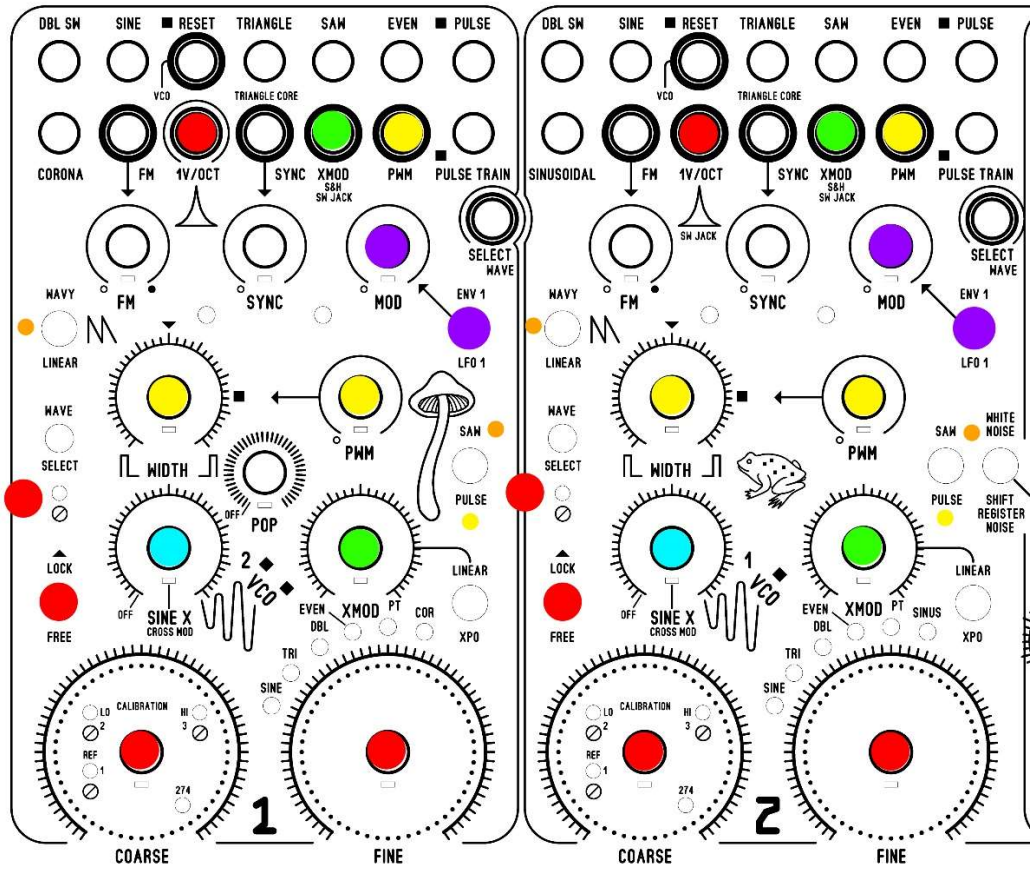
Quickstart: only 2 patch cables are needed to get some musical notes going. 1v/octave input and TRIG input. The external gear is assumed to be a midi cv keyboard or sequencing device.

The outputs for monitoring sound are found on the right. MONITOR is a stereo jack, you can use headphones there. CH1 and CH2 are mono outputs. The mono outputs are roughly -2v/+2v, a bit hotter than pro audio line level signals. Use the Monitor Knob to adjust the level of both MONITOR OUT and CH1/CH2 OUTS.

If you wanted to patch the outputs to a euro format module, you might have to amplify a bit.

The goal of this instrument was to not depend on having to look up this manual. Once you get familiar with the synthesizer, the layout is straight forward. This is definitely easier to use than a modular synthsizer.



Red Section: pitch tuning related controls. Coarse knob, Fine Tune knob, Lock Switch, and Trimmers.

These controls are used to quickly move around the frequency of the two vco's. When the toggle switch is set to Free, you can use the Coarse knob to adjust the frequency. When the toggle switch is set to LOCK, the small trimmer above it is used to setup your favorite musical note. Out of the box VCO1 is set to 32.7hz-33hz C note. VCO2 lock trimmer is setup 1 octave up, C note 65.41hz. Fine Tune knob is available no matter what mode the toggle switch is set. It is best to have fine tune knob most of the time set to 12 o' clock position and adjust accordingly.

