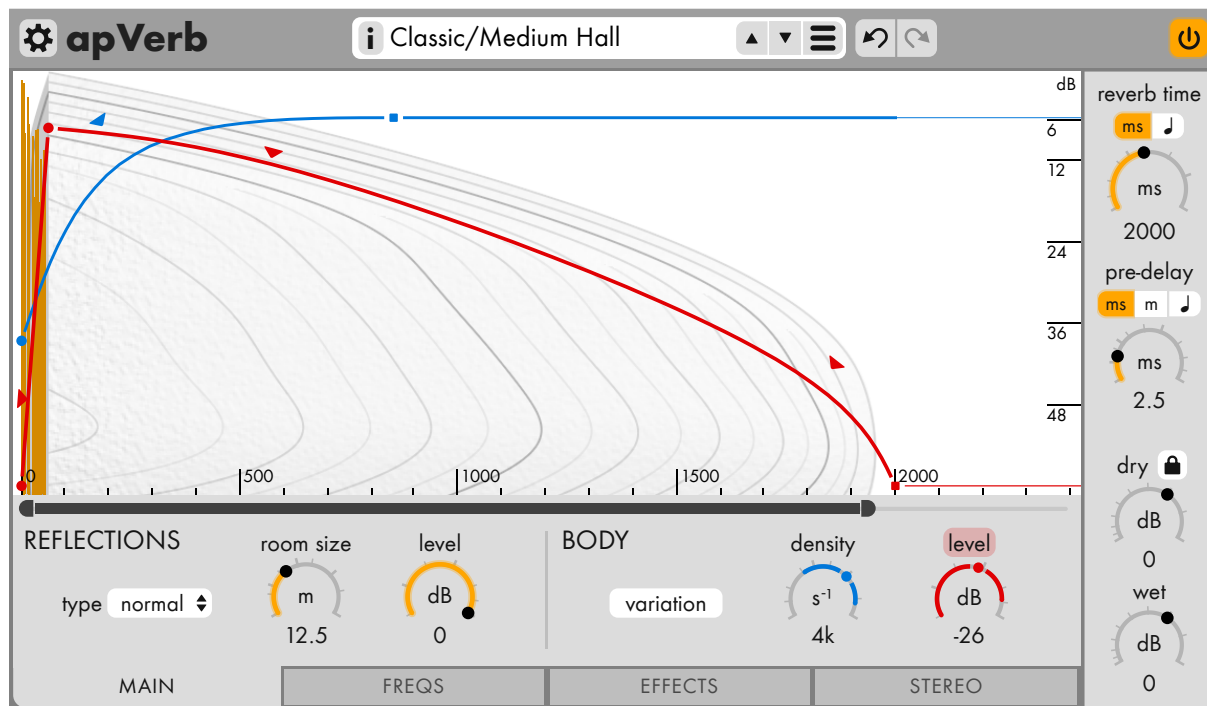


# apulSoft apVerb v1.0.1 Manual

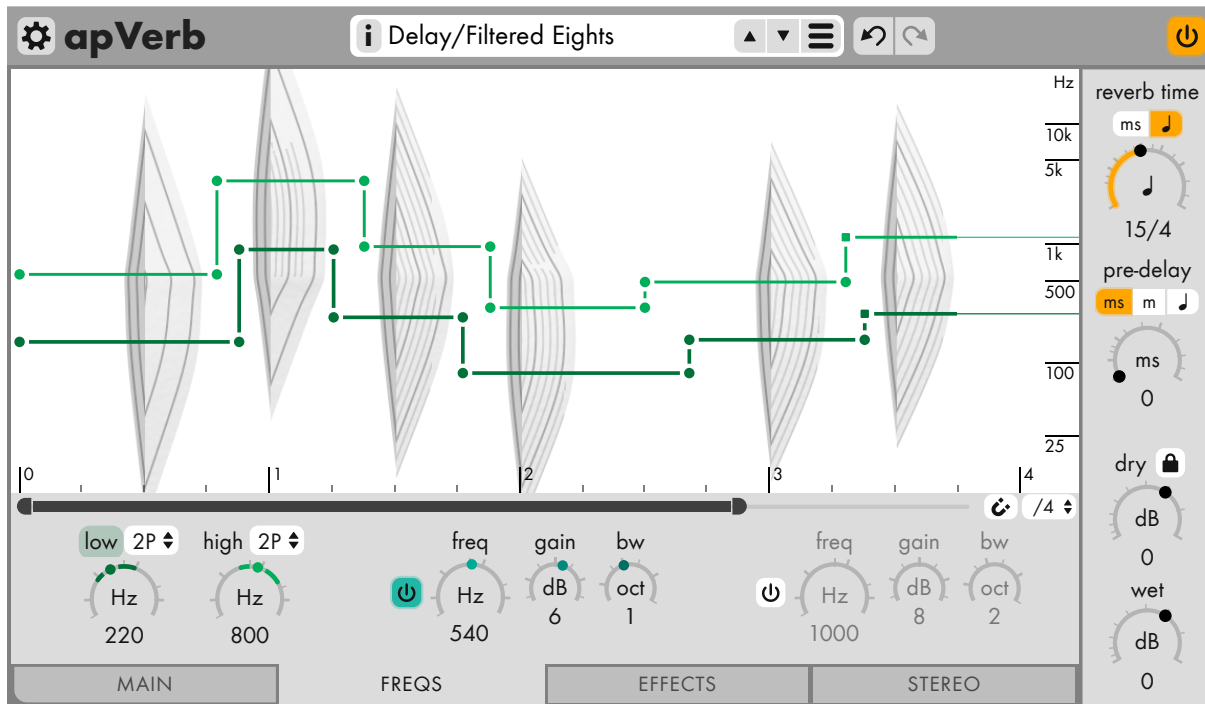
super smooth & flexible algorithmic reverb audio plugin  
(AU/AAX/VST3/VST)



