Velocity Control

GROUP INPUT MODULES

When recalling the function overview on page 11, you might remember that, beyond the Oscillator section, Schmidt's signal path is divided into two parallel and almost identical sections. Each of these sections, called Groups, sports a filter array to shape the Oscillator timbres with. Splitting up the signal path into two parallel groups allows for the creation of two very different timbres out of the Oscillator signals at the same time. Apart from the filters, which we will explore soon, both groups contain input and output routing modules that allocate the different Oscillator signals to the available filter inputs, and later combine the filter outputs into one stereo signal.
Following the signal path, we will have a closer look at the Group Input modules first.





Group 1 In
signal source selection and mixer for filter inputs Group 1

Group 2 In
signal source selection and mixer for filter inputs Group 2

Each Group has two parallel filters (VCF and Dual Filter / DF) and each of these filters has two inputs (A and B). All four Oscillator outputs can be routed to each of these inputs by using the controls of the Group Inputs.

GROUP 1 IN

Group 1 In feeds both filters of group 1 with all available Oscillator signals. You will find the following controls:

VCF 1

- **Input A**: Selects one Oscillator output and routes it to input A of VCF 1.
- **Level A**: Adjusts the level of the signal fed into input A of VCF 1.
- **Input B**: Selects one Oscillator output and routes it to input B of VCF 1.
- **Level B**: Adjusts the level of the signal fed into input B of VCF 1.
- **Input B => Filter Modulation**: Feeds the signal of Input B into the cut-off modulation input of VCF 1 instead of Input B to produce filter frequency modulation.
- **DF1 Out => VCF1**: Adjusts the signal amount that is fed into the input of VCF 1 by Dual Filter 1 output. The standard parallel configuration of VCF 1 and DF 1 is now gradually morphed into a serial configuration. Please note that the parallel outputs are still available together with the serial routing.

DF 1

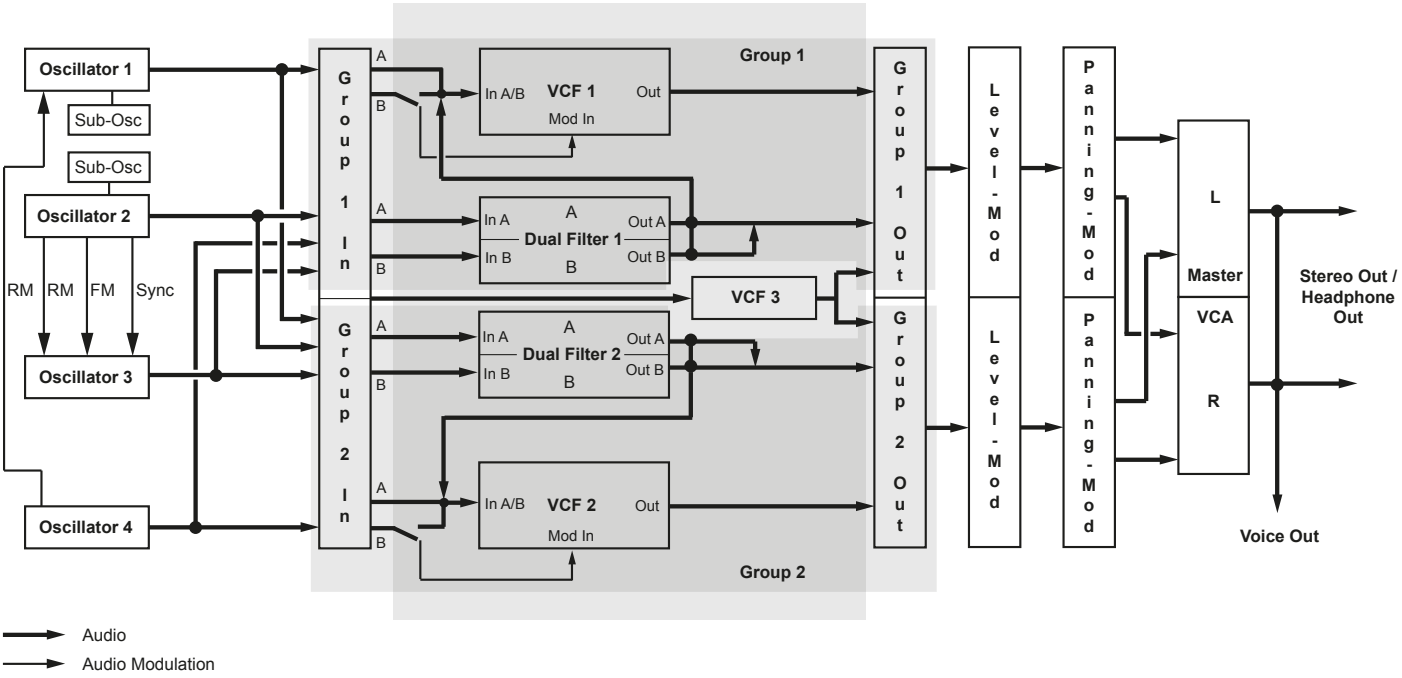
- **Input A**: Selects one Oscillator output and routes it to input A of Dual Filter 1.
- **Level A**: Adjusts the level of the signal fed into input A of Dual Filter 1.
- **Input B**: Selects one Oscillator output and routes it into input B of Dual Filter 1.
- **Level B**: Adjusts the level of the signal fed into input B of Dual Filter 1.
- **Mix A+B**: Mixes inputs A and B.

GROUP 2 IN

Group 2 In feeds both filters of group 2 with all available Oscillator signals. Group 2 is structured exactly like Group 1.

FILTER SECTION

As has previously been mentioned, the filter section is divided into two nearly identical groups to provide two different sonic treatments of the Oscillator signals in parallel. In addition to this, a third signal path can be found which feeds a very simple filter. After the filter section, the signals are combined in a stereo sum.



Since both groups and their respective filter sets are structured in an almost identical fashion, we will focus on just one group in detail and discuss the little differences later.

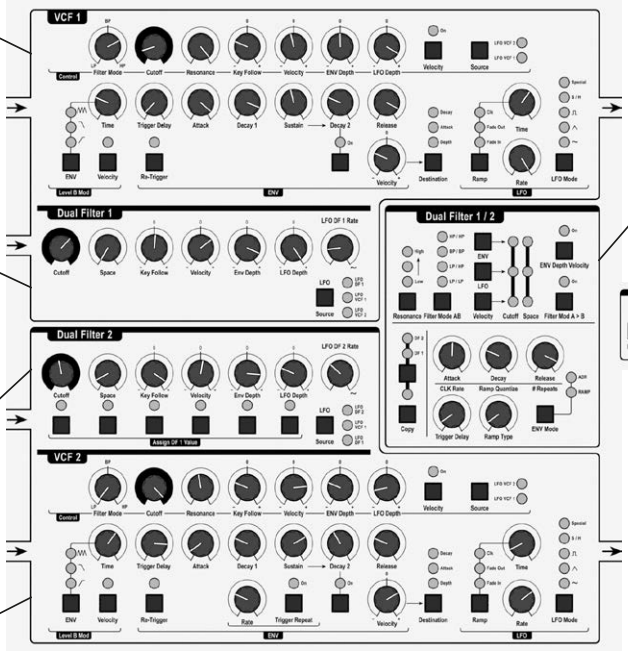
The following figure shows the controls of the entire filter section. As with the Oscillator section, the filter section also contains all the necessary modulation sources (envelopes and LFOs).

VCF 1
Moog style filter Group 1 with envelope and LFO for cutoff modulation and LFO for level modulation Input B Group 1

Dual Filter 1
Dual-Multimode Filter Group 1

Dual Filter 2
Dual-Multimode Filter Group 2

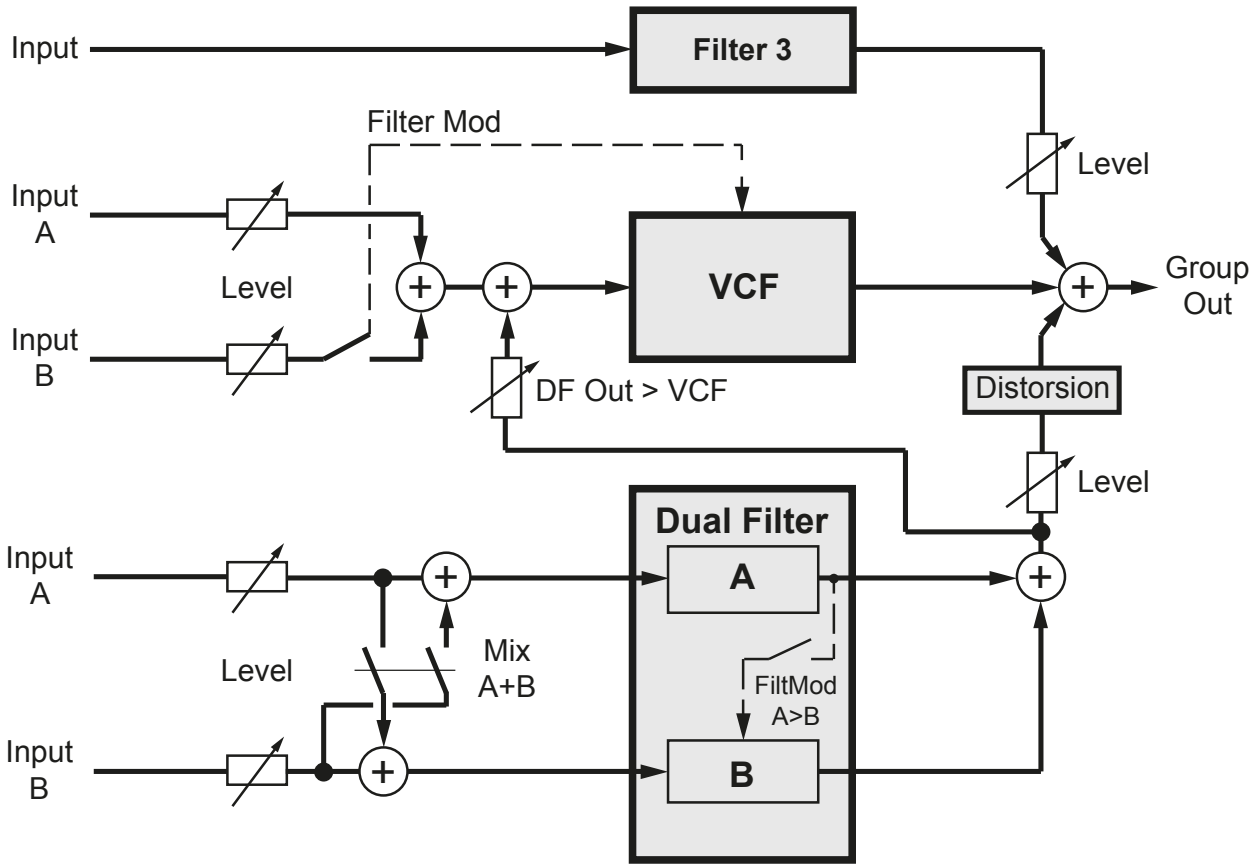
VCF 2
Moog style filter Group 2 with envelope and LFO for cutoff modulation and LFO for level modulation Input B Group 2



Dual Filter 1/2
Modulation of Dual Filter 1 and 2 (LFO, Ramp-Gen.)

