Step into the World of Eurorack

BASICS - VCO, VCF, ENV, LFO

KLANKSPEL

SOUND & TECHNOLOGY

- Essential concepts and modules in our Eurorack systeem -

VCO - Voltage Controlled Oscillator

The oscillator is the primary component of a modular synthesizer. It's what generates the sound (a continuous tone). Often, various waveforms are available as outputs. The main waveforms include sine, triangle, sawtooth, and square waves. While the frequency of a note determines its pitch, the waveform determines its timbre or character. The Voltage-Controlled Oscillator (VCO) has a potentiometer (a knob) to adjust the frequency or pitch of the note. This knob is often labeled as Frequency or Tune.

Additionally, one or more Control Voltage (CV) inputs (1V/octave or not) can be used to modify the pitch and other parameters with an electrical signal sent by another module, such as a Low-Frequency Oscillator (LFO) to create tremolo or vibrato effects.

Another use of the CV input is when a signal is sent by a sequencer, allowing it to play a different note at each step of the sequencer.

There are numerous VCO modules available, each with its unique characteristics, sound possibilities, and functionalities.

Here are some examples of popular VCO modules that you can find in a Eurorack system:

- Mutable Instruments Plaits: Plaits is a versatile digitally-controlled macro-oscillator that can generate various waveforms and produce a wide range of sound types.

- Make Noise STO: The STO (Single T-amp Oscillator) is a compact analog oscillator with multiple waveform options and a unique character.

- Intellijel Dixie II+: Dixie II+ is an analog oscillator with multiple outputs and various waveforms, including sawtooth, triangle, and pulse waves (square wave).

- Doepfer A-110-1: A straightforward analog VCO with sawtooth and square waves, suitable for basic sounds.

VCF - Voltage Controlled Filter

As the name suggests, it's a module used to filter and control the frequencies of audio signals, and it's an essential component in sound shaping within modular synthesizers.

Signal Input: You send an audio signal (such as an oscillator output) to the input of the VCF.

Voltage Control (CV): The VCF has a CV input that allows you to apply a voltage control signal to manipulate the filter frequency. This means that you can change the filter's position and determine which frequency bands of the audio signal pass through using voltage control.

Output of Filtered Signal: The VCF outputs the filtered audio signal, which can then be routed to other modules for further processing.

A VCF is a crucial component for shaping the sound in a modular synthesizer to create different sonic characteristics.
There are various types of filters available in the Eurorack format, including:

Low-Pass Filter (LPF): This allows low frequencies to pass while attenuating high frequencies. It produces a warmer sound and is often used to soften sounds.

High-Pass Filter (HPF): This allows high frequencies to pass while attenuating low frequencies. It can be used to make sounds sharper and reduce bass frequencies.

Band-Pass Filter (BPF): This allows a specific frequency range to pass through while attenuating frequencies outside of that range. It can be used to emphasize specific frequency bands.

Notch Filter: This attenuates a specific frequency and the frequencies around that peak, allowing you to remove certain frequency components from the signal.

Multiple Filters: Some VCF modules include multiple filter types and modes, providing you with greater flexibility in shaping the sound.

Here are some examples of popular VCF modules that you can find in a Eurorack system:

- Mutable Instruments Ripples: Ripples is a multimode filter module with multiple filter modes and additional features such as a low-pass gate (LPG) and a resonator.

- Make Noise QPAS: QPAS stands for "Quad Core Stereo Analog Polyphonic" and offers a variety of filter modes and sound possibilities for creating complex stereo and polyphonic sounds.

- Intellijel Polaris: The Polaris is a multimode filter and resonator module with different filter modes and a resonance peak.

- Doepfer A-106-6 XP Filter: This is a multimode filter module with a wide range of filter types, including low-pass, high-pass, band-pass, and notch.

VCFs can be used to manipulate sounds, create effects, and develop sound textures in a modular synthesizer setup.

VCA - Voltage Controlled Amplifier

A fundamental module used to control the amplitude (volume) of an audio or control voltage signal in response to another control voltage signal. VCAs are essential for shaping the dynamics and modulation of sound in a modular synthesizer system.

This is how a VCA typically works:

Signal Input: You send your audio or control voltage signal to the VCA's input.

