

ButterSynth Manual

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Introduction

ButterSynth is a hybrid six-oscillator wavetable, FM, and sample-based AuV3 (and standalone) synthesizer with a vast sonic range — from gentle pads to screaming leads and basslines. Mix any combination of wavetable, FM, sample and granulator synthesis engines for one truly massive sound.

For the more advanced users, you'll love using ButterSynth's thoughtfully designed interface, incredibly powerful modulation matrix, fully-featured internal FX rack, factory waveform and sample libraries, and almost limitless scope for fun, experimentation and sound design. For less experienced synth programmers, ButterSynth includes a library of hundreds of ready-to-use presets, sparking your creativity to start making music right away.

Headline features...

- Mix and match any combination of 6 synthesis engines to either emulate your favourite synths of yester-year or build a synth ready for the future.
- Dual-wavetable engines provide enormous scope for sculpting your own sound, each featuring multiple phase modulation and wave folding options, plus a fully-adjustable unison module which supports up to 7 voices.
- Built-in wavetable editor gives you the ability to tweak, morph, and hand-draw your own custom wavetables, with each wavetable supporting up to 256 frames.
- FM engine offers 4 operators with a selection of 12 modulation paths. Each operator can be loaded with any waveform from the factory or user library and can also self-modulate via the feedback dial.
- Sample and Granulator engines both support loading user samples (either imported or from the factory library) and control precisely how they are chopped, triggered and layered. Both also feature the same powerful unison modes available in the WT engine.
- Highly configurable 32-slot modulation matrix featuring precise mix/max ranges, self-modulation (via the amount target), plus configurable response curves and layer modes. Simply long-tap any parameter to set it as a Mod destination!
- Full suite of versatile control sources which includes: 4x MSEG-style looping curve envelopes, 4x LFOs, 4x step sequencers, X/Y pad with motion recording, 8x Macro dials and a powerful arpeggiator inspired by Kirnu Interactive's Cream.
- The EFX rack lets you build your own insert effects chain using any combination of the 16 built-in FX modules. Modules available at launch include delay, reverb, distortion, chorus, OTT compression etc. Note - FX parameters can also be targeted by the mod matrix, unlocking the possibility to program 'per voice' modulated effects.

- All presets, wavetables, samples and other settings are stored in the Files app, making bulk import/export, backup and community sharing quick and easy.
- All of this is housed in an irresistibly designed 4-tab UI that makes synth programming quick and fun.

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The Basics

User Interface

ButterSynth's interface is divided into four pages: OSC, MATRIX, CTRL and EFX. Each of these pages has several sub-tabs, such as the engine selector on the OSC page, or the four tabs that contain all 32 modulation slots on the MATRIX page.

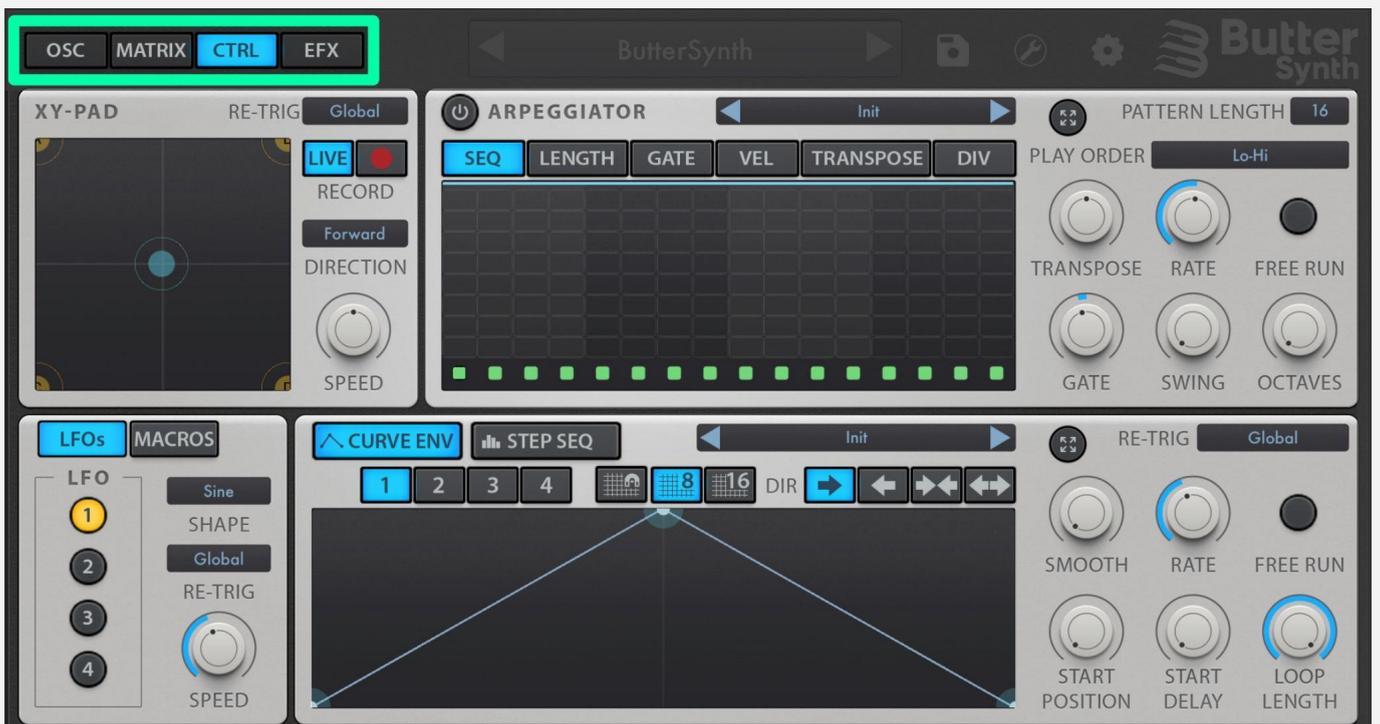
OSC (Oscillators) contains controls for all six oscillators, plus 4x freely-assignable ADSR envelopes, 2x multimode filters and voice/polyphony settings.



MATRIX (Mod Matrix) provides 32 slots for modulation assignment and configuration. New modulations can either be assigned from this tab or by tapping and holding any parameter/dial and choosing the modulation source from the pop-up list.



CTRL (Control modules) provides a page filled with control modules that can be used as modulation sources or to trigger note sequences.



EFX (EFX Rack) provides a flexible FX chain that can be filled with any number of ButterSynth's 16 built-in EFX rack units. The rack can be loaded with any combination of units, and you can drag and drop individual units to control the order in which each effect is applied.

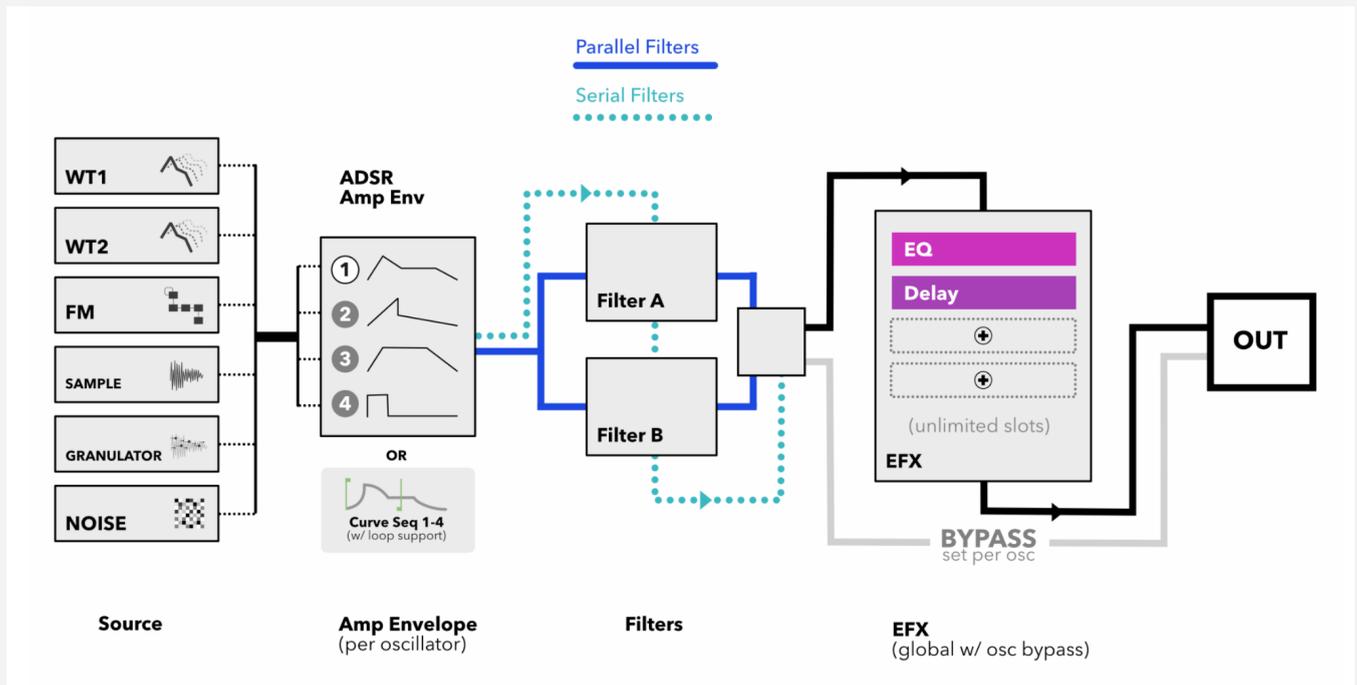


The other controls, which are accessed from the title bar, are...

- 🔍 **Preset browser**
- 💾 **Quick save** - long-press to activate
- 🔧 **Patch Settings** - settings for midi bindings, key-zone mapping and per-oscillator EFX routing controls.
- ⚙️ **Global settings** - settings oversampling, Pitch Bend range, Bluetooth midi etc.

