AudioKit Synth One

THE ULTIMATE GUIDE

FRANCIS PREVE

Preface

“I would teach children music, physics, and philosophy; but most importantly music, for the patterns in music and all the arts are the keys to learning.”
— Plato.

When first asked by AudioKit to write the guide to using Synth One, I realized that this was an opportunity to share my decades of experience with thousands of budding artists. Some might be in school, while others may be lifelong learners who are just beginning with synthesizers. Writing this book was a chance to transfer some of the knowledge from the Synthesis 1 courses I’ve taught as a college professor. Bringing my understanding of sound to the next generation of electronic music artists and producers is an honor.

What you hold in your hand is the essence of forty years of synthesizer programming, compiled into a short iBook that explains the tools within Synth One, while also demonstrating the essential concepts for using *every* analog synthesizer, from the Minimoog to the Minilogue. It’s been a labor of love for over a year and I hope it helps ***you*** reach new levels of creativity.

For those who want to continue their exploration of synthesis and sound design via other software tools, please visit francispreve.com for more tutorials—and free downloadable presets at symplesound.com.

Finally, as with *all* of my previous books, this guide is dedicated to Seabrook Jones. With love...

Chapter 1

Exploring Synth One

Getting started with AudioKit Synth One

USES FOR SYNTH ONE

1. **Musical Instrument**
2. **Sequencer**
3. **Sound Effects**
4. **Microtonal Scales**

> **Note:** This guide also includes a bank of 40 presets that demonstrate each of the techniques explained in this book.
>
> The “Ultimate Guide Tutorial Presets” is now included as part of AudioKit Synth One, so you can hear each synthesis concept in this guide applied to Synth One’s tools.

About Synth One

AudioKit Synth One is an iOS synthesizer created by Matthew Fecher, Aure Prochazka, and Marcus Hobbs—in addition to contributions from over a hundred volunteer engineers for this international open source project.

Synth One development began in 2016, and the iPad app was launched on June of 2018, with an iPhone version released in January 2019.

Since those releases, Synth One has been downloaded by thousands of musicians and won multiple awards, as well as helping countless artists get started in the world of synthesis and sound design. Synth One has also become a part of many forward-thinking educational programs, both in K-12 and higher education. As such, it's arguably the most groundbreaking synthesizer in the iOS App Store.

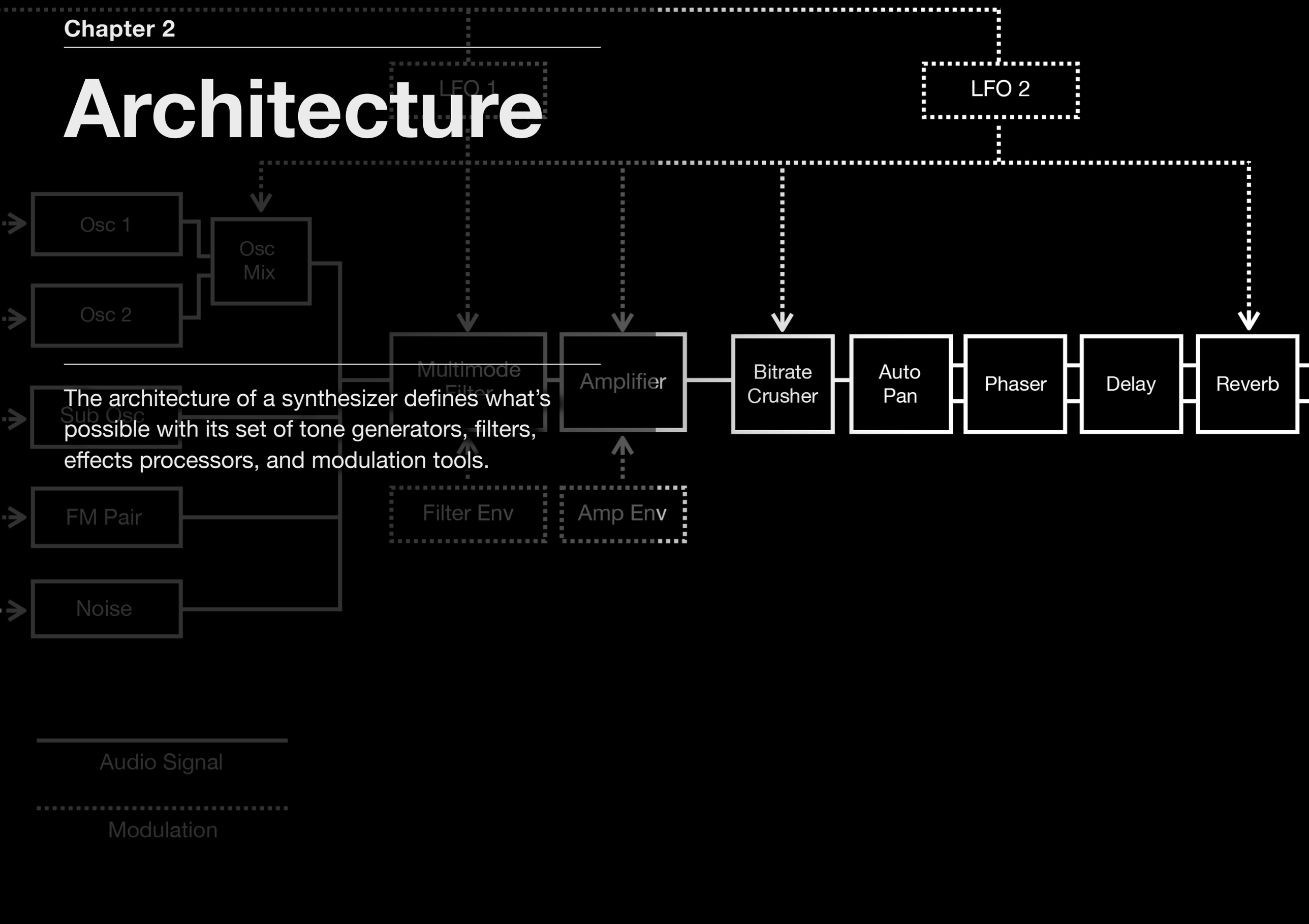
Learning the basics of synthesis requires understanding the functions of many common audio tools. In Synth One, these components are organized in the form of “panels” that can be freely swapped using the panel navigation buttons on the right side of each section. On the iPhone (or when the keyboard is expanded on an iPad) only one panel is visible at a time. On an iPad, you can access *two* panels when the keyboard is in “Hide” mode. Seeing both panels at once is the ideal way to learn Synth One.

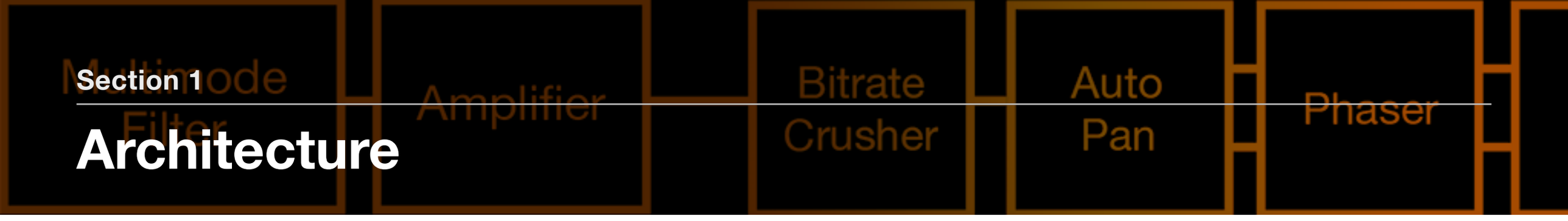

AudioKit Synth One
Web
Apps
Filter Envelope: 55%
Save
More
Panic
About
OSC 1
OSC 2
Master Volume
Filter
Low Pass
Glide
TUNE
Semitones
Mono
Legato
Preset/Value Display
This section lets you select presets. When not in use, it displays parameter values in real-time.
Panel 1 Navigation
These Arrows move between parameter panels, allowing you to reconfigure the user interface.
Sub
Volume
Mix
FM
Noise
-24
Volume
OSC 1
OSC 2
OSC 1-2
Volume
Mod
Volume
Anti-Aliasing
Widen
Arp
120 bpm
PAD
Filter Envelope
Amplitude Envelope
Panel 2 Navigation
These Arrows move between parameter panels, allowing you to reconfigure the user interface.
Global Settings
This section lets you configure the MIDI and performance settings for Synth One.
Attack
Decay
Sustain
Release
Env Amt
Sustain
Release
Pitch Track
Keyboard
The resizable keyboard lets you play notes in either ET12 or microtuned scales
Settings
Wheels
Keys
Link
Hold
Mono
MIDI Learn
Transpose:
0
Octave:
0
Show

Chapter 2

Architecture

The architecture of a synthesizer defines what's possible with its set of tone generators, filters, effects processors, and modulation tools.





Section 1

Architecture

ARCHITECTURE AND SYNTHESIS PANELS

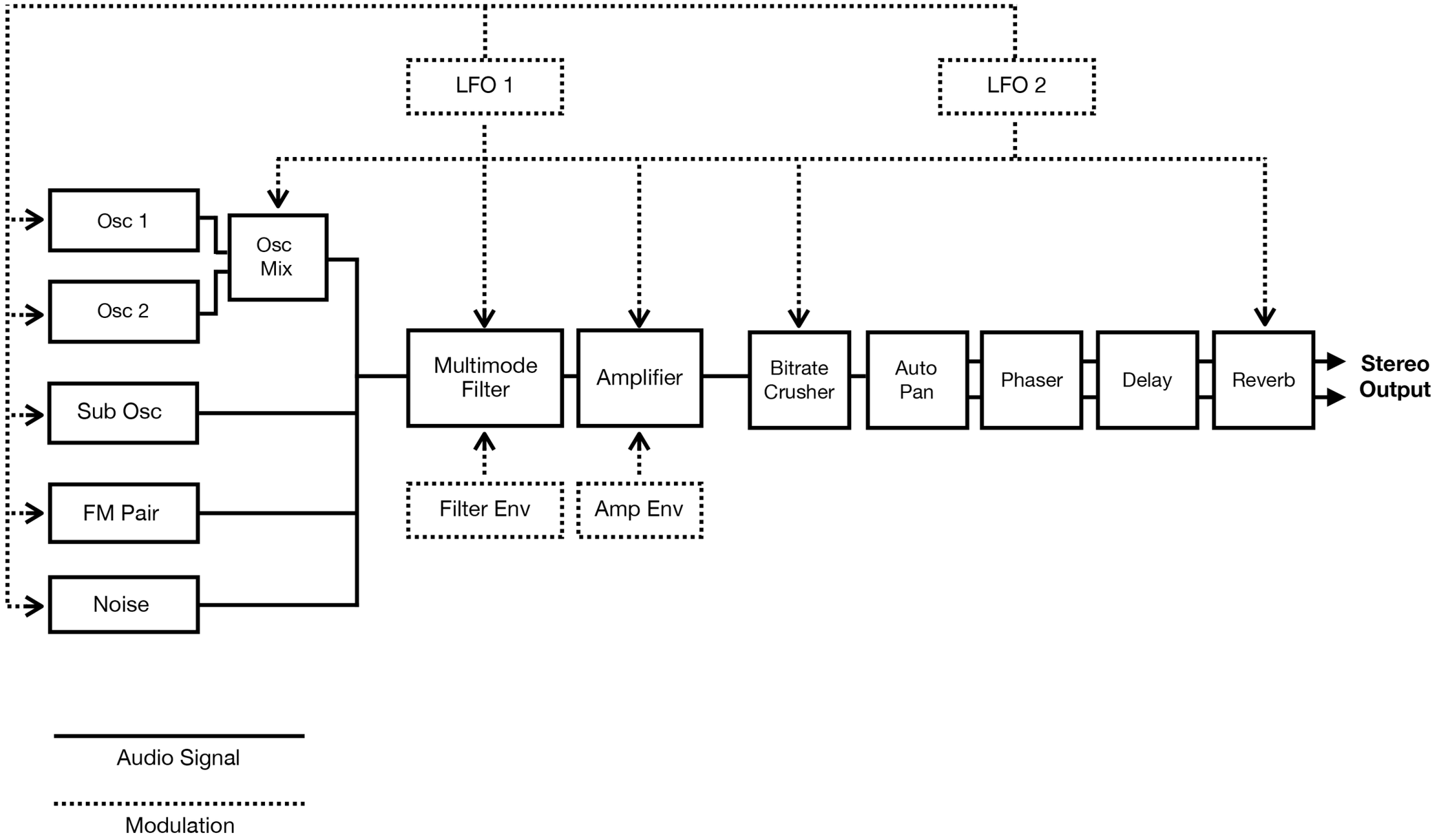
Architecture

In addition to circuitry or software, the ***architecture*** of a synthesizer is one of the primary factors in determining its overall sound. For example, the architecture of a Minimoog is three oscillators and a noise generator, routed into a low-pass filter, with independent envelopes for amplifier and filter cutoff. The architecture of a Roland SH-101 consists of one oscillator (with mixable waveforms), a sub-oscillator, and a noise generator feeding a low-pass filter and amplifier, with a *single* envelope for both—but also including a flexible LFO and step-sequencer. Similar concepts, but different architectures.

Synth One uses a somewhat different signal flow than either of the above synths. There are two oscillators, a sub-oscillator, an FM pair, and a noise generator. These are mixed, and then processed by a multi-mode filter and amplifier. At the end, there are several effects. LFOs are also available for adding motion to the sound.

Since Synth One has a sophisticated set of tools, this chapter includes a flow chart that shows its synthesizer and processing elements for creating or editing sounds, with labels and descriptions for each module.