Voltage Control Input (CV): The VCA has a CV input that allows you to apply a control voltage signal. This control voltage determines how much the amplitude of the input signal is attenuated or amplified. When the CV is positive, it amplifies the signal, and when it's negative, it attenuates the signal. The magnitude of the control voltage corresponds to the gain applied to the input signal.

Signal Output: The VCA outputs the modified signal, which can then be sent to other modules for further processing or sound shaping.

VCAs are used in various ways in a Eurorack system:

Amplitude Control: In audio applications, VCAs are used to control the loudness of audio signals, enabling volume modulation, dynamic control, and even tremolo or gating effects.

Modulation: VCAs are also used to control the depth and intensity of modulation sources such as LFOs or envelopes. This can be used to create expressive, evolving, and dynamic timbral changes in your sound.

CV Processing: VCAs can be used to modify control voltage signals, such as shaping the response of an envelope generator or controlling the level of pitch modulation.

VCAs are available in various forms and with different functions in the Eurorack format, including single-channel and multi-channel options.

Some VCAs have additional features such as mixer functionality, offset controls, and multiple CV inputs, making them versatile tools for sound shaping and modulation in a modular synthesizer setup.

Here are some examples of popular VCA modules that you can find in a Eurorack system:

- Mutable Instruments Tangle Quartet: This module provides four independent VCAs in one and can be used for versatile amplitude and CV control.

- Make Noise Maths: While primarily considered a mathematical modulation module, Maths can also be used as a VCA to control the amplitude of a signal.

- Intellijel Quad VCA: This module includes four independent VCAs in one, with additional capabilities such as cascading and mixing.

- Doepfer A-132-3 Dual Linear/Exponential VCA: This is a dual VCA module with both linear and exponential response settings for precise amplitude control.

ENV / ADSR - Envelope Generator

In a Eurorack system, an "ENV," short for envelope generator, is a module used to control the envelope or time-based characteristics of specific parameters within an audio signal. Typically, it is used to affect the loudness (volume) of the audio signal, but envelope generators can also be used to modulate other parameters, such as filter frequency, pitch, and more.

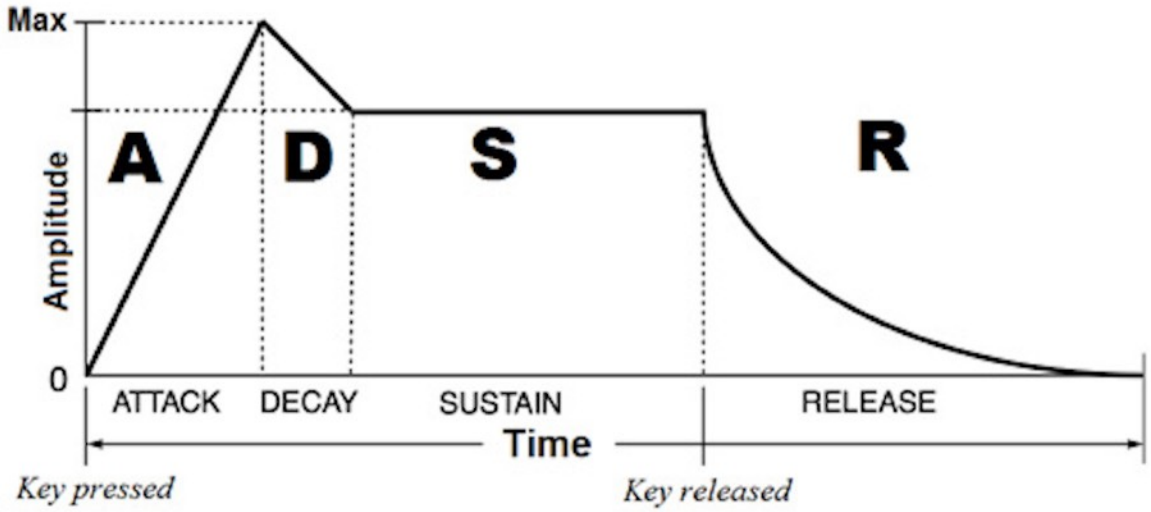
An envelope generator in a Eurorack system usually consists of the following basic components:

1. **Attack**: This determines how quickly the loudness rises from silence to its peak level after receiving a trigger or gate signal.

