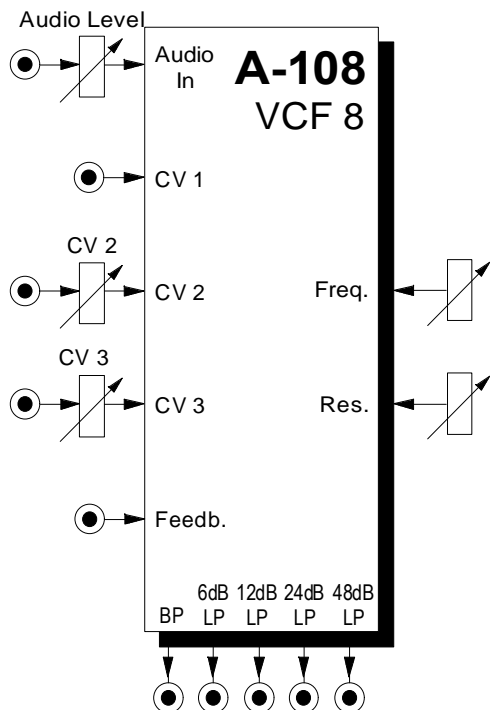


## 1. Introduction



Module A-108 is a completely new, unique voltage-controlled **low pass/band pass filter** based on the well-known **transistor ladder** (Moog ladder).

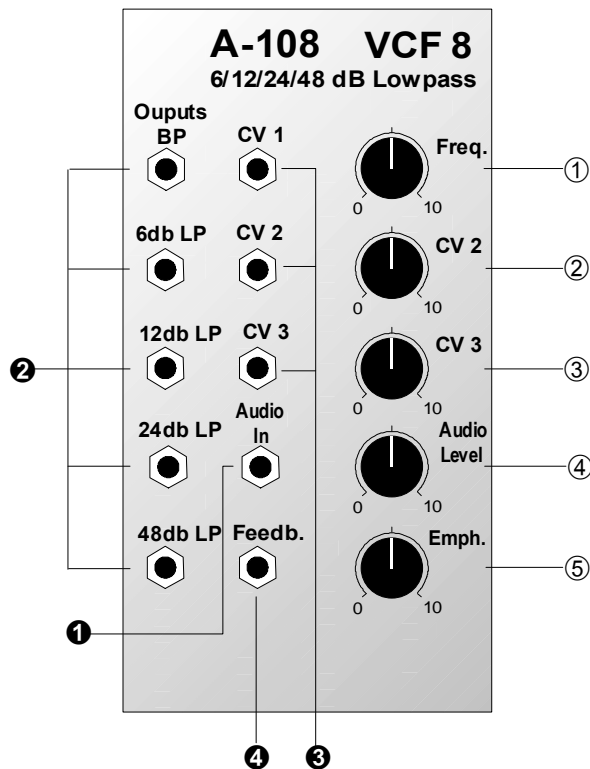
The module has **internally an 8 stage low pass filter** with different slopes available: 6, 12, 18, 24, 30, 36, 42 and 48 dB per octave. In the factory the outputs with **6, 12, 24 and 48 dB** are connected to the four low pass **sockets at the front panel**. In addition it features an **band pass** output (i.e. band pass with transistor ladder).

The module has **manual controls** for **frequency** and **resonance** available. Resonance can be adjusted right up to **self-oscillation**, in which case the filter will behave like a **sine wave oscillator**. **Three CV inputs for frequency control** are available. **Two** of them are equipped with **attenuators**.

The A-108 features an **external feedback input** that enables the **insertion of additional modules** into the feedback path.

The **audio input** is **very sensitive** so that **distortion** is possible even with normal A-100 levels.

## 2. VCF 8 - Overview



### Controls:

- ① **Freq. :** Manual frequency control
- ② **CV 2 :** Attenuator for frequency control voltage at input ② / CV2
- ③ **CV 3 :** Attenuator for frequency control voltage at input ③ / CV3
- ④ **Audio Level :** Attenuator for audio input ①
- ⑤ **Emph. :** Resonance control

### In / Outputs:

- ① **Audio In :** Audio input to the filter
- ② **BP, 6 db LP ... 48 db LP :** Filter outputs
- ③ **CV 1:** Control voltage input for frequency control, approx. 1V/Oct.
- ④ **CV 2:** Control voltage input for frequency control, level controlled by ②
- ⑤ **CV 3:** Control voltage input for frequency control, level controlled by ③
- ④ **Feedb. :** external feedback input for resonance (audio input)

### 3. Controls

#### ① Freq.

Control ① is used to adjust the **filter frequency** manually, i.e. the **middle frequency**  $f_M$  for the **band pass** resp. the **cut-off frequency**  $f_C$  for the **low pass** (see fig. 1).

👉 The actual filter frequency results from the sum of the manual control ① and the external control inputs CV1 ... CV3.

#### ② CV 2 • ③ CV 3

For voltage control or modulation of the cut-off frequency the CV inputs ② can be used. The controls ② and ③ act as attenuators for the inputs CV2 and CV3 to adjust the **control voltage level**.

#### ④ Audio Level

This attenuator is used to control the amount of signal entering the filter audio input ①. If the filter's output distorts, turn this control down, unless you deliberately want the distorted sound as a special effect. The filter 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.

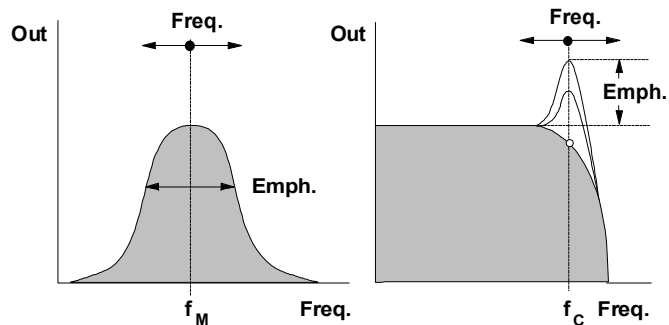
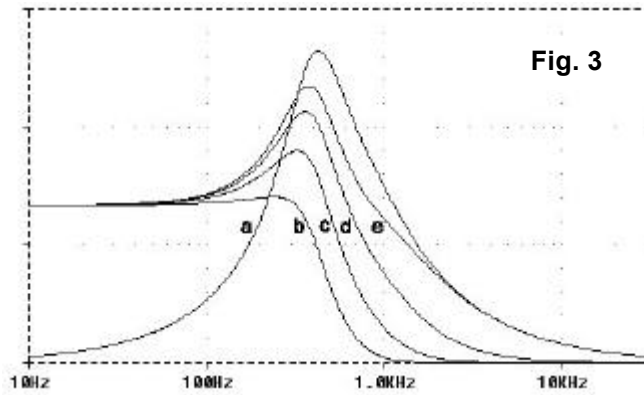
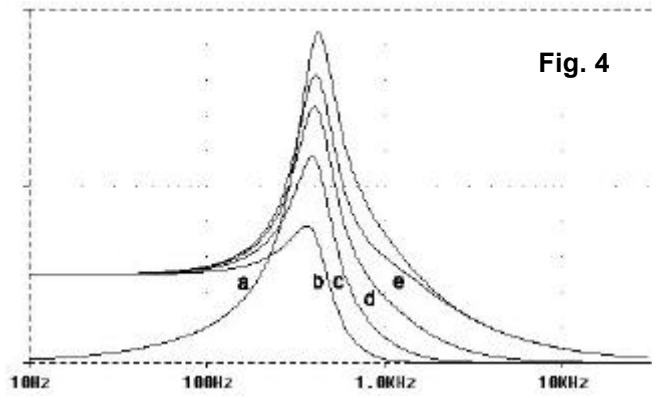
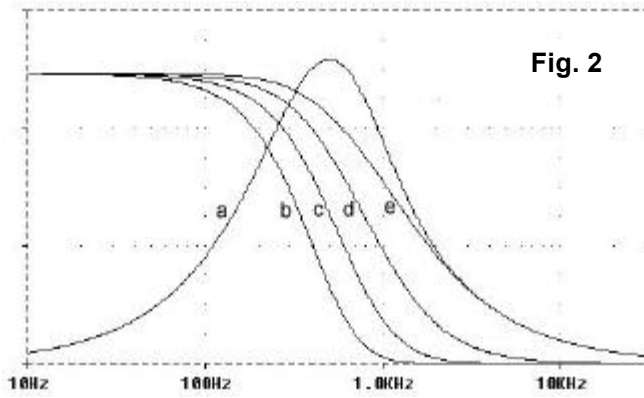


Fig. 1: Frequency response of band and low pass

#### ⑤ Emph.

Control ③ is used to adjust the filter's **resonance** (or emphasis) - the parameter which emphasises the frequencies around the cut-off point  $f_C$ . For the band pass this control changes the bandwidth (see Fig.1-4). Close to its maximum setting, the filter becomes so resonant that it goes into **self-oscillation**, and starts behaving like a **sine wave**. You can take advantage of this effect, and use the VCF as an additional sine oscillator. Self oscillation will break off at high distortion levels as the internal feedback signal is drown out by the distorted audio signal. This feature may intentionally be used to create new sounds. If you want to use the filter as a sine wave oscillator no audio signal should be fed in (or control ④ to zero).



**Fig. 2:** Filter response curves (minimal resonance)

**Fig. 3:** Filter response curves (middle resonance)

**Fig. 4:** Filter response curves (high resonance)

For all figures:

- a : Band pass
- b : 48 dB Low pass
- c : 24 dB Low pass
- d : 12 dB Low pass
- e : 6 dB Low pass


## 4. In / Outputs

### ① Audio In

This is the filter's **audio input** socket. Patch in the output from any sound source (eg. VCO, noise generator, subharmonic oscillator, sampler, mixer output).

### ② BP • 6db LP • ... • 48db LP

The sockets ② are the **filter outputs** with the filter types band pass (BP) as well as 6, 12, 24 and 48 dB low pass (LP).

 You may change the factory settings of the cut-off slopes (6, 12, 24, 48 db) for the four low pass outputs (see chapter 6 for details).

### ③ CV 1 • CV 2 • CV 3

The sockets CV1, CV2 and CV3 are **control voltage inputs** to control the **filter frequency**. Input **CV1** has no attenuator and works approximately to the **1V/octave standard** (not as exactly as the VCOs). Inputs CV2 and CV3 are equipped with the attenuators ② and ③ so that the sensitivity of these inputs can be adjusted. With attenuators set to 10 (fully clockwise) the sensitivity for CV2 and CV3 is about 0.5V/octave.

If you patch one or more modulation sources (e.g. LFO, ADSR, Random, S&H, Theremin, Ribbon, MIDI-to-CV) to these inputs, the cut-off frequency of the filter will be modulated by the sum of the control voltages: i.e., the sound color changes according to the sum of the control voltages put out by the modulators.



If you use the VCF as a sine wave oscillator, it is recommended to connect the pitch CV to socket CV1 as this input works approximately to the 1V/octave standard. Do the same if you want the filter's cut-off frequency to track exactly with the pitch of a note.

### ④ Feedb.

Module A-108 has available an **external audio input for resonance**. This socket is normalled, i.e it is connected to the 48 dB low pass output unless another signal is patched into this socket. Different modules can be inserted into the feedback loop (see chapter 5 for examples). E.g. inserting a VCA enables voltage controlled resonance. It is also possible to feed back other filter outputs than the 48 dB low pass to obtain another resonance behaviour.

## 5. User Examples

The filter's cut-off frequency can be modulated in various ways: e.g. ADSR (A-140, A-141, A-142), LFO (A-145, A-146, A-147), Sample & Hold (A-148), Random (A-118), Joy-Stick (A-174), Theremin (A-178), Ribbon (A-198) or via MIDI (A-190/A-191). Many of these examples can be found in the manuals of the other filters of the A-100 system.

One special feature of the A-108 is the **external feedback input**. This enables the insertion of any audio processing module into the feedback path. Inserting a VCA leads to voltage controlled resonance. In this case the control voltage of the VCA works as voltage control input for the filter's resonance. Other modules that are suitable for insertion are e.g. phaser (A-125), frequency shifter (A-126), waveform processor/distortion (A-116, A-136) or even other filters.

Another example is a **filter with voltage controlled cut-off slope** in combination with the voltage controlled mixer A-135 and the morphing controller A-144. Fig. 5 shows the corresponding patch.

The four low pass outputs (6/12/24/48 dB) of the A-108 are connected to the four audio inputs of the voltage controlled mixer A-135.

The levels of the four mixer paths are controlled by the control voltages coming from the morphing controller A-144. The audio output signal of the filter with voltage controlled cut-off slope is available at the output of the voltage controlled mixer A-135.

The control voltage that is used to control the cut-off slope is connected to the control voltage input of the morphing controller A-144. That way it is possible to sweep the cut-off slope from 6 ... 48dB (fig. 5, ②) with the control voltage applied to the CV input of the A-144. In the example the voltage is generated by a joy stick (A-174) and called "character modulation". Of course any other control voltage (e.g. LFO, ADSR, MIDI-to-CV, Theremin, Random) could be used to control the "character", i.e. the cut-off slope. For more examples please refer to the A-144 user's manual.

The patch in fig. 5 has these control inputs available:

- **Char. Mod.** filter cut-off slope
- **Freq. Mod. 1** filter frequency 1 (e.g. ADSR)
- **Freq. Mod. 2** filter frequency 2 (e.g. LFO)

If the 48dB low pass output of the A-108 is connected to the feedback input of the A-108 through a VCA even the resonance is voltage controlled (= control voltage of the VCA).

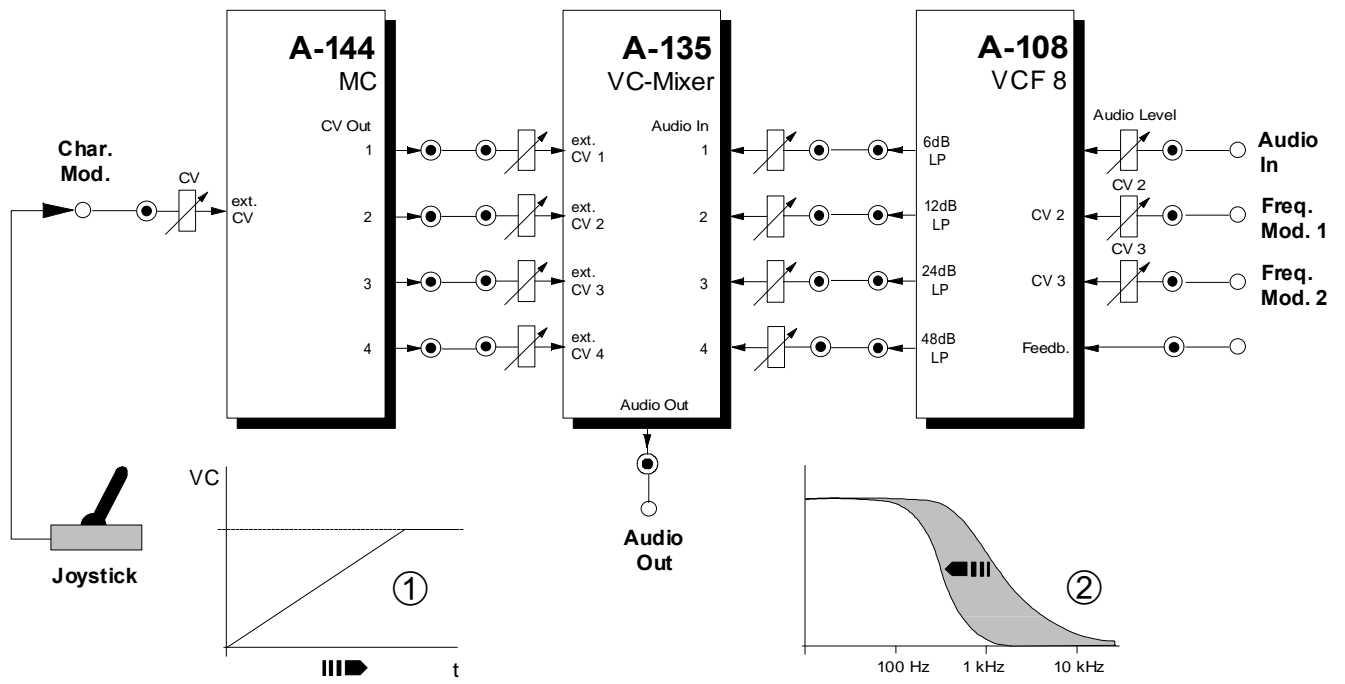


Fig. 5: Low pass filter with voltage controlled cut-off slope

## 6. Changing the assignment of the four low pass outputs

Only 4 output stages are available as this seems to be sufficient from our experience. In the factory the 4 outputs are connected to the filter stages with 6, 12, 24 and 48 dB cut-off slope. This is a well-considered compromise as these outputs generate audible different sounds. E.g. the audible difference between the 48dB and 42dB or between 42dB and 36dB is very little. So it would make not much sense to have 30, 36, 42 and 48 dB available instead of 6, 12, 24 and 48 dB.

But if desired any of the 8 filter stages can be connected to one of the 4 outputs. By changing the internal connections (jumpers or wires) each filter stage is available - but only four at a time. Even a multi-way switch could be used but from our results the factory setting (6/12/24/48dB) is the best combination for musical applications.

The factory settings can be changed if the corresponding jumpers on the pc board are removed and rearranged for the desired new output combination.

On the pc board 4 double row pin headers are available (see picture on next page). The positions of the

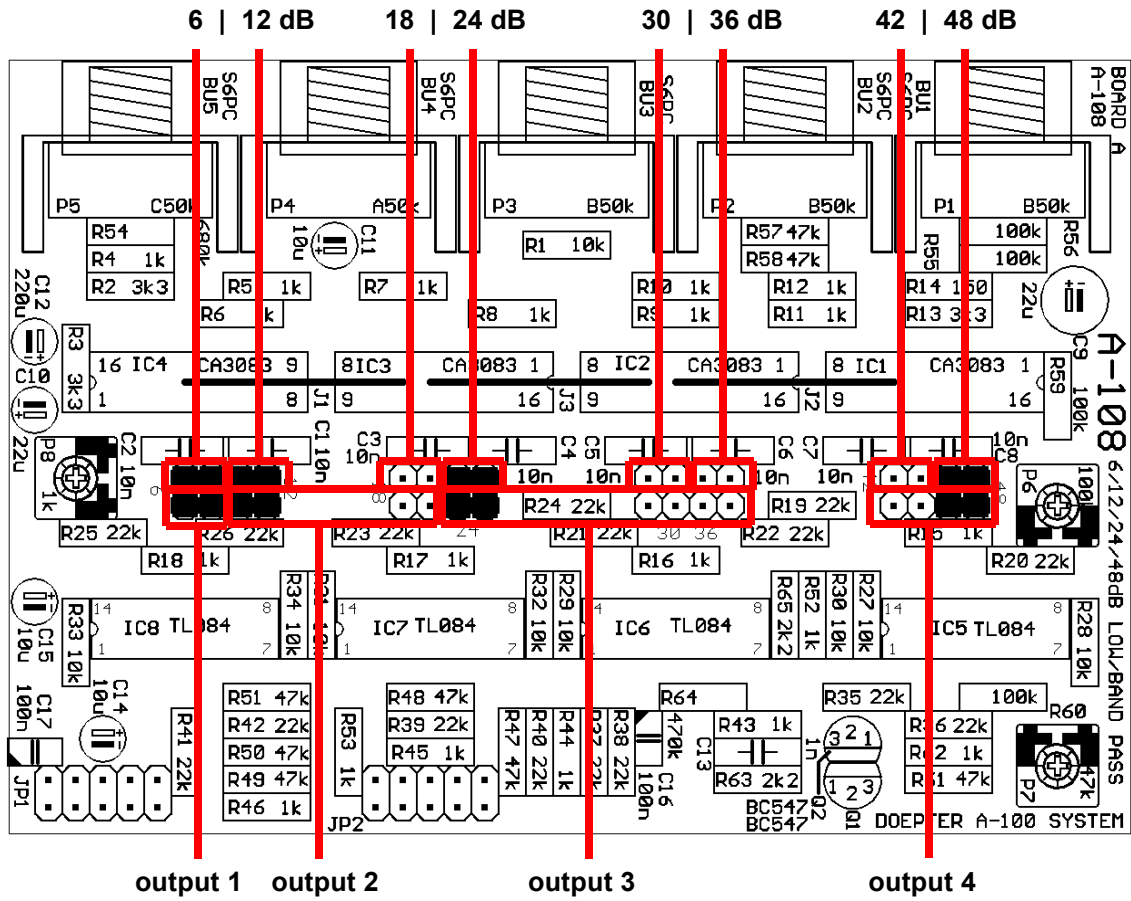
jumpers on these pin headers determine the assignment of the filter stages to the outputs. One pair of jumpers is responsible for each of the filter stages. The factory setting of the jumpers is marked **black**.

These are the possible jumper settings (the factory settings are printed **bold**):

- Output 1: only **6 dB** possible
- Output 2: **12 dB** or 18 dB
- Output 3: **24 dB** or 30 dB or 36 dB
- Output 4: 42 dB or **48 dB**

In principle each filter stage can be connected to one of the four output stages but this would require additional wiring and cannot be carried out by changing the jumper settings only (e.g. 18 dB to output 3). All combinations not listed above have to be made with wires two by two instead of the jumpers. The upper row of the pin headers are the 8 filter stage outputs in pairs. The lower row of the pin headers lead to the inputs of the 4 output stages in pairs whereby the pins below 6 db belong to out 1, the pins below 12 and 18 to out 2, the pins below 24, 30 and 36 to out 3 and the pins below 42 and 48 to out 4. For details please refer to the A-100 service manual (additional charge).





## 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.



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