The 1V/Octave jacks are used to patch to your external midi to CV keyboard or sequencer. You only need 1 patch cable to control both vco's. Use VCO1 1v/octave for that. If you patch another cable into VCO2 1v/octave, you break the internal switch jack daisy chain.

Aqua Section: Cross Modulation. This knob is a 'Send Sine Wave' FM parameter. VCO1, SINEX knob, will send VCO1 sine wave to VCO2 exponential CV input, for Frequency Modulation. VCO2, SINEX knob, will send VCO2 sine wave to VCO1 exponential CV input, for Frequency Modulation. When both SineX knobs are used, you are doing Cross Modulation. In order to shut these features OFF you need the SINE X knobs to be fully counter clockwise. All of this is internally, permanently patched.

Green Section: XMOD knobs. Use the toggle switch to the right of this knob to select the style of modulation, Linear or Exponential. Linear FM is weaker, Exponential is stronger. You can externally patch a signal using the jacks above to change the internal pre-patched setup. This is pre-patched to an analog Sample and Hold. The Sample and hold clock uses the TRIGGER input jack, and will change it's sampling at every trigger pulse. The Sampling is taken from the Internal White noise generator. This is creating a random effect. When there is no Trigger signal, and no XMOD jack patch, it is normal for the XMOD knob to have some +voltage. So turning the XMOD clockwise will tune the vco 'up' in frequency. Have the XMOD knobs fully counter clockwise to have these set to OFF. When using the Sample and hold, and the toggle switch setup to Linear FM, the mode is very weak, this is normal.

Yellow Section: Pulse Width Modulation and Pulse Width Adjustment. These controls are only used when the waveform in use is Pulse Wave. Use the Toggle Switch labeled SAW/PULSE located to the right of PWM knob. You need the switch setup to PULSE to hear the parameter changes. SAW/PULSE switch determines 'VCO1 and VCO2' knob on the mixer section.

SAW waveform has its own style. You can select the style using the toggle switch Wavy or Linear. Use Linear for a normal SAW waveform. Wavy was a different Harmonic, you can easily hear the difference. Remember that you need to have VCO toggle switch also setup to SAW, instead of Pulse.

Purple Section: This is another exponential Frequency Modulation, pre-patched, to either LFO1 or Envelope Generator 1. Use the Toggle Switch to select LFO1 or ENV1. Envelope Generator applied here will create percussion sounds. Use the Sine wave at a lower frequency, and MOD knob fully clockwise to create a Drum patch. Envelope Generator 1 is the same Envelope Generator used for the Filter.

Pop Knob VCO1. This creates a short strike sound used for percussion sounds. It is more audible when using a Sine wave or Triangle Wave. To turn off the effect, have the knob fully counter clockwise. The strike happens when using TRIG input jack.

SYNC and RESET for each VCO. Sync input is so strong that it needed an attenuator knob, 'SYNC Knob. Sync will tear apart the triangle core right at the top of the waveform. At strong settings, the effect starts to sound like quantization. This is the original circuit found on the Bergfotron advanced vco. Which the two vco's are based on.

Reset is a circuit that resets the vco timing capacitor. This forces the triangle core waveform to restart from the bottom. Use Reset for more traditional Master and Slave Frequency locking patches.

Select Waveform button and External Select Wave jack. Use these to select the waveform for WAVE 2 in the mixer section. The red LED's should move in sequence when in use (button push or external patch). If you patch a curvy waveform like a triangle wave into select wave jack, it is normal behavior to skip out of sequence. Use a pulse or square wave if exact sequencing count is the goal.

All of the signal outputs jacks in the VCO sections are roughly -5V/+5V signals. These are used for modular patching. A ring graphic indicates an Input, no ring graphic indicates an Output.

*******Each VCO has its calibration located under the Coarse Knob. You will need a small Hex wrench to remove the big knob. There is no need to do this unless you are at guru level analog wizardry, and wish to re-calibrate. The EOS synth should be calibrated right out of the box, there is no need to tinker with this.

But just in case, here are the Parameters for Calibration. This is only for experts in this hobby.

You need a hex wrench, frequency counter, and a volt meter. All parameter are on the front panel, no need to open up the synthesizer.