2. **Decay**: After the attack phase, the loudness starts to decrease in the decay section. This specifies how long it takes for the loudness to drop from its peak to a certain sustain level.

3. **Sustain**: As long as the gate signal remains active, the sound stays at a specific level, the sustain level. This allows you to hold the sound at a particular volume as long as the gate signal is active.

4. **Release**: When the gate signal ends, the sound gradually fades away in the release section. The release determines how long it takes for the sound to fully disappear after the gate signal becomes inactive.



An envelope generator is an essential module in a Eurorack system because it allows you to add dynamics and expression to your sounds. You can use it to create percussive sounds, slow pads, filter sweeps, and a variety of other sound effects and modulations.

Envelopes are often used to control other modules in your system, such as Voltage-Controlled Amplifiers (VCAs) and Voltage-Controlled Filters (VCFs), to shape the sound in various ways.

Here are some examples of popular ADSR modules that you can find in a Eurorack system:

- Doepfer A-140: This is a simple but effective ADSR envelope generator that can generate basic envelopes for sound control.
- Make Noise Maths: Maths is actually a complex modulation module but can be configured as an envelope generator for both simple and complex envelope shapes.
- Mutable Instruments Tides: Tides is a versatile module originally designed as a modulator but can also function as an envelope generator.
- Intellijel Quadra: Quadra is a quad envelope generator and LFO module that supports both ADSR and ASR envelope modes.
- Make Noise Contour: This is an ADSR envelope generator with additional features such as a built-in low-pass gate (LPG).

LFO - Low Frequency Oscillator

A module that generates a low-frequency audio signal, typically below the audible frequency range, and is used to modulate other modules in your modular system. LFOs are essential components of a modular system because they are used to create periodic modulations, such as changing the pitch, filter frequency, amplitude, and other parameters of sound-generating or processing modules.

Some features and applications of an LFO in a Eurorack system include:

1. **Low Frequency**: An LFO generates signals at low frequencies, typically ranging from a fraction of a Hertz (Hz) to several tens of Hertz. This low frequency makes it suitable for generating slow and regular changes in sound parameters.

2. **Waveforms**: LFOs can produce different waveform types, including sine waves, triangle waves, sawtooth waves, pulse waves, and more. Each waveform has its specific character and applications.

3. **Modulation**: An LFO can be used to modulate other modules in your system. For example, you can use an LFO to modulate the pitch of a Voltage-Controlled Oscillator (VCO) for vibrato effects, influence the filter frequency of a Voltage-Controlled Filter (VCF) for filter movements, or control the amplitude of a Voltage-Controlled Amplifier (VCA) for tremolo effects.

4. **Speed** and **Depth**: You can set the speed (frequency) of the LFO as well as the depth of modulation (amplitude). This allows precise control over how the modulation affects sound parameters.

5. **Synchronization**: Some LFOs offer synchronization options, allowing you to sync the LFO with your modular system's clock. This makes it easier to integrate LFO modulation into your music production.

LFO modules are available in various shapes and sizes, with a range of features and capabilities. They can be used to add movement and liveliness to your sounds, ranging from subtle timbral changes to expressive modulation effects.

Here are some examples of popular LFO modules you might consider:

- Mutable Instruments Tides: Tides is a versatile and flexible module originally designed as a modulator but can also be used as a complex LFO.

- Make Noise Maths: While generally considered an envelope and modulation module, Maths can also serve as an LFO to generate a wide range of waveforms and modulation.

- Intellijel Dixie II+: Dixie II+ is primarily an oscillator but can also function as a simple LFO with various available waveforms.

- WMD/SSF ModBox: ModBox is a versatile modulation module with a built-in LFO that offers various waveforms and modulation possibilities.

- Doepfer A-145-4 Quad LFO: This module features four independent LFOs, which is useful for generating multiple modulations.

- Behringer 140: Double envelope/LFO, a legendary analog double envelope/LFO module for Eurorack. The LFO provides 5 waveforms: sine, triangle, square, ramp, and sawtooth.