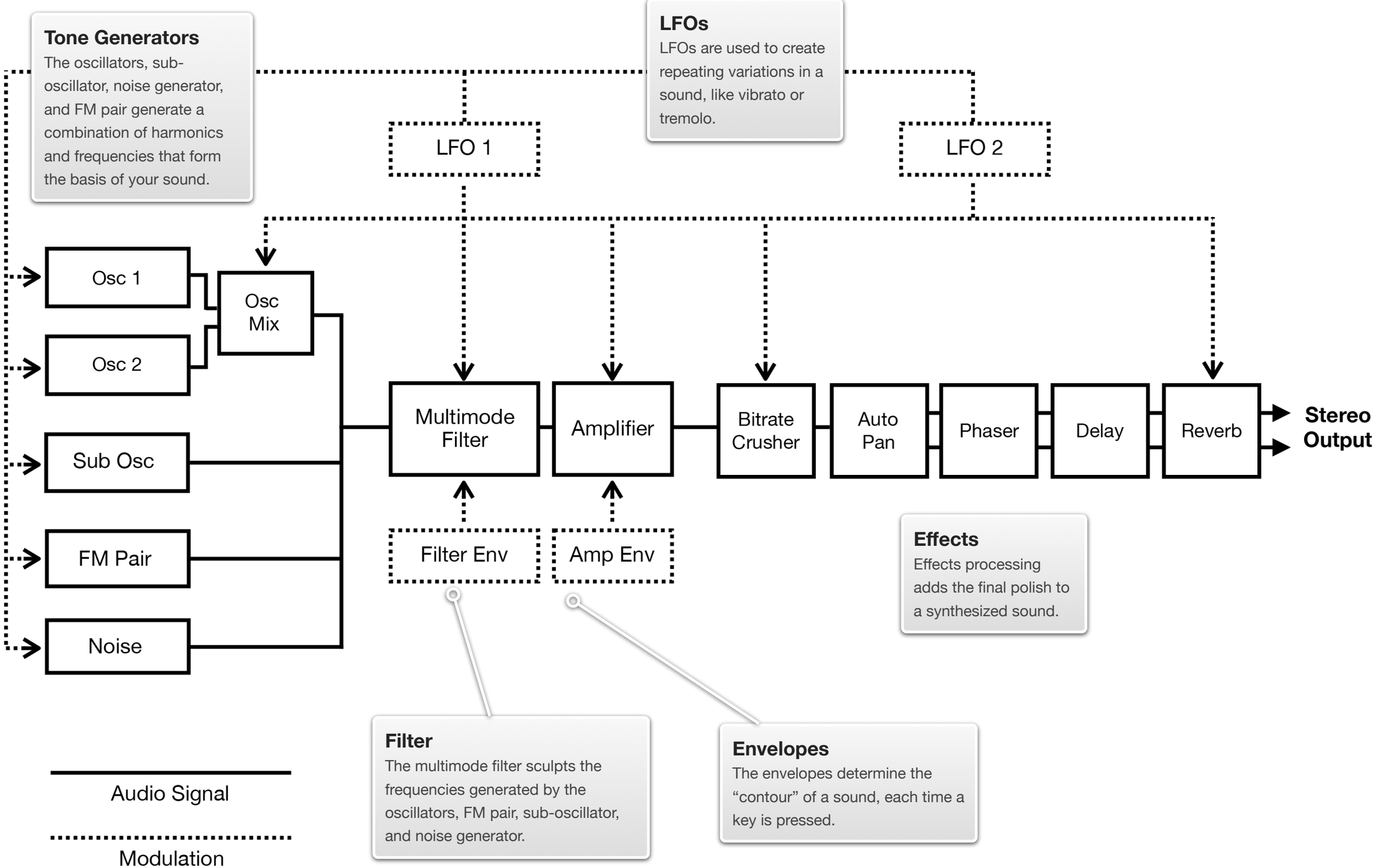
If you're new to synthesis, don't be intimidated by these graphics. ***All*** synthesizers have a signal flow—just like a guitarist's effects pedals—so learning how your sounds are created and processed is an important part of this journey.



This diagram shows the signal flow and modulation routing for Synth One's synthesizer functions.

Tone Generators
The oscillators, sub-oscillator, noise generator, and FM pair generate a combination of harmonics and frequencies that form the basis of your sound.

LFOs
LFOs are used to create repeating variations in a sound, like vibrato or tremolo.



Effects
Effects processing adds the final polish to a synthesized sound.

Filter
The multimode filter sculpts the frequencies generated by the oscillators, FM pair, sub-oscillator, and noise generator.

Envelopes
The envelopes determine the “contour” of a sound, each time a key is pressed.

Section 2

Panels

SYNTH ONE PANELS

1. Preset Manager
2. Main Panel
3. Envelope Panel
4. Effects and LFO Panel
5. Tune Panel
6. Performance & MIDI

Understanding The Synthesis Panels

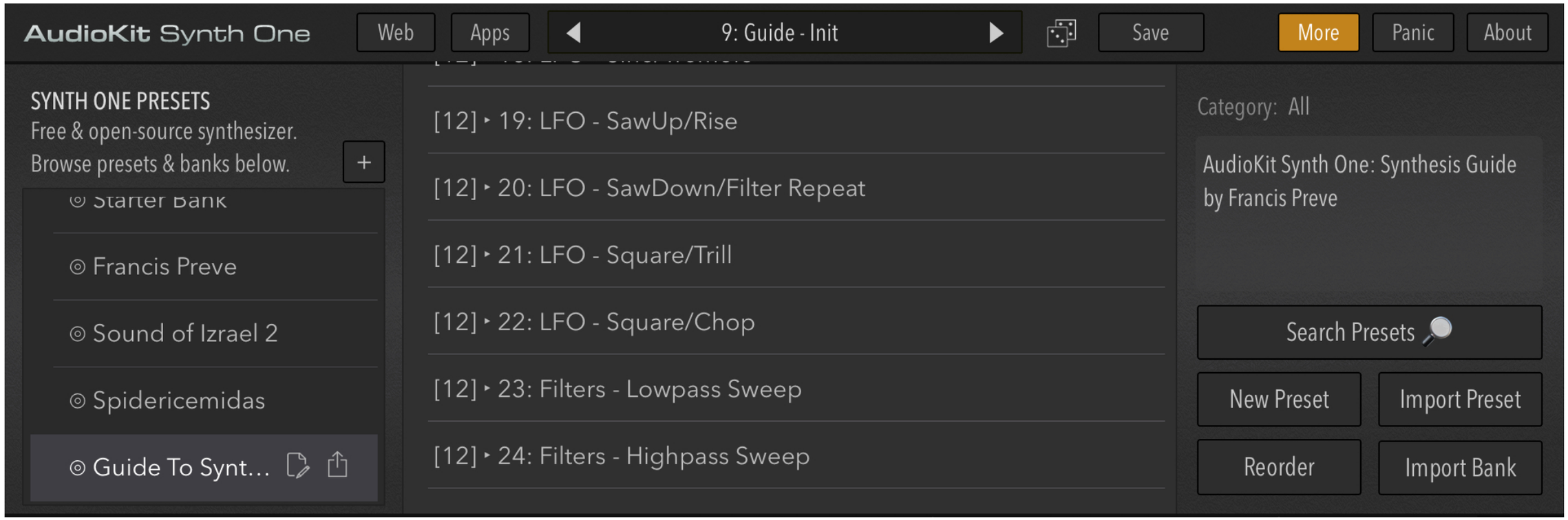
Each Panel in Synth One contains a specific set of tools for a design task. Using the navigation arrows on the right side of the screen lets you switch between panels—and on an iPad, you can configure two panels at once to make your synthesis work even easier.

Later chapters in this guide go into much more detail about the specifics of each synthesis function, so it helps to familiarize yourself with the location of these various tools, which are grouped based on their use.

If you're using an iPad, having two panels onscreen lets you set up the interface for specific tasks. For example, if you're starting from scratch on an "Init" preset, you'll want to configure the interface with the Main Panel and the Env Panel visible, so you can create the basic tone for your sound.

Once you have a sound you like, you can add motion and effects by swapping the Env Panel for the FX Panel and fine-tune your sound even more.

If you're performing—or using Synth One as a synchronized tone-generator via Ableton Link—you can set these panels up as Pad and Seq, allowing you to play a sequence while manipulating Filter and LFO properties in real-time. In the following pages, we'll explain the tools available on each panel.



Preset Manager

The best way to understand a synthesizer's "personality" is by exploring its presets.

Clicking a preset's name opens Synth One's preset manager, which lets you hear and use sounds from a variety of designers.

A bank of demonstration presets for each concept is now included in the latest release of Synth One, so if you're using this iBook to learn more about synthesis, be sure to download the most current version of Synth One and look for "Ultimate Guide Tutorial Presets".

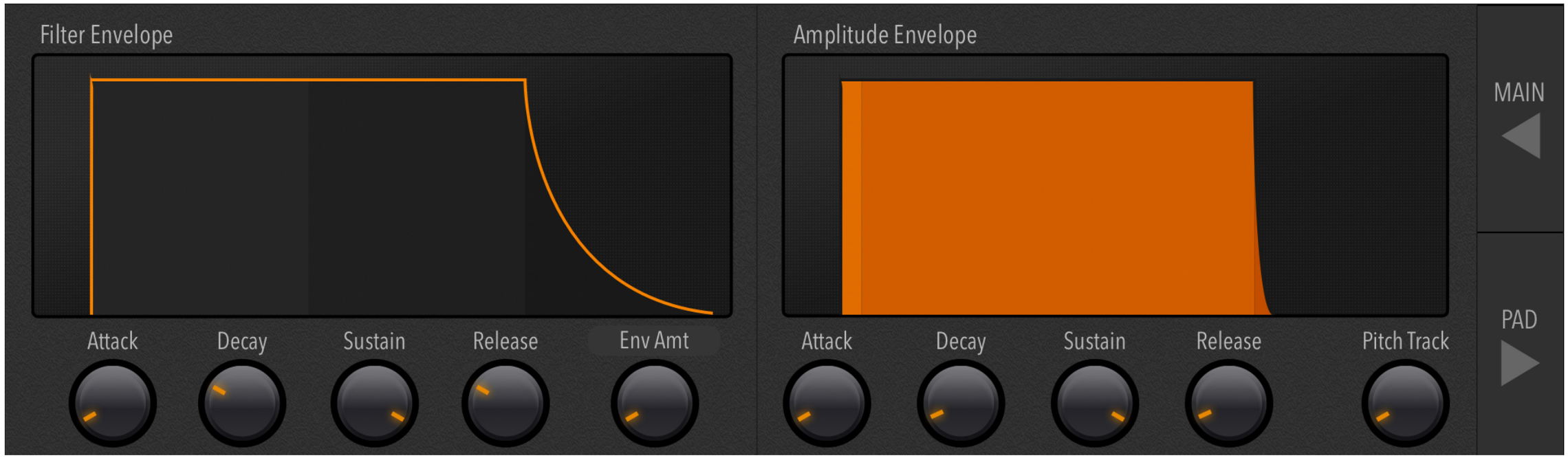
Next, we'll look at each of the synthesis panels for the various tone generating and processing functions.

Main Panel

The Main panel contains the primary tone generation tools for creating sounds in Synth One. Once you've got the basic sound created, you can then add motion via envelopes and LFOs—or process the sound with effects.

The modules on the Main panel include two oscillators, a sub oscillator, an FM carrier/modulator pair, a noise generator, and the mixing tools used to blend these tone generators into an original sound. Since Synth One uses *subtractive synthesis* (like many vintage analog synths) there's also a filter on this panel for removing frequencies from the tone generators, a little bit like an EQ. There are additional parameters for adding glide (portamento) and refining the sound with anti-aliasing and stereo widening.

A full explanation of the Main panel's features can be found in the Tone Generators and Filters chapters.



Envelope Panel

The Envelope Panel accesses two different types of envelope, for controlling how the sound begins, changes over time, and ends (when you release a key).

The Amplifier envelope governs the volume of the sound.

The Filter envelope controls the timbre of the sound, based on the filter type that's selected on the Main panel.

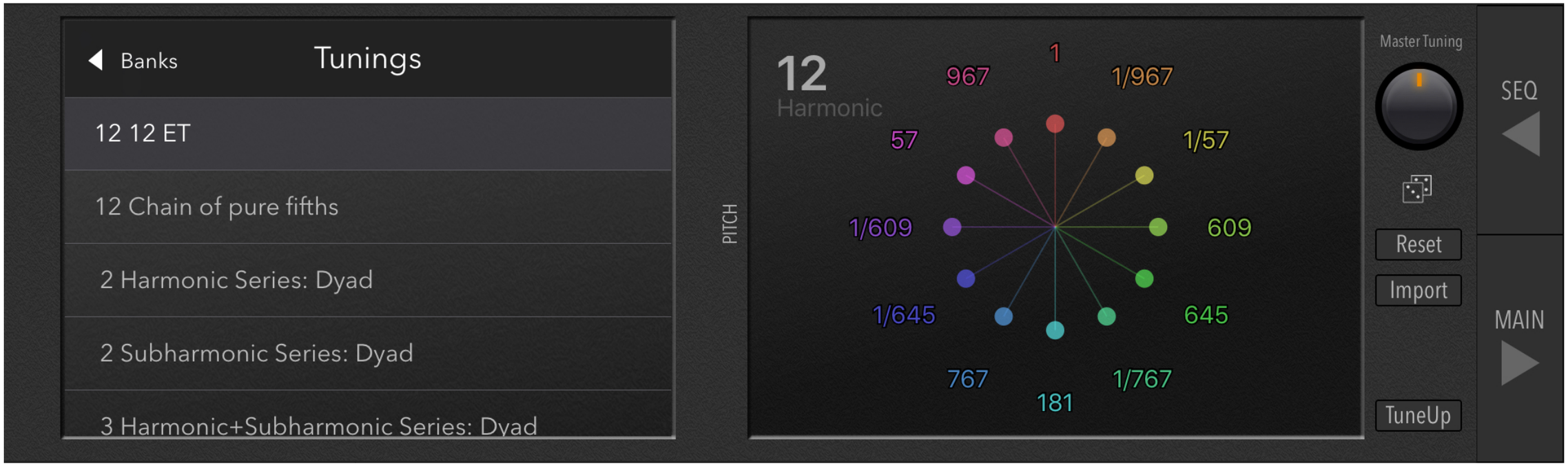
A full explanation of the Envelope Panel can be found in the Modulation Sources chapter.

FX Panel

The FX panel includes modules for both effects processing and LFO parameters, which let you animate your sound using modulation techniques like vibrato (pitch), tremolo (volume), and several types of harmonic motion.

These effects include bit-crushing (bitrate crusher), auto-panning, phaser, delay, and reverb. The architecture diagram, earlier in this chapter, shows the order of these signal processors.

The two LFOs can be assigned to multiple destinations simultaneously, with each LFO having its own independent rate and waveform. Each LFO can also be synced to tempo for rhythmic effects.



Tune Panel

In addition to the most common 12-tone Equal Temperament scale that's the primary standard for Western (and mainstream) musical styles, the Tune panel also offers a massive assortment of unusual and experimental ***microtonal*** scales for exploring other approaches to music and sound design.

These tuning parameters and microtonal scale modes are covered in detail in this guide's Tuning chapter.

Seq Panel

The Sequencer panel lets you program Synth One's integrated step sequencer, for creating original musical patterns and rhythms.

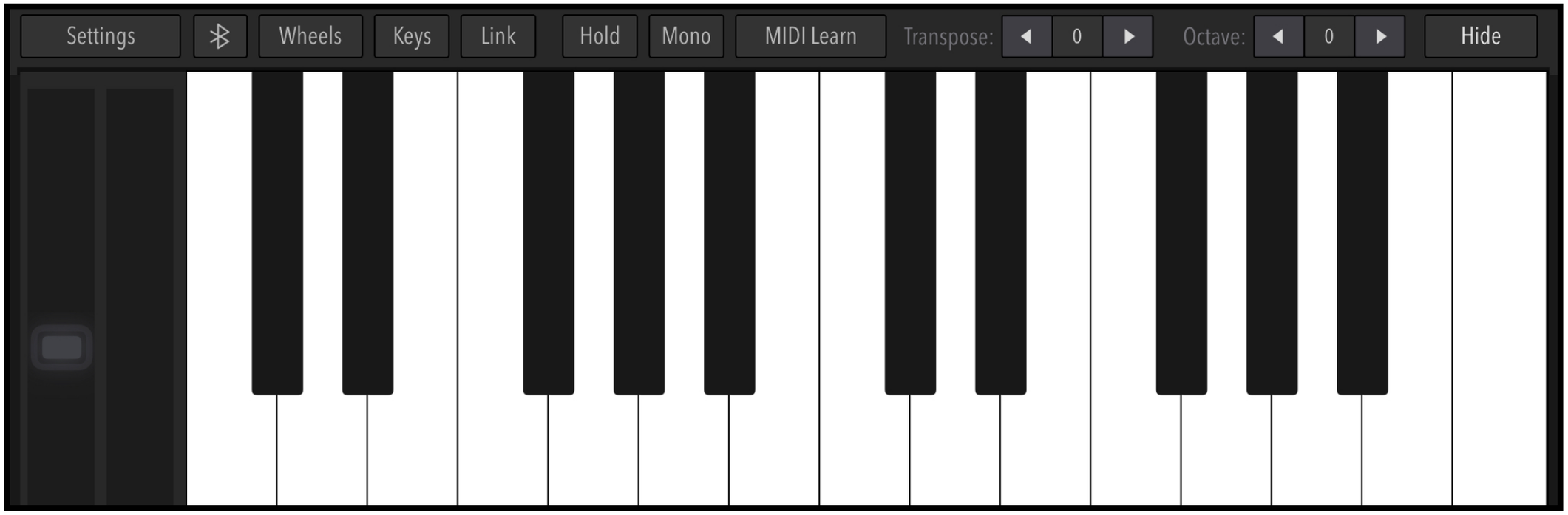
Controls for the Arpeggiator functions are also available at the top of this panel.

