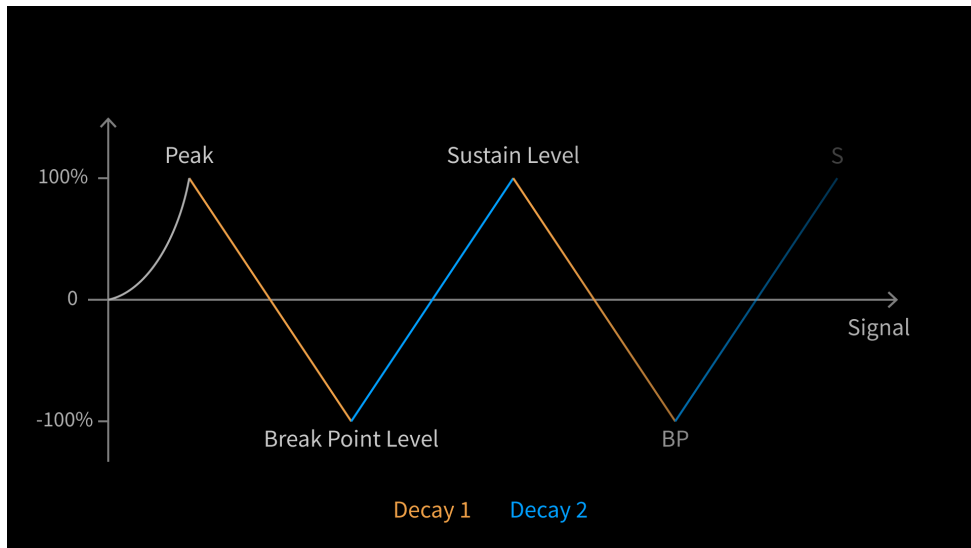


An Introduction to the Loop Function of Envelope C



With the Spring 2023 update, we have added a loop function to the C15's Envelope C, which gives the C15's synthesis new possibilities for sound shaping. The loop is established via **Breakpoint** and **Sustain** as well as **Decay 1 and 2**. In terms of functionality, the Loop Envelope is reminiscent of an LFO, but offers many other facets that reflect the expressive power of the C15, creating unique and complex modulation signals.

In keeping with our claim to transfer the expressivity of the performer into the synthesis as best as possible, the Loop Envelope was designed in such a way that its parameters can be modulated during the loop via the **Macro Controls**. This creates a modulation that is constantly changeable and always alive.

But let's hear it!

Let's try out the Loop Envelope on the example of a cutoff modulation, the mother of all modulations. Load the sound *No Virus* from the bank *NL SynthLeads* - it is the first preset of the bank. Why don't you play the sound? You will hear that it is a preset in the style of a virtual-analog synthesizer, i.e. it uses a classic, subtractive synthesis with two saw waves and a low pass filter at its center.

