WAVES

H-REVERB

ALGORITHMIC FIR REVERB

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Chapter 1 – Introduction

1.1 Welcome

Thank you for choosing Waves! In order to get the most out of your Waves processor, please take the time to read through this manual.

In conjunction, we also suggest you become familiar with www.wavesupport.net. There you will find an extensive **Answer Base**, the latest **Tech Specs**, detailed **Installation** guides, new **Software Updates**, and current information on **Authorization** and **Registration**.

By signing up at www.wavesupport.net, you will receive personalized information on your registered products, reminders when updates are available, and information on your authorization status.

1.2 Product Overview

Waves H-Reverb is a pioneering algorithmic FIR reverb based on Finite Impulse Response technology and designed to provide lush, spacious, warm reverberation effects. It presents a fresh approach to digital reverberation, fusing classic reverb concepts together with innovative features never before seen in digital reverb effects.

H-Reverb's features a collapsible interface. The collapsed view features the most important reverb controls, while the expanded view features advanced controls for complete control over every aspect of the effect's sound and character.

H-Reverb's preset library provides a vast collection of halls, rooms, plates and nonlinear reverb presets created by top-tier sound engineers.

H-Reverb's special engine combines the best of both worlds of reverb—that of synthetic feedback-based reverbs, and that of IR convolution-based reverbs (more about this in the Concepts and Terminology section).

In addition to the basic reverb controls common to many reverb effects, H-Reverb features extra features that offer enhanced control and further depth and dimension:

Input echoes replicate the input signal and mix either discretely to the output or into the reverb for diffused sound. Output echoes generate more replicas of the actual reverb and provide some enhancement to depth and dimension.

An Internal Dynamics section allows selecting between three dynamics modes: Compression, Ducking, and DeEssing. Ducking lowers the reverb loudness while the direct signal is apparent and blooms the reverb loudness to a higher level when the direct signal is gone. The DeEssing mode lets you create bright reverb sounds by controlling the hissing spray effect of sibilance in the reverb.

Modulation options include AM Depth and Rate, which are applied to the input of the reverb and create a more airy and stereo-spread reverb; and FM Mix, which creates a chorusing and flanging effect at the reverb output.

H-Reverb also features an input drive control to overdrive the input signal and get richer harmonics in the reverb tail. H-Reverb applies analog modeling on the reverb output, modeling the A-to-D components of a hardware unit.

1.3 Concepts and Terminology

FIR vs. IIR Reverb: Finite Impulse Response (FIR) filters are fixed in length, whereas Infinite Impulse Response (IIR) filters are based on a feedback loop and decay through a recurring attenuation factor inside the feedback loop.

The IIR approach takes the same amount of calculation resources for short reverb times as it does for long ones. The feedback loop creates a comb filter that requires the use of further dispersion filters designed to break regularities, but some signature coloration remains. Another limitation is that the decay of an IIR filter is linear, preventing the creation of real-gated, reversed, and similar types of reverb.

FIR reverbs consume more resources the longer the reverb time, but are free of any inherent coloration and allow much more control over the time response.

Nearly all commercial synthetic parametric reverbs use IIR, i.e., feedback-looped reverb tail generators. FIR is used in IR Convolution reverbs. In this case, a sampled impulse response is the finite length filter convolving the direct signal. H-Reverb uses synthetic parametric controls to shape and color the reverb as desired, providing superior quality and flexibility unavailable in IIR/feedback-based reverbs.

1.4 Components

WaveShell technology enables us to split Waves processors into smaller plugins, which we call **components**. Having a choice of components for a particular processor gives you the flexibility to choose the configuration best suited to your material.

H-Reverb has two sets of time components: regular H-Reverb components that allow up to six seconds of reverb time, and "long" H-Reverb components that allow up to 12 seconds of reverb time. The main reason for having two components is to give you some control over the amount of CPU consumption: the long components take up approximately 30% more CPU, but we believe it's only rarely that you will need more than six seconds of reverb time.

Each set of time components includes several channel configuration components, including mono, mono-to-stereo, and stereo. For those of you engaged in surround sound production, we also offer mono and stereo to 5.0 or 5.1 multichannel formats, as well as 5-to-5 and 5.1-to-5.1 to insert across full surround auxiliaries.

