Hampshire Electronics

Dual VCF in Eurorack Format
Instructions and Details

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Overview

The Hampshire Electronics Dual VCF is a 100% analogue voltage-controlled filter in the popular Eurorack format.

The VCF features two completely independent filters, a high pass (6db) and low pass (12db).

These filters can be used completely independently or chained to produce highly controllable band-pass and notch filters, with controllable Q and filter cut-off.

The filters are of the state-variable style, inspired by the classic filters on the MS-20 synth of the late 1970s. This filter style is rightly regarded as a classic.

The LP filter section self-oscillates at high resonance settings and, due to its high performing matching transistor pairs, can also be used as a sine-wave voltage-controlled oscillator (VCO).

The key details of the VCF are:

- 20HP Wide Eurorack module with thin profile (20mm deep from faceplate)
- Controls designed and laid-out with performance in mind
- 100% analogue circuitry
- Tough yet light composite faceplate
- Provides independent LP and HP filters and combined BP and Notch filters
- Uses two highly log-conformant LS-358 matched transistor pairs for accurate key tracking
- The HP section self-oscillates, enabling usage as a sine-wave VCO
- Filter cut-off CV inputs for both HP and LP filters with attenuator pots
- Tracking CV inputs for both HP and LP filters with 1v/Oct tracking
- Internal routing of LP filter output to HP filter input
- Dedicated band-pass and notch filter outputs
- Diode protected power input
- 28ma @ +12v
- 28ma @ -12v

Installation

Power Availability

The Dual VCF module draws the following current from your power supply:

28ma @ +12v

28ma @ -12v

You should first ensure that your power system has enough power capacity to drive the module before considering installation. If you are in doubt, please consult with your power supply manufacturer.

Connecting the Power

Refer to the writing on the back of the module next to the 16-pin power connector to ensure that you connect the power supply correctly. The +12v, -12v and ground (GND) pins will be clearly marked.

The power inputs are diode protected but damage may occur if the unit is connected incorrectly.

Fitment

Use the screws provided to firmly fit the module into your case. You should make sure that the module does not move when you insert and remove patch cables.

Using the Dual VCF Module

The Dual VCF module includes dedicated Low-Pass (LP) and High-Pass (HP) filters. The controls on the left of the module manage the LP filter and those on the right the HP filter.

Low-Pass Filter (LP)

The low-pass filter is a 12dB resonant filter with controllable cut-off frequency and peak (resonance).

Inputs and Outputs

To use the LP filter an input source between -5v and +5v should be inserted into the in jack socket. The output jack socket can then be used for the filtered output.

CUTOFF knob

The CUTOFF knob adjusts the frequency at which the filter operates. Turning the knob to the left will reduce the cut-off frequency and let fewer frequencies of the input sound pass to the output. Turning the knob to the right increases the cut-off frequency and lets more frequencies pass from the input to the output.

Sweeping the CUTOFF knob from fully clockwise to fully counter clockwise will show the full filter range, from un-filtered to fully-filtered.

Cutoff and track input jacks

The cutoff and track jack inputs can be used to control the cut-off frequency via a voltage source. Both of these inputs accept -5v to +5v input range. A positive voltage will increase the cut-off frequency whereas a negative voltage will reduce the cut-off frequency.

The difference between the inputs is that the cutoff input can be attenuated via the CUTOFF CV knob. When the CUTOFF CV knob is fully clockwise then the full voltage at the cutoff CV input is used to vary the cut-off frequency. Turning the CUTOFF CV knob counter clockwise reduces the amount of voltage, thus reducing the effect on the cut-off frequency.

The track input is not attenuated and operates at a 1v/oct scale. This input has excellent tracking due to the matched transistor pair used and can therefore be used to give good key tracking of the filter by inserting a 1v/oct pitch signal.

PEAK knob

The PEAK knob adjusts the peak, or resonance, of the filter. This is the amount of filtered signal is passed back into the input. When the PEAK knob is fully counter clockwise then the filter has no resonance and the signal at the output jack socket will be the pure filtered input.

Turning the PEAK knob to the right increases the resonance. This creates the unique resonant filter sounds so ubiquitous with analogue synthesizers.

At high resonance levels the filter becomes self-resonant. This means that the filter will self-oscillate with no signal at its input, generating a sine wave. The filter can therefore be used as a simple sine wave oscillator with a 1v/Oct signal at the tracking input and the CUTTOFF knob used to control the oscillation frequency.

High-Pass Filter (HP)

The low-pass filter is a 6dB resonant filter with controllable cut-off frequency and peak (resonance).

Inputs and Outputs

To use the HP filter an input source between -5v and +5v should be inserted into the in jack socket. The output jack socket can then be used for the filtered output.

CUTOFF knob

The CUTOFF knob adjusts the frequency at which the filter operates. Turning the knob to the left will decrease the cut-off frequency and let more frequencies of the input sound pass to the output. Turning the knob to the right increases the cut-off frequency and lets less frequencies pass from the input to the output.

Sweeping the CUTOFF knob from fully counter clockwise to fully clockwise will show the full filter range, from un-filtered to fully-filtered.

Cutoff and track input jacks

The cutoff and track jack inputs can be used to control the cut-off frequency via a voltage source. Both of these inputs accept -5v to +5v input range. A positive voltage will increase the cut-off frequency whereas a negative voltage will reduce the cut-off frequency.

The difference between the inputs is that the cutoff input can be attenuated via the CUTOFF CV knob. When the CUTOFF CV knob is fully clockwise then the full voltage at the cutoff CV

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Band-Pass Filter (BP)

The band-pass filter is a combination of the 12dB high-pass filter and the 6dB low-pass filter. Band-pass filters only allow a range of frequencies to pass – this enables you to focus on a particular frequency of your input source. In essence it a serial filter – first the input frequency will be low-pass filtered and then it will be high-pass filtered.

Band-pass filters can be incredibly useful when creating sounds such as hand claps, where you want to focus on a particular frequency range and filter out the rest.

The Dual VCF module internally patches the out of the LP filter into the in of the HP filter. As a result, in order to achieve a band-pass filter, the input source should be inserted into the in of the LP filter and the output should be taken from the out of the HP filter.

The low cut-off frequency of the BP filter will then be the cut-off of the LP filter and the high cut-off frequency of the BP filter will be the cut-off of the HP filter. This enables any range of frequencies, and the centre frequency, to be easily controlled. The width of the frequency range, or the 'Q', of the BP filter will be the difference between the high cut-off frequency and the low cut-off frequency.

The ability to independently control the frequency band by using the HP and LP filter cut-offs gives great control over the band-pass filter.

Notch Filter (Notch)

The notch filter is a combination of the 12dB high-pass filter and the 6dB low-pass filter. Notch filters allow all frequencies to pass other than a specific range. In essence they are the inverse of the band-pass filter. The output for a notch filter is the summation of the outputs of the LP and HP filters.

In order to use the notch filter, the same input signal should be inserted into the in of both the HP and LP filters. The output is then taken from the notch output.

The low cut-off frequency of the notch filter will then be the cut-off of the LP filter and the high cut-off frequency of the notch filter will be the cut-off of the HP filter. This enables any range of frequencies to be easily notched out. The width of the frequency range, or the 'Q', of the notch filter will be the difference between the high cut-off frequency and the low cut-off frequency.

The ability to independently control the frequency band by using the HP and LP filter cut-offs gives great control over the notch filter.