© 2023 apulSoft  
<http://www.apulsoft.ch>

VST plugin technology by Steinberg.  
AU plugin Technology by Apple.  
AAX plugin Technology by Avid.  
Manual written with  $\LaTeX$  on June 27, 2023

## Introduction



apVerb is an audio plugin designed to create algorithmic reverbs with exceptional smoothness and flexibility. The plugin generates reverb from thousands of semi-randomly spaced delay lines - inspired by a recently invented form of noise called velvet noise. The carefully spaced delays offer resonance-free reverb tails that can surpass the smoothness and flexibility of traditional reverb algorithms. The delay lines are processed by filters and effects to achieve all kinds of reverbs and delay-like effects.

apVerb provides full control of many reverb parameters over time, thanks to its 20 curve-based multi-segment envelopes. Besides traditional reverb types, this enables the creation of reverse reverbs, reverb losing density over time, increasing frequency bandwidth over time, and more. Moreover, apVerb can sync envelope times to the host tempo, making it possible to create rhythmical reverbs and effects.

apVerb offers positional audio by simulating early reflections in virtual room geometries. Users can add chorus, phase distortion, and saturation effects to the reverb.

## Contents

|   |           |
|---|-----------|
| <b>1 End User License Agreement</b>                 | <b>4</b>  |
| <b>2 System Requirements</b>                        | <b>5</b>  |
| <b>3 Installation</b>                               | <b>5</b>  |
| <b>4 User Interface</b>                             | <b>6</b>  |
| 4.1 Title/Top Bar . . . . .                         | 6         |
| 4.1.1 Preset Section/Undo/Redo . . . . .            | 6         |
| 4.2 Bottom Tab Buttons . . . . .                    | 7         |
| 4.3 Spectrogram . . . . .                           | 7         |
| 4.4 Envelope Editing . . . . .                      | 9         |
| 4.5 Right Side: Time & Mixer . . . . .              | 10        |
| 4.6 Main (Reflections & Body) Tab . . . . .         | 11        |
| 4.6.1 Reflections . . . . .                         | 11        |
| 4.6.2 Body . . . . .                                | 11        |
| 4.7 Freqs Tab . . . . .                             | 12        |
| 4.8 Effects Tab . . . . .                           | 13        |
| 4.8.1 Chorus . . . . .                              | 13        |
| 4.8.2 Phase Distortion . . . . .                    | 13        |
| 4.8.3 Saturation . . . . .                          | 13        |
| 4.8.4 Effects Crossover Filter . . . . .            | 13        |
| 4.9 Stereo Tab . . . . .                            | 14        |
| 4.10 Plugin Settings & Information Dialog . . . . . | 14        |
| <b>5 Signal Flow</b>                                | <b>16</b> |
| <b>6 Unlocking the Full Version of apVerb</b>       | <b>17</b> |
| <b>7 Frequently Asked Questions (FAQ)</b>           | <b>18</b> |
| <b>8 Changelog</b>                                  | <b>19</b> |

# 1 End User License Agreement

END-USER LICENSE AGREEMENT FOR apulSoft apVerb

This apulSoft End-User License Agreement ("EULA") is a legal agreement between you (either an individual or a single entity) and apulSoft for the software accompanying this EULA, which includes computer software and electronic documentation ("SOFTWARE PRODUCT" or "SOFTWARE"). By exercising your rights to make and use copies of the SOFTWARE PRODUCT, you agree to be bound by the terms of this EULA. If you do not agree to the terms of this EULA, you may not use the SOFTWARE PRODUCT.

## DISCLAIMER OF WARRANTY

This product is provided on an "AS IS" basis, without warranty of any kind, expressed or implied, including any warranties of fitness for a particular purpose. The authors shall not be liable for damages of any kind. Use of this software indicates you agree to this.

## SOFTWARE PRODUCT LICENSE

The SOFTWARE PRODUCT is protected by copyright laws and international copyright treaties, as well as other intellectual property laws and treaties. The SOFTWARE PRODUCT is licensed, not sold.

## GRANT OF LICENSE

Installation and Use: You may install and use copies of the SOFTWARE PRODUCT on all computers you own. Reproduction and Distribution: You may not reproduce or distribute the SOFTWARE PRODUCT except to make backup copies, or to install as provided for above.

## DESCRIPTION OF OTHER RIGHTS AND LIMITATIONS

Limitations on Reverse Engineering, Decompilation and Disassembly: You may not reverse engineer, decompile, or disassemble this SOFTWARE PRODUCT. Software Transfer: You may permanently transfer all of your rights under this EULA, provided you retain no copies, you transfer all of the SOFTWARE PRODUCT, and the recipient agrees to the terms of this EULA. Termination: Without prejudice to any other rights, apulSoft may terminate this EULA if you fail to comply with the terms and conditions of this EULA. In such event, you must destroy all copies of the SOFTWARE PRODUCT and all of its component parts.

