Noise VCA

Noise Generator with state variable VCF and VCA

1. Introduction

An all-in-one noise 'voice'. A white noise generator followed by a state-variable VCF (switchable high-, band-, or lowpass characteristic) with adjustable resonance (Q) and a VCA makes this versatile module ideal for most standard noise applications. The integrated filter provides a wide range of rich and colourful noise sounds. The VCF has a 2nd input, allowing one to combine external audio with the noise, or to replace the VCF's noise input completely with an external source.
The VCA mode can be switched between exponential or linear characteristic, with a muting option when the switch is in its middle position; the 'Offset' knob allows one to shift the VCA's start point by adding a negative or positive voltage to the VCA's CV input.

2. Features

- **Noise generator with integrated state-variable VCF and VCA**
- **3 direct outputs:**
  - White Noise
  - Sub F (Random CV)
  - VCF Out (Coloured)
- **Switchable VCF characteristic:**
  - Highpass
  - Bandpass
  - Lowpass
- **Adjustable filter resonance (Q)**
- **Switchable 2nd VCF signal input:**
  - White noise
  - White noise & external signal combined
  - External signal
- **VCA with switchable CV mode:**
  - Linear CV
  - 0 (mute)
  - Exponential CV

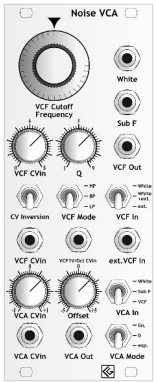
- **Eurorack module**
- **Width: 10 HP**
- **Dimensions: 128,5 mm x 50,5 mm**
- **Depth: ≈40mm**
- **Supply voltage: ±12V**
- **Current consumption: +12V: ≈42-45mA; -12V: ≈41-43mA**
- **Available in banana or 3,5mm minijack version**

Front view

Left side view

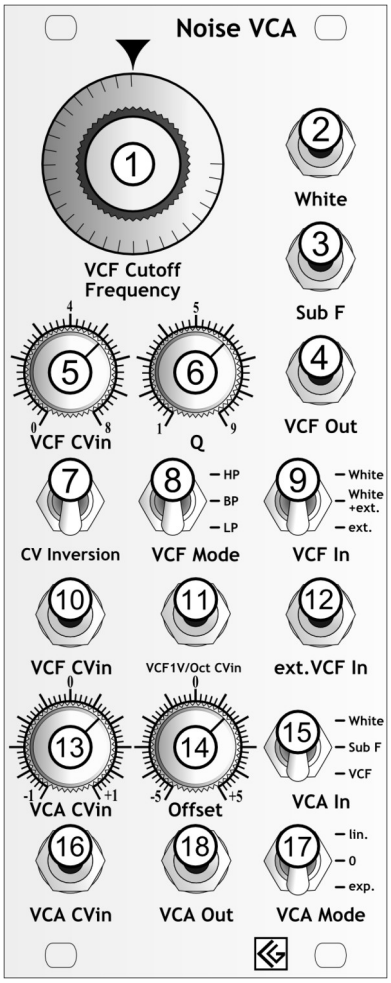
Right side view

Banana version (Rev.3)



Drawing

3. Functions



① **VCF Cutoff Frequency** The filter's cutoff frequency is adjustable from ≈ 10 Hz to 15000 Hz (over 10 octaves).

② **White Noise Output** Direct output. The amplitude is ≈ 8 Vpp (with 'Hi-Boost' jumper [2] set in upper position = off). The noise output level (and thereby that of the following stages 'Sub F', VCF and VCA) is adjustable on the backside pcb with trimmer [1] . The high-frequency amount of the white noise spectrum can be increased or decreased with jumper [2] (Please read chapter *4. Adjustment*).

③ **Sub F (Random CV) Output** Direct Output. This output provides a random CV for modulation. The amplitude is ≈ 8-10Vpp.

④ **VCF Output** Direct output of the VCF. Depending on the position of switch ⑨ (**VCF in**), either filtered noise, a filtered external audio signal - input on socket '**ext. VCF In**' ⑫ - or a combination of both is available. The filter characteristic can be chosen with the switch '**VCF Mode**' ⑧ and variied with the knob **Q** (Resonance) ⑥ ; its frequency is set with the 'VCF **Cutoff Frequency**' knob ① and can be modulated by an external CV signal applied to the '**VCF CVin**' socket ⑩ (modulation depth adjustable by knob '**VCF CVin**' ⑤ and polarity invertible by switch ⑦) or applied to the '**VCF 1V/Oct.in**' socket ⑪

⑤ **VCF CV In** Input level control knob for the VCF modulation voltage applied to the '**VCF CVin**' socket ⑩ . Polarity can be changed with switch 'CV Inversion' ⑦ . With the knob in fully ccw position, modulation depth is 0; by turning it CW, the modulation depth will increase.

