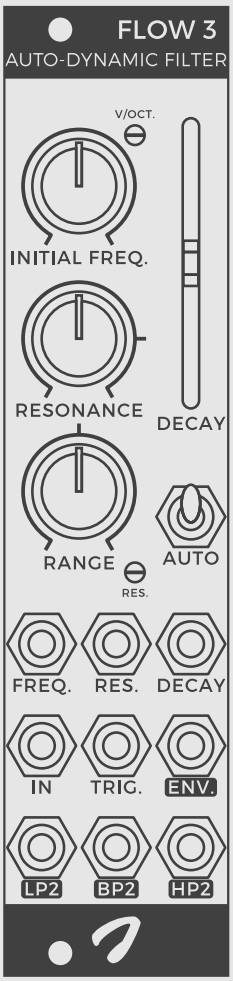
FLOW 3 AUTO-DYNAMIC FILTER

USER MANUAL



Joranalogue
AUDIO DESIGN

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INTRODUCTION

Flow 3 is a filter that sounds bigger than it looks. Behind the compact 6 HP front panel lies a novel variation on the classic state variable filter topology, offering simultaneous lowpass, bandpass and highpass outputs. Core integrator saturation provides for a sound that's clean, yet distinctive.

The resonance response is exceptionally smooth—and it can easily reach self-oscillation. In this mode, temperature-compensation and exact calibration make Flow 3 a reliable quadrature sine/cosine oscillator with tight pitch tracking.

But the ace up Flow 3's sleeve is its auto-dynamic nature: it is a filter that can modulate itself. This is achieved by a combined decay generator/envelope follower circuit which controls the filter frequency over an adjustable range. Either fire decay envelopes from external triggers, or flip it to auto mode to follow along with the incoming signal's amplitude envelope (or both, simultaneously).

Creating heavy-hitting analogue kick drum sounds becomes a breeze. And with a bit of patching, Flow 3 can even be used as a spectrum splitter (or 'crossover'), cleanly separating the full audio range into low and high portions, for dual-band signal processing. This is possible thanks to the Linkwitz-Riley filter response at minimum resonance.

Let yourself get carried away as Flow 3 takes the old auto-filter concept to new voltage-controlled heights.

CONTENTS

In the Flow 3 box, you'll find:

- → Product card, stating serial number and production batch.
- → 16-to-10-pin Eurorack power cable.
- → Mounting hardware: two black M3 x 6 mm hex screws, two black nylon washers and a hex key.
- → The Flow 3 module itself, in a protective, reusable cotton bag.

If any of these items are missing, please contact your dealer or support@joranalogue.com.

INSTALLATION

Before installation, make sure your Eurorack system has been powered down for at least 5 minutes and is placed horizontally on a stable surface.

Locate a suitable spot in your system in which to mount your module. First plug the included power cable between the module and a free output header on the power distribution board or cable.

Keep an eye on the polarity: the red stripe on the cable, denoting the –12 V power voltage, should always point towards the bottom of the module: 'red stripe down'. All our modules are equipped with keyed headers, aiding correct orientation.

Also pay attention to the polarity of the cable on the power distribution side. Contact the manufacturer of your rack in case you are uncertain.

Even if the polarity ends up reversed, this will not damage your module. However, this may not be true for modules of other brands.

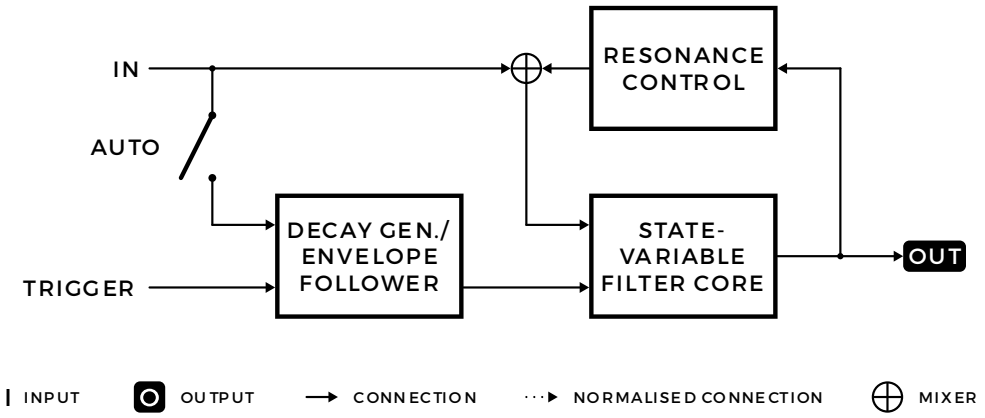
Next, it's time to screw your module in place. Included with your module, you'll find a set of M3 screws and nylon washers. Place the nylon washers onto the screw threads, and using the supplied 2.5 mm hex key, fasten the screw/washer combo onto the rack rails, through the module's front panel.