Chapter 2 – Quick Start Guide

H-Reverb will launch showing its collapsed GUI, allowing quick access to the essential reverb time, pre-delay, ER selection, and mix controls.

- Launch the Waves H-Reverb plugin on your reverb aux buss or track insert.

- Send a signal to the reverb aux and listen to it through the default preset.

- Cycle through presets using the next/previous preset arrow control at the top of the toolbar.

- You can also click the load menu, where you will find a library of presets categorized by application (Hall, Plate, Room, etc.), as well as presets by a prestigious list of world-renowned sound engineers and producers.

- Once you find a nice preset, allow yourself to get a little creative and experiment with the controls. Even when the GUI is collapsed, you can turn sections of the advanced controls on and off using the toggle at the bottom of the GUI.

- This may be a good time to expand the GUI and see if some of the more advanced controls might be working for you.

- There are quite a few advanced controls, so we've tried to lay them out in a way that will help you use them without too much trouble. The more you use the plugin, the more you will understand what each of the sections can do for you.

Chapter 3 – Interface and Controls

3.1 Interface

3.2 Controls

3.2.1 Main Controls

Pre-Delay Mode

Free/Sync; Default: Free

The pre-delay precedes the reverb time with a pure delay. The pre-delay control has two options: **Free** (which is the default) and **Sync**.

- **Pre-Delay Free** sets the pre-delay time in milliseconds and therefore does not change with the tempo.

  Range: 0–500 ms; Default: 24 ms; Reset: 0 ms

- **Pre-Delay Sync** sets the pre-delay time in note-length values and therefore changes with the tempo.

  Range: 1/2, 3/8, 1/3, 1/4, 3/16, 1/6, 1/8, 3/32, 1/12, 1/16, 3/64, 1/24, 1/32, 3/128, 1/48, 1/64, 3/256, 1/96, 1/128; Default: 3/256.

Buildup Time

Range: 0–2 seconds; Default: 0.025ms

Buildup time determines how long it takes the reverb to reach its peak level. In natural rooms, it takes some time until the reflections build into a tail. The larger the room and the further the walls are from the listener, the longer the buildup time. H-Reverb enables you to go way beyond natural reverb, however, and well into the realm of special effects such as ghostly 0.5-second to 2-second buildups, creating reverse-like verbs that sound magical and haunting.

Reverb Size

Range: 0.5–2; Default: 1.

Reverb Size controls the density of the early reflections as well as the slope of the buildup. The normal factor of 1 distributes the ERs evenly. Higher values space them out with wider gaps and show a more gradual/concave buildup typical to larger spaces, whereas lower values condense them and make them overlap, creating faster buildup and conveying the sense of a smaller space.

Reverb Time

Range: 0.1 to 6 (regular H-Reverb) or 12 (Long H-Reverb) seconds; Default: 4.21 seconds. The Reverb Time control sets the duration of the reverb decay envelope, i.e., the time it takes the reverb to decay by 120 dB. The decay is linear until the reverb envelope is changed by the related advanced controls **X-Time** and **X-Gain**.

ER Select

Range: 1–10; Default: 5

Selects an ER Model from among ten options. The control has a display showing the ER number and a schematic representation of the ER reflections' time and gain. At the sides of this display are arrows: a back arrow on the left-hand side and a forward arrow on the right-hand side. Clicking on the arrows toggles to the next or the previous ER, and clicking on the display area pops up a menu showing all 10 ERs, allowing you to select one, random access style.

ER/Tail Balance

Range: 0–100; Default: 73.2

ER/Tail Balance provides control over the mix between ER gain and tail gain. The midpoint is 50 = unity (i.e., 0 gain for both ER and tail). Turning to the left (counterclockwise) reduces the tail gain, leaving ER gain at unity. Turning to the right (clockwise) leaves the tail gain at unity and reduces ER gain.

Dry/Wet:

Range: 0–100; Default: 100

Controls the mix and balance between the direct path and the effect. The fully wet default is used to output the reverb effect only. This is suitable for use in an auxiliary send setup where you "send" sources to reverb but the direct sound of the sources is mixed from their related tracks. If you are using H-Reverb as an insert on the channel you are affecting, you can use the Dry/Wet control to create the right balance between the dry signal (your direct source) and the wet signal (the reverb effect).

