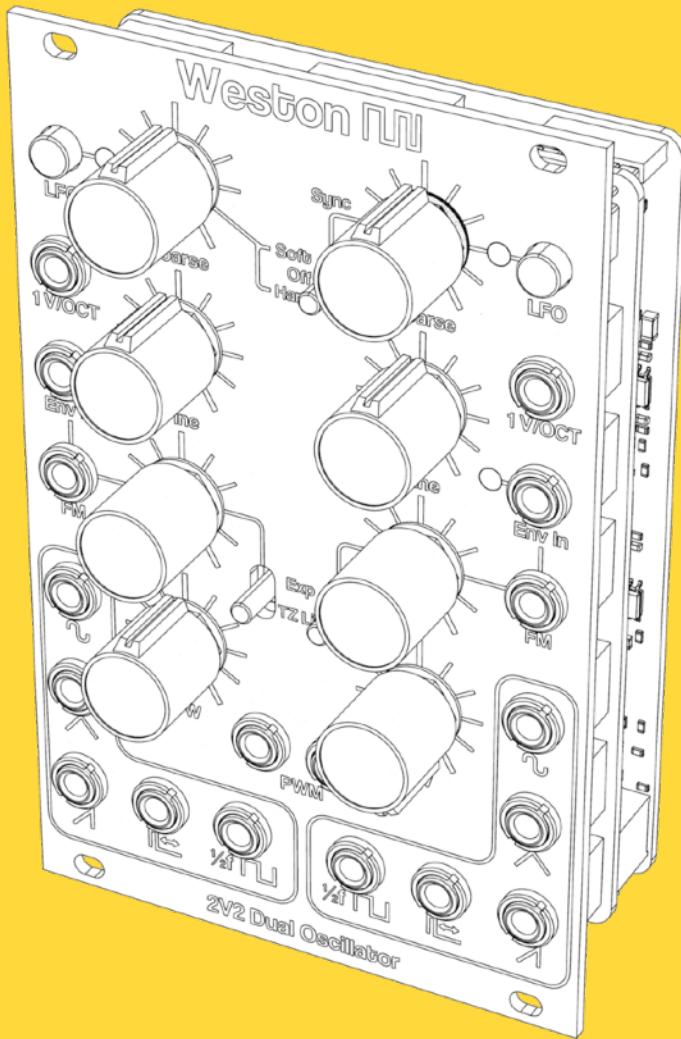


2V2

Dual Analog Oscillator

Eurorack Module

User Manual



Weston Precision Audio

Designed In Portland, Oregon
Revision 02 - May 21, 2024

DESCRIPTION

2V2 is a dual voltage controlled oscillator (VCO) module in Eurorack format. This VCO is available as a pre-built unit as well as a Through-hole DIY panel and PCB set. This document is the user manual for the pre-assembled unit. However, the functions described, except for the trimmer locations, are the same for the DIY version and the prebuilt version.

2V2 contains 2 analog triangle-core VCO units. Each VCO core on 2V2 is functionally identical, with the exception that VCO B contains a small bit of extra circuitry that allow it to be sync'd (both "hard" and "soft") to VCO A. Additionally, each VCO may be switched to LFO (low frequency oscillator) operation.

Both VCOs can be modulated externally in a standard exponential manner, as well as "through zero" linearly. There are also 2 VCAs on board for shaping FM modulation with an external envelope or signal!

2V2 has been engineered using temperature-compensated VCA modules so that it is extremely stable under ambient temperature changes. Each VCO is capable of good VCO tracking over 7 octaves or more. Each VCO contains the "standard" host of outputs (triangle, sine, pulse, saw), as well as sub-octave square outputs.

SPECS

Module Size: 16HP

VCO Output (All outputs ~1kOhm Impedance): Triangle, Square, Sub-Octave Square, Sawtooth and Sine.

Inputs (All inputs >=100kOhm Impedance): Volts/octave, FM, Envelope In.

All individual wave outputs: 10 Volts peak-to-peak nominally.

Power input: +12V & -12V via standard 10 pin Eurorack connector.

Power consumption (+12V / -12V):
Typ: 115mA / 85mA
Max: 125mA / 95mA

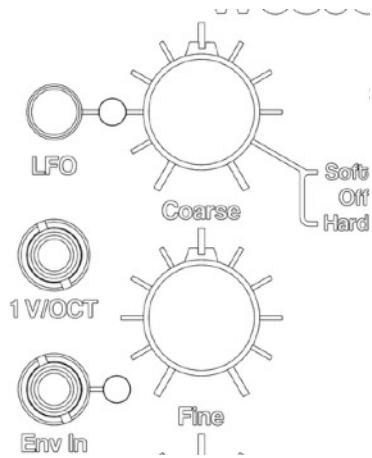
MAXIMUM LIMITS

Supply Voltage: +13.5V / -13.5V

Any inputs: Supply limits.

MAIN CONTROLS & I/O

Each VCO is functionally identical and contains the same inputs and outputs. Thus, one can simply draw and imaginary vertical line down the center of the module. Everything on the left side is the same as the right.



