Bully Beef Bass Oscillators from Dome Music Technologies

Bully Beef Bass Oscillators from Dome Music Technologies is a dual sawtooth oscillator. It has unique features which make it ideal for designing fat bass sounds.

Version 1.1, April 2023

Overview

Bully Beef Bass Oscillators is a dual sawtooth oscillator designed specifically for making powerful bass sounds. It has two unique features which make it particularly suited to bass sounds:

1. The two oscillators can be detuned by a constant frequency difference. This means that the phasing between them (the 'beat frequency') cycles at the same rate, irrespective of the pitch they are playing.
2. Each oscillator has the ability to set the amplitude of the fundamental frequency component independently of the other harmonics. One problem with two oscillators tuned to the same pitch is that the fundamental frequency (the 'first harmonic') can completely cancel out when they are out of phase with each other. Bully Beef allows you to remove the fundamental of one oscillator so that its amplitude in the other oscillator remains constant at all times. You can also choose to boost the fundamental by an extra 6 dB for added 'weight'.

Version 1.1 Updates, April 2023

The following features have been added to Bully Beef to bring it up to Version 1.1:

Oscillator Sync Input and Osc 2 Phase Offset knob.

Osc 2 Waveform Polarity Switch

Tuning and Interval Controls

The Octave, Semitone and Fine Tune controls set the basic pitch of both oscillators.

Octave can be set to 8’ (highest), 16’ or 32’ (lowest). The Semitone knob allows you to tune +/- 12 semitones (one octave) in semitone steps. The Fine Tune knob allows you to tune +/- 1 semitone.

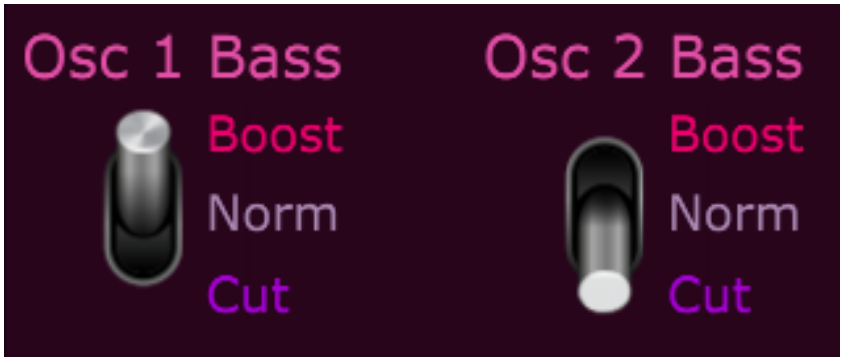
The Interval switch sets the musical interval between Osc 1 and Osc 2. The interval is applied to Osc 2 only, shifting its pitch in an upwards direction.

In the “Unison” position, both Oscillators are tuned to the same pitch (Ratio 1:1).

In the “Fifth” position, Osc 2 is set to a frequency exactly 1.5 times that of Osc 1 (Ratio 3:2). This differs very slightly from the interval of seven semitones in Twelve Tone Equal Temperament (1.4983 times).

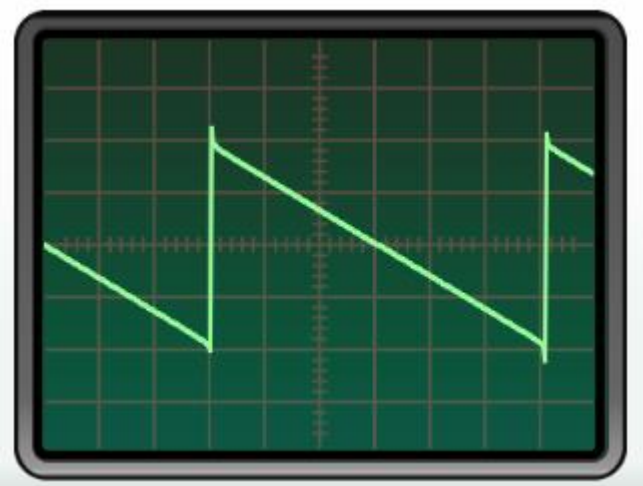
In the “Octave” position, Osc 2 is set to a frequency exactly 2.0 times that of Osc 1 (Ratio 2:1).