⑥ **Q (Resonance)** By turning this knob clockwise the filter resonance increases, up to self-oscillation. With the knob turned fully cw, the VCF may also be used as an VCO.

⑦ **VCF CV Input Inversion Switch** With the switch in upper position, the polarity of the input voltage applied on socket '**VCF CVin**' ⑩ remains the same; with the switch in lower position, the modulation CV becomes inverted.

⑧ **VCF Mode Switch** Selects the VCF's operation mode:

- Switch in upper position: **Highpass** filter (12dB/oct.)
- Switch in middle position: **Bandpass** filter (6dB/oct.)
- Switch in lower position: **Lowpass** filter (12dB/oct.)

⑨ **VCF In** VCF audio input selector. With this switch in upper position '**Noise**', *white noise* is the input for the filter. With the switch in middle position '**Noise+ext.**' , a combination of white noise and the external audio signal applied on the '**ext. VCF In**' socket ⑫ is feeding the filter's input. With the switch in lower position '**ext.**', only the external audio signal will be processed by the VCF.

⑩ **VCF CV Input** VCF cutoff frequency modulation input. Modulation depth can be adjusted by knob '**VCF CVin**' ⑤ ; its polarity is invertable with switch ⑦ .

⑪ **VCF 1V/Octave CV Input** The 1V/oct. tracking can be adjusted precisely by trimmer 6 (1V/oct.) and trimmer 7 (HF-trim) on the outer PCB (Please read chapter ***4. Adjustment***)

⑫ **Ext. VCF In** 2nd external signal input for the VCF. This input allows an external audio signal to be fed into the VCF. This signal may replace the internal noise source or can be combined with it; depending on the position of switch '**VCF In**' ⑨ .
Note: Trimmer 4 on the backside PCB (from Rev.3) is for adjusting the input level, due to the wide range of possible input signals and filter settings (it may happen that the filtered signal is becoming distorted - with high Q setting - or that it is too low).

⑬ **VCA CV in** Input level control knob for the CV source applied on '**VCA CV**in' ⑯ controlling the VCA's amplification (for its input signal selectable by switch '**VCA In**' ⑮) . In center position (denter locked) the level is 0 and there is no CV modulation of the VCA. By turning the knob clockwise, the CV will modulate the selected input signal. By turning this knob counterclockwise, the inverted CV modulates the VCA's input signal ('polarizer').

⑭ **Offset** VCA offset control. With this polarizing control knob either a positive or negative voltage can be added to the VCA's CV input. In center position (denter locked), the offset voltage is 0. By turning the knob CW, a positive voltage with range up to +5V will be added, by turning the knob CCW, a negative voltage up to -5V is addable. By turning this knob CW, the pure, unmodulated VCA's input signal (selectable by switch '**VCF In**' ⑨) will be provided on the VCA's output '**VCA Out**' ⑱ - with variable amplification. In combination with an applied CV on '**VCA CVIn**' ⑯ , a negative offset voltage added (turning the knob CCW) may be used to shift the VCA's operation point - so that only from a certain amount of positive input CV begins to open the VCA (Example see chapter ***6. Patches*** Example 4).

⑮ **VCA In** Signal input selector for the VCA. The position of this switch determines which signal is being processed by the VCA.
- Switch in upper position: **White** noise
- Switch in middle position: **Sub F** (Random)
- Switch in lower position: **VCF** Output

