The secrets of subtractive synthesis

The secrets of subtractive synthesis

The 4 Element Synth

Rob Papen

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The best way to watch the DVDs, is in your studio using a computer with a good sound card. When you start to edit sounds on your synthesizer, always keep in mind that audio peaks can occur which could damage your audio system. So be careful, and use low volume settings.

Welcome

Welcome to this unique masterclass training, in which I want to increase your skills in editing and making new sounds with synthesizers. It doesn't matter if you are a beginner or a pro, this training will give you a solid base and fresh new ideas for working with synthesizers.

I'll focus on subtractive synthesis in this training since this is the most commonly used synthesis for synthesizers. Samplers also fit into this synthesis group.
The method I use is called The 4-Element Synth©.

This method is very powerful because of its clear system and easy accessibility. This is the same well tested training method I use in my masterclass training here in the Netherlands. As well as teaching you a solid foundation, it will help you develop a personal sound. I'll also add many practical tips, tricks and sound examples of how a sound can be made.

It's important to use this book as a guide and to follow it step by step. The 4-Element Synth chart can be found at the very end of this book. In addition to this book and the DVDs, it is the other main part of this tuition so fold it open and keep it next to you during the entire training.

After completing this masterclass training, you'll have a very different and more effective approach to your synthesizers and because of that, you'll get a lot more pleasure out of them.

Yours,

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The 4 Element Synth

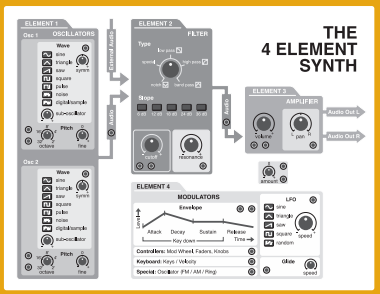
The 4 Element Synth

The entire master class is constructed around The 4 Element Synth. In this book, you'll find a printed version of our synth in schematic form. Keep it next to you during the entire session. Let's take a closer look at it now. As you can see, this synth is built using 4 elements. They all have their own color. Green for Element-1, Blue for Element-2, Brown for Element-3 and Yellow for Element-4. This schematic covers all the basics about subtractive synthesis! There are of course, many variations on these concepts, such as synthesizers that have three or four oscillators instead of two oscillators like the one you see in The 4 Element Synth. But the differences are still just variations. To understand the secrets of subtractive synthesis and to learn the art of making and editing presets, The 4 Element Synth has everything we need.

Important note:
The goal of this training is for you to adapt The 4 Element Synth as a way of thinking and an approach towards subtractive synthesis. You'll soon see and come to understand that the chart is indeed a essential key to subtractive synthesis.

Watching the DVDs is best inside your music studio using the computer and a good audio card.

More things to learn from the chart. If we look at Element-1 or the Green section, we can see it has darker and lighter parts. These other green part represent different parts within the Element-1. Well, let me tell you, this makes life a lot easier. You can now conclude from studying the chart that an oscillator is made up of two parts. So if you look at an oscillator in one of your synths and see all those knobs and parameters, you'll know by looking back at the chart that it's still only made up of two parts. As you can see, from this point on, the chart is very important in this training.



Element 1

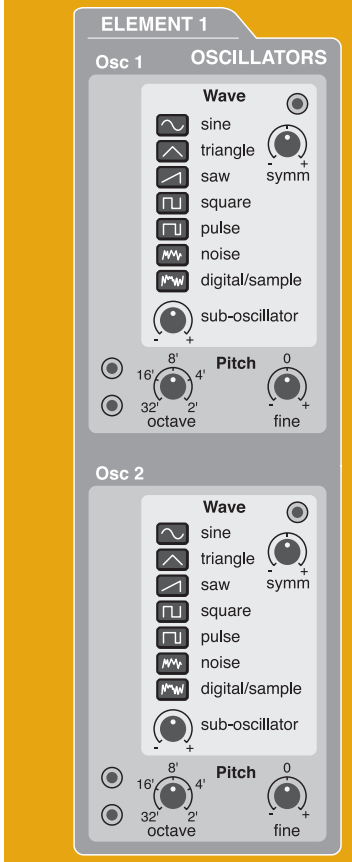
Element-1 / Oscillators

Introduction

The basis of each sound starts at Element-1. It's the green part on the 4 Element chart. Take the printed chart and look at Element-1. If you look closely at the chart you'll see that the Element-1 is named oscillators. This term and its variations are used on every subtractive synthesizer.