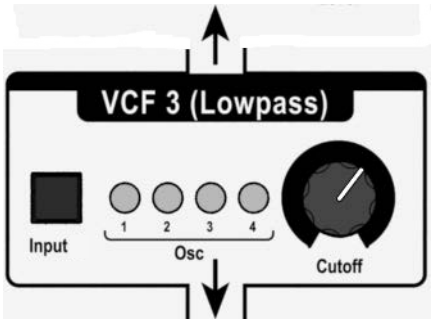
VCF 3
12 dB Lowpass filter

Lets use our magnifying glass again. The following figure shows the entire signal path of one group plus filter 3 in a more detailed way:



On the left-hand side you see the Group In module with the level controls and routing keys. Centrally, you will find the three filters (one group plus filter 3). On the right-hand side you will see the Group Out Mix module that combines the filter outputs.

FILTER 3

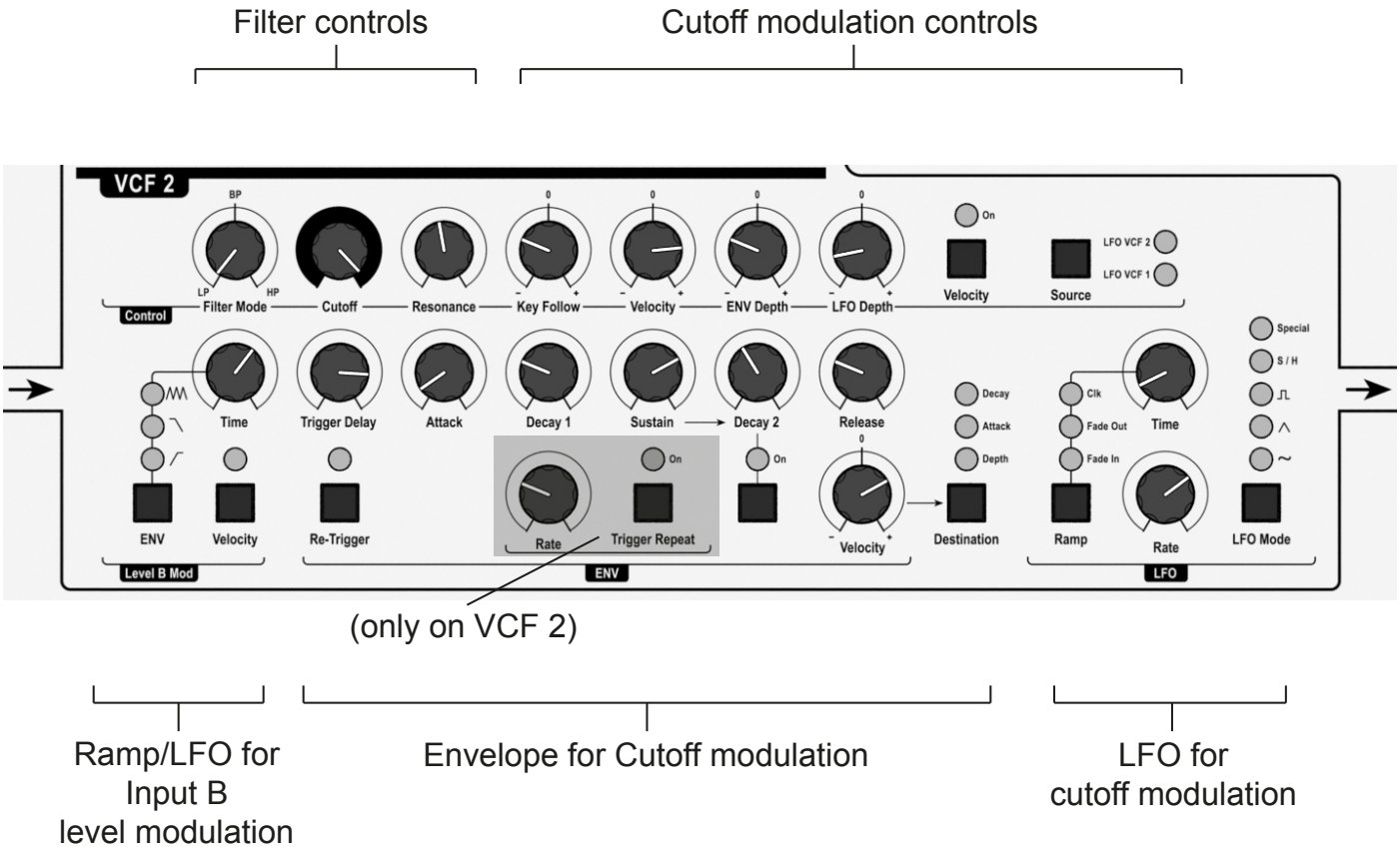


Let‘s start with Filter 3. Its a very simple 12 dB (two-pole) low-pass filter. The cut-off frequency can be adjusted but not modulated (no envelops or LFOs). It does a good job when fattening up signals even a bit more. It also adds some girth to harsh and gritty timbres if so desired.

- **Input**: Selects one Oscillator output and routes it to the input of VCF 3.
- **Cutoff**: Cut-off frequency of VCF 3 (no modulation).

VCF 1 / 2

Each VCF uses two inputs (A and B) that are combined. The VCFs are 24 dB (four-pole) filters with resonance and continuously variable response characteristics. In low-pass mode, they equal the classic Moog filter. Response characteristics, cut-off frequency and resonance can be adjusted, cut-off frequency can be modulated by keyboard position (Key Follow), keyboard velocity, envelope, and LFO. Input B can be used as cut-off modulation source as well. Each VCF sports an envelope generator and an LFO. LFOs can be combined and synced to each other. An additional modulation source controls the level of input B (Level B Mod).



Filter Controls:

- **Filter Mode**: Shifts the filter response characteristics continuously from low-pass to band-pass to high-pass.
- **Cutoff**: Cut-off frequency.
- **Resonance**: Resonance intensity.

Cut-off modulation controls:

All values are added to the resulting modulation depth. Please refer also to section „Real Time Controllers“ on page 62.

- **Key Follow**: Adds the key position to cut-off modulation amount. Negative values invert the effect.
- **Velocity** (control): Adds keyboard velocity to cut-off modulation amount. Negative values invert the effect.
- **ENV Depth**: Adds the envelope to cut-off modulation amount. Negative values invert the polarity of the envelope.
- **LFO Depth**: Adds LFO modulation to cut-off modulation amount. Negative values invert the effect of the LFO curve.
- **Velocity** (key): When enabled, keyboard velocity affects the LFO modulation depth.

- **Source**: Selects the LFO(s) from VCF 1 and/or VCF 2 as VCF frequency modulation sources. If both LFOs are selected, their modulation signals are combined. Use different rates and waveshapes to produce more complex cut-off modulation.

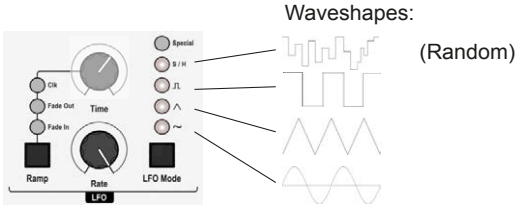
LFO controls:

The LFOs modulate the VCF cut-off frequency periodically. They sport several operation modes:

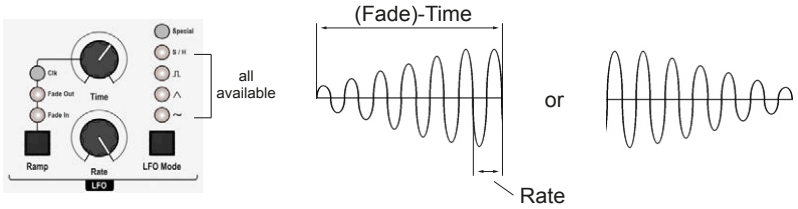
- In ***Standard LFO Mode*** (”**Ramp**” ***OFF***), ”**Rate**” controls the LFO frequency and ”**LFO Mode**” determines the modulation shape.
- In ***Fade Mode***, the LFO generates a fade in/out modulation. The fade time is adjusted using the ”**Time**” control.
- In ***Clock Mode***, more complex and random modulation waveshapes are produced. The settings of ”**Time**”, ”**Rate**” and ”**Mode**” determine the resulting modulation waveshape.

The following figure shows the different possible settings and their resulting waveshapes:

Standard LFO Mode:

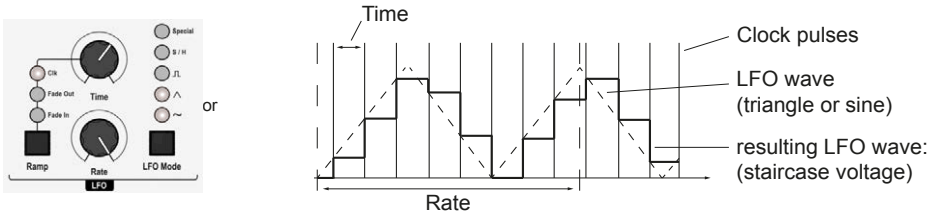


Fade in/out Modulation Mode (available waveshapes as above):

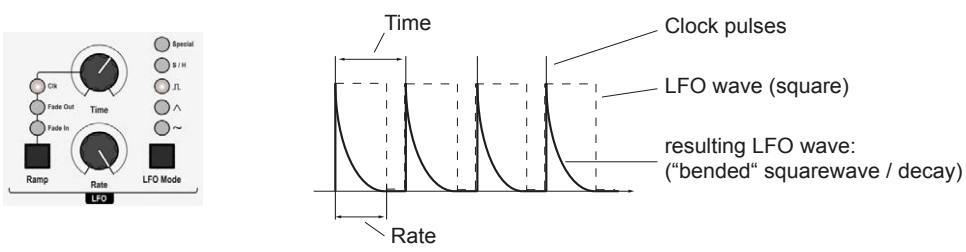


Clock Mode (different complex waveshapes, depending on ”Mode” setting):

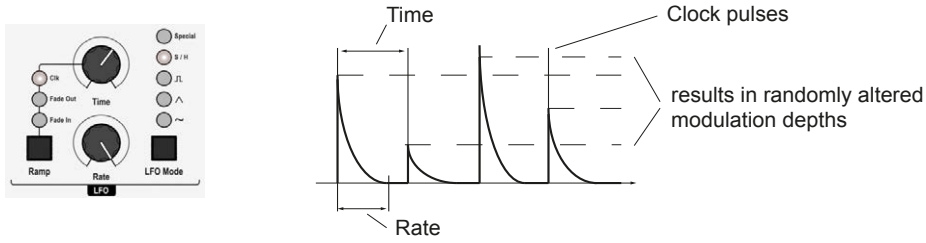
Staircase voltage:



”Bended“ squarewave (decaying shape):



Random Modulation:



