

**BMA_009 SUMO
USER'S MANUAL**



INTRODUCTION.

SUMO - VCO WITH EXPANDED HARMONIC POSSIBILITIES

Congratulations on your acquisition of SUMO, the voice of the national synthesizer!

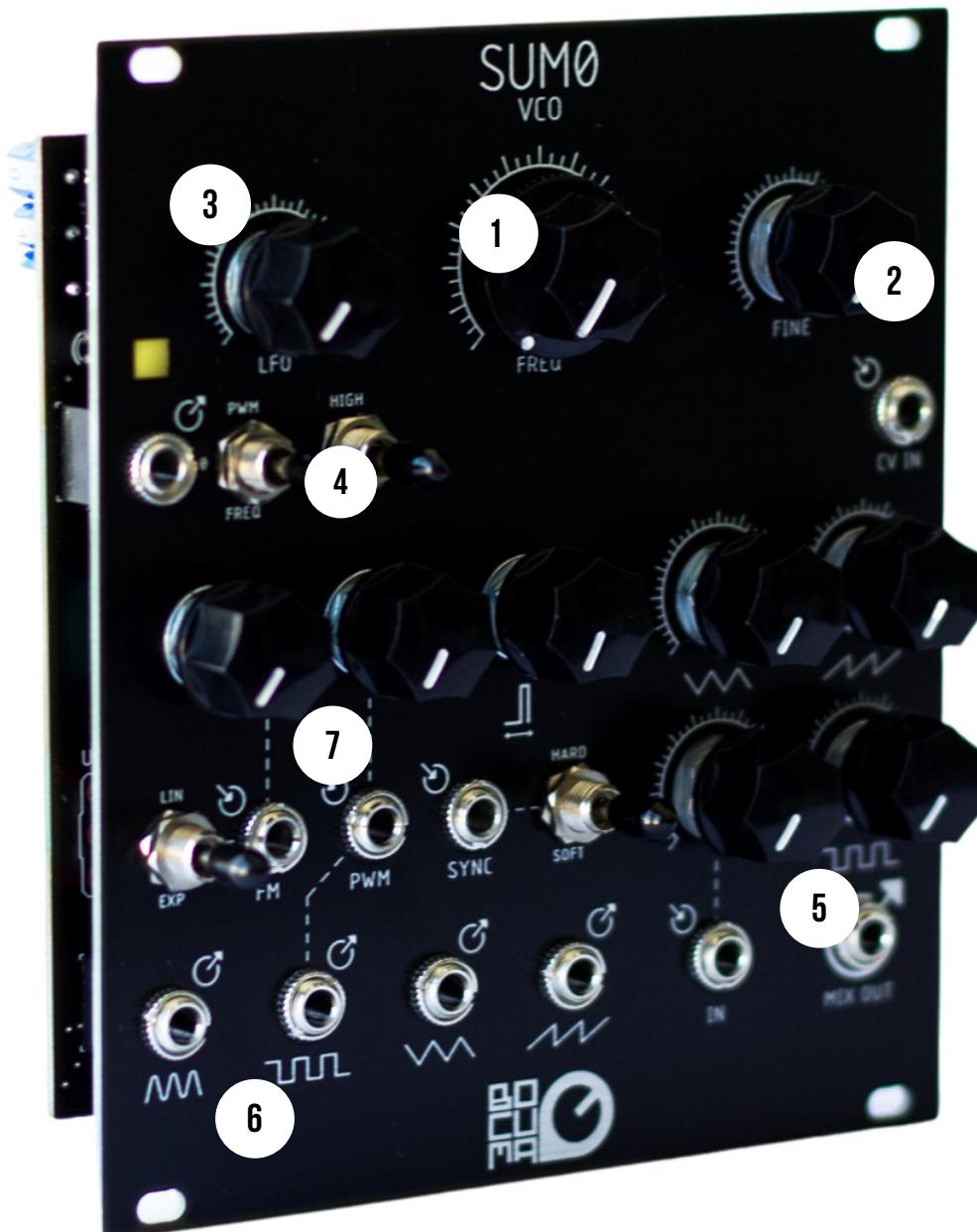
SUMO is a 22HP voltage controlled oscillator designed to allow the creation and manipulation of complex waveforms with high harmonic content.

We hope you enjoy it as much as we enjoy designing and assembling it for you.

LAYOUT.

SUMO VCO

1. Frequency adjustment (coarse)
2. Fine frequency adjustment (fine)
3. LFO
4. LFO output and controls
5. Signal summing
6. Independent outputs
7. Modulation controls



USER'S GUIDE.

EACH OF SUM0'S SECTIONS AND THEIR MAIN FUNCTIONS ARE DETAILED AS FOLLOWS



COARSE and FINE frequency settings (1 and 2 in the layout).

In this section SUM0 can adjust its operating frequency. The knob labeled "FREQ" adjusts the frequency from minimum to maximum clockwise. This knob is complemented by the fine adjustment knob labeled "FINE", which allows you to make more precise frequency adjustments.

