Allpasser

Rack Extension User Manual

dustydevices

Introduction

Allpasser is a Rack Extension effect device by Dusty Devices. It features two sets of 2-pole allpass filter stacks with feedback, three LFOs, an extensive modulation matrix and an analysis display.

Allpass filters alter the phase of certain frequencies without actually filtering anything like a conventional filter does. This might seem pointless at first, but there are many practical and fun uses for them. For example, when mixed with the original dry signal, the result is a phaser! Another common application is in certain broadcasting areas, where allpass filters are used to spread out the transient energy of a signal in time to reduce the peak-to-peak amplitude, so the signal can be limited harder. The same behaviour can also be used to ”beef up” the low end or make everything sound like a wild sci-fi laser.

Front Panel

Bypass/On/Off Standard Reason feature. Bypass lets the signal through without applying any processing, On is the normal processing mode, Off doesn't process the signal and silences the outputs.

Patches Standard Reason interface for loading and saving patches.

Processing Mode The signal flow can be configured in the following ways:

- **Series** The dry signal is first processed by the filter set 1, which is then fed to the filter set 2 to be processed.
- **Parallel** The dry signal is processed by both 1 and 2, which are then summed.
- **Left / Right** The left channel is processed by 1, and the right channel is processed by 2.
- **Mid / Side** The signal is converted into mid and side channels. The mid channel is processed by 1, and the side channel is processed by 2. They are then converted back into left and right channels for the output.

Filter Section

The two 2-pole allpass filter sets 1 and 2. Each set has its own parameters.

Active Toggle

Below each filter set number, a toggle that activates or deactivates the filter set.

Freq

The frequency at which the phase shift is rotated -180 degrees, so the dry and processed signals are out of phase. Below this point the phase shift approaches 0 degrees, and above this point it approaches -360 degrees.
Range from 20 Hz to 22 kHz.

Q

Sometimes also called phase bandwidth in allpass filters, Q controls how steeply the phase rotates around the set frequency. Lower values widen the out-of-phase portion around the frequency. Conversely, higher values make the out-of-phase portion narrower.
Range from 0.022 to 22.63.

Stack

The number of allpass filters applied in series, all set at the given frequency and Q. The more filters, the more phase rotation.
Range from 0 to 64.

Whereas a single 2-pole allpass filter causes 360 degrees of phase rotation across the whole frequency range, *two* filters result in a total of 720 degrees of rotation. This results in the phase being rotated *twice* past the 180-degree point where the signal is completely out of phase. It also has the jolly interesting effect that it changes where the 180-degree out-of-phase portions happen as well. Add even more stacked filters and you get a whole lot of phase rotation and out-of-phase portions. Naturally, low Q values spread these out more, while high Q values cram them closer together.

Even without mixing the dry signal with the processed one, with a large enough stack, interesting changes in the signal can be heard when different parts of the frequency spectrum are being shifted by wildly differing amounts.

Fdbk

Feedback. While allpass filters themselves don't affect the amplitude of any given frequency, feeding their output back to their input introduces resonances and cancellations that depend on the total phase rotation. The feedback can also be negative.
Range +/- 99 %.

Global Section

Mix

Your garden-variety dry/wet control. Mixes the dry signal with the processed one.

Gain

In case you want to go wild with the feedback or you just need another gain stage, here's a gain control for free without adding another device.

Anti-Ring

Sometimes the filters can cause loud and nasty ringing at very high frequencies when a frequency is quickly being modulated up to the highest possible setting. Enabling Anti-Ring mitigates this type of ringing. Recommended to have on when experimenting with the device, or when using fast modulation on the frequencies.

Anti-Ring is a 12 dB/oct lowpass filter, and mostly useful at a sample rate of 44.1 kHz, since the maximum filter frequency of 22 kHz is very close to the Nyquist frequency of that sample rate. The cutoff frequency of the Anti-Ring filter is 21 kHz at 44.1 kHz and increases linearly with the sample rate.

Soft Clip

Soft clipping applied to the output signal after the Gain.

Analysis Display

Multi-mode display showing various properties of the applied filters. When Processing Mode is set to either series or parallel, this displays a combined graph for both filter sets. In Left / Right and Mid / Side modes there are two dedicated graphs representing each channel, blue for 1 and pink for 2.

Phase

The phase rotation wrapped within +/- 180 degrees. Each vertical line signifies an out-of-phase point in the frequency range. In parallel mode, vertical lines that don't span the full 360 degrees may appear. These discontinuities correspond to the frequencies that cancel out when both filter sets are summed.

Group Delay When an allpass filter alters the phase of a signal, different frequencies are delayed by different amounts. Group Delay displays the delay by frequency.

The vertical axis of the display adapts to its maximum value, ranging from 60 microseconds to 4000 milliseconds.

Mag Magnitude (or amplitude) difference of the processed signal compared to the dry signal in decibels. The magnitude remains at 0 dB unless any feedback is introduced or both filter sets are active and set in parallel.

The vertical axis of the display adapts to its maximum value, ranging from +/- 6 dB to +/- 48 dB.