Note - the **Wavetable editor** has its own separate interface, which can be launched by tapping the **[Edit]** button on either of the two Wavetable oscillator engines.

Signal Path



A note about CPU & RAM usage

ButterSynth does not stop you building chip-frazzling mega-patches and maxing out your DSP/CPU. Combining (up to) six synthesis engines plus unison, polyphony, oversampling, complex modulation and dense layers of effects, you'll quickly discover that ButterSynth can become a real monster of a synth — both in sound and DSP requirements. This doesn't mean ButterSynth requires more CPU than other AUV3 synths on iOS, but it does mean that during the course of experimenting and building your own patches you will quickly learn the DSP limits of your own particular device.

Here are a few tips to help to keep your patches sounding lush and massive whilst staying safely within your CPU limits:

- When used as an AUV3 plugin, iOS currently requires all instances of ButterSynth to share an allocated slot of 1GB RAM (500MB on older iPads). This limit is imposed by the operating system and applies to ALL PLUGINS, not just ButterSynth. This means there is an upper limit to the number of instances of ButterSynth you can run at the same time, although we expect you would have to try hard to reach this limit. *Note - patches with long samples will use a larger amount of RAM than those without.*
- As your patches get increasingly demanding on the CPU, you may find it better to switch ButterSynth to monophonic mode. Polyphonic patches - *especially those with long release tails* - can be quite CPU-intensive.
- Using all six synth engines at once is not recommended for older iOS devices (i.e. those made before 2018 or with chips slower than the A12). If you do want to layer synth engines on older devices, we recommend disabling polyphony.

- The EFX rack allows any number of modules to be loaded into the chain, but (obviously) each additional module increases the CPU demand of the synth. Heavy FX users may need to experiment a little to find the upper limits of their particular device.

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OSC (Oscillators)

The OSC page is home to ButterSynth's six synth engines that can be combined and layered in any configuration. These include 2x Wavetable oscillators (WT1/2), four-operator FM synth, Sampler, Granulator and a noise generator.

Quick-tips for experienced users

- Each of the six synth engines has its own **Filter A/B routing** options and can be **keyzone-mapped** or set to **bypass the EFX effects** rack via the **patch settings** window (.
- Each of the two Wavetable engines can be used as an FM sources for the other (**WT1 > WT2** or **WT2 > WT1**). These are FMX and FM options in the Phase Mod menu.
- 2x and 4x oversampling can be enabled per oscillator via **global settings** (). This menu also provides a toggle to oversample the Distortion EFX Unit.
- There is no dedicated Mixer view, so you'll need to balance the relative levels of each activated oscillator using the volume controls in the bottom-right corner of each Oscillator module. There are also post-filter gain controls for Filter A and Filter B.



Activating and switching oscillator engines

Each synth engine is activated using the **on/off** controls on the left panel, and the blue tabs control which engine's controls are currently shown in the main section.

When building complex, layered patches you may find it easier to solo oscillators when making changes to the parameters. Use the 'S' (Solo) buttons on the left panel to solo one or more of the engines at once. (the noise generator does not have a solo control)

Note: you are free to choose how many of the six oscillators are enabled for each of your patches, but be aware that using all six at once requires a higher DSP load. The same is also true for setting higher polyphony, unison, oversampling, and complex EFX chains.

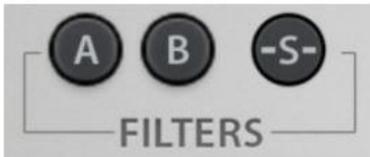
Tip: disabled oscillators always retain their settings, and configurations for all oscillators are stored each time you save or update a preset.

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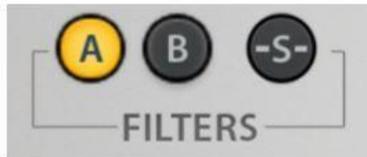
Common Oscillator Features

Filter Routing

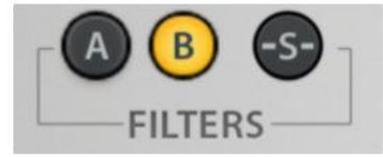
Each oscillator module can be routed into the two multimode filters, labelled Filter A and Filter B. The filters can be routed in parallel and serial modes (or bypassed), and this can be configured differently for each oscillator module.



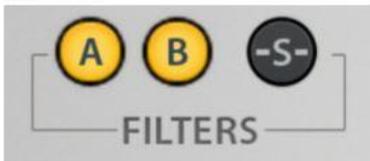
When all buttons are off, all filter routing for this oscillator is disabled (Bypass mode). *This is the default/init setting.*



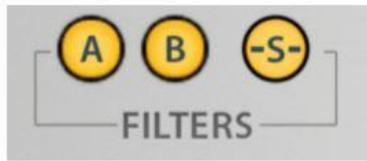
This oscillator is routed to Filter A only.



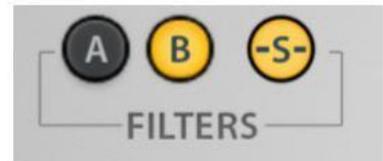
This oscillator is routed to Filter B only.



This oscillator is routed to both Filter A and Filter B separately (Parallel mode).



This oscillator is routed through Filter A and then into Filter B (Serial mode).



NOTE - If only one Filter is active (A or B) then enabling Serial mode has no effect on the sound.

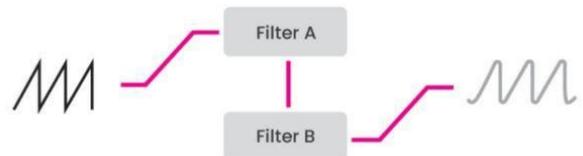
Parallel/Serial Modes

Enabling both Filter A and Filter B sends the signal to both filters in **Parallel mode**. This means a separate copy of the audio is fed through each of the 2 filters independently and then recombined afterwards.

Pressing the -S- button (when both filters are enabled) turns on **Serial mode**. In Serial mode, the signal from the oscillator is fed into Filter A and then the output of Filter A is fed into Filter B.



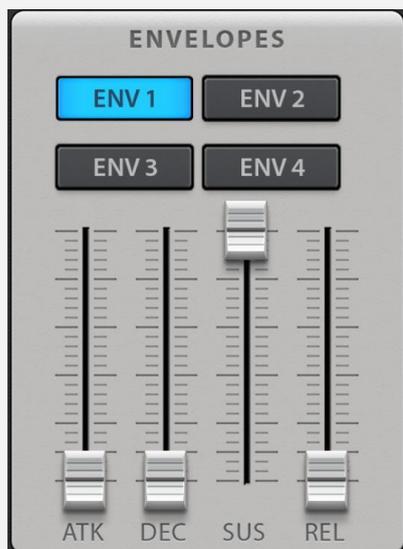
Parallel Filter Mode



Serial Filter Mode

> See [Filters](#) for a full explanation of each filter's controls

Envelopes



The Osc tab features four assignable ADSR envelopes (labelled ENV 1-4) that can be used to control the amp envelopes using the envelope assignment buttons in the control panel for each of the 6 oscillator engines. You are free to alternate, share and layer these envelopes in any combination across the active oscillators in your patch.

For example, ENV 1 is assigned to both WT1 and WT2 with a quick attack value, and ENV 2 is assigned to the sample engine with slower attack and release values.

These envelopes are not only limited to be used for amplitude. They can be freely assigned as modulation sources for any other parameter in ButterSynth using the Mod Matrix.

A common setup might be to use ENV 1 for your amp envelope and then use ENV 2 to modulate Filter Cutoff over time. You can do this by long-pressing the Filter Cutoff dial and selecting Envelope 2 from the pop-up menu of modulation sources.

Unison

Unison is available for the Wavetable and Sample engines, and is capable of (up to) 7 voices.

Note that adjusting the unison controls (Detune, Width, etc) won't have any effect unless there are at least 2 unison voices.

Voices

Sets the total number of layered unison voices, up to a maximum of 7. **When set to one voice, unison mode is disabled.**

Note - increasing the number of unison voices will increase the DSP load.

Detune

Sets the amount of tuning variation (in cents) for each layered unison voice.

Width

Sets the amount of stereo panning applied to each layered unison voice

Phase

Sets the amount of phase offset applied to each layered unison voice.