In the Element-1 you can see that there are two independent oscillators, oscillator 1 and oscillator 2. There are synthesizers on the market with more than two oscillators of course, but for explaining subtractive synthesis, two oscillators are more than enough. The key word for Element-1 (green) is oscillator!

If we take a closer look at one of the oscillators, we see that it's built around two components called pitch and wave. Both components are separated by using different colors of green.



Remember this:

- ***Element-1 is the basis for each sound and has oscillators.***
- ***Element-1 has two independent oscillators, oscillator 1 and oscillator 2.***
- ***Each oscillator has two main components called pitch and wave.***

Element-1: 'Introduction Element-1'.

Element 2

Element-2 / Filter

Introduction

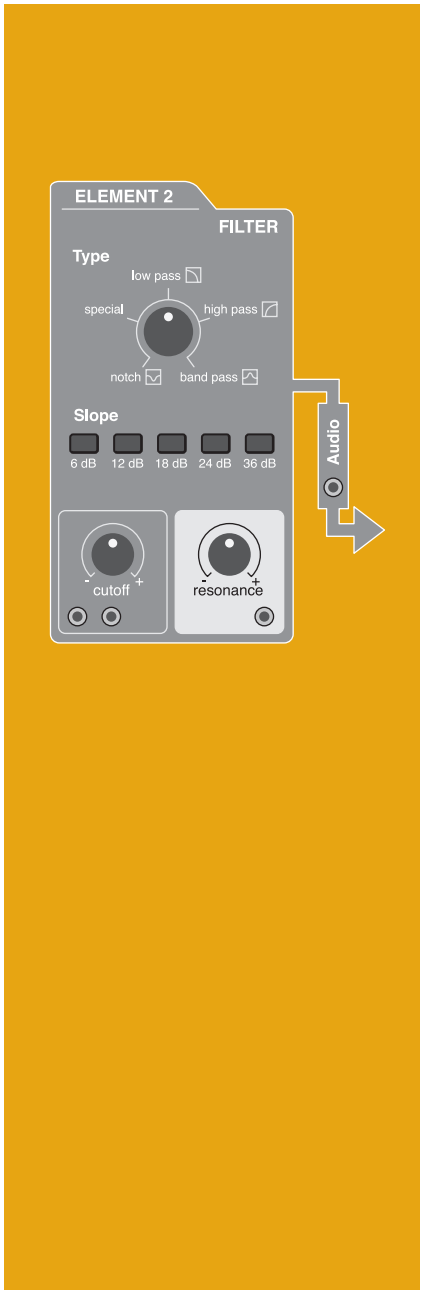
Check the 4ES chart and look at Element-1. Notice how it connects to Element-2. The audio signal from both oscillators of Element-1 are mixed together and then sent to Element-2.

If you look closely at the chart, you'll see that the Element-2 is named filter. This tells us that the next step in the audio signal route inside a subtractive synthesizer is the filter. Inside the 4ES we have one filter and for explaining subtractive synthesis this is enough. Of course, in the real world, two or more filters are possible as well as variations. But keep in mind these are only variations and for explaining the basic concepts we do not need them.

We have learned that the basis of each sound begins with Element-1, which are called oscillators. With these we generate the raw audio material that we will further sculpt with the other synth tools, which in this case are called filter or Element-2. Another green connection you see is called external audio. This means that external signals from your mixer or another instrument can also be sent into Element-2/ Blue.

Let's start at the beginning: Element-2 filters the harmonics of the audio signal that comes from the oscillators. That's why this type of synthesis, which is the basis of our training here, is called subtractive: we are taking out parts of the whole sound being generated by the oscillators using the filter. Of course, subtractive means not only that the filter is used in a static way, but can also be used in a very dynamic way using tools from Element-4.

Okay, here's what's important to know about this filter. A synthesizer filter of a subtractive synthesizer has two dynamic parameters which we call cutoff and resonance. These are parts you can change dynamically by using your hand (turning the knobs) or by using parts from Element-4 to do it automatically. Therefore, in the 4ES chart the cutoff knob and the resonance knob are the only ones that have modulator inputs.