Off Let's be real – dealing with a lot of complex numbers is expensive. No one has imaginary amounts of CPU power, so the option to turn off the Analysis Display has been provided.

Modulator Section

Allpasser offers two LFOs (low frequency oscillators) and an envelope follower. These can be used to modulate an extensive array of other parameters.

LFO

Waveform There are six different LFO waveforms available in Allpasser. Sine, Triangle, Sawtooth and Square are all pretty self-explanatory. S&H is a sample and hold noise. S&H Lerp is a variety of S&H where the adjacent values are being interpolated linearly.

Rate LFO rates vary from 0.001 Hz to 100 Hz in free-running mode, or from 128 quarter notes (32/1) to 1/64th note in tempo-synced mode. There are a total of 32 different time divisions, including some triplets. The divisions are arranged in the order of their absolute length.

S&H and S&H Lerp generate a new value each time the Rate "ticks."

Sync Toggles the LFO tempo sync on and off.

Follower

Envelope follower. Generally speaking, it basically generates a signal that expresses how loud something is, which makes it useful and fun for modulating all kinds of parameters. Sort of like how a compressor knows to turn down the audio when it gets too loud, or an auto-wah guitar pedal controls a filter's cutoff according to how much the guitar wails.

Input

The channel configuration that the envelope follower uses for generating the envelope. Mid is the center channel (L+R), Side is the side channel (L-R), and Left and Right are the corresponding channels of the input. Allpasser uses Main inputs by default, but automatically switches to the Sidechain inputs if connected.

Att

Attack. Not unlike the attack on a compressor effect. Whenever the input exceeds the current envelope value, this is the time it takes for the envelope to reach the current input loudness within a certain acceptable margin. Range from 1 millisecond to 10 seconds.

Rel

Release. Similarly, like the release on a compressor. Whenever the input is quieter than the current envelope, this is the time it takes for the envelope to reach the current input loudness within a certain acceptable margin. Range from 1 millisecond to 10 seconds.

Modulation Matrix

Allpasser has a flexible 4x3 modulation matrix with four source slots that can be applied to three destinations each. This means you can easily send one source to three separate destinations, each with their own amounts and modifiers – all while not wasting extra source slots.

Source

There are seven modulation sources available. In addition to two LFOs, an envelope follower and three CV inputs, there is also Const, which is a constant value of 1. This can be used as a variable bias.

Amt

Bipolar modulation amount in the range of +/- 100. Negative values flip the modulation polarity.

Destination

Modulation can be applied to 17 destinations:

Freq 1 & 2	Filter frequency
Q 1 & 2	Filter Q
Stack 1 & 2	Filter stack
Feedback 1 & 2	Filter feedback amount
Mix	Dry/wet mix
Gain	Yes
LFO Rate 1 & 2	Note: It's also possible for an LFO to self-modulate its own rate. This opens up some fun possibilities, such as warping the LFO shape.
FollowerAtt	Envelope follower attack time
FollowerRel	Envelope follower release time
CV Out 1–3	Modulation signals can be routed to the Mod Out CV in the back panel. This allows further processing of the modulation signals before routing them back into Allpasser, or using them to modulate other devices.

Φ (Phase)

Not much space in the GUI? Not to worry, we have Greek alphabet! This is *phi*, denoting phase offset for the source, with a range of 0 to 360 degrees. Phase offset only applies to LFO sources, since it's somewhat challenging to guess what the periodicity of an arbitrary CV input or an envelope follower signal might be.

When modulating both filter frequencies with the same LFO, it can be a great idea to offset the other by some amount, especially when processing in Left / Right mode. Offsetting the phase of an LFO while modulating its own rate can also yield some rather interesting results.

LPF

A 12 dB/oct lowpass filter with a Q of 0.5. Especially useful for smoothing out the S&H or any other modulation signals with sudden changes. Also worth trying out when self-modulating an LFO's own rate.
Range from 0.1 Hz to 250 Hz or disabled altogether.

Rear Panel

Modulation Input

Individual CV inputs for the parameters with dedicated scaling knobs available where applicable. There are also three extra CV inputs that are freely assignable in the modulation matrix.

Sending a non-zero CV value into an Active CV input overrides the front panel toggle. A positive value toggles it on, and a negative CV value toggles it off.

Mod Out

Three extra CV outputs for sending out any modulation signals, and the envelope follower output as both CV and audio.

Audio Connections

Main inputs and outputs for processing the audio, and sidechain inputs for the envelope follower.

Follower Trim

Envelope follower level detection trim. Some input signals might be too quiet for the envelope follower to react in a useful way, so this can be used to boost the level without affecting the actual signal. Applies to both Main and Sidechain inputs.
Range from -12 dB to +36 dB in 6 dB increments.

Latency

The latency introduced by Allpasser is basically zero, except when and where it isn't. The latency is perhaps best indicated by the Group Delay analysis display.

Thanks

All the beta testers and their constant pushing.
Laatikko for being my rubber duck during development.
Allpass filters for making music have bally bass sounds.