

WAVES

CODEX

USER GUIDE



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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 that 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 **Licensing** 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 licensing status.

1.2 Product Overview

Waves CODEX is an advanced polyphonic granular wavetable synthesizer designed to provide complex evolving sounds that can range from acoustic and analog emulations, to completely new, previously unheard sounds. CODEX's controls are highly inviting, combining tradition with intuitive interaction in a way that lets users easily customize existing presets and build custom patches from the ground up. The unique wavetable oscillators are embedded in a subtractive synthesis engine that allows further shaping of the sound using traditional analog subtractive components and layout.

1.3 Concepts and Terminology

CODEX is powered by Virtual Voltage™ technology, which connects its various generators and transformation filters, envelopes and modulators. CODEX therefore uses many of the same terms used by its hardware forerunners: VCF (Voltage-Controlled Filter), VCA (Voltage-Controlled Amplifier), and so on.

While anyone acquainted with synthesis should feel right at home with the subtractive

section of CODEX, the advanced oscillators might at first seem daunting. Please browse through the oscillator section of this manual to become better acquainted with the unique features and vast possibilities of CODEX's oscillators. The learning curve will pay off when encountering other synthesizers, whether software or hardware, analog or digital.

All users can partake in the instant gratification of CODEX's vast selection of factory presets. CODEX's team of experienced preset developers created hundreds of presets, sorted by category, so you can quickly find the exact sound you need—leads, pads, basses, sound effects, sequences, gated rhythmic lines, motions, and more. Or just browse around until something catches your ear and captures your imagination.

Whether in the studio or live on stage, many musicians like to control their synth parameters in real time for enhanced creativity and expression. While CODEX supports the basic automation features of plugin hosting technologies such as VST, it also supports MIDI Learn. Assigning a CODEX control to a knob on your MIDI controller is as easy as right-click > Learn > knob turn, done!

Granular wavetable synthesis, analog modeling, and supreme sound quality do come at a price. CODEX can be rather CPU- and RAM-hungry compared to other software synthesizers. During the days of analog hardware, less expensive oscillators were often considered “dirty,” while accurate oscillators were costlier than was practical for most musicians. Ironically, in today's digital world, creating a pristine oscillator is relatively easy; it's the “dirtiness” that takes more CPU calculations to recreate. To conserve CPU power, CODEX lets you select the maximal number of simultaneous voices.

1.4 Components

CODEX has one component: CODEX Stereo.


CODEX is a virtual instrument plugin and will appear under the related selection menus for virtual instruments under all supported DAW host applications.

Waves CODEX also works as a standalone application, using ASIO (Windows) or Core Audio (Mac) drivers to play through your audio device of choice. CODEX receives MIDI data to trigger notes and control changes.

CHAPTER 2 – QUICK START GUIDE

Open CODEX on an instrument track in your DAW of choice, or launch the CODEX standalone application.

1. Select a preset from CODEX's factory presets.
2. Play!

Use the next/previous preset arrow controls on the toolbar  to scroll through presets. If you're looking for a certain type of sound, click the load button to reveal the factory presets, sorted by category.

CHAPTER 3 – INTERFACE AND CONTROLS

3.1 Interface



3.2 Controls

The CODEX interface is arranged into four sections grouped according to function:

- Voice generation and subtractive elements (blue)
- Modulation sources and patches (purple)
- Effects, EQ, global and output sections (green)
- Arpeggiator/sequencer (red)

3.2.1 Oscillators



CODEX has two wavetable oscillators which are labeled **1** and **2**.

OCTAVE determines the pitch range.

Range: 32, 16, 8, 4, 2 (from lowest to highest pitch)

TUNE determines the pitch.

Range: -12 to +12 semitones

FINE fine-tunes the pitch.

Range: -100 to +100 cents

RESOLUTION determines the resolution of the oscillator.

Range: 0 to 100

TABLE selects one of 64 internal or imported wavetables.

Range: 1 to 64

WAVE selects a specific section of the wavetable to be used as the oscillator.

Range: 0 to 10

FORMANT controls the formant of the oscillator by altering the spectral peaks of the sound spectrum.

Range: -100 to 100

START determines the start point of the wavetable scan.