Output

Range: -24 to +18 dB; Default: 0 dB

Controls the output level, allowing you to level the output as needed.

Reverse

On/Off; Default: Off

Reverses the direction of the reverb time envelope to achieve breathy, upward-swelling, reverse-type reverb.

3.2.2 Advanced Controls

3.2.2.1 Decay Envelope

X-Time

The percentage of the reverb time during which the transition between decay and release occurs.

X-Gain

Range: -120 to +12 dB; Default: -60 dB.

The X level defines the gain at the cross-point between the first and second decay slopes.

Density

Range: 0–100%; Default: 100%

Full density will sound very uniform and smooth, while low density will sound like sparse individual echoes.

3.2.2.2 Input Echoes

The Input Echoes section replicates the input audio using up to 6 delayed taps which can be fed discretely to the effect's output or into the reverb generator.

Type

Seven echo types are offered as internal presets that set the series of taps.

- **Discrete:** Range: -inf to 0 dBFS; Default: -18.4
- **Diffused:** Range: -inf to 0 dBFS; Default: -29

3.2.2.3 Output Echoes

The Output Echoes section comprises a series of four delayed replicas of the overall reverb effect, adding further warmth, depth and dimension.

Amount

Range: 0–10; Default: 5.81

Controls the gain of the output echoes.

Size

Range: 0–100%; Default: 65%

Controls the timing and interval between the output echoes.

Tone

Range: 0–10; Default: 7.2

0 is the darkest setting, 10 the brightest.

3.2.2.4 Dynamics Section

This section allows you to apply compression to the wet path, that is, to compress the reverb tail using a detector on the wet path itself or on the dry path, effectively ducking the wet path to make way for the dry signal. Alternatively, you can use the DeEss mode, which enables you to create bright reverbs that have less of a high-frequency spray on sibilants.

Dynamics Section On/Off

An On/Off button is provided for fast A/B of the Dynamics Section's contribution.

Mode

A 3-state toggle lets you select between three modes: **Duck**, **Comp** and **DeEss**.

- **Duck** keys dynamics from the dry signal, ducking the wet signal when the dry signal is present.

- **Comp** keys dynamics from the wet signal, compressing the dynamics of the wet signal to make it less linear.
- **DeEss** keys a de-essing filter on the input (dry signal not affected!) When DeEss mode is selected, the Recovery control is replaced by a Range control.

Threshold

Range: 0 to -50; Default: -18

Controls the compressor threshold, where 0 = +10 dBFS and -50 = -40 dB.

Recovery (available in Comp and Duck modes)

Range: 30–3000 ms; Default: 300 ms

Controls the compressor's release time.

Range (available in DeEss mode)

Range: 0 to -24 dBFS; Default: -18

Specifies the de-esser's maximal reduction.

3.2.2.5 EQ Controls

H-Reverb's EQ controls are located near the EQ graph on the left-hand side of the expanded GUI. These include special shelf filters that cut down to -80 dB, effectively behaving like a cut filter. Such a shelf is there for filtering the early reflections, while the reverb tail can be filtered using high and low shelves as well as two bell filters.

ER Filter

The ER filter controls are located atop the EQ graph. ER filters can be used to provide a sense of the material of the walls in terms of how much high-frequency content gets absorbed before sound is reflected back. Higher cutoffs and higher filter gains will simulate more reflective materials like glass and marble, whereas lower cutoffs and lower gains will simulate softer wall materials or draped walls absorbing the high frequencies.

- **ER Filter Frequency:** Range: 1000–14000; Default: 2958
- **ER Filter Gain:** Range: -80 to +12; Default: -22.5

Reverb EQ

Reverb EQ bands are sorted below the EQ graph in vertical columns from left to right in relation to the frequency ranges they are designed to process.