Mix

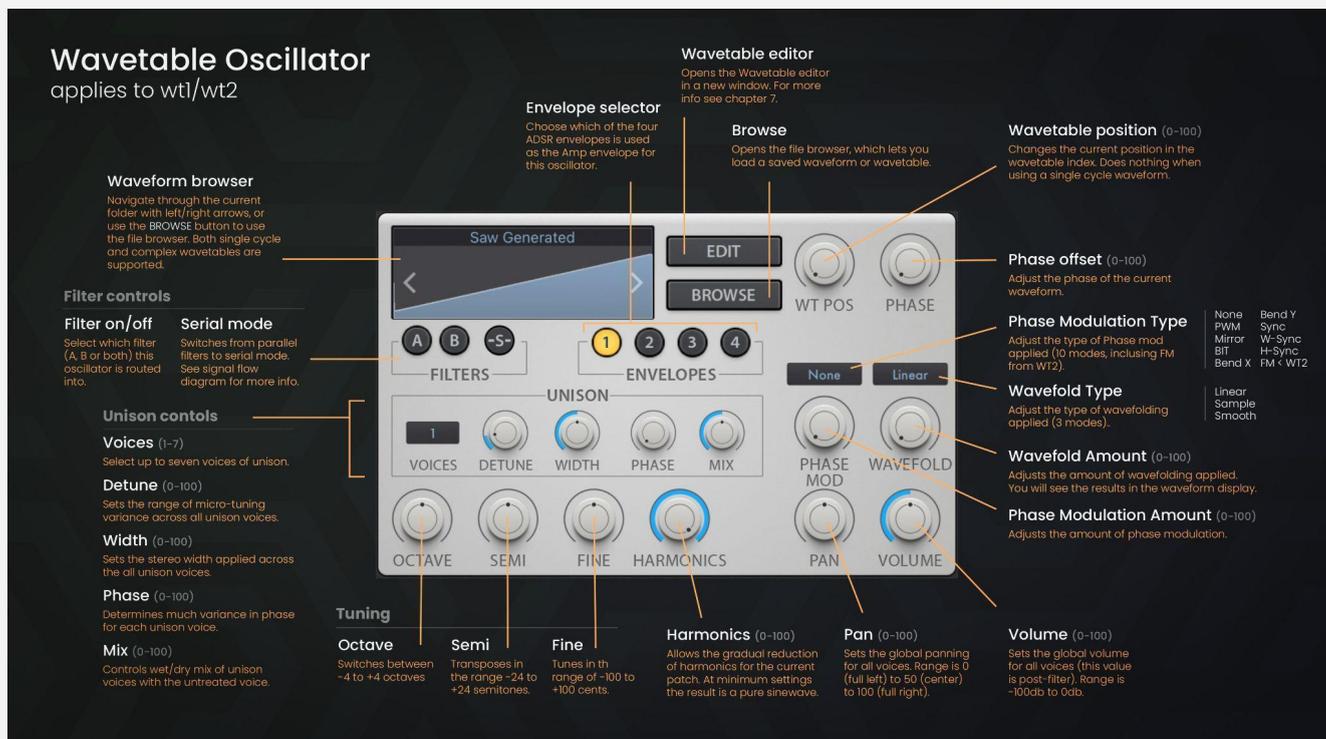
Controls the amount of wet/dry mix between the unison and non-unison sound

Please note - adding unison voices increases the DSP requirements for your patch. If you are using older devices, enabling monophonic mode will help limit the amount of extra DSP required.

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Wavetable (WT1/WT2)

WT1 and WT2 are a matching pair of wavetable oscillators with identical controls and features. They also have their own built-in wavetable editor.



ButterSynth's two Wavetable oscillators cater for a wide range of synthesis needs, ranging from traditional standard oscillator waveforms (sine, saw, triangle, square) through to complex wavetables of up to 256 frames.

You'll find a large library of static waveforms and complex wavetables included with the app, but you are also welcome to import your own or hand-draw and build custom ones using the built-in wavetable editor.

Wavetable library, import and editing

Included in ButterSynth's wavetable library are all the standard simple waveforms (sine, saw, triangle, pulse, etc) plus a large selection of more unusual and exotic morphing wavetables. Additional wavetables can be imported to ButterSynth via the iOS files app.

Wavetables can be tweaked or drawn entirely from scratch using ButterSynth's built-in wavetable editor.

Whether you work with single-frame waveforms or multi-frame wavetables, you'll also find a suite of powerful unison, phase modulation, harmonic and wave folding controls which push your sound design capabilities further than many synths.

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FM

The FM engine features four operators that can be arranged in 12 different algorithm types. Each operator has adjustable waveforms, ratio, depth and self-feedback controls. Tuning and pan settings apply to all operators.

FM Oscillator

Operator Selector/Browser
Select the waveforms loaded into each of the four operator slots. Tapping brings up the waveform browser, which also provides access to user-imported waveforms.
NB - wavetables are not compatible with the FM module, but individual WT frames can be exported from the WT editor and used for FM.

Waveform Factory Library
Basic (4)
Analogue (60)
Classic (26)
Complex (57)
Drawn (150)
+User Library/imported

Algorithm Selector
Changes the FM topology. There are 12 different configurations to choose from.

Amp Envelope selector
Choose which of the four ADSR envelopes is used as the Amp envelope for this oscillator.

Semitone tune
Transposes in the range -24 to +24 semitones. Applies to all operators.

Fine tune
Tunes in the range of -100 to +100 cents. Applies to all operators.

Octave
Switches between -4 to +4 octaves. Applies to all operators.

Volume
Sets the global volume for all voices (this value is post-filter). Range is -100db to 0db.

Filter controls

Filter on/off Select which filter (A, B or both) this oscillator is routed into.

Serial mode Switches from parallel filters to serial mode. See signal flow diagram for more info.

Ratio/Feedback Controls

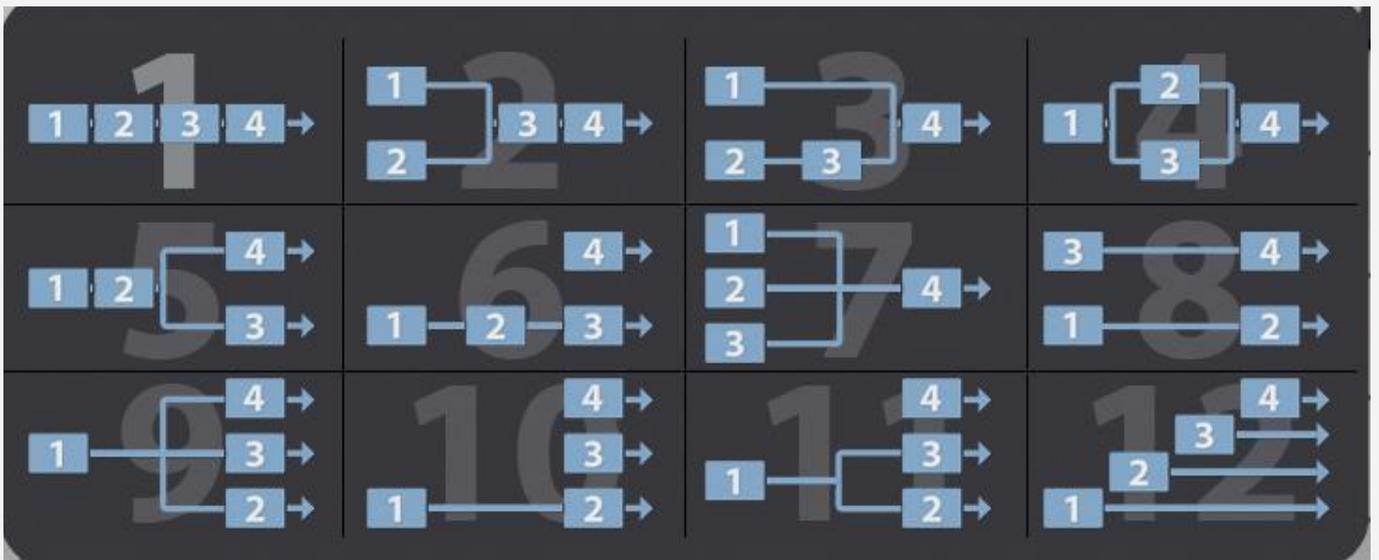
Ratio mode Sets the ratio of each operator's pitch relative to the incoming note. Values range from 0.25 to 33.

Feedback mode Sets the amount of self-feedback applied to each of the four operators.

Operator Depth Level/Depth controls for each of the four operators.

Dial switcher (Ratio/Feedback mode) Toggles between RATIO and FEEDBACK control for the top row of dials. Dial position is stored per mode (so each dial can be in a different position for each mode).

Pan Sets the global panning for all voices. Range is 0 (full left) to 50 (center) to 100 (full right).

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Granulator

The Granulator engine takes a sample and creates a swarm of grains to provide a rich texture that is ideally suited to pads and as a layered texture alongside ButterSynth's other synth engines.

Granulator Oscillator

The interface features a central control panel with a sample display at the top showing a waveform for '02-Energy_01_01'. Below the display are filter and envelope sections. The filter section includes buttons for 'A', 'B', and '-S-'. The envelope section has four numbered buttons (1-4) and a 'BROWSE' button. The main control area contains knobs for 'START', 'END', 'RANDOM', 'PULSE FREQ', 'GRN LEN', 'VOL RND', 'OCTAVE', 'SEMI', 'FINE', 'KEY TRK', 'PAN', and 'VOLUME'. A 'Sample Browser' button is also present.

Sample Display/Browser
Displays the currently loaded sample

Filter controls

Filter on/off
Select which filter (A, B or both) this oscillator is routed into.

Serial mode
Switches from parallel filters to serial mode. See signal flow diagram for more info.

Sample Browser
Opens the sample browser

Amp Envelope selector
Choose which of the four ADSR envelopes is used as the Amp envelope for this oscillator.

Grain Position Controls

Start
Sets the start marker for each new grain

End
Sets the end marker for each new grain

Random
Sets the amount of randomness applied to the start and end position, but always remaining within the boundaries set by Start and End dials

Grain Adjustments

Pulse Freq
Controls the density of the grains. Higher values create more grains (and require more DSP).

Grain Length
Sets the maximum length of each grain (restricted by the Start/End settings)

Volume Randomiser
Sets the amount of volume jitter across each of the grains.

Octave
Switches between -4 to +4 octaves.

Semi
Transposes in the range -24 to +24 semitones.

Fine tune
Tunes in the range of -100 to +100 cents.

Key Tracking
Toggles whether the grains should be tuned according to incoming pitch.

Pan
Sets the global panning for all voices. Range is 0 (full left) to 50 (center) to 100 (full right).

Volume
Sets the global volume for all voices (this value is post-filter). Range is -100db to 0db.

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Noise

The Noise engine offers a choice between white and pink noise, filter and envelope assignment controls, plus volume, pan, and a built-in DJ-style LP/HP filter for tonal adjustments.



ON/OFF

Enables (or disables) the Noise engine.

White or Pink

Selects White or Pink noise profiles. Both produce audio that covers the full frequency spectrum. Pink noise has slightly boosted levels at either end of the spectrum, giving a deeper sonic quality, whereas White noise has even levels across all frequencies.

Filter routing

■ see [Common Oscillator Features](#) for more information.

Envelope assignment (1/2/3/4)

■ see [Common Oscillator Features](#) for more information.

