RealPhase
User's guide

Basic concepts

The phaser effect

A phaser is essentially a group of notch filters moving together along the frequency axis, as a low-frequency oscillator (LFO) modulates their center frequencies, creating a sweeping effect. When feedback is applied, resonant peaks can also appear in the frequency response.

The exact position of individual filters within the group can be independently tuned by the manufacturer, and can be a part of the characteristic sound of any given phaser model.

The momentary frequency position

Similarly to the cutoff frequency of filters, for phasers, the principal modulated parameter is also frequency-like.

Unlike filters however, this value designates a complex array of individually-tuned notch filters. Since there is no standardized and technically useful way for a single frequency value to adequately describe this complexity, it will be treated as an abstract control value (between 0% and 100%), referred to as the **frequency position** of the phaser throughout this user's guide.

This also lines up with RealPhase's capacity for hosting different self-contained models, with potentially wildly differing architectures, notch filter configurations, per-element modulation curves.

Stereo operation

Control block for stereo settings

Stereo mode

In addition to the standard L/R channel mode, RealPhase also supports a mid-side (M/S) configuration, plus any setting in between these two modes via a built-in fractional M/S converter.

For mono inputs (or sounds with little discernible stereo width), the L/R mode should be used.

Mid-side mode allows adding stereo effects without any strong movement or pulsation in the L-R dimension. Using the MIX BALANCE control can be an essential part of the workflow when working with M/S modes, since it allows independent fine-tuning of the phaser's intensity in the mid and side channels. The MIX BALANCE setting can also alter spatial characteristics in M/S modes (with the exact effect depending on the original input sound and the particular phaser effect itself).

Stereo separation

The STEREO PHASE parameter controls the difference in processing between the two channels. When set to 0, the phaser will apply the same effect to both channels.

While STEREO PHASE normally represents the phase difference between the left and right LFO's, in some cases its meaning can be more abstract, and the ±180 degree setting may simply represent the maximum stereo depth possible under the given modulation mode.

Modulation and structure options

Setting	Summary	Details
Triangle	Triangle wave (hypertriangular LFO based on real sampled hardware)	LFO drive: Overdrive for the oscillator's output. LFO bias: Center (neutral) position of the oscillator.
Sine	Sine wave	LFO drive: Overdrive for the oscillator's output. LFO bias: Center (neutral) position of the oscillator.
Stereo sync (triangle)	Triangle wave (phase-locked stereo oscillator)	This LFO is guaranteed to maintain constant stereo separation, unlike regular stereo LFO's. This implies a slight difference in modulation ranges of the two stereo channels. Changing the polarity of the STEREO PHASE setting swaps the asymmetrical profile of the two channels. LFO drive: Overdrive for the oscillator's output. LFO bias: Center (neutral) position of the oscillator.
Infinite rise / Infinite fall	Quasi-shepard algorithm (model-agnostic add-on utilizing parallel structures and cross-fading)	Overlap: Transition smoothness / seamlessness
Sawtooth rise / Sawtooth fall	Sawtooth wave	LFO drive: Overdrive for the oscillator's output. LFO bias: Center (neutral) position of the oscillator.
S & H	Sample & Hold random wave	LFO drive: Overdrive for the oscillator's output. LFO bias: Center (neutral) position of the oscillator.

Square	Square wave	Note: due to the shape of the waveform, changing the LFO drive alone will not result in a different modulation. LFO drive: Overdrive for the oscillator's output. LFO bias: Center (neutral) position of the oscillator.
Composite	Two oscillators summed together; the first oscillator is a triangle one.	Note: OSC2 is is a mono oscillator. OSC2 Waveform: The waveform for the 2nd oscillator. OSC2 Rate: the speed multiplier in relation to the primary oscillator (can only be faster). OSC2 Ampl: mixing ratio control between OSC1 - OSC2. At 100%, OSC2 takes over completely. OSC2 phase: The phase difference between the two oscillators. LFO drive: Overdrive. Uses a more intense, raw algorithm compared to standalone oscillators. LFO bias: The center of the oscillator's range. Uses a different algorithm compared to standalone oscillators.
Parallel	Two phasers in a parallel configuration.	OSC1 Waveform: The waveform for the 1st phaser's LFO. OSC2 Waveform: The waveform for the 2nd phaser's LFO. OSC2 Rate: the speed multiplier in relation to the primary oscillator (can only be faster). OSC2 phase: The phase difference between the first and second phaser's LFO.
Direct Entry	External modulation.	Note: stereo separation is controlled by the STEREO PHASE parameter Mod. Entry: The modulation value (frequency position).
Direct Entry (Parallel)	External modulation using a 2-way parallel phaser.	Note: stereo separation is controlled by the STEREO PHASE parameter Mod. Entry: The modulation value (frequency position) for the 1st phaser Mod. Entry 2: The modulation value (frequency position) for the 2nd phaser