- **LoShelf:** On/Off
- **LoShelf Freq:** Range: 20–1000Hz; Default: 240 Hz
- **LoShelf Gain:** Range: -80 to +12 dB; Default: 0
- **LoBell:** On/Off
- **LoBell Freq:** Range: 60–4000 Hz; Default: 604 Hz
- **LoBell Gain:** Range: -24 to +12 dB; Default: -1.0 dB
- **LoBell Q:** Range: 0.26–6.5; Default: 0.7
- **HiBell:** On/Off
- **HiBell Freq:** Range: 1000 Hz to 15 kHz; Default: 2398 Hz
- **HiBell Gain:** Range: -24 to +12 dB; Default: 0 dB
- **HiBell Q:** Range: 0.26–6.5; Default: 0.7
- **HiShelf:** On/Off; Default: On
- **HiShelf Freq:** Range: 2000–16000 Hz; Default: 2192 Hz
- **HiShelf Gain:** Range: -80 to +12 dB; Default: -30.9 dB; Reset: 0

3.2.2.6 Time Filters

The Time filter section offers control over one of three modes: **Damping**, **Envelope**, and **LFO** (with Damping as the default). The graph dynamically changes according to the selected mode. The mode selector is a radio button.

Damping Mode is classic and is similar to what's available in many other reverbs. The graph shows the frequency response on the X axis and the reverb time ratio on the Y axis. The damping ratio relates to the reverb time, so if you have a reverb time of 4 seconds and you set the low damping to 400 Hz with a ratio of 1.5, the reverb's mids and highs will decay in four seconds, while the low frequencies of 400 Hz and below will continue two more seconds, taking six seconds to decay fully.

Damping Controls:
- **LF Cutoff:** Range: 50–1600 Hz; Default: 721 Hz
- **LF Ratio:** Range: x0.1–x2; Default: x1.20
- **HF Cutoff:** Range: 1000–15000 Hz; Default: 3699 Hz
- **HF Ratio** Range: x0.1–x2; Default: x0.89; Reset: x1

Resonant Filter Modes – Envelope and LFO: The LFO and Envelope modes have a set of common controls—two (F1 and F2) located within the graph frame on the left-hand side (F1 just below the graph, F2 just above it), and four (Type, Q, Mix, Flip) located below the graph frame. F1 and F2 set the sweep range by determining the Start and Stop cutoff frequencies, respectively. Type determines the filter type (high-pass vs. low-pass); Q determines the filter slope and resonance, Mix determines the mix between the filtered and non-filtered reverb response; and Flip determines the direction of the sweep, from F1 to F2 or from F2 to F1.

Envelope/LFO Controls:

- **F1:** Start frequency for filter travel. Range: 100–15000; Default: 100
- **F2:** Stop frequency for filter travel. Range: 100–15000; Default: 6695
- **Filter Type:** HiPass/LoPass; Default: LoPass
- **Q:** Range: 0.5–10; Default: 1.2
- **Filter Mix:** Range: 0–100 Default: 100
- **Flip:** F1>F2, F2>F1; Default: F1>F2

Envelope sets the sweep speed as a percentage of the reverb time.

LFO sets the sweep speed using a rate control, either an absolute rate in Hz, or a relative sync rate where the speed is determined by a note duration value, where one cycle is equal to a 1/32nd note at the set BPM.

Envelope Res Filter:

- **Attack Time:** Range: 0–100%; Default: 0%
- **Decay Time:** Range: 0–100%; Default: 34.4%

LFO Res Filter

- **LFO Rate Mode:** Free/Sync
- **LFO Free Rate:** Range: 0.1–20 Hz; Default: 2 Hz.
- **LFO Sync Rate:** 4/1, 3/1, 2/1, 1/1,1/2, 3/8, 1/3, 1/4, 3/16, 1/6, 1/8, 3/32, 1/12, 1/16, 3/64, 1/24, 1/32; Default ¼.

3.2.2.7 Modulation

To add even more fun to the game, we've included some modulations. You can add some stereo sensation by applying amplitude modulation on the input to the reverb effect. You can also add some

magic by mixing subtle frequency-modulated (pitch-modulated) replica at the output. To hear the effect most pronouncedly, you can play a continuous sustained note and play with the controls.

AM Depth

Range: 0–100; Default: 20

Controls the AM depth imposed on the reverb effect input. In stereo output components, it also creates some stereo movement.

