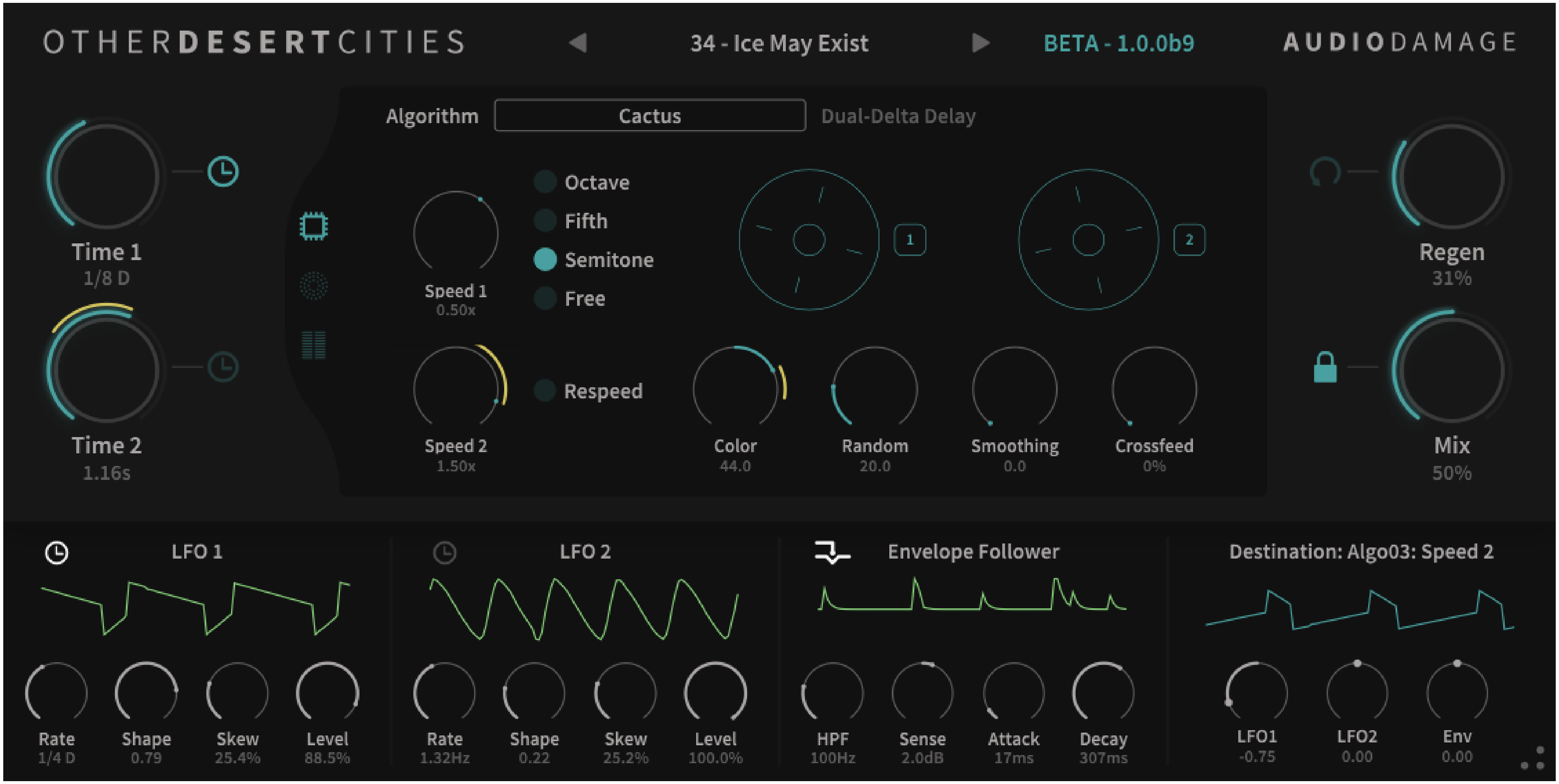
Other Desert Cities User's Guide
Audio Damage, Inc.
Release 1.0



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Introduction

Thank you for purchasing Other Desert Cities, our multiple-mode delay-based effects plugin. Rather than following the main thoroughfare of delay plugins intended to obsessively recreate hardware units long since passed, Other Desert Cities takes you down less-traveled roads. We visited a number of contemporary effects, both hardware and software, while seeking inspiration. The result is half a dozen different processing modes, which—like the cities of Arizona whose names they bear—have both common characteristics as well as individual charms. In addition, like heat rising from a long, flat highway, a diffusion processor creates shimmer and blur. Finally, a flexible modulation system adds curves and bumps.

We had a great deal of fun creating Other Desert Cities and hope that you enjoy exploring its possibilities. Happy travels!

System Requirements

The following table summarizes the operating system requirements and provided formats for Other Desert Cities:

Operating System	Minimum Version	Formats
macOS	10.11	AudioUnit, VST2, VST3 and AAX, 64-bit; Apple M1 code present except for AAX (at time of writing)
Windows	8.1 x64	VST2, VST3 and AAX, 64-bit
iOS	iOS 11 or iPadOS 13	AUv3, standalone app with IAA

To use Other Desert Cities, you'll need a host application such as Ableton Live, Steinberg Cubase, Apple Logic, Avid ProTools, etc[1]. We assume that you are familiar with using plugins with your host. If you have general questions about using plugins with your host, please refer to its documentation.

The iOS versions of Other Desert Cities require an iPad; newer models will provide better performance.

Demonstration Version

We encourage you to download and try the demonstration version of Other Desert Cities before purchasing it. The demo version of Other Desert Cities is the same as the regular version, but has the following limitations:

- Presets cannot be saved, nor can parameter values or other settings. This includes the information usually stored by your host DAW. If you save a DAW session with an instance of the demo version of Other Desert Cities, Other Desert Cities will revert to its default state when you reload the session.
- Other Desert Cities will cease to generate audio at all 20 minutes after you add it to your DAW session. You can remove it and add it again, but it will revert to its default state.

[1] Product names and plugin format names are copyrighted by their respective owners.

Overview

In brief, Other Desert Cities is comprised of two delay lines, a diffusion processor, and a variety of signal-routing and gain controls. The delay lines operate together in one of six *algorithms*[2], or modes of operation. These algorithms provide six different personalities, ranging from a basic stereo delay to oddities with variable speed and direction. The diffusion processor's effect ranges from subtle blurring and smearing to reverb-like washes. A pair of low-frequency oscillators and an envelope follower serve as modulation sources for adding periodic changes and signal-responsive dynamic effects.

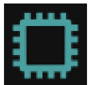
For brevity in this document, we'll often abbreviate Other Desert Cities as ODC.

Common Controls

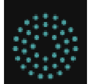
There are four knobs with associated switches that are always visible in ODC's window, regardless of which central pane is active. These four are the knobs you'll use most often when dialing in the effect you're after. They are:

Pane Selectors

ODC's window has a central area or pane which displays three different groups of controls, one group at a time. These groups are:



The Algorithm pane, with controls specific to one of ODC's several algorithms



The Diffuser pane, with controls for the diffusion processor

The Levels pane, with controls for setting signal levels at several points inside the plugin

Switch between these three panes by clicking one of the three small icons to the left of the pane.

Time 1 and 2

The **Time 1** and **Time 2** knobs at the left of the plugin's window set the length of the two delay lines. Many of ODC's algorithms have other controls which affect the delay time, but the Time 1/2 knobs are your first stop for setting the initial delay setting. Their value is expressed in seconds, shown below each knob. The maximum time is two seconds.

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[2] The word *algorithm* gained an unlikely inclusion in the music technology vernacular in 1979 when it was used by Eventide on their H949 Harmonizer. The user manual defined it as "a precise, describable process which acts upon or modifies inputs in a specific manner." In the context of Other Desert Cities, it means mode of operation or way of messing around with audio.

The clock-shaped sync switches to the right of either knob cause the delay times to synchronize to the tempo setting of your host DAW. Turn on the sync switch and the delay time switches to metrical units rather than seconds, e.g. "1/8" represents an eighth note. Dotted and triplet note lengths are indicated with “D” and “T” respectively. When sync is engaged the delay times will change in response to changes in your DAW's tempo, freeing you from the need to change the time manually.

