



## Voltage Controlled Noise Oscillator

We would like to thank you for considering a place for the VCNO in your modular synthesizer. We think you will enjoy its unique character and find it useful in your musical endeavours. VCNO is a eurorack modular format product and requires a +/-12V eurorack standard power supply and enclosure to operate.

### MANY FLAVOURS OF NOISE

VCNO is a noise oscillator, capable of producing full spectrum white noise. But that's where its similarity to other noise generators stops. VCNO can be used like a VCO – you can modulate the pitch over CV and use its multiple outputs simultaneously, each with a distinct sonic character. As well, you can patch it into a VCA or use it to modulate and trigger other elements in your modular system.

The key difference between VCNO and other fixed noise generators available in eurorack is the method of creating noise. Instead of a fixed white noise generator being the source, VCNO uses a variable frequency Linear Feedback Shift Register (LFSR), which creates a pseudorandom sequence of bits (square waves). When these bits occur at frequencies well above the audio spectrum, the resulting sound heard by our ears is full spectrum white noise. While this method of noise generation is technically digital (like in vintage computer sound chips, such as the C64's legendary SID), VCNO has been implemented using discrete analog hardware, without the use of digital microcontrollers.

Pseudorandom means that, eventually, the sequence repeats – but given a clock signal of 120 bpm, for example, it will take many months to repeat. The sequence of bits always starts at a random place, so for all intents and purposes it is totally random. Watch our video demo to see on the oscilloscope exactly how our ears interpret a random pattern of square waves as pure white noise.

White noise is of course very useful in a modular system – for creating snares and hi-hats or for filtered noise pads, for example - but being able to adjust the frequency and having different 'flavours' of noise that you can mix, blend, pan and effect separately, means this little 6hp module can really punch above its weight.

### FEATURES

#### NOISE and GATE Outputs

- **NOISE is the main LFSR output. With the pitch knob turned fully clockwise this will output pure white noise. As you turn the pitch down, the noise evolves into crunchy noise, reminiscent of vintage video game sounds**
- **GATE is a DC-coupled output. This is perfect for supplying random triggers in your system**

#### Three Alternative Outputs

- **Each of the three alternative outputs – SCREECH, SIZZLE AND TEAR have their own unique sonic characteristics**
- **SCREECH features a dark, howling overtone to the main NOISE output**
- **SIZZLE features a related control, which takes the output from pure white noise when turned fully clockwise to a vinyl-like crackle when turned anti-clockwise**
- **TEAR sounds like the noise generator is broken and tearing itself apart**
- **All outputs work simultaneously and are simultaneously affected by the pitch knob or CV**

#### PITCH Input

- **The frequency of VCNO can be modulated via CV – just patch any CV signal into this jack**
- **A bipolar attenuverter lets you find the right level and polarity for your CV signal**
- **A switch on the back lets you select either logarithmic or linear response to CV signal.**

#### CLOCK Input

- **A clock signal input here bypasses the internal frequency generator. You can apply a clock from a trigger sequencer to create a pseudorandom drum trigger pattern synced to the rest of your drums**

# TECHNICAL SPECIFICATIONS

**Width:** 6HP | **Depth:** 30mm  
**Current draw:** +49mA, -39mA @ 12V

## INTERFACE

### PITCH KNOB

This controls the pitch of all four outputs. It has an exponential response, because this is how we perceive pitch – it sounds as though the pitch is more effectively spread across the knob travel. The **PITCH CV input** can be set to respond in an exponential or linear fashion. Experiment with these to see which one works for you. In general, a logarithmic pitch response is more natural to our ears, but when frequency modulating at audio rates, linear can provide different sounding results

**A switch on the back of the module allows you to select between logarithmic and linear response at the PITCH CV input jack. Turn your modular off before adjusting this switch!**

### SIZZLE

Turn the SIZZLE control fully clockwise and the output will be the same as the main NOISE output – white noise. Start to turn it anti-clockwise and you will begin to remove individual square waves from the output. It will begin to sound like frying sausages. Keep turning it and it will begin to sound like vinyl crackle. **SIZZLE works best when the PITCH is producing high frequency white noise.** This means that when modulating the PITCH with CV, the SIZZLE output will morph from sizzling sounds to crunchy LFSR noise!

### NOISE AND GATES OUTPUTS

NOISE is the main output. GATES is the same output but DC-coupled instead of audio-coupled.

### ALTERNATIVE OUTPUTS

Each output has its own unique characteristics, which are different configurations of the main LFSR output. Like a VCO with multiple waveshaping outputs, all four audio level outputs are always on and available for simultaneous use in your system.

**In addition to its own character, a switch on the back of the module lets you select the pitch range of SCREECH in relation to the main NOISE output – from low to high, in three steps. This is useful to configure the SCREECH output to run at a different octave than the main output, simultaneously!**

### CLOCK INPUT

When a jack is plugged in here, it replaces the internal PITCH generator of VCNO. This input accepts any clock signal with a positive-going voltage of about 2V or more. The signal should return below zero before going positive again in order to properly clock the noise generator. Ideally, it should be a square wave, but other signal shapes will work as well.