## COPYRIGHT

All title and copyrights in and to the SOFTWARE PRODUCT (including any images and text incorporated into the SOFTWARE PRODUCT), the accompanying printed materials, and any copies of the SOFTWARE PRODUCT are owned by apulSoft or its suppliers.

## 2 System Requirements

- macOS
  - macOS 10.11 or newer on an Intel or Apple Silicon CPU (64-bit only).
  - A host application that can load VST, VST3, AU or AAX plugins running in 64-bit mode.
  - Pro Tools (AAX): The minimum required Pro Tools version is 11.0.
- Windows
  - Windows Vista or newer. Both 32-bit and 64-bit versions of Windows are supported.
  - A CPU that supports AVX instructions.
  - A host application that can load VST, VST3 or AAX plugins running in 32-bit or 64-bit mode.
  - Pro Tools (AAX): The minimum required Pro Tools version is 10.3.5.
  - An application to view pdf files to read this manual.

## 3 Installation

- macOS
  - Quit all plugin host applications.
  - Double-click **apverb-mac(..).pkg**.
  - Follow the OSX installation procedure.
  - Open a host and create an instance of apVerb in a plugin slot.
  - The apVerb GUI shows a welcome screen with the options to run the plugin in demo mode after 5 seconds of delay, to buy a license online or to enter a serial number to unlock the full feature-set.
- Windows
  - Quit all plugin host applications.
  - Double-click the **apverb-installer-win(..).exe** to start the installation. On newer versions of Windows, it may be necessary to confirm the launch because of user access management.
  - Follow the installation procedure. During the install, you have the option to set the path to the apVerb data folder, where settings, presets and the manual are installed into.
  - If VST2 versions are installed, the installer provides the option to select destination folders for VST2 plugins for both 32-bit and 64-bit.
  - Open a host and create an instance of apVerb in a plugin slot.
  - The apVerb GUI shows a welcome screen with the options to run the plugin in demo mode after 5 seconds of delay, to buy a license online or to enter a serial number to unlock the full feature-set.

## 4 User Interface

Most of the controls have **tooltips** that get displayed after hovering over them with the mouse for a while (if the tooltips preferences setting is enabled). If the function of a control is unclear, use tooltips.

Many controls on the user interface can be dragged with the mouse to change values.

- If the **Shift** key is held down, values snap to predefined markers at round values during dragging.
- Holding **Ctrl** switches dragging to be scaled by 1/20 for fine adjustments.
- Double-clicking most of the value-based controls opens a popup editor to enter a new value with the keyboard.

### 4.1 Title/Top Bar

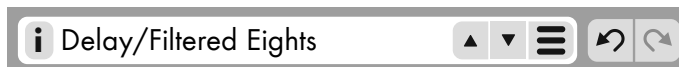


Click the **gear button** on the left or the plugin title to open the preferences/information dialog.

On the top right corner, the **enable processing** button allows to bypass audio processing. Modern hosts supporting AU/AAX or VST3 plugin formats hook this up to their plugin bypassing system.

Before the full features of apVerb are enabled by entering a serial, the **→full version** button is displayed to the left of the enable button. It opens a dialog with options to buy an apVerb license online, to enter the purchased serial number or to keep running in demo mode.

#### 4.1.1 Preset Section/Undo/Redo



The white box shows the name and path of the current preset. It can be clicked to edit the name. The "i" button on the left opens the preset description popup that can also be used to edit the description.

On the right side are up/down arrow buttons to cycle through presets inside the same folder as the currently loaded one. The rightmost button opens the preset menu. It lists all available presets with folders as they are organized on disk. Below the presets the following entries are available:

**save current preset..** The current state of the plugin is added to the preset menu. In the prompt that pops up, the preset name can be edited and folder paths can be added which automatically creates folders on disk if necessary. Presets in the menu can be overwritten by using the same name/path.

**import preset..** Load a preset from a .avrbpreset file.

**export current preset..** Store the current state of the plugin as a .avrbpreset file to any location.

**manage preset folder in finder/explorer..** This opens the filesystem folder that contains the presets shown in the menu. Normal file operations can be used to restructure this folder and the preset menu adjust accordingly.

To the right of the white preset box are the **Undo** and the **Redo** buttons. apVerb supports an unlimited number of undo steps.