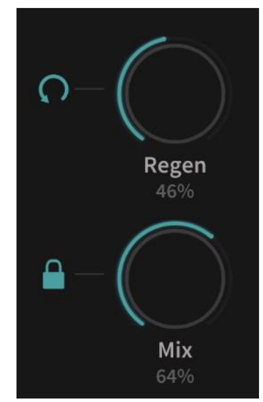
When the sync switch is on, the maximum delay time is ten seconds, which works out to two measures at a tempo of 48bpm.

Regen

The **Regen** (short for Regeneration) knob feeds some of the signal emerging from the delays back into their inputs. As you turn the knob up, more of the signal is fed back. This causes the delayed signal to repeat. If the Regen is set to zero, you'll hear a delayed copy of the input sound only once (or more, for some algorithms such as the Thermal multi-tap mode). As you turn the knob up, you'll hear the sound recirculate through the delays, gradually fading out. Turning the Regen knob fully clockwise makes the sound repeat more or less indefinitely, although many algorithms will change the sound substantially as time goes by and the signals recirculate through the delay processor. The percentage indicator below the knob indicates approximately how much of the delayed signal is fed back to the input—approximately because each algorithm has a slightly different gain structure and feedback path. Regeneration is also affected by the **Regen Balance** knob described below.

The Loop switch to the left of the Regen knob engages a different regeneration path. Turning this switch on makes the sound repeat over and over with little or no change. Some of ODC's algorithms inherently modify the signal, making a perfect loop impossible, but in general the Loop switch will cause indefinite repeating with less change and more stability than setting the Regen knob to 100%.

Mix

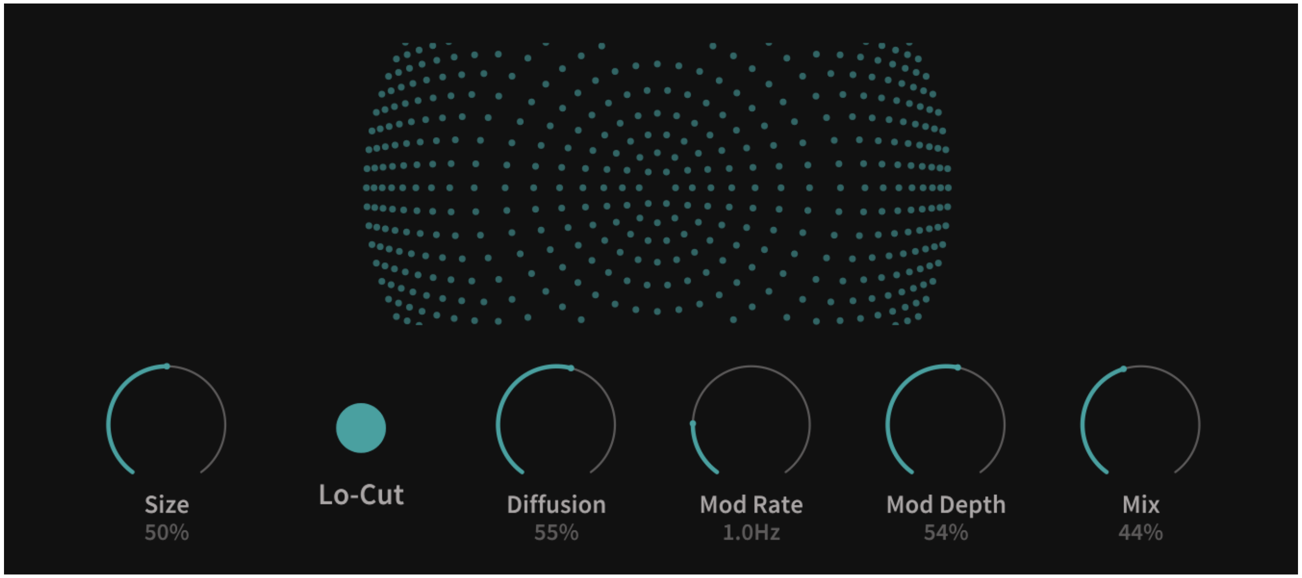


The **Mix** knob sets the mixture of the original signal entering the plugin (the "dry" signal) and the signal generated by the plugin's delays, filters, etc. (the "wet" signal). At a fully anti-clockwise setting, you'll hear only the dry signal. At the opposite extreme, you'll hear only the wet signal. Intermediate settings give you a proportional mix of the two signals; at the center position you get equal amounts of both. The Mix setting is shown as a percentage of the wet signal below the knob. Use a setting of 100% if you're using the plugin as a send effect, and something around 50% if you're using it as a channel-insert effect. The signal mixture is also affected by the Wet Balance knob described below.

If you turn on the lock switch to the left of the Mix knob, the mix setting won't change when you load presets. The mix setting is always *stored* in presets but is *retrieved* only when the Lock switch is off.

Diffuser Pane

In addition to the two delays and their six modes of operation, ODC contains a diffusion processor, or diffuser for short. The diffuser is composed of delay-based filters that soften and smear audio passing through them. Each filter is modulated by a low-frequency oscillator (LFO). This modulation prevents the filters from resonating at any specific frequency but can also be used to create unusual tremolo-like effects.



If ODC were a reverb effect, the **Size** knob would control the apparent size of the simulated reverberant space. The Size knob sets the lengths of the delays used within the diffuser. Turning the knob clockwise increases the delay times and generally makes the effect sound thicker or more smeared-out. If both the Delay time and Diffusion knobs are turned to a fairly high value, the diffuser will sound somewhat like a reverb processor.

The Size knob interacts with the **Depth** knob in the sense that at longer delay times the modulation LFOs change the delays over longer time intervals. In other words, the effect of the LFO modulation will be more audibly apparent at higher settings of the Size knob.

The **Diffusion** knob controls how much the diffuser softens or smears the audio passing through it. If this knob is rotated fully anti-clockwise, the diffuser is a collection of short delays and will produce an effect similar to a simple chorus processor. Rotating the knob clockwise increases the amount that the diffuser smears the audio.

The **Lo-Cut** knob engages a high-pass filter at the diffuser's input, removing low frequencies. Turn this switch on to reduce muddy build-up or rumbling, particularly when you have the global Regen knob turned up.

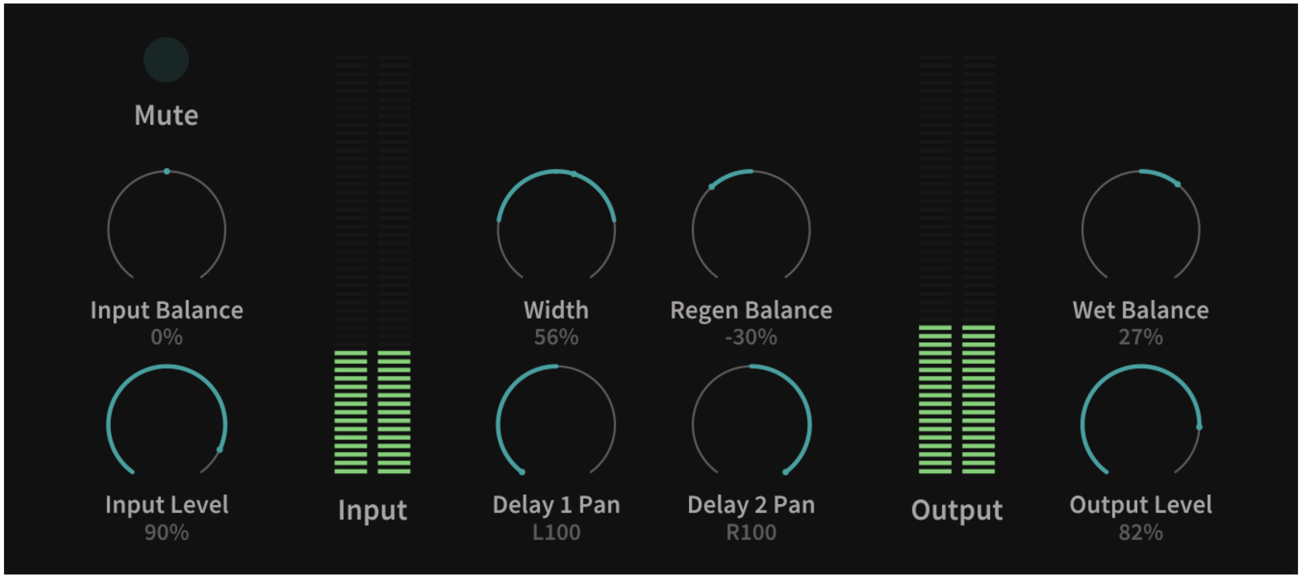
The **Mod Rate** knob sets the speed with which the filters are modulated (changed) by the diffuser's low-frequency oscillators (LFOs). As you rotate this knob clockwise the modulation rate increases. At low rates—within the first half of the knob’s rotation—the modulation is usually not noticeable and serves to prevent the diffusion network from resonating and ringing. At higher settings, particularly if the Depth knob is also turned up above 50%, you'll hear unusual modulation effects.