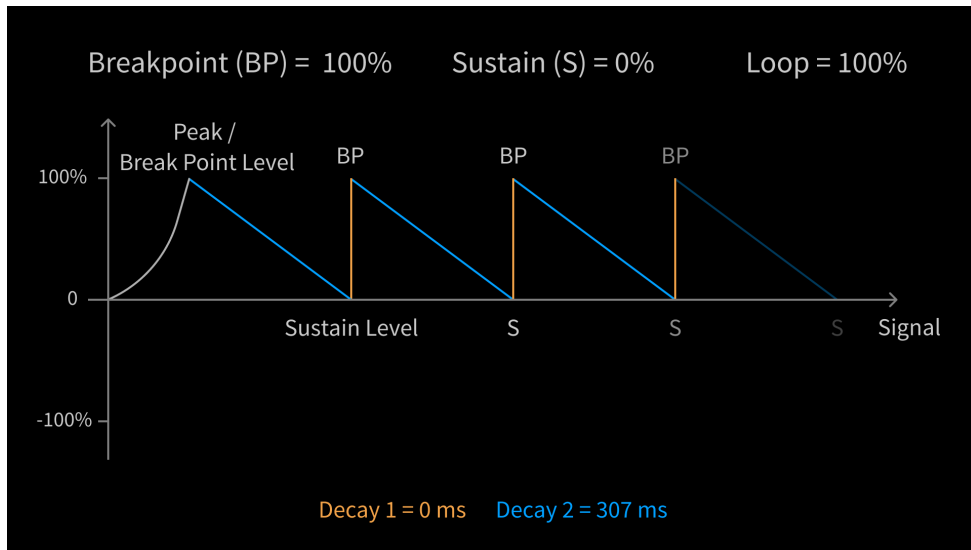
Activating the Loop

Now let's bring the filter to life. To do this, navigate to the new Loop parameter by pressing Decay 2 of Envelope C four times. **Loop** is the fourth parameter in this stack. Now set **Loop** to 100% and play the sound again in a lower register. Can you hear how the filter is already modulated by the loop envelope? That's because in this preset, **Envelope C** is already affecting the **Cutoff** frequency. To make the Loop Envelope more audible even with a soft velocity, you should adjust the **Level Velocity** of **Envelope C** slightly. At 0 dB **Level Velocity**, the strength of the keystroke has no effect on the **Breakpoint** and **Sustain Levels** of the envelope.

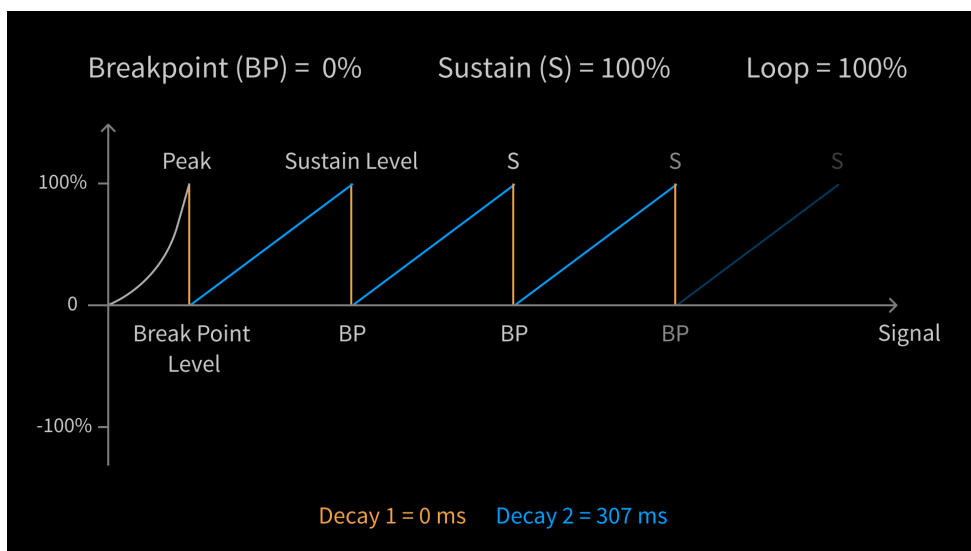
Let's take a closer look by calling **Cutoff - Env C** (press the **Cutoff** button twice). The value shows 48 st, which means that the envelope modulates the filter in a range of + 48 semitones. Let's change this value to - 60 st, which will make the effect a bit more concise. So we modulate the filter in lower frequencies.