LP/HP

A combined (DJ-style) lowpass and highpass filter that can be used to tune the overall tone of the noise. Turning the dial left (counter-clockwise) engages the lowpass filter, whereas turning the dial right (clockwise) enables the highpass.

Pan

Controls the stereo position of the noise engine.

Volume

Sets the pre-filter gain of the noise engine. Allows you to control the balance of noise relative to any other oscillators/sources.

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Filters



Quick-start

- The two main filters (Filter A & Filter B) can be routed in parallel or serial modes or bypassed entirely. Filter routing is set 'per oscillator', which (for example) means you could have WT1 feed into Filter A and WT2 through Filter A and then Filter B in serial mode.
- Both Filter A & B include a wide range of modes in both 12db and 24db slopes, including LP, HP, BP, notch, peak and comb, all of which are available in warm analogue (Ladder) or clean digital (SVF) modelling types.
- Up to 3 additional filters can be added via the EFX effects rack. These EFX filters feature the same modes and settings, plus an additional 6 'z-plane' filters based on classic EMu hardware samplers (courtesy of Airwindows).

There are (up to) five multi-mode filters available to help you sculpt your sound in ButterSynth.

Filter A and Filter B are the two main filters found on the Osc tab and can be configured and routed in **parallel** or **serial** modes independently for each of the oscillator modules. The other 3 multi-mode filters can be loaded as (optional) EFX rack units, which means each one of them can be loaded pre- or post- other EFX units.

Each filter can be set to one of 17 different types (including Lowpass, Highpass, Bandpass, etc) all of which are offered in 12db and 24db slope modes. There is also the option to choose between Ladder and State Variable modelling types.

Confused about how to enable and route filters? See the [Common Oscillator Features](#) section

Filter Controls

Type

This is where you determine each filter's mode, slope and modelling type.

There are 17 options:

- **LDR** - *Moog-style Ladder Filter*
 - **Lowpass** 12db or 24db
 - **Highpass** 12db or 24db
 - **Bandpass** 12db or 24db
 - **Notch** 12db or 24db
- **SVF** - *digital style State Variable Filter*
 - **Lowpass** 12db or 24db
 - **Highpass** 12db or 24db
 - **Bandpass** 12db or 24db
 - **Peak** 12db or 24db
- **Comb** - *classic comb filter*

💡 Three additional filter modules are available to use as part of ButterSynth's EFX rack. These modules work in an identical way to the main filters, but they also include 6 additional 'z-plane' filter modes based on the Airwindows Zfilter plugins. See *EFX section for more information.*

Parameters

In addition to the standard **Cutoff** and **Resonance** dials, both filters also include (post-filter) **Drive** and **Volume** controls which enable you to overdrive the filter and compensate for changes in gain caused by different filter settings, respectively.

All four parameters can be set as targets in ButterSynth's Mod Matrix. Remember you can also long-press any of these dials to quickly setup a modulation mapping (for example LFO 1 > Filter A Cutoff)

🦉 **Did you know?** The filter's Cutoff dial uses a logarithmic (non-linear) response curve so that users can have finer control over the all-important lower ranges of the frequency spectrum.

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Envelopes

Quick-start

- The four ADSR envelopes can be easily assigned to each of the six oscillator engines as amp envelopes, or used as modulation sources via the mod matrix. It is also possible to control the amp envelope by assigning one of four **curve envelopes (with loop support)** from the CTRL (control) tab or any other suitable modulation source (eg. square LFO) via the mod matrix.
- The four ADSR envelopes provide a quick and easy way to control the amp envelopes for each of the 6 oscillators, and can also easily be assigned as modulation sources for other parameters via the Matrix (e.g. Filter Cutoff).
- If you'd like more advanced and precise control of your amp envelopes (i.e. adjustable curves and looping sections) you can use assign any one of the **four looping curve envelopes** available on the CTRL tab. Curve envelopes also have a wide range of **retrigger conditions** compared to the more basic ADSR envelopes.

ADSR Envelopes

The OSC tab provides four ADSR envelopes that can be used - *in any combination* - as Amp envelopes for each of the 6 Oscillator engines. You do this using the envelope selector radio buttons provided in the controls of each oscillator.

You can also use any one of these ADSR envelopes to modulate other parameters (such as Filter cutoff) by creating a mod matrix entry. The quickest way to set this up is to long press the destination dial and select one of the 4 ADSR envelopes as the source. The min/max and amount of modulation can be fine-tuned from the Matrix tab (see part 4 of this guide)

Power tip: Replacing ADSR amp with a Curve Envelope

Thanks to ButterSynth's flexible modulations and control devices it's possible to bypass the standard ADSR envelopes and use one of the 4 looping Curve Envelopes to control the amplitude of your oscillator(s).

To do this you will first need to assign an ADSR envelope to your Oscillator and put it in 'gate mode' (0 Attack, 0 Decay, 100% Sustain, 0 Release). Now long-press the oscillator's volume dial and select Curve env 1-4 as the source. Finally, lower the volume dial initial value to 0 then switch to the CTRL tab and set the curve shape, options, and trigger conditions for the Curve Envelope you set as the Source.

To do this, assign one of the basic ADSR envelopes to your oscillator and set it to 'gate mode' (full sustain, zero ADR) then map any one of the four MSEG-style (looping) Curve envelopes to your oscillator's volume parameter using the Mod Matrix.

Voicing and Portamento



Legato

Determines whether the AMP Envelopes are retriggered when a new note is played while some other note is still held down

Legato works in both mono and polyphonic mode.

Mono

Switch the synth to a monophonic mode where only one note is played at one time. Playing a new note means the mono note just changes it's pitch

Portamento

Determines the time it takes to slide to a new pitch when a note is played while some other note is held.

Always Portamento

When enabled a (1 octave) upwards portamento is applied to the first note.

Tempo

Determines the internal tempo used for example in the arpeggiator, curve env etc.

Master Volume

Master volume is the last volume control applied to the sound

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MATRIX (Modulation Matrix)

The Mod Matrix provides 32 modulation slots, spread across four tabbed pages. Value ranges are set using a combination of min/max values and amount dial, making it easy to determine the direction and uni-/bi-polarity of each modulation.

Quick-start

- Most parameters can be targeted for modulation, including the controls of EFX units and the amount dial of other matrix slots.
- 🖱️ Long-press (almost) any parameter dial in Buttersynth's interface to setup a Mod Matrix destination. Select a source from the pop-up list, then fine-tune settings via the newly-created Mod Matrix entry.
- Parameters in ButterSynth come in three varieties: **simple** (e.g. Cutoff), **bi-directional** (e.g. finetune) and **stepped** (e.g. Octave). The range of simple parameters is 0.0-1.0, bi-directional parameters are -1.0 to 1.0, and stepped parameters 'quantise' to the nearest whole value.
- For advanced users, each matrix slot also provides the ability to set non-linear response curves, plus a 'mode' setting that controls how modulations interact when two or more slots target the same parameter.
- 💡 **TIP** - if you enable **'Visualise Automation'** in the global settings menu You will see a white dot around any parameter that has a modulation applied that represents the dial's modulated position.



Source

Selects the modulation source.
Options include: None, Aftertouch Ch, Aftertouch Poly, Curve Env 1-4, Env 1-4, LFO 1-4, Macro 1-4, Mod Wheel, Note Key, Note Velocity, Pitch Wheel, Step Seq 1-4, XY Pad Point A-D, XY Pad X-axis, XY Pad Y-axis.

Destination

Selects the modulation destination.
Options include: *(almost any parameter. including EFX modules and the amount dial of other matrix slots).*

Min/Max

All modulations are applied relative to a parameter's starting position (aka its 'home value'). The Min/Max values set in the Mod Matrix should be considered as *relative value ranges* that modulate parameters according to their starting value.

Amount

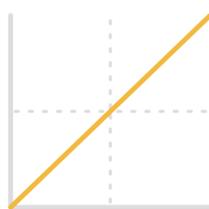
The Amount dial allows you to scale back the overall amount of modulation. Its primary use is as a modulation target for other matrix slots, but can also be used as a way of temporarily 'muting' individual matrix slots when building up complex, multi-dimensional modulation arrangements.

Mode

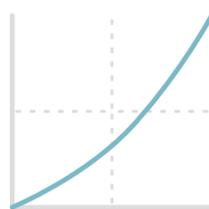
Choose between **Add** (default), **Multiply**, **Subtract** or **Divide**. This setting determines how multiple matrix slots targeting the same destination should interact with one another. This is an advanced feature and rewards user experimentation.

Curve

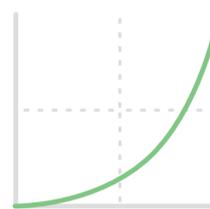
Modulations are linear by default, but adjusting the curve response allows for more pronounced and inverted response curves (see diagram below). There are 8 total curves available: Linear, Exp, Log, SLog (+inverted versions of each).



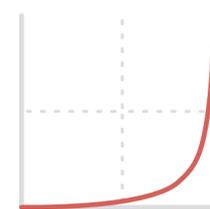
Linear



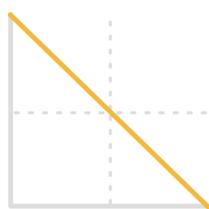
Exp



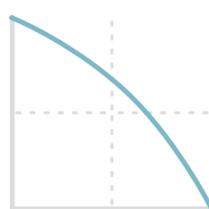
Log



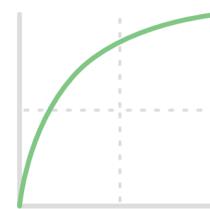
S Log



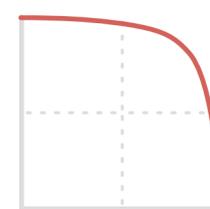
Linear Inv



Exp Inv



Log Inv



S Log Inv

Visualising automation



If 'Visualise Automation' is enabled in Global Settings the applied modulation range can be seen in the Amount knob. The white dot is the modulated control current value. The white line represents the modulation range.