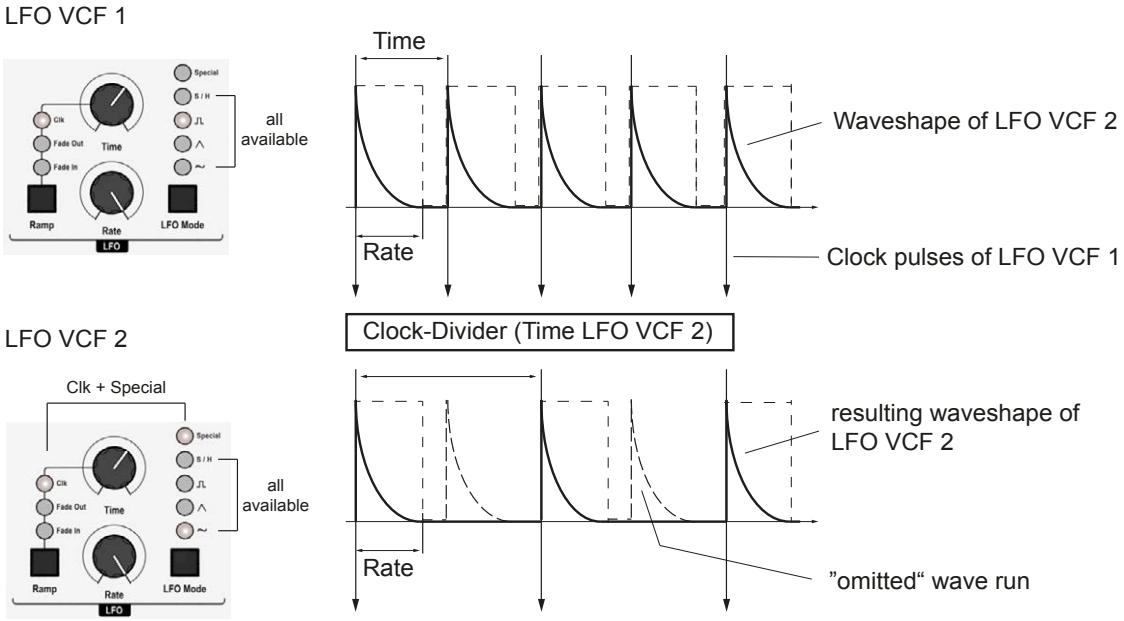
LFO synchronisation:

LFO VCF 2 can be synchronised to LFO VCF 1. LFO VCF 1 produces a clock signal that is run through a divider and then fed into LFO VCF 2. That way, both LFOs cannot only run in sync but also at different frequency ratios.

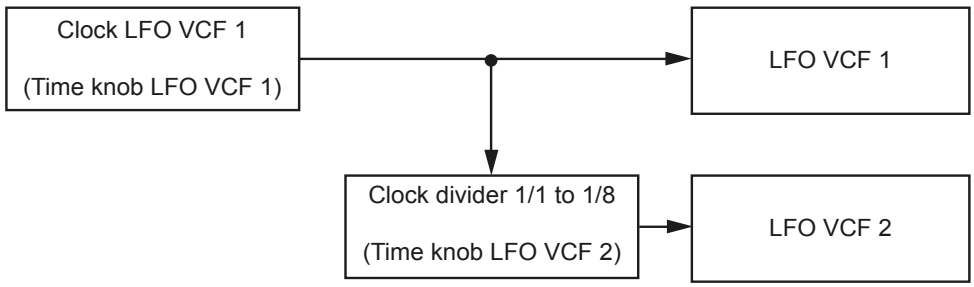
This is how to enable the sync function:

1 - Select **Ramp =** ”***CLK***” on both LFOs.
2 - Select any waveshape (”**LFO Mode**” key) on LFO VCF 1. This setting, in combination with the LFO 1 **Rate** setting, determines the waveshape that modulates VCF 1.
3 - Select desired waveshape of LFO VCF 2 (”**Mode**“). This setting, in combination with the LFO 2 **Rate** setting, determines the waveshape that modulates VCF 2.
4 - Hit **Ramp** in LFO VCF 2 again. The ”***SPECIAL***“ LED lights up and indicates that both LFOs are now running in sync.
5 - Alter **Mode** (waveshape), **Rate** and **Time** settings of both LFOs as you please.

The following figure shows the interaction of both LFOs when sync is active.



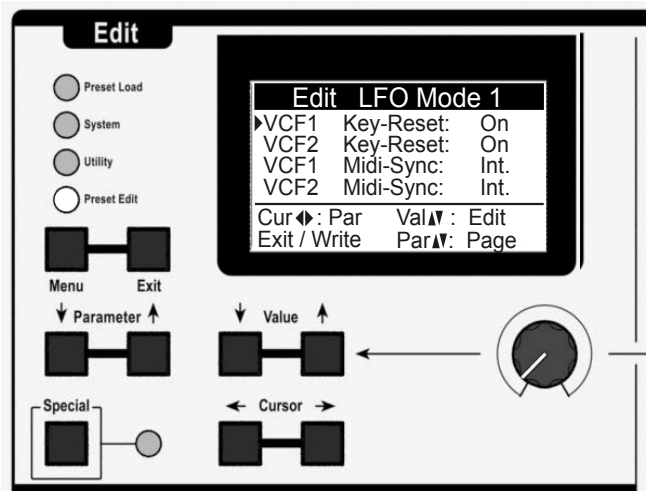
”Rate” and ”Mode” determine the waveshapes, ”Time” determines the master clock resp. clock divider.



Please bear in mind that you can swap or mix both LFO signals using the **Source** keys. Really wild modulation is waiting for you.

MIDI-clock sync:

Both LFOs can be synced to MIDI clock. These settings have to be executed using a menu. Please have a closer look at the Edit section on Schmidt's panel.

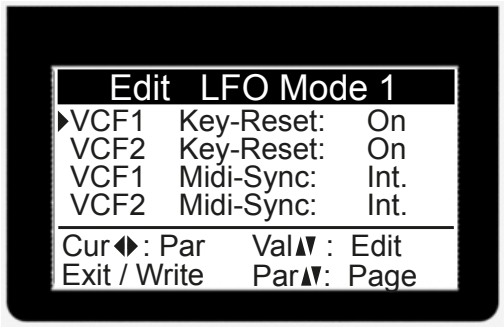


1 - Hit the **Menu** Key until the ***PRESET EDIT*** LED lights up. You are in the Preset Edit menu now.

2 - Hit **Parameter up/down** keys to turn the menu pages until you enter the second page of the Preset Edit menu.

Now the LCD shows the following screen:

Use this page to set the sync options of the LFOs of VCF1/2:

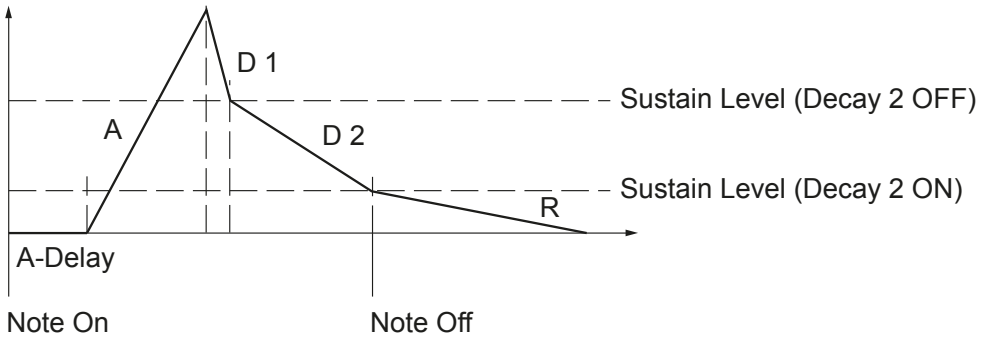


- ***Key-Reset***: restarts the VCF1/2 LFOs via note-on information.
- ***MIDI-Sync***: synchronizes VCF1/2 LFOs to MIDI clock. When enabled, you can select between 13 different clock divider ratios. „***INT***." means MIDI clock sync is disabled. *LFO-MIDI-Sync is also controlled by the function „MIDI-Clock-LFO-Automatic Switching". It is part of the Special menu, described on page 74.*
- ***Cursor left/right***: Previous/next function
- ***Value up/down***: Change value
- ***Exit:*** Quits Edit LFO Mode 1 page.

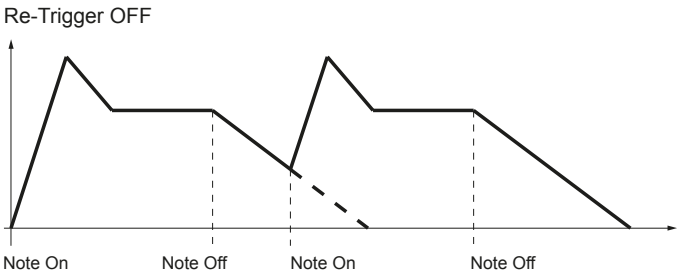
Envelope controls:

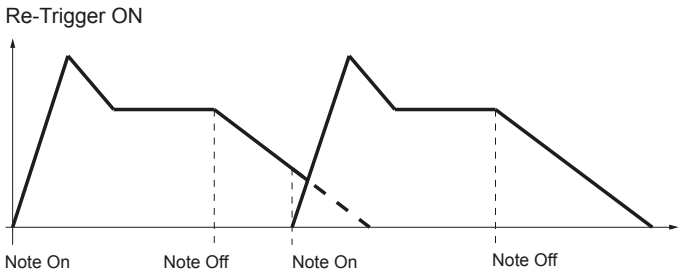
The envelopes ENV 1 and ENV 2 apply a modulation curve to the cut-off frequency of VCF 1 or VCF 2 respectively.

The following figure shows the envelope curve and its time and level parameters:



- **Trigger Delay**: Delays the start of the ***Attack*** phase.
- **Attack**: Adjusts rise time from zero to maximum level.
- **Decay 1**: Adjusts fall time from maximum level to ***Sustain*** Level
- **Sustain**: Adjusts ***Sustain*** level.
- **Decay 2** (control): Adjusts fall time from ***sustain*** level before receiving note-off message.
- **Decay 2** (key): Enables / disables ***Decay 2*** phase.
- **Release**: Adjusts fall time from sustain level after receiving note-off message.
- **Re-Trigger**: Retriggers the envelope if a new note-on message is received before the previous envelope duty circle has been completed fully.
  OFF: Envelope starts at the current level of the previous envelope duty cycle.
  ON : Envelope starts at zero level.





- **Destination**: Determines which envelope modulation parameter is affected by keyboard velocity:
  OFF: No keyboard velocity on envelope parameters.
  DEPTH: Keyboard velocity controls envelope modulation depth.
  ATTACK: Keyboard velocity controls Attack phase.
  DECAY: Keyboard velocity controls Decay phase.
- **Velocity**: Adjusts the effect of the keyboard velocity control on the parameters listed above. Negative values invert the effect.



Please note: Do not confuse this with the cut-off modulation control also named "Velocity" (see above).