The **Mod Depth** knob determines how much the delays within the diffuser are modulated. If this knob is rotated fully anti-clockwise, the delays are not modulated at all, and the diffuser creates an unchanging effect that can be prone to a metallic ringing timbre. As you rotate this knob clockwise—even slightly—the LFOs vary the lengths of the delays in the diffuser, removing the ringing and imparting a smearing effect. The further you rotate this knob the more the delays are changed. You will often find that the Mod Depth, Mod Rate, and Size knobs all need to be adjusted together since their individual influences over the diffuser's sound are interdependent to some extent. For instance, you may find that decreasing the Mod Rate when you increase the Mod Depth produces a better sound.

The **Mix** knob controls the relative amounts of the original, unprocessed (dry) signal and the processed (wet) signal in the diffuser's output. Use this knob to control the overall amount of the chorusing effect. When the knob is rotated fully anti-clockwise, you'll hear only the original signal. As you rotate the knob clockwise, the amount of wet signal increases and the amount of dry signal decreases. At the center "12 o'clock" position, there is an equal amount of wet and dry signal in the output. If you rotate the knob fully clockwise, you'll hear only the processed signal. The best setting for this knob will vary widely depending on your source material, the overall sound character you're trying to achieve, and the settings of the other knobs, so try everything from just a touch to 100% wet. Also note that in most of ODC's algorithms the diffuser is placed within the feedback path for the delays, so successive repeats of delayed sounds will become more smeared out each time they pass through the diffuser.

Levels Pane

This pane contains knobs for setting input and output levels, panning, and various other gain adjustments within ODC. There are also a pair of vertical meters which display the activity of the signals entering and leaving the plugin.



Input

The controls at the left side of the pane affect the loudness of signals as they enter the plugin. From top to bottom:

The **Mute** button simply turns off the input signal, in a nice click-free manner. It's handy for killing the input signal without changing the level knobs.

The **Input Balance** knob attenuates either the left or right input signal, changing the levels of the input signals relative to each other. If it's at the center position, the signals aren't affected. Turn the knob to the left and you'll hear less of the right input signal; turn it to the right and you'll hear less of the left input signal. Setting it to either extreme silences the opposite signal.

The **Input Level** knob attenuates both input signals equally. Rotating it anti-clockwise reduces the loudness of both signals entering the delays. Note that this knob does not affect the unprocessed signal which passes through the plugin; that's what the global Mix knob is for.

The meters to the right of these controls show you the relative levels of the signals after they're altered by the controls.

Panning

The knobs in the center of the pane affect the stereo placement of the signals as they leave the plugin.

The **Width** knob reduces the apparent stereo width of the output signals by blending the left and right signals. While hard-panned, pitch-altered delays are a wondrous effect, sometimes a more subtle stereo placement is appropriate. When the Width knob is set fully clockwise, and if the Delay 1 Pan and Delay 2 Pan knobs are set to their extremes, the output channels remain independent, giving you the widest possible stereo effect. Rotate it all the way anti-clockwise and both output channels have the same signal, giving you a monophonic output.

The **Regen Balance** knob attenuates the feedback for the delay processors, as set by the Regen knob. If left at its center position, both processors will have as much feedback as shown by the Feedback knob. Rotate the Regen balance towards the left and the feedback level for Delay 1 reduces. Rotate it towards the right and Delay 2 will have less feedback. The net effect is that repeating sounds will fade out equally if the knob is at its center position and fade out more rapidly on one side or the other if the knob is rotated to that side.

The **Delay 1 Pan** and **Delay 2 Pan** knobs set the stereo placement of the two delay processors. They work in conjunction with the Width knob described above. Turning the Pan knobs left and right moves the output of the corresponding delay processor between the plugin's left and right output channels. Leave them at their left and right extremes respectively for normal stereo operation or modulate them with an LFO for moving delay effects.

Output

The knobs at the right of the pane affect the loudness of the signals as they leave the plugin. The meters marked **Output** show the relative levels of the signals after these knobs, and the panning knobs, exert their influence.

The **Wet Balance** controls the relative loudness of the signals emerging from the two delay processors. Rotating it to the left attenuates the Delay 1 processor's signal, rotating it to the right reduces the Delay 2 signal.

The **Output Level** knob simply sets the overall loudness of the output signals.

Algorithms

ODC has six different operating modes, called algorithms. Each algorithm processes audio in a different manner; only one algorithm is active at any time. They're all based on digital delay processes—that is, recording a signal in your computer's memory and playing it back later. As such, they all share the common controls like Time 1 and 2, Regen, Mix, and all of controls in the Levels pane. They also all share the diffusion processor and its controls. Their differences lie mostly in how they play back the recorded audio, for example, by playing it backwards or at a different speed.

The six algorithms are named after small cities in Arizona. With a brief description of their behavior, they are:

Desert Shores - a straightforward stereo delay with saturation and filtering

Mecca - plays the delayed signal backwards, with attention to smooth reversal

Cactus - plays the delayed signal at any speed from zero to twice normal, in either direction

Thermal - a multi-tap delay with up to 16 output taps

Mirage - a hybrid of a variable-speed delay and a multi-tap delay

Sky Valley - a granular delay

None of the algorithms attempt to exactly model any specific hardware device, but several were created after our close examination of a few of the more interesting guitar pedals and other delay processors currently on the market. We'll describe each one in detail in the following sections. We'll focus on what makes each algorithm different from the others; bear in mind that everything we've said so far about the global controls, the diffuser, and the modulation features applies to each algorithm. In some instances, we'll mention how the idiosyncrasies of a particular mode cause the global controls to operate in a different manner than usual.

Filters

All of ODC's algorithms have filters for altering the tone of the delayed signals. Depending on the algorithm, there is either a pair of knobs or a single knob for controlling the filters.

In algorithms with two knobs, the **Low Cut** and **High Cut** knobs control a pair of filters which shape the tone of the delayed signal. As its name suggests, the Low Cut knob controls a filter which removes lower frequencies. Turning it up removes frequencies less than the number shown below the knob. The High Cut knob has the opposite effect: turning it up removes frequencies higher than the number displayed beneath the knob. In general, turning up the Low Cut makes the sound thinner or brighter, while turning down the High Cut knob makes the sound duller or warmer.

A couple of the algorithms combine the filter controls into one knob labeled **Color**. If left at its center position, both filters are open, leaving the sound unaffected. Turning the Color knob clockwise removes low frequencies, making the sound brighter; turning the knob anti-clockwise removes high frequencies, making the sound darker. Under the hood the Color knob uses the same low- and high-cut filters as other algorithms, but one knob controls both.

Crossfeed

Some of ODC's algorithms have a knob labeled **Crossfeed**. The Crossfeed knob changes the path by which signals are fed from the output of the delays back to their inputs. Usually only the output of the delay is fed back to itself, i.e., the output of Delay 1 goes back to Delay 1, and the output of Delay 2 goes back to Delay 2. Turning up the Crossfeed knob sends an increasing amount of each delay's output to the other delay: some of Delay 1's output goes to Delay 2, and vice-versa. If you turn it fully clockwise, each delay line receives only the signal from the other delay. This knob works in concert with the Regen knob; the Crossfeed knob doesn't have any effect unless you turn up the Regen.

