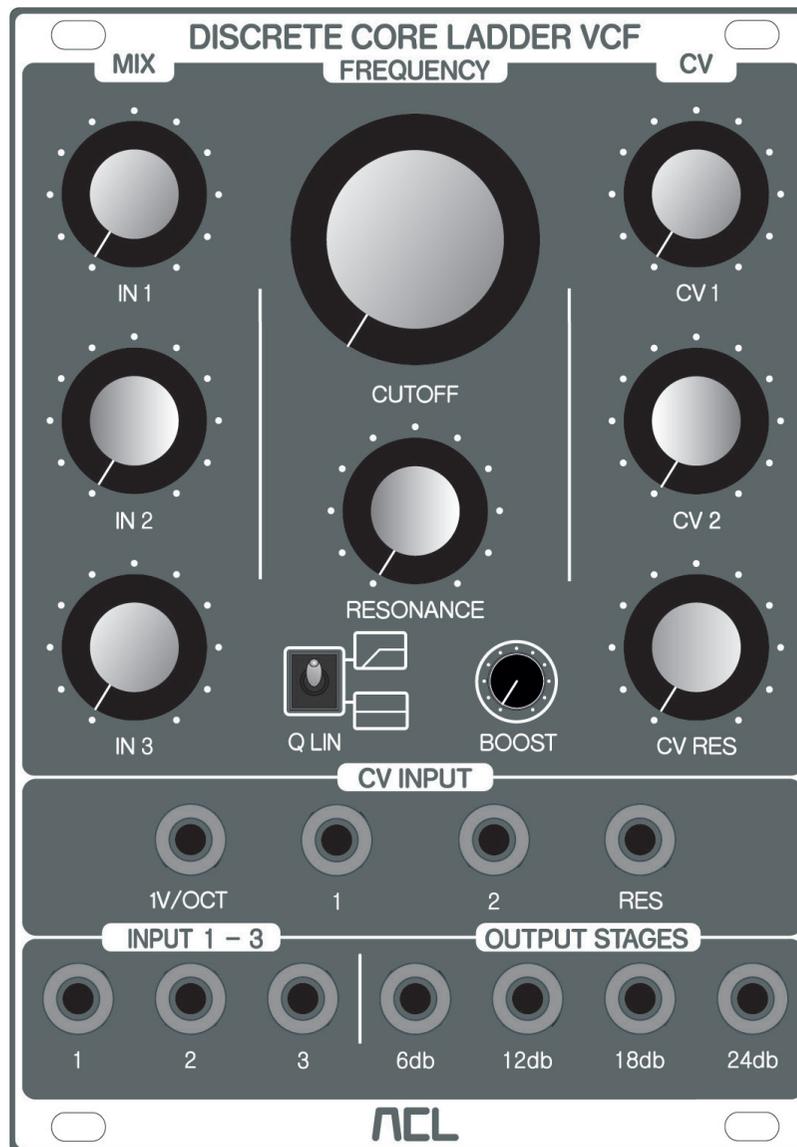


# ACL

Audiophile Circuits League  
Musical Instruments Manufacture

## Discrete Core Ladder VCF

### User's Manual



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# 1. INTRODUCTION

Audiophile Circuits League. -Discrete Core Ladder VCF is a classical transistor ladder design. A fully discrete, low noise, low distortion audio path is used in the whole circuitry.

The Discrete Core Ladder VCF consists of 4 stages, providing an buffered output for each of the 4 stages separately in order to get a 6dB, 12dB, 18dB and 24dB/octave -sloped filter output individually.

(The outputs at different stages then could be mixed together using a polarizing mixer to achieve different filter slopes and types.)

The cutoff frequency of the VCF can be controlled manually using the knob named "CUTOFF" and by 3 independent external control voltages, connected to the input jacks named "1V/OCT", "CV1" and/or "CV2", while "CV1" and "CV2" inputs got an attenuator each (Knobs named "CV1" and "CV2").

The VCF's resonance can be controlled manually and by an external CV connected to the "RESONANCE" input and is attenuated by the knob named "RESONANCE CV". When resonance is turned fully, up self oscillation will occur, enabling to use the VCF as an quadrature VCO since each stage output signal is phase shifted by 90° to the previous stage.

Resonance is provided by feeding back the output of the last stage to the input of the 1st stage.

A switch called "Q LIN" switches between 2 different feedback settings, affecting the frequency linearity of the feedback path: In a very classic design of a lowpass adder VCF, the lower frequencies are damped more than higher frequencies, generating a loss of resonance and therefore no self oscillation at low cutoff frequencies.

By switching "Q LIN" to "--", the resonance will not depend on the cutoff setting, so the cutoff setting will have no influence on the Resonance setting of the filter. Self oscillation is possible down to frequencies lower than 1 Hz.

If "Q LIN" is switched to "/--", the resonance will be decreased, if the cutoff frequency is decreased, so at very low cutoff-frequencies, no self-oscillation is achievable.