Check on the Reference Voltage before you begin any recalibration.

-Reference Voltage. There is a reference voltage for the internal VCA exponential converter. Out of the factory it is setup to 0.2743V. If you see exactly 0.274V, this is just fine, leave it alone.

0.275V or 0.2739V should not throw the tuning totally out of whack. The precision would be very lightly off. Still musical, but under a frequency counter, you can see that it can be tighter.

0.264V would start to throw off the entire 1v per octave scale.

The small hole on the panel is where you can poke a volt meter probe to get your reading.

REF tunning trimmer is used to adjust the voltage.

This parameter is a set and forget. You should not be having to adjust it often.

The High and Low trimmers for 1V per Octave Scale.

These are the same type of adjustments found on just about all analog vco's. Nothing special here. You can get these as tight as you want. There are no matched transistors, I am using VCA's for the exponential conversion. So if you have the patience, you can achieve very tight tolerances for tuning.

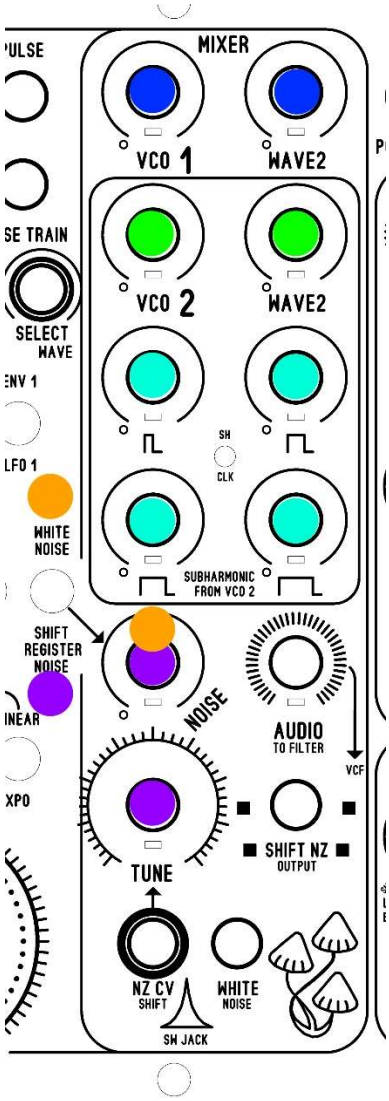
Use 50Hz as your starting Frequency for 0V,

The goal is to get 1V 100hz, 2V 200hz, 3V 400hz, 4v 800hz. Use this range to determine adjustment for LOW trimmer.

5V 1600hz, 6V 3200hz. Use this range to adjust High Trimmer. When you adjust high trimmer, you slightly throw off low trimmer. You need to rinse and repeat a few times both low trimmer and high trimmer adjustments to get tight tuning.

For example, this is great tunning: 50.0hz, 100.0hz, 200.1hz, 400.0hz, 800.1hz,1600.2hz, 3201.0hz or 3204hz.

-1/+1 Hertz is close enough, you can get it tighter, but if you are a beginner, and you got in a scary situation of totally messing up the scaling, this would get your synth back to ballpark.



This is the mixer section.

VCO 1 only has two possible mixing choices, VCO 1 knob and WAVE 2 knob.

VCO1 is either going to be a saw wave or pulse wave. Determined by toggle switch.

VCO2 has the same parameters, but with the addition of a sub harmonic generator. The white LED indicator located in this area, has nothing to do with the mixer. This led only lights up when you use the TRIG jack.

Noise Generator, and Final Output AUDIO to Filter knob.

