

## 1. Introduction

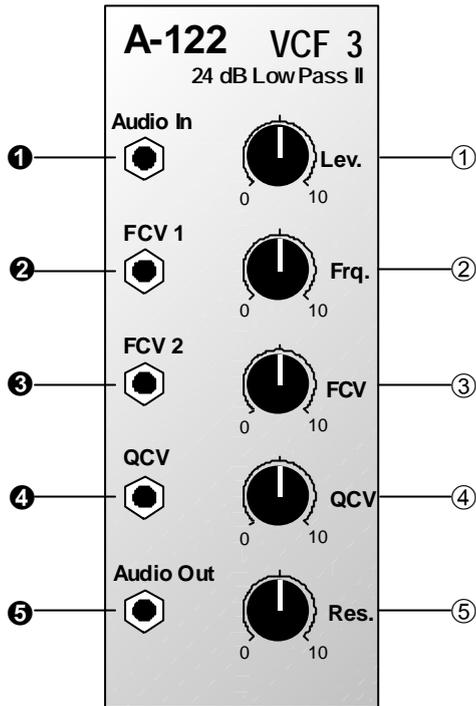
Module **A-122 (VCF 3)** is a **voltage-controlled low-pass filter**, which filters out the higher parts of the sound spectrum, and lets lower frequencies pass through.

The **cut-off frequency** determines the point at which filtering takes effect. You can control this manually, or by voltage control (**filter modulation**, for instance by an LFO). Two CV inputs are available.

The cut-off slope is **-24 dB/octave**. The circuitry uses a Curtis CEM 3320 chip, and is very similar to the classic **Oberheim filter sound**. Because of its different circuitry and controls, the A-122 has a considerably different sound to the A-120 'Moog-like' filter, especially in the way the resonance behaves.

**Voltage controlled resonance:** on the VCF 3, resonance can be controlled not just manually, but by voltages as well, right up to self-oscillation. In this case, the filter behaves like a sine wave oscillator.

## 2. VCF 3 - Overview



### Controls:

- 1 **Lev.** : Attenuator for audio input !
- 2 **Frq.** : Cut-off frequency control
- 3 **FCV** : Attenuator for filter CV at input §
- 4 **QCV** : Attenuator for resonance CV at input \$
- 5 **Res.** : Control for setting the filter's resonance (emphasis)

### In / Outputs:

- ! **Audio In** : Input to the filter
- " **FCV 1** : Input for voltage control of the filter cut-off frequency (1 V /octave)
- § **FCV 2** : ditto, level controlled by 3
- \$ **QCV** : Input for voltage control of the filter's resonance; level controlled by 4
- % **Audio Out** : Output from the filter

### 3. Controls

#### 1 Lev.

Use this attenuator to control the amount of signal entering the filter input §.

H If the filter's output sounds distorted, turn this control down, unless you deliberately want the sound as a special effect.

#### 2 Freq.

With this control you adjust the **Cut-Off Frequency**  $f_c$ , above which the filter attenuates all frequencies.

At 10, the filter is fully open. The more you 'close down' the filter, the more the high frequencies are filtered (see Fig. 1): the sound becomes mellower and less bright, until at 0 the filter is completely shut down, and there will be no output signal at all.

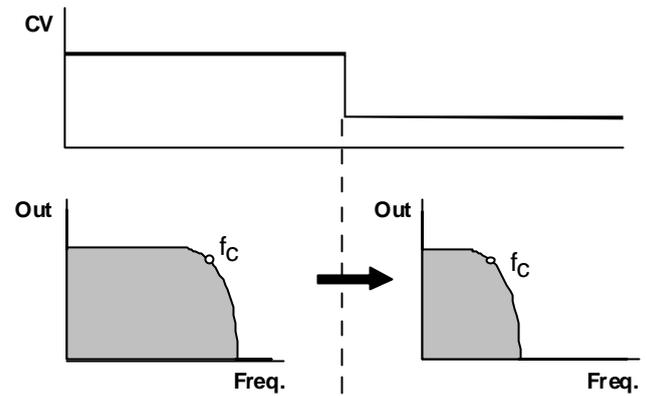


Fig. 1: White noise put through a low pass filter

#### 3 FCV

For voltage control or modulation of the cut-off frequency using CV input § (see Fig. 1), use attenuator 3 to control the **level of voltage control**.

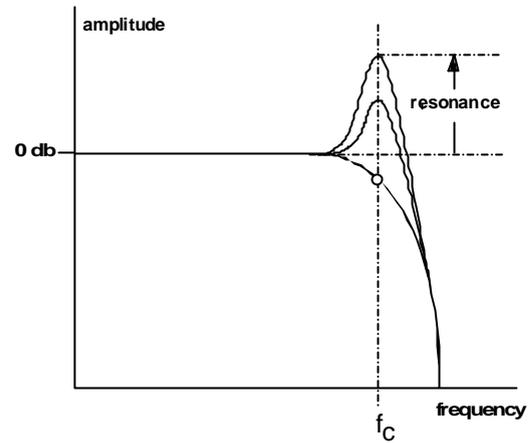
#### 4 QCV

Attenuator 4 gives you control over the **level of voltage control** applied to resonance.

#### 5 Res.

With this control you adjust the filter's **resonance** (or 'emphasis') - the parameter which emphasises the frequencies around the cut-off point  $f_c$  (see Fig. 2). It strengthens or emphasises the band of frequencies around the filter's cut-off point.