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CTRL (Control Modules)

The CTRL tab provides a collection of five control modules that can be used as modulation sources via the mod matrix, plus an arpeggiator. to trigger notes (Arpeggiator), modulate parameters via the mod matrix (LFO, Curve Env, Step Seq, X/Y Pad), or provide hands-on control of parameter combinations via on-screen or MIDI controller mappings (e.g. X/Y Pad, Macros).



With the exception of the Arpeggiator, all other control modules must be linked with one or more parameters via the mod matrix before they will have any effect. Please refer to the [Mod Matrix](#) section of this manual for more information.

💡 Remember you can **long-press any mappable parameter dial** and select a mod source from the pop-up list to create new a Mod Matrix entry. Switch to the Matrix tab to finetune or remove any existing mappings.

Control Modules



XY-Pad

4-pole X/Y touchpad controller, with recordable patterns and adjustable retrigger conditions.

Up to four quadrants (labelled A-D) can be assigned via the Mod Matrix. The X/Y pad can be used for live modulation or can record and store a pre-recorded sequence. Recorded sequences will trigger and loop according to the Retrig conditions, and have adjustable speed/direction controls.



LFO

Four LFOs each with their own shape, retrigger and speed controls. Each LFO can be freely assigned via the Mod Matrix.

The re-trigger options provide a highly configurable way to trigger and sync each LFO (either globally or per voice). Please refer to the [Re-Trig Settings](#) section for more information.

Available shapes: **Sine**, **Triangle**, **Square**, **Sawtooth**, **Random L** (Long) and **Random S** (Short).



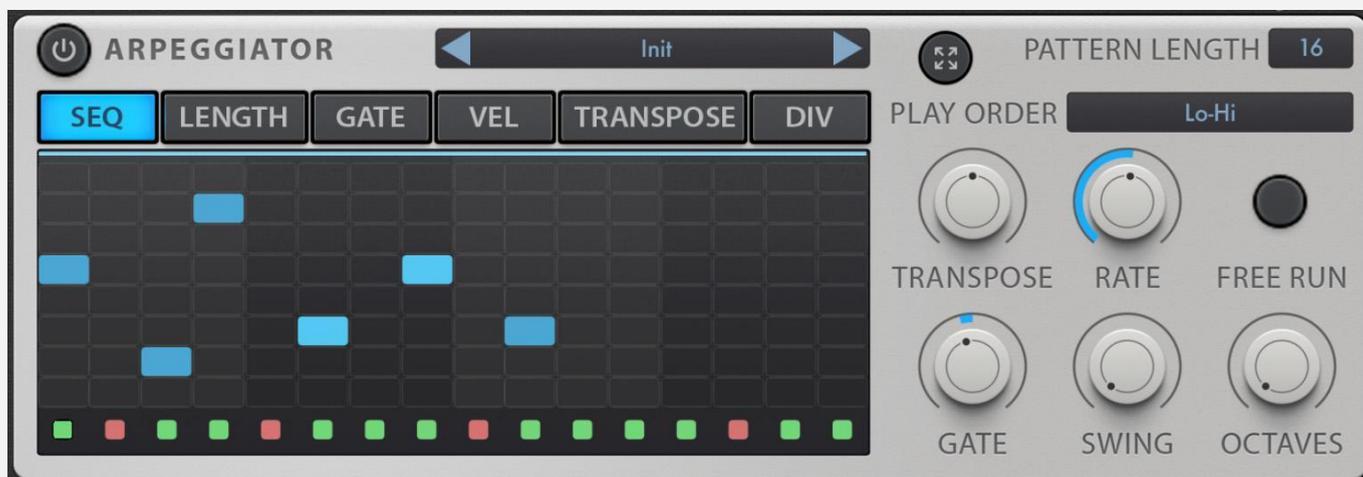
Macros

Four assignable macro dials that can be used to adjust multiple parameters with a single dial (or single modulation source).

Assign destinations and modulation sources via the mod matrix, or map these dials to your midi controller of choice — or do both!

Arpeggiator

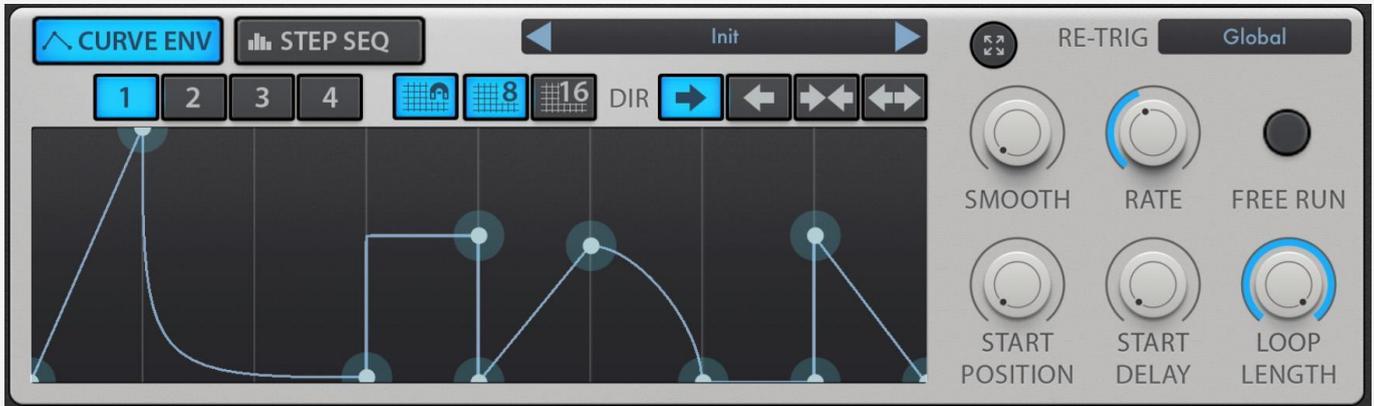
16-step arpeggiator with an optional sequencer layer that lets you override and tweak its underlying looping patterns.



■ see [Arpeggiator](#) section for more information.

Curve Envelope

16-step arpeggiator with an optional sequencer layer that lets you override and tweak its underlying looping patterns.



■ see [Curve Envelope and Step Sequencer](#) section for more information.

Step Sequencer

16-step arpeggiator with an optional sequencer layer that lets you override and tweak its underlying looping patterns.



■ see [Curve Envelope and Step Sequencer](#) section for more information.

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Re-trig settings

Re-Trig modes are an essential part of determining how each of the control modules should react to incoming MIDI notes, and the conditions under which they trigger and re-trigger.

All control modules (except Arpeggiator and Macros) have a retrigger setting, and by default this is set to Global. In global mode, a single instance of this control (eg. LFO) loops continuously and ignores incoming MIDI notes.

*The following modes use a **shared trigger** across all voices:*

- **Global** - a single instance of this module loops continuously and is shared with all subsequent MIDI notes, i.e. it never retriggers.
Note - If the module's rate is synced to the master/host tempo, setting 'global' will sync this control to the host transport.
- **Global First (aka Global Legato)** - a single instance of this module starts when it detects the first incoming MIDI and is shared for all notes that overlap (i.e. legato). Once all notes have been released, the next detected note will re-trigger the module.
- **Global All** - a single instance of this module starts when it detects the first incoming MIDI note, and retriggers for every subsequent note. In other words, every new MIDI note will cause the module to retrigger.
- **Loudest** - Only new notes with *higher velocity* than those currently held will retrigger the module.
- **Quietest** - Only new notes with *lower velocity* than those currently held will retrigger the module.
- **Lowest** - Only new notes with *lower pitch* than those currently held will retrigger the module.
- **Highest** - Only new notes with *higher pitch* than those currently held will retrigger the module.

*The following modes create an **independent trigger per voice**:*

- **New Note** - a separate instance of this module is created for each incoming MIDI note, up to max polyphony. Each new instance triggers when the new note starts, and loops for the duration of that note. For example, if you set an LFO to a new note, an independent LFO will be triggered for each new note you play.
- **One Shot** - Behaves just like "New Note" except each instance only plays once and does not loop. This mode can be particularly useful when using curves as a replacement for ADSR envelopes.
- **One Shot Legato** - Behaves just like "One Shot" but does not retrigger for legato notes.
- **New Note ASR** (only available for the Curve Env) - Behaves just like "New Note" but introduces an Attack, Sustain and Release stage that operates based on the curve's loop settings. The area of the curve before the loop section is the Attack, the area within the loop section is the Sustain, and the area of the curve after the loop is used for the Release.

Arpeggiator

16-step arpeggiator with an optional sequencer layer that lets you override and tweak its underlying looping patterns.



The sequencer window provides a range of tools to manually override the standard patterns (set via “play order”) of the arpeggiator. These ‘overrides’ are split across 6 tabs with controls for note sequencing, step length, gate length, velocity, transposition, and divisions (aka ratcheting). Individual steps of the pattern can also be muted using the row of green/red LED lights that run along the bottom of the sequencer window, creating rhythmic gaps in your arp sequences.

⚠ Note - unlike the other Control modules the Arpeggiator is hard-wired to all 6 oscillator engines. The arp does not appear as a source or destination in the Mod Matrix, and it is not possible to disconnect the arp from a particular oscillator.

Module Controls

On/Off

Toggles the Arpeggiator module on/off.

Preset manager

Lets you load or save arpeggiator pattern presets independently of other patch settings.

Fullscreen editor

Expands the sequencer window to full-screen, making it easier to adjust by hand

Play order

Controls the underlying pattern of the arpeggiator. All sequencer adjustments are applied on top of the basic play order.

By default, the arpeggiator’s play order is set to “Lo-Hi” which takes all incoming notes (e.g. a chord) and cycles through in Low-to-High (Lo-Hi) pitch order for each active step of the arp pattern.

If we take a simple CMaj7 chord (4 keys, CEGB) then the eight available play orders of the Arpeggiator produce the following looping patterns...