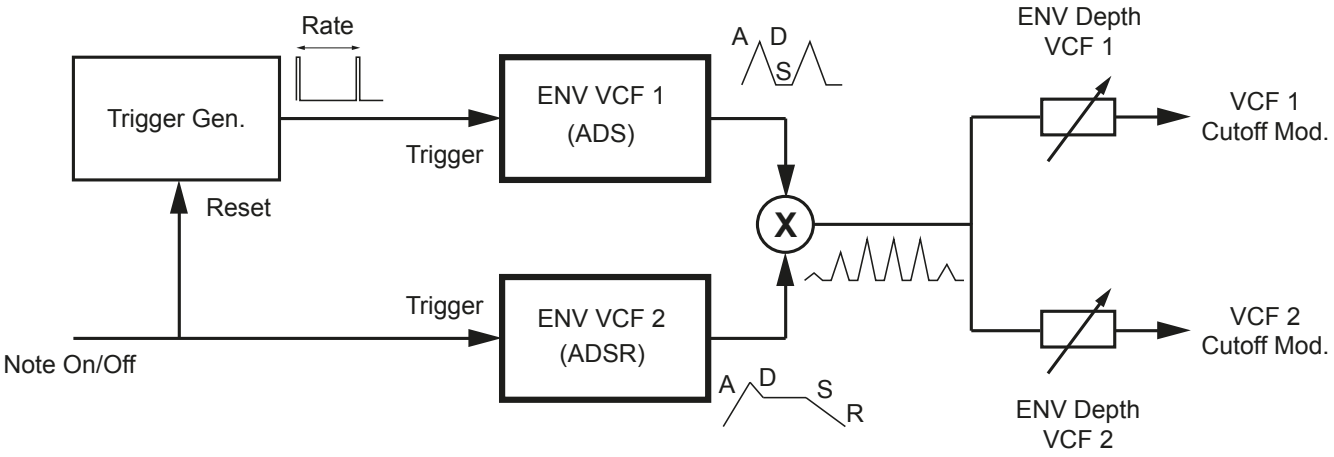
Envelope Trigger Repeat:

If Trigger Repeat is enabled, a trigger generator becomes active which continuously retriggers Envelope 1 as soon as a note-on message comes in. This results in a gate-like chopping effect. Its shape can be controlled by ***Attack***, ***Decay***, and ***Sustain*** parameters of envelope 1 (***Trigger Delay***, and ***Release*** become inactive).
The intensity is adjusted individually for VCF 1 and VCF 2 by the ***ENV Depth*** controls. Envelope VCF 2 generates its usual ADSR shape that is now controlling the intensity of the effect dynamically. This way you can fade the chopping effect in and out.

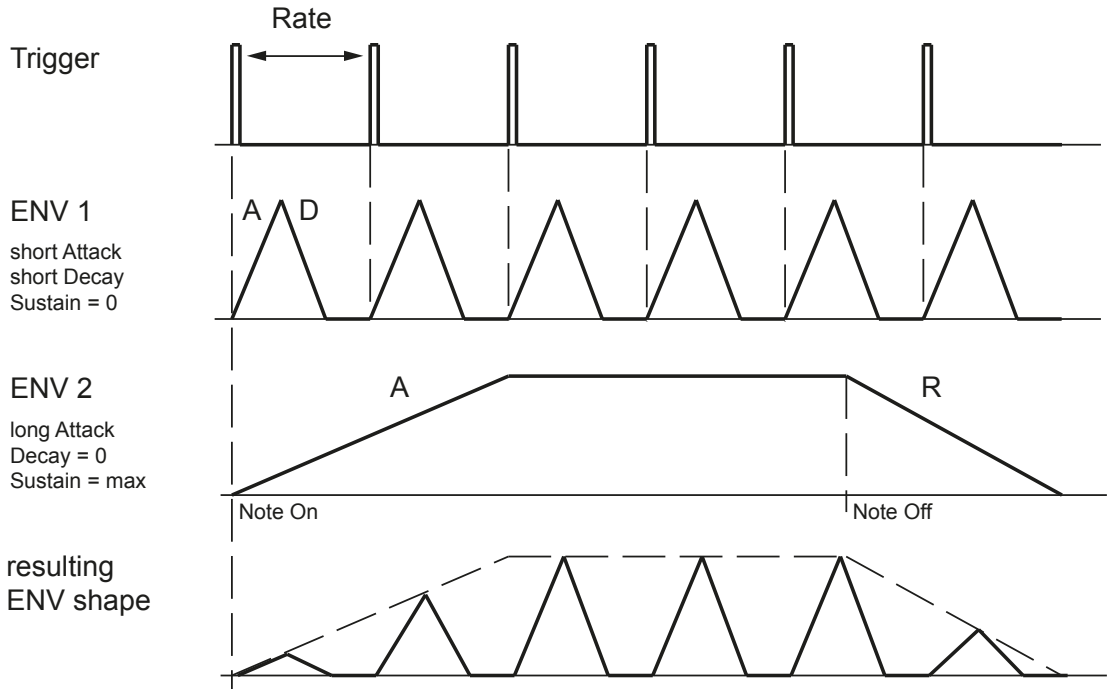
- **Trigger Repeat** (VCF 2): Enables the Envelope Trigger Repeat function.
- **Rate** (VCF 2): Controls the frequency of the ***Trigger Repeat***.

The following two figures explain the function of the Trigger Repeat:

Operation principle of the filter envelope trigger generator:



Operation example of the filter envelope trigger generator:



Level B Mod controls:

This section controls the level of the VCF input B. It is a kind of ”mini envelope / LFO combination”. This feature can be very useful especially when input B is used for cut-off modulation (please refer to section Group In on page 36, 37). That way you can fade the modulation effect in and out.

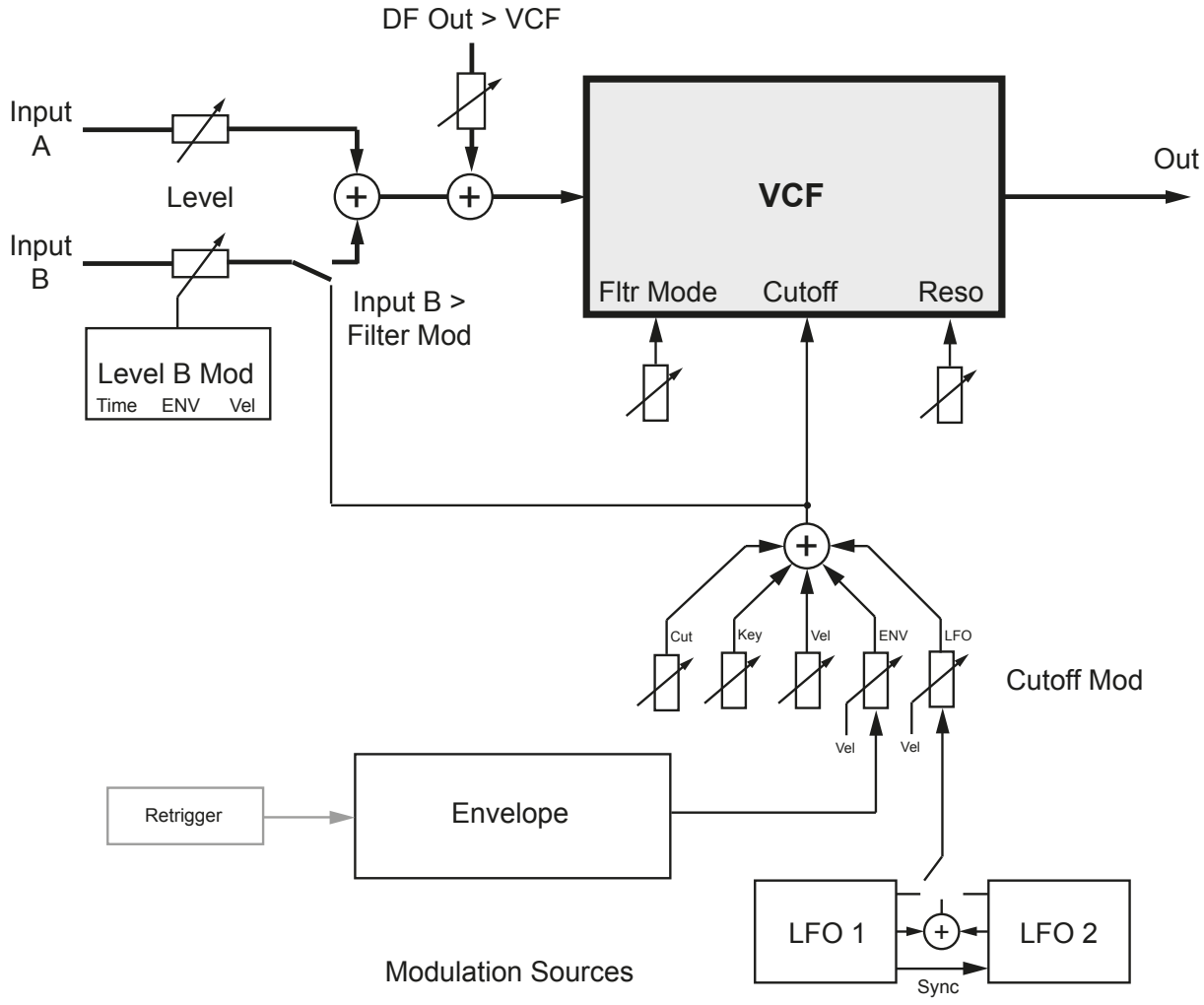
- **ENV**: Determines the shape of the modulation:
  - **/I**: Rising ramp (one shot)
  - **I**: Falling ramp (one shot)
  - **/\/**: Triangular waveshape (continuous)
- **Time**: Adjusts the modulation rate.
- **Velocity**: When enabled, keyboard velocity affects modulation depth.