Modulation speed & alignment

Primary LFO

Unless direct entry is used instead of automated modulation, the main LFO of the phaser is always active, and it's the designated clock reference for all additional LFO's.

When tempo syncing is enabled, the primary LFO's - and by extension each secondary LFO's except for range modulation - output can be offset in time using the PHASE OFFSET parameter, a feature that is frequently part of the workflow when creating highly rhythmic modulation patterns. It can mean the difference between misaligned, shuffled or perfectly synced up rhythmic effects.

The PHASE OFFSET parameter can also be used in experimental ways, like adding temporary deviations or glitches on top of a running LFO.

> Tip: phase offsetting can be used to create complementary modulations (e.g. 0, 180 or 0, 60, 120) on different tracks to add variety, or to even out simultaneous time-based effects in the mix (i.e. not have multiple phasers sweep with the exact same timing & direction on different tracks in case they share the same tempo setting).

Rate factors

Throughout RealPhase, there are a number of LFO's or periodic modulation sources that are synced to the primary LFO.

This relationship is established via rate multipliers. Logically, a "4x" indication means a factor of 4 in modulation speed compared to the primary LFO. The notation for divisors is x/<divisor>, such as "x/4", indicating an LFO that runs at one quarter speed of the primary LFO (this is to clearly differentiate from note duration references in tempo sync mode).

Modulation depth and range

Overview

The sweep range (or modulation range) is the interval between the minimum and maximum frequency positions. The wider this interval, the more depth the modulation will have. Conversely, reducing it can decrease or even stop all time-varying effects.

The modulation range can be controlled at multiple levels:

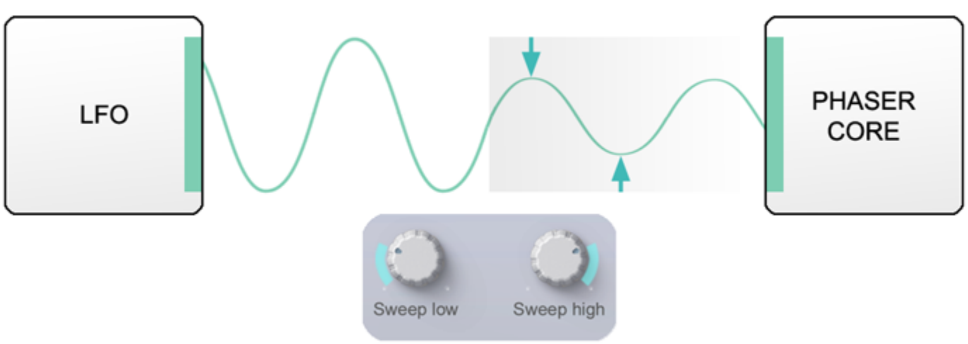
1. Master controls
2. Range modulation
3. LFO bias and drive (when available)

Modulation range control options

Master controls (sweep low / sweep high)

The SWEEP LOW and SWEEP HIGH settings control the modulation range at the top level, right before the control signal is sent to the core phaser element.

These can be used as performance controls, similar to filter cutoff knobs (especially at high feedback settings where phasers with a low number of stages can deliver a more distinct filtering effect).



