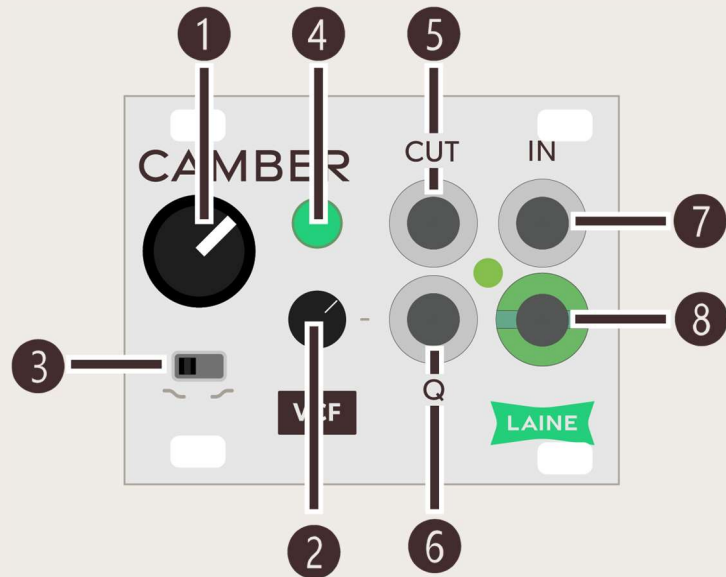


# CAMBER

## Three Pole VC Filter



Designed in the Intellijel 1U format for Eurorack modular systems.

Thank you for your module purchase from Laine. We hope you enjoy sculpting your audio with this ultra-compact, lively voltage-controlled filter.

### Overview

Camber is designed to be a fun, tactile filter with a small footprint. It's sound is neutral enough for basic filtering without a fuss, with a much more aggressive tone available using high resonance settings in three-pole mode.

### Filter Core

The core of the filter is based on a state variable topology using 2164 VCAs and 1% tolerance integrating capacitors. Resonance and feedback control is provided by the fantastic circuit design originally by Neil Johnson "Voltage Controlled 3-Pole State Variable Filter" recently made available in Sound Semiconductor documentation.

### Operation

Camber is switchable between low pass and high pass responses with one pole (6dB) and three pole (18dB) flavours of each. It has full CV control of both cutoff frequency and resonance amount. The input is DC-coupled allowing LFO and CV signals to be routed through the filter.

The filter will also act as a simple oscillator producing a clean sinusoidal signal with the resonance control turned \*almost fully clockwise, and no signal at the audio input.

Dialling in the resonance so that it is just under the point of self-oscillation allows the filter to be "Pinged" by sending gate signals to the audio input. This is useful for tuned percussion sounds and FX.

\*The exact point of self-oscillation is dependent on environmental temperatures and resonance calibration

### Front Panel

#### 1 Cutoff Frequency Control

Turn to adjust the cutoff of the filter, clockwise from low to high frequencies. This also controls the frequency of self-oscillation when no audio input is patched.

#### 2 Resonance Control

Turn clockwise to increase resonance, self-oscillation begins around 4 o'clock

#### 3 Mode Switch

Low-pass Response - Mode Switch in the left position.

High-pass Response - Mode Switch in the right position.

#### 4 Pole Switch

One Pole/6dB Slope Pole - Switch in the raised position

Three Pole/18dB Slope - Pole Switch latched down.

The 6dB pole setting has a gentle cutoff slope allowing more frequencies through the filter around the cutoff point. For the 18dB pole setting, the slope is much steeper producing a more assertive filter response.

#### 5 Cutoff CV Input

For full range inject between 0V to +8V with control knob turned anti-clockwise

#### 6 Resonance CV Input

For full range inject between 0V to +8V with control knob turned past 4 o'clock. +8V produces maximum damping, not maximum resonance as you might expect. This can be advantageous when sending the same signal to both cutoff and resonance CV inputs and allows for simplified input circuitry.

#### 7 Audio Input

For signals under 14VPP, there is ample internal headroom for the filter to operate without clipping. For higher resonance settings bordering on self-oscillation, the input will require external attenuation.