Shaping the Envelope

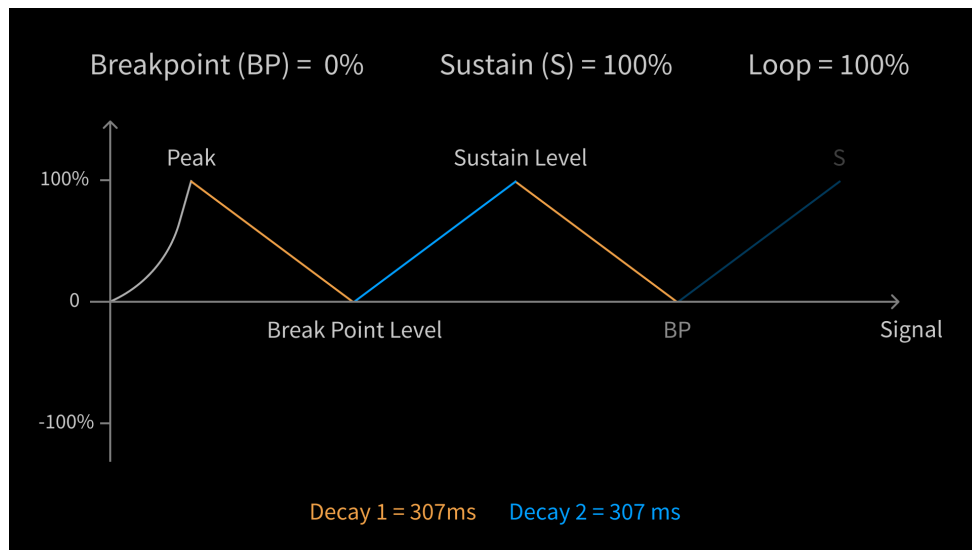
If you listen carefully, you will hear that the modulation signal corresponds to a sawtooth wave. Let's take a closer look at the parameters to understand why this is so. The relevant parameters here are **Decay 1 and 2**, as well as **Breakpoint** and **Sustain**, because with these parameters we shape the loopable part of the envelope. When we play a key, the voice starts normally with the attack phase and then goes through the other phases normally until the sustain level is reached. As soon as the **Sustain** level is reached (i.e. after the **Decay 2** phase has been passed), the envelope does not go into the release phase, but starts a new cycle by jumping to the breakpoint. This process is repeated until the key is released, at which point the signal enters the release phase.



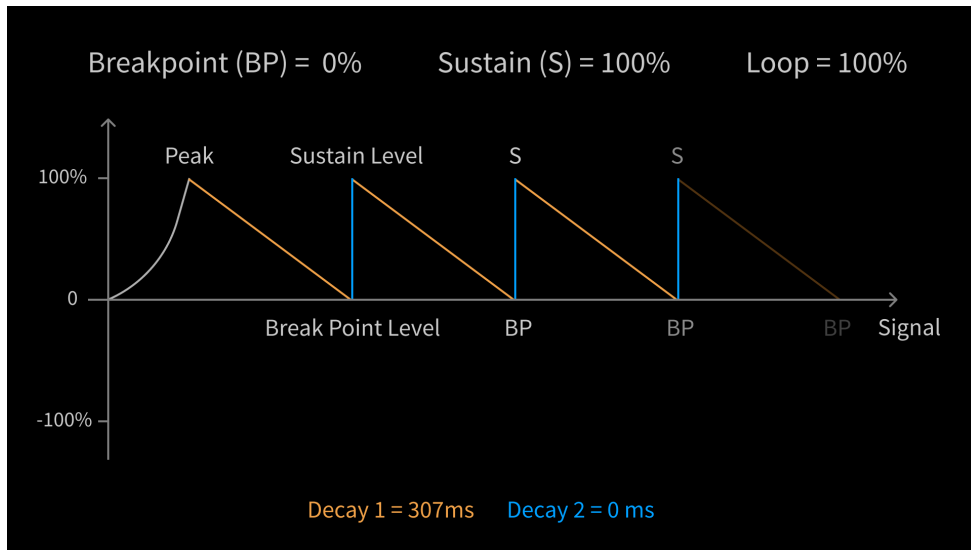
In our example, **Decay 1** is set to 0 ms, **Breakpoint** to 100%, **Decay 2** to 307 ms and **Sustain** to 0%, resulting in a falling sawtooth (see picture). First, we want to change the values for **Breakpoint** and **Sustain Level**. Set **Breakpoint** to 0% and **Sustain** to 100%. This will change the resulting envelope shape from a falling saw wave to an ascending one.