More details can be found in the Performance & MIDI chapter.

Pad Panel

The Pad panel includes two independent X-Y pads for controlling the behavior of both LFO 1 and the Filter with one finger each. This panel is very useful for live performance, in conjunction with the Sequencer panel.

The Performance & MIDI chapter includes information on using these pads.



Global Settings and Keyboard

In addition to offering a multi-octave keyboard for playing chords and melodies directly from your iOS device, this section also lets you configure the performance settings, MIDI behavior, keyboard layout, and global preferences.

The Performance & MIDI chapter includes detailed information on configuration and MIDI control.

Chapter 3

Tone Generators

Whether it's plugging a guitar into a string of effects pedals or a vocalist singing in a recording studio with EQ and reverb, every sound begins with a pitched component. For synthesizers, this element is often called a tone generator, which encompasses everything from oscillators to noise sources to FM algorithms.

Section 1

Oscillators

REFERENCE PRESETS

1. **Sine Wave - Trap Bass**
2. **Triangle - Flute**
3. **Square - 8-bit Game**
4. **Square - Woodwind**
5. **Sawtooth - Analog Brass**
6. **Sawtooth - Analog Strings**
7. **Pulse - String Machine**
8. **Pulse - Clavinet**
9. **Pulse - Reed/Oboe**
10. **Sub Osc - Synth Bass**
11. **FM Tone**
12. **Noise Burst**

Oscillators—whether digital or analog—are tone generators that create quickly repeating waveforms to serve as the basis for further processing. Whether they're analog-style oscillators, FM operators, or wavetable oscillators, the output of an oscillator is a rapidly cycling waveform with specific harmonic content.

Some waveforms—like sawtooth, square, and pulse waves—are extremely "bright" and contain many high-frequency harmonics, which can be modified with a filter.

Other waveforms—like sine and triangle—produce minimal harmonics and are suitable for supporting brighter waveforms, emphasizing specific frequencies, or adding bass.

Many famous analog synths are based on just **four** simple waveforms: Sine, Triangle, Square, and Sawtooth. The Minimoog, Sequential Prophet 5, ARP Odyssey, and Roland Jupiter-8 *all* use multiple oscillators with two or more of these waveforms for their tone generation capabilities. The secret is learning how to combine several oscillators to create unique tones with specific harmonics.

AudioKit Synth One offers four different types of oscillators for creating original tones.

There are two primary oscillators (OSC 1 and OSC 2) that use wavetable synthesis to smoothly transition between triangle, square, pulse, and sawtooth, so you can

create hybrid tones that combine aspects of two waveforms. This adds a lot of complexity to their signal.

OSC 1 and 2 can be tuned and mixed to create intervals (like octaves or fifths) or subtle detuning effects that add richness to the sound.

The sub-oscillator adds a sine or square wave to your sound. This is generated one octave below the fundamental frequency, which is the note you are playing. Its volume knob changes the level of its signal in relationship to the oscillators.

For example, if you play Middle C, the sub-oscillator will generate a sine or square wave one octave below Middle C. There's also a button labeled "-24" that will lower the pitch to *two octaves* below the note you are playing, so this is a useful tool for adding bass to your sound.

The FM section is a fourth tone generator that consists of two sine wave oscillators: Carrier and Modulator—sometimes called a "classic FM oscillator pair". These are always tuned to the fundamental (the note you are playing).

The FM volume knob, increases the level of the Carrier, which alone can be used to increase the "fullness" of your sound. The Mod knob adjusts the amount of FM applied to the Carrier and increases its brightness by changing its shape. Higher values add more harmonics to the signal. If you're already familiar with FM synthesis, note that the modulator and carrier are both tuned to the first harmonic, creating a 1:1 ratio relationship.

Understanding Waveforms and Harmonics

RELATED PRESETS

1. **Sine Wave - Trap Bass**
2. **Triangle - Flute**
3. **Square - 8-bit Game**
4. **Square - Woodwind**
5. **Sawtooth - Analog Brass**
6. **Sawtooth - Analog Strings**
7. **Pulse - String Machine**
8. **Pulse - Clavinet**
9. **Pulse - Reed/Oboe**

Every waveform has its own harmonic spectrum, also known as its “timbre”. Every musical instrument has a timbre, which is one of the primary ways that our ears distinguish it from others in a band or music production. For example, the timbre of a guitar is different than the timbre of a flute because of their harmonics. Thus, timbre is the sonic “fingerprint” of that instrument.

Here’s a list of the waveforms available in Synth One:

Sine

The sine wave is the carrier waveform of the FM section, and is heard when the modulation (Mod) amount set to minimum (0). The sine wave is the building block of all sound and consists of a single frequency. Used alone, the simplicity of a sine wave can be a useful tool for bass **(ProTip: Trap and hip-hop basses often consist of a sine wave)**, but it can also be used for simple flutes or bell tones when shaped with the appropriate amp envelope. Every harmonic consists of a single sine wave.

Note: *Because a sine wave contains no additional harmonic content, filtering will have no audible effect on it, other than reducing its volume.*

Square

The square wave consists of only *odd* harmonics, descending in volume *linearly*. Its timbre is often called “hollow” as it bears a resemblance to woodwind instruments like clarinet, recorder, and flute.

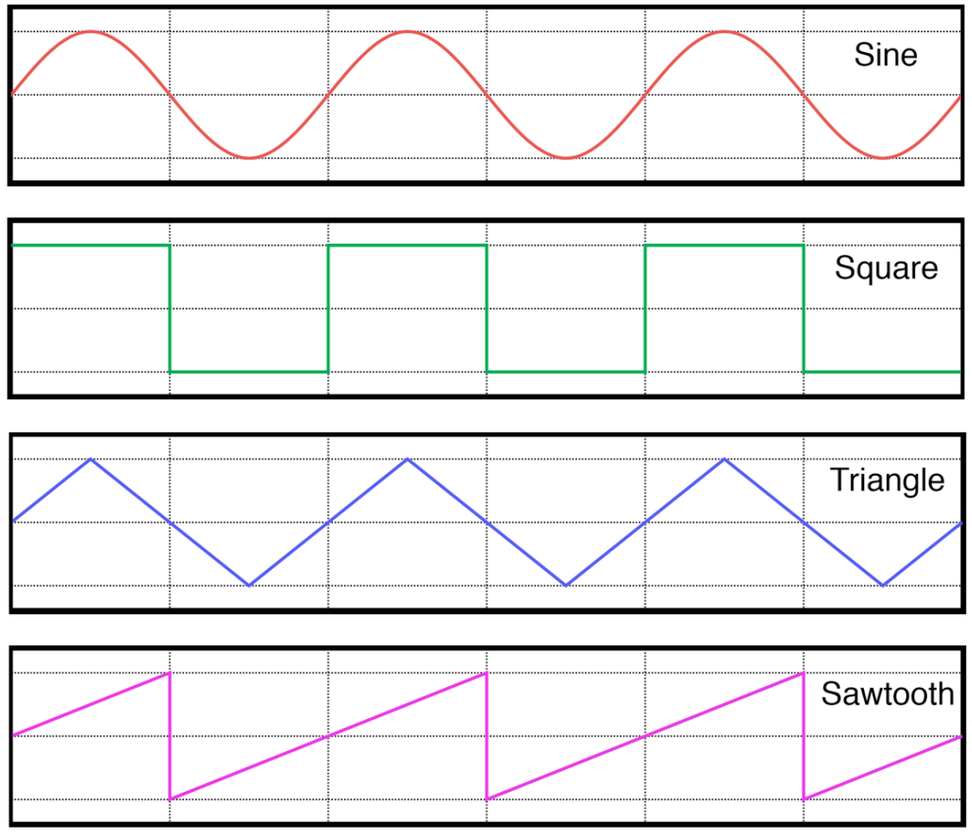
Since the square wave consists of rapidly alternating levels, it is the easiest waveform to create digitally, as it can be recreated by quickly alternating between 1 (maximum) and 0 (minimum). This is why the square wave was so popular as the dominant tone in vintage video games—it required very little CPU to generate.

Triangle

Triangle waves also consist entirely of odd harmonics, but these are descending in volume *exponentially*. Because of this, the high harmonics are softer and are not as bright as a square wave, but they still produce a similar “hollow” tone.

Because of the lack of upper harmonics, filtering has very little effect on triangle waves, but they’re excellent for adding body and fullness when blended with other waveforms, like a “brighter” sine wave.

Gallery 3.1 Waveforms and their specific harmonics



This image displays the waveform shapes, the next image shows the harmonics for each waveform.

Sawtooth

The sawtooth waveform consists of all harmonics, descending in volume *linearly*. It is very bright, with many high frequencies, which makes it very flexible in conjunction with filtering.

The combination of both even and odd harmonics makes the sawtooth useful for emulating acoustic instruments like strings and brass, but it can also be used for obviously synthetic sounds like pads and plucks.

Pulse

By varying the duration of the “up” and “down” states of a square wave, which is 50% up and 50% down, pulse waves can be created. These have a more nasal sound than the hollow, flute-like sound of a square wave, and are sometimes referred to as “reed-like”. Their timbre is dependent on the ratio of up and down, so pulse waves have a wide range of applications in emulating acoustic instruments like oboes and violins. With a percussive envelope, they can simulate the Clavinet keyboard. For more obviously synthetic sounds, pulse waves are often used for vintage string textures.

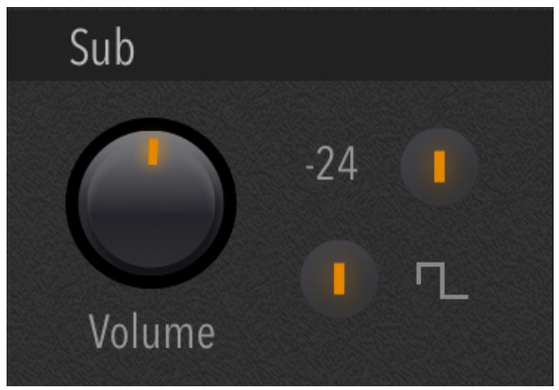
Section 3

Additional Tone Generators

RELATED PRESETS

1. Sub Osc - Synth Bass
2. FM Tone
3. Noise Burst

Sub Oscillator



The sub-oscillator generates a tone that is one or two octaves below the note you are playing, depending on whether “-24” is active (two octaves). Its waveform can be either a sine wave or a square wave.

Selecting the square wave is useful for recreating the sound of vintage single-oscillator synthesizers like the Roland SH-101, while the sine wave is better for increasing low-end, a bit like a specialized EQ that tracks notes.

FM Oscillator

The FM oscillator is a “classic FM oscillator pair” tuned to a 1:1 carrier:modulator ratio. This specific ratio creates a series of all integer harmonics that vary in volume depending on the Mod (modulation) depth.

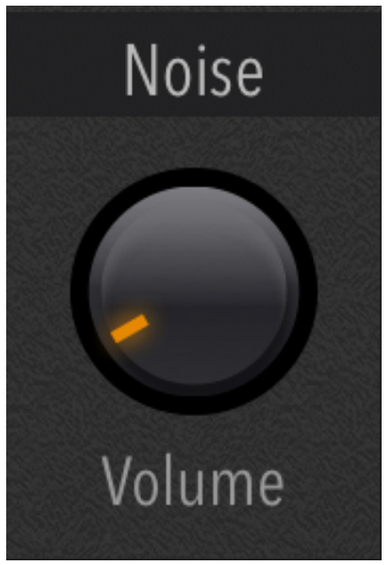
With the Mod parameter set to zero, the FM oscillator generates a sine wave at the pitch of the note you are playing. This is the

first harmonic—also known as the fundamental—and can be used to add “body” to a sound. Increasing the value of the Mod parameter transforms the sine wave to a much brighter, “digital” waveform.

Setting the Mod value to a low-to-medium range and then blending the volume of the FM section is an excellent way to add tonal depth to Oscillators 1 and 2.

Noise Generator

Scientifically speaking, white noise is a complex randomized signal that contains all frequencies at equal volume. This sound depends on filtering for its texture and tonal shape.



The sound of noise is common in nature. When used in conjunction with a low-pass filter, it can resemble waves or wind. When used with a high-pass filter, it can sound like hissing. Blended with a triangle or sine wave, it can be used to simulate the sound of air—or breath—in an instrument.

Mixing and Tuning

RELATED PRESETS

1. **Tuning - Multi Octave**
2. **Tuning - Fifth**
3. **Tuning - Major Triad**
4. **Tuning - Minor Triad**
5. **Tuning - Detuned Sawtooths**

Mix and Tuning Combinations

Mixing and tuning multiple tone generators to different intervals is an essential design technique for creating a wide range of sounds by blending different sources. Detuning is another way to add complexity and thickness to sounds.

The following presets in the Learning Synthesis Bank demonstrate these concepts by tuning the tone generators

Tuning - Multi Octave creates a big sound by stacking all of the tone generators at different octaves.

Tuning - Fifth creates a familiar sawtooth lead sound by tuning oscillator 1 to the root (fundamental) and oscillator 2 to a fifth (7 semitones) above it.

Tuning - Major Triad creates a major chord by using the FM generator to provide the root (fundamental) then using oscillator 1 to add the major third (4 semitones) and oscillator 2 to add the fifth (7 semitones).

Tuning - Minor Triad creates a techno chord stab by starting with the Major Triad configuration, but tuning oscillator 1 at 3 semitones and adding a percussive filter envelope.

Tuning - Detuned Sawtooths sets oscillator 2’s detuning to a value of 4.0

Section 5

Understanding Harmonics

RELATED LINKS

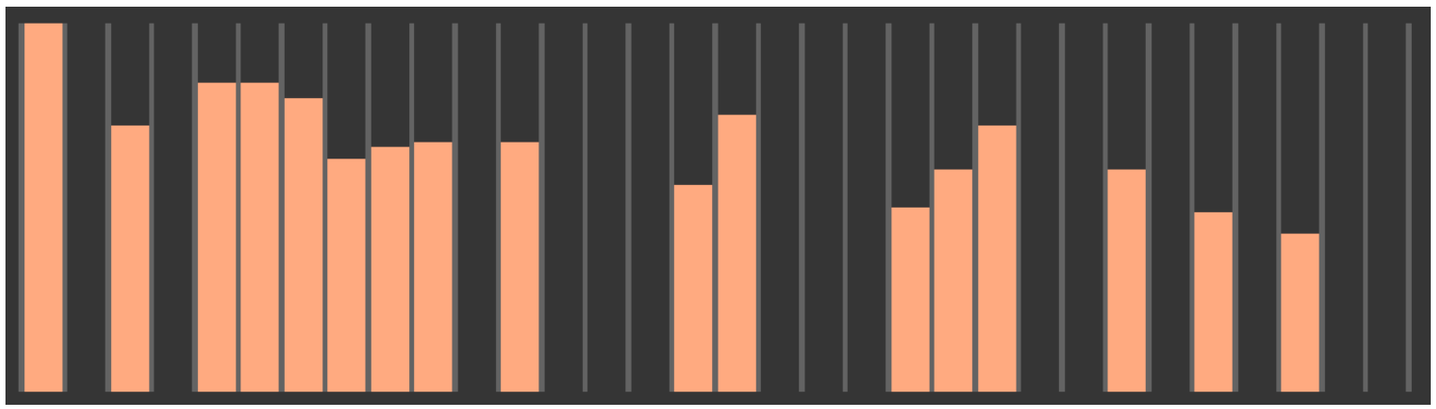
1. **Harmonic Series (Wikipedia)**
2. **Harmonic Series in Music**
3. **The Harmonic Series (Oberton)**
4. **Harmonic Series Overview (Hub Guitar)**

What are harmonics?