If your case uses sliding nuts, you'll need to position them first. Repeat until all screws are in place; always use all the supplied screws to install a module.

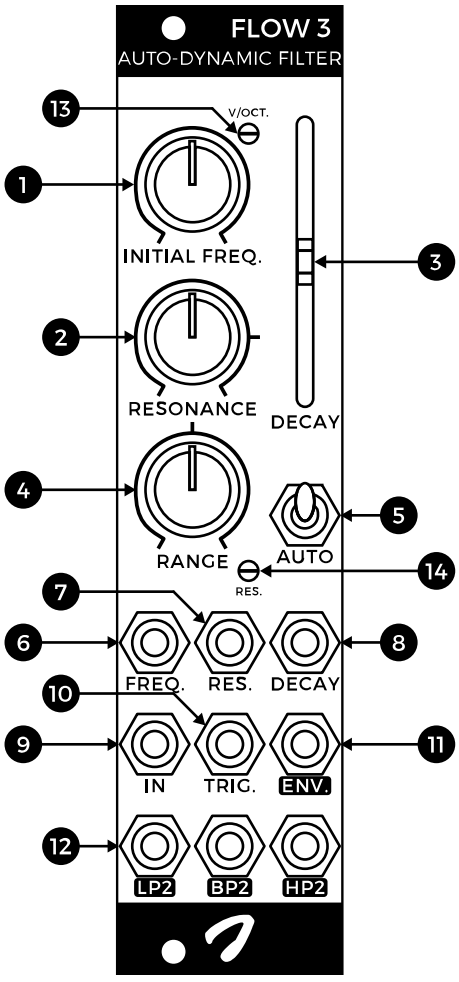
Note that some racks might use a different thread than the supplied M3 screws, or the rails might be recessed too deep for the supplied screws to fit. In this case, you'll need to source third-party screws matching your rack.

Now you can power up your rack and enjoy your new module!

SIGNAL FLOW



CONTROLS & CONNECTIONS



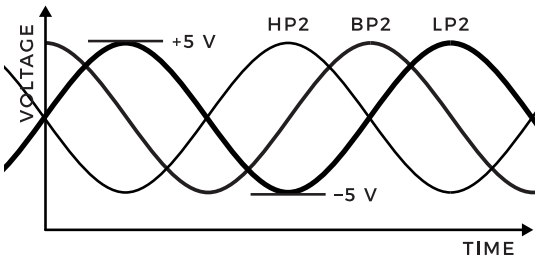
1 INITIAL FREQUENCY KNOB

The initial filter frequency, prior to envelope modulation, is determined by this knob. It has a range of 22 Hz to 22 kHz.

2 RESONANCE KNOB

The resonance knob controls a feedback path from the filter output back to the input, causing the filter frequency to be emphasised.

At higher feedback levels, self-oscillation will be achieved, turning the module into an excellent quadrature sine wave VCO. At maximum resonance, all outputs will resonate at approximately 10 V_{pp} (although this will vary somewhat with temperature).

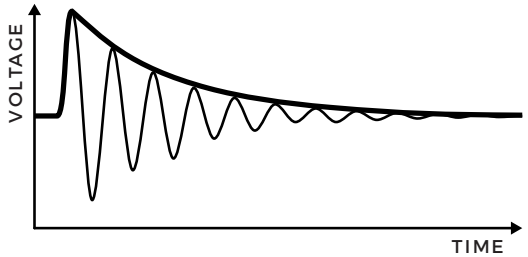


3 DECAY RATE SLIDER

Use this slider to set the decay slew rate of the combined decay generator/envelope follower, from fast on the bottom to slow on top. The decay time range is 100 ms to 3 seconds, according to an exponentially-decaying (convex) curve.