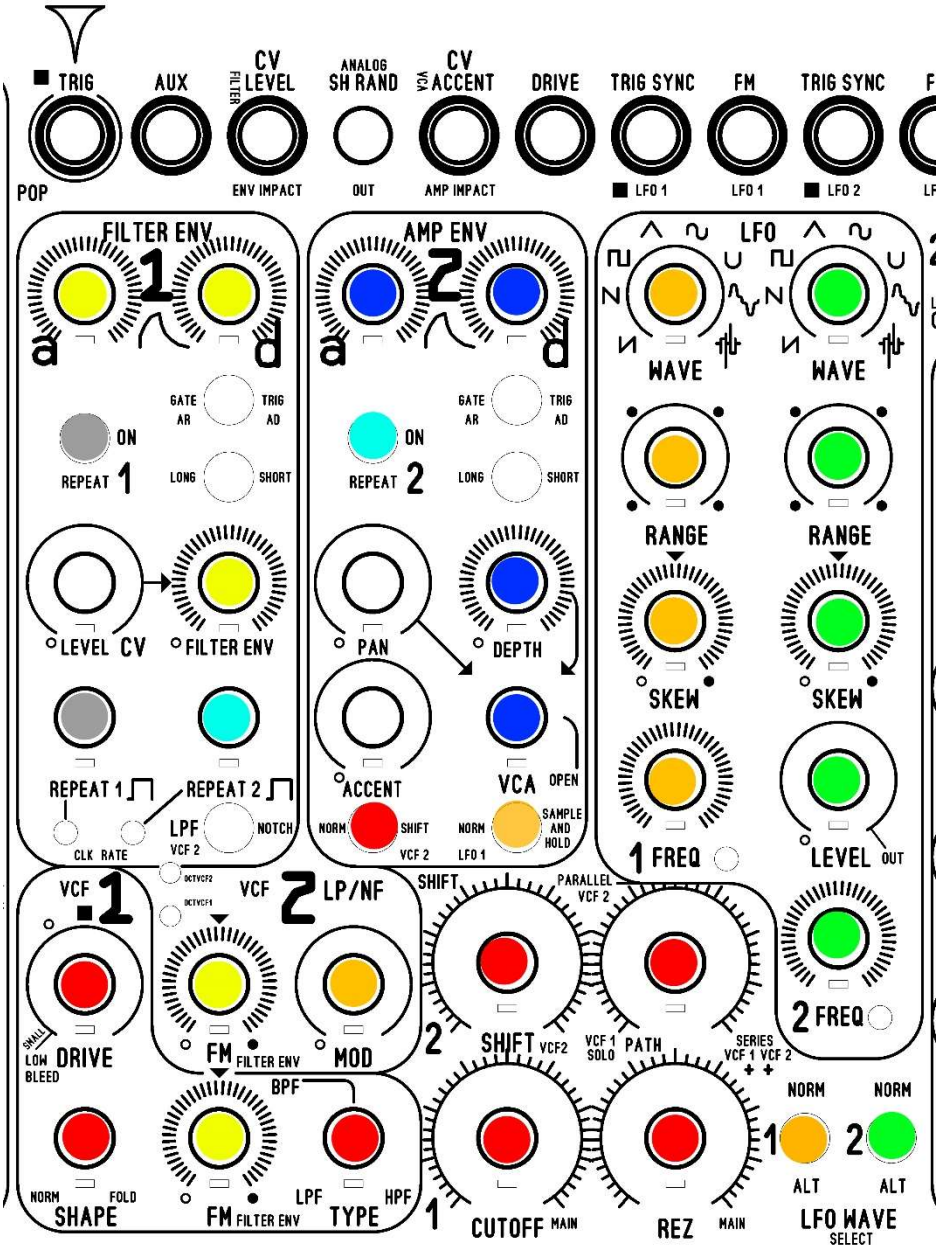
There are two Noise Generators. White Noise and Shift Register Noise. White Noise is static, Shift Register Noise is tunable. The TUNE knob is only used when using Shift Register Noise.

You select which noise mode using the toggle switch. The ‘NOISE’ knob is used to mix the effect.

NZ CV is a jack used to Control Voltage TUNE knob.

SHIFT NZ and White Noise jacks are outputs. Roughly -5V/+5V signals.

The AUDIO to Filter knob is used to send the entire mix of all your mixer settings to the analog filter. This saves you from having to re-adjust a bunch of knobs. It is perfectly fine to have this knob fully clockwise. There is no gain.



The filter section a confusing at first use. Have the PATH knob fully counter clockwise to use as a normal solo filter. SHIFT knob is basically Cutoff knob for Filter #2. You only use SHIFT knob if Path knob is set up clockwise into PARALLEL MODE and SERIES MODE.

Shift Knob can be setup to act like a full sweep-able cutoff knob, or setup as a Fine tune adjustment for VCF #2. This is selected by toggle switch.

VCF#2 only has two states: Normal Low Pass mode or Notch Pass mode. Selectable my toggle switch.