AM Rate

Range: 0–100; Default: 20

Lower is slower, higher is faster. The AM is a little chaotic, but at full depth on a sustained sound you will hear very well what it's doing.

FM Mix

Range: 0–100%; Default: 100%

This is essentially a mix value, where anywhere between 0% to 100% will introduce a little flanging, while 100% will leave a slight modulating detune.

3.2.2.8 Global Section

Drive

Range: 0–100; Default: 0

Pushes the input against a clipper (like a vintage hardware reverb getting a hot input), making the wet signal harmonically richer.

Tempo Source

Internal/Host; Default: Host

Selects whether the tempo is set by the host tempo or manually by adjusting the internal tempo control.

Tempo

Sets reference tempo to the input echoes and the other tempo-synched controls.

Analog

On/Off; Default: Off

Turns on analog modeling in the style of the Waves NLS plugin.

Digital

Off/12 bit/8 bit

H-Reverb can be quantized to lower bit rates to create lo-fi sounds reminiscent of vintage digital reverbs.

3.2.2.9 Surround Section

H-Reverb's Surround components include another section of controls right in the middle of the GUI. These give you further control over the balance and the hi/lo EQ of the surround (rear) channel outputs.

The Surround components also let you determine whether to introduce reverb to the Center channel and by how much. The trick with the Center gain is that too much can make the front image narrower, which is usually an unwanted artifact.

Surround EQ

- **Surround LoShelf Freq:** Range: 20–1000 Hz; Default: 240 Hz
- **Surround LoShelf Gain:** Range: -80 to +12 dB; Default: 0
- **Surround HiShelf Freq:** Range: 2000–16000 Hz; Default: 4604 Hz
- **Surround HiShelf Gain:** Range: -80 to +12 dB; Default: -6

Center Gain

Range: -60 to 0 dB; Default: -6 dB

Controls the level of the Center speaker reverb.

Front/Rear Balance

Range: -100 to 100; Default: 50

-100 = Surrounds only, 100 = Front Stage only.

Chapter 4 – The WaveSystem

4.1 The WaveSystem Toolbar

All Waves plugins feature the WaveSystem toolbar which takes care of most administrative functions you will encounter while working with your Waves software. The features of the WaveSystem toolbar are the same on practically all Waves plugins, so familiarity with its features will be helpful whichever plugin you are using.

Toolbar Functions

᭦	Opens the plugin About box
Undo	Undoes the last 32 actions
Redo	Redoes the last 32 undone actions
Setup A/B	Toggles between two presets, useful for comparison of parameter settings
L/R Arrows	Move to the previous or next preset
Copy A→B	Copies the current settings to the second preset register
Load	Recalls presets from file
Save	Saves presets in the Waves file formats
?	Opens the PDF manual for the plugin you are using

4.2 Preset Handling

Preset Types

Factory Presets are permanent presets in the Load menu. Factory presets cannot be overwritten or deleted. When applicable, different component plugins may have different factory presets.

User Presets are your favorite settings of the plugin saved as a preset in the Load menu, under 'User Presets'. User Presets can be overwritten and deleted.

Setup Files may contain more than one preset. For example, a single file can contain all the presets for a session. When you open a Setup File, all its setups become part of

your Load pop-up menu for fast access. This can be particularly useful with multiple instances of a plugin in a single session. By saving all the settings you create into a single Setup File, they can all be quickly available for every instance of that plugin.

Loading Presets and Setups

Load

Click on the Load button to see the Load pop-up menu. The menu is divided into four sections. If a section is not currently available it will not appear in the Load pop-up menu.

Open Preset File…   Select to open any setup or preset file, whether from the Library or your own creations.

'Filename.xps':   Displays any currently loaded Setup File and its presets.

Factory Presets: Displays the default Factory Presets.

User Presets: Displays any loaded User Presets.

Saving Presets and Setups

Save

Click on the Save button to see the Save pop-up menu. Four options are available. If an option is not currently available it will be grayed out and inaccessible.

Save to New File…   Select this to start a new Setup file. There are two prompts - first for the setup filename, then for the preset name. You must provide a name for both the setup file and the preset. Click OK (ENTER) to complete the save. It is a good idea to create a folder in which to save several setup files for a project.