The harmonic series forms the basis of both timbre and tuning in music and consists of a set of sine waves that correspond to exact frequencies in relationship to the “fundamental” harmonic.

The fundamental harmonic is the first harmonic in a given harmonic set and correlates with the note you are playing. For example, if you play Middle C using a sine wave with the FM generator (see the FM section of the oscillator chapter) you’ll hear ***only*** the first harmonic at around 262 Hz, with no additional harmonics.

Each successive harmonic is also a sine wave that’s mathematically related to the fundamental as an integer multiple. Additionally, octaves occur every time the frequency doubles. Below is an example of customized harmonics displayed in Ableton Operator.



If calculating harmonics sounds too “mathy”, here’s a simple description of the first eight harmonics as notes using the Equal Temperament scale:

1st Harmonic: Fundamental (the note you are playing)
2nd Harmonic: 2x Fundamental - one octave higher than the fundamental
3rd Harmonic: 3x Fundamental - one octave plus one fifth higher than the fundamental, plus two cents (1/100th of a semitone)
4th Harmonic: 4x Fundamental - one octave higher than the 2nd harmonic, or two octaves above the fundamental
5th Harmonic: 5x Fundamental - a major third higher than the 4th harmonic, minus fourteen cents
6th Harmonic: 6x Fundamental - a fifth higher than the 4th harmonic, plus two cents
7th Harmonic: 7x Fundamental - a minor seventh higher than the 4th harmonic, minus thirty-one cents
8th Harmonic: 8x Fundamental - also, one octave higher than the 4th harmonic, or three octaves above the fundamental

Note: The harmonic series extends upward infinitely, but optimum human hearing has a theoretical maximum of around 20000 Hz (Hertz, or cycles per second). This can also be written as 20 Hz to 20 kHz (kilohertz).

Thus, if the first harmonic is Middle C at 262 Hz, these are the frequencies for the first eight harmonics.

1st Harmonic: 262 Hz
2nd Harmonic: 2 x 262 = 524 Hz (an octave above middle C)
3rd Harmonic: 3 x 262 = 786 Hz
4th Harmonic: 4 x 262 = 1048 Hz (two octaves above middle C)
5th Harmonic: 5 x 262 = 1310 Hz
6th Harmonic: 6 x 262 = 1572 Hz
7th Harmonic: 7 x 262 = 1834 Hz
8th Harmonic: 8 x 262 = 2096 Hz (three octaves above middle C)

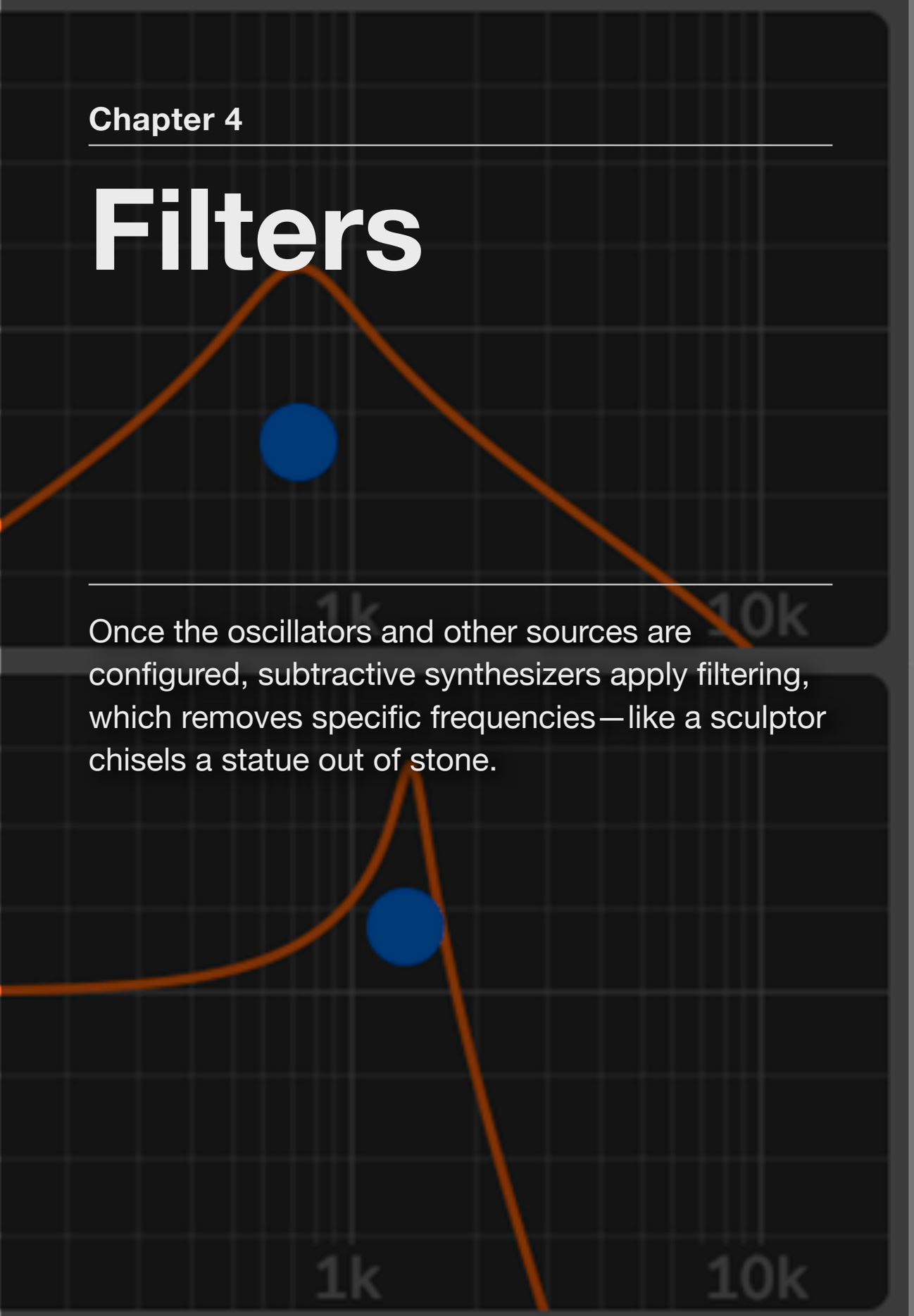
While each harmonic can be played as a note in a musical context (see the Tune chapter for more information), more commonly, we hear groups or “chords” of harmonics as timbre. Timbre is the word used to describe the “color” or “identity” of a given musical instrument. For example, a flute has a harmonic set that emphasizes odd harmonics, while brass or stringed instruments often contain all of the harmonics. It’s the volume of each harmonic in a note that helps us determine which instrument we are hearing.

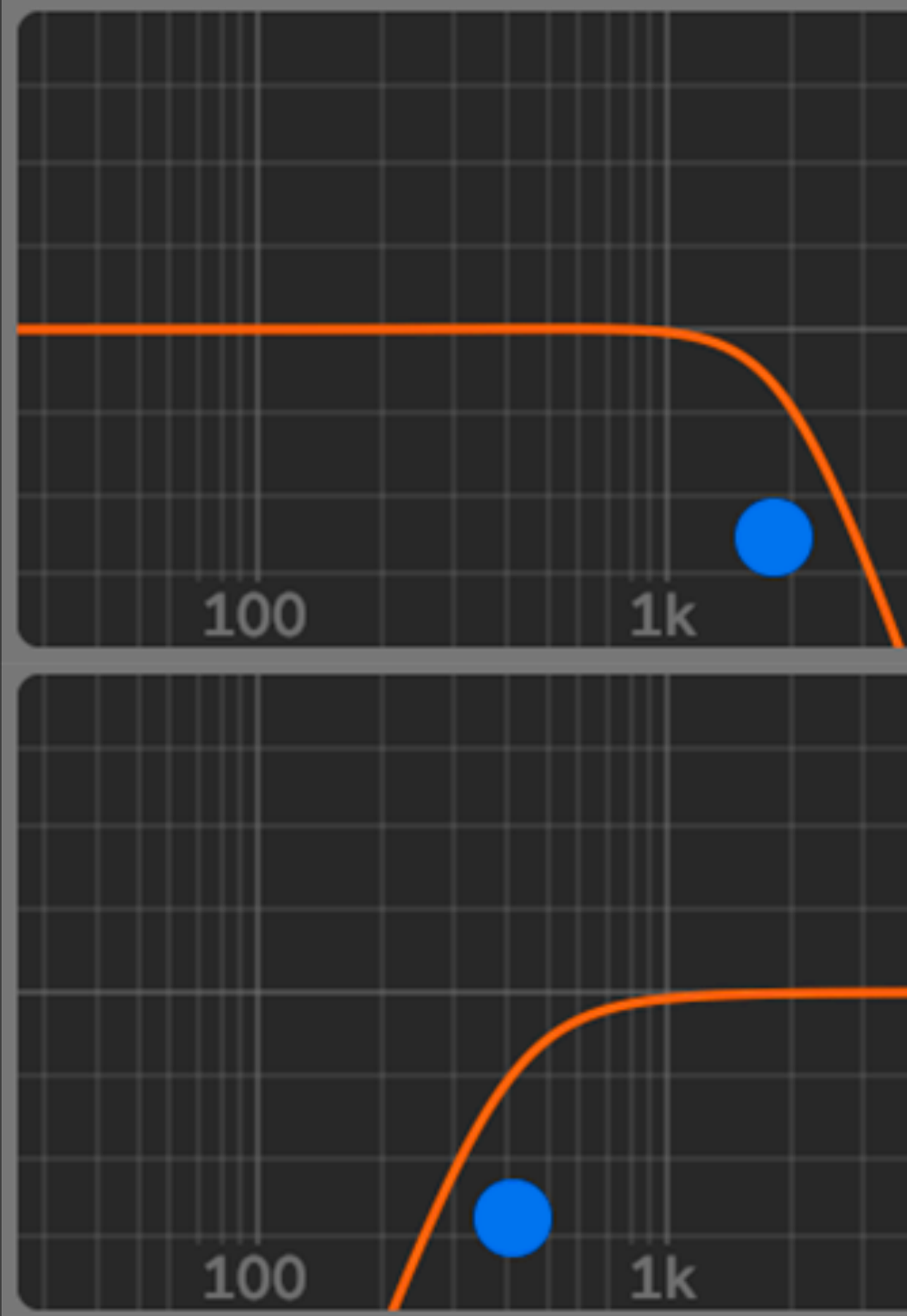
But we can also use the harmonic series to play a form of music tuning called “microtonal”. Synth One’s Tune panel allows us to select and use these microtonal scales.

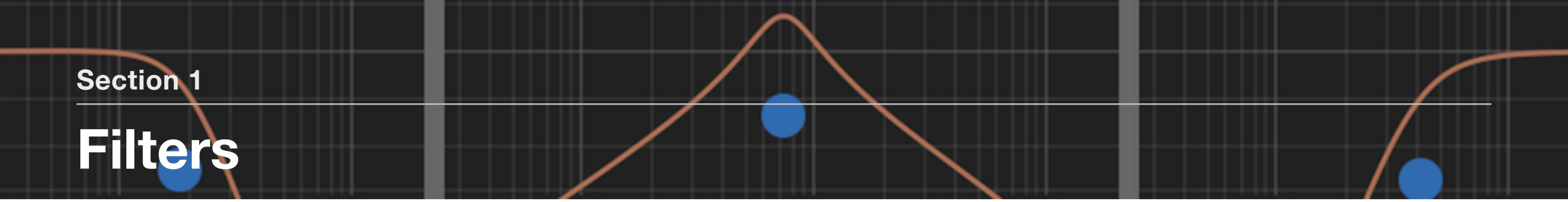
Chapter 4

Filters

Once the oscillators and other sources are configured, subtractive synthesizers apply filtering, which removes specific frequencies—like a sculptor chisels a statue out of stone.







Section 1

Filters

RELATED PRESETS

1. Filters - Lowpass Sweep
2. Filters - Lowpass Resonant Sweep
3. Filters - Highpass Sweep
4. Filters - Bandpass Sweep

Subtractive Synthesis and Filtering

Synth One is a *subtractive synthesizer*, much like *every* mainstream analog synthesizer of the past 50 years. “Subtractive synthesis” simply means that a complex combination of one or more tone generators serves as the basic sound, which then has some of its frequencies removed—or “subtracted”—to create a new sound.

The tool for this subtraction is called a “filter” and functions like an advanced and extreme EQ, a bit like bass or treble controls on your car stereo or other music player.

There are many filter types, and each type subtracts a different frequency range. Synth One includes three specific filter modes. These are used to sculpt the output of the blended oscillators and noise source to refine the overall sound of your designs.

This chapter explores three of the most common filter modes available on synthesizers and how they apply to Synth One.

Low-pass Filters

A low-pass filter is the most common filter found on classic analog synths. It is also the filter that closely resembles the behavior of many acoustic and natural properties.

Low-pass filters remove higher frequencies while allowing lower frequencies to pass. The point at which these frequencies are attenuated is called the Cutoff Frequency. In a low-pass filter, all frequencies below the cutoff frequency are passed while the frequencies above the cutoff are reduced in volume. This is somewhat similar to lowering the treble EQ control on a stereo, but with far more extreme results.

Many low-pass filters, including the filter on Synth One, also include a Resonance parameter. This increases the volume of the cutoff frequency itself, creating a “ringing” tone at that frequency. If you increase the resonance and then sweep the value of the cutoff parameter, you’ll hear a squelchy/squeaky effect, similar to the sound associated with the Roland TB-303.

Low-pass filters also benefit from modulation sources like the envelope or LFO, which will automatically sweep the cutoff for repeating or dynamic effects.

Gallery 4.1 Examples of low-pass filters

Synth One’s low-pass filter includes control over cutoff frequency and resonance.

Using envelope modulation, many instruments, ranging from plucks to brass to squeaky techno basses can be recreated via this filter motion.

High-pass Filters

High-pass filters are the opposite of low-pass filters. That is, they remove low frequencies while allowing the upper frequencies to pass. As with the low-pass, this frequency is set by the Cutoff parameter.

In Synth One, the high-pass filter is non-resonant and doesn't emphasize the selected frequency of the Cutoff parameter.

Gallery 4.2 Examples of high-pass filters

Synth One's non-resonant high-pass filter mode includes a cutoff frequency parameter.

Band-pass Filters

Band-pass filters are hybrids of both low-pass and high-pass, allowing a range of frequencies to pass while reducing the volume of frequencies outside that range. Here, the aptly-named “Width” parameter adjusts the range of the band of frequencies that are passed, a bit like a parametric EQ.

Band-pass filters are the same filter type as those found in guitar wah-wah pedals, so this mode is useful for similar effects, especially when the frequency is modulated with an LFO or mod wheel.

Gallery 4.3 Examples of band-pass filters

Synth One’s band-pass filter mode includes control over the central filter frequency and the width of the range that is passed

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Note: The Modulation chapter includes information and tutorials on techniques for modulating filter parameters.

Chapter 5

Modulation Sources

Without some sort of motion, sounds can be static and lifeless. Modulation sources like LFOs and envelopes let you animate the oscillators, filters, and effects—breathing life into your sounds.