Bass Boost / Cut Switches

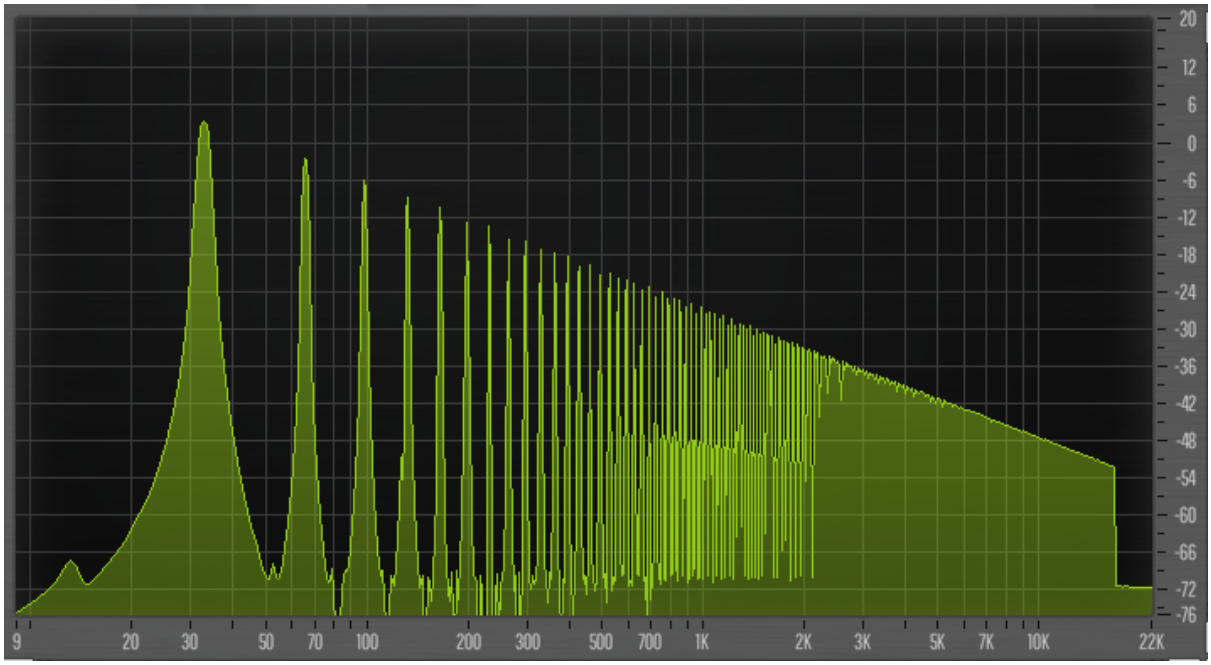


Both oscillators can select between three different waveforms, which have different harmonic content.

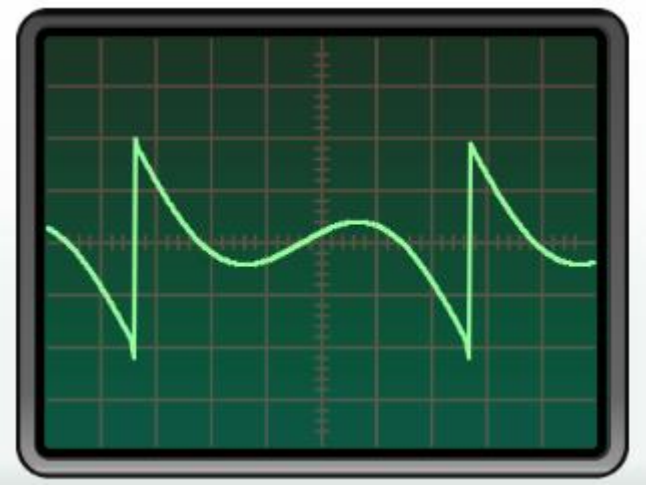
In the “Norm” position, the oscillator will output a standard falling sawtooth waveform:



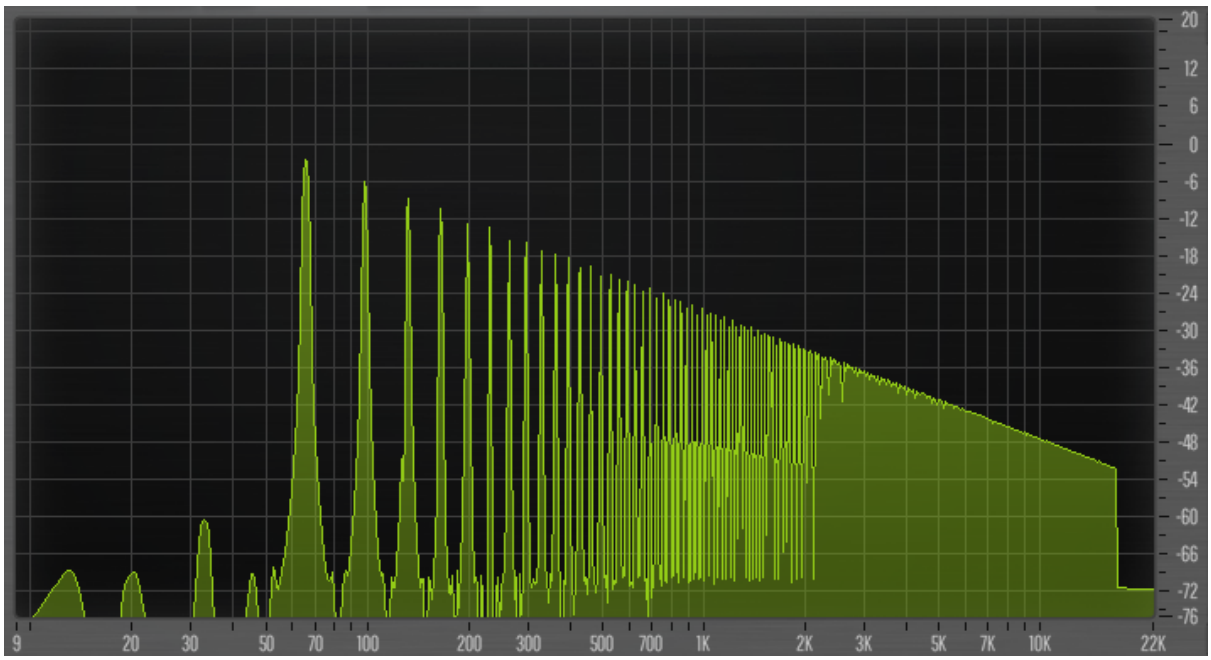
The spectrum of the “Norm” waveform looks like:



In the “Cut” position, the oscillator will output a standard falling sawtooth waveform with its fundamental component removed:

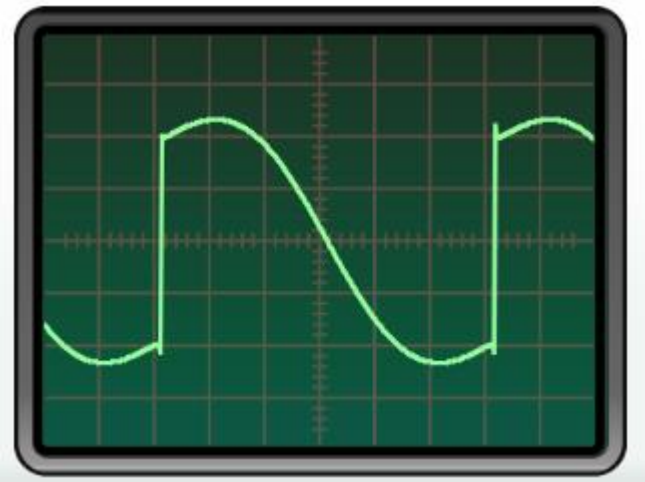


The spectrum of the “Cut” waveform looks like:

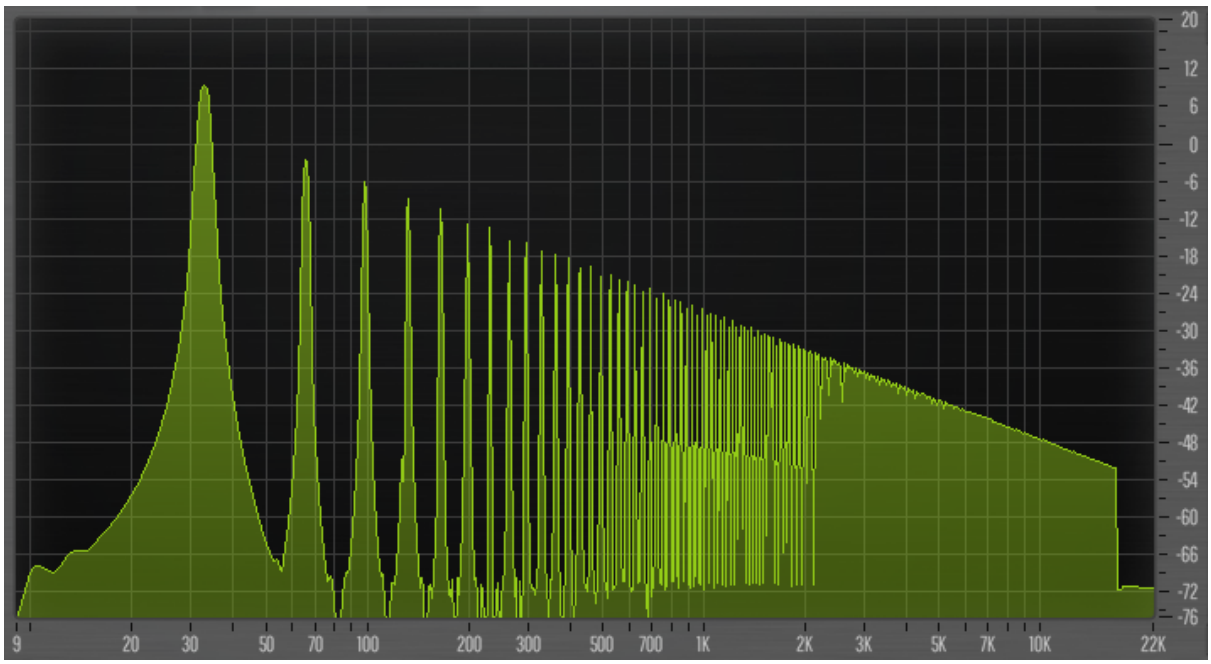


Note that the fundamental frequency (at 32 Hz) is missing.

In the “Boost” position, the oscillator will output a standard falling sawtooth waveform with its fundamental component doubled:



The spectrum of the “Boost” waveform looks like:



Note that the fundamental frequency (at 32 Hz) is 6 dB higher than it is in the “Norm” setting.

Detune Knob

The Detune knob sets the linear frequency difference between Osc 1 and Osc 2. The frequency difference (in absolute Hz) is constant, regardless of the musical pitch of the oscillators. This differs from most other voltage controlled oscillators, where the absolute frequency difference increases as the pitch rises. In standard VCOs, the frequency *ratio* between two oscillators is kept constant.

In the 12 o'clock position, the detune frequency is 0 Hz and there is no audible 'phasing' between the oscillators.

In the 7 o'clock position (-1.0), there is a 1Hz difference between the two oscillators. Osc 1's frequency *decreases* by 0.5 Hz, while Osc 2's frequency *increases* by 0.5 Hz.

In the 5 o'clock position (+20.0), there is a 20Hz difference between the two oscillators. Osc 1's frequency *increases* by 10 Hz, while Osc 2's frequency *decreases* by 10 Hz.

Oscillator Mix Knob

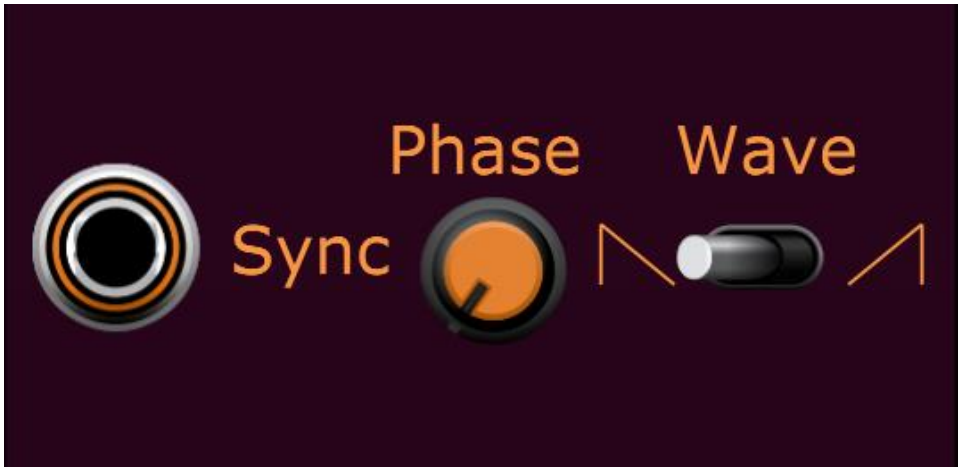
The Oscillator Mix knob adjusts the balance of the two oscillators.

In the 12 o'clock position (0), both oscillators have equal intensity.

