

# FUN VCF

## USER'S GUIDE



## MODULE DESCRIPTION

FUN VCF is a double state variable filter with the common controls and separate outputs. Its core is based on the soviet Polivoks synthesizer's filter featuring new stock KP140УД1208 and KP140УД18 operational amplifiers. Original schematic was redesigned in the following way:

- High Pass output was added
- full frequency sweep in the hearing range is now possible 20 Hz – 20 kHz
- no artifacts for the filter to pass unwanted high frequencies at Low Pass output
- inherent distortion when the Frequency is set to its low range is eliminated (compensation can be omitted with the jumper on the PCB).

Two identical state variable filters are available in one module, each of them has separate input, three outputs – High Pass (12 dB/oct), Band Pass (6 dB/oct), Low Pass (12 dB/oct), plus a common for both filters Frequency Modulation (FM) input. Both filters are factory fine tuned to be as identical as practical for good stereo operation.

But the module is not limited for stereo filtering. The user can take any output of one filter and patch it to the second filter's input (serial connection). This way not only the usual combinations of  $12+12=24$  dB/oct Low Pass and High Pass, or  $6+6=12$  dB/oct Band Pass filter modes are possible, but also any in-between modes like passing 12 dB/oct high pass through 6 dB/oct Band pass. The user is welcome to check the possible routings.

It should be mentioned that subject filter's resonance is self oscillating and has a huge impact on the sound. Which becomes merely monstrous in case a serial connection of the both onboard filters is used.

## SPECIFICATIONS

**input level:** -5V ... + 5V

can also accept inputs exceeding [-5V...+5V] amplitude with peculiar distortion

**output level:** around -2,5V ... + 2,5V in low “Resonance” settings with up to -15V ... + 15V in self oscillation

**output impedance:** 1 kOhm

**module depth:** 3 cm or 1,5 inches

**power consumption:** +15 /-15 mA at +/-15 Vdc

## CONTROLS DESCRIPTION

As it was already mentioned FUN VCF has two identical filters in it. Both have the common controls – manual “Frequency” control, manual “Resonance” control and frequency modulation “FM” control voltage attenuator.

**FREQUENCY** – scale dial is from 0 to 10. This control sets cut off frequency for all the outputs for both filters at the same time.

**RESONANCE** – scale dial is from 0 to 10. This control sets filter resonance for all the outputs for both filters at the same time. Resonance settings in 5-10 scale region may introduce some distortion to the input signal of -5V ... + 5V amplitude. If this distortion is not desirable – please reduce the input amplitude.

**FM** – scale dial is from 0 to 10. This control sets frequency modulation amount of the cut off frequency for all the outputs of both filters at the same time.

0V ... + 5V control voltage applied to the “FM” input will raise the cut off frequency in the whole hearing range 20 Hz-20 kHz if “Frequency” control is set to 0 mark and “FM” control is set to 10 mark. Similarly negative control voltage 0V ... - 5V will decrease the cut off frequency in the whole hearing range from 20 kHz to 20 Hz if “Frequency” control is set to 10 mark and “FM” control is set to 10 mark. So if the user does not need the filters to pass above/below the human hearing range – the relative settings of the “FM” and “Frequency” amounts should be adjusted.

Please note that internal cut off frequency value can be virtually below zero (0 Hz) due to negative control voltage signal and FM knob set non zero setting. This may lead to some unusual sounds with fast audio rate FM modulations (most likely square waves). If this effect is not desirable – the user can force the filter to ignore those “negative” frequencies by removing PCB jumper.

**IN1** – first filter input to be processed and to appear at the relative left column outputs: HP, BP, LP. Any AC signal, preferably -5V ... + 5V (10 V pk-pk).

**IN2** – second filter input to be processed and to appear at the relative right column outputs: HP, BP, LP. Any AC signal, preferably -5V ... + 5V (10 V pk-pk).

**FM** – control voltage input for the cut off frequency modulation. Can be either AC or DC. -5V ... + 5V input voltage range is welcome.