When using the envelope follower function, this slider can be adjusted to fine-tune the response for an optimal balance between speed and envelope smoothness.

The figure below shows the envelope follower tracking a decaying incoming sound source, at a perfectly matching decay rate.



The default envelope attack time is 1 ms. However, Flow 3's envelope follower is of a unique two-stage design, automatically slowing down the attack slew rate when operating on a steady signal. This greatly reduces envelope ripple, while still maintaining a fast response to sudden signal changes.

The LED on the lever shows the module's status in real time. The brightness is at all times correlated with the envelope output voltage.

4 RANGE KNOB

The range knob sets the frequency modulation depth of the decay generator/envelope follower. It is a polariser knob, with 0 in the centre, +1 volt per octave maximum and –1 volt per octave minimum.

5 AUTO SWITCH

The auto switch is used to enable the envelope follower function. When enabled, the input signal's amplitude envelope will automatically modulate the filter frequency, as determined by the range knob.

When this switch is disabled, only decay envelopes explicitly generated by the trigger input will modulate the filter.

6 FREQUENCY CV INPUT

This input is used to modulate the frequency in an exponential fashion, with a standard 1 volt per octave response. This enables accurate audio pitch in filter or oscillator mode.

Frequencies down to 22 mHz (a period of 45 seconds) are available by applying negative CV, allowing Flow 3 to function as a voltage-controlled quadrature low frequency oscillator (VCQLFO).

7 RESONANCE CV INPUT

The resonance amount can be modulated through this input, with +5 V corresponding to maximum resonance.

8 DECAY RATE CV INPUT

An increase in voltage here will increase the decay slew rate, and thus decrease the decay time, at approximately 1 volt per octave. Or, in other words: the decay time is halved for each additional volt of CV.

Through external modulation, decay raters beyond the slider range can be accessed.

9 SIGNAL INPUT

Connect the signal to be filtered here. This input is DC-coupled. However, the connection to the envelope follower is AC-coupled, rejecting frequencies below 16 Hz.

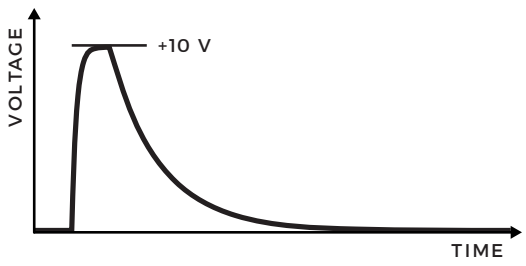
Flow 3 can clip and distort with certain input signals, especially if they are high-level, rich in harmonics and resonance is added. This is because all outputs are unity gain, and removing harmonics can in fact result in a signal's amplitude rising. This distortion can be used as a deliberate sonic effect. If you prefer to avoid it however, simply lower the amplitude of the input signal.

Applying a trigger signal to this audio input, with the resonance knob on the verge of self-oscillation, will yield crisp percussive 'filter ping' sounds. The amplitude and decay time are set by the frequency and resonance parameters, as well as the trigger pulse voltage. Enable the auto switch and turn up the range knob to add a pitch envelope to these filter pings.

Note that the trigger pulses should be short (1 ms or less), to avoid audible 'double triggering' on the falling edge.

10 TRIGGER INPUT

The trigger input is used to generate a +10 V peak envelope, with a fast attack (1 ms) and adjustable decay. This can be combined with the envelope follower feature, to add 'accents' on top of the input signal's envelope.



Flow 3's trigger input is uniquely designed to be driven reliably even from weak, slow, bipolar signals. It features Schmitt action, with a +2 V low and +3 V high logic threshold.

11 ENVELOPE OUTPUT

The output signal of the combined decay generator/envelope follower is available via this socket. It is always a positive voltage, within 0 V and +12 V. The envelope amplitude is independent of the position of the range knob.

With the auto switch off and the range knob centred, it is possible to use Flow 3's decay generator and filter circuits completely independently.