## SOME PATCH IDEAS

- **Patch multiple different VCNO outputs into different filters and/or other sound modifiers, but then sum them together with a sub-mixer afterward**  
Pairs excellent with stereo Red Dragon filters! Adjust and modulate each filter so that you are extracting different characteristics from each output, but then summing them together into one texture. Things can get wild pretty fast!
- **Use VCNO as an external noise source for the Mutant Drums**  
The Mutant Hihats, Clap and Snare are particularly excellent to pair with VCNO their external input source. Many of the Mutant Drums let you use an external audio source instead of their internal sound generators.
- **Create an entire chiptune drum kit with VCNO to use in your patches**  
If you have modules that can store samples, use those – otherwise an Octatrack or other performance sampler is a great pairing. All you need are some envelopes, VCAs, perhaps a filter or two and a VCNO to make all sorts of percussion sounds from scratch. The key to many percussive sounds is to apply a decaying envelope to the pitch. This concept can be applied to standard oscillators, but also works well with VCNO to create snares, claps and other tones.
- **Use the GATES output to create pseudorandom drum trigger sequences**
  - 1.) *Simplest way*: patch your sequencer's clock into VCNO's clock input to sync them together. Use VCNO's GATES output directly to trigger drums or other events in your modular. The resulting pattern will be gates that turn on and off at random, but in sync with your sequence.
  - 2.) *More complicated method (but more control)*: patch your sequencer's clock into VCNO, except instead of taking the GATES output directly, plug it into an AND (or NAND) logic gate module. For the other input to the AND gate, insert the gate output of a sequencer which lets you program the gates on or off. The AND gate's output then becomes your *programmable* pseudorandom gate source. The result of this patch is that you can *select particular* steps which you would like the chance of a random gate happening on, and leave out the ones you don't want them to ever occur on.
- **Create howling wind that evolves into horrific screeching**  
A common application of white noise is to run it through a fairly resonant low-pass filter, while modulating the cutoff frequency a little bit. This sounds a lot like howling wind. Try emulating this classic patch, but using the SCREECH or other outputs of VCNO as the source. When modulating the PITCH of VCNO, the sound will evolve from howling wind at maximum frequency, to terrifying screeches at lower VCNO frequencies.
- **Self-patch VCNO for completely different noises from the main output**  
Try patching the alternative outputs into the PITCH CV input while listening to the main output for wildly different sounds. The SCREECH and TEAR outputs fed back into PITCH seem to have the biggest effect on the sound. Don't forget to try this using each of the SCREECH pitch settings selected using the switch on the back.

## QUICK REFERENCE CARD

If you've lost your packaging, or do not wish to cut out the card on the packaging sleeve, you might find this handy to print out and have near your modular system.



The image is a quick reference card for the Hexinverter VCNO module. It features a central illustration of a person wearing a blindfold and a backpack, standing next to a rack of modular synthesizer equipment. The card is divided into several sections: a top left section with the Hexinverter logo and the product name 'VCNO' in large red letters; a top right section with a detailed photograph of the VCNO module's faceplate, showing various knobs and buttons labeled 'PITCH', 'SIZZLE', 'NOISE', 'SCRCH', 'GATES', 'SIZZLE', 'TEAR', and 'CLOCK'; a middle section with descriptive text about the module's operation and controls; a bottom left section with logos for 'EURORACK FORMAT' and 'кибер панк'; a bottom center section with large red and blue text asking '256 ОТТЕНКОВ ЧИСТОГО ШУМА?'; and a bottom right section with 'QUICK SPECS' including 'WIDTH 6HP', 'DEPTH 30mm', and 'CURRENT DRAW +49mA, -39mA'. The overall design is dark with red and blue highlights.

**HEXINVERTER ÉLECTRONIQUE**

# VCNO

VOLTAGE-CONTROLLED NOISE OSCILLATOR

VCNO stands for **Voltage Controlled Noise Oscillator**. It generates noise using the same method that early digital computer sound chips used. Except it does so using discrete logic, without the use of software or microcontrollers.

Unlike transistor-based white noise sources, **the PITCH is adjustable, and voltage controlled**. At maximum, full spectrum white noise is produced. As you turn the pitch down, the noise begins to fall apart, producing **crunchy, C64-esque noise sweeps**, all the way down to sub-audio frequencies. A bipolar attenuverter provides control of your pitch modulation source.

VCNO doesn't stop at retro LFSR noise. Simultaneous, different flavours are on tap. Think of these like the different waveform outputs on an analogue VCO. They are not simple effects, but rather **complete rewirings of the noise circuitry**.

**SCRCH**: This output has a dark, unearthly sounding screeching overtone.

**SIZZLE**: When the SIZZLE control is at maximum, it sounds just like the main **NOISE** output. As you turn the control down, fewer blips of noise make it through, resulting in a vinyl-like crackle. Very evolving sounds when modulating PITCH with CV.

**TEAR**: This output adds a broken, tearing sound to the noise.

VCNO also provides random utility in your system. Apply a **CLOCK** signal and get random **GATES** out. Perfect for creating pseudorandom drum trigger patterns when you apply your trigger sequencer's clock.

**EURORACK FORMAT**

кибер панк

## 256 ОТТЕНКОВ ЧИСТОГО ШУМА?

**QUICK SPECS**

- WIDTH 6HP
- DEPTH 30mm
- CURRENT DRAW +49mA, -39mA