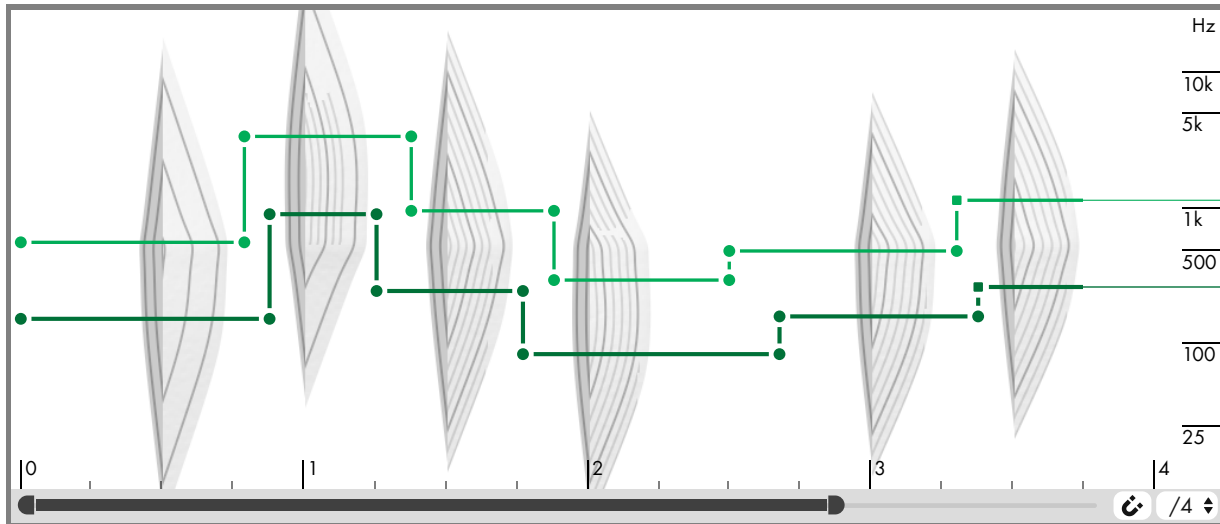
**Note:** Saving and importing preset files is only available in the full version of apVerb.

## 4.2 Bottom Tab Buttons



The large buttons at the bottom switch between the display modes of the left part of the apVerb interface. The selected tab determines which envelopes are displayed on top of the graphical display and which knobs/parameters are shown on the bottom part. Switching the active tab does not alter audio processing in any way.

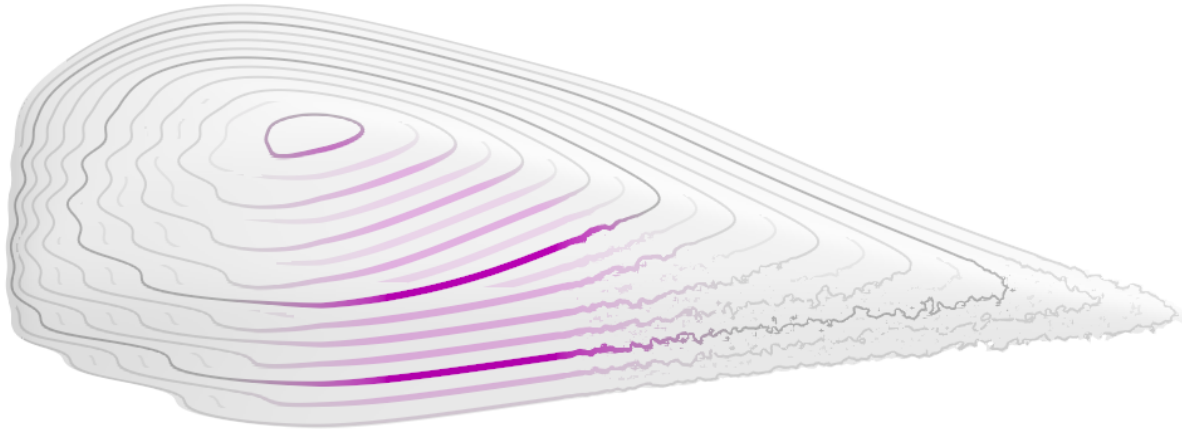
## 4.3 Spectrogram



The spectrogram displays a model of the reverb defined by the envelopes and is not affected by tab selection at the bottom. The reverb model is displayed as an isoline graph with time going from left to right and logarithmical frequency from bottom to top. The curved lines are isolines of equal decibel volume. Thick lines are drawn for 0dB, -24dB and -48dB, thin lines every 6dB or 3dB depending on the amount of change. This works like (and is inspired by) contour lines on a topographic map.

The fill between the lines is slightly shaded to show ridges and valleys and is noise-modulated depending

on the density value over time. A high **density** displays as “smooth hills” while low densities lead to “rough terrain”.



Spectrogram with (left to right) chorus, saturation and phase distortion effects

The **effects** section is displayed using graphical effects on the isolines. **Chorus** is shown as sine-modulation, **phase distortion** as random displacement and **saturation** as thicker colored lines. The effect high- and lowpass filters limit the effect display to the affected frequency regions.

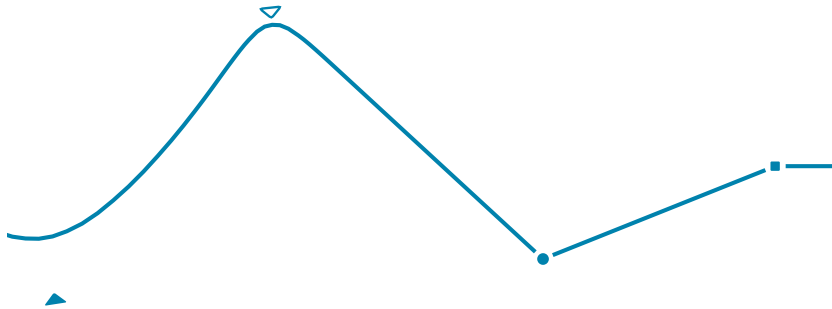
The displayed time range of the spectrogram is adjusted using the dual slider below it. If the reverb time is synced to the host tempo, additional buttons appear next to the slider. The **subdivision** popup chooses the displayed beat subdivision. The **magnet** button makes control points snap to the set beat subdivision and displays the subdivision as lines instead of ticks.