Filter modulation summary:

In order to grasp this rather complex operation fully, please memorize the following figure: It shows the audio signal path and all modulation paths of the VCF:

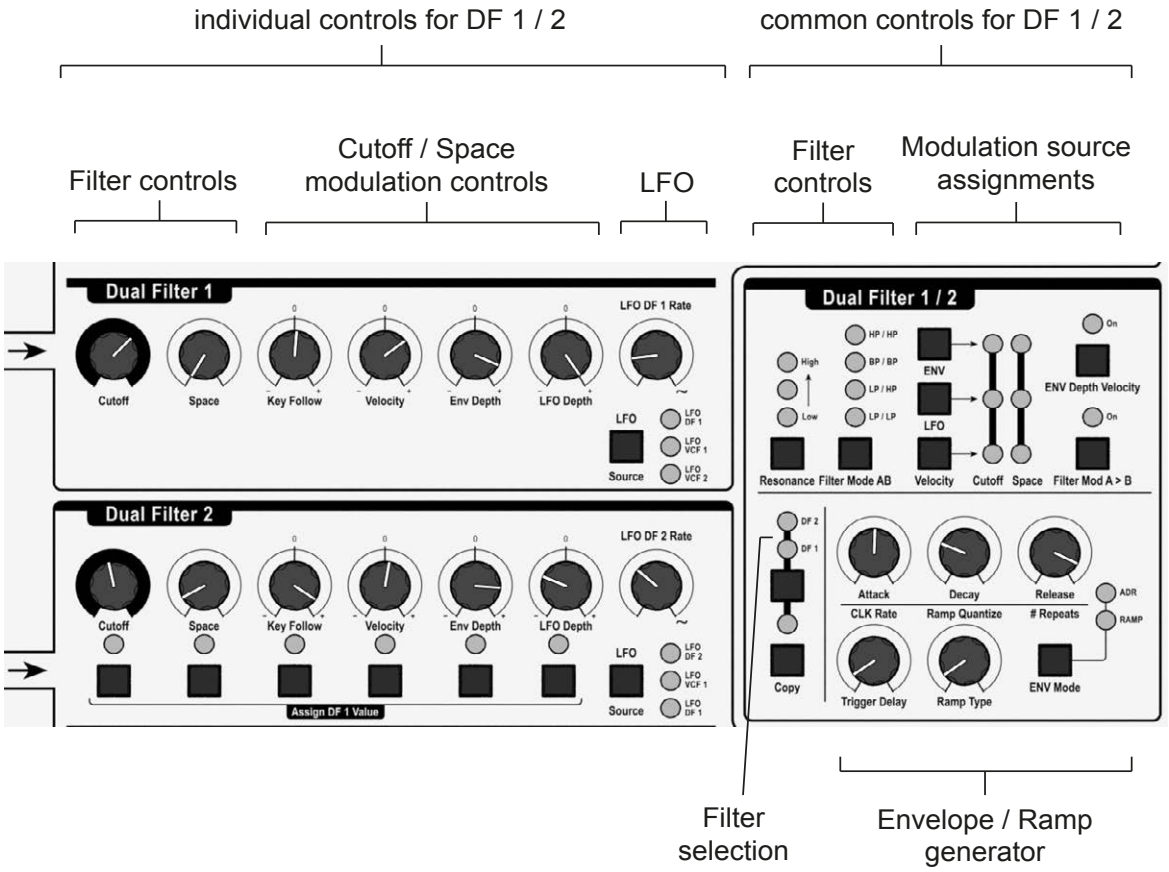
- Audio runs from inputs A and/or B through the filter where it is processed further.
- Input B level can be modulated (***Level B Mod***) and/or used for cut-off modulation in the audio range (***Input B > Filter Mod***).
- The output signal of the Dual Filter can be mixed into the VCF input (***DF Out > VCF***).

In the lower half of the following figure the cut-off modulation sources are displayed: The envelope with its retrigger generator as well as LFO VCF 1 and LFO VCF 2. Last but not least, the different modulation depth controls (***Cutoff***, ***Key Follow***, ***Velocity***) are listed, along with the VCF envelope and LFO(s).



DUAL FILTER 1 / 2

Dual Filter 1 and 2 are structured identically. Each of the to Dual Filters offers a pair of parallel multi-mode (state-variable) filters with 12 dB slope each and variable resonance. Each half of the filter section uses its own input (A and B).
Cutoff and Space can be adjusted separately for each part of the filter section, resonance and response characteristics are governed by a common control for both filters and a selector key. Modulation sources are keyboard velocity as well as one LFO and one envelope / ramp generator. The latter is shared by Dual Filter 1 and Dual Filter 2. Instead of the internal LFOs, both VCF LFOs can be used as modulation sources.



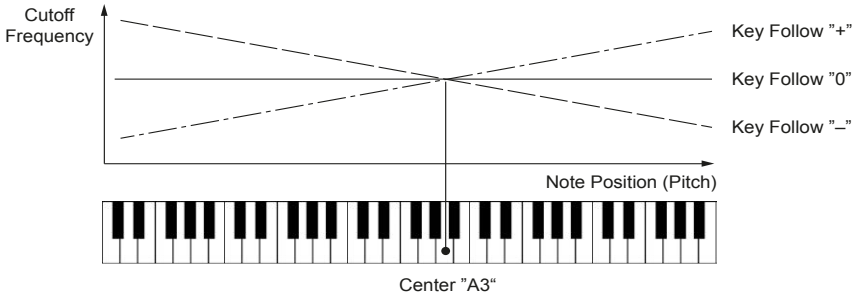
Individual controls for DF 1 and DF 2:

Filter controls:

- **Cutoff**: Cut-off frequency
- **Space**: Spacing between the respective cut-off frequencies of the two filter sections.

Cutoff / Space modulation controls:

- **Key Follow**: Adds key position to the cut-off modulation amount. Negative values will invert the effect.



- **Velocity**: Adds keyboard velocity to the ***cut-off*** / ***space*** modulation amount. Negative values will invert the effect.

- **Env Depth**: Adds envelope / ramp generator modulation to ***cut-off*** / ***space*** modulation amount. Negative values will invert the shape of the envelope / ramp.
- **Assign DF 1 Value**: (six keys, only DF 2) If enabled, the related parameter uses (copies) the value setting of DF 1.

Again, all values are added to the resulting modulation depth. Please refer to page 59.

LFO controls:

- **LFO Depth**: Adds LFO modulation to ***cut-off*** / ***space*** modulation amount. Negative values will invert the effect of the LFO curve.
- **LFO DF Rate**: LFO modulation rate.
- **LFO Source**: Selects the LFO that is modulating the Dual Filter:
  LFO DF 1
  LFO VCF 1
  LFO VCF 2

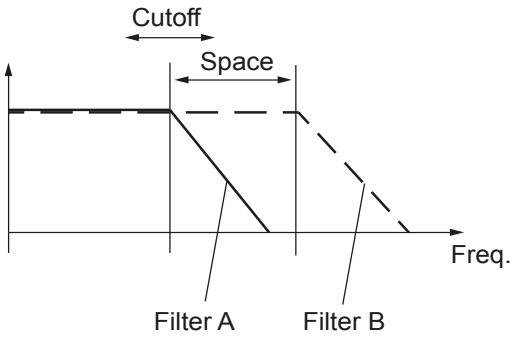
When LFO VCF 1 or 2 is selected, all sync features of these LFOs can be used in conjunction with the Dual Filters.

Common controls for DF 1 / 2:

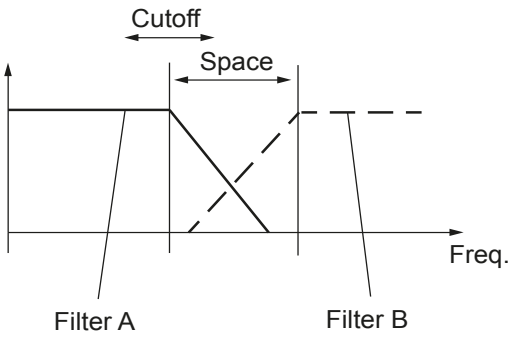
Filter controls:

- **DF1 / DF2**: Assigns all following functions to DF1 or DF2. If both **LEDs** light up, DF2 temporarily uses the settings of DF1. Switching back to LED ***DF1***, reverts to DF2s individual settings.
- **Copy**: Hitting the Copy key twice copy/pasts the current settings to the respective other Dual Filter.
- **Resonance**: Resonance intensity can be selected in seven steps.
- **Filter Mode AB**: Selects the response characteristics of both filter sections:
  LP / LP: Both filter sections = lowpass. Producing a 24 dB low-pass filter.
  LP / HP: Filter A = lowpass, filter B = highpass. Producing a notch filter.
  BP / BP: Both filter sections = bandpass. Producing a comb filter.
  HP / HP: Both filter sections = highpass. Producing a 24 dB high-pass filter.

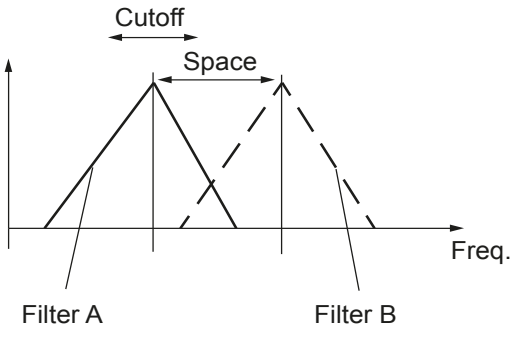
LP / LP => LP



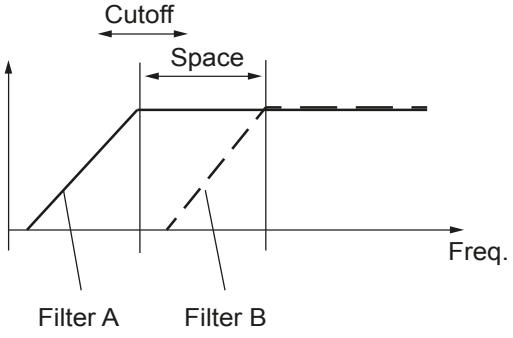
LP / HP => Notch



BP / BP => Comb



HP / HP => HP



Modulation source assignments:

- **Velocity**: Keyboard velocity modulates ***cut-off*** or ***space***.
- **LFO**: LFO modulates ***cut-off*** or ***space***.
- **ENV**: Envelope / Ramp modulates ***cut-off*** or ***space***.
- **Filter Mod A->B**: Output signal of filter section A modulates ***cut-off*** frequency of filter section B.
- **ENV Depth Velocity**: Envelope modulation depth is controlled by keyboard velocity.

Envelope / Ramp generator:

The Envelope / Ramp generator is a modulation source that produces an ADR envelope for shaped modulation or 32 waveshapes for complex continuous modulation of cut-off or space.

- **ENV Mode**: Selects the operation mode of the Envelope / Ramp generator:

=> ***ADR - ENVELOPE GENERATOR MODE*** (shaped modulations). The controls have the following functions:

Trigger Delay: Delays the start of the Attack phase.

Attack: Adjusts rise time from zero to maximum level.

Decay: Adjusts fall time from maximum level before note-off is received.

Release: Adjusts fall time after note-off is received.

=> ***RAMP - RAMP GENERATOR MODE***. (continous modulations). The controls have the following functions:

Ramp Type: Selects 32 different waveshapes.

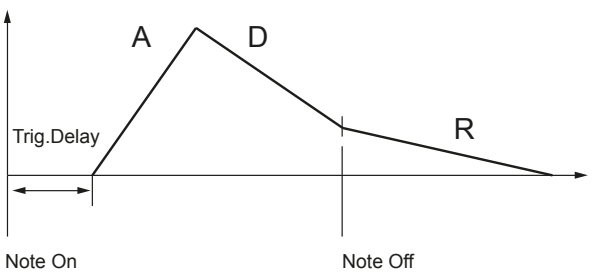
CLK Rate: Modulation frequency.

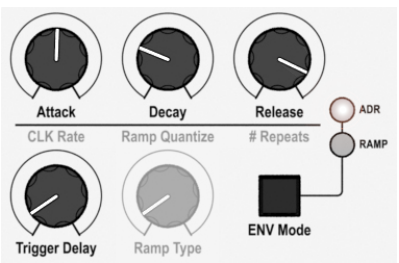
Ramp Quantize: Smoothes the selected waveshape. Available settings (shown in the LCD in Schmidt‘s Edit section):

SQUARE: ”Edgy” waveshape
MIX 1-3: Three settings with increasingly smoothed waveshapes.
RAMP: Rounded, slewed waveshapes
 # REPEATS: Determines the number of envelope duty cycles from ***ONE*** to ***EIGHT*** (shown in the LCD). With each repeat, the modulation depth fades out gradually. Great for ”echoing” effects. If value is set to ”***CONT***”, the modulation is generated continuously just like a conventional LFO but with more complex waveforms.