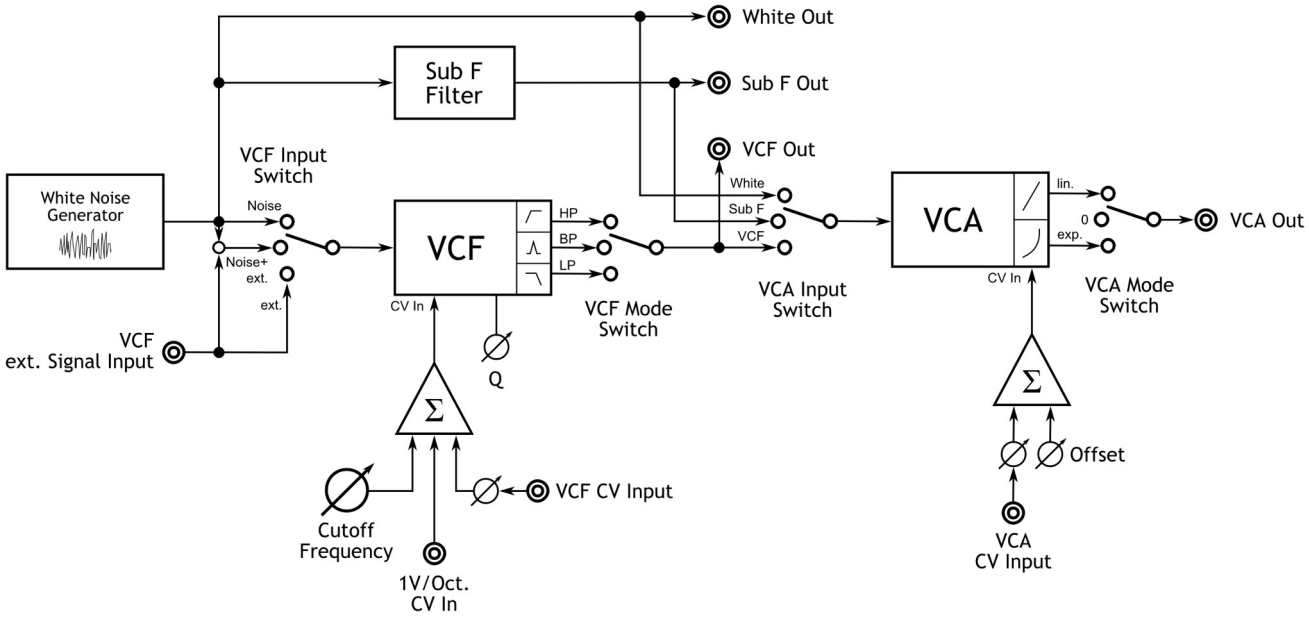
⑯ **VCA CVin** Control voltage input for the VCA. The amount and polarity is adjustable with knob '**VCA CVin**' ⑬ .

⑰ **VCA Mode** With this switch the VCA's operation mode can be selected between linear CV or exponential CV processing and 0 (mute):

- Switch in upper position: **Linear**
- Switch in middle position: **0** (muting)
- Switch in lower position: **Exponential**

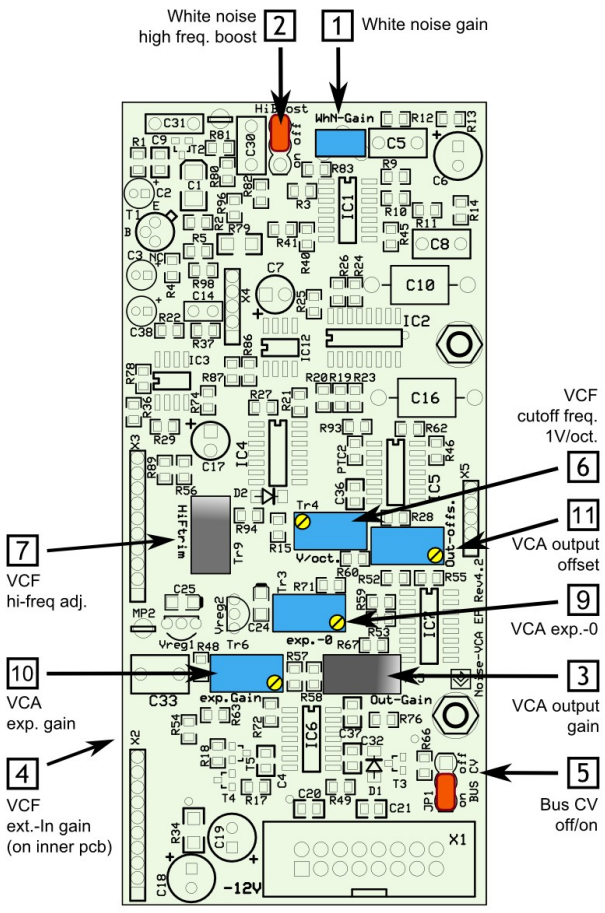
⑱ **VCA Out** Output socket for the VCA. The position of switch '**VCA In**' ⑮ decides, which input signal is being processed; controllers '**VCA CVin**' ⑬ (for socket '**VCA CVin**' ⑯), '**Offset**' ⑭ and switch '**VCA Mode**' ⑰ are responsible for the CV processing.

Audio routing



4. Adjustment & Settings

1. General Adjustments



1 White noise gain

The general white noise level is set by this trimmer . By default, it is adjusted for an amplitude of ≈8Vpp on output '**White**' ②.

Note: Changing the setting of this trimmer will also affect the noise output levels of '**Sub F**' ③ , '**VCF Out**' ④ and '**VCA Out**' ⑰.

2 White noise high frequency boost

With this jumper in lower position, the high-frequency spectrum of the white noise source can be increased. There will be more brillance - but it will also affect the VCF's sound characteristic, there may be some feedthrough even when the filter's cutoff is closed.