Element 3

Element-3 / Amplifier

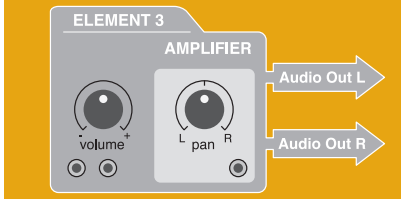
Introduction

We are now at the final stop of the audio route of a subtractive synthesizer. It is called the amplifier and inside the 4ES we call it Element-3. As we said earlier in this training, Element-1, Element-2 and Element-3 are the audio parts of a subtractive synthesizer.

The audio signal starts at Element-1 and from there it goes into Element-2 and continues to the final stage, Element-3, which is the amplifier. We are already familiar with amplifiers from our studio setup or just think of a guitar player using a guitar amplifier.

But...why does an electronic device like a synthesizer have an amplifier and what does it amplify? Normally you amplify something that has no output in volume, right? A synthesizer has power of its own, so why does it have an amplifier?

Well, there are two reasons why. First of all, we need to amplify the signal that comes out of the filter. But most importantly we need control over the volume and this can only be done by using an amplifier. Look at the 4ES chart and you'll see that Element-3 has only two parameters, volume and panning. You won't find the panning control on all synthesizers and many will have volume as the only parameter of the Element-3/amplifier.

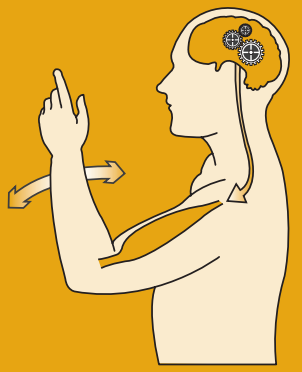


Remember:

- ***Volume parameter is the only amplifier parameter usually found on all subtractive synthesizers.***
- ***Panning is a parameter only found on more modern subtractive synthesizers.***

Element 4

Element-4 / Modulators



Introduction

At the very beginning of this book we added a chapter called 'Before you move on'. It was essential to talk about Element-4 before we could explain the other elements. Element-4 is called 'modulators' and these are absolutely essential in producing sounds on a subtractive synthesizer.

A good illustration of what Element-4 is about and how essential it is to sound production, is to compare it to the human body and brain. Without the commands of our brain it's impossible to make our arms move or our legs....

Let us now reiterate the essential key to understanding Element-4. We also mentioned this in the chapter 'Before you move on'.

The key to Element-4 is: it makes the other elements work and adds dynamic changes.