Section 1

Modulation Sources

RELATED PRESETS

1. LFO - Sine/Vibrato
2. LFO - Sine/Tremolo
3. LFO - Square/Trill
4. LFO - Square/Chop
5. LFO - SawUp/Rise
6. LFO - SawDown/Filter Repeat
7. Envelope - Resonant Decay
8. Envelope - Lowpass Swell

Modulating Parameters

Tone generators, processed by filters, and then routed into an amplifier, are the basis for subtractive synthesis, but without modulation tools, the results can be static and flat.

Modulation sources—specifically envelopes and LFOs—add motion to the main tone generation elements, making them dynamic and interesting. Synth One includes two LFOs and two envelopes that can be used to animate many of the synthesis parameters in distinctive ways.

This chapter covers the use of Synth One's synthesis modulation tools: Envelopes and LFOs

Section 2

Understanding LFOs

RELATED PRESETS

1. **LFO - Sine/Vibrato**
2. **LFO - Sine/Tremolo**
3. **LFO - Square/Trill**
4. **LFO - Square/Chop**
5. **LFO - SawUp/Rise**
6. **LFO - SawDown/Filter Repeat**

Understanding LFOs

The term LFO is an acronym for Low Frequency Oscillator. In the early days of voltage controlled synthesis, oscillators could be tuned below the range of human hearing, so that their cycles were too *slow* to be heard as musical pitches. However, in this low frequency range, their *voltages* could be used to modulate the behavior of other properties of oscillators, filters, and amplifiers in a repeating manner. The “shape” of these repetitions is determined by the waveform of the modulating LFO.

For example, a triangle or sine wave LFO can be used to modulate the pitch (frequency) of an oscillator to create vibrato. Alternately, if that sine or triangle LFO was applied to volume (amplifier), the result would be tremolo—an effect often found on guitar amplifiers. Applying this waveform to cutoff frequency, especially with a band-pass or low-pass filter, creates a wah-wah effect as the LFO modulates the timbre (harmonics) of the signal. And that’s just using a standard triangle wave!

The choice of waveform and the rate of the LFO can create a *very* wide range of effects, especially when applied to other synthesis functions. Below is a list of the waveforms in Synth One (and many other synthesizers) and their effect on different synthesizer elements.

Synth One includes two LFOs that can be *simultaneously* routed to multiple synthesis and effect parameters. In this section, we'll explore the specifics of LFO 1 and LFO 2 and how to use them. The associated presets listed at the beginning of this chapter will provide examples of many of the techniques described.

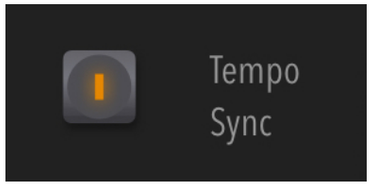
LFO Rate

Each LFO has its own Rate control, which governs the speed of the LFO modulation.

LFO Amount

The intensity of the LFO modulation is controlled by the Amount parameter. This is applied to all destinations that are assigned to that specific LFO. The Routing section explores these options in depth.

Rate/Tempo Sync



Pressing the Tempo Sync button locks the LFOs to Synth One's master tempo for rhythmic effects. With Tempo Sync off, the LFOs run freely, which can be more appropriate for natural effects like vibrato.

LFO Waveforms

Sine wave

Sine waves—and on some synths, triangle waves—are the most common modulation waveform in synthesis. Because of their shape, they smoothly transition between two values, which optimizes them for recreating the motion of vibrato (pitch), tremolo (volume), and wah-wah (filter) effects.

Square wave

Square waves switch between two equidistant values that are determined by the LFO depth. Applied to oscillator pitch, this will simulate “trills”, which are created when a performer alternates between two notes. Applied to volume or filter cutoff, square waves create a chopped, pulsing effect.

Sawtooth (up)

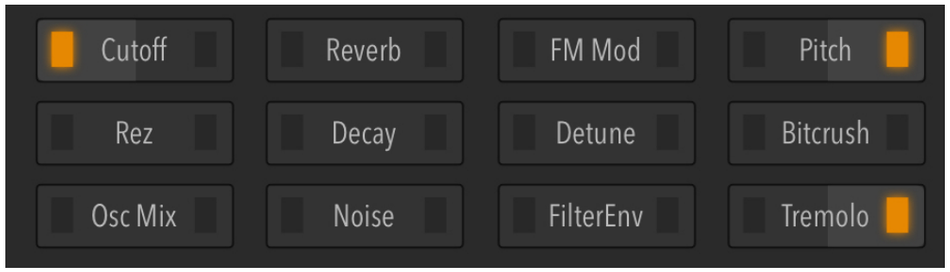
Upward sawtooths, sometimes referred to as “ramp” waves, begin at a low value and rise to their maximum (set by the LFO depth) then drop immediately back to the original value and repeat the rise, based on the LFO speed. When applied to pitch with an extremely slow LFO speed, this waveform is useful for creating EDM “riser” effects. With volume and filter cutoff, the result is reminiscent of a backward recording.

Sawtooth (down)

Downward sawtooth waves start at a high value and smoothly descend to a lower volume before repeating. Applied to volume/amp, this is an excellent tool for simulating echoes. Applied to filter cutoff, it can be used for sounds that repeat like a sequence or arpeggiator. Applied to pitch, they’re also useful for “alarm” sounds.

LFO Modulation Routing

The yellow button on each destination assigns either LFO 1 or LFO 2 to a specific parameter. The LFO modulation depth is applied globally to all assigned destinations. The global depth is controlled by the correlating LFO amount parameter.



Cutoff: Modulates the cutoff frequency of the filter. Good for adding wah-wah effects.

Reso: Modulates the resonance of the filter. Useful for unusual timbral animation when LFO 1 modulates cutoff and LFO 2 modulates resonance.

Osc Mix: Modulates the blend of oscillators 1 and 2. Also good for timbral effects, especially when tempo-sync is active.

Reverb: Modulates the wet/dry Mix of the Reverb effect. This can be used to simulate spatialized “echo” effects.

Decay: Modulates the Decay time of the Amp envelope. When synced, this can be used in conjunction with the sequencer to emulate the effect of changing gate lengths.

FM Mod: Modulates the modulator depth of the FM oscillator pair. This is useful for rhythmic timbral effects and sweeps.

Detune: Modulates the depth of Oscillator 2 detuning, but only if Osc 2’s detuning is set to a value other than zero (0).

FilterEnv: Modulates the depth of the filter envelope modulation amount, which is also useful when synced within a sequence.

Pitch: Modulates the pitch of all oscillators for vibrato and trill effects.

Bitcrush: Modulates the amount of the Bitrate Crusher effect.

Tremolo: Modulates the volume of the dry (pre-effects) synthesizer signal.

Section 3

Understanding Envelopes

RELATED PRESETS

1. **Envelope - Lowpass Swell**
2. **Envelope - Resonant Decay**

Understanding Envelopes

Envelopes shape the sound of each note that you play. In the acoustic realm, an envelope determines how the sound begins, how it changes over time, and how it ends.

For example, a snare drum begins instantly, then quickly decays to silence, thus its envelope can be described as “percussive”. A flute or violin has a softened beginning that fades in slightly, sustains at full volume, then either fades out or ends quickly. In the case of an acoustic piano, the sound begins immediately, then fades out over a long period of time if the key is held - and releases very quickly when the key is lifted.

So, envelopes allow you to define each note’s contour, allowing the creation of percussive sounds, flowing pads, or unusual leads.

In the tradition of many popular analog synths, Synth One includes two envelopes. One for amplifier (volume) and another for filter cutoff. Both envelopes include four sections that govern the overall contour: Attack time, decay time, sustain level, and release time.

Attack Time: Determines how long it takes for a sound to fade in - or for the filter cutoff to increase.

Decay Time: Determines how long it takes for the envelope to decrease in value until it reaches the sustain level.

Sustain Level: Determines the loudness or brightness of the sound until the key is released (lifted).

Release Time: Determines how long it takes for the sound to fade out completely after the key is lifted.

Amplifier Envelope

This envelope controls the volume of the sound, based on the settings of its four parameters. The Amp envelope also includes a parameter for Pitch Tracking.

The Pitch Tracking knob controls the volume proportional to pitch (log2 of frequency), with greater amounts reducing the volume for the higher keys on a keyboard. The musical application for Pitch Tracking is to reduce the volume of high pitched notes, which for many timbres can sound louder than low pitches that have the same volume.

YouTube Link: In this Ableton Loop presentation on the nature of sound and listening, the importance of amplitude envelopes is demonstrated in multiple contexts.

Filter Envelope

This envelope controls the value of the filter cutoff frequency, which shapes the timbre and brightness over time whenever a key is played. The depth of this modulation is determined by the Env Amt parameter.

To experiment with the filter envelope, it's best to set the cutoff frequency to 50% and the envelope amount to maximum — and set the Amp Envelope to immediate attack time, full sustain level, and medium release time. With these settings, the decay time has no effect on the volume, since the sustain is at maximum.

From there, increase the attack time. Short values will add a brassy blip to the beginning of a sound, while longer settings will introduce a harmonic "swell".

Alternately, start with an instant Attack time, then set the Sustain level to zero, and try different decay time values. Short decays will create plucks and "arps", while longer decays can be used to emulate pianos or bells.

Note: *In order to hear the effect of the filter envelope Release time,* ***you need to set the release time for both the filter and amp identically—or have a longer release on the amp envelope.***

Chapter 6

Effects

For some producers, effects are like frosting on an already excellent cake. For others, they're an essential part of a preset's character.

Effects

RELATED PRESETS

1. Bitrate Crusher - Resonant Talking
2. Autopan - Stereo Tremolo
3. Phaser - Synthpad
4. Delay - Pluck Echo
5. Reverb - Noise Burst
6. Reverb - Techno Sawtooth

Integrated Effects

At the end of its signal chain, Synth One includes a set of effects processors to add final polish to the synthesizer's sound. These are a bit like effect pedals for an electric guitar, taking the original sound and further enhancing it.

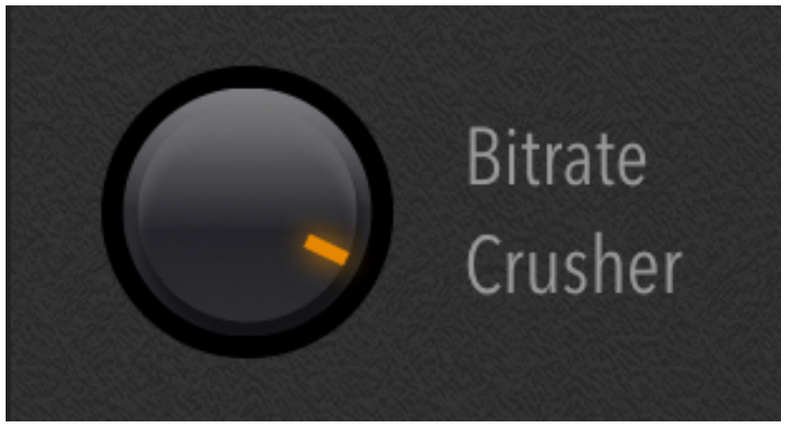
The **Architecture chapter** shows a diagram that displays the order of the effects.

Generally speaking, there are two design approaches to applying effects to a synthesized sound. The first—and more common—tactic is to treat the synthesizer sound like a "cake" and use effects like "frosting", embellishing the sound and giving it more flavor. The second approach is to use effects as creative elements in the sound design process. Factory presets that demonstrate this technique are "Solaris" and "Sky Terror". Both sounds rely on Synth One's reverb processor and LFOs for their character.

This chapter will describe Synth One's five effects and give production tips for your designs.

Bitrate Crusher

Historically, the earliest samplers from the vintage digital era of the 1980s were low-quality and often introduced undesirable artifacts like aliasing and noise. Like guitar or vocal distortion—which was once considered “bad”—bit-crushing has since become a signature tool for adding digital grit to a sound by downsampling the audio and generating aliased tones, depending on the frequencies in the original sound.



Tip: By reducing the bitrate crusher to a very low value, then sweeping the filter cutoff with a high resonance setting, you can create EDM “talking” effects.

Auto Pan

This effect uses a sine wave LFO to move the signal around the stereo field in a cyclical manner, like a stereo tremolo effect. Rate controls the speed of the effect, while amount controls the width of the stereo motion.

Tip: This effect is excellent for adding stereo tremolo to electric pianos and guitar-like sounds.

Phaser

Phasers consist of multiple all-pass filters in an array and impart a “whooshing” effect similar to a flanger. In this Phaser, the Rate knob determines the speed of the effect, the Notch and Feedback parameters control the tone, and the Mix knob adjusts the balance of the effect.

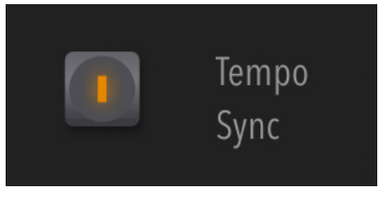
Tip: Phasers are excellent for pads and string sounds, and are also useful for processing noise to create EDM breakdown and riser effects.

Delay

This is the source of repeating echo effects. With long delay times you’ll hear distinct repeats of the notes played, while short delay times can be applied to simulate small room ambiences. The Feedback parameter determines low long the echoes will repeat, while the Mix knob controls the volume of the echoes.

Tip: Short delay times with high feedback can create metallic effects. However, it’s very important to be careful with this parameter when wearing headphones, since too much feedback can result in loud tones *that could damage your hearing*.

Note: The Tempo Sync switch lets you synchronize delay times to the BPM of your music for enhancing the rhythmic properties.



Reverb

Reverbs simulate the sound of an acoustic, ambient space like a room, concert hall, or garage. In Synth One, the reverb algorithm sounds like an arena or plate reverb at maximum size. Smaller size settings create a smaller, more room-like sound.

Three parameters tailor the overall sound of this reverb effect: Size, Low Cut, and Mix.

Size affects the overall decay of the reverb, as described above.

Low Cut removes bass, while **Mix** controls the blend of the effect.