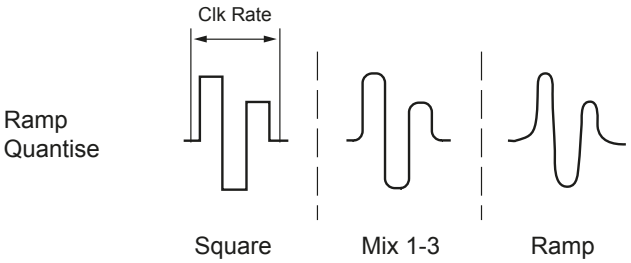
The following two figures explain both modes, their parameters, and their possible settings:

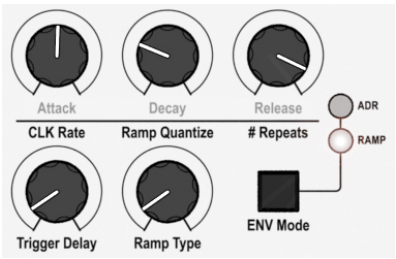
ADR Mode

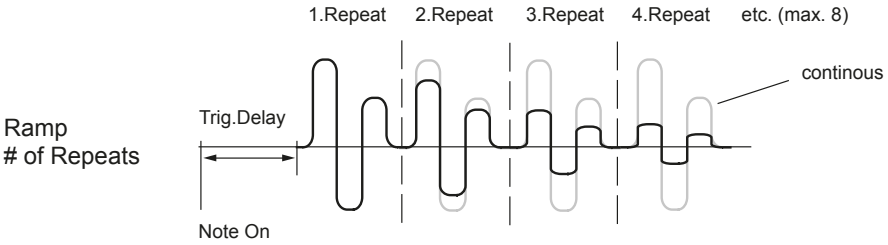




Ramp Mode



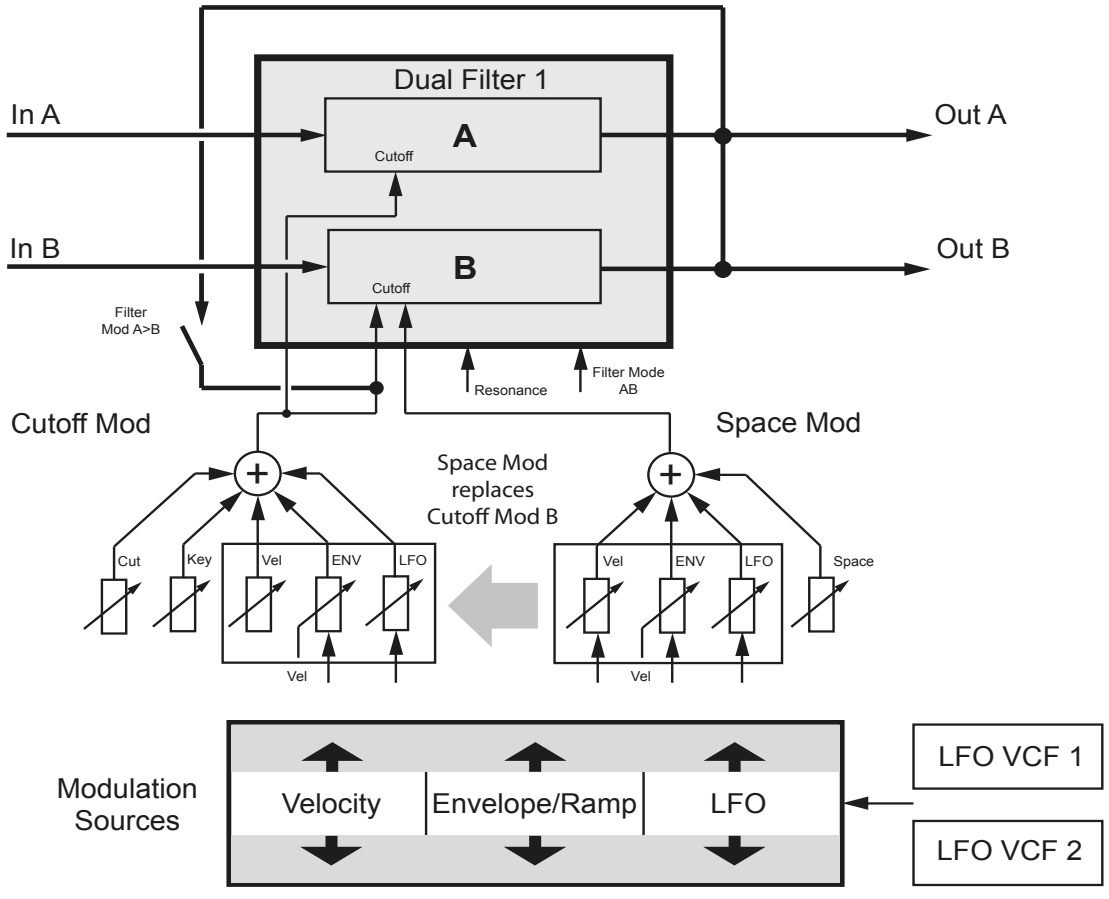




Dual Filter Signal Flow / Modulation Routings:

In order to grasp yet another complex section, please memorize the following figure. It shows the audio signal path and all modulation paths of Dual Filter 1. Dual Filter 2 works exactly the same way.

Audio is sent into inputs A and/or B, processed and then sent to the outputs A and B. Modulation destinations are ***cut-off*** and ***space***. The available modulation sources are combined and fed into the mod inputs of the filter sections A and B. Apart from that, the output signal of filter A can be fed back into the cut-off modulation input of filter B (**Filter Mod A->B** key). ***Resonance*** and ***Filter Mode AB*** cannot be modulated.



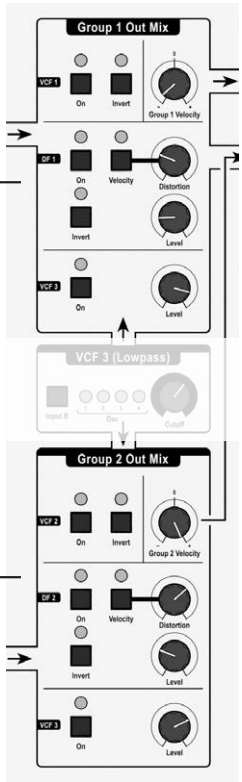
Dual Filter 2

GROUP OUTPUT MODULES

The Group Output modules come after the filter section. They sum all filter output signals into a stereo signal. You should be already familiar with the signal path – if you might need a recap, please refer to page 12.
The controls for Group 1 Out Mix and Group 2 Out Mix are identical.

Group 1 Out Mix
mixer for filter outputs
Group 1

Group 2 Out Mix
mixer for filter outputs
Group 2



- **VCF 1 ON**: Enables / disables the output of VCF 1.
- **VCF 1 Invert**: Inverts the output phase of VCF 1.
- **Group 1 Velocity**: Keyboard velocity controls output level of Group 1. Negative values will invert the effect.
- **DF 1 ON**: Enables / disables the outputs of Dual Filter 1.
- **DF 1 Invert**: Inverts the output phase of Dual Filter 1.
- **DF 1 Level**: Controls the output level of Dual Filter 1.
- **Distortion**: Distorts the output signal of Dual Filter 1.
- **Velocity** (control): Puts distortion amount under the control of keyboard velocity.
- **VCF 3 ON**: Enables / disables the output of VCF 3.
- **VCF 3 Level**: Controls the output level of VCF 3.

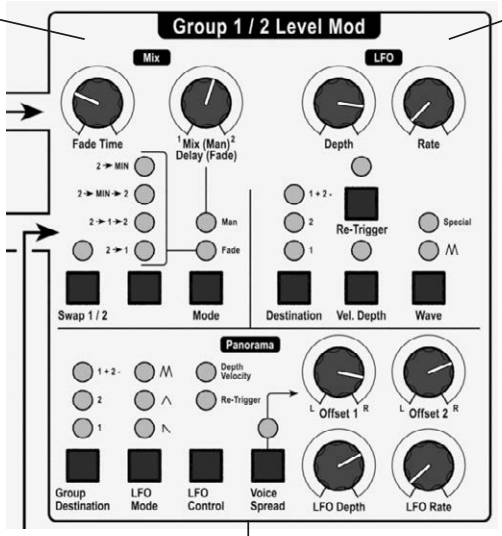
Group 2 controls work exactly the same way.

GROUP 1/2 LEVEL MODULATION

Schmidt‘s advanced architecture allows you to tap two different sound variations at the Group outputs – why not toy around with them a bit? Here we go: Since both Group outputs are routed to one stereo channel, the volume of both signals can easily be modulated or swept across the stereo panorama respectively. That is exactly what Group 1/2 Level Mod does.

Mix
crossfade of
output signales
of Group 1 / 2

LFO
LFO for crossfade
modulation



Panorama
panorama control of stereo sum
with LFO panning

MIX

The Mix controls a cross-fade between both signal outputs of Group 1 and 2 or fades them in and out separately.

- **Mode**: Determines whether the (cross)fade is performed manually (”***MAN***“) using the **Mix/Delay** control or automatically (”***FADE***“).

- **Mix/Delay**: - If **Mode** key is set to ”***MAN***”, this control governs the cross-fade manually.
  - If **Mode** key is set to ”***FADE***“, this control governs the delay time before the fade starts.

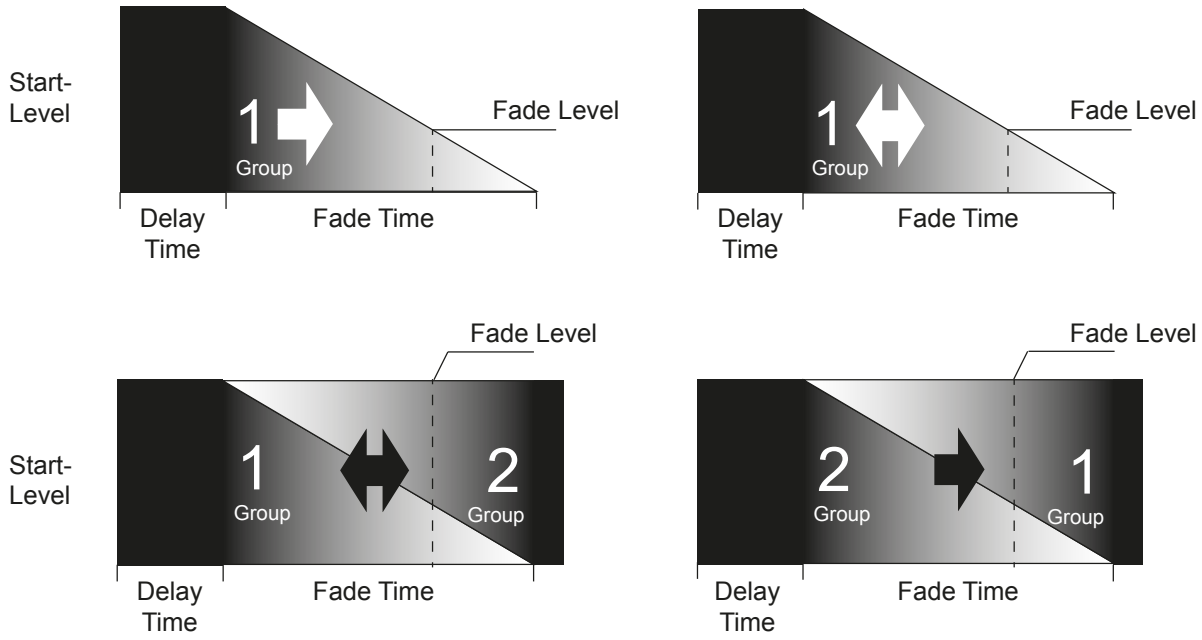
The current value setting before the **Mode** key is switched to “***FADE***“ determines the sweep level or the minimum level of the Group controlled by the sweep respectively.