In the 7 o'clock position (-10), only the output of Osc 1 can be heard.

In the 5 o'clock position (+10), only the output of Osc 2 can be heard.

Sync, Phase Offset and Wave Polarity Section



Under normal conditions, Osc 1 and Osc 2 are free-running relative to each other, *and* relative to the outside world. This is ideal when you want the detuned beat frequency between the two oscillators to sound like a free-running LFO. However, there are times when you might want to set the phase offset between the two oscillators; for example, so that the phasing sound starts at the same position within a phase sweep every time a new note is played. This is where the Sync Input jack and the Phase Offset knob come into play.

Sync Input

The Sync Input accepts any voltage signal from DC up to audio rates. It detects a rising edge trigger when the input voltage goes from at or below 0.0V to above 0.0V. This differs from most gate or trigger inputs within the Voltage Modular universe, where 2.5V is the normal threshold value. The 0.0V threshold for Sync was chosen for use with audio rate inputs, where Bully Beef will perform as a typical 'hard sync' slave oscillator.

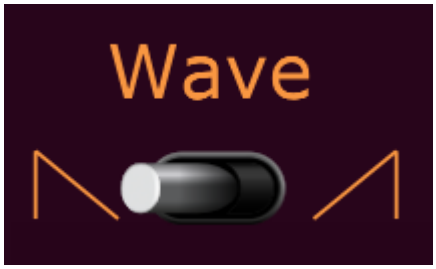
Phase Offset Knob

The Phase (Offset) knob determines the phase of Osc 2 relative to Osc 1 when a sync pulse is received at the Sync Input. Osc 1 always resets to 0 degrees in its cycle, whereas Osc 2 can be varied from 0 degrees (7 o'clock), thru 180 degrees (12 o'clock) up to 360 degrees (5 o'clock).

If both oscillators are at exact simple ratios (Detune=0.0), you can use the Phase Offset, Interval and Osc Mix controls to create interesting 'digital' waveshapes. This happens due to the interference of the harmonics against each other. In this situation, it's best to connect the Sync Input to the Gate or Trig Output on the CV Sources panel. This ensures that the relative phase will be reset on every key-press, giving you consistent waveforms over time. Note that you will have to keep pressing a new note every time you want to hear what a new Phase Offset sounds like; turning the Phase knob won't achieve anything until the offset is locked in by a pulse at the Sync Input.

Using the Sync Input to achieve traditional 'hard sync' effects is simple - just connect the output of another oscillator to the Sync Input. Then, as you raise the pitch of Bully Beef (manually or via the CV In), you will hear that typical aggressive hard sync sound. Turning the Phase knob can lead to interesting variations on the typical hard sync sound (Oc 2 only – Osc 1 will always reset to phase = 0 degrees). These variations are not usually available on other syncable oscillators. Off the top of my head, I can only think of the CA Super Oscillator's "Skew" and the VM921's "Clamping Point". Apologies to other developers if I've missed you out! Classic "Sync Sweep" sounds can be achieved using the CV Input and setting Depth to large values.

Osc 2 Wave Polarity Switch



The Wave switch allows you to switch the shape of Osc 2's waveform between falling sawtooth (Left position, default) and rising sawtooth (Right position). This can lead to interesting waveforms at the output, as the constructive and destructive interference of the harmonics is drastically altered. In particular, it allows you to mix rising and falling sawtooth waveforms to construct 'square' waveforms. Try the following settings (with Wave to the right – rising sawtooth) to hear examples of these sounds:

Interval	Osc Mix (Osc 1:Osc 2)	Effect
Unison	0 (1:1)	Thru-zero Pulse Width Modulation
Fifth	-2 (3:2)	'Digital' waveforms
Octave	-3.333 (2:1)	Square Osc and Sub Osc

Inputs, Output and Modulation Depth

The V/Oct input is normally connected to the keyboard pitch output or sequencer output. Any volts-per-octave source can be used though, even audio signals.

The CV input allows for logarithmic voltage control of pitch.

The signal at the CV socket is attenuated by the "Depth" knob:

> In the 7 o'clock position (0), the CV input has no effect on pitch.
>
> In the 12 o'clock position (+2), +5V at the CV input will raise the pitch by 2 semitones (one whole tone).
>
> In the 5 o'clock position (+12), +5V at the CV input will raise the pitch by 12 semitones (one octave).

The "Out" socket outputs the mixed audio signal from both oscillators.