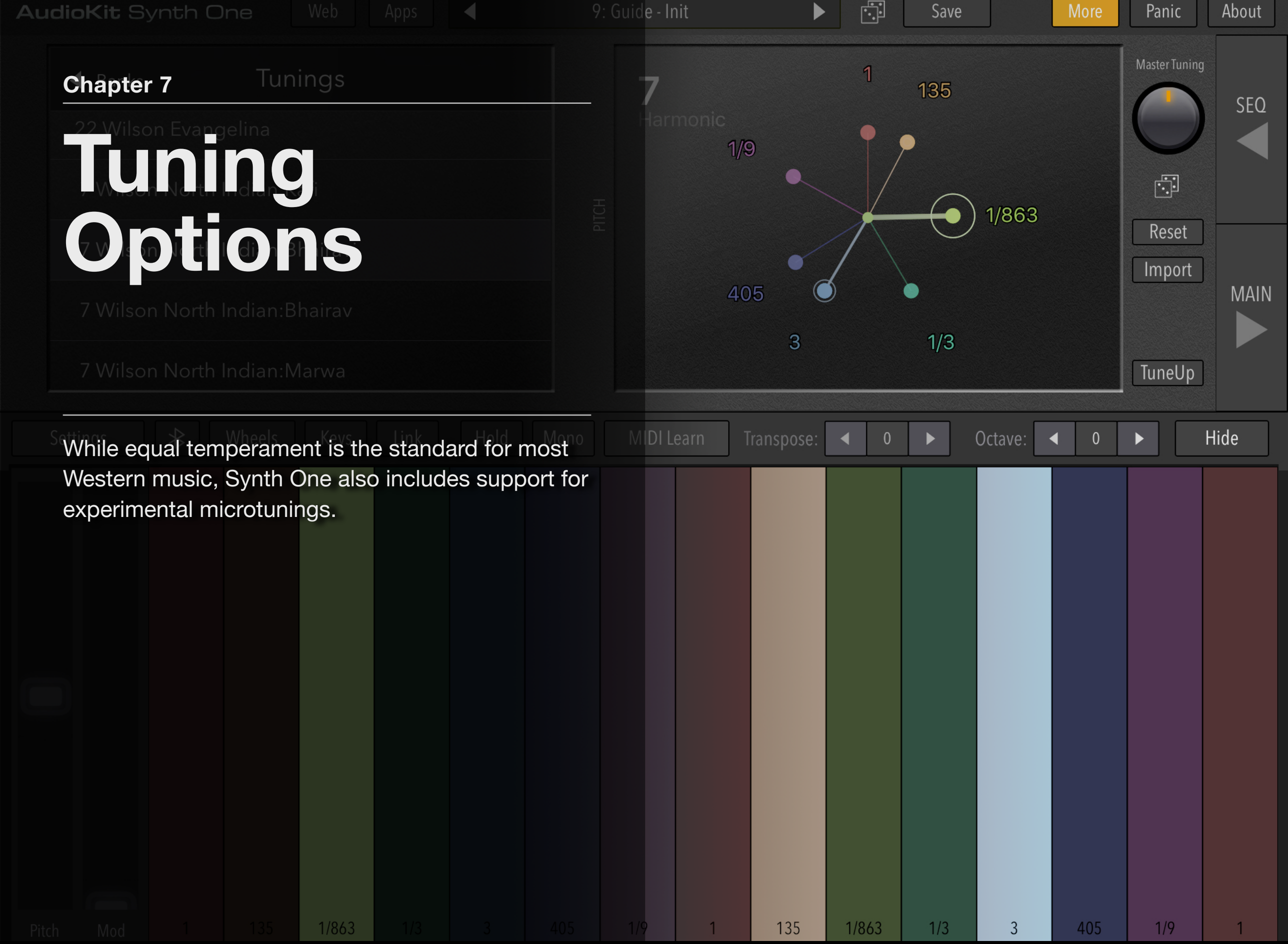
Tip: The popular “techno arena sawtooth” sound is simply a lightly filtered sawtooth with a big reverb effect.

Tip: Applying Low Cut to your reverbs can really help keep your mixes clean, as low frequencies in the reverb’s decay can sometimes add bass-range “clutter” or “mud” to a mix.

Chapter 7

Tuning Options

While equal temperament is the standard for most Western music, Synth One also includes support for experimental microtunings.



Section 1

Tuning Options

RELATED WEB LINKS

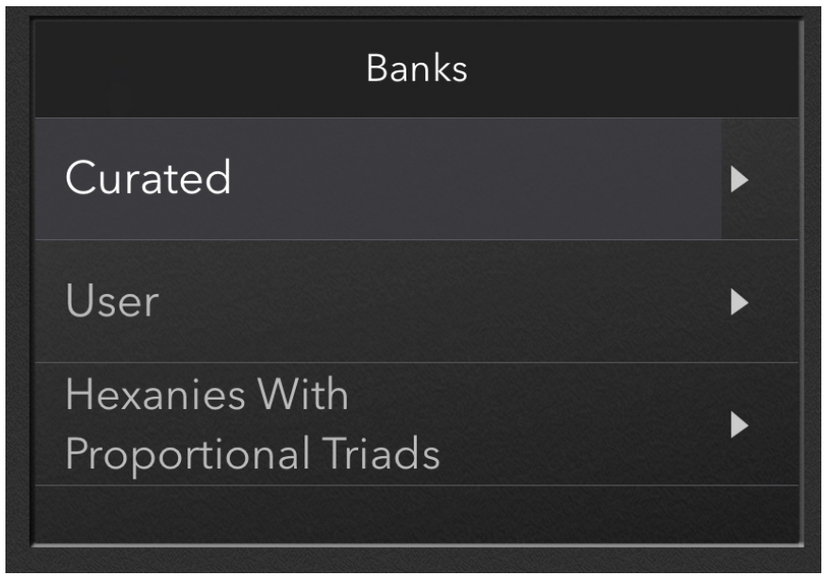
1. TuneUp
2. Scala file format and library
3. Understanding Equal Temperament
4. Understanding Pythagorean
5. The Wilsonic Archive
6. The Sonic Sky

Understanding Microtonality

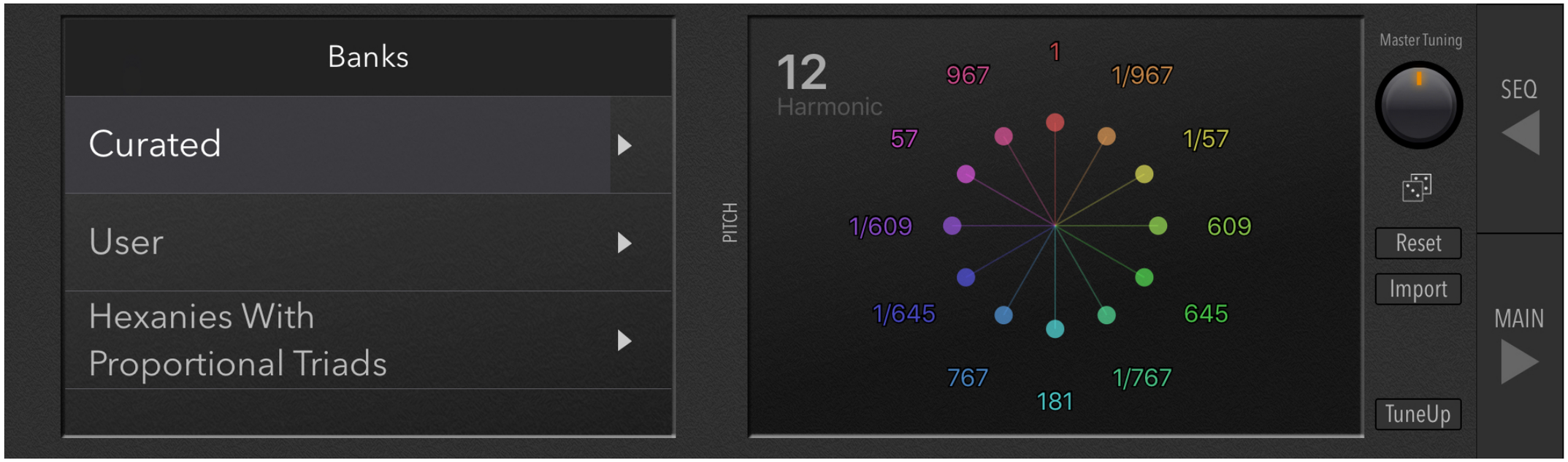
Since the first cultures and societies created music, a fundamental convention has been to share a common scale, or tuning. Microtonality is the art of creating tunings from aesthetic palettes of pitches. Synth One lowers the barrier to exploring alternate tunings by providing a rich collection of presets.

Tuning Banks

You can explore the tunings in the Synth One Tune panel's tuning banks, as well as import tunings to the User bank from some applications and the widely-adopted Scala (.scl) file format. Synth One is bundled with 3 tuning banks: Curated, User, and Hexanies With Proportional Triads.



Tuning Banks



Curated: The Curated bank features over a hundred historic and contemporary tunings, including many that are based on the harmonic series, which is an archetypal resource for tunings. The harmonic series relationships create the octave, fifth, fourth, third, sixth, second, seventh, and so on. Synth One's Curated tuning bank features some of the simpler harmonic and subharmonic scales such as the Dyad (2 pitches), Triad (3 pitches), and others.

User: The User bank includes the Twelve Tone Equal Temperament (12ET) scale, which is what most Western music (including pop, dance, rock, and R&B) is based upon. In fact, the 12ET scale is so widely adopted that it is the default tuning in Synth One. The scale is a compromise of the harmonic "Pythagorean" chain of 12 thirds, containing the same "good" fifths and thirds in each of the 12 key modulations.

[See the Harmonic Series section for a more in-depth description of how these pitches relate to each other.]

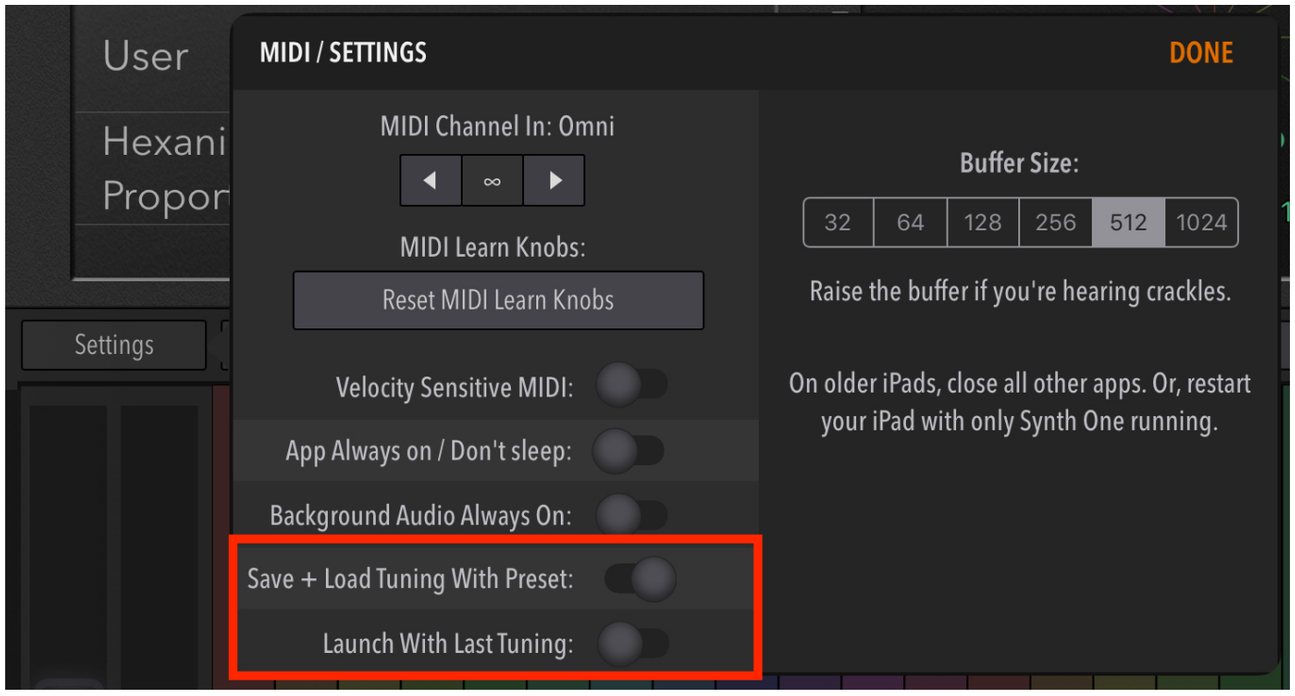
Hexanies With Proportional Triads: These are exotic tuning scales that are created by combining sets of four or more harmonics. Many of these are based on geometric patterns.

Working with Microtonal Scales

Since microtonal scales are all based on harmonic relationships, it can be useful to think of these as *musical presets in themselves*. That is, each scale offers its own way of "coloring" your musical performance in a manner that correlates with your selected synthesized sound.

Ultimately, whether you like a scale will be a matter of personal preference, so give yourself some time to explore and experiment with these tuning options and decide which ones match your musical goals.

Tuning Settings



The Performance, MIDI, Settings chapter explains how several of the global settings interact with the Tune page, but here's a summary.

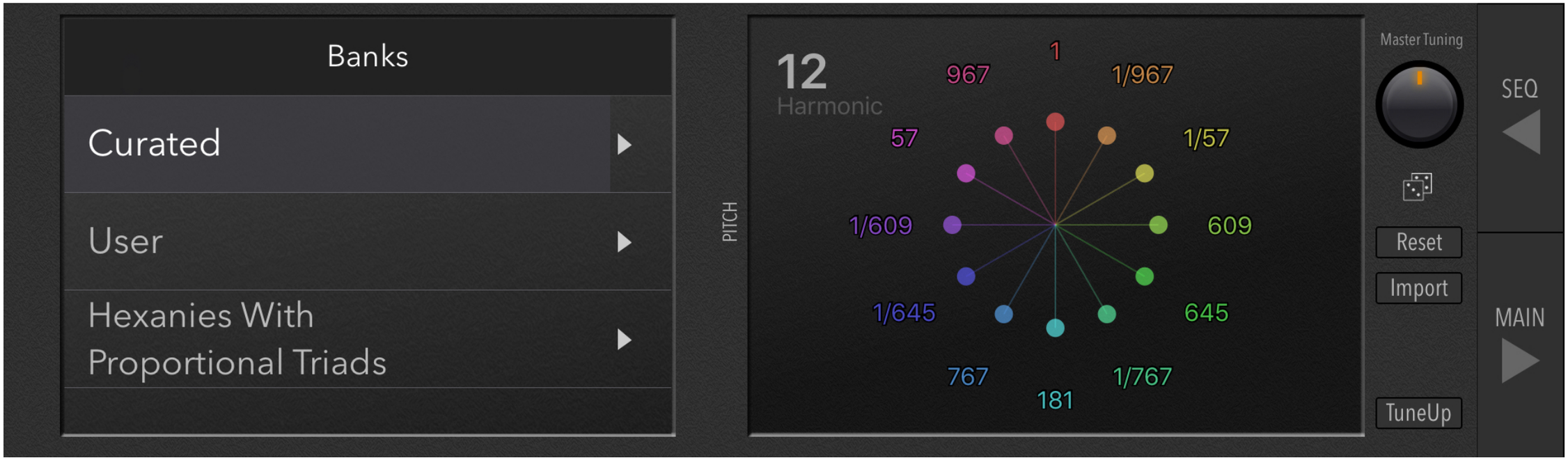
Save + Load Tuning With Preset lets you save your selected tuning with the preset.

* **Off (default)** Presets will always play the currently selected Tuning

* **On** Presets will play the tuning saved with the preset, and will save the current tuning with the preset. When loading a preset its tuning will be loaded, 12ET being the default.