## 4.4 Envelope Editing

Every envelope in apVerb has a specific color and a knob in the bottom section assigned to it. The knob shows the center value of the envelope as a handle with its color as well as its value range as colored line. The knobs can be used to apply an offset to the envelopes. As long as an envelope is constant (a straight horizontal line) it auto-hides from the interface until its knob is touched. In that case the knob just behaves like a regular knob to change its parameter globally over time.

apVerb uses cardinal bezier spline curve envelopes defined by three types of control points:



An envelope with (left to right) a smooth, tight, break and final control point.

**smooth** A control point that smoothly pulls the envelope to its position, displayed as a filled triangle. This type can be created by dragging from the envelope line. This gets previewed by two bend arc markers while the mouse is hovering over the envelope line.

**tight** A control point that pulls the envelope tightly to its position, displayed as a hollow triangle. These have the same effect as two smooth control points at the same position. They can be created using the right-click context menu on a control point and choosing "tight".

**break** A control point that makes the envelope go through the point - leading to a corner, displayed as a filled circle which interrupts the envelope line. Two corners in a row lead to a straight line in between. All envelopes always start and end with corners. Corners are created by double-clicking on the envelope line.

The final point of each envelope gets a special filled square marker. It works like a corner towards the left side and sets a constant value on the right side. Constant parameters just display one such point at the start. The horizontal line to the right of a final control point can be dragged up and down to change the constant value. This is indicated by triangular markers while the mouse is hovering.

Envelope control points can be dragged with the mouse. Adjacent points are pushed away by drags that would otherwise change the control point order.

Holding **Ctrl** while dragging increases resolution by 20x.

When Holding **Shift**, the curve itself can be dragged by dragging the two adjacent control points.

By dragging a **selection rectangle** from empty space or by **Shift**-clicking multiple control points, a set of control points can be selected at the same time. The selection can then be transformed using handles on its border or by dragging the center of the rectangle.

To **create an envelope** for a previously constant value, click the knob and start editing the straight line of the same color displayed on the graph.

There is always a **topmost** envelope with all editing features enabled. It is the last one touched and sets the unit and markings on the right-side vertical ruler. The offset-knob belonging to the topmost envelope has its label marked by a color underlay. To make a different envelope topmost, just click the envelope or its knob.

As envelopes cannot alter the sound of the reverb once the reverb time has passed, parts after the reverb time (set by the body level envelope) are drawn as much thinner lines.

#### 4.5 Right Side: Time & Mixer

The right section of the plugin interface contains timing and dry-wet mixer parameters.

**reverb time** The buttons control what the timing of all envelopes is based on. **ms** means milliseconds - all parameters with envelopes of apVerb use absolute time and the main graph uses milliseconds as its horizontal axis.

The **quarter-note** button switches the time base to beats - the reverb can be defined in relation to the tempo of the music - if the hosts feeds that information to the plugin.

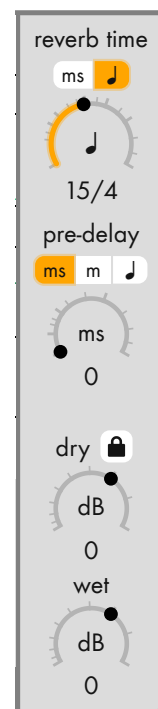
Note: If the **beats** mode is active, any tempo change leads to a recalculation of the reverb, which leads to some cpu load.

Changing the reverb time value using the knob or by entering a new value after double-click does scale all 20 envelopes at the same time.

**pre-delay** These parameters apply a delay to the incoming signal before processing. It can be based on **milliseconds**, **meters** or the **tempo** of the music. The pre-delay simulates the distance of the listener to the audio source. This distance influences the calculation of the early-reflection delays as it changes the position of the source in the simulated room. This only applies as long as the distance is small enough to fit inside the room size.