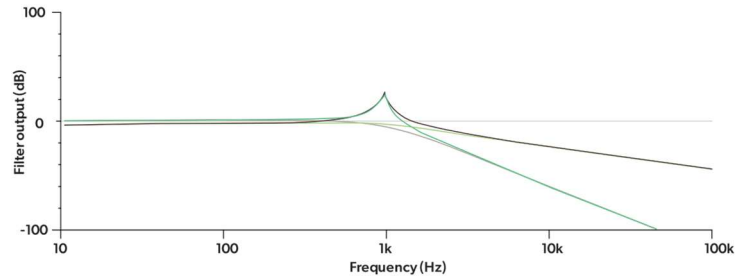
#### 8 Filtered Output

## User Manual

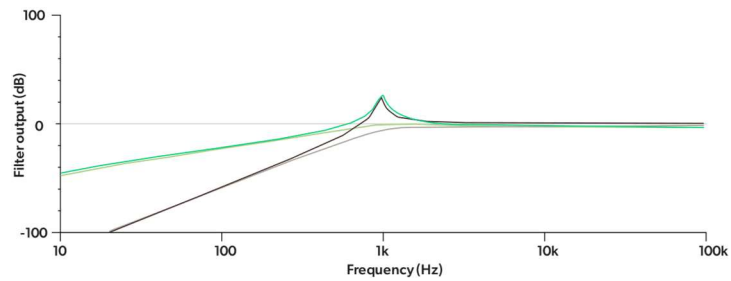
Revision 21/12/23

## Typical Response Graphs

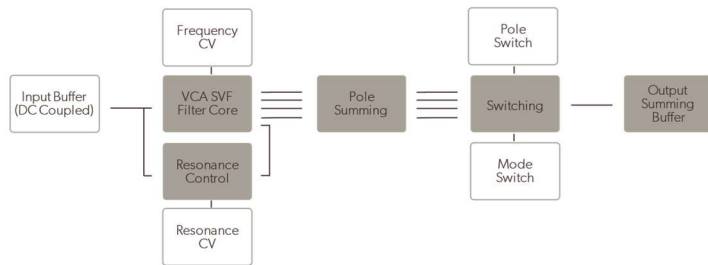
Low pass at 1kHz, Brown=One Pole(6dB) Green=Three Pole (18dB)



High pass at 1kHz, Brown=One Pole(6dB) Green=Three Pole (18dB)



## Signal Flow Diagram



## Specifications

- Intellijel 1U format
- Width 10HP
- Depth 33mm
- Power requirements  
~40mA +12V  
~40mA -12V
- Control voltage range  
0-8V
- Impedance:  
Input 100K  
Output 1K

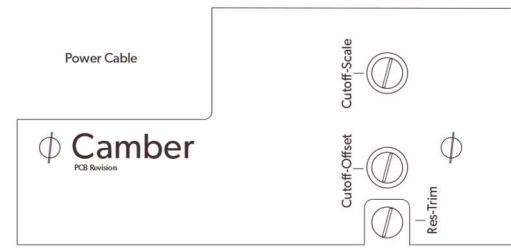
## Warranty

Laine warrants this product to be free of defects in materials or construction for a period of one year from the date of purchase (proof of purchase or invoice is required.)

Defects resulting from incorrect power supply voltages over or under 12V, abuse of the product, removing knobs, changing face plates, or any other causes determined by Laine to be the fault of the user are not covered by this warranty, and normal service charges will apply. During the warranty period, any defective products will be repaired or replaced, at the discretion of Laine, on a return-to-Laine basis with the customer paying the shipping cost to Laine.

Laine implies and accepts no responsibility for harm to person or apparatus caused through the operation of this product.

## Rear Panel Trim Pots and Calibration



Camber is not calibrated for a voltage per octave response during manufacturing, instead it is adjusted to give the most satisfying feedback when turning the cutoff control. This can be adjusted to taste using the dedicated trimmer controls through the rear panel. Cutoff-Scale adjusts the range available to the cutoff frequency control. Cutoff-offset will shift the cutoff frequency in small amounts and is useful for voltage per-octave calibration.

## Voltage per-octave Calibration

Camber will track reasonably well over four octaves, however there is no temperature compensation built into the circuitry and calibration requires a powered warm up period of 20 minutes before adjustment. Re-tuning for different environments will also be necessary.

- Set the Mode to Low Pass
- Set the Pole response to one pole (6db) (Pole switch latched up)
- Turn the frequency control to 8 roughly o'clock.
- Turn the resonance control clockwise so that it starts to self-oscillate.
- Disconnect any resonance CV input signals.
- Connect the note CV output of a well-calibrated keyboard to the frequency CV input.
- Connect the filter output to a VCA and listen to the tone at the output.
- With a small flat-headed screwdriver, adjust the freq-scale, and freq-offset trimmer pots through the rear panel until the musical intervals played on the keyboard are correctly reproduced.

The actual note values are unimportant, but when playing an octave on the keyboard, it must sound like an octave).

## Maximum Resonance Calibration

Turn the frequency control to 12 o'clock. With no resonance CV connected, turn the Resonance control fully clockwise, and turn the trim pot anti-clockwise until self-oscillation begins to occur. Higher values will result in clipping and unpredictable behaviour at high frequencies.

## Standards Compliance

This device complies with international EMC and Safety Standards when installed in a fully compliant rack. It has been assembled and tested in the United Kingdom.

### UKCA

UK Electrical Equipment (Safety) Regulations 2016 (SI 2016/1101) UK Electromagnetic Compatibility Regulations 2016 (SI 2016/1091.) The Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment Directive (RoHS2) 2011/65/EU.

### CE

EU Low Voltage directive (LVD) 2014/35/EU, EU Electromagnetic Compatibility directive (EMC) 2014/30/EU. The Restriction of the use of certain Hazardous Substances in Electrical and Electronic Equipment Directive (RoHS2) 2011/65/EU.

### FCC

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference,
- (2) this device must accept any interference received, including interference that may cause undesired operation.

### Electromagnetic Compatibility

BS EN 55032:2015, Class B. BS EN 55035:2017.

### Electrical Safety

BS EN 62368-1:2014 + A11:2017, EN 62368-1:2014 + A11:2017, CSA CAN/CSA-C22.2 NO. 62368-1 2nd Ed, 2014.

### Environmental Temperature

Operating: +1 to 30°C.  
Storage: -20 to 50°C.



## Product Support Contact

Please contact [jack@laine.uk](mailto:jack@laine.uk) with any questions, return requests and comments.

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