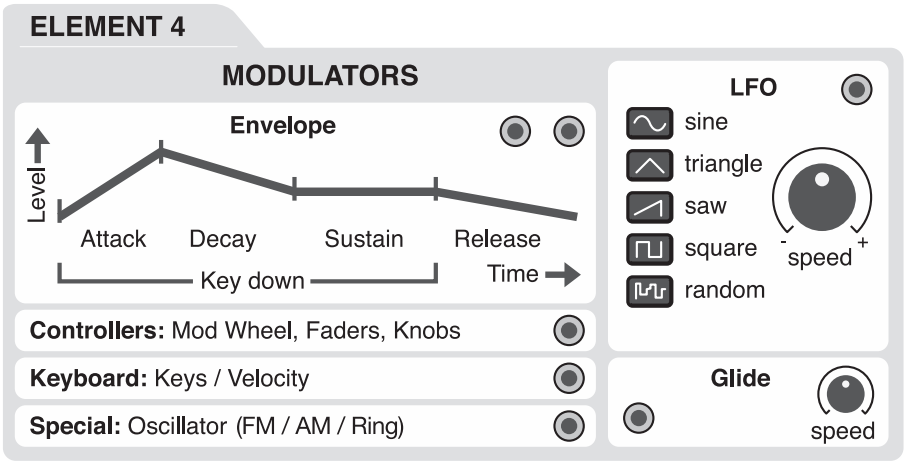


Figure 4.01

The DVD Menu

DVD 1 Introduction > General introduction
DVD 1 Introduction > Brief introduction subtractive synthesis
DVD 1 Introduction > Intoduction 4 Element Synth
DVD 1 Introduction > Before you move on
DVD 1 Element-1 > Introduction Element-1
DVD 1 Element-1 > Waveforms part 1
DVD 1 Element-1 > Harmonics
DVD 1 Element-1 > Waveforms part 2
DVD 1 Element-1 > Waveform examples > Sinus
DVD 1 Element-1 > Waveform examples > Triangle
DVD 1 Element-1 > Waveform examples > Saw
DVD 1 Element-1 > Waveform examples > Square
DVD 1 Element-1 > Waveform examples > Pulse
DVD 1 Element-1 > Waveform examples > Symmetry modulation
DVD 1 Element-1 > Waveform examples > Noise
DVD 1 Element-1 > Waveform examples > Digital
DVD 1 Element-1 > Waveform examples > Samples
DVD 1 Element-1 > Sub-oscillator
DVD 1 Element-1 > Waveform modulation
DVD 1 Element-1 > Oscillator pitch > In general
DVD 1 Element-1 > Oscillator pitch > Octaves detuning
DVD 1 Element-1 > Oscillator pitch > Fine detuning
DVD 1 Element-1 > Oscillator pitch > More than two oscillators
DVD 1 Element-1 > Oscillator pitch modulation
DVD 1 Element-1 > Oscillator sync
DVD 1 Element-1 > Oscillators in general > More is better?
DVD 1 Element-1 > Oscillators in general > Start phase
DVD 1 Element-1 > Oscillators in general > Bass sounds
DVD 1 Element-1 > Conclusion

DVD 2 Element-2 > Introduction Element-2 part 1
DVD 2 Element-2 > Introduction Element-2 part 2
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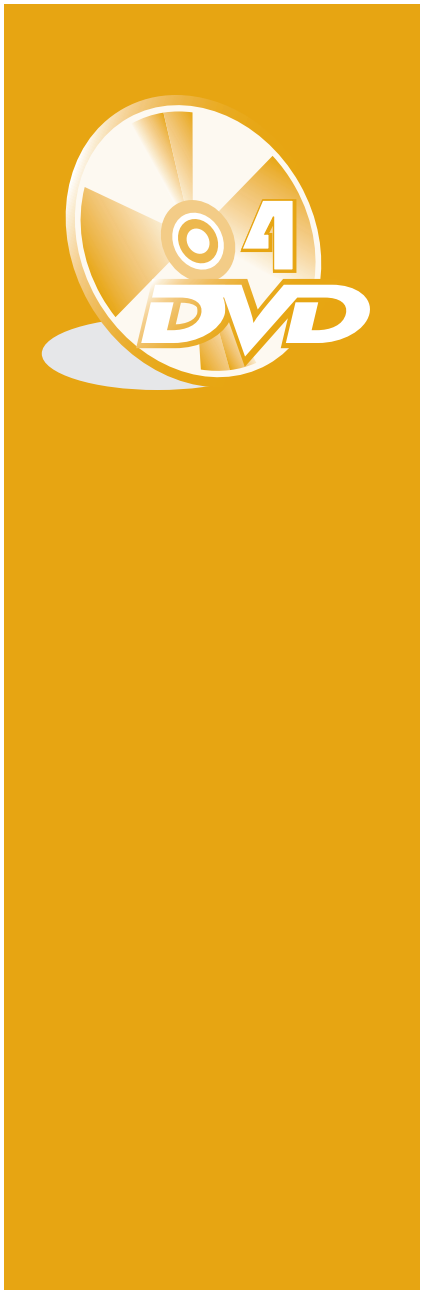
DVD 2 Element-2 > Cutoff frequency
DVD 2 Element-2 > Resonance
DVD 2 Element-2 > Resonance uses
DVD 2 Element-2 > Low-pass filter
DVD 2 Element-2 > High-pass filter
DVD 2 Element-2 > Corrective high-pass filter
DVD 2 Element-2 > Band-pass filter
DVD 2 Element-2 > Notch filter
DVD 2 Element-2 > Special filter
DVD 2 Element-2 > Cutoff frequency modulation
DVD 2 Element-2 > Using envelope modulation
DVD 2 Element-2 > Cutoff frequency keyboard note modulation
DVD 2 Element-2 > Using LFO Modulation
DVD 2 Element-2 > Special cutoff modulation
DVD 2 Element-2 > Resonance modulation
DVD 2 Element-2 > Conclusion
DVD 2 Element-3 > Introduction Element-3
DVD 2 Element-3 > Volume parameter
DVD 2 Element-3 > Three types of volume
DVD 2 Element-3 > Amplifier envelope
DVD 2 Element-3 > Exceptions
DVD 2 Element-3 > Panning
DVD 2 Element-3 > Conclusion