VCF#1 has Low Pass Mode, Band Pass Mode, and High Pass Mode. Use the TYPE knob to mix in between filter types for VCF1.

Most of these parameters are colored red above.

DRIVE Knob is used to amplify the signal coming from the mixer section. When fully counter clockwise, there is a very low amount of signal still going to the filters. Use the AUDIO to Filter knob to fully kill any sound coming from the mixer section.

DRIVE has CV, use the above DRIVE jack to voltage control this parameter. Normally an envelope generator is patched to that.

SHAPE Knob is a basic wave folder, there is no CV possible for this parameter. Have to knob fully counter clockwise to kill the wave folder effect. The wave folder is happening right after the DRIVE circuit in the signal chain. Drive Knob can be used to adjust the tone of the Wave Folder.

MOD knob for the filters is internally patched to LFO 1. It is marked Orange. LFO1 Modulation it sent to both VCF1 and VCF2. There are additional independent VCF CV's located to the right of the synthesizer. Labeled VCF1 VCF2 CV. These are independent from MOD knob.

You can patch External Audio using AUX jack located at the top. This circuit has gain, so if you patch a Euro Format Audio Signal like Braids Module, you will need to attenuate the signal. There is a RED Clipping Led to indicate clipping for this input. The AUX was meant for Line Level Signals. No damage is done by Clipping the signal. If you like the overdrive sound, so be it.

FM Filter Envelope. The FM below is for VCF1, and the one above is for VCF2. The circuit is bi-polar, so knob position 12'o clock is considered low, or OFF. It will never truly be off at 12' o clock.

You can use the above Filter ENV knob to totally kill the Envelope send.

The Envelope generator sections are based from the blue lantern APE module. The graphics help separate the two envelope generator sections. One is for the Filters, and the others is specifically for the stereo VCA's. Both sections have the same toggle switches. Use Gate Mode for keyboard playing, and trigger mode for 1 shot fast sequencing or percussion mode. The long and short toggle switch changes the length of the Attack and Decay cycle.

Repeat Knobs are analog square wave generators. You can activate each one by toggle switch. These will gate activate each envelope generator. REPEAT knob determines the frequency. Use the orange led to indicate rate.

Filter Envelope Section has an internal additional VCA to simulate velocity parameter, like found in your DAW sequencer or midi sequencer. Level CV knob and CV level Jack above is used to vari this internal VCA. Have the Filter ENV knob at a lower counter clock wise setting to use this feature successfully.

Otherwise manually adjust Filter ENV knob yourself live to effect both analog filters. FM knobs below are more of a set and leave alone.

AMP Envelope section is for the stereo VCA's. The Panning Knob and Panning input jack is best used with -5V/+5V signals. The Accent Knob and accent jacks has an internal diode clipper and best used with +5V signals. You can use bi-polar signals on the accent, but the diode clipping will only send positive portion to the vca cv section.

VCA knob manually offsets both vca channels. Fully clock wise will open the vca so that you can hear audio for testing or creating a live sustain.

The Depth Knob determines how much envelope generator voltage is sent to the stereo vca's. If sound gets to loud for you and the vca's are being overdriven, you can solve that by adjusting this parameter, turn the depth knob counter clockwise.

It is normal behavior that there is audio sound level drop between gate mode and trigger mode in the AMP section. Trigger mode is softer in sound, and gate mode is louder in sound. You can use the vca knob to adjust and compensate.

There are two digital LFO's. Both of these are based off the mini digital Blue Lantern Module LFO's.