Desert Shores - Stereo

The Desert Shores algorithm provides a relatively utilitarian stereo delay. If you're familiar with other delay plugins you won't find any surprises here, although you may appreciate the seamless cross-fading and high-quality interpolation we use. We want ODC to become your go-to plugin for all delay-effect needs, so as such we needed to provide a mode for those numerous occasions in which a simple delay is all that's needed to get the job done. Of course, the modulation features and the diffuser can move Desert Shores into more exotic territory with little effort.

Turning up the **Saturation** knob imparts mild distortion on the signal passing through the delay. All hardware delays of yesteryear had at least a small amount of inherent distortion. While we may not have appreciated that at the time, once we had perfect digital delays we realized that the distortion is part of the charm of vintage units. Distorting the delayed signal helps separate it from the original signal, letting it recede into the background as it repeats and fades out.

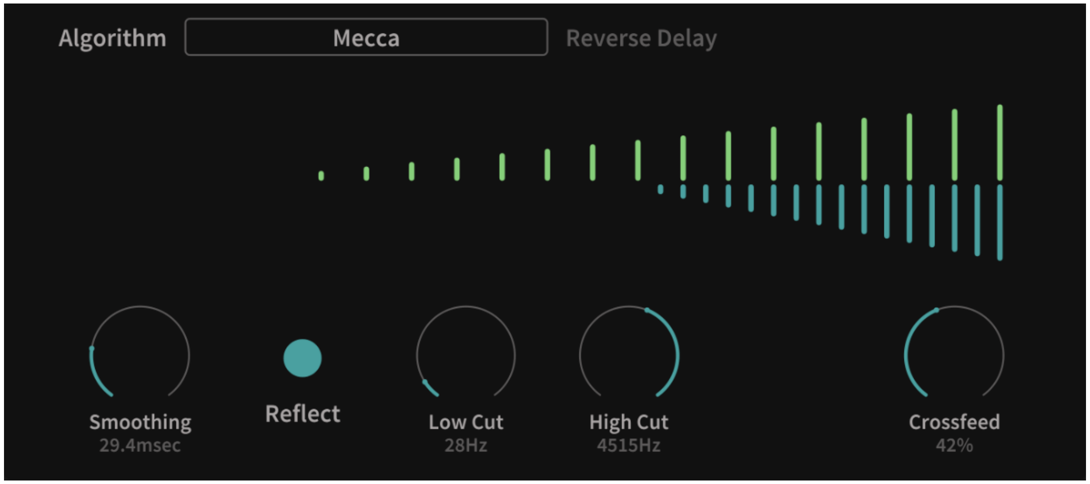
The **Spread** knob affects the time of both delay lines, offsetting the times set with the Times 1 and 2 knobs. It is a bidirectional control and has no effect when left at its center position. Rotating it to the right from center increases the time of Delay 1 while decreasing the time of Delay 2; rotating it to the left has the opposite effect. The number below the knob indicates the total amount of change of the times, relative to each other. For example, a setting of 40ms means that Delay 1's time is increased by 20ms and Delay 2's time is decreased by 20ms. This control operates in milliseconds regardless of whether the sync switches next to the Time knobs are engaged.

To get a true ping-pong effect, the incoming signal must pass through only one of the delays first before traveling to the other delay, so set the controls as follows: Crossfeed to 100%, Input Balance to either +100% or -100%, Regen Balance to 0%, Delay 1 Pan and Delay 2 Pan to opposite extremes. Note that ODC's Crossfeed and other balance controls allow you to create a variety of effects that are more complex than a simple ping-pong delay.

The Desert Shores algorithm has independent Low Cut and High Cut knobs for controlling the filters.

Mecca - Reverse

Mecca is a reverse delay effect, that is, it plays the delayed sound backwards. It's a bit of a brain-bender on the inside, but basically it works by recording one delay-length chunk of audio and playing that chunk backwards while simultaneously recording a new chunk. After the new chunk has been recorded it begins playing that chunk backwards while another new chunk is recorded, and so on. Reverse delays work particularly well with sounds with a distinct envelope, such as drums, guitar, piano, etc. They're also great on vocals, particularly if you're scoring a horror film about demonic possession. Mecca is perhaps at its best when the delays are synced to your host DAW, the synchronized reverse sounds providing rhythmic counterpoint to the original sound.



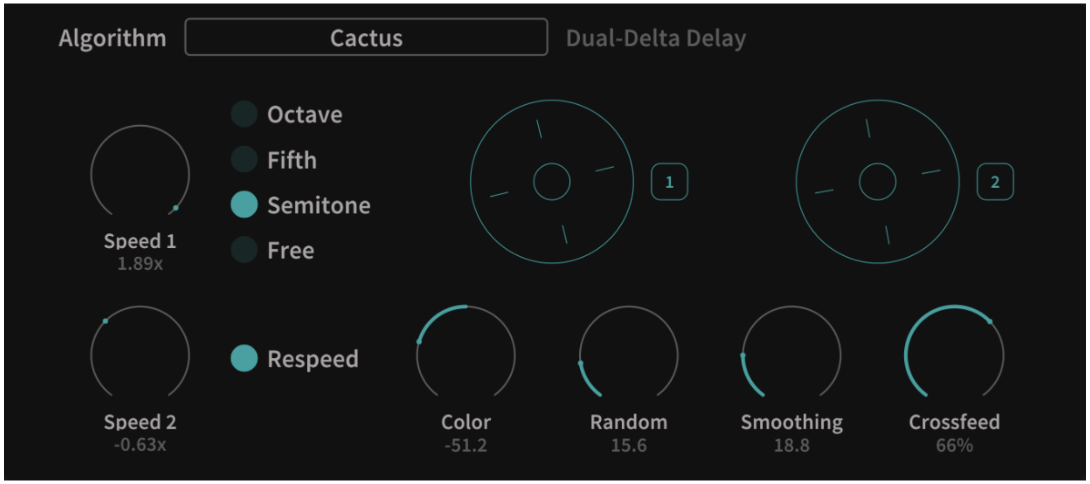
Since the delayed audio is divided into chunks by the reversed playback, discontinuities in the delayed sound are inevitable. Mecca strives to reduce these discontinuities with some clever crossfading of the beginning and ends of the reversed chunks. The **Smoothing** knob controls the length of this smoothing interval. Turning up the knob lengthens the duration of the smoothing, reducing the potential for clicks in the audio with the possible drawback of reducing transients in the sound. The knob has a range of zero to 100 msec (a tenth of a second) but use your ears to tailor the smoothing to suit your material.

The **Reflect** switch changes how audio is fed back through the delay lines. If Reflect is on, the reversed signal is used for feedback. This means that the sound appears to switch direction with each recirculation, since if you reverse a sound twice you end up playing it forwards. If Reflect is off, or if the global Loop switch is on, a separate, non-reversed signal is fed back and each repetition of the sound will play backwards,

The Mecca algorithm has independent Low Cut and High Cut knobs for controlling the filters.

Cactus - Dual-Delta

Cactus may be ODC's most idiosyncratic operating mode. Each delay operates as a variable-speed looper, playing back the recorded audio at any speed from zero to twice normal, either forwards or backwards. In this mode the Delay 1 and 2 controls set the lengths of the looping buffers. Since the variable playback speed can differ from the fixed recording speed, this algorithm doesn't produce predictable delay times. Also, because looping depends upon a buffer of predictable length, the delay times can't be modulated in this mode, and don't respond well to host parameter automation.



The **Speed 1** and **Speed 2** knobs control the playing speed for the two buffers. The number below each knob represents the speed relative to the constant recording speed. Negative values indicate backwards playing. For example, a value of 1.0x means that the audio is played normally, +2.0x means the audio is played at twice its original speed, and -0.75x means that the audio is played backwards at three quarters of its original speed. Double-clicking either knob resets it to its default setting of 1.0x.

The four selector switches to the right of the Speed 1 knob cause both speeds to jump between fixed values corresponding to musical intervals. For instance, playing audio at twice its original speed raises its pitch by one octave, so clicking the **Octave** switch restricts the speeds to powers of two, such as 2.0x, 0.5x, -0.25x (down two octaves and backwards), etc. The **Fifth** and **Semitone** switches confine the speeds to the corresponding intervals; the Fifth setting also includes octaves. Note that these speed-quantization buttons affect modulation signals also.