Range: 1 to 64

MID determines the midpoint of the wavetable scan.

Range: 1 to 64

END determines the endpoint of the wavetable scan.

Range: 1 to 64

SPEED determines the wavetable scanning speed.

Range: 0 to 100 (free-running), 4/1 to 1/32 (synched)

SCAN SYNC determines whether the wavetable scanning is synchronized to the host clock.

LOOP – When enabled, wavetable scanning loops continuously between ‘MID’ and ‘END’ points.

IMPORT allows the integration of user-selectable WAV files. Imported WAV files are automatically converted into wavetables by CODEX. These new wavetables are saved along with presets. CODEX supports WAV files of any length, bit-depth and sampling frequency. For optimal results, samples of between one and five seconds are recommended.

FC enables CODEX's advanced formant correction algorithms.

When enabled, formant can be controlled using the 'FRMNT' knob.

OSC SYNC synchronizes the triggering of the OSC 2 waveform to the rate of OSC 1.

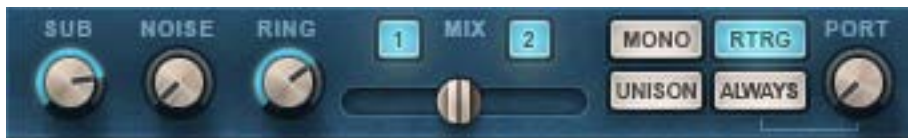
When activated, OSC 2 pitch controls affect only the timbre of OSC 2, not its pitch.

Range: On/Off

FM (Frequency Modulation) controls the amount by which the frequency of OSC 2 is modulated by OSC 1. (*OSC 2 only*)

Range: 0 to 100

3.2.2 Additional Oscillators & Mix Section



This section is used to combine OSC 1 and OSC 2, and to add noise, sub-oscillation and ring modulation.

SUB mixes in a triangle wave one octave below OSC 1.

Range: 0 to 100

NOISE mixes in white noise.

Range: 0 to 100

RING controls the ring modulation of OSC 1 and OSC 2.

Range: 0 to 100

OSC 1 / OSC 2 activate each oscillator.

Range: In/Out

MIX balances the mix between OSC 1 and OSC 2.

Range: -50 to +50

MONO toggles between monophonic and polyphonic modes.

Range: On (mono) / Off (polyphonic)

RTRG controls envelope re-triggering. When activated, every note restarts the envelopes. (*Mono mode only*)

Range: On/Off

UNISON activates a doubling effect which creates a richer sound.

Range: On/Off

PORT determines the glide time (portamento) between notes.

Range: 0.5 to 2500 ms (0 to 2.5 seconds)

ALWAYS/LEGATO determines whether glide will occur always, or only when the previous note is still held.

Range: Legato, Always

3.2.3 Voltage Controlled Filter (VCF)



The VCF section includes selectable filter slope, frequency and resonance parameters as well as a filter envelope which determines the filter movement on each trigger.

TYPE determines the filter type.

Range: High Pass, Low Pass, Band Pass, Band Reject

SLOPE toggles between two types of pole filters.

Range: 2-pole/12 dB per octave, 4-pole/24 dB per octave

CUTOFF controls the VCF cutoff frequency.

Range: 0 to 100 (20 Hz to 20 kHz)

RES controls the amount of filter resonance.

Range: 0 to 100

ENV determines the envelope's cutoff modulation depth.

Range: -100 to 100

KBD controls keyboard tracking using C3 as its reference point.

Range: 0 to 100

FM controls the amount of frequency modulation on filter cutoff by OSC 1.

Range: 0 – 100

ADSR determines the filter's envelope cutoff behavior after a note is triggered:

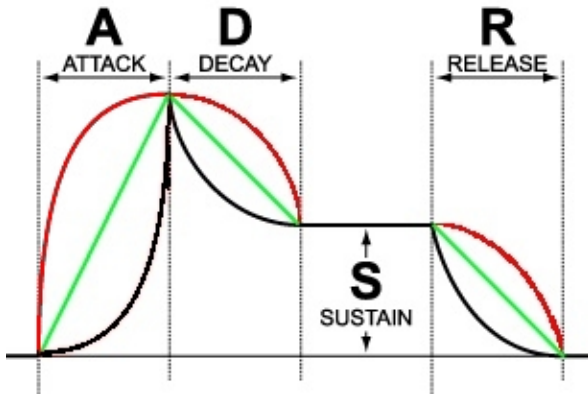
A (Attack): 1 to 10,000 (1 millisecond to 10 seconds)