Save 'File Name' –   Overwrites the settings of the loaded preset (whether a
"Preset Name"   User Preset or a preset from a Setup File) with the current settings. If a Setup File is currently loaded, the name of the Setup File is displayed followed by the name of the preset itself. If a User Preset is loaded, its name is displayed.

Save to 'File Name' As…   Saves the current settings as a new preset into the Setup file that is open (if one is not open, the option is grayed out). You will be prompted to give the preset a name.

Put into Preset Menu As… Save the current settings into a User Preset that will always be in your Load menu (until deleted). You will be prompted to give this preset a name. User Presets are stored in the plugin's preference file.

Deleting Presets

You may delete User Presets and presets within a Setup File. Factory Presets and Setup Library files cannot be deleted or overwritten.

1. Hold the Command (Mac)/Control (PC) key down.
2. Click-and-hold the Load button to see the pop-up menu.
3. While still holding the Command/Control key, select the preset or setup to delete.
4. A confirmation box will appear, allowing you to cancel or 'OK' the deletion.

A/B Comparison and Copying

A/B

The Setup A/Setup B button may be clicked to compare two settings. If you load a preset in the Setup B position, this will not affect the preset loaded into the Setup A position, and vice-versa.

If you want to slightly modify the settings in Setup A, copy them to Setup B by clicking the **Copy to B** button, then alter Setup A and compare with the original Setup B.

The name of the current setup will be shown in the title bar (on platforms which support it), and will switch as you change from Setup A to Setup B.

Note: an asterisk will be added to the preset name when a change is made to the preset.

4.3 Interface Controls

Controls can be in one of three states:

1. **Not Selected** where the control is not the target of any user entry
2. **Selected** where the control is the target of mouse control entry only
3. **Selected and Active** where the control is the target for both mouse and keyboard entry

Toggle Buttons

Toggle buttons display the state of a control, and allow switching between two or more states. **Single-click** to change the control's state. Some toggle buttons have a text display which updates with the current setting, and others (bypass, solo, or monitoring toggles) illuminate when the control is active.

Some plugins have **link buttons** between a pair of toggle buttons, allowing click-and-drag adjustment while retaining the offset between the controls.

Value Window Buttons

Value windows display the value of a control and allow **click-and-drag** adjustment, or **direct control via the keyboard**.

❖ **Using the mouse**, click-and-drag on the value window to adjust. Some value windows support left/right, some up/down (as you hover over a button, arrows will appear to let you know which direction of movement that button supports). You may also use your mouse-wheel to adjust parameter values.

❖ **Using the arrow keys**, click once with mouse to select the button, and then use up/down – left/right (depending on the direction supported by that button) to move in the smallest incremental steps across the button's range (holding down the arrow keys will move faster through the range).

❖ **Using key entry**, double click on the button to open the value window, and directly enter the value from your keyboard. If you enter an out of range number, the button stays selected but remains at the current setting. (System beeps if system sounds are on.)

Some plugins have **link buttons** between a pair of value windows, allowing click-and-drag adjustment while retaining the offset between the controls.

Hover Box

Hovering boxes will appear and display the control value when hovering with the mouse over the control.

Multiple Control Selection

One of the most powerful features of the WaveSystem is the ability to select and adjust multiple controls simultaneously. Using the mouse, drag-select the desired group of buttons or graphic controls by clicking and holding at a point outside the controls, and forming a rectangle that includes the controls you wish to adjust. Alternatively, press and hold Shift while clicking the mouse on any control you wish to link. This method is useful when you want to select two or more controls that are not adjacent to one another.

TAB Functions

TAB moves the 'selected' status to the next control, with shift-TAB moving in the reverse direction. Additionally, the Mac has an option-TAB function for 'down' movement and shift-option-TAB for 'up' movement where applicable.

If you have several Value Window Buttons selected, TAB functions will take you through the selected controls only. Hitting Esc or Return will return the 'focus' to the DAW application.

4.4 Waves Preferences (Pro Tools only)

When launching Pro Tools, hold Shift to view the Waves plugin Preferences window. The following options are available:

- Don't use AudioSuite plugins
- Don't use RTAS plugins
- Rescan all plugins
- HUI control surface support (low resolution)
- Enable single-click text entry