The **Respeed** switch changes how audio is fed back through the buffers when the global Regen knob is turned up. If Respeed is on, the variable-speed playback signal is used for feedback, so the audio will repeatedly move upwards or downwards in pitch each time it plays. If Respeed is off, or if the global Loop switch is on, an unaltered copy of the audio in the buffer is fed back and each repetition of the sound will play at the speed set by the Speed knobs.

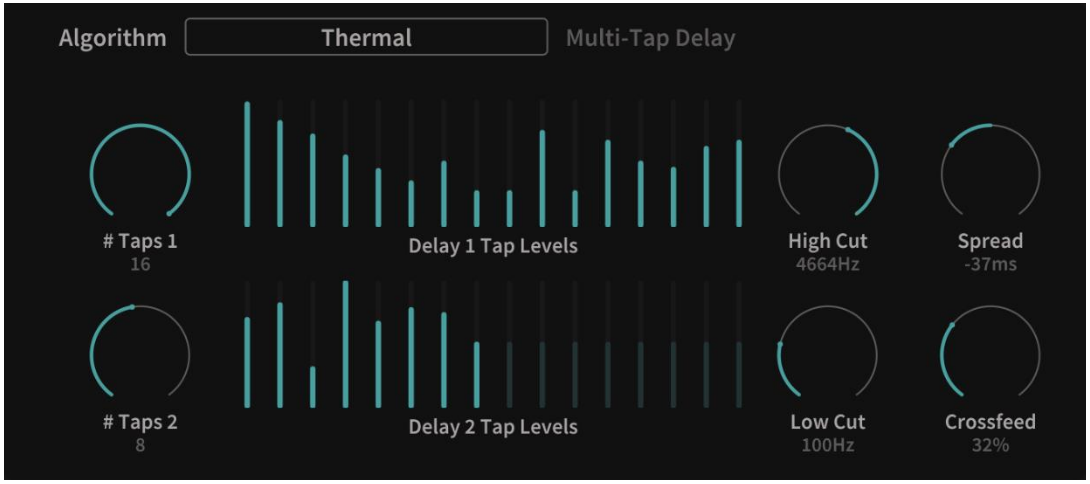
Normally the entire length of the buffer is played. If you turn up the **Random** knob, a randomly chosen fraction of the buffer is played instead, starting at a randomly chosen position. The more you turn up the knob the greater the randomness.

When the playback speed in a looper differs from the recording speed, sooner or later the position of the newly recorded signal will collide with the position of the played signal. This almost always produces some sort of discontinuity in the audio such as a small click. ODC attempts to ameliorate this inevitability with the **Smoothing** knob. Turning up the Smoothing knob applies some ramping and crossfading to the playback signal in the vicinity of the recording position. The higher the Smoothing setting the longer the ramping, which usually makes the transition less apparent. There's no theoretically perfect setting for this knob; tune it to your source material by ear.

The Cactus mode has a single Color knob for controlling the filters.

Thermal - Multi-Tap

A basic digital delay is sort of like a long tube: sound enters at one end and eventually comes out the other end. The time it takes for the sound to travel the length of the tube creates the delay. If you imagine cutting a hole in the tube halfway along its length, and listening at that hole, you'd hear the sound delayed half as long as the sound emerging from the end of the tube[3]. If you were to cut several holes in the tube at different locations, put a mic next to each, and mix the signals together, you'd get a sort of echo effect with several delayed copies of the sound. This is what a multi-tap delay does. The delayed sound is gathered from not only the end of the delay buffer, but at several intermediate locations, or taps. The signals from each tap are added together to produce a series of delayed copies of the sound.



Multi-tap delays are useful for producing rhythmic effects or simulating sound echoing from several different hard surfaces (referred to as "early reflections" in reverb processors). Thermal, ODC's multi-tap mode, provides up to 16 equally spaced taps, each with adjustable volume level.

The two knobs labeled **# Taps** set the number of active taps per delay. The taps are equally spaced along the delay, so for example a setting of 2 divides the delay into two equal-length delays, each with half of the time shown by the corresponding Time knob. A setting of 5 divides the delay into five segments, and so on. The last tap always corresponds to the end of the delay, that is, the time set by the Time knob.

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[3] If you're thinking that doing this would require a really long tube, you're quite right. Bear with us for the sake of explanation, though. That said, someone did create a commercial delay processor with a long, coiled hose with a speaker driver at one end and a microphone at the other end. Yes, really. Do an internet search for Cooper Time Cube. It’s quite a device.

The vertical sliders labeled **Delay Tap Levels** set the volumes or gains for each of the taps. There are sixteen sliders for each delay, corresponding to the maximum number of taps available for each delay. If the # Taps knob is set to fewer than 16, the same number of sliders are active (lit up) and the remaining sliders are inactive (dimmed). The rightmost active slider controls the level of the last tap. The height of each slider sets the gain for each tap; click and drag on a slider to set its level from zero to 100% or unity gain. Drag across several or all sliders to set their levels rapidly.

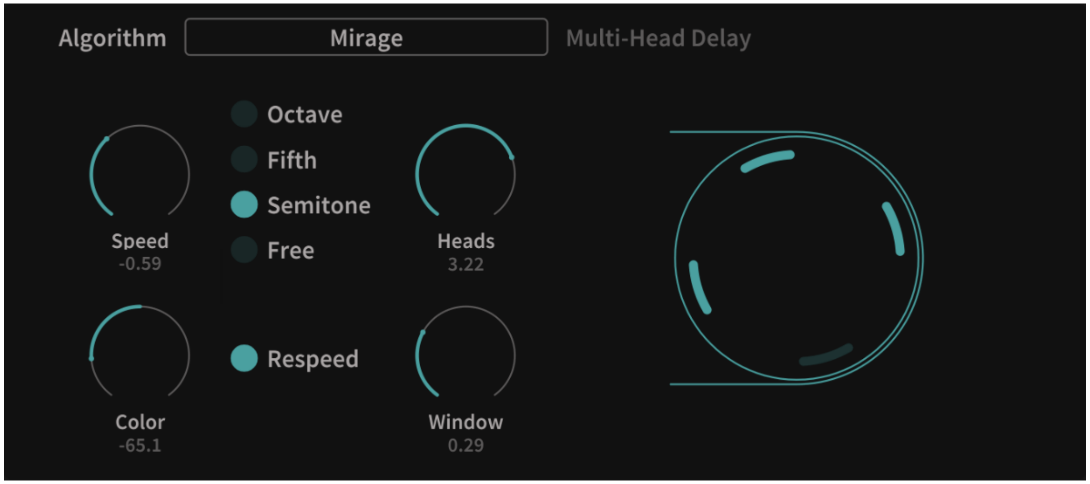
The **Spread** knob affects the time of both delay lines, offsetting the times set with the Times 1 and 2 knobs. This knob is bidirectional and has no effect when left at its center position. Rotating it to the right from center increases the time of Delay 1 while decreasing the time of Delay 2; rotating it to the left has the opposite effect. The number below the knob indicates the total amount of change of the times, relative to each other. For example, a setting of 40ms means that Delay 1's time is increased by 20ms and Delay 2's time is decreased by 20ms. This control operates in milliseconds regardless of whether the Sync switches next to the Time knobs are engaged. All of the taps are adjusted correspondingly, moving together or apart to maintain their equal division of the overall delay time.

The Regen and Crossfeed knobs work as described above in the Common Controls section, with an additional detail: only the signal from the last active tap is fed back.

The Thermal mode has independent Low Cut and High Cut knobs for controlling the filters.

Mirage - Multi-Head

ODC's Mirage mode owes its inspiration to an unusual electro-mechanical device from the previous century: the Eltro Information Rate Changer, produced by Infotronic Systems, Inc. In brief, the Eltro is a tape player that has four playback heads instead of the usual single head. The heads are mounted on a rotating cylinder. An electric motor spins the cylinder, causing the heads to move faster or slower relative to the speed of the tape moving past them. The heads are equally spaced around the cylinder, so each head plays a short segment of the tape as it rotates into and out of contact with the tape. By mixing the signals of all four heads together, the Eltro produced a (nearly) continuous playback of the audio on the tape, faster or slower than the original—or backwards if the cylinder spun in the opposite direction. Coupled with a tape deck that could play at any speed, the Eltro was capable of playing audio faster or slower than the original without changing its pitch, or changing its pitch without changing its speed. Nowadays we take this sort of manipulation of audio for granted, but in 1967 digital audio processing was not yet possible and the Eltro was a technological marvel. There is an excellent description of it at this website: http://www.wendycarlos.com/other/Eltro-1967/index.html



Note that the description "multi-head" refers to the four rotating heads in the Eltro, a system different than tape echo devices (e.g. the Maestro Echoplex) which used several stationary playback heads. ODC's Thermal mode produces an effect similar to those devices.