**HP** – 12 dB/oct High Pass filter output.

**BP** – 6 dB/oct Band Pass filter output.

**LP** – 12 dB/oct Low Pass filter output.

**POWER INPUT** - male 6 pin MTA-100 PCB mount connector - a standard dotcom power connector. To be plugged to a regulated +15Vdc and -15Vdc PSU only when the power supply is OFF. Mind the proper positioning on the pins.

## **USEFUL TIPS AND TRICKS**

Though there is no Resonance control voltage regulator onboard, it can be replaced by other modules. Patching BP output to any VCA and then mixing the result with the input signal to be processed by the filter will lead to the Resonance voltage control.

Patch one filter's outputs to the second filter's input.

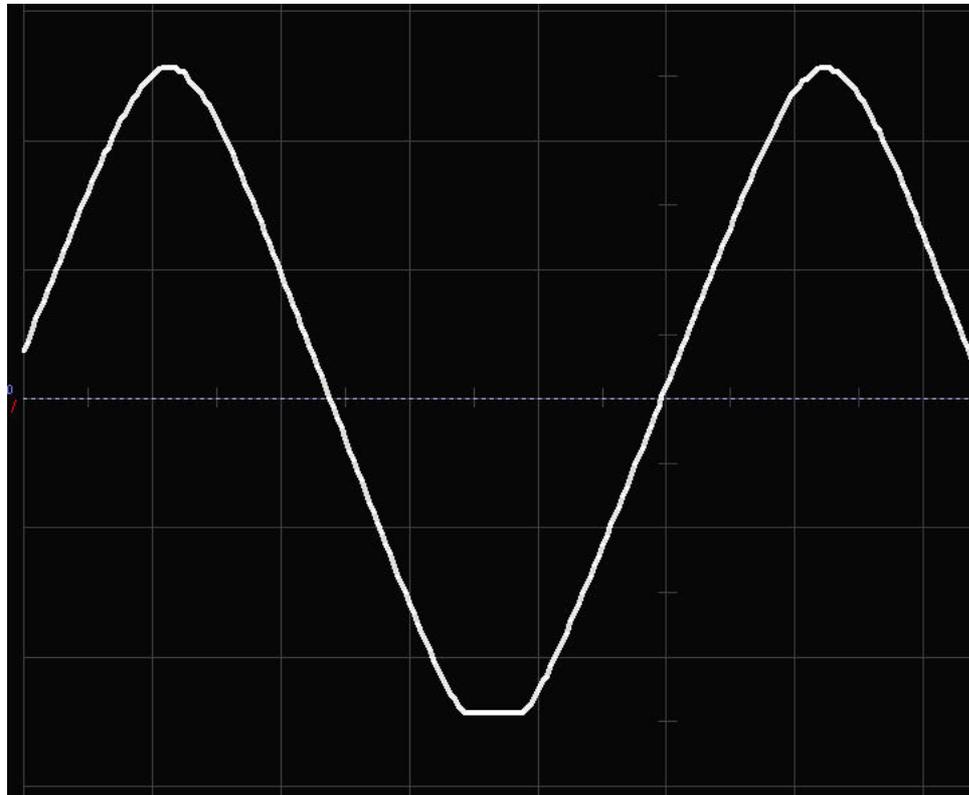
Use external mixer/scanner to mix different filters' outputs.

Some of the obvious ways to modulate the cut off frequency:

- 1) velocity CV – the harder the notes are pressed the higher the FUN VCF frequency; by using inverted velocity CV the cut off frequency can be decreased the harder the notes are pressed;
- 2) pitch CV – cut off frequency will be scaled by the pitch being played (classic key follow);
- 3) LFO or ADSR – to modulate the cut off frequency;

## SELF RESONATING WAVEFORM

Unlike many other state variable filters – FUN VCF does not output clean sine waveform when it self resonates with no input: it's more like asymmetrically clipped sine, please check the picture below.



## CALIBRATION

There is only one part of the module which may require the user's adjustments – onboard trimmer. By default all units are tuned to give manual sweet of the cut off frequency in the range around 20 Hz - 20 kHz, so do not change the trimmer's setting unless you will need to shift this range.

If you will have questions regarding the calibration – please contact [hnerding@gmail.com](mailto:hnerding@gmail.com)

**HAPPY NERDING!**