The cutoff frequency is temperature stabilized and shows good tracking with 1V/Oct. to up to 5 octaves. 3 audio signals can be connected, being summed together to one signal in order to enter the VCF.

When approaching 8V PP, the ladder will start to saturate, creating a awesome creamy and compressed sound, which will bend and evolve more and more to a very strongly saturated and distorted sound, the further the ladder gets overdriven by the signal.

In many ladder VCF designs, the lower frequencies gets more attenuated (bass loss), when increasing resonance, approximating a bandpass behaviour at very high resonance settings. We spent a knob called "BOOST" for restoring the low frequencies and boosting them at high resonance settings.

That way you can make very bombastic bass sounds, since the sound might got higher resonance settings and still kept it's bass fundament.

When not overdriven by input audio signals, the overall distortion of the fully discrete audio signal circuitry is quite low due to the use of low distortion discrete buffers, enabling a very clean sine wave when self-oscillating no too strongly, unlike some other designs.

The use of matched components made it possible to keep the CV-feedthrough quite low.

## 2. WARRANTY

In the event of a fault in use, we will repair or replace it free of charge under the warranty terms stated below. The warranty period is valid for one year from the day of purchase. If repair is necessary, please ask the dealer you purchased it from.

We can not guarantee the incidental damage caused by the breakdown or damage that occurred during use of this product. In addition, warranty will expire in the following cases:

- Failure / damage caused by use of unspecified power supply / accessories.
- Failure / damage caused by incorrect connection or use of power cable.
- Failure / damage caused by improper handling method.
- Failure / damage caused by natural disasters (fire, flooding etc.) and pollution.
- When the cause of breakdown or damage lies in equipment other than this product.
- Failure / damage caused by improper modification, adjustment, parts replacement.
- Failure / damage when used under particularly severe conditions, when loaned/rental/hired out to 3rd party.

### Is it a malfunction?

Please read the user's manual carefully and check again. If you think that there is still a problem, please consult the dealer you purchased from or contact us (English) .

[support@audiophilecircuitsleague.com](mailto:support@audiophilecircuitsleague.com)

# 3. INSTALLATION

## ⚠ WARNING

\*Always turn the Eurorack unit off and unplug the power cord before plugging the Eurorack power cable.

\*When attaching the Eurorack power cable, please be careful not to touch the terminal part.

Connect to the Eurorack's system power supply (+ 12V) using the supplied Eurorack power cable.

Connect the 16-pin connector to the Eurorack power connector. Connect the red mark on the power cable so that it matches the pin on the (- 12 V) side of the power connector.

Connect the 10 pin connector to the shrouded header on the back of the module. The header is protected against reverse-plugging.