D (Decay): 1 to 10,000 (1 millisecond to 10 seconds)

S (Sustain): 0% to 100% amplitude

R (Release): 1 to 10,000 (1 millisecond to 10 seconds)

At 0, time constants are linear; at positive values, the envelope slopes become more concave (below, in black), for a punchier response. Negative values result in a more convex slope shape, for smoother response (below, in red.)



VEL sets the VCF cutoff in relation to the Note On velocity.

Range: 0 to 100

SHAPE determines the contour of the envelope time constants.

Range: -50 to 50

3.2.4 Voltage Controlled Amplifier (VCA)



The VCA envelope controls the note level from trigger to release:

A (Attack): 1 to 10,000 (1 millisecond to 10 seconds)

D (Decay): 1 to 10,000 (1 millisecond to 10 seconds)

S (Sustain): 0% to 100% amplitude

R (Release): 1 to 10,000 (1 millisecond to 10 seconds)

VEL sets the envelope depth in relation to the Note On velocity.

Range: 0 to 100

SHAPE determines the contour of the envelope time constants.

Range: -50 to 50

PUNCH controls the dynamic transient enhancer which makes for a “snappier” attack.

Range: On/Off

3.2.5 Low-Frequency Oscillators (LFOS)



CODEX features four LFOs: two free and two synchronized. The free LFOs have a continuous cycle time control, while the synched LFOs are voice-triggered and use musical note values (based on the host BPM) to determine the oscillation rate.

TYPE controls the LFO waveform shape.

Range: Sine, Saw Down, Saw Up, Triangle, Pulse, S&H (random)

RATE controls the frequency of the free LFO.

Range: 0.1 to 100 Hz

TIME controls the rate of the synched LFO, locked to the project's BPM.

Range: 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

LED pulsates at the same rate as the LFO.

3.2.6 Envelope 3



In addition to the filter and the VCA envelopes, CODEX includes an envelope generator that can be freely assigned to selectable destinations via the modulation matrix.

A (Attack): 1 to 10,000 (1 millisecond to 10 seconds)

D (Decay): 1 to 10,000 (1 millisecond to 10 seconds)

S (Sustain): 0% to 100% amplitude

R (Release): 1 to 10,000 (1 millisecond to 10 seconds)

VEL sets the envelope depth in relation to the Note On velocity.

Range: 0 to 100

SHAPE determines the contour of the envelope time constants.

Range: -50 to 50

3.2.7 Modulation Matrix



The Modulation Matrix allows the patching of modulation sources to selectable destinations.

PHASE inverts the phase, per assignment. Depending on the phase setting, this will change the direction of the modulation.

Range: On/Off

SRC determines the modulation source.

Range: LFO1, LFO2, LFO3, LFO4, Env3, Modwheel, Keyboard, Velocity, Aftertouch, Bender, VCF Envelope, Sequencer

DEST determines the destination of the modulation source.

Range: Global Pitch, OSC 1 Freq, OSC 1 Resolution, OSC 1 Formant, OSC 1 Table, Scan 1 Start, Scan 1 Mid, Scan 1 End, Scan 1 Speed, OSC 2 Freq, OSC 2 Resolution, OSC 2 Formant, OSC 2 Table, Scan 2 Start, Scan 2 Mid, Scan 2 End, Scan 2 Speed, OSC 2 FM, Sub, Noise, Ring, OSC Mix, VCF Cutoff, VCF Res, VCF FM, VCF Env, VCF A, VCF D, VCF R, VCF Crv, VCA, VCA A, VCA D, VCA R, VCA Crv, Pan, HP, LP, Dist, Crusher, Chorus, Delay Mix, Delay Rate, Reverb, Porta, LFO 1 Rate, LFO 2 Rate, LFO 3 Rate, LFO 4 Rate, Env3 A, Env3 D, Env3 S, Env3 R, Env3 Crv, Arp/Seq Rate, Arp\Seq Gate, Mod 1, Mod 2, Mod 3, Mod 4, Mod 5, Mod 6

MOD sets the degree to which the modulation source affects the destination.