At close to maximum resonance, the filter starts to self-oscillate, and behaves like a **sine wave oscillator**. Thanks to this effect, you can use the filter as an independent tone source.



**Fig. 2:** How resonance affects the behaviour of a low pass filter.

## 4. In / Outputs

### ! **Audio In**

This is the filter's **audio input** socket, where you patch in the output from any sound source.

### " **FCV 1**

Socket FCV 1 is a **voltage control input** for the filter. It works on the 1V / octave rule, like the VCOs.

If you connect the output of a modulation source (eg LFO, ADSR) to this input, the cut-off frequency of the filter will be modulated by its voltage: ie, the sound color changes according to the voltage put out by the modulator.

P If you use this VCF as a sine wave oscillator, connect a pitch control voltage to this input. Do the same if you want the filter's cut-off frequency to track exactly with the pitch of a note.

### § **FCV 2**

Socket § is also a **voltage-control input** for the filter. Unlike on socket " , though, you can adjust the level of voltage by using the attenuator 3 , and thus control the intensity of modulation effect on the filter.

### \$ **QCV**

This socket is the **voltage control input** for the filter's **resonance**.

If you patch a modulation source (eg LFO, ADSR) to this input, the resonance of the filter will be modulated by it: increases in voltage will increase the amplitude of the frequencies around the filter cut-off point.

### % **Audio Out**

**Filter output** % sends out the filtered audio signal.

## 5. User examples

The filter's cut-off frequency can be modulated in various ways:

- **VCF - LFO**

Modulation of the cut-off frequency produces cyclical changes of the **sound spectrum**. At low frequencies (c. 1 - 5 Hz), you get a "**Wah-Wah**" effect. Modulation in the audio range produces interesting sounds; the same principles apply here as with frequency modulation of the A-110 VCO (see chapter 6).

- **VCF - ADSR**

Modulation by an envelope results in gradual change of the **sound spectrum**. Typical uses would be the **synthesis of electric bass or drum sounds**, and **filter sweeps**, which slowly sweep through the audio spectrum, emphasising different harmonics.

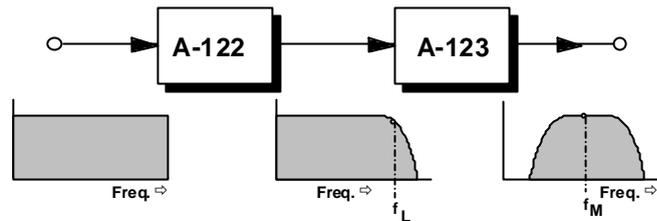
- **VCF - Keyboard CV**

This modulation produces pitch-related filter opening: the higher the pitch, the more the filter opens, and the brighter the sound becomes.

### 24 dB Bandpass • 24 dB Notch

By combining the A-123 high pass filter with the A-122 low pass filter, it's possible to create **24 dB band pass** or **24 dB notch filters** (as opposed to the A-121 multi-mode filter's 12 dB) with **voltage controlled resonance**.

To create a **bandpass** filter, put both modules **in series** (see Fig. 3). The band-width is governed by the difference between the cut-off frequencies of the two filters  $f_L$  (A-122) and  $f_H$  (A-123); the middle frequency is half way between the two:  $f_M = (f_L + f_H) / 2$ .



**Fig. 3:** 24 dB band pass filter (resonance = 0)

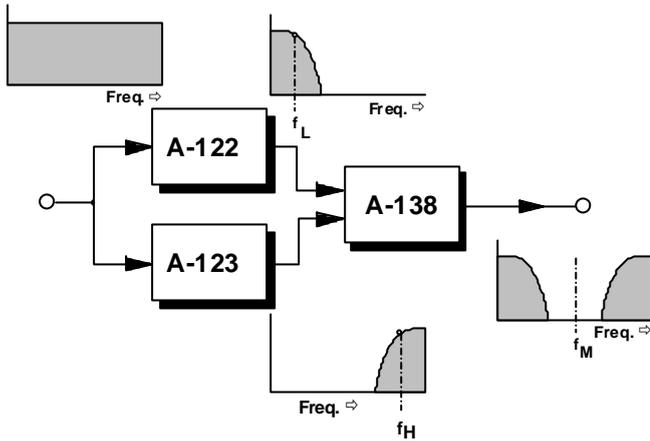


Fig. 4: 24 dB notch filter (resonance = 0)

A **notch filter** is created by putting both modules in **parallel**, and controlling their outputs with an A-138 mixer (see Fig. 4). The band-width and middle frequency are determined by the same factors as in the bandpass.

When modulating these 'construction kit' filter types, certain rules apply:-

- To **maintain the exact bandwidth**, the cut-off frequencies of both filters must be modulated by the same amount.
- If you modulate the cut-off frequency of just one of the filters, or both of them by different amounts, or different modulators, the bandwidth and middle frequency will themselves be modulated.
- At a resonance setting of greater than zero, or when the resonance is modulated, the middle frequency will be skewed. With different resonance settings or modulation of each filter, this will have the same result.

Further examples can be found in the manual for the A-123 high pass filter.

## 6. Patch-Sheet

The following diagrams of the module can help you recall your own **Patches**. They're designed so that a complete 19" rack of modules will fit onto an A4 sheet of paper.

Photocopy this page, and cut out the pictures of this and your other modules. You can then stick them onto another piece of paper, and create a diagram of your own system.

Make multiple copies of your composite diagram, and use them for remembering good patches and set-ups.

- P
- Draw in patchleads with colored pens.
  - Draw or write control settings in the little white circles.