- **Fade Time**: Duration time of the fade.

- **Fade** (key): Determines the direction of the sweep – please also refer to the following figure:
  - ***2 => MIN***: Group 2 from full level to Fade level while Group 1 is keeping its level constant.
  - ***2 => MIN => 2***: Group 2 from full level to Fade level and back to full level while Group 1 is keeping its level constant.
  - ***2 => 1***: Group 2 is cross-faded with Group 1.
  - ***2 => 1 => 2***: Group 2 is cross-faded to Group 1 and back to Group 2.

- **Swap 1/2**: Interchanges positions of both groups.

The following figure will illustrate the different (cross)fade options and their parameters:



LFO

The LFO controls add a level vibrato (tremolo) to both groups.

- **Rate**: Modulation frequency
- **Depth**: Modulation intensity
- **Wave**: Waveform selection of the LFO:
  /VV: Triangular LFO waveshape
  SPECIAL: Space for future updates
- **Re-Trigger**: Note-on message restarts the LFO wave at a zero crossing.
- **Vel. Depth**: Adds keyboard velocity to the level modulation amount.
- **Destination**: Determines the destinations of the level modulation. The following options are available:
  NO LED: LFO modulation disabled.
  1: Modulation on Group 1.
  2: Modulation on Group 2.
  BOTH LEDS 1 + 2 Modulation on Group 1 and 2 with identical phase.
  1+2– : Modulation on Group 1 and 2 with inverted phase.

PANORAMA

The Panorama controls govern stereo panning of both groups by a dedicated LFO.

- **Offset 1**: Stereo position of Group 1.
- **Offset 2**: Stereo position of Group 2.
- **Voice Spread**: Spreads out Schmidt‘s eight voices across the stereo field. The width of the stereo field is determined by the ***Offset*** values.
- **LFO Rate**: Modulation frequency

- **LFO Depth**: Modulation intensity

- **LFO Mode**: Determines the movement of the Group signals within the stereo field:
  /VV: Continuous panning (triangular waveshape).
  I: One movement from left to right / vice versa and back (one shot saw-tooth waveshape). Enables ***Re-Trigger*** automatically.
  /\: One movement from left to right / vice versa and back (one shot triangular waveshape). Enables ***Re-Trigger*** automatically.

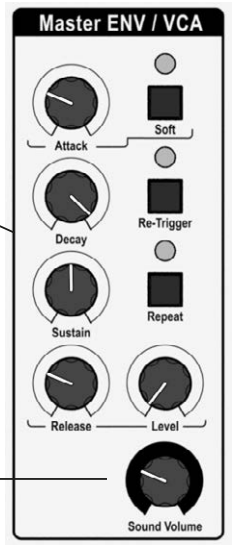
- **Re-Trigger**: Note-on message restarts the LFO wave within a zero crossing (triangular waveshape). Always active when LFO one-shot waveshapes are enabled.

- **Group Destination**: Determines the destinations of the panning modulation:
  NO LED: LFO panning modulation disabled.
  1: Panning modulation on Group 1.
  2: Panning modulation on Group 2.
  Both LEDs 1 + 2: Panning modulation on Group 1 and 2 with identical phase.
  1+2– : Panning modulation on Group 1 and 2 with inverted phase.

MASTER ENV / VCA

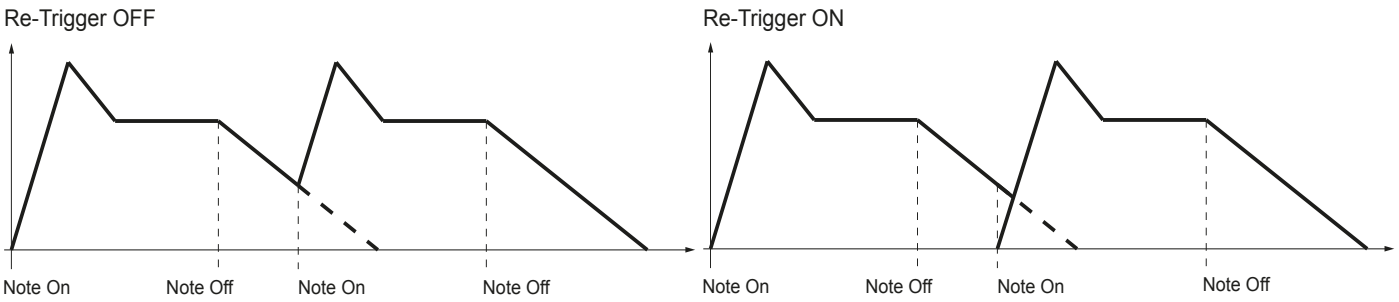
This is the main VCA controlled by the master envelope generator. It shapes the volume contour of the entire sound and determines the output volume of a single sound.

Master ENV / VCA
ADSR envelope for level modulation



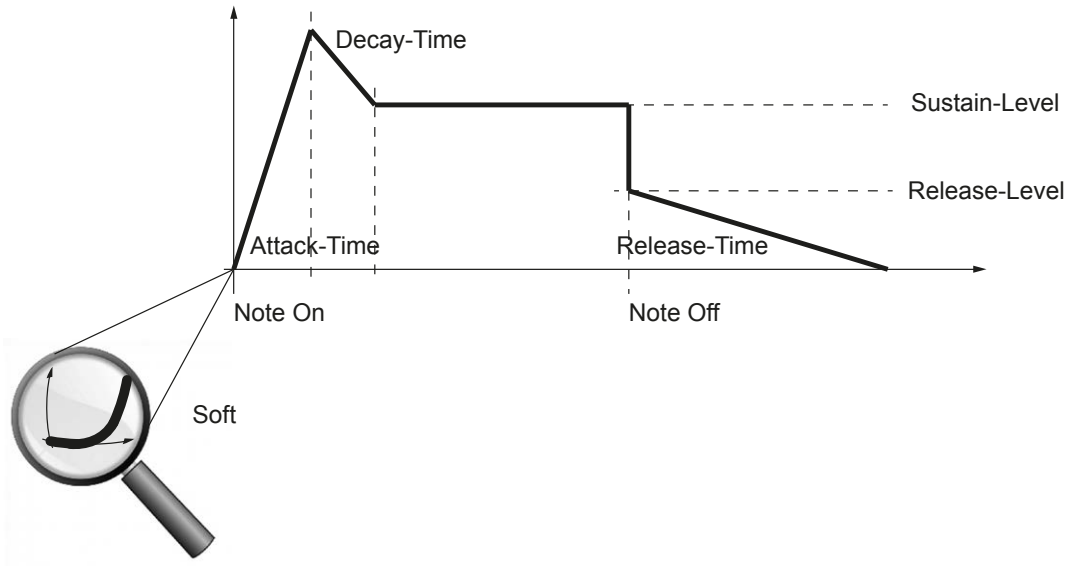
Sound Volume
volume single sound

- **Attack** (control): Adjusts rise time from zero to maximum level.
- **Soft** (key): Softens the initial state of the attack time in order to avoid audible artefacts when wide note sweeps are played. Very useful with longer attack times.
- **Decay**: Adjusts fall time from maximum level to Sustain Level.
- **Sustain**: Adjusts Sustain level.
- **Release**: Adjusts fall time from sustain level after note-off message.
- **Level**: Starts the release state below the selected sustain level. When used e.g. with percussive sounds, it produces some kind of ”reverb tail“-effect instead of the familiar fading sound.
- **Re-Trigger**: Determines the start of the envelope when a new note-on message is received before the previous envelope duty cycle has been completed.
  OFF: Envelope starts at the current level of the previous envelope cycle.
  ON: Envelope starts at zero level.



- **Repeat**: Repeats (loops) the envelope infinitely.

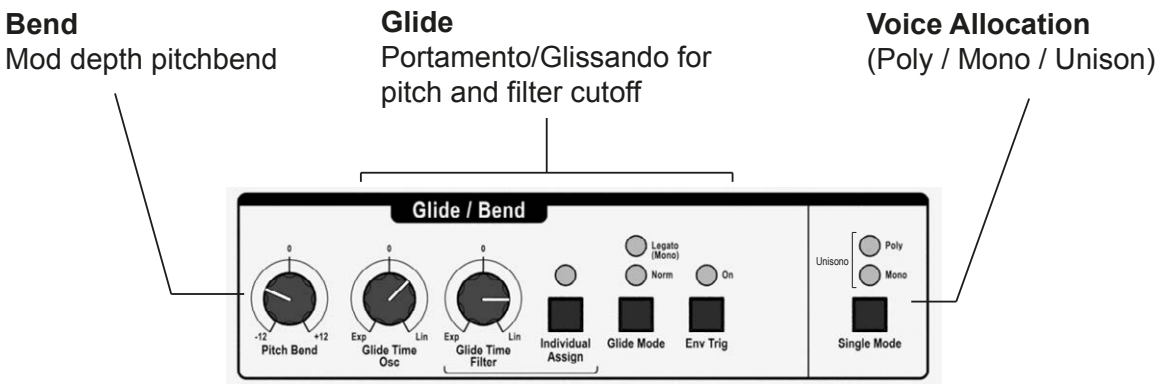
The following figure shows the parameters of the master envelope:



- **Sound Volume**: Determines the volume of the active single sound. This setting is stored within a preset and is overwritten by turning the global **Volume** / **Phones** controls.

GLIDE / BEND

This section controls the glide / portamento effect for both pitch and filter cut-off frequency as well as the note allocation in single mode. Let‘s start with the latter.



Voice Allocation

- **Single Mode**: Determines Schmidt‘s voice allocation when running in single mode.
  POLY: Eight-voice polyphonic
  MONO: Monophonic (last note priority)
  BOTH LEDS: Unison mode (eight voices stacked on just one key – last note priority).

In Unison mode (both LEDs on), the **Master Tune** control (left of the keyboard) determines the detuning of the eight voices. This setting is stored within a preset. To tune such an unison-preset, switch **Single Mode** to ***MONO***, tune the preset with the **Master Tune** control and return to ***UNISON***.