Range: 0% to 100%

3.2.8 Arpeggiator/Sequencer (ARP/SEQ)



The ARP/SEQ section functions both as a traditional arpeggiator and as a 16-step sequencer. Each sequencer step has an In/Out toggle as well as a pitch control which may be set +/-24 semitones from the currently held note.

MODE determines the operational mode.

Range: Off, (Arp) Up, (Arp) Down, (Arp) Up/Down, (Arp) Random, Sequence

OCT determines the range, in octaves, of the arpeggiator.

Range: 1, 2, 3, 4

RATE sets the arpeggiator rate. The drop-down menu activates the host BPM sync function and sets the rate using note values. When the rate is set to Free, the host BPM sync is off and the rate is set manually using the knob on the right.

Range: Free (host BPM sync off; range 1 to 50 Hz), 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

GATE determines the length of each sequencer step as a percentage of its note length.

Range: 5% to 100%

STEPS determines the number of steps in the current sequence.

Range: 1 to 16

HOLD enables latching of arpeggiator and sequencer notes after the keys are released.

RTRG enables re-triggering of arpeggiator and sequencer notes when new notes are played.

SWING pushes even-numbered notes/steps toward the next odd-numbered note/step, to create a shuffle/swing feel.

Range: 0 to 100

3.2.9 Effects (FX)



DIST controls the amount of distortion effect. Distortion is applied per voice, eliminating IMD (inter-modulation distortion.) Settings below 50% create a warm, saturated drive effect; settings above 50% result in a more aggressive, “crunchier” sound.

Range: 0% to 100%

PRE VCF is a toggle control which determines the placement of the distortion effect in the signal path, either pre-VCF or post-VCF.

Range: Pre/Post

CRSHR is a distortion-like effect which simulates a reduction in the sample-rate and resolution of the sound.

Range: 0 to 100

DELAY is a stereo delay which allows separate delay times for left and right channels, using note values.

- **LEFT** sets the delay time for the left channel.
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
- **RIGHT** sets the delay time for the right channel.
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
- **MIX** determines the amount of delay effect in the mix.
Range: 0 to 100
- **FEEDBACK** determines the amount of gain fed back to the delay input.
Range: 0 to 100

REVERB controls both the amount and size of the virtual plate reverb sound. In addition to increasing the amount of reverb, higher values also increase the reverb size and time.

Range: 0 to 100

CHORUS determines the amount of chorus modulation.

Range: 0 to 100

3.2.10 EQ



The EQ section is a 4-band fixed-frequency graphic equalizer with high-pass and low-pass filters. At high boost levels, the EQ saturates with different tonal qualities than the Distortion module.

HiPASS controls the high-pass filter frequency.

Range: 20 to 20,000 Hz

LoPASS controls the low-pass filter frequency.

Range: 20 to 20,000 Hz

100 controls equalization at 100 Hz.

Range: -30 to +30 dB

600 controls equalization at 600 Hz.

Range: -20 to +20 dB

1500 controls equalization at 1500 Hz.

Range: -20 to +20 dB

9000 controls equalization at 9000 Hz.

Range: -25 to +25 dB

3.2.11 Global and Out Sections



TEMPO displays the current tempo.

Range: 1 to 300

SOURCE determines the clock source.

Range: Host, Internal

BEND RANGE determines the range of the pitch bender.

Range: 0 to 12

VOICES determines the number of voices that can be played simultaneously.

Range: 1 to 32

GAIN sets CODEX's overall output volume, after all generators and processors.

Range: -80 to 0 dBFS

METER displays CODEX's overall output energy.

CHAPTER 4 – STANDALONE APPLICATION

The CODEX standalone application requires an ASIO driver for Windows or a Core Audio driver for Mac OS-X.

CODEX.exe (Win) or CODEX.app (MAC) loads the CODEX instrument and configuration preferences dialogs.