Located near the "FINE" knob is the input connector for 1V/Oct.





Modulation controls and signal outputs (Sections 6 and 7 in the layout).

This section provides access to different modulation and signal manipulation parameters, as well as the independent outputs of each of the waveforms generated by SUMO's oscillation engine.

From left to right and denoted with their respective symbology, we find the sine, square, triangular, and sawtooth waves. Note that the square waveform is linked to the PWM input, the attenuator, and the manual control for the pulse width modulation, which we will detail later.

In this section there are also 2 selector switches corresponding to frequency modulation (exponential, linear and "off" in the center) and sync (hard, soft and "off" in the center).

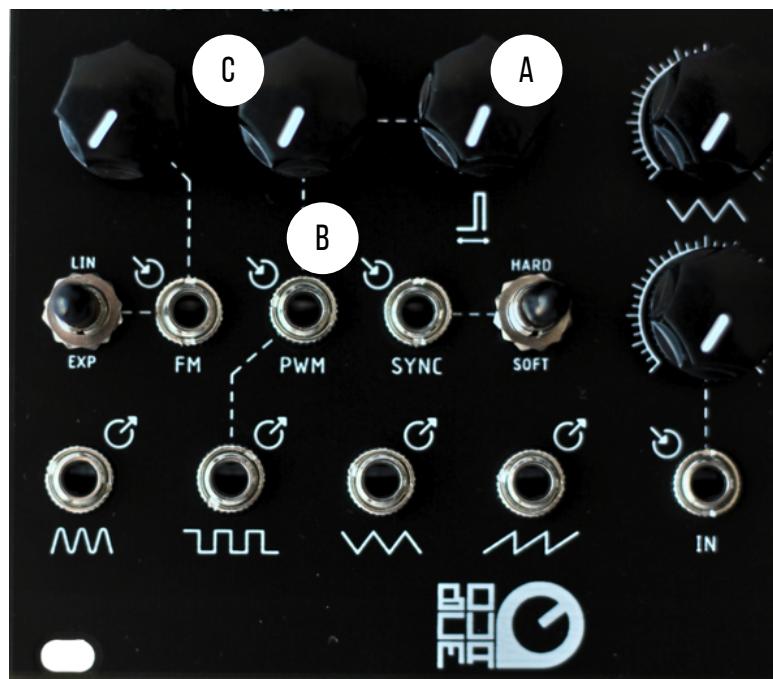




Modulations.

Pulse width modulation for square waves:

The square waveform of SUMO can be pulse width modulated manually using the control knob on the panel (A) or by means of an external signal at the input called "PWM". This input is passed through an attenuator (C) and the manual control (A), as indicated by the dotted line on the panel starting from the output of the square waveform.

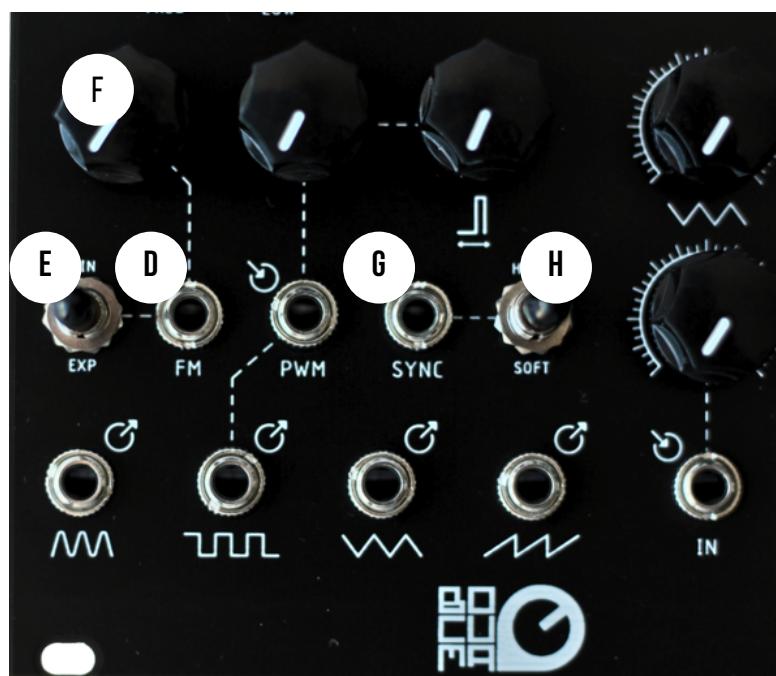


To modulate the pulse width manually, turn the knob (A) from left to right to vary the pulse width of the square waveform. To maintain a square waveform without modulating its PWM leave this knob at half (50%) or 12:00hrs clockwise.

To modulate the pulse width with an external signal, connect a modulation signal to the PWM input (B). The knob (C) functions as an "intensity" control or attenuator, varying the modulation intensity from minimum to maximum clockwise.

Frequency modulation or "FM".