Although there is no dedicated CV input for the range parameter, an external VCA can be used between this envelope output and the frequency CV input to add this capability.

12 FILTER OUTPUTS

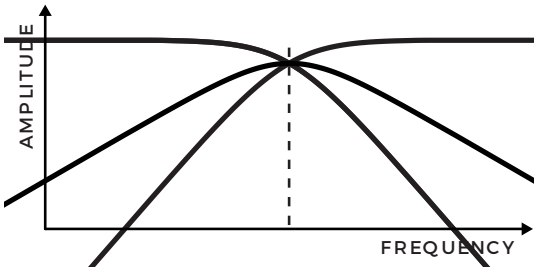
These are the outputs from the different stages inside the state-variable filter core. They all have a 2-pole response and can be used simultaneously.

The lowpass output will attenuate frequencies above the filter frequency (also known as 'cutoff', 'corner' or 'centre'), at –12 dB/octave. It self-oscillates at a phase of 180˚.

The bandpass output selects a band of frequencies around the filter frequency. Below and above that, the attenuation slope is –6 dB. It self-oscillates at a phase of 90˚.

Finally, the highpass output will attenuate frequencies below the filter frequency, at –12 dB/octave. It self-oscillates at a phase of 0˚.

The figure below shows all these responses superimposed, at minimum resonance.



Note that at minimum resonance, all outputs will attenuate –6 dB at the filter frequency, dipping down a bit further than the typical –3 dB response. This creates a few unique possibilities.

Mixing the lowpass and highpass outputs together at unity gain (addition) will cause them to cancel out exactly at the filter frequency, creating a narrow notch filter response.

If instead the difference is calculated between lowpass and highpass (subtraction), the result will be a flat response, restoring the original signal spectrum exactly. This can be easily achieved by inverting one of the signals before mixing.

This type of complementary filter is also known as a Linkwitz-Riley filter. It makes Flow 3 ideal for dual-band processing of complex audio signals, splitting the full audio spectrum into low and high frequency portions at an adjustable crossover frequency.

Do consider that in this configuration, the bandpass filter output's maximum response is at this same –6 dB point. A small amount of resonance (knob set to around 10 o'clock) will cause this output to peak at unity gain (0 dB) instead.

13 VOLT PER OCTAVE TRIMMER

This trim potentiometer is used to calibrate the module's pitch tracking. Since it is accessible from the front panel, calibration can be easily performed without removing the module from the system. Each module is individually calibrated during production; do not adjust this trimmer if not needed.

Should you find your Flow 3 to be out of tune, set it to oscillator mode (no input signal, maximum resonance). Set the initial frequency knob to about 20 % of its range (9 o'clock).

Make sure Flow 3 has been powered for at least 20 minutes at a stable ambient temperature. Now connect any output to a calibrated digital tuner.

During the tuning process, the volt per octave input should be continually switched between 0 V and a precision +5 V source, toggled automatically or by hand. Leave all other inputs unpatched.

Using a dedicated trimming tool or standard 2.5 mm flat screwdriver, adjust the trimmer until the interval between both states is exactly 5 octaves. For example, if 0 V corresponds to a pitch of C1 + 23 cents, +5 V should yield C6 + 23 cents.

14 RESONANCE TRIMMER

The second trim potentiometer sets the self-oscillation amplitude at maximum resonance. Use the same settings as for the V/oct. calibration procedure and display the BP2 output signal on an oscilloscope. Adjust the trimmer until the sine wave's amplitude is exactly 10 V_{pp}.

Although the volt per octave tracking is temperature-compensated, the resonance amplitude is not. It will change slightly with ambient temperature, as in any other analogue VCF. If an accurate 10 V_{pp} amplitude is required, recalibrate this trimmer whenever the temperature changes.

At low settings of this trimmer, Flow 3 will not be able to achieve self-oscillation. If your module can't self-oscillate, an improperly adjusted resonance trimmer is probably the reason why.

PATCH IDEAS

BASS DRUM SYNTHESISER

Flow 3 makes for a great 'kick' or bass drum synthesiser in a convenient, compact package. In this patch idea, only an external trigger signal is required. When these trigger pulses are sent into the signal input and the envelope follower is enabled, they will simultