1. Introduction

Module **A-109** is a **voltage controlled audio signal processor** containing the components **VCF**, **VCA** and **PAN** (see fig. 1 on page 4).

The module is based on **Doug Curtis' CEM3379** that was used in many Sequential™, Ensoniq™ and PPG™ synthesizers.

The **audio in/outputs** of the module are **normalized**, e.g. the VCF output is fed into the VCA input privided that no jack plug is inserted to the VCA audio input socket.

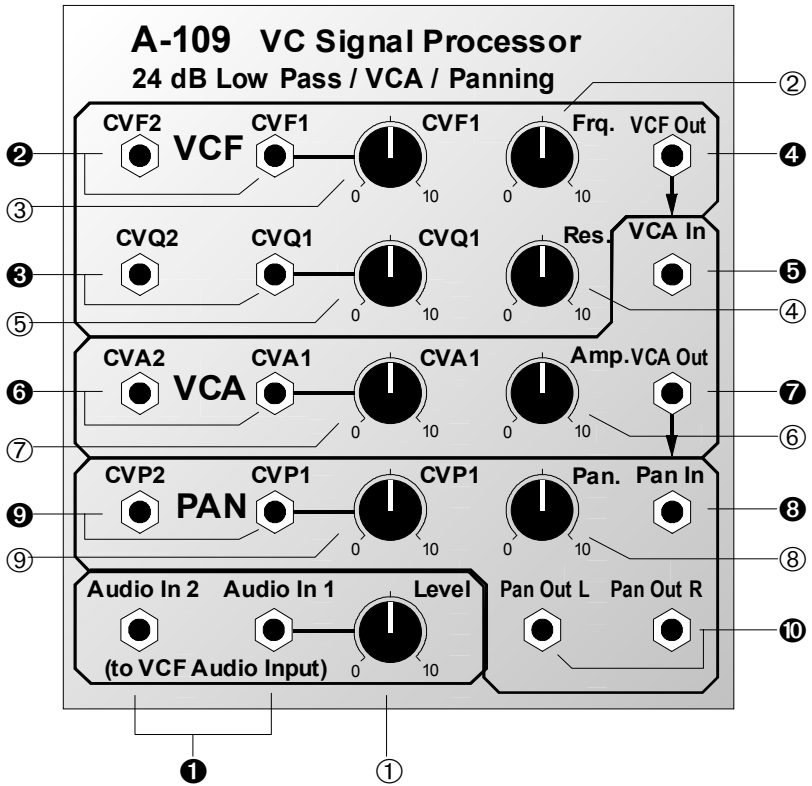
The **VCF** is a **24 dB low pass** filter with **voltage controlled resonance**. The filter has a so-called "**constant amplitude versus resonance design**", i.e. the peak-to-peak output level remains within 6dB when the output waveform rings from added resonance.

Manual controls for **frequency** and **resonance** are available as well as **2 CV inputs for both** (one with attenuator). The frequency range is about 5 Hz ... 20kHz, resonance ranges from 0dB up to **self oscillation**.

The **main VCA** has a **combined exponential/linear control scale**: exponential from about 0...+200mV (corresponding to about -100dB ... -20dB attenuation), and linear from about 200mV...+5V (corresponding to about -20dB...0dB). The "rounded" knee at the scale bottom allows an envelope to decay to zero with a natural exponential sound. **Manual control** for **amplitude** is available as well as **2 CV inputs** (one with attenuator).

The **gains** of the **panning VCAs** are **complementary**, beeing equal and half of maximum at about +2.5V CV. The control scales are linear between about +1 and +3.5V CV, becoming logarithmic beyond these extremes. **Manual control** for panning is available as well as **2 CV inputs** (one with attenuator).

2. Overview


A-109 VC Signal Processor
24 dB Low Pass / VCA / Panning
CVF2
VCF
CVF1
CVF1
Frq.
VCF Out
CVQ2
CVQ1
CVQ1
Res.
VCA In
CVA2
VCA
CVA1
CVA1
Amp.
VCA Out
CVP2
PAN
CVP1
CVP1
Pan.
Pan In
Audio In 2
Audio In 1
Level
(to VCF Audio Input)
Pan Out L
Pan Out R
0
10

Controls:

① **Level** : Attenuator for input signal at socket ❶ (Audio In 1)

② **Frq.** : Manual control of filter frequency

③ **CVF1** : Attenuator for input signal at socket ❷ (CVF1)

④ **Res.** : Manual control of filter resonance

⑤ **CVQ1** : Attenuator for input signal at socket ❸ (CVQ1)

⑥ **Amp.** : Manual control of VCA amplitude

⑦ **CVA1** : Attenuator for input signal at socket ❻ (CVA1)

⑧ **Pan** : Manual panning control

⑨ **CVP1** : Attenuator for input signal at socket ❾ (CVP1)

In- / Outputs:

❶ **Audio In 1 • Audio In 2** : VCF audio inputs

❷ **CVF1 • CVF2** : CV inputs for filter frequency (CVF1 with attenuator)

❸ **CVQ1 • CVQ2** : CV inputs for filter resonance (CVQ1 with attenuator)

❹ **VCF Out** : Filter output

❺ **VCA In** : VCA audio input

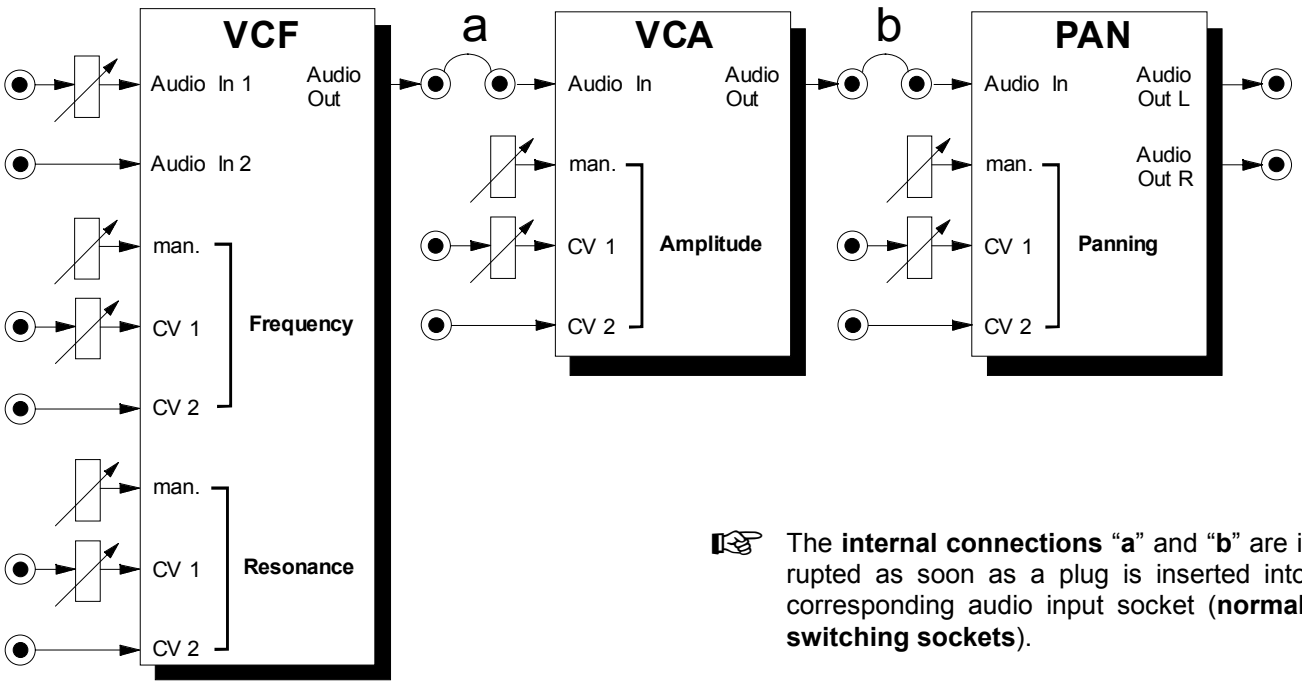
❻ **CVA1 • CVA2** : CV inputs for VCA amplitude (CVA1 with attenuator)

❼ **VCA Out** : VCA output

❽ **Pan In** : Panning audio input

❾ **CVP1 • CVP2** : CV inputs for panning (CVP1 with attenuator)

❿ **Pan Out L • Pan Out R** : Audio outputs of the panning unit



☞ The **internal connections** "**a**" and "**b**" are interrupted as soon as a plug is inserted into the corresponding audio input socket (**normalized switching sockets**).

Fig. 1: A-109 structure

3. Controls

① Level

Use this attenuator to control the amount of signal entering the filter input "Audio In 1".

☞ If the filter distorts, turn this control down, unless you deliberately want the distorted sound as a special effect. The audio input is very sensitive so that distortion is possible even with normal A-100 levels. Distortion appears about from position 5 with normal A-100 audio levels.

② Frq.

Control ② is used to adjust the **filter frequency** manually, i.e. the **cut-off frequency f_c** of the filter.

In the maximum position of this control the low pass filter is open. The more you turn down this control, the more the high frequencies are filtered. The sound becomes mellower and less bright (see Fig. 2) until at 0 the filter is completely shut, and there will be no output signal at all.

The actual filter frequency results from the sum of the manual control ② and the external control inputs CVF1 and CVF2.

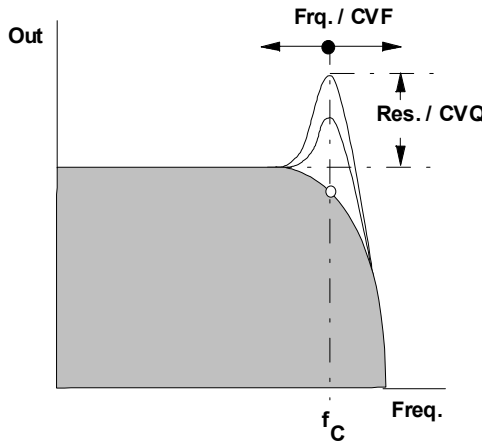


Fig. 2: Frequency response of the filter

③ CVF1

For voltage control or modulation of the **cut-off frequency**, use the frequency CV inputs ❷. Use attenuator ③ to adjust the **control voltage level** of the frequency CV input CVF1.

④ Res.

With this control you adjust the filter's **resonance** (or emphasis or Q factor) - the parameter which emphasises the frequencies around the cut-off point f_C (see Fig. 2). Close to its maximum setting, the filter becomes so resonant that it goes into **self-oscillation**, and starts behaving like a **sine wave oscillator**. You can take advantage of this effect, and use the VCF as an additional oscillator.

The actual resonance results from the sum of the manual control ④ and the external control inputs CVQ1 and CVQ2.

⑤ CVQ1

For voltage control or modulation of the **resonance**, use the resonance CV inputs ❸. Use attenuator ⑤ to adjust the **control voltage level** of the resonance CV input CVQ1.

⑥ Amp.

With this control you adjust the VCA's **amplitude** (or audio level). The **main VCA** has a **combined exponential/linear control scale**:

- **exponential** from about 0...+200mV (corresponding to about -100dB ... -20dB attenuation)
- **linear** from about 200mV...+5V (corresponding to -20dB...0dB attenuation)

The "rounded" knee at the scale bottom allows an envelope to decay to zero with a natural exponential sound.

⑦ CVA1

For voltage control or modulation of the **VCA amplitude**, use the amplitude CV inputs ❻. Use attenuator ⑦ to adjust the **control voltage level** of the amplitude CV input CVA1.

⑧ Pan

With this control you adjust the modules **panning setting** - the parameter that defines the amplitude relation between the audio outputs **Pan Out L** and **Pan Out R** (⑩), resp. the **position** of the audio signal in a **stereophonic** environment.

The middle position of this control corresponds to equal amplitude for both outputs, resp. middle stereo position.

The actual panning setting results from the sum of the manual control ⑧ and the external control inputs CVP1 and CVP2.

The **gains** of the **panning VCAs** are **complementary**, beeing equal and half of maximum at about +2.5V CV. The control scales are linear between about +1 and +3.5V CV, becoming logarithmic beyond these extremes.

⑨ CVP1

For voltage control or modulation of the **panning**, use the panning CV inputs ❾. Use attenuator ⑨ to adjust the **control voltage level** of the panning CV input CVP1.

4. In- / Outputs

❶ Audio In 1 • Audio In 2

These are the filter's **audio input** sockets. Both inputs form a miniature audio mixer. The signal at the "Audio In 1" socket is equipped with an attenuator to adjust the audio level of this input.

☞ As the input "Audio In 2" does not have available an attenuator high input levels may cause distortion at this audio input. To avoid this use "Audio In 1" that is equipped with an attenuator.

❷ CVF1 • CVF2

These are the **control voltage inputs** for the **filter frequency**. The control voltages of both sockets are added to manual control ②.

CVF1 is equipped with an **attenuator** that allows control the level of voltage - the intensity of modulation effect on the filter frequency - with the attenuator ③.

Socket **CVF2** does not have an attenuator and works approximately on the **1V / octave** rule, like the VCOs.

If you patch a modulation source (eg LFO, ADSR) to these inputs, the cut-off frequency of the filter will be modulated by the voltages, i.e. the sound color changes according to the voltages put out by the modulators.

If you use the VCF as a sine wave oscillator, connect the pitch CV into the CVF2 socket. Do the same if you want the filter's cut-off frequency to track with the pitch of a note.

❸ CVQ1 • CVQ2

These are the **control voltage inputs** for the **filter resonance**. The control voltages of both sockets are added to manual control ④.

CVQ1 is equipped with an **attenuator** that allows control the level of voltage - the intensity of resonace modulation on the filter - with the attenuator ⑤.

Socket **CVQ2** does not have an attenuator. The voltage range for this input is approximately 0...+5V (0V = no resonance, ~ +4...5V = self oscillation).

If you patch a modulation source (eg LFO, ADSR, sequencer, random CV) to these inputs, the resonance of the filter will be modulated by the voltages.

❹ VCF Out

Socket ❺ is the **audio output** of the **filter**. The socket is connected to the audio input of the VCA (see fig. 1).

❺ VCA In

This socket is the **audio input** of the **VCA**. It is internally connected to the VCF output ❹ (normalized socket) provided that no plug is inserted into the socket ❺.

❻ CVA1 • CVA2

These are the **control voltage inputs** for the **VCA amplitude**. The control voltages of both sockets are added to manual control ⑥.

CVA1 is equipped with an **attenuator** that allows control the level of voltage - the intensity of amplitude modulation on the VCA - with the attenuator ⑤.

Socket **CVA2** does not have an attenuator. The voltage range for this input is approximately 0...+5V.

❼ VCA Out

Socket ❼ is the **audio output** of the **VCA**. The socket is connected to the audio input of the panning section.

❽ Pan In

This socket is the **audio input** of the **Panning section**. It is internally connected to the VCA output ❼ (normalized socket) provided that no plug is inserted into the socket ❽.

❾ CVP1 • CVP2

These are the **control voltage inputs** for the **Panning section**. The control voltages of both sockets are added to manual control ⑧.

CVP1 is equipped with an **attenuator** that allows control the level of voltage - the intensity of panning modulation - with the attenuator ⑨.

Socket **CVP2** does not have an attenuator. The voltage range for this input is approximately 0...+5V.

A typical application is the periodical "walking" of a signal in the stereo panorama. For this the triangle or sine output of a LFO is connected to one of the sockets ❾ to control the panning.

❿ Pan Out L • Pan Out R

These sockets are the **left** resp. **right audio output** of the panning section.

5. User Examples

Module A-109 makes available three important basic modules: 24dB low pass (VCF), VCA and PAN. At least VCF and VCA are required for most of the standard synthesizer patches. The sub-modules are usefully pre-patched to minimize the required external patches.

Because of the normalized audio input sockets the sub-modules of the A-109 can be used even separately from each other.

As the A-109 is nothing but a collection of modules that are still available in the A-100 please look at the examples in the manuals for the A-100 filters (e.g. A-102, A-103, A-105, A-108, A-120, A-122), VCAs (e.g. A-130, A-131, A-132) and the separate panning module (A-134) to find some typical applications.

6. Patch-Sheet

The following diagram of the modules 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.

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