Using the master controls to reduce the depth of the main LFO

Range modulation

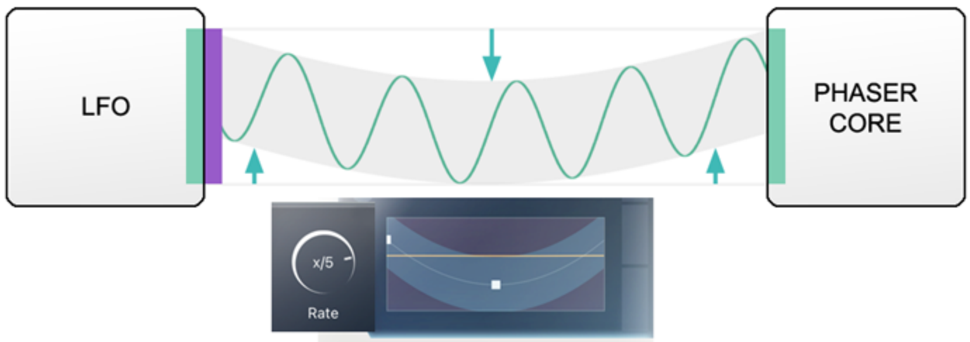
Changing the sweep range can be automated via the range modulation feature. It's a periodic envelope capable of outputting two values (low, high) that define the modulation range at any given moment. The speed of range modulation is tied to the primary LFO via a multipler.

Range modulation was designed to replace / assist with most manual adjustments of the sweep range in a performance, which are typically gradual and slow changes. However, it can be set to run at the same speed as the primary LFO, creating a more intense transformation of the original modulation.

Tip: absence of a moving vertical cursor in the editor indicates that range modulation has not been activated.

The main readout from the editor is the area (shown in light blue) which represents the envelope that bounds or narrows down the primary modulation for the phaser.

The horizontal axis represents time, and the editor depicts one full cycle of the periodic envelope (which is essentially a custom LFO). The vertical axis corresponds to the full sweep range.

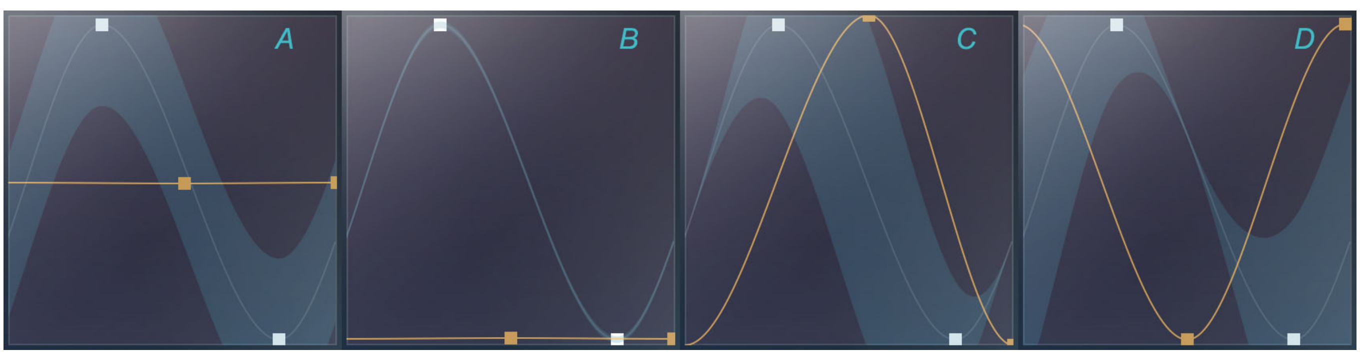


Automatic movement of the entire sweep range (at one fifth of the LFO speed)

The envelope can be edited through its two control curves: one for the center (blue) and one for the width (orange). Both curves have two adjustable control points, and the curvature can also be adjusted in addition to the x,y positions.

The envelope is generated symmetrically around the center curve. The following cases illustrate the effects of changing the width curve:

A. Constant width is represented by a horizontal line
B. Dragging the control points to zero transforms the envelope into a regular oscillator, drowning out existing modulation and stereo separation
C. Example of variable width: 100% range near the middle, pinched to zero width at the edges
D. Inverse of case "C", 0% width at the middle



Different width configurations using the same center curve

Range modulation - Advanced

LFO's

Two independent LFO's can be enabled for the two control points of the center curve by setting a non-zero AMOUNT value, adding variation to the automated sweep range changes.

A typical setup would usually have the LFO's running at lower rates than the range modulation's main cycle.

> Note: The rates of these LFO's are tied the the primary LFO, and **not** to the rate of the range modulation itself. This requires extra care when trying to speed up or slow down range modulation as a whole, requiring changing up to 3 rate settings in the most complex case.
> Also please note that there is a discrete set of available rate multipliers (e.g. doubling the speed of the 1/5 factor is not possible as there is no 1/2.5 option).