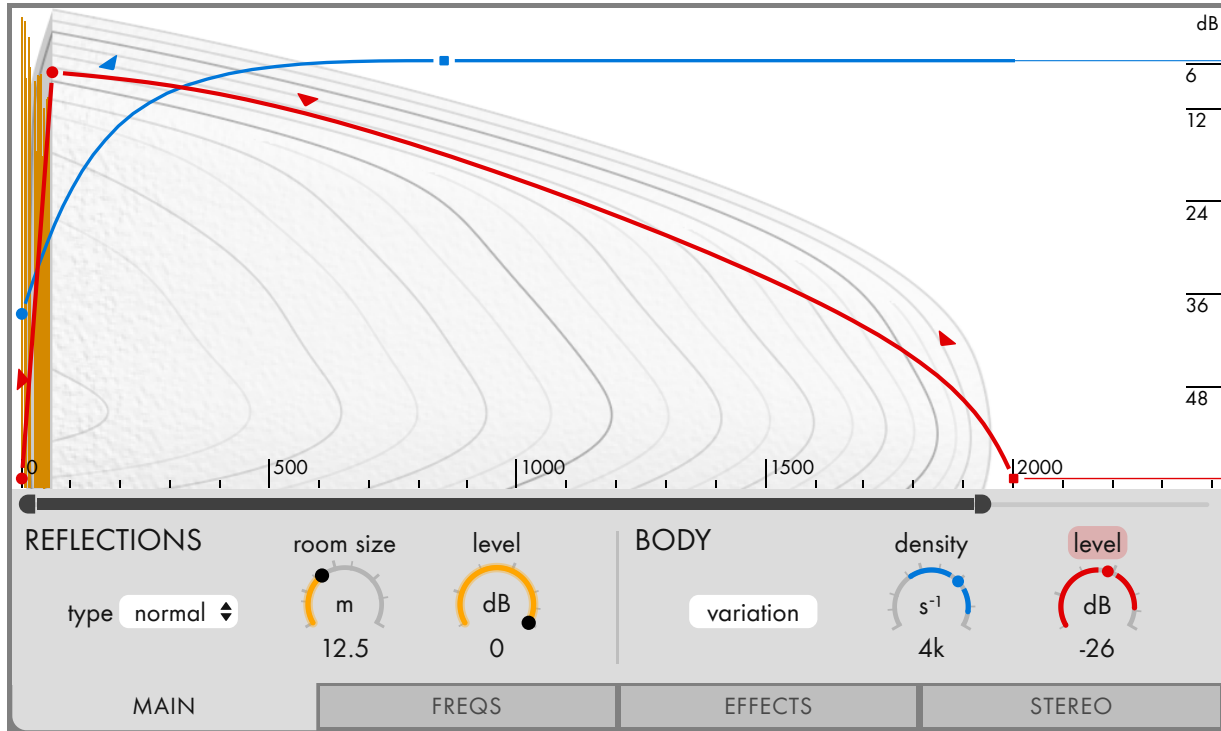
**dry level** The **dry** knob controls the level of dry (unprocessed) input signal added to the output. If apVerb is used on an effect bus, this is usually set to **off**. Used as an insert effect, the 0dB settings means the input signal remains unchanged on the output. The **lock** button locks the dry level, so it doesn't get changed from preset switches. The initial state of the dry level lock is determined by its value in the Init preset.

**wet level** The **wet** knob controls the level of the processed signal added to the output. The wet level does not change the spectrogram or the volume envelope display.



## 4.6 Main (Reflections & Body) Tab

The main tab contains parameters controlling the simulated room (for reflections) and the density and shape over time of the velvet noise body.



### 4.6.1 Reflections

The early reflections of apVerb are generated using multiple delay lines that use delay times calculated from idealized rooms. Multiple room-shapes can be selected in the **type** popup menu. They differ in the numbers of walls and room geometries. Early reflections are simulated in directional stereo. The **roomsizes** knob defines the diameter of a sphere enclosing the room. The **level** knob sets the level of the earliest reflection, all others get their level calculated from that according to distance and room shape.

The reflections parameters are not connected to envelopes, but set globally. While the main tab is active, the single reflections are displayed as red vertical lines starting at time 0.

### 4.6.2 Body

The reverb body is generated from decorrelated and modulated stereo velvet noise. The pulse positions of the velvet noise are based on constrained random values. The **variation** button creates a different random sequence that changes the sound. The lower the density, the greater the difference, since lower density pulses have more room for random shifts.

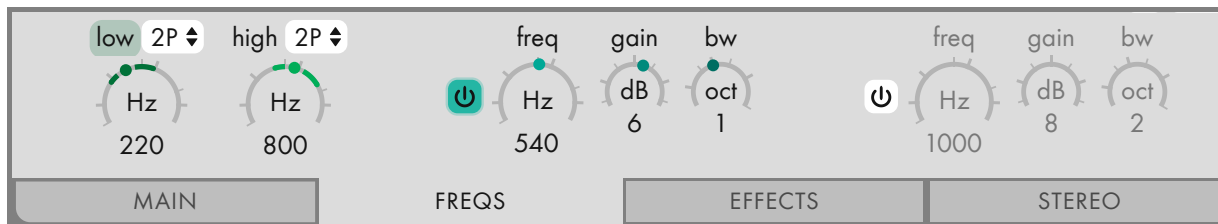
The blue **density** parameter and envelope define the number of velvet impulses per second. Below

100 the single impulses become audible as semi-regular random delays. Values between 100 and 1000 sound quite digital - similar to early digital noise generated using shift registers. Above 1000 lies the zone of extreme smoothness, where the velvet noise sound (and the resulting reverb tails) can sound much smoother than the common flavours of random white noise.

The red **level** parameter is connected to the red volume envelope, freely shaping the reverb level over time. The volume envelope is special as it always start and ends at the minimum value and its knob only affects control points that are not at minimum level - enabling setting the level on delay-like envelopes.

#### 4.7 Freqs Tab

The frequencies tab is all about changing the reverb's frequency response over time using a low-cut, a high-cut and two parametric eq filters. The filters are applied to both the early reflections and the reverb body.