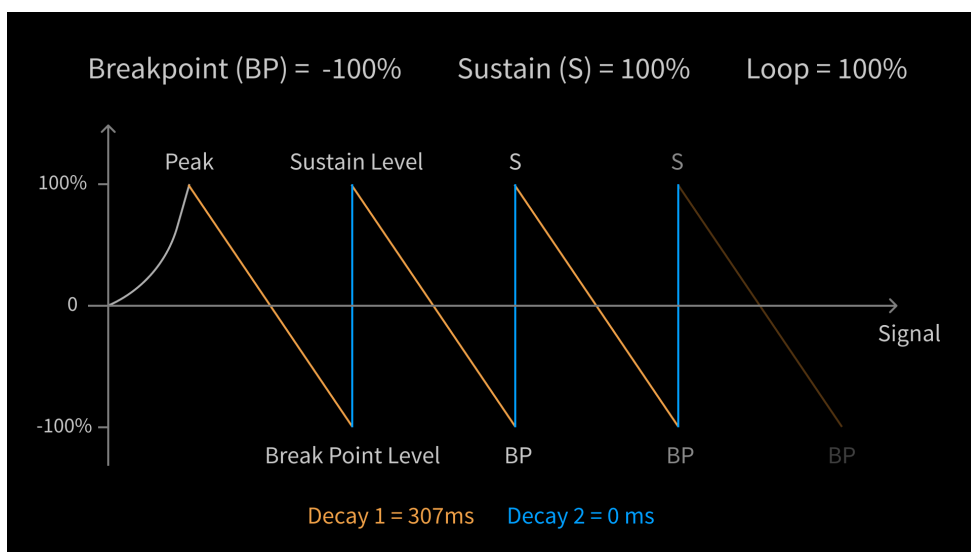
Let's now increase the value of **Decay 1** to 307 ms as well. By the way, you can do this while playing a note. Take your time while increasing it, then you can hear how the sawtooth slowly turns into a triangle. You will notice that after the attack phase there is a plateau with the duration of Decay 1.



If we now set the **Decay 2** value to 0 ms, we get a sawtooth again, but this time an ascending one. This way we can seamlessly change between the waveforms. The use of **Macro Controls** is particularly suitable for this. Why don't you use **Macros E** and **F** and assign them to the two **Decay** times respectively (the new virtual **Ribbons 3** and **4** are perfect for this, by the way). Now you can shape the envelope via the **Macro Controls**. Alternatively, you can use a **Macro Control** and inverted amounts to control both **Decay** times at once.



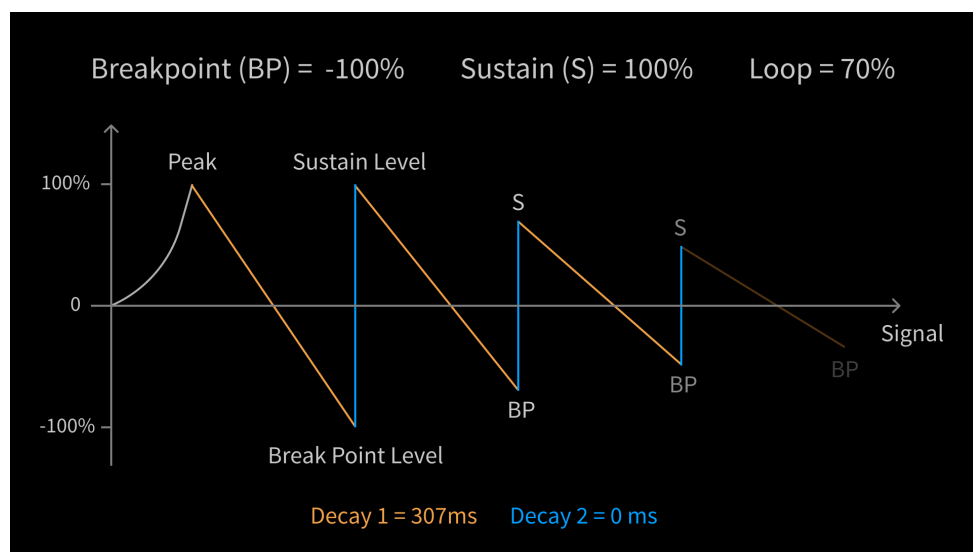
As you already know, we can change the envelope shape not only via the **Decay** parameters - **Breakpoint** and **Sustain** also have an influence on it. If we increase the distance between the two values, the shape becomes deeper, while if we decrease the distance, it flattens. Why don't you reduce the **Breakpoint** value from 0% to -100%? The envelope must now travel twice as far in the same amount of time. Of course, this also increases the modulation depth, which results in a significantly different sound.