The frequency of SUMO can be modulated by an external control signal. Connect a control signal to the "FM" input (D). This input passes through the selector switch (E) which switches between two modulation modes: exponential and linear (off-center) and, in turn, is routed to the attenuator (F) which varies the modulation intensity from minimum to maximum clockwise.



Sync.

Similar to frequency modulation, the sync connector (G) accepts an external signal and passes through the selector switch (H). There is no attenuator for this option.

These are the main ways to modulate sum0's signals using an external control signal. Next, we will explore how to use the integrated LFO to make SUMO modulate itself.



LFO

SUM0 is equipped with a low frequency oscillator (LFO) although strictly speaking, it behaves more like a variable frequency oscillator, since it reaches audible frequencies. We designed it this way because we wanted to expand the exploration possibilities in the field of frequency modulation. The waveform of this oscillator is triangular and below we detail its internal connection or "normalization".



The LFO knob (I) adjusts the speed or frequency of the LFO which in turn offers 3 operating ranges: low, mid and high, selectable by the switch (K). The LFO is pre-routed to the destination switch (J) which allows routing its signal to frequency modulation at its "down" position or pulse width modulation at its "up" position (deactivated at the center position). The connector (L) provides an output of the LFO for use outside the module. Connecting a cable at this point opens the internal normalization making the LFO work independently. It is worth mentioning that the LED is a visual indication of the speed at which the LFO is operating at any given time.



Modulations with the LFO.

Modulating the PWM with the LFO.

To modulate the PWM using the integrated LFO, set the switch (J) to its "PWM" position (up), this routes the LFO signal to the "PWM" connector (B) described in section "II.I Modulations", without the need of a patch cable. From here, you can modulate the pulse width as described above, with the only difference that, instead of using an external signal, we will use the signal from the integrated LFO.



Frequency modulating with the LFO.

To perform a frequency modulation or "FM", place the switch (J) in the "FREQ" position (down), this directs the LFO signal to the FM connector (D) described in section "II.I Modulations", without the need of a patch cable. From here, you can modulate the frequency as described above, with the only difference that, instead of using an external signal, we will use the signal from the built-in LFO.

IV

Signal summing.

The signal summing section is a mixer that allows you to add the square, sawtooth and triangle signals to each other. Each of the knobs adjusts the presence level of each signal at the "mix out" connector (M). This output is independent from the outputs of each waveform and can be used simultaneously with them.



Also, an external signal (from another oscillator, for example) can be mixed with the signals generated by SUMO by means of the connector (N).

(Note: exceeding the nominal levels of an Eurorack audio signal may damage this input or alter the correct operation of the summing unit. (Proceed with caution).

V

Calibration.

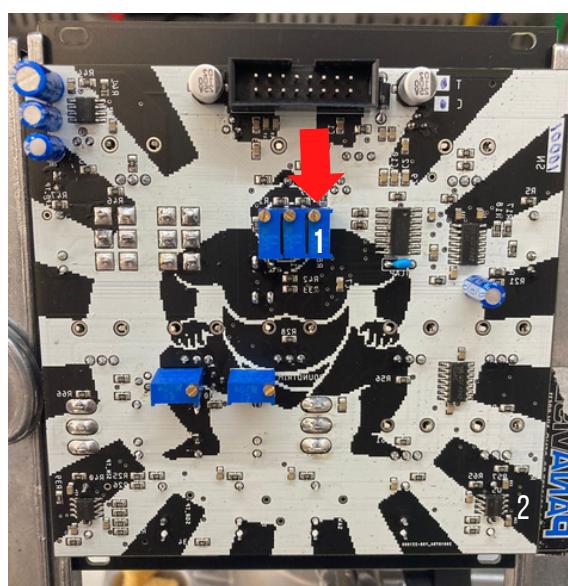
We meticulously calibrate each SUMO unit for proper operation. However, due to voltage variations in each power supply, some fine adjustments may be necessary and can be executed as described below.

1V/OCT tracking calibration.

To make fine adjustments to SUMO's 1V/Oct tracking you will need to access the back of the module without disconnecting it from the power supply.

1. Connect a voltage control signal to the CV IN input and a tuner to the audio output corresponding to the sawtooth waveform.
2. With the FREQ and FINE knob all the way to the left (minimum setting) place a 1V signal to the CVIN input and observe the frequency on the tuner.
3. Make 1V increments and observe the frequency on the tuner, adjusting the screw (1) as necessary so that each 1-volt increment corresponds to one octave on the tuner.

Note: tampering with the other adjustment screws may result in complete decalibration of SUMO. Proceed with caution. If you have any problems, please contact us at contacto@bocuma.mx



TO FINISH...

Nerdy Specs:

Size and format: 22 HP EURORACK

Power consumption: +/- 12V 12mA

Our inspiration to create is you and all the musicians and sound artists who challenge the status quo to explore new horizons and, to do so, make use of technology and innovation.

We wish you excellent sound explorations!

Designed and assembled with a lot of passion in Guadalafunk, Mexico.
Capital of the Mexican national oscillation.

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WWW.BOCUMA.MX