Pattern Length

Tap and drag to set the length of your arp pattern from 1-16 steps.

Note that all arp sequences will reset when the sequencer loops back to step 1 no matter how complex your pattern or how many notes you hold at once. You may find that reducing the number of steps below 16 provides a better loop length for your pattern.

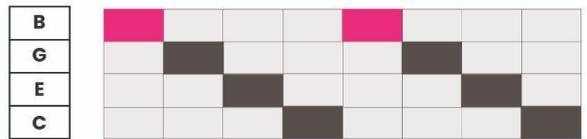
Lo-Hi

X steps



Hi-Lo

X steps



As played

X steps



Reversed

X steps



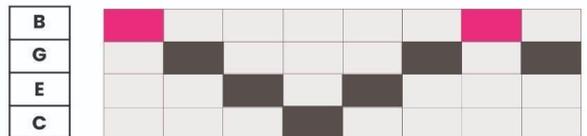
Lo-Hi (Alt)

2X-2 steps



Hi-Lo (Alt)

2X-2 steps



As played (Alt)

2X-2 steps



Reversed (Alt)

2X-2 steps



Note - the length of each pattern is determined by how many notes are held simultaneously. The basic 4 patterns play each note once per sequence, but the "Alt" patterns repeat some notes and last for 2X-2 steps (where X is the number of keys held).

Arp Sequencer Controls

Transpose

Shifts the pitch of all notes by +/-X semitones.

Rate

Determines the playback speed of the arpeggiator. By default, the rate is synced to the host/master BPM and measured in tempo divisions. Enabling Free run unbinds the Rate and lets you set a speed independent of the master tempo.

Free run

Detaches the Rate setting from the host/master tempo.

Gate

Sets the default gate length of each note in the arpeggiator sequence.

Swing

Applies swing timing to the arpeggiator pattern.

Octaves

Determines whether additional notes should be inserted into the pattern at higher octaves. When set to any value above "1 Octave", the pattern of notes will be extended so that each note is repeated at higher octaves.

A simple demonstration of this would be to set the dial to "3 Octaves" and hold a single note. You will hear this note repeated 3 times at increasing octaves (root, +1, +2) before the pattern begins again.



Programming the Arp Sequencer

The Arpeggiator sequencer has six tabs, providing controls for Sequence, Step Length, Gate, Velocity, Transpose and Divisions (aka ratcheting).

- **Sequence (Seq)** lets you manually override the current play order by programming your own sequence of notes. The notes in the sequence are represented as numbers according to the order in which they are played or their pitch order (if played simultaneously). For example, if you play a CMaj triad with a sequence of

2-3-1 the arp will play the middle note (E) first, followed by the highest note (G) and then ending on the root note (C) before repeating this sequence. *Note - any gaps in the manually configured sequence will be filled in according to the current "play order" setting.*

- **Length** lets you adjust the step length of each step in the sequencer, increasing from 1x up to 8x.
- **Gate** lets you adjust the gate length of individual steps in the sequence, allowing you to create a mixture of legato and staccato rhythmic variations. If you want to adjust the default gate for all notes, use the Gate dial on the right-hand side of the module.
- **Velocity** gives you control over each step's velocity, which is usually tied to the note's volume, but can also affect other parameters if you set velocity as a source for other destinations in the mod matrix.
- **Transpose** lets you tweak the semitone tuning of specific notes in the pattern. One example of this might be to program a sequence of pitches (melody/riff) that play each time you press a single key, for example a minor scale.
- **Divisions (Div)** let you apply a ratcheting effect to individual steps in the sequence, causing them to retrigger X times.

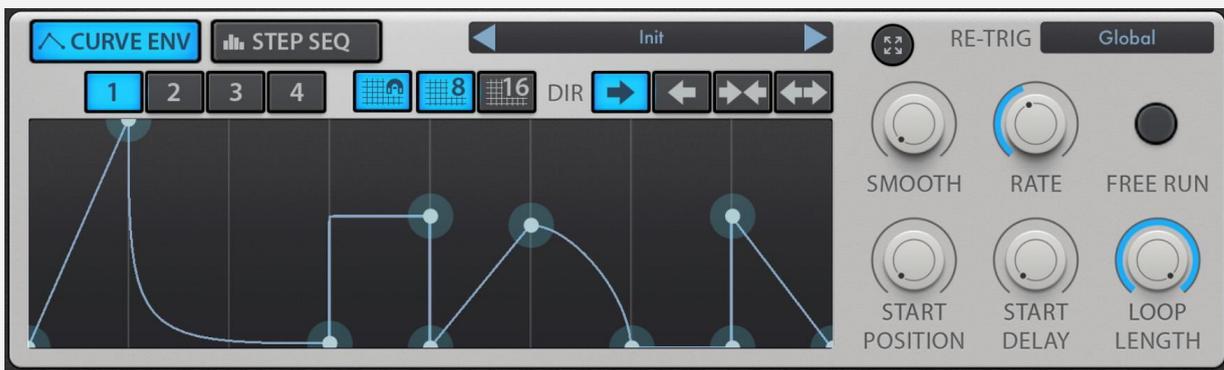
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Curve Envelope and Step Sequencer

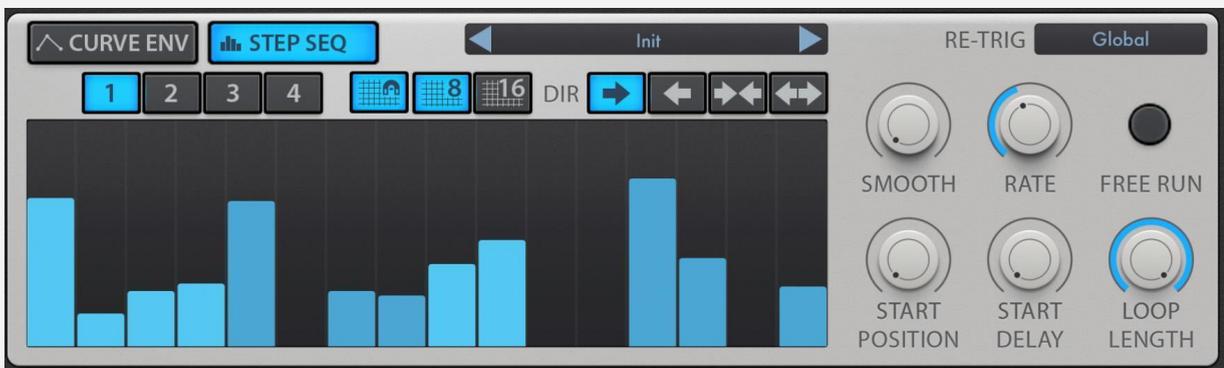
The Curve and step sequencers are another way of controlling parameter values over time via the modulation matrix. There are four of each type, and the controls are mostly the same for both. The main difference is that using the curve envelope the user can 'draw' a curved (or jagged) envelope whereas the step sequencer always works with simple bars and discrete steps.

The values at the bottom of each window represents the min value and at the top, the max value, as set in the mod matrix.

Curve Envelope



Step Sequencer



Module Controls

Smooth

Makes the bigger value changes smoother and not so abrupt

Rate

Sets the speed the control is running

Loop length

Sets the length of the loop. The looped are is the clear are and the are which is not used is greyed out

Free Run

When the free run control is disabled only exact quarter note values can be used. When enabled values set are in seconds

Start position

Sets the start position for the control to start

Start delay

Sets the time the control waits before running

Dir (Direction)

Sets the direction in which the control runs. The options are **Forward**, **Backward**, **Forward alt**, **Backward alt**.

In alt modes the playback doesn't start from the beginning when the end is reached but goes back to the start following the curve

Snap to grid

Only used in the curve editor. When enabled the curve points snap to the grid making the drawing easier

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EFX (Effects Rack)

The EFX tab houses ButterSynth's FX rack, where you can build your own custom insert FX chain including delays, reverbs, distortion and more.

Quick-start

- There are 17 built-in FX modules that can be arranged into a custom rack. Each module can only be used once except the Filter (which has 3 identical but individually numbered instances)
- Most of the FX rack parameters can be targeted by the Mod Matrix.
- Note - you can bypass the EFX rack for individual Oscillators by deactivating the relevant FX button on the MIDI mappings panel (wrench icon).

At launch, there are **17 EFX units** included with ButterSynth which can be loaded and arranged in any order and combination, resulting in your own custom insert FX rack.

You can only load one instance of each unit per rack, although there are 3 identical copies of the Filter (numbered 1-3) to allow more complex filtering chains.

Most EFX parameters can be set as Mod Matrix destinations.

Common controls for all EFX units

- **Add unit** - Double tap on the effect in the top FX list or tap+hold and drag to desired location. When inserting by double tapping the effect is inserted at the bottom of the list.
- **Remove unit** - tap the X button in the top-left corner of any EFX unit to remove it from the rack. *Note all parameter settings and matrix assignments are retained even if the unit is removed. If you remove an EFX unit by mistake, re-loading that unit will restore all previous parameter settings and modulation bindings.*
- **Toggle on/off (aka bypass)** - the yellow on/off button (top-right) lets you manually disable/bypass individual rack units.
- **Reposition (hold and drag)** - EFX modules are processed from top to bottom. To reposition any of your loaded units hold the horizontal bar icon (bottom-right) then drag-&-drop the unit into its new position in the rack.
- **Wet/Mix dial** - All EFX modules except EQ include a Wet/Mix control that lets you adjust the wet/dry signal mix.

EFX Units

Filter 1/2/3

Three multi-mode filters that work just like Filter A/B, but also include 6 additional 'z-plane' filter modes. There are 3 copies so you can use more than one in your FX chain.



ButterSynth provides 3 identical copies of the Filter module (numbered 1-3) so that it's possible to have more than one filter stage in FX configurations, and also so that you can easily target each of the 3 Filter modules individually via the Mod Matrix.

