

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.

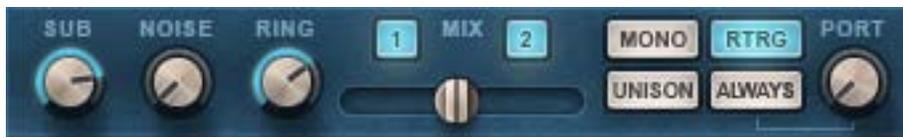
When activated, OSC 2 pitch controls affect only the timbre of OSC 2, not its pitch.

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:

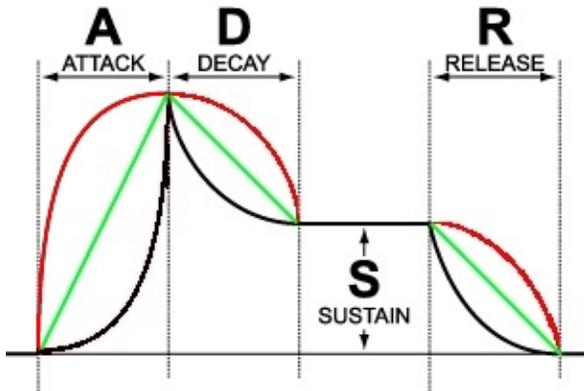
A (Attack): 1 to 10,000 (1 millisecond to 10 seconds)

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: -30 to +30 dB

1500 controls equalization at 1500 Hz.

Range: -30 to +30 dB

9000 controls equalization at 9000 Hz.

Range: -30 to +30 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

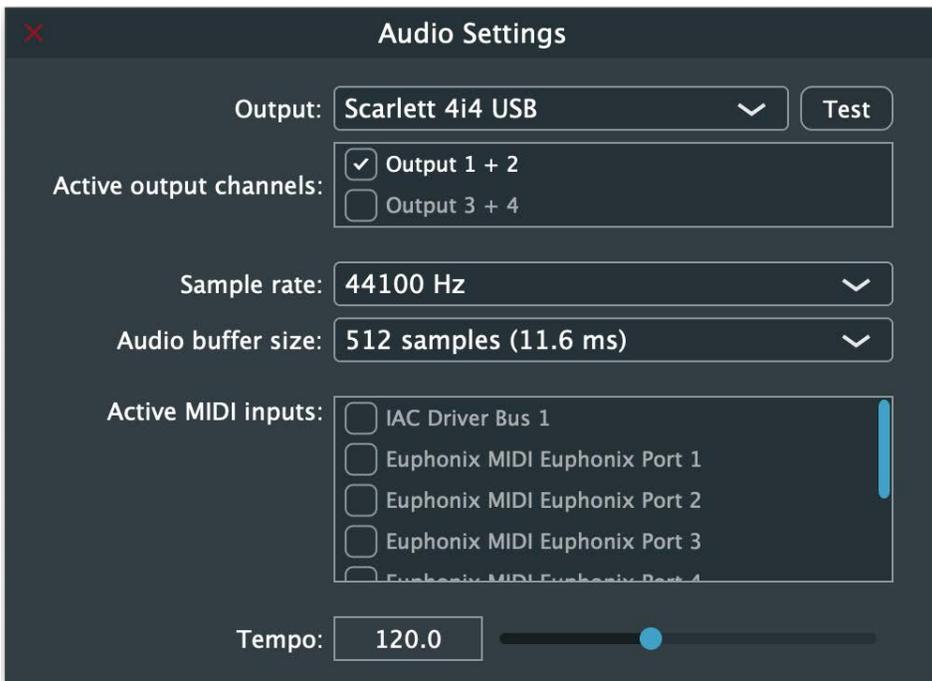
METER displays CODEX's overall output energy.

CHAPTER 4 – STANDALONE APPLICATION

The CODEX application can be used as a standalone instrument. It requires ASIO drivers for Windows or Core Audio for macOS. Codex.exe (Win) or codex.app (Mac) loads the CODEX instrument and configuration preferences dialogs. Set up the standalone application from its File menu:

- All Notes Off Sends an All-Notes-Off MIDI command to CODEX. This is useful in cases of “stuck” sustaining notes.
- Preferences Displays the Preferences dialog for the Audio, MIDI, and User Choices configurations.

PREFERENCES



Output displays the audio devices available on the system.

Test plays a sound if the outputs are configured correctly.

Active Output Channels allows selection of audio outputs from the selected device.

Sample Rate displays and sets the sample rate.*

Audio Buffer Size displays and sets the buffer size, which influences latency.*

*In Windows, sample rate and buffer size cannot be changed from this panel. To modify these settings: close the application, adjust sample rate and buffer size with



Windows Only

your driver's control panel (link shown below), and then relaunch.

Active MIDI Inputs displays a list of available MIDI input devices on the current system. Select the MIDI device for receiving MIDI data.

Tempo: Sets the tempo for all relevant plugins. By default, tempo-based Waves plugins are in a “tempo listen” state and will fix to this value.

CHAPTER 5 – THE WAVESYSTEM

Use the bar at the top of the plugin to save and load presets, compare settings, undo and redo steps, and resize the plugin. To learn more, click the icon at the upper-right corner of the window and open the WaveSystem Guide.