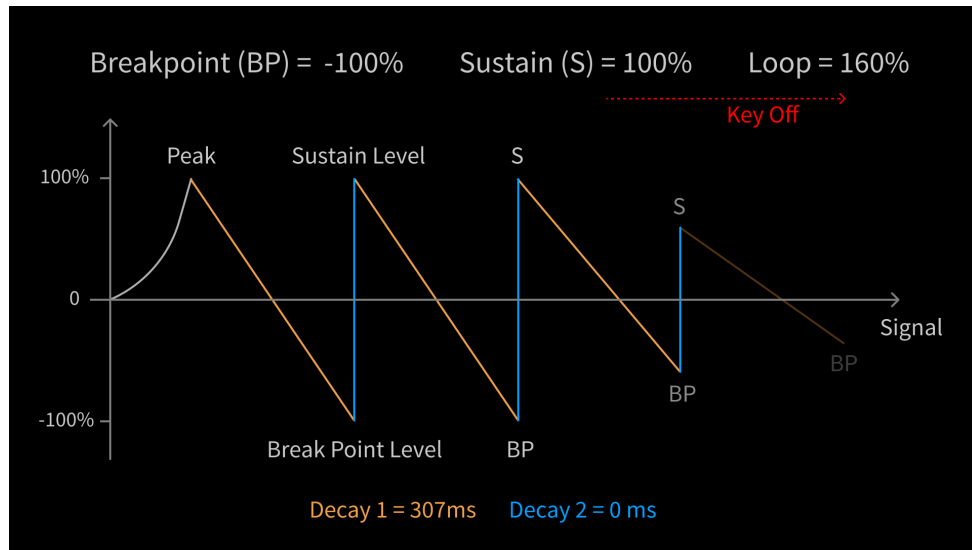
A closer look at the loop parameter

We should take another look at the **Loop** parameter. As you may have noticed, the **Loop** parameter has a value range from 0% to 200%. Up to now we had used **Loop** with 100%. Turn the parameter down a bit, to about 70%. If you now play the sound, you will notice that the modulation decreases more and more over time. 70% means that after each loop cycle, the **Breakpoint** and **Sustain** levels are only 70% of their previous values and approach 0 with each cycle. In this way, interesting new sound variations can be achieved. For example, you can use an **AP Tune** or **Comb Pitch** modulation with very fast **Decay** times and a relatively small **Loop** value to simulate the blowing sound of a wind instrument.

*Please note: The value of the **Loop** parameter is sampled only with every key down and key up event. Changing the value while holding the note will therefore have no effect on the corresponding voice until the release phase is triggered.*



You may now wonder how the envelope behaves for **Loop** values above 100%. Let's go back to our preset for this (*No Virus*). Extend the release values of **Envelopes A** and **B** to a value between 4000 and 5000 ms. Now increase the **Loop** value to about 160%. If you now press a key and release it again immediately, you will notice that the loop continues to run even after the key has been released. The **Loop** amount decreases by 60% per cycle after the key is released, while it remains at 100% for the duration of the keystroke. By the way, for **Loop** values up to and including 100%, the release phase is entered directly when the key is released. At 200% the loop runs at full scale until infinity and never decays.



More than an LFO

The **Loop Envelope C** is more than just an LFO replacement. First of all, this is recognizable by the fact that the envelope acts per voice and not like a global LFO. On the other hand, however, especially by the fact that all the parameters of the C15's synthesis, which are supposed to transfer the expressivity of the performer into the sound, naturally also affect the Loop Envelope. We invite you to play around with the **Decay Times**, **Level Velocity** and **Level Key Tracking** as well as **Time Key Tracking** parameters. This way you can dynamically influence the loop through your playing.

Other Modulation Targets:

We encourage you to try other use cases of the **Loop Envelope**. Of course, the classic synth sounds come to mind first and we have also chosen the **Cutoff** as the modulation target in this introduction. If you are interested in this kind of sound, you should try the **Loop Envelope** in conjunction with the **Pitches** or the **Filter Resonance**. However, less typical modulation destinations also promise interesting sound results. As already mentioned, the parameters of the **Comb Filter** are suitable for exciting experiments in the field of wind instruments, but also chorus and flanger-like effects can be achieved here. And, if you experiment with feedback, **PM FB** and **FB Mix** could be interesting targets. There is still a lot to try out and discover here.