The filter module contain all 17 modes present in ButterSynth's main filters (see Filter section for more details) plus six additional modes which use **AirWindows Z-Filter**, modelled on the coveted 'z-plane' filters on vintage Emu hardware (e.g. Emu 6400 sampler).

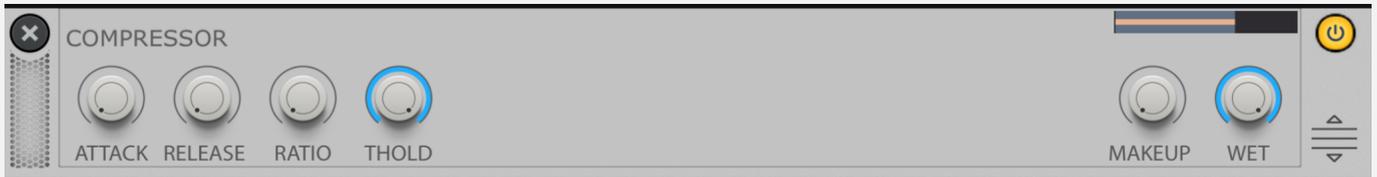
Additional Z-filter modes (6 total):

- ZFilter Low Pass / High Pass / Band Pass
- ZFilter 2 Low Pass / High Pass / Band Pass

When using one of the Z-filters you will notice that cutoff and resonance are replaced with controls for Bias and Poles. Please refer to the Airwindows ZFilter documentation for more information on how these controls work.

Compressor

Typical dynamics compressor with adjustable Attack, Release, Ratio, Threshold and Makeup gain.



BoTT (OTT Compressor)

3-band upwards and downwards compressor/limiter inspired by OTT. BoTT is all about extreme (Over-The-Top) dynamics processing. Be careful with your ears. 😊



Input

Sets input gain.

Band controls (Limiter & Threshold)

BoTT splits the signal into **High**, **Medium** and **Low** frequency bands (arranged from top to bottom). Each band has a Limiter (on/off) and Threshold setting which is set by sliding the threshold marker left or right.

- **Limiter** - Forces a band's output to not exceed the Threshold value. When the Limiter is enabled for a band the button is grey.
- **Threshold** - Sets the threshold level (in dB) which determines the amount of upwards and downward compression and the Limiter separately for each of the 3 bands (high, medium, low). Lowering the threshold will make the compression more prevalent, whereas raising the threshold will make the upwards compression stand out more.

Time

Sets the attack and release value for all 3 bands for both upwards and downwards compression.

U-comp

Sets the *upwards compression ratio* for all 3 bands. Higher settings will push the quieter parts of each band upwards towards the threshold value.

D-comp

Sets the *downwards compression ratio* for all 3 bands. Higher settings will squash the louder parts of each band downwards towards the threshold value.

Gain

A post-compression makeup-gain that provides additional controls for BoTT's output levels and wet-dry mix. If you set BoTT to 100% wet the gain dial lets you control the total gain output by all 3 bands.

Smasher

Soft brick-wall limiter with adjustable pre-gain, threshold and makeup.



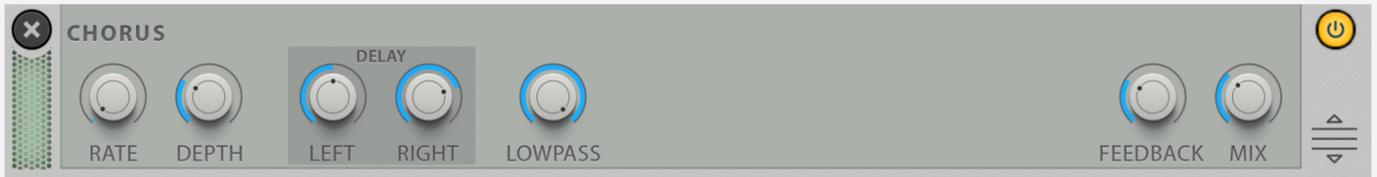
Crusher

A simple bitcrusher effect.



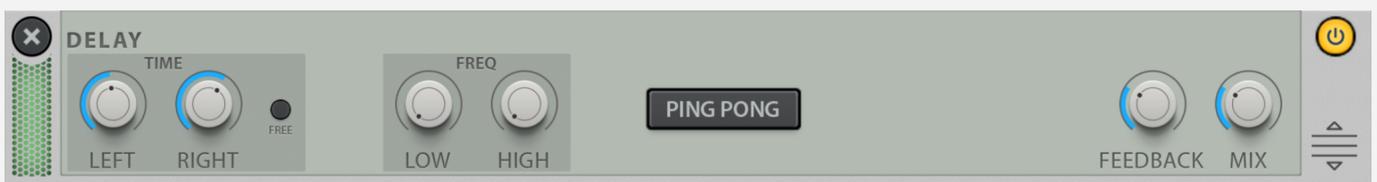
Chorus

Tempo-synced stereo chorus with rate and depth dials, plus separate left/right voice controls. Also includes a lowpass filter.



Delay

Stereo delay with (optional) “ping pong” mode and feedback LP/HP EQ. If you want a mono delay set the Left and Right Time dials to the same setting.



Pocketverb (Airwindows)

Lush sounding hall reverb with (X) different modelling types. Includes controls for Size and Gating.

Based on Pocketverb by Airwindows. See Airwindows website for more details.



Reverb

A simple plate reverb with adjustable Size, Damp, Mod Rate, Mod depth and input Lo-/Hi-cut controls.



Phaser

A simple Phaser with Rate, Depth and Feedback controls.



Note - the Mix dial is set 100% dry by default.

EQ

A 2-band parametric EQ with adjustable Frequency, Q and Gain.



Distortion

Distortion module with (X) modes and adjustable response curve. Drag the curve up or down to adjust the response.



You can oversample the Distortion EFX unit via the **Global settings** menu (⚙️)

Note - Both Mix and Amount dials are set to 0 by default.

Verbity (Airwindows)

A simple Reverb based on Airwindows Verbity which uses a feedforward topology. Provides controls for Size, Feedback and Dark.



More information is available via the [Airwindows website](#)

Pitch Delay (Airwindows)

Un-synced tape delay with (optional) pitch shift and lowpass band added between delay cycles. Adjusting the Pitch dial allows for creative delay tails that pitch up or down by a fixed amount each cycle.



For more information refer to the [Airwindows website](#)

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Global Settings and MIDI Mapping

Global Settings Menu

Oversampling

Oversampling reduces the aliasing in the oscillators and in the distortion FX. CPU consumption get higher the more oversampling is used

MIDI Devices / Input & Output

- **Automatic connection:** Connects MIDI input device automatically when the application is opened
- **Input:** Select the MIDI input device
- **Channel:** Select the MIDI input device channel
- **Stop All Notes:** Stops all notes playing. Acts as a MIDI panic

Other settings

- **Pitch Wheel Range:** Set the min/max values for the internal pitch wheel control or received pitch wheel MIDI CC values
- **Polyphony Limit:** Limits notes played simultaneously. The lower the value the lower the CPU consumption
- **Choke Same Notes:** Choke the previous note if a note played is currently playing. If enabled can reduce CPU consumption
- **Load Last Saved Preset:** If enabled last saved preset is automatically loaded when the application is started
- **Limit output:** Limits the output audio preventing accidental loud noises
- **Visualise Automation:** Shows the automation applied to the control realtime. The automation min/max range is also shown in the Modulation Matrix amount knob
- **Confirm Preset Save:** When a preset is changed while the current preset has changes on it a dialog is displayed to confirm if the user wants to save the current changes or not. If this setting is disabled all changes are lost when the preset is changed.

Patch & MIDI Configuration

MIDI Mapping

MIDI CC Mapper enables creation of custom MIDI CC mappings. Press 'Presets +' text to create a new mapping configuration

- Swipe a Controls list item to the left in order to see the Listen button. When the listen button is pressed the icon changes and the application starts listening to MIDI CC messages. The first MIDI CC message sent to the application is assigned as the desired control.
- MIDI Mapping configuration preset can be deleted by swiping the preset list item to left and pressing the Delete-button

Bypassing EFX

Processing of FXs of individual OSC can be enabled/disabled from the Key Zone Editor FX column.

When FX processing is disabled the audio from specific OSC is not run through the Effects rack

Key Zone Editor

With Key Zone Editor one can specify specific key areas where individual OSCs function.

To set value to the Start/End buttons first click a button and then click note from the internal or external MIDI keyboard

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Preset & File Management

ButterSynth's preset and file manager is fully integrated with the iOS Files app. This makes re-organisation, managed backups, and bulk importing/exporting of presets and samples extremely straightforward.

Browsing the preset library

You can cycle through patches using the left/right arrows to either side of the patch title display, or open the full browser to locate a specific patch. The patch browser also lets you filter patches by category.



Preset Categories

In ButterSynth, a **Category** is a container/folder into which user presets can be stored and organised. You can create as many different categories as you wish, and they behave just

like folders. Indeed, they will even appear as separate folders when you view the preset library via the Files App.

All user presets must be saved within a category. *If you are saving your first user preset you will need to add a new category and select that category before the save option will appear.*

It's also possible to save un-named and tweaked factory presets by long-pressing the  **quick-save icon**. If you do this those presets will all be stored in a first available User folder.

Note - you can easily move presets into other categories using the Files App OR by loading the preset and re-saving it into your desired category via ButterSynth's preset browser.

Preset Tags

When saving a user preset you will be given the chance to assign your patch with one or more **tags**.

Tags can be used to filter all categories in either the factory or user preset libraries if you are looking for presets of a specific type (e.g. bass, pad, FX) or a combination of types (e.g. Lead+Plucked).

ButterSynth's factory presets all have pre-assigned tags that cannot be changed. If you save your own version of a factory preset, however, you will be able to change the tags associated with this new user preset.