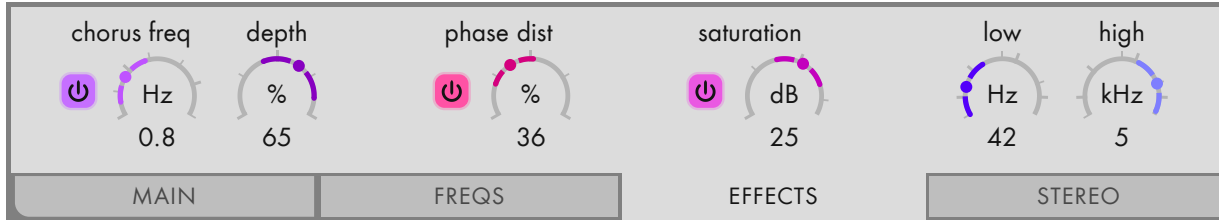


The **low** and **high** parameters control the low and high cut filters that reduces low and high frequency content. The set frequencies define the -3dB point. The number of poles on the popup buttons define the filter slope. Each pole results to 6.02dB/oct slope steepness. Steeper slopes make the filter cutoff much more audible due to the resonances created by the poles.

The two **parametric eq** bands can be turned on and off using the **enable** buttons. They have **frequency**, **gain** and **bandwidth** parameters. The bandwidth is defined as the distance in octaves between the two frequencies that get half the gain (in decibels) applied.

## 4.8 Effects Tab

The effects tab contains controls for all effect parameters with envelopes. The effects are applied in series and change the reflections as well as the body of the reverb.



### 4.8.1 Chorus

The stereo chorus in apVerb is based on two high-quality time-varying delays mixed with the original signal. The delay-times and phase offsets are inspired by a classic synthesizer chorus. The **chorus enable** button turns chorus on and off, **chorus freq** controls the speed of delay time modulation and **depth** the amount of delay time modulation.

### 4.8.2 Phase Distortion

Phase distortion is based on velvet noise like the main reverb. 15 delays per stereo channel in a 10 ms window randomly modulate their positions. It can be turned on and off using the **phase distortion enable** button. The **phase dist** parameter controls the modulation speed. At low speeds this acts like a stereo decorrelation effect, while high speeds lead to turning more and more sinusoidal/tonal components of the signal into noise.

### 4.8.3 Saturation

apVerb's saturation effect is based on one of the algorithms used in apShaper. It's a slightly asymmetrical tanh saturation algorithm with the same advanced aliasing-suppression method (antiderivate antialiasing). The **saturation enable** button turns saturation on and off while the **saturation** parameter controls the gain applied to the reverb before going through saturation. The saturation output is rms level-matched with the input before going into the crossover filter and summing. When setting the crossover frequencies for saturation, it is important to consider the processor order: saturation happens before the crossover band-splitting. Saturation tends to add additional harmonics as well as intermodulation products that are higher and lower than the original signal and to become audible, the frequency range needs to be sufficiently large.

### 4.8.4 Effects Crossover Filter

After all effects are applied, a 3-band **crossover** filter is used to blend the effects result with the pure signal. The effects band is the middle band between the **low** and **high** frequency parameters. The crossover filter uses phase-matched 12dB/octave slopes.

## 4.9 Stereo Tab

These parameters (with envelopes) allow to adjust stereo width and balance globally or over time.



Width is separated into low and high width with an adjustable crossover frequency. If the crossover frequency is set to its minimum, only the **width high** parameter is used over the entire frequency spectrum. A width of 100% means the fully decorrelated stereo channels from the body model are used.

Balance is applied after the stereo widening/narrowing and reduces the width unless it is set to its center value 0.

## 4.10 Plugin Settings & Information Dialog

This dialog is accessed by clicking the gears icon or the plugin name in the top left corner of the main apVerb Interface.

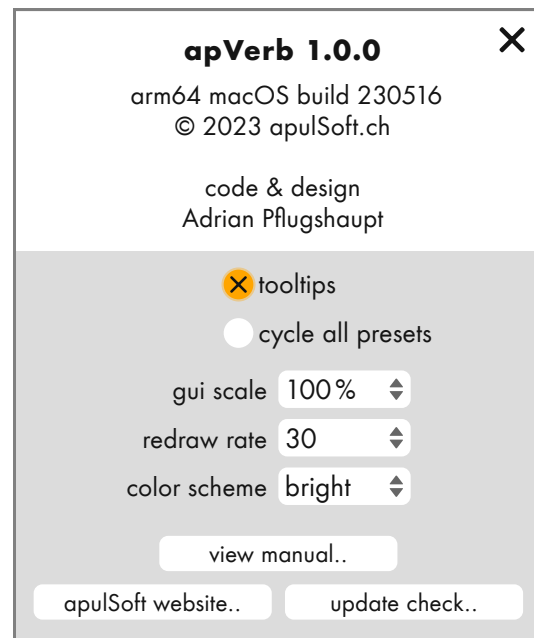
The settings apply to all instances of apVerb. Instances using the same plugin format in the same host update immediately, all others once the plugin is reloaded.

**tooltips** If activated, text hints pop up after the mouse hovers over a control for a second.

**cycle all presets** When switching presets using the preset cycle buttons on the top bar, cycle through the entire preset structure including folders instead of staying inside the current folder.

**gui scale** Choose how large the plugin interface should be drawn. The popup features a few presets. It is also possible to enter a value between 25 and 500. **Note:** Some hosts require plugin window reopening or even restarts to adapt to a new size.

**redraw rate** The number of interface redraws per second. A slow computer might not be able to reach high rates. High refresh rates only work well with small host audio buffer sizes because new information is only available once per buffer size.