Pitch Display

The Pitch Display renders the currently selected scale with lines and colors based on the pitch. C is 12 o'clock. F# is 6 o'clock, etc. Despite the fact that all of these scales are based on C, many do not start on "C", and many have pitches that are very close together. All

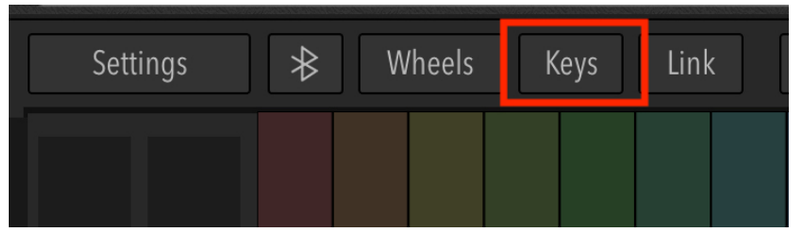


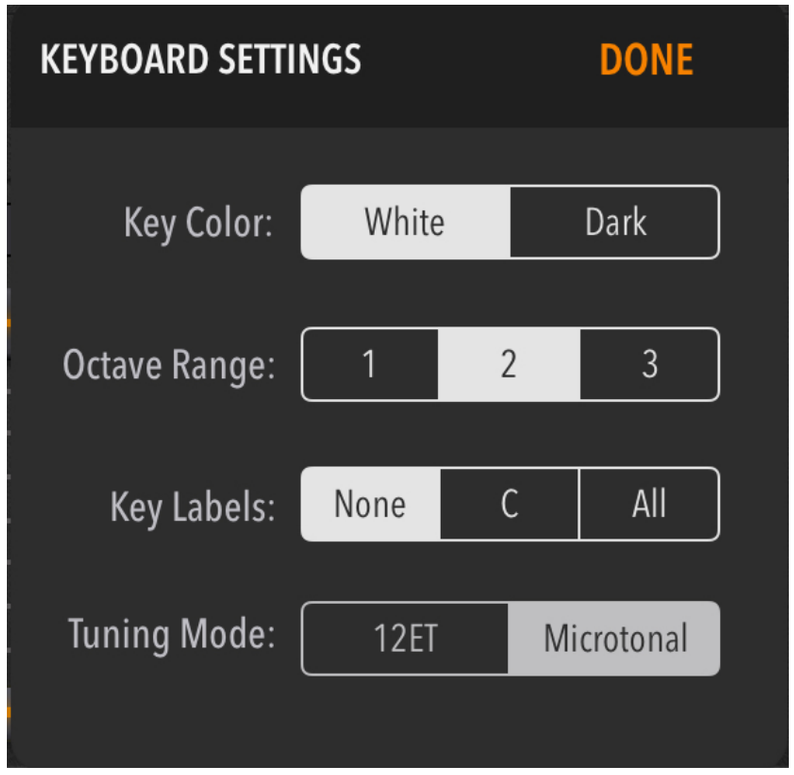
octaves of a note have the same position. The pitches will illuminate as you perform on the keyboard.

Note: You can tap the Pitch Display to cycle the view between units of Harmonic, Frequency, Pitch (Log2), and Cents.

Keyboard Settings

Clicking the Keys button opens up a settings window that offers several options.



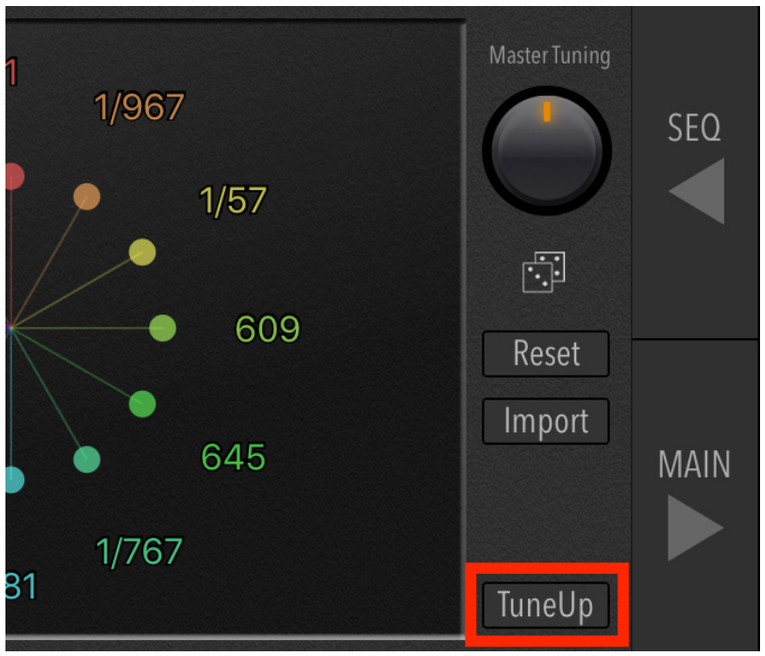


Key Color: White and Dark modes switch the colors of the on-screen piano keyboard between traditional (White) and a black/grey keyboard.

Octave Range: Adjusts the range of the on-screen keyboard from one to three octaves.

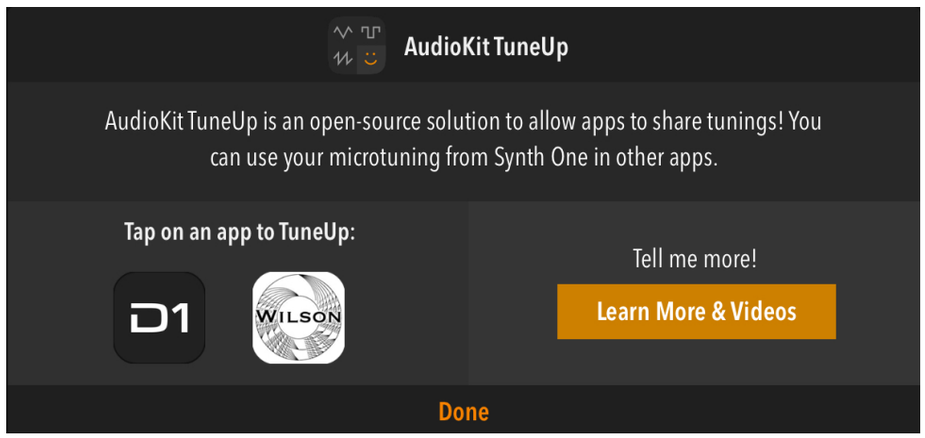
Key Labels: This toggles a display that shows the note names for the keys on the piano keyboard—and is an excellent way for beginners to learn the musical names for each key/note.

Tuning Mode: This feature allows allows you to toggle between the traditional piano keyboard and a Synth One keyboard that correlates the color of the keys with the colors of the pitches in in the Pitch Display window of the Tune panel.



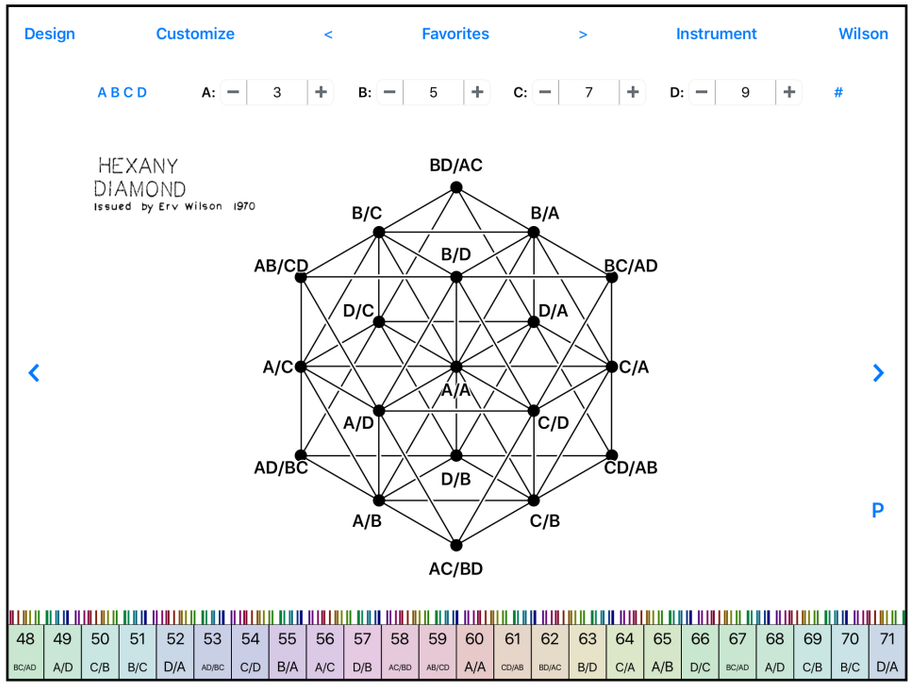
AudioKit TuneUp

The AudioKit TuneUp button opens a window that allows Synth One to share a microtonal scale with other compatible synthesizers. Tap the button to open a display that allows you to select either Wilsonic or Digital D1.



Wilsonic is a free microtonal scale design iOS app that's available on the iOS App Store. It also includes the ability to fast switch between Synth One and Digital D1 (via the Wilsonic app's "Instrument" button).

App Store link for Wilsonic



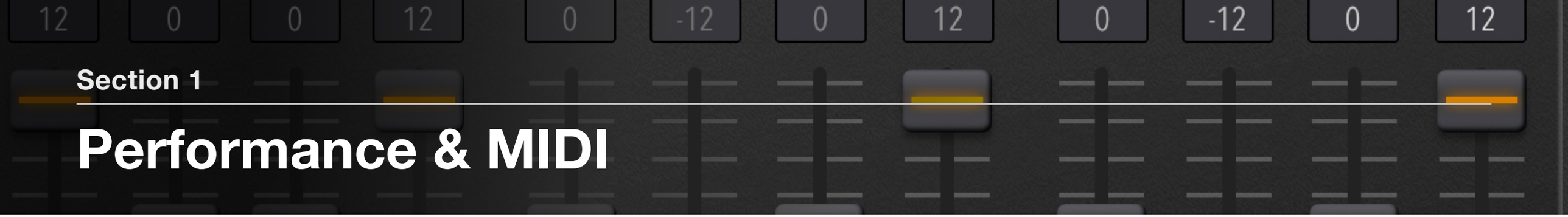
Scala File Import

Synth One can also import Scala files—a widely-supported text file format for tunings—to the User tuning bank. To do this, attach your .scl file as a document to an email, long press the attachment, and Synth One will appear as a sharing option. From there, the “Import” popover will show a file system of documents. Select a .scl file to import.

Chapter 8

Performance & MIDI

MIDI, Bluetooth, Ableton Link, and integrated performance controls allow Synth One to work in a wide variety of production environments.



Section 1

Performance & MIDI

RELATED WEB LINKS

1. **Wikipedia: MIDI**
2. **Wikipedia: MIDI Controller**
3. **Ableton Link**

Performance and MIDI

Once you learn the basics of sound design and synthesis, you can start using your own original sounds in your productions, whether it's composing a track, creating sounds for other media (film, TV, gaming), or performing live.

This section is divided into two areas: Performing sounds within the app itself and using MIDI and Ableton Link to integrate Synth One into your iOS production workflow by integrating it with other tools, both hardware and software.

Performance controls include the onscreen keyboard, step sequencer, and X-Y pads.

MIDI control options include standard MIDI (with additional hardware) and Bluetooth MIDI, which allows you to connect compatible MIDI controllers wirelessly via the Bluetooth standard.

Ableton Link is also available, for both WiFi synchronization on a connected network or with Link-enabled software in your personal collection of music apps.

This chapter will cover the specifics of all of these features, so you can use Synth One for a wide range of musical and creative audio tasks.

Section 2

MIDI & Synchronization

RELATED WEB LINKS

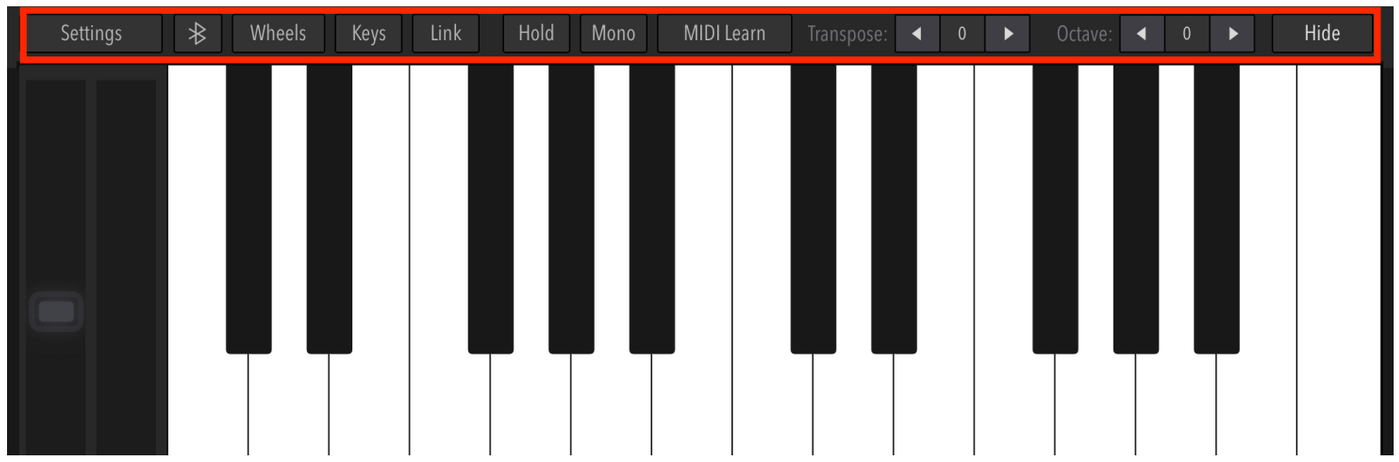
1. **Wikipedia: MIDI**
2. **Wikipedia: MIDI Controller**
3. **Ableton Link**

What Is MIDI?

The acronym MIDI stands for Musical Instrument Digital Interface and allows music technology products to communicate in real-time via USB, Bluetooth, or a 5-pin DIN cable. For example, by connecting a hardware MIDI synthesizer to a computer sequencer or Digital Audio Workstation (DAW), the computer can send MIDI data that will “play” the keyboard.

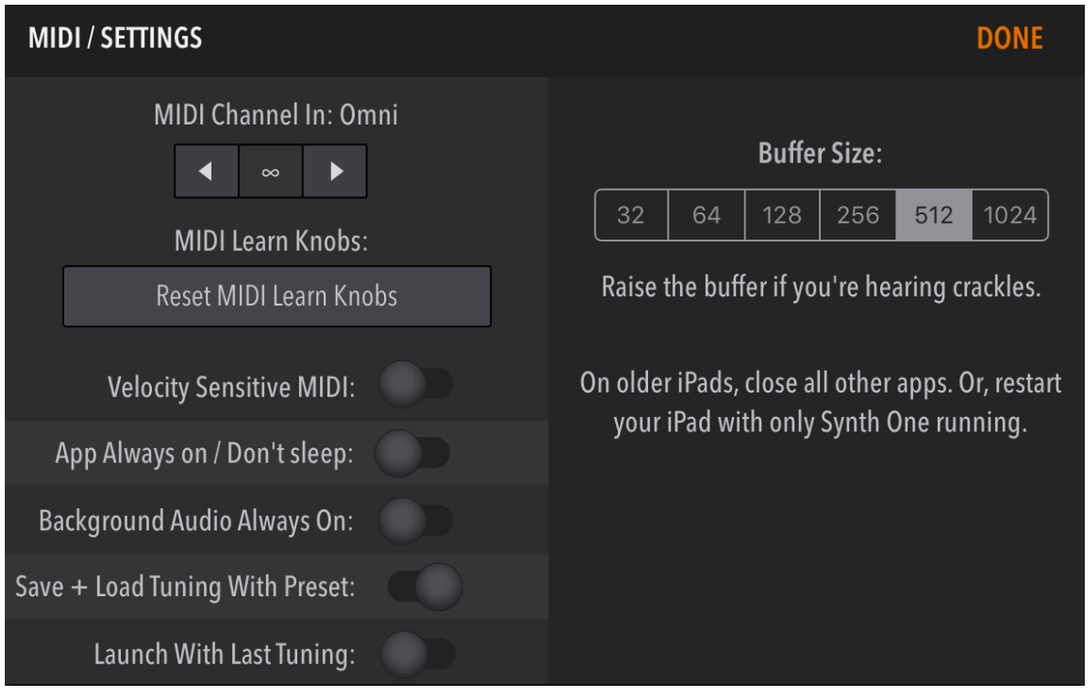
While a complete description of MIDI is beyond the scope of this guide, you can learn more about MIDI using the Related Web Links in this section’s sidebar.

Settings are accessed via the top row of buttons across the keyboard.



Settings Panel

The Settings panel allows you to configure various aspects of Synth One's MIDI behaviors.



MIDI Channel In: Sets the MIDI receiving channel for Synth One, when used in a larger MIDI channel-based rig or workflow. This defaults to Omni (receives on all channels simultaneously) which will work for most configurations.