Since all contemporary DAWs provide their own tools for pitch/time manipulation, we didn't attempt to clone the Eltro. Instead, Mirage is a sort of hybrid of a looper and a delay with features inspired by the Eltro. The Delay Time knobs set the size of circular buffers in which the incoming audio is continuously recorded. One to four equally spaced "heads" move around this buffer, playing the recorded audio. You can change the speed and direction of the motion of the heads, thus changing the speed, pitch, and direction of the audio. The heads are aligned such that the first head is opposite the recording position. This means that the apparent delay time between recording and playback is *half* that of the Delay Time setting. Of course, if the speed is set to something other than 1.0, the apparent delay time changes continuously because the distance between the recording and playback locations changes continuously.

Because of the unusual configuration of this algorithm, the Delay Times are not available as modulation targets and don't respond well to parameter automation.

The **Speed** knob changes the speed and direction at which the playback heads move. It has a range of -2 to +2. The default setting of 1.0 plays the audio at the same rate and direction as it was recorded. Speeds greater than one play it faster, speeds less than one play it slower. Negative values play it backwards.

The four selector switches to the right of the Speed knob cause the speed to jump between fixed values corresponding to musical intervals. For instance, playing audio at twice its original speed raises its pitch by one octave, so clicking the **Octave** switch restricts the speeds to powers of two, such as 2.0x, 0.5x, -0.25x (down two octaves and backwards), etc. The **Fifth** and **Semitone** switches confine the speeds to the corresponding intervals; the Fifth setting also includes octaves.

Note that these speed-quantization buttons affect modulation signals also.

The **Respeed** switch changes how audio is fed back through the buffers when the global Regen knob is turned up. If Respeed is on, the variable-speed playback signal is used for feedback, so the audio will repeatedly move upwards or downwards in pitch each time it plays. If Respeed is off, or if the global Loop switch is on, an unaltered copy of the audio in the buffer is fed back and each repetition of the sound will play at the speed set by the Speed knobs.

The **Heads** knob adjusts the levels of the signals from the four playback heads. You can think of it as a rotary switch which turns on from one to four of the heads as you rotate it. The original hardware had no such control at all; all four heads always had full gain but only two heads came into contact with the tape at a time, creating a crossfade as one head moved away from the tape as another approached it. While developing this mode we realized that providing control over the simulated heads added quite a bit of flexibility, creating a sort of variable-speed multi-tap looping delay.

The first head is always on, since a plugin which doesn't make any sound just isn't very useful. Rotating the knob through the values up through four turns on the corresponding number of heads. You'll notice, though, that the number displayed beneath the knob shows fractional values, for example, 3.14. Intermediate values like this control the gain of the next head. Following that same example of 3.14, heads one through three will be fully on and have unity gain, while the fourth head will be turned up only 14%.

As a further nod of the head(s) to the Eltro, the level of each head is affected by its distance to the recording position within the circular buffer. Since the playback heads can move at a speed different than that of the recording position, sooner or later the playback position(s) and the recording position will collide. Normally this would create a click in the audio. To avoid this, we reduce the level of a head's signal as it moves closer to the recording position, reducing it all the way to zero (silence) when the two meet. This both gets around the click-inducing collision problem and adds to this mode's quirky personality. If only one head is turned on, and if the speed is other than 1.0, you'll occasionally hear the signal disappear altogether when the recording and playback positions coincide. So, just like the Eltro, using two or more heads means that you'll always hear something.

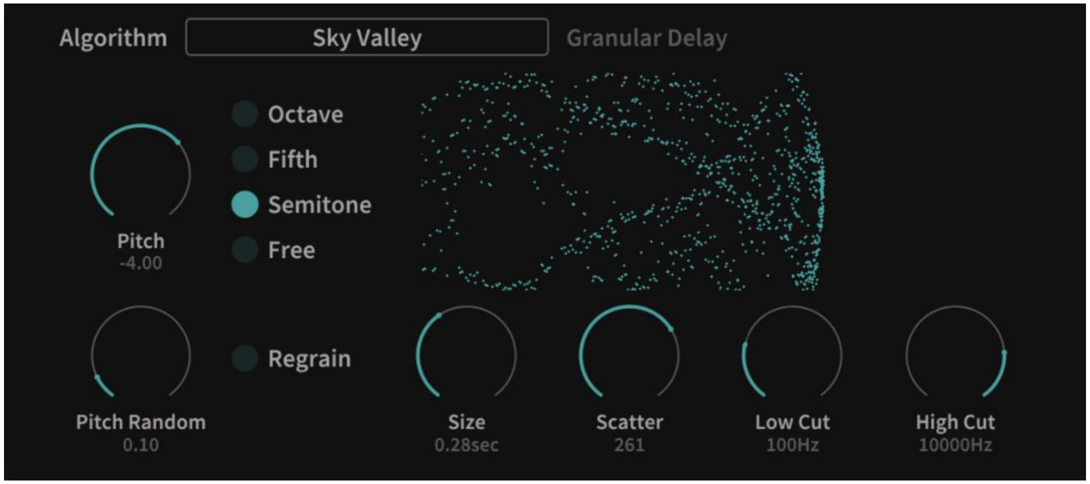
The **Window** knob also affects the gain of the signals produced by the playback heads. If you picture the Eltro's heads spinning away, moving away from and closer to the tape in turn, you'll realize that the signal from each head doesn't simply switch off and on. There must be a little bit of a ramp created by the distance between the head and the tape. Unfortunately, we don't have access to an actual Eltro, so we can only guess at the shape of this ramp. The Window knob imparts a ramped shape to the gain of the heads as they rotate around the delay buffer, based on their distance to the recording position as described previously. At its minimum setting, the Window knob produces a simple linear ramp equivalent to that distance: if the playback and recording positions coincide, the gain is zero. If the playback position is halfway around the circular buffer relative to the recording position, that head has full gain. The result is a simple triangular ramp. Turning up the Window knob makes the sides of the triangle steeper but clips the gain at a maximum value of unity, producing a trapezoidal gain.

A low Window setting produces a relatively quiet signal because most of the buffer is played with a gain of less than 100%. Turning up the Window increases the overall level of the signal because an increasing amount of the buffer is played with full gain. At the maximum setting, only a small dropout occurs when the playback and record positions align. The Window knob affects all the levels from the heads equally, so turning up the Window increases the overlaps of the signals from the heads and hence the overall volume of the signal emerging from the delays.

The Mirage algorithm has a single Color knob for controlling the filters.

Sky Valley - Granular

Last on our tour of desert cities is Sky Valley, ODC's granular delay mode. "Granular delay" means different things to different people, but it's fair to say that a granular delay must be a delay effect which is somehow related to granular synthesis. Granular synthesis is based on the notion of playing back a previously recorded sample by dividing it up into short segments called grains. These grains are played separately or layered together, and played at different pitches, volumes, with different shapes, and so on. If we replace that previously recorded sample with a delay buffer which is continuously recording audio, we have what we might call a granular delay. Instead of simply playing a delayed copy of the input signal, we can play the delayed signal at a different pitch, or break it apart and play pieces of it scattered in pitch, time or both.



ODC's granular delay provides one set of controls for both delay lines. The delay times, regeneration, and other global controls operate as usual, but the following parameters affect the granular processes for both delays.

The **Pitch** knob varies the perceived pitch of the grains by changing the speed at which each grain plays. The number below the knob presents the change in pitch in semitones, and has a range of -36 to +12. At its default setting of zero, the grains play at normal speed, playing the delayed signal at its usual pitch. Positive values raise the pitch, negative values lower it. In musical terms, this knob transposes the grains with a range of three octaves lower to one octave higher.