Glide / Bend

Depending on the mode selected, glide options and envelope response can be changed:

- **Glide Mode**: Turns Glide On/Off or selects its response respectively:
  NO LED: Glide disabled.
  NORM: Glide enabled. Active with every note trigger.
  LEGATO: Glide only active when playing legato-style (only available in Mono and Unison modes!)

- **Env Trig**: Usually set to ***ON***. If ***Glide Mode*** is set to ”***LEGATO***“, this key can be used to enable the triggering of all envelopes.

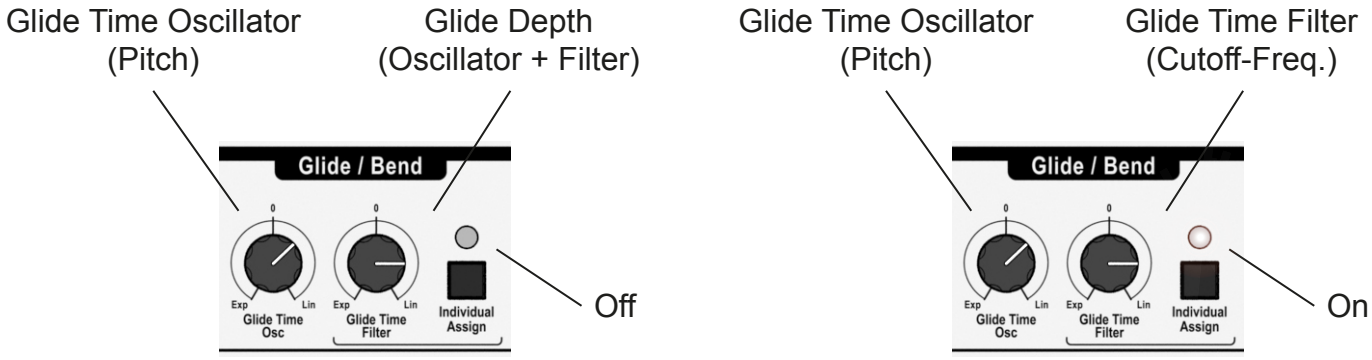
- **Pitch Bend**: Sets the range of the pitch bend wheel (up to 12 semitones). Negative values invert the effect of the pitch bender. Depending on a global setting (page 74), this value works just for the current preset or on a global level.

- **Glide Time Osc**: Glide duration of the Oscillator pitch.

- **Glide Time Filter**: - Glide duration of the filter cut-off (if ”**Individual Assign**“ is set to ***ON***).
  or
  - Glide depth of pitch and cut-off (if ”**Individual Assign**“ is set to ***OFF***).
  In both settings, the glide effect can have different gradations:
  EXP: The glide time is directly proportional to the interval played.
  LIN: The glide time is independent of the interval played.

- **Individual Assign**: Controls the assignement function to pitch and filter cut-off:
  OFF: Oscillator pitch glide and filter cut-off glide are both controlled simultaneously by the **Glide Time Osc** control. The **Glide Time Filter** control governs Glide Depth.
  ON: Oscillator pitch glide is governed by the **Glide Time Osc** control.
  Filter cut-off glide is governed by the **Glide Time Filter** control.

The following figure shows the different function states of the Glide / Bend controls in relation to the **Individual Assign** control setting:



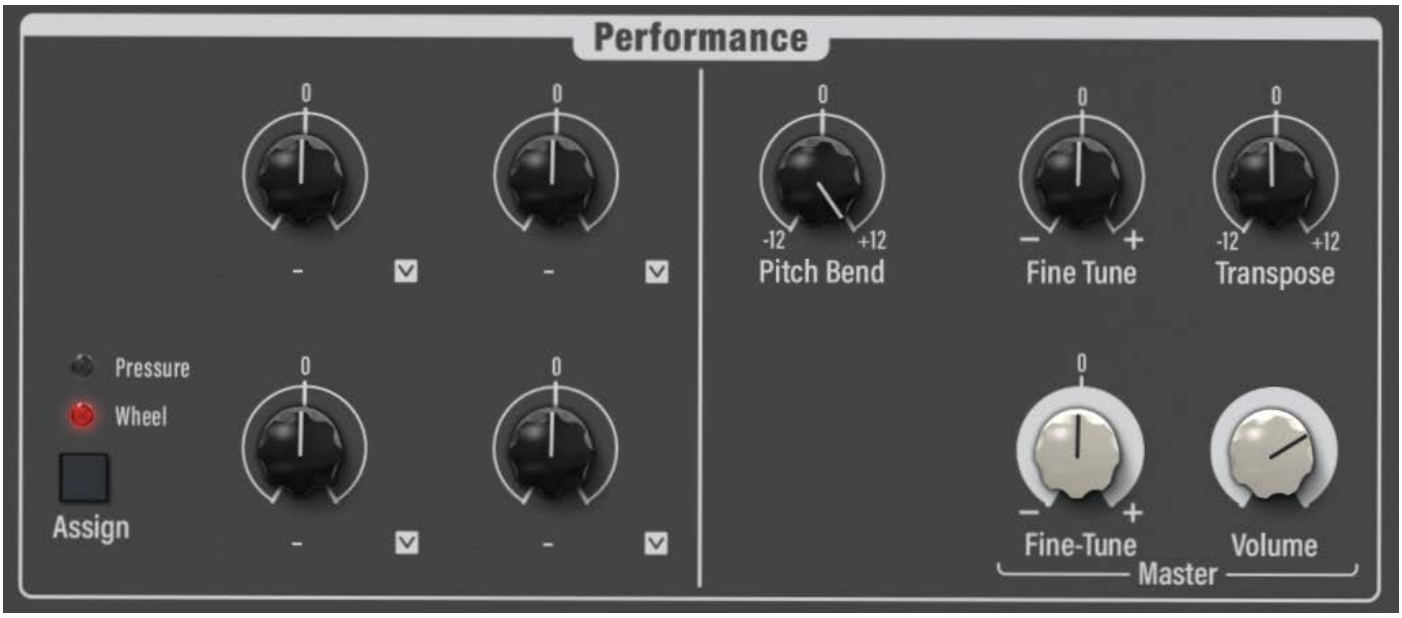
What is ”Glide Depth“?

As mentioned above, the **Glide Time Filter** control governs a parameter we call ”***Glide Depth***”. When playing polyphonically, a standard glide function can sound quite extreme, especially when playing wide intervals using a high portamento rate. With ”Glide Depth” you can attenuate the glide effect.

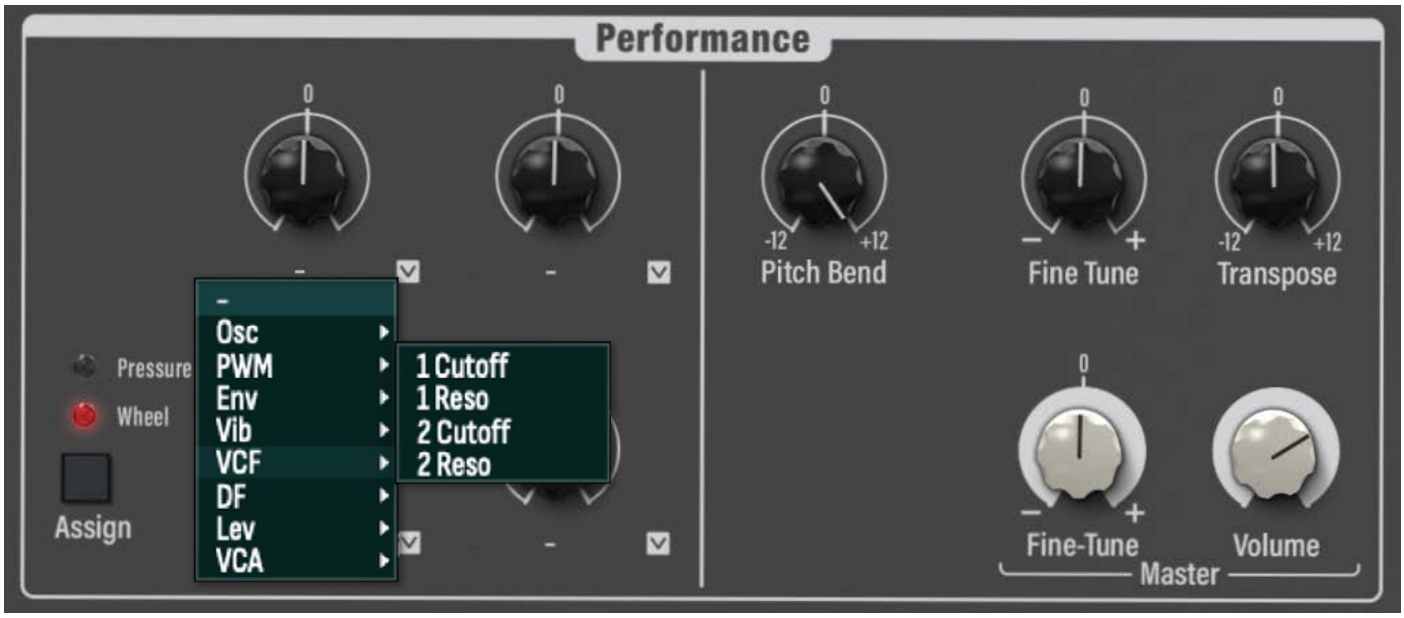
An example: Set **Individual Assign** to ***ON*** and choose a medium value for ***Glide Time Osc***. Play some monophonic lines using wide intervals first and listen to the glide effect. So far, so well. Now, please play some chord changes, also using wide intervals. The result might not be all that satisfying as it takes a while for the respective pitches to fall into place.
Now disable **Individual Assign**. The **Glide Time Filter** control becomes the control of ***Glide Depth***. Set ***Glide Depth*** value to e.g. ”***2 SEMITONES***“ and play the chords again. You will notice that the glide effect is much less intense but musically a lot more useful. This is because the polyphonic notes use a much smaller sweep interval (in this example a maximum of two semitones rather than a full octave or the like) than monophonic notes, played without using the Glide Depth parameter.

REALTIME CONTROLS

You can use the modulation wheel and aftertouch to send modulations to up to four destinations.



Simply click below one of the four knobs and select the desired destination from the drop-down window.



You can adjust the intensity of the modulation using the knob.

V.

APPENDIX

MIDI IMPLEMENTATION

MIDI CONTROLLER ASSIGNMENTS

If you are interested in the complete MiDI controller assignments, please refer to the Schmidt Synthesizer manual on our website at www.schmidt-synthesizer.com.

The Schmidt Vi plugin is equipped with a MIDI Learn function.
Simply right-click the corresponding function on the panel to program the corresponding value into your DAW.

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THANKS TO

Stefan Schmidt:	Product Conception
Axel Hartmann:	Product Design
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IMPRINT

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:e:m:c:
electronic music components

Tuchmacherstr. 7
D-89129 Langenau
www.emc-de.com

Tel: 07345 8009800
Fax:07345 8009811
info@emc-de.com