Note: when range modulation is disabled, the LFOs' real-time effect on the control curve is not reflected on the UI.

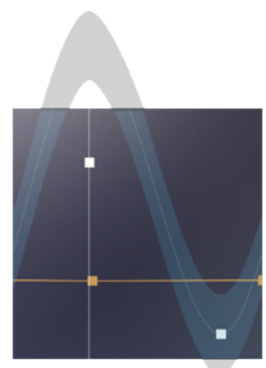
LFO for control point 1 of the center curve

Anti-overflow

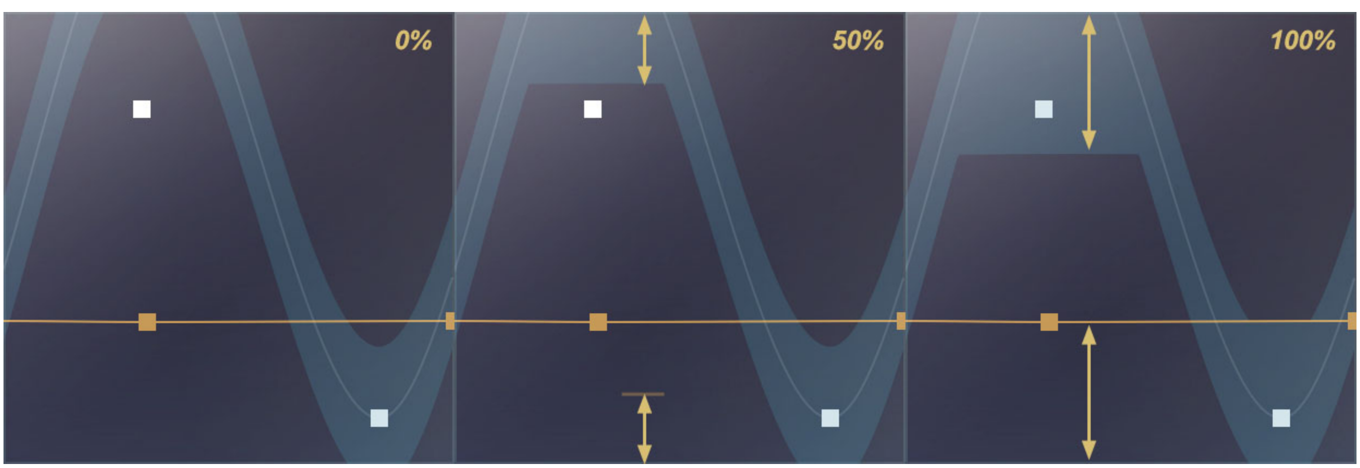
Especially when using LFO's, the momentary range can sometimes fall outside the bounds of the 0% - 100% window. This leads to clipping, and can effectively reduce the range to a singular value, equivalent to setting the SWEEP LOW and SWEEP HIGH controls to the same value.

Even when the range width doesn't collapse to zero (total clipping), the width reduction may still be undesirable, as it can diminish modulation depth and any configured stereo separation.

The ANTI-OVERFLOW setting can be used to force the momentary range maintain a minimum width, a given percentage of the momentary width curve value.



Demonstration of out-of-bounds ranges occuring. Complete clipping near the maximum, partial clipping at the minimum.



Preventing range collapse using the anti-overflow setting

Oscillator Drive & Bias

Drive and bias corresponds to saturation and DC offset applied to a modulation source. As such, this feature is designed to alter LFO waveforms besides potentially offering an additional level of control over the modulation range.

Note: the perceptibility of the bias effect gradually diminishes with the increase of the drive parameter, as the resulting amplified waveform encompasses the full modulation range.

High drive settings can be used to:

- Slow down or halt modulation (movement) at the low and high extremes due to saturation effects
- Turn any ramping, transition or movement faster, more intense (followed by a longer rest period once the boundary is hit, as per the previous point)

When using a composite LFO, OSC2 can be used to create intermittent excursions away from a saturated state caused by a high drive setting, opening possibilities to create strong, rhythmic or sporadic, disturbance-like modulation patterns.

Note: The composite LFO uses a different, more intense algorithm for drive and bias.

Links & Resources

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