The four selector switches to the right of the Pitch knob constrain the knob to musical intervals. The bottom setting of Free leaves the Pitch knob unconstrained, so you can tune it by ear. At the risk of stating the obvious the **Semitone** and **Octave** setting cause the pitch to change by semitones and octaves respectively. The **Fifth** setting is slightly less obvious: it constrains the pitch to fifths and octaves. Note that these pitch-quantization buttons affect modulation signals also.

The **Pitch Random** knob causes random variations in pitch in each grain. Small amounts of randomization can produce blurring or chorusing effects; large amounts break the grains apart, creating detuned clouds of sound. The Pitch Random function is not affected by the pitch-quantization switches.

Turning on the **Regrain** switch routes the granulated sound back into the delay lines when the Regen knob is turned up. As the signal recirculates through the delay, the granular processor repeatedly breaks it apart, changing its pitch and/or shape. If the Regrain switch is off, the feedback signal returns to the delay without alteration, so successive repeats are affected only once by the granular processor.

The **Size** knob sets the duration of the grains. Traditionally, granular synthesis techniques use fairly short grains, in the range of around 1-50 msec. To provide a broad range of effects, ODC's grain size can be as long as one second. Adjusting the grain size can produce smoother pitch-shifting effects with different source material, but mostly the Size knob is present to create a more or less "grainy" sound.

Turning up the **Scatter** knob imparts random delays to the onset of the grains. This separates the grains from one another, breaking apart the original audio signal. The more you turn up (or modulate) the Pitch Random and Scatter knobs, the less the delayed signal will resemble the original.

The Sky Valley algorithm has independent Low Cut and High Cut knobs for controlling the filters.

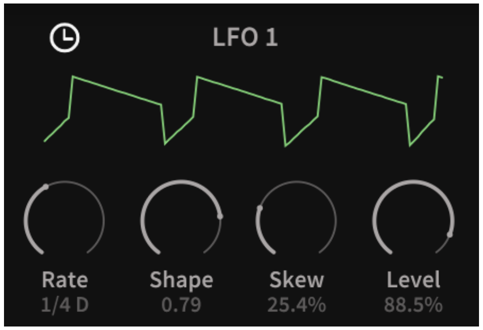
Modulation

ODC has several sources of modulation—that is, signals which can change the values of ODC's parameters. If you're familiar with synthesizers either hard or soft, or some other effects plugins such as our Discord pitch manipulator, you'll recognize ODC's modulators.

LFO 1, 2

ODC has a pair of low-frequency oscillators, or LFOs, which generate repeating signals. The two LFOs are identical but operate independently.

The **Rate** knob controls determine how fast the output of the LFO varies over time. They operate either in units of frequency (Hertz, or cycles per second), or in metrical units. The LFO's rate can be set from one cycle every 100 seconds (or 0.01 cycles per second, abbreviated 0.01 Hz) to 14 cycles every second (14 Hz). If you click the sync switch—the clock-shaped icon to the left of the LFO's title—the Rate control operates in metrical units, or fractions of a measure. When the sync switch is engaged, the LFO synchronizes to your host DAW's tempo and transport position. The Rate knob then sets the LFO's cyclic speed in rhythmic units, ranging from 2/1 or one cycle every two measures to 1/32 or 32 cycles per measure. A "D" in the displayed value means a dotted-note length, while a "T" represents a triplet length.



The shape of the LFO's output is controlled with the **Shape** and **Skew** knobs. The Shape knob adjusts the basic shape of the signal, morphing it smoothly through three standard shapes: a sine wave, a triangle wave, and a square wave.

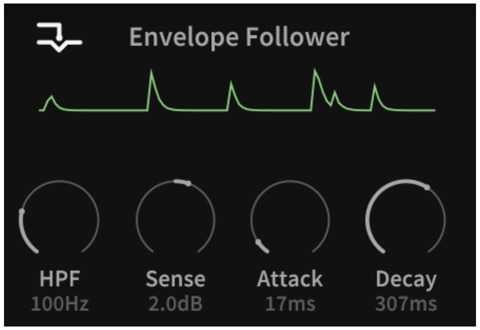
The Skew knob adjusts the horizontal symmetry of the wave, and has a different effect depending on the wave's initial shape. For example, if the Shape knob is set to produce a triangle wave, the Skew knob varies the wave from a downward-sloping ramp to a rising ramp. If the Shape is set to a square wave, the Skew knob varies the duty cycle of the wave. Skewing the sine wave bends it into a sort of curved ramp wave, either rising or falling depending on which direction you skew it.

Finally, the **Level** knob sets the amplitude or size of the LFO's output. The higher the level, the more the LFO changes all the parameters it is modulating. You can also change the LFO's influence on the parameters individually, which we'll get to when we talk about modulation routing in the next section.

A moving graph above the knobs shows you the combined effects of the Rate, Shape, Skew and Level knobs.

Envelope Follower

The Envelope Follower generates a signal by measuring the loudness or amplitude of signals arriving at ODC's inputs. The resulting signal can be used, among other things, to recreate the "dynamic" or ducked delay effect made famous by a particular hardware delay processor produced by a Danish company late in the previous century. In a ducked delay, the level of the delayed signal is reduced ("ducked") as the input signal becomes louder, and then increased in the absence of the input signal, such that the delayed signal doesn't obscure the original signal.



The graphical sidechain switch changes the input signal routing for the envelope follower. If this switch is turned off, the envelope follower receives the main audio input for the plugin. Stereo signals are summed to mono since the envelope follower emits a monophonic modulation signal. If the switch is on, the envelope follower receives signals from the sidechain audio input, which presumably originates in a different track in your DAW. Each host has its own way of setting up sidechain connections, so you'll have to refer to your host's manual if you haven't done this before. In general, you'll probably need to both turn on the sidechain input for ODC using its own switch, then enable a sidechain input for ODC with a switch provided by the DAW, then choose the source of the sidechain signal with a popup menu also provided by your DAW.

The **HPF** knob controls the operating frequency of a high-pass filter applied to the envelope follower's input signal. Turning the knob up increases the cutoff frequency of the filter, removing more low frequencies from the signal. Adjusting this filter can make the envelope follower more responsive to transient signals by removing low-frequency rumble from the input.

The **Sense** knob simply boosts or attenuates the level of the input signal. Turn it clockwise to raise the signal level, anti-clockwise to lower it.

The **Attack** knob governs how quickly the envelope follower responds to rising input signals. At its minimum setting of zero, the envelope follower modulation signal increases just as quickly (or slowly) as the input signal increases. Turning the knob up slows down the envelope follower, which can make it less twitchy when responding to individual notes or create slowly swelling effects.

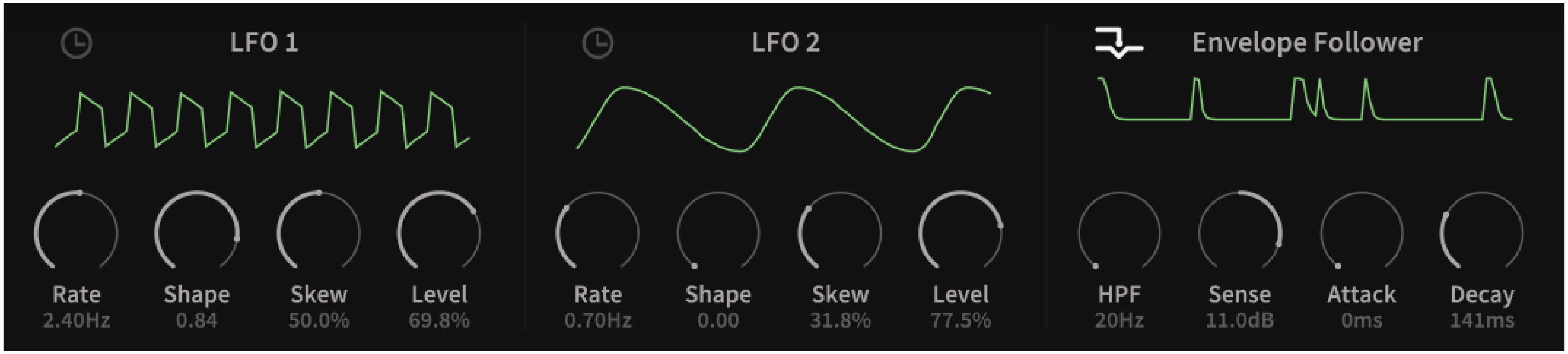
Similarly, the **Decay** knob controls how quickly the envelope modulation signal returns to zero when the input signal falls. Turning it up slows down the response, making the modulation signal smoother.