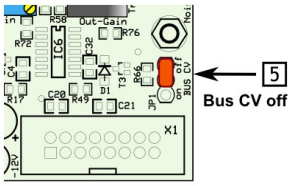
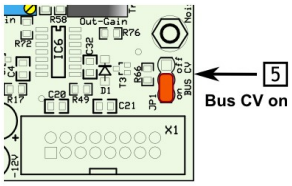
3 VCA output gain

Adjustment of the VCA's total output level on socket '**VCA Out**' ⑱ . By default, this trimmer is set that the level of the output is ≈ the level of the direct outputs ② , ③ or ④ - with the VCA offset knob ⑭ fully turned up clockwise (equivalent would be a CV of +5V applied on '**VCA CVin**' ⑯ and knob '**VCA CVin**' ⑬ fully turned up cw).

4 VCF external input gain

The level of an external input signal connected to '**ext. VCF In**' ⑫ can be attenuated or increased for best adaption, due to the wide range of volume variations in combination with different VCF settings.

2. Bus CV 5

	
Jumper "JP1" in "off" position (PCB): The Bus CV is not connected.	Jumper "JP1" in "on" position (PCB side): The Bus CV is controlling the VCF's cutoff frequency.

3. VCF 1V/Oct. Adjustment [6] [7]

The NoiseVCA's VCF is already carefully adjusted. No further calibrations should be needed. In case of e.g. unintentional adjustment, here is a description of the required adjustment procedure:

1. Connect the output '**VCF Out**' ④ to an amplifier. With switch '**VCF In**' ⑨ in lower position ('ext.') / no external signal applied on ⑫ and '**Q**' knob ⑥ fully turned clockwise, the filter is becoming self-oscillating.
2. Connect both a calibrated VCO and the ***Noise VCA's*** 'VCF Out' to your mixer or soundsystem, listening simultaneous to both frequencies, and bring them in tune on a middle-range note, preferably around 1200 Hz as ground-note, because here is the VCF's CV 0-point (Cutoff frequency knob ① ≈ 5,4 on scale).
3. Apply a CV source, e.g. a keyboard, to both device's 1V/oct. input (Noise VCA: Socket ⑪); bring the oscillations in tune again (nearby the ground-note).
4. Play or generate 2 alternating notes (with a distance of 3-4 octaves); e.g. 1200 Hz and 150 Hz and calibrate trimmer [6] until the tracking is best; if necessary, bring the ground-notes of both oscillators in pitch again.
5. Slightly calibrate trimmer [7] (HF-trim) for better high frequency matching (from ca. 4000Hz)
6. If necessary, repeat procedure from step 4.

4. VCA Adjustments

In case of e.g. unintentional decalibration - if a new VCA adjustment is required.

1. **Exponential 0-point** [9]

Adjust the exponential converter's 0-point with trimmer [9]. With the '**VCA Mode**' switch ⑰ in ***lower*** position ('**exp**'); the '**VCA In**' switch ⑮ in the upper position ('**White**'), the '**Offset**' knob ⑭ in the middle position (center locked) and no CV applied, the VCA's output signal on '**VCA Out**' ⑱) should be as quiet as possible with no *white noise* signal passing through (compare to when switch '**VCA Mode**' ⑰ in *middle* position ('**0**'), but the '**Offset**' knob ⑭ should still react sensitively when turned CW.

2. **Exponential Gain** [10]

The trimmer [10] adjusts the exponential converter's amplification. With '**Offset**' knob ⑭ turned fully cw, the output volume of the VCA should be the same both in '**lin.**'and '**exp.**' mode (compare by toggling switch '**VCA Mode**' ⑰). With this trimmer you can adjust the VCA's volume in '**exp.**' mode.

3. **CV Feedtrough on VCA Output** [11]

Connect an audio source on socket '**VCA CVin**' ⑬ , e.g. a squarewave signal, and turn up the level knob cw. Adjust the trimmer [11] for minimal feedthrough of the applied CV signal to the VCA's output ⑱ .

5. Contact & Support

CG-Products
Christian Günther
Forster Str. 50
10999 Berlin

info@cg-products.de
www.cg-products.de

Phone: ++49 30 61286299
Mobile ++49 178 7699267

Product webpage: *https://www.cg-products.de/module/noisevca/*

This is for Revision 4.2

Documentations for previous versions please see here:
Rev.4 (different arrangement of control elements on the front panel)
https://www.cg-products.de/documentations/Noise-VCA_documentation-Rev.4.pdf
Rev.3
https://www.cg-products.de/documentations/Noise-VCA_documentation-Rev.3.pdf
Rev.2.3 (without ext.VCF-In gain trimmer)
https://www.cg-products.de/documentations/Noise-VCA_documentation-Rev.2.3.pdf

© Christian Günther May 2023