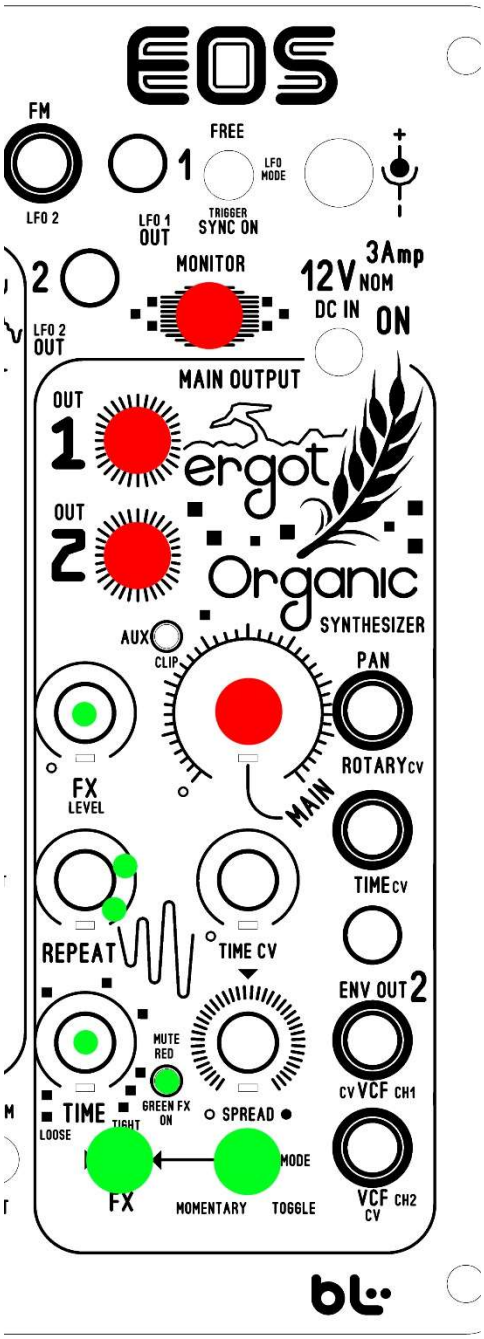
There are two banks of wave shapes. Selected by toggle switch. Bank 2 is labeled ALT (Alternative)

LFO 1 has a toggle switch to turn any wave form into a sample and hold version.

LFO2 is not internally patched to anything. You are free to patch this extra lfo. The level knob on LFO2 is basically an output attenuator.

The toggle switch above labeled lfo sync is used to reset the lfo cycle on trigger. This is hardwired for both lfo's. The SKEW knob needs to be a little bit passed 12' o clock for it to successfully reset. If the SKEW knob is set fully counter clockwise, SYNC Mode activated, and trigger signals are patched, you will not successfully reset the lfo.

LFO SYNC is not a clock bpm-based feature, it resets the waveform, it does not synchronize the lfo to your groove box clock tempo.



On power up there is an internal circuit that resets the FX section to GREEN, meaning FX ON.

There is no memory. If you do not want WET fx every time you turn on the synth just have the FX Level knob set fully counter clock wise. FX level knob is just a WET FX level mix.

Momentary and TOGGLE Mode. This is used to determine the action of the small red button.

On toggle mode, on each push you change the state of the logic, on or off. The LED RED and GREEN are only used in toggle mode. Red indicates off, Green indicates on.

On Momentary mode, the FX is only active why you push down the button and hold your finger down. This is a common DJ type live interaction mode.

The trails are not abruptly muted in either button modes.

Repeat will slightly feedback and oscillate if fully clockwise. You need to feed it a sound for it to do that. You can do that by manually turning the VCA knob clock wise to 'open' really quick.

The circuit itself was possible to self-oscillate with no sound input needed, but it got a bit out of control, I had to do exact resistor values to get a sweet spot. I settled on feed the oscillation, rather than having a growing square wave right on power up if the repeating knob was left fully counter clockwise.

The timing Knob when fully counter clockwise gets tighter and looser when clockwise. You get longer echo's clockwise. The longer the decay, the more degraded the FX sound. This is normal behavior.

Use the SPREAD knob to manually adjust both channels echo timings at once. You get cool effect. Try it out.

Time CV is an attenuator for the TIME CV input jack.

Red section Monitor jack and channel output jacks.

Monitor Jack is a stereo Jack. Use this for headphones or USB powered speaker.

CH2 and CH2 are mono output jacks. They have a -2V/+2V output. 1K ohm based.

Use the Monitor Knob to lower the level if the signal is clipping.

These are slightly hotter than Pro Audio Level Signal (+/-1.7V). This is ready to go with consumer gear like audio interfaces, audio mixers, DJ mixers, etc.

If you patch the outputs to Euro Format Gear, you might have to amplify a little bit to achieve -5V/+5V

The AUX external input line level, you will have to attenuate a Euro Format signal. There is no damage if you don't attenuate, it will sound distorted is all. I use a certain op amp. My distortion on my products never sound bad, it's up to you.