Saving patches

Whether working from the Init patch or an existing Factory/User preset, as soon as you adjust any of the dials or parameters ButterSynth will register that there has been a change to the preset. You'll know when this has happened because the patch title and quick-save icons will both show an asterisk.

Using the quick-save feature

Long-press the  disk icon to quick-save the current patch. *To avoid accidental use, tapping this icon has no effect.*

The behaviour of quick-save changes depending on the following conditions:

Edits made to a user patch: quick-save overwrites the existing stored preset with current settings. Be careful not to overwrite your favourite user patches if you haven't previously backed them up.

Edits made to a Factory/init patch: quick-save opens the name and tag window. All quick-save factory presets are stored in the “_Exported” User folder. If you’d like more control over where your presets are saved, open the full patch browser, use the full navigation and save controls to pick where the preset should be stored.

All user presets can be accessed via the iOS Files App, making it very easy to backup, export and import groups of patches.

You are also welcome to rename and re-arrange your user folders and user presets outside of ButterSynth. However, if you make changes to the file system externally while ButterSynth is running, we suggest reloading the app (or plugin) to avoid potential issues.

Importing and exporting presets, wavetables, and samples

Importing external content is done via the Files App. Files App can be opened from corresponding preset/sample import dialog by pressing the ‘Open Files App’ item

All exported content is copied to _Exported folder under User Library

When new content is copied to user Document’s folder it is automatically updated to the application. *AUv3 plugins can’t access to user Documents folder and therefore the automatic updating is not possible*

Supported sample types

- WAV 8/16/24/32 bit mono
- FLAC mono
- Serum (VST synth) wavetable .wav files

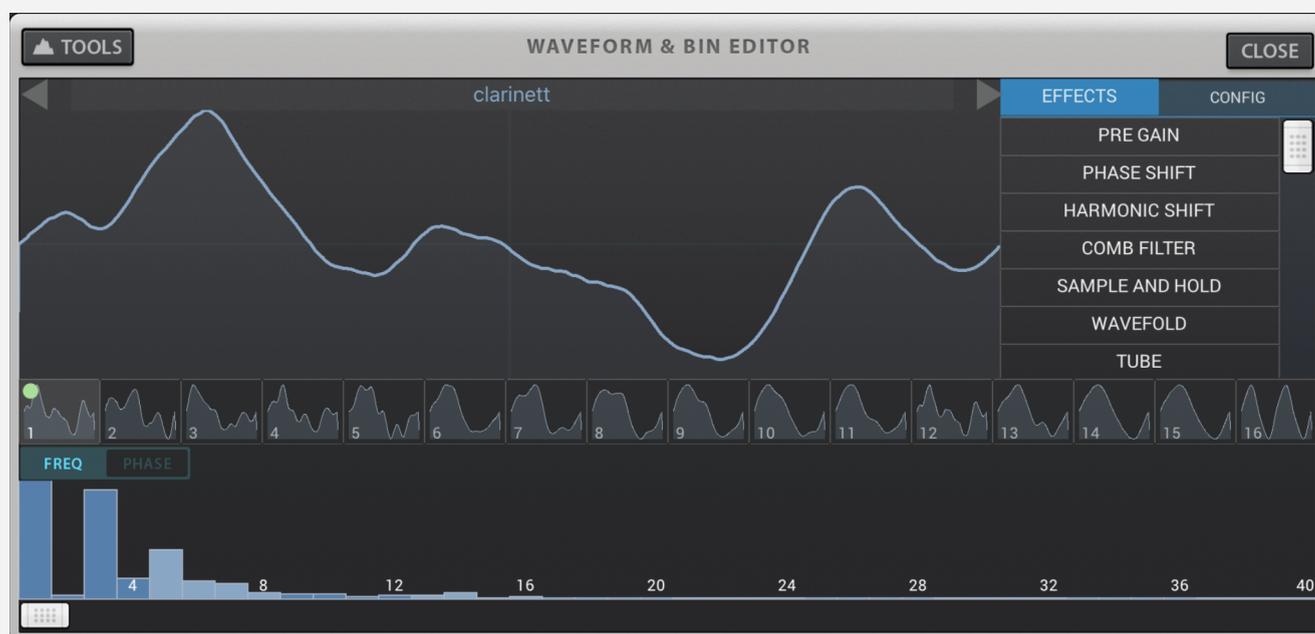
Note - ButterSynth wavetables are are stored as mono wav files, precisely 2048 samples in length.

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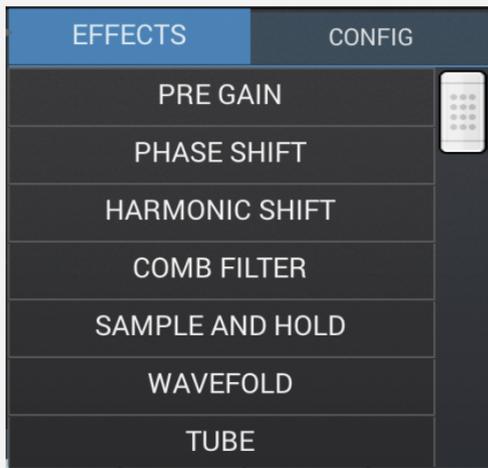
Wavetable Editor

The Wavetable and bin editor lets you edit and draw and configure your own custom wavetables. You can import/export whole wavetables or individual frames, edit existing ones, or draw something entirely original from scratch. ButterSynth's Wavetable editor also includes a suite of non-destructive effects that can be used to adjust your drawn waveforms in interesting ways.

> You access the wavetable editor via the **Edit** button on either of the two Wavetable engines (WT1 and WT2).

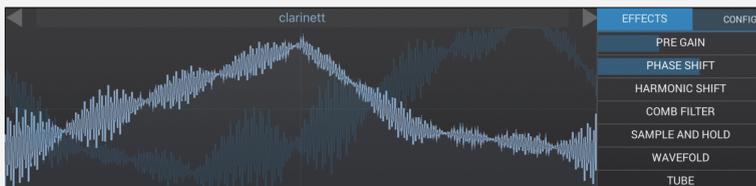


Effects

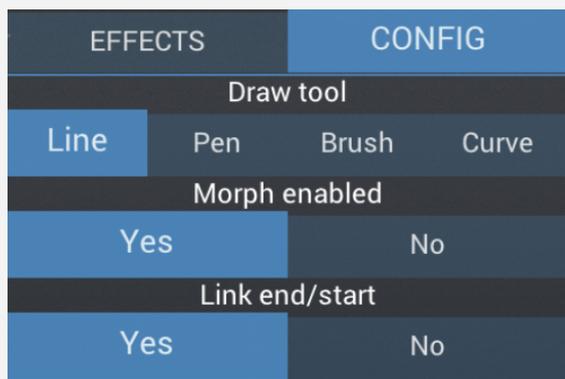


Each of these effect processes affects your waveform in a unique way and is applied by dragging the bars from left to right (0-100%).

The post-effects waveform is drawn in a lighter colour so you can visualise how the different combinations of effects are being applied to your original waveform.



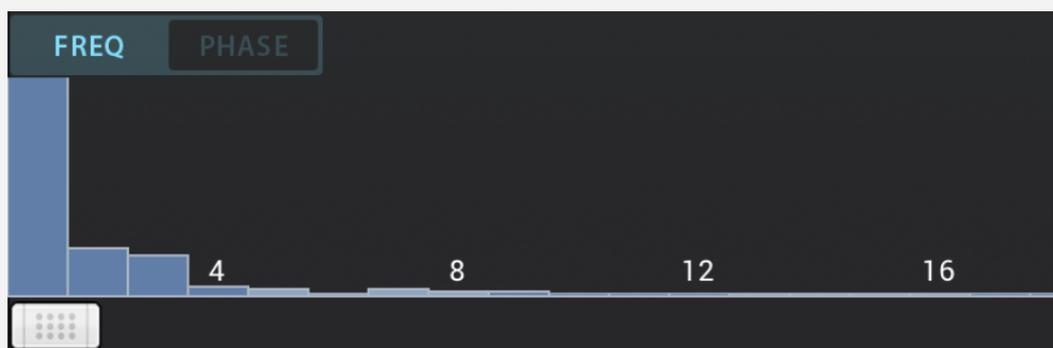
Config



- Choose from one of four different drawing tools: **Line**, **Pen**, **Brush** or **Curve**.
- When **Morph** is enabled Wavetable OSC WT POS control changes from one wavetable to another by linearly interpolating the start and end values.
- Link end/start works when the Curve Draw Tool is chosen by linking end/start points together. When linked and moving either the start or end point the other point follows the vertical position

Bin editor

The bin editor provides an alternative way to edit waveforms by targeting individual frequency 'bins'. Each bin consists of a **Frequency** (e.g. 657Hz) and **Phase** section. You can switch views using the **FREQ/PHASE** tabs at the top of the bin editor. There are a total of 1023 editable bins (NB the first bin - 0Hz - is omitted).



Tools Menu

The Tools menu (top-left corner) provides a range of useful commands for manipulating individual frames or the entire wavetable. **Please note there is NO undo command.**

- **Mark selected:** Mark the currently selected frame. Marking frames is an essential part of the copy/move commands (see below)
- **Delete selected:** Deletes the currently selected frame.
- **Delete AFTER selected:** Deletes all frames after the currently selected one.
- **Copy marked to selected:** Copies the marked frame into the currently selected frame
- **Move marked to selected:** Moves the marked frame into the currently selected frame.
- **Load/Save single:** Load (or save) a single waveform on the currently selected frame
- **Load/Save multi:** Load (or save) the entire wavetable (all frames). **Note that loading a full wavetable will overwrite all existing frames.**
- **Resample:** Buttersynth will resample the currently loaded preset (via its internal synth engine) and convert the resulting audio into wavetable frames. For example *'Resample Synth output 16'* generates 16 wavetable frames. **Note - this process will overwrite any existing frames.**

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