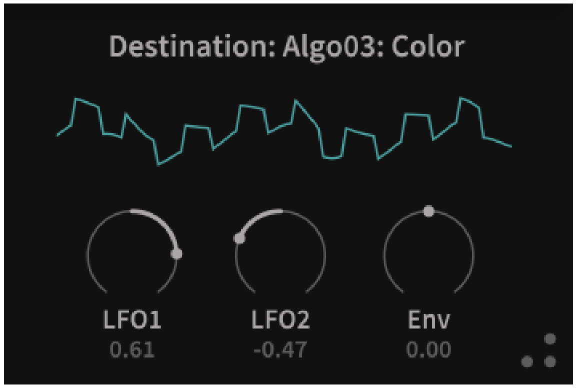
A moving graph above the knobs shows the envelope follower's output and can be particularly useful for seeing how the Attack and Decay knobs adjust its response.

Modulation Routing

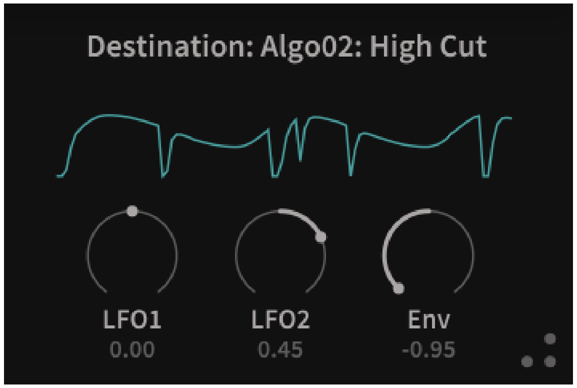
ODC's modulation routing uses a simple system devoid of the clutter of simulated patch cords. Whenever you click on (almost) any of the global, algorithm-specific, or diffuser knobs, the pane at the lower right corner changes its title to match the control you clicked. The three knobs labeled **LFO1**, **LFO2**, and **Env** control how much each of the three modulation sources affect that parameter. The knobs are bidirectional; at their default, center position there is no modulation connection between the source and destination. Turning a knob clockwise means that the associated modulator increases the target parameter; turning it anti-clockwise causes the modulator to decrease the target parameter. If you adjust more than one of these knobs for a given target, the modulation signals are added together before arriving at the target. The moving line shows this modulation signal. Also, an animated arc on the perimeter of the parameter's knob shows you the range over which the modulation is altering the parameter. As with all other knobs, double-clicking a modulation knob returns it to its default position, removing the modulation connection.

Here are a couple of examples of modulation routings, given these settings of the modulation sources:





LFO1 and LFO2 modulating Color, with opposite polarities



LFO2 and the envelope follower modulating the High Cut filter, with the envelope follower inverted

Presets

Other Desert Cities includes a number of presets to serve as a demonstration of its capabilities and inspirations for your own creations. To access the presets, click the name of the current preset at the top of the window to open the preset browser. Click the name again to dismiss the preset browser.

The browser displays presets within two lists of folders. The leftmost list shows the folders within ODC's preset collection, grouped in two categories: Factory and User. Clicking any of these folders reveals its contents in the next list. These folders can contain sub-folders of their own; clicking any of these displays their contents—the presets—in the rightmost list. Clicking on a preset name loads the settings into Other Desert Cities. Double-clicking a preset name loads the preset and dismisses the preset browser.

After clicking on any of the lists, you can move up and down in the list with the corresponding arrow keys on your keyboard. You can also go through all the presets in all the folders by clicking the left and right pointers on either side of the preset name at the top center of ODC's window.

Loading a preset irretrievably erases ODC’s current settings, so if you have created a sound that you want to use again, save it as a new preset before loading another preset. To save your own presets, click the **Save Preset** button at the right edge of the window. Other Desert Cities will prompt you to enter a name for the preset with a standard system file dialog box.

The folders and presets in the browser correspond to folders and files within ODC’s own folder on your storage device (i.e. your computer’s hard drive or SSD). This folder is located at `C:\ProgramData\Audio Damage\ODC\` on Windows, and `~/Music/Audio Damage/ODC/` on macOS. Theoretically you can save your presets anywhere you like, but for them to show up in ODC’s User list they must be placed in the User folder within ODC’s folder. Also, to avoid possible collisions during future updates, do not store your presets within the Factory folder.

Any folders you create within the User folder will show up as folders in the User list. You can create sub-folders within the User folder, but not folders within those sub-folders.

You can delete presets and folders from the lists by clicking their name and then clicking the **Delete Preset** or **Delete Folder** button. Other Desert Cities will give you a chance to confirm this action or cancel it. If you confirm, the preset/folder will be removed from your storage system and is gone for good.

Default Preset

If you save a preset with the special name “Default” in the User folder, new instances of ODC will load it automatically when you add it to your DAW session. You can use a default preset file to give you the same starting point with ODC, maybe in a particular mode and with delay times that you find yourself using on every new song in your current project.

Importing and Exporting Presets

Preset files are plain-text XML files so that you can exchange them online in forums, copy them between a Windows computer and a Macintosh, email them to your friends, etc.

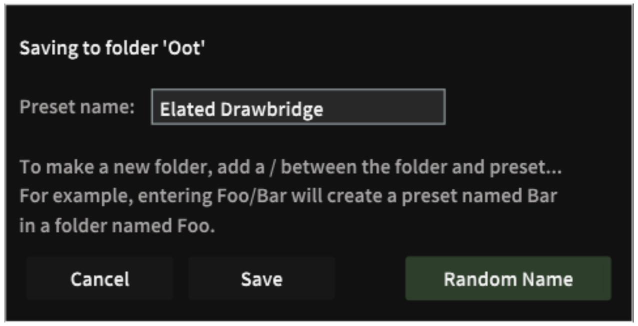
The **Copy To Clipboard** and **Paste From Clipboard** buttons copy ODC’s current settings to the system clipboard and paste settings from the clipboard. You can use the copy and paste commands to transfer settings between two instances of ODC or paste the settings into an email message or text editor. When copied to the clipboard, presets are presented in the same XML text as used in preset files.

The **Import Preset / Zip** button provides a way to add presets to Other Desert Cities without manually moving them into the appropriate folders in your file system. Clicking this button produces a file-browser window wherein you can select either a single preset file or a .zip file containing one or more presets. After you select the file, Other Desert Cities copies the preset(s) into whichever folder you have selected in ODC’s preset list, unzipping the file first if necessary.

Depending on whether you’ve selected a preset or Folder, the **Export Single Preset** or **Export Folder As Zip** button performs the complementary functions of the **Import** button. First select either a preset or a folder in ODC’s list, then click the export button. A file-save window appears; choose a location in your file system, give the file a name, and click Save. If you have chosen a folder in Other Desert Cities’s preset list, the plugin places it and all of the presets it contains in a .zip file.

Save Options

Clicking the Save Preset button invokes a dialog box with a couple of helpful features. As the text therein describes, you can create a folder within the destination folder (whose name is given at the top of the dialog box) by adding the folder's name to the beginning of the preset's name, separate by a slash mark. Bear in mind that the User folder accommodates only one level of sub-folders: you can create folders inside the User folder, but not folders within those folders.



Clicking the **Random Name** button replaces the preset's name with a pair of words chosen at random from two lists. While the resulting names won't have any connection with what the plugin is doing, you may find this button useful for coming up with alternatives to routine names like "My Nice Delay 17".

Automation

Most of ODC's controls can be automated using your host's automation features. Consult your host's documentation for information on how to use its automation features. Not all of ODC's parameters respond well to automation; for instance, changing the Time parameters of Cactus or Mirage is likely to produce artifacts which you're unlikely to think of as musically useful.

And Finally...

Thank you for purchasing Other Desert Cities. We make every effort to ensure your satisfaction with our products and want you to be happy with your purchase. Please write to support@audiodamage.com if you have any questions or comments.