The standalone application's menu file contains three items:

- All Notes Off – sends an All Notes Off MIDI command to the CODEX synthesizer, useful in cases of “stuck” sustaining notes.
- Preferences – displays the preferences dialog for Audio, MIDI, and user settings.
- Exit

THE PREFERENCES DIALOG

The preferences dialog allows configuration of Audio, MIDI, and user settings.

Audio offers control over the following parameters:

- **Device** displays the audio devices available on the system.
- **Output Channels** allows selection of audio outputs from the selected device.
- **Sample Rate** allows selection of sample rate.
- **Control Panel** (Windows) launches the selected ASIO device's control panel for selection of buffer size and latency.
- **Buffer Size** (Mac) allows selection of buffer size, which determines latency.

MIDI offers control over the following parameters:

- **MIDI Input Device** displays a list of available MIDI input devices on the current system, allowing you to select the MIDI device through which to receive MIDI data.
- **Input Channel** – CODEX standalone is ready to receive MIDI in OMNI mode from all channels. The MIDI channel control allows the selection to receive MIDI input only from certain channels as selected in the checkboxes.


Load Previous Settings – When checked, loads with the settings used most recently; when unchecked, loads with default settings.

CHAPTER 5 – THE WAVESYSTEM

5.1 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 no matter which plugin you are using.

Toolbar Functions

	Opens the plugin's 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.
Load Filter	A CODEX-exclusive toolbar which lets you specify whether certain preset characteristics should be loaded. See the next section for details.
L/R Arrows	Moves 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

5.2 Preset Handling

Preset Types

Factory Presets are permanent presets in the Load menu. Factory presets cannot be overwritten or deleted.

User Presets are your favorite settings of the plugin, saved as presets 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



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.

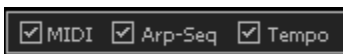
Open Preset File... Select to open any setup or preset file, whether from the Library or your own creations.

'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.

Load with Preset – MIDI, Arp/Seq and Tempo



The Load with Preset filter is a CODEX-exclusive custom toolbar that lets you choose whether or not to load certain preset characteristics such as MIDI assignments, arpeggiator/sequencer settings, and tempo. When checked, these parameters are loaded. Here are some practical examples:

MIDI – Let’s say you’ve assigned a MIDI controller knob to CODEX’s VCF cutoff. Loading the next preset will reset this parameter; you will then have to redo the MIDI Learn routine in order to attach the knob to the control. However, if you uncheck the MIDI checkbox, the next preset will be loaded, but the current MIDI assignment will remain in place.

Arp-Seq – Let’s say you have a bass line arpeggio that you like, and you want to test the pattern using a different sound. Uncheck the Arp/Seq checkbox, and the preset will be loaded without any associated Arp/Seq settings, leaving the pattern as is.

Tempo – Let’s say you are working on an arpeggio with an internal tempo of 140. Loading presets may set the tempo to a different value or to the value determined by your host computer. To ignore tempo settings saved with other presets, uncheck the Tempo box, and your current tempo setting will remain in place when other presets are loaded.

Saving Presets and Setups



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' – "Preset Name" Overwrites the settings of the loaded preset (whether a 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 none is open, the option is grayed out). You will be prompted to give the preset a name.

Put into Preset Menu As... Saves the current settings into a User Preset that will remain 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.

Please note: Special characters (!, @, #, %, ^, etc.) are not supported in preset names.

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



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, you can copy them to Setup B by clicking on the Copy to B button, then altering Setup A and comparing 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.

5.3 Interface Controls

Controls can be in one of three states:

- **Not Selected**, where the control is not the target of any user entry.
- **Selected**, where the control is the target of mouse control entry only.
- **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, while 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 either **click-and-drag** adjustment or **direct control via the keyboard**.

- **Using the mouse**, click-and-drag 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 the mouse to select the button, then go up/down or 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 will stay selected but remain at the current setting.

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

Sliders

Click or scroll the mouse wheel on the slider itself or anywhere within the slider's track. The numerical value of the slider settings is displayed in a hover window above the slider path.

Hover Box

Hover boxes will appear and display the control value when you hover 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, Macs have an option-TAB function for 'down' movement and a shift-option-TAB function 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.

5.4 Waves Preferences (Pro Tools only)

When launching Pro Tools, hold Shift to view the Waves Plugin Preferences window.

The following options are available:

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