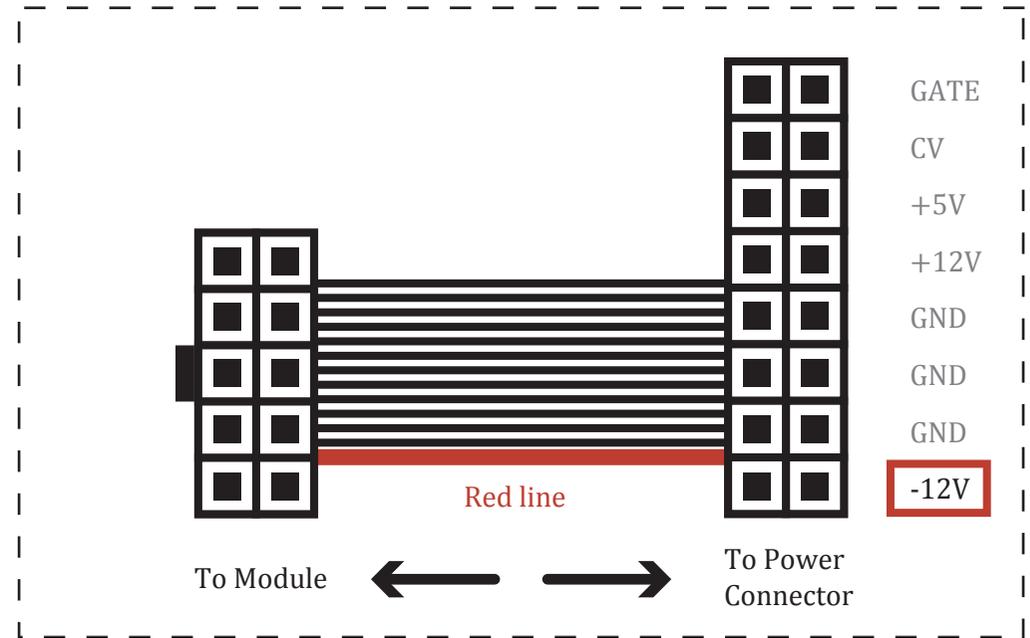


FIG.1 : Eurorack power cable

## 4. FUNCTION OF PANEL COMPONENTS

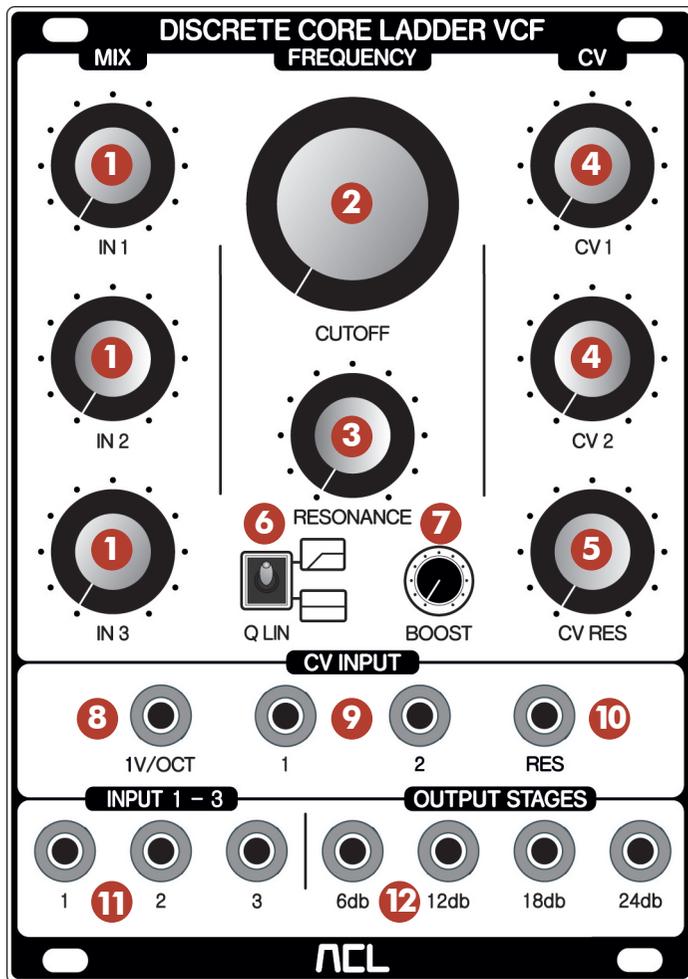


FIG.2 : Front Panel

### ① "MIX IN 1~3" knobs

Adjusts the amount of audio signal inputs from ⑪ "INPUT 1-3" jacks. 3 different audio signals can be connected, they can be summed and processed with VCF.

### ② "CUTOFF" knob

Adjust the filter cutoff.

### ③ "RESONANCE" knob

Adjust the resonance of the filter. When resonance is full, it self-oscillates and can be used as a substitute for the oscillator.

### ④ "CV 1" "CV 2" knobs

These are two CV signal attenuators for controlling the filter cutoff. CV signals are input from ⑨ "CV INPUT 1" "CV INPUT 2" input jacks.

### ⑤ "CV RES" knob

This is attenuator for the signal to control the filter resonance with the CV signal. CV signals are input from ⑩ "RES" input jack.

### ⑥ "Q LIN" switch

Switch two different feedback path frequency linearity.

By switching "Q LIN" to "--", the resonance will not depend on the cutoff setting, so the cutoff setting will have no influence on the Resonance setting of the filter. Self-oscillation is possible down to frequencies lower than 1 Hz.

If "Q LIN" is switched to "/--", the resonance will be decreased, if the cutoff frequency is decreased, so at very low cutoff-frequencies, no self-oscillation is achievable.

### ⑦ "BOOST" knob

This knob is for restoring the low frequencies and boosting them at high resonance settings.

### ⑧ "1V/OCT" jack

As mentioned above, it can be used as a substitute for the oscillator when it self-oscillates with full resonance. By inputting the PICTH CV signal to this jack you can play the scale. The cutoff frequency shows good tracking with 1V/Oct to up to 5 octaves.

### ⑨ "CV INPUT 1" "CV INPUT 2" input jacks

Input two CV signals for controlling the filter cutoff. Corresponding attenuators are ④ "CV 1" "CV 2" knob.

### ⑩ "RES" input jack

Input the signal to control the filter resonance with the CV signal. The corresponding attenuator is ⑤ "CV RES" knob.

### ⑪ "INPUT 1~3" jacks

3 different audio signals can be connected, they can be summed and processed with VCF. The corresponding attenuators are ① "MIX IN 1~3" knob.

### ⑫ "OUTPUT STAGES" output jacks

From each of the jacks equipped with 4 slopes of 6 dB, 12 dB, 18 dB, 24 dB / octave, it is possible to independently output audio signals. Also, when self-oscillating with full resonance, sine waves are output from the four output jacks. The jacks next to each other will output waveforms shifted by 90 degrees each. For example, if 0 degrees sine wave is output at 6 db, the jack of 12 db will output a sine wave of 90 degrees, and so on.

# 5. SPECIFICATIONS

## Power

Eurorack system power supply

## Width

18 HP

## Depth

22 mm

## Power consumption

Ca. 65mA on -12V / ca. 65mA on +12V

## Accessories

- Eurorack power cable x1
- Mounting screws x4