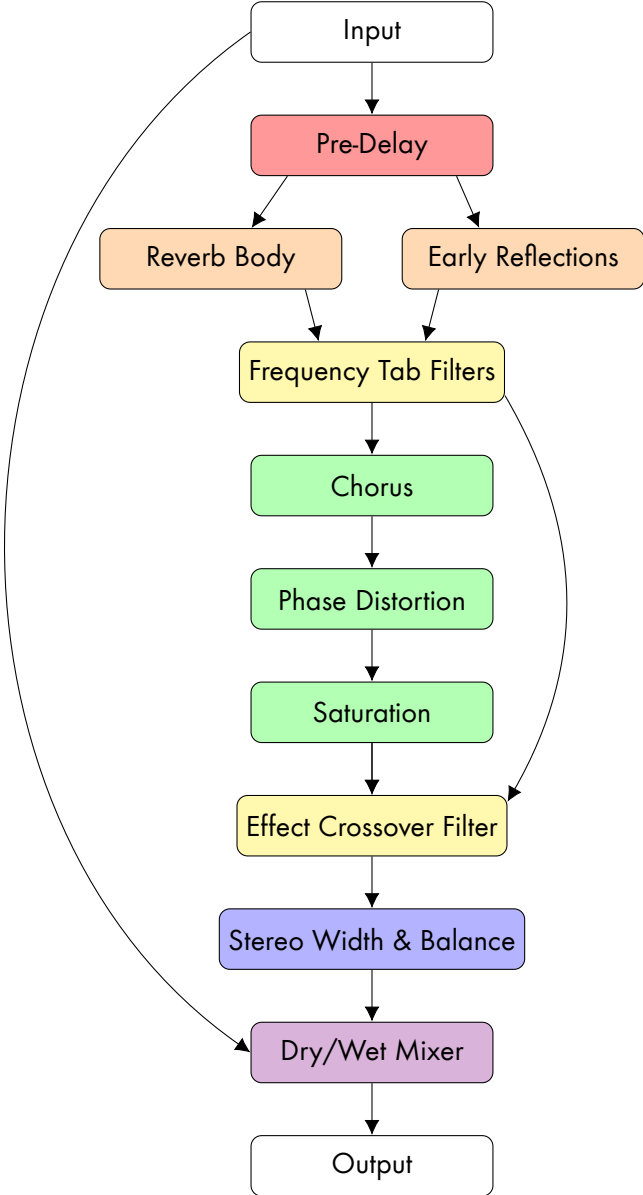
**color scheme** Switch between multiple interface color schemes. The menu contains all installed schemes. New ones can be added by renaming and editing the existing scheme files. They are located in a folder called ColorSchemes next to the apVerb presets folder. Use the **manage in finder/explorer..** entry of the presets menu to navigate to the presets folder and go one level up. The color schemes use an xml based format and can be edited in a text editor. More information can be found inside the **bright.xml** file.

**apulSoft website..** Open the default webbrowser and visit <http://www.apulsoft.ch>.

**view manual..** The apVerb manual is opened in a pdf viewer application.

**update check..** This opens a special page on the apulSoft homepage and sends version information. The version gets checked against the latest release and changes get displayed in the system's default browser.

# 5 Signal Flow





## 6 Unlocking the Full Version of apVerb

**apVerb Authorization**

**Unlock apVerb**  
Please enter your serial number below.

Serial:

Once you bought an apVerb license from the apulSoft homepage (which can be opened from the demo welcome screen or the global settings dialog), there are two ways to enter your serial and unlock the plugin.

- When you first open the apVerb plugin interface, a demo screen appears with a **enter serial..** button. Click this button open the serial entry dialog.
- If the plugin is running in demo mode, the  button is displayed on the top right which brings up a license dialog where the **enter serial..** button can be used to open the serial entry dialog.

Just enter the serial exactly as received and click **OK.** to unlock the full version.

In case the serial is not accepted, check the following things:

- The serial needs to be an apulSoft apVerb serial consisting of **AVRB** followed by 5 sections of 4 hexadecimal digits (0-9, A-F).
- If copy/paste was used, try typing manually. Copy/paste sometimes copies more than was intended (line breaks, tab stops, etc).

## 7 Frequently Asked Questions (FAQ)

- **I lost my serial. How can I retrieve it?**

Just head to <http://www.apulsoft.ch> and use the **contact apulSoft** link. Please add enough information to locate your order in the database and you will receive your serial info as soon as possible.

- **The window size does not match the interface size after adjusting the GUI scale. What now?**

Depending on how the host application handles resizing of plugins triggered by the plugin, changing the GUI scale might not immediately work correctly. Any change to the GUI scale is stored in a global preferences file that is read whenever a new instance of apVerb is created. If this problem occurs, first try to just close and reopen the plugin window/editor. If that does not help, set the desired scale on the settings pane and then restart your host application. As long as GUI scale is not changed again, window and content should match.

## 8 Changelog

- Version 1.0.1
  - Prevent envelopes from exceeding the max reverb time (20 seconds).
  - UX fixes to envelope editing.
  - Default values for all knobs.
  - BUGFIX: Strange noises when using non-power-of-two audio buffer sizes.
  - BUGFIX: Fix compatibility with Windows machines without AVX2.
  - BUGFIX: Correctly report the tail time to hosts.
  - BUGFIX: Correct default values on dry/wet/reflections-level and roomsize knobs.