DVD 3 Element-4 > Introduction Element-4
DVD 3 Element-4 > Are all movements arranged by Element-4?
DVD 3 Element-4 > Modulation amount
DVD 3 Element-4 > Envelopes > Introduction
DVD 3 Element-4 > Envelopes > How an envelope works
DVD 3 Element-4 > Envelopes > Attack
DVD 3 Element-4 > Envelopes > Decay
DVD 3 Element-4 > Envelopes > Sustain
DVD 3 Element-4 > Envelopes > Release
DVD 3 Element-4 > Envelopes > Working with envelopes
DVD 3 Element-4 > Envelopes > Envelope and cutoff frequency
DVD 3 Element-4 > Envelopes > Positive and negative modulation
DVD 3 Element-4 > Envelopes > Sustain fade
DVD 3 Element-4 > Envelope and Element-1 pitch
DVD 3 Element-4 > Envelope and Element-1 waveform
DVD 3 Element-4 > Envelope and Element-2
DVD 3 Element-4 > Envelope and Element-3
DVD 3 Element-4 > Envelope and Element-4
DVD 3 Element-4 > Trigger/play modes
DVD 3 Element-4 > LFO > Introduction
DVD 3 Element-4 > LFO > LFO speed
DVD 3 Element-4 > LFO > LFO speed modulation
DVD 3 Element-4 > LFO > LFO waveforms
DVD 3 Element-4 > LFO > Sinus, saw and pulse
DVD 3 Element-4 > LFO > Random and sample&hold
DVD 3 Element-4 > LFO > Waveform modes
DVD 3 Element-4 > LFO and Element-1 > Introduction
DVD 3 Element-4 > LFO and Element-1 ..... Pitch modulation FX sound
DVD 3 Element-4 > LFO and Element-1 ..... Pitch modulation tip 1
DVD 3 Element-4 > LFO and Element-1 ..... Pitch modulation tip 2
DVD 3 Element-4 > LFO and Element-1 ..... Waveform modulation
DVD 3 Element-4 > LFO and Element-2
DVD 3 Element-4 > LFO and Element-3
DVD 3 Element-4 > LFO and Element-4



DVD 4 Element-4 > Keyboard introduction
DVD 4 Element-4 > Keyboard note information > The basic connection
DVD 4 Element-4 > Keyboard note information > Wave modulation
DVD 4 Element-4 > Keyboard note information > Note information and Element-2
DVD 4 Element-4 > Keyboard note information > Note information and Element-3
DVD 4 Element-4 > Keyboard note information > Note information and Element-4
DVD 4 Element-4 > Keyboard velocity information > Introduction
DVD 4 Element-4 > Keyboard velocity information > Velocity and Element-1
DVD 4 Element-4 > Keyboard velocity information > Velocity and Element-2
DVD 4 Element-4 > Keyboard velocity information > Velocity and Element-3
DVD 4 Element-4 > Keyboard velocity information > Velocity and Element-4
DVD 4 Element-4 > Sequencers and arpeggiators
DVD 4 Element-4 > Controllers in general
DVD 4 Element-4 > Pitch wheel controller
DVD 4 Element-4 > Modulation wheel controller
DVD 4 Element-4 > Aftertouch
DVD 4 Element-4 > Ribbon and other controllers
DVD 4 Element-4 > Glide
DVD 4 Element-4 > Special modulation
DVD 4 Element-4 > Unison mode
DVD 4 Element-4 > Chord play modes
DVD 4 Element-4 > Conclusion

Rob Papen is a globally renowned sound designer whose sounds and virtual synthesizers are used and loved by many synthesizer players and music producers.
This 200+ page book, which is accompanied by four DVDs with over 10 hours of content, gives an in-depth insight into his approach of working with subtractive synthesis.

In 2001, Rob Papen began giving exclusive masterclasses teaching 'synthesizer sound design' in his studio. For these training sessions, Rob developed his own method to explain the secrets of subtractive synthesis, called 'The 4 Element Synth'.

This masterclass training is now transformed into a combined book and DVD package that also delivers numerous 'tips and tricks' which will help you to design and tweak your own sounds.
Throughout the masterclass, a variety of hardware and software synthesizers are explored.
We are sure this synthesizer sound design training is an eye-opener for every synthesizer player, from novice to pro. A must have for everyone who takes his sounds seriously!

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