Reset MIDI Learn Knobs: If you want to change the configuration of a preset's MIDI parameter assignments (more info in the MIDI Learn section), click this button to return to the defaults.

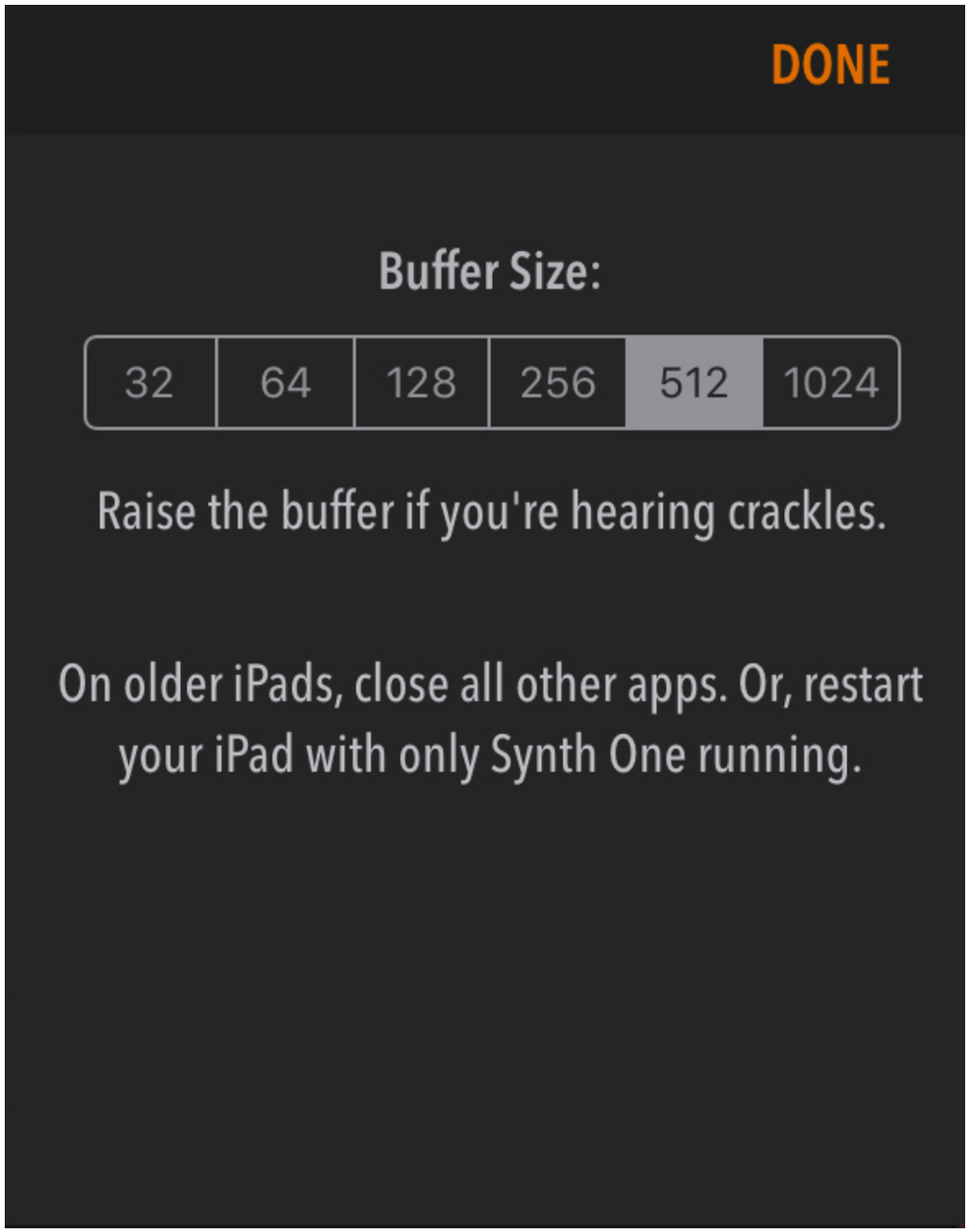
Velocity Sensitive MIDI: Toggles velocity sensitivity on/off. With a compatible MIDI controller, you can enable Velocity Sensitivity for MIDI, which will increase the volume of notes that are played forcefully, or reduce the volume for softer playing.

App Always on/Don't Sleep: Prevents your iOS device from going to sleep while the app is in use. This is useful for live performance and some studio situations.

Background Audio Always On: Allows Synth One to be used in conjunction with multiple music apps, so that when other apps are active, Synth One will still be heard.

Save + Load Tuning With Preset: Toggles the ability to save specific Microtunings as part of any preset.

Launch With Last Tuning: Restores the last active Microtuning when Synth One is relaunched.



Buffer Size: Synth One's performance is dependent on the CPU speed of your iOS device. Low buffer sizes reduce latency, which means that notes trigger "faster" and are heard immediately. Higher buffer settings add a delay between the playing of a note and when the note is heard.

Note: In some circumstances, older devices may sound or perform poorly with very low buffer settings. If you hear crackles or other audio issues that are not the result of bad cables or malfunctioning headphones, increase the buffer size for better performance.

Bluetooth MIDI

Synth One can receive MIDI from keyboards, controllers, and DAW/sequencers in two primary ways, either via an Apple-certified Lightning-to-USB connection kit (and compatible MIDI hardware, like a USB keyboard controller) or via Bluetooth MIDI, which allows MIDI note and performance data to be sent via Bluetooth to your iOS or iPad OS device.

While there are many portable MIDI controllers available, one of the most popular and versatile is the Korg NanoKey Studio, which supports many of Synth One's MIDI features, including keyboard control and assignment of parameters to its eight knobs (via Synth One's "MIDI Learn" function, described below). The NanoKey Studio is also compatible with MIDI via USB, via a certified Lightning adapter.

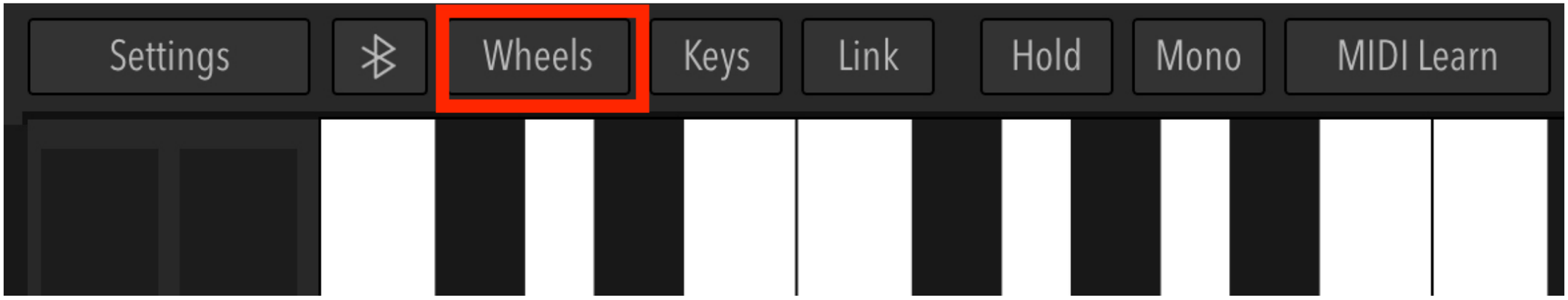
Steps for setting up a Bluetooth MIDI connection:

1. Make sure that Bluetooth is enabled on your iOS device.
2. Make sure that Bluetooth is enabled on your MIDI Controller. (The NanoKey Studio does this by default, when not connected via USB.
3. Click the Bluetooth icon in Synth One (device will show "Not Connected")
4. Select the device. When it shows "Connected", MIDI is active.

Korg NanoKey Studio

The Korg NanoKey Studio includes a two-octave velocity sensitive keyboard, eight knobs, eight drum pads, and an X-Y touch surface.

Wheels



Many keyboard controllers include wheels, levers, or a modulation joystick for controlling pitch bend and performance modulation (“mod wheel”). Clicking Synth One’s “Wheels” button allows you to set and/or adjust the behavior of these performance tools for Synth One.

Mod Wheel Destinations: The motion of the mod wheel can be used to control one of three parameters: Filter cutoff, LFO 1 depth, and LFO 2 depth. This setting is saved with each preset.

Pitch Bend: The behavior for the pitch bend wheel can also be saved as part of a preset, with the option of setting different maximum values for both up and down. For example, with an upper limit of 2 and a lower limit of 12, the pitch bend wheel can “bend” notes up by two semitones or down by 12 semitones.

Pro Tip: One of the most common settings for pitch bends is a whole-step (2 semitones) up and a whole-step (2 semitones) down.

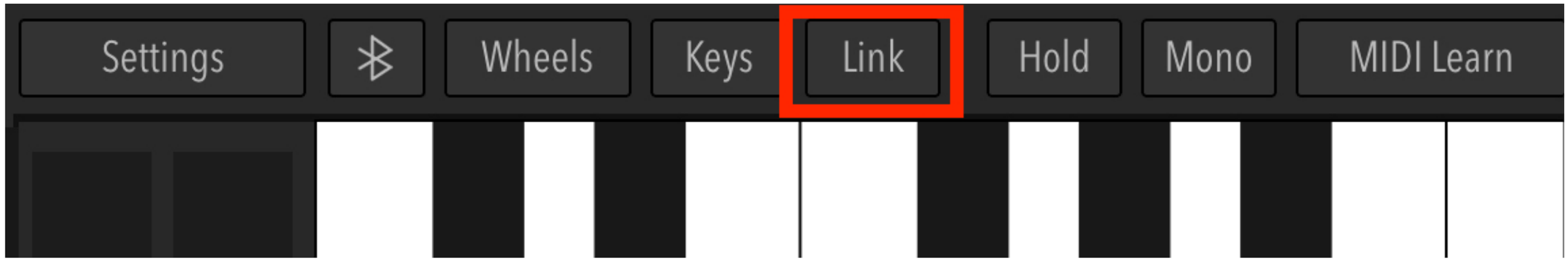
MIDI Learn

The MIDI Learn function lets you assign the knobs or faders on a compatible MIDI controller to control almost any of Synth One's front panel parameters.

To assign a specific parameter to a knob, turn MIDI Learn on and tap the parameter (for example, Noise Volume). A blue outline around a parameter means that Synth One is "listening" for MIDI data, so if you turn a knob on your controller, that knob will be assigned to Noise Volume. Once a parameter is assigned, the parameter has a translucent grey overlay.

To revise the controller assignment for a specific parameter, tap it again and adjust the desired knob or fader.

Synchronization



Link: Ableton Link is a synchronization protocol that allows multiple apps, separate iOS devices, or even computers to synchronize their tempos for performance and sequencing purposes. If you're working with Link-compatible apps, turn this setting on.

More information on Ableton Link can be found in the Sidebar at the beginning of this section.

Section 3

Performance

RELATED PRESETS

1. Seq - Example
2. Seq - Octave Pattern
3. Seq - Melody w/Delay
4. Seq - Techno Resonant
5. Glide - R&B Lead
6. Glide - Theremin

Performance

Even without connecting an external controller, Synth One offers three major tools for playing and manipulating sounds within the app itself.

The behavior and properties of the on-screen keyboard are covered in the Tuning chapter, so this section will explain the specifics of the Seq panel and Pad panel functions in depth.

Sequencer

Synth One includes a note-based step sequencer that can play a user-defined sequence of up to 16 notes (steps). This sequence will be transposed to whatever notes you play, with 0 being the note played and each numeric value being a transposition of that note, in semitones.

In addition to the settings for each step, the parameters for the step-sequencer are Steps and Division.

Steps determines the total number of steps in the sequence. If Steps is set to 8, the first eight steps in the sequence will play repeatedly as notes are held. If it's set to 16, all sixteen steps in the sequence will play before the sequence resets and starts over. The duration for each step is set by the Division parameter.

Division determines the note-value duration for each step, based on the global tempo. If the duration is set to 1/4 note, each step will be that value and a 16-step sequence will play over four measures. If the duration is set to 1/16 note, each step will be that note-value and a 16-step sequence will play over one measure, which is one of the most common configurations.

The transposition for each step is set via a two-octave slider with a maximum of +12 semitones and a minimum of -12 semitones. A value of 0 means that the step will not be transposed and will play the note(s) currently held.

At the bottom of each slider (step) is a button that toggles the step on/off. If a step is off, a rest will be inserted instead of a note, similar to how a Roland TR-808 is programmed.

Below is an example of a 16-step sequence, with rests inserted for steps 4, 6, 7, 11, and 15, creating a syncopated rhythm. Each of the transpositions are set to values of +12 (one octave up), +7 (a fifth up), 0 (no transposition), -5 (a fifth one octave lower), or -12 (one octave down).

Pad Panel

Synth One also includes a Pad panel that features two X-Y pads, each dedicated to a different set of performance controls. In the center of the panel, “Snap” can be toggled on/off. In “off” mode, any changes you make on the pads will be retained in your preset.

On the left, there’s a modulation pad that controls the depth (vertical axis) and rate (horizontal axis) of LFO 1. This can be used to add modulation to any sound as you play, similar to the MIDI modulation wheel—but with more nuanced control.

Since the amplitude (depth) of LFO 1 can be assigned to multiple parameter destinations, it’s possible to have one gesture control modulation on pitch, filter, reverb, and bit-crushing simultaneously!

On the right side of the Pad panel, you can control the cutoff (horizontal axis) and resonance (vertical axis) of the filter for dynamic modulation of those parameters as you play.

Note: In bandpass filter mode, the vertical filter axis correlates with Width. In highpass mode, it has no effect whatsoever.

The above image shows the tutorial preset “Seq - Octave Pattern” with both Pad and Seq panels active. Note that the Hold parameter is also active. In this configuration, playing a single note will start the sequence, which will continue playing while you perform live on the Pad controls.

Mono, Legato, and Glide

This area of the Main interface allows you to set Synth One to monophonic mode, which allows only one voice, which is useful for lead sounds. Many acoustic instruments like flute and trumpet are also monophonic, as is the human voice (in most cases).

Turning **Mono** on activates this one-voice mode, while the **Glide** parameter allows notes to sweep in pitch as you play. The value of the Glide parameter controls the speed of this pitch sweep.

The **Legato** button changes the behavior of the Glide, so that the pitch sweep is only active when the original note is held while the new key is pressed, allowing for performance articulations. If all notes are released before a new note is played, no Glide (sweep) is applied.

Tip: *Glide - R&B Lead* and *Glide - Theremin* are presets that demonstrate using glide for dramatic musical effects.

Chapter 9

Additional Resources

A collection of online resources to help you expand your understanding of synthesis.

Section 1

Online Resources

WEB LINKS

1. Synthtopia
2. Create Digital Music
3. Bedroom Producers Blog
4. Symplesound.com
5. francispreve.com

Expanding your knowledge...

The knowledge in this book can also be applied to many other synthesizers, ranging from hardware like the Korg Minilogue, Roland System-8, and Sequential Prophet-6 to softsynths like Xfer Serum and Kilohearts Phase Plant.

Using this book as a starting point, you can then discover more about synthesis and sound design via the websites listed in this chapter's sidebar.

Synthtopia is great for staying up-to-date on the latest synthesizer news, Create Digital Music is an excellent resource for commentary and insights into electronic music and new technology, and Bedroom Producers Blog has many links for free software and sounds.

My own website - francispreve.com - includes tutorials, downloadable sounds, and educational videos from my YouTube channel.

So once you learn the essentials via this guide, you can advance your skills with these web resources. This book may be just the beginning of your synthesis journey.