Tuning:

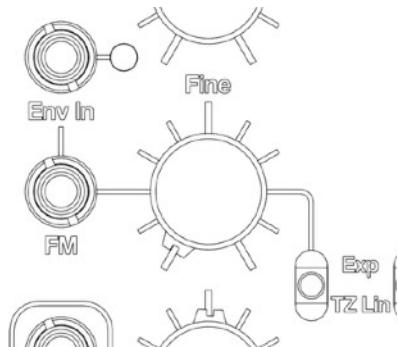
These are standard tuning pots, the upper one being a very coarse adjustment, and the other being a fine (about 27:1 ratio) adjustment.

1 V/Oct Input:

This is a standard 1 Volt per Octave input for pitch control of the VCO.

LFO Button:

This is a toggling-type button, which when depressed will cause the amber LED next to it to light, and that VCO's core will oscillate about 0.015 of the frequency as in normal mode and thus become an LFO (Low Frequency Oscillator)



FM Input:

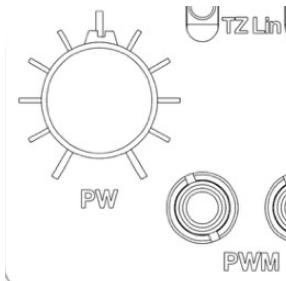
This is the input for Frequency Modulation signals (FM). The switch immediately to the right (or left for the right-hand VCO) selects whether the modulation will be exponential in response, or through-zero linear.

FM Amount Potentiometer:

The pot to the right of the FM input shown above (or to the left for the right-hand VCO) attenuates the amount of signal sent to modulate the VCO.

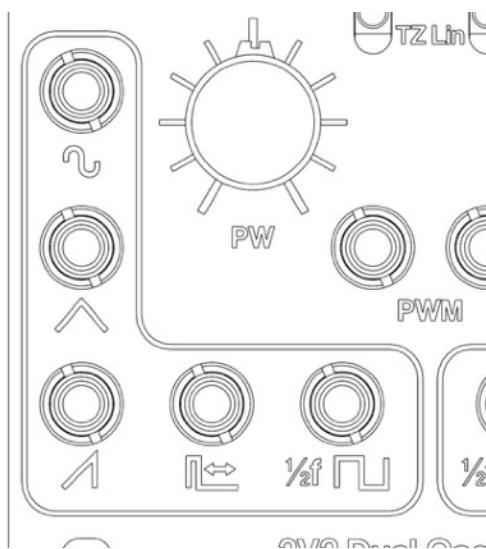
Env In Input:

A signal inputted here will modulate the *amount* of signal sent to modulate the VCO. The overall amount of modulation is still governed by the FM amount pot. The input could be an envelope or any other signal, but it must be unipolar (0 to 5V for 0% to 100% modulation). Larger voltages can be inputted to "Env In", but the FM-shaping VCA cuts off at 100%, which is about a 5V input to "Env In"



PW Potentiometer:

This pot adjusts the nominal pulse width of the Pulse output of each VCO core from 0 to 100%, with the center (high noon) position being 50% or a square wave.



WAVE OUTPUTS

Each VCO core has 5 outputs. From top to bottom, left to right:

Sine:

An approximate sine wave formed by feeding the triangle output to an

overdriven matched differential pair circuit.

Triangle:

The triangle wave from the VCO core.

Sawtooth:

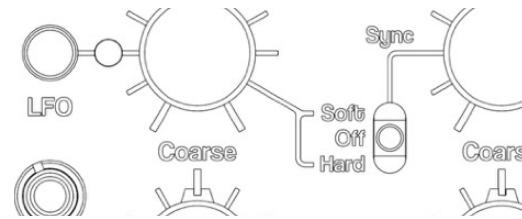
Sawtooth wave converted from VCO core's triangle and square outputs.

Pulse:

A standard pulse output from feeding a PW + PWM signal and the triangle to a comparator.

Sub-Octave Square (1/2f):

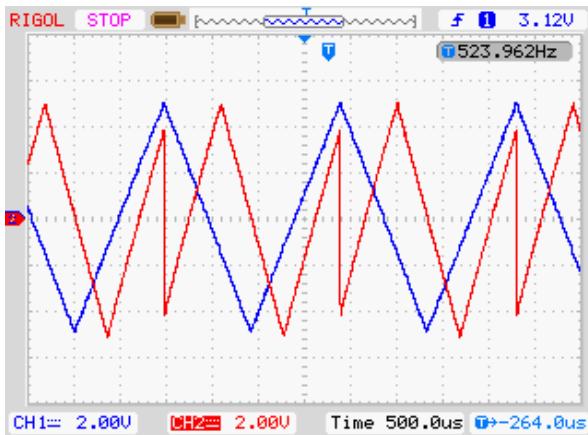
A square wave of 1/2 the frequency of all the other wave outputs.



SYNCING AND MODULATION

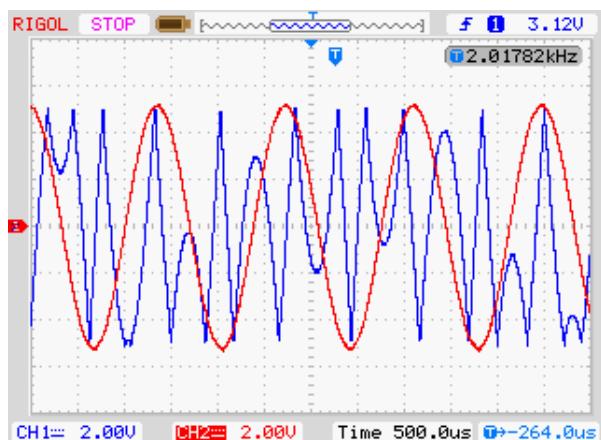
Using the 3-position sync switch, the right-hand VCO core can be synced to the left-hand VCO core. In the center position, sync is disabled. In the upper position, the right VCO is "soft-synced"

to the left, meaning the triangle reverses on each positive zero-crossing of the left VCO. In the lower position, the right VCO is “hard-synced” to the left, meaning that the capacitor is discharged to zero on each positive zero-crossing of the left VCO. The following scope shots show the difference. The blue wave is VCO A (left VCO) and the red wave is VCO B (right VCO):

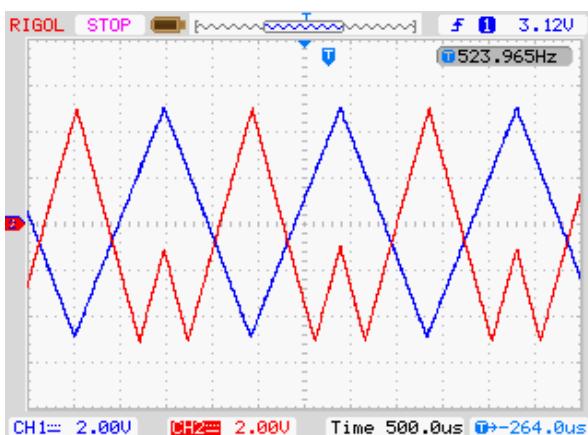


Hard Sync

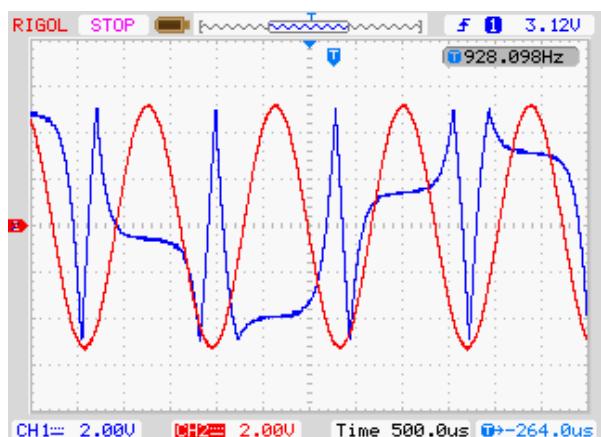
As described on page 3, each VCO has a modulation switch which can be switched to exponential or through-zero linear (TZFM) type of frequency modulation. The following scope shots show the difference. The modulating wave (red) has been patched to the FM input of the carrier wave (blue). Due to its balanced nature, the fundamental observed frequency of the carrier wave stays relatively constant when using TZFM. This is not true with exponential FM.



Through-Zero Linear FM



Soft Sync



Exponential FM

USER CONFIGURATION OPTION: CVB JACK NORMAL

There is a solder jumper on the back side of the jacks PCB which selects the “normalling” of the right VCO (VCO B) CV jack, which means what happens to this jack when nothing is plugged in. There are 2 options as described below. 2V2 comes configured with option (2):

- 1) “CVA”. If you select this option, the right VCO will inherit the CV signal inserted into the left CV jack when there is nothing inserted in to the right CV jack.
- 2) “0V”. If you select this option, the right VCO will receive no CV voltage when there is nothing inserted into the right CV jack.

The image to the right shows the jumper configured for option “2”.

To change the setting on your 2V2, simply remove the 4 screws on the back of the module and carefully pull off the rear PCB. Melt the solder jumper with a soldering iron and remove the solder with a solder-sucker or wick. Then, reapply a blob of solder shorting across the option (1) or (2) location.



MAINTANENCE

2V2, like most modular synth equipment will not need any particular periodic maintenance. However, some people may want to adjust the trimmer pots on the module, such as perfecting the V/oct response for your particular case, MIDI converter, etc.. The following trimmer pots are located on the rear PCB of 2V2 and are labeled on the top side of the board with their function:

On the top edge of the rear PCB:

- V/oct trimmer VCO A (VOA)
- High Frequency compensation trimmer VCO A (HFA)
- V/oct trimmer VCO B (VOB)
- High Frequency compensation trimmer VCO B (HFB)

On the bottom edge of the rear PCB:

- Sine shape trimmer VCO A (SINA)
- Sine shape trimmer VCO B (SINB)

CONCLUSIONS

As with any piece of modular synth equipment, it is best to just play with it by itself and with other modules. Find what you like and most importunely, have fun making music!!

REVISION HISTORY

- 02: Add description of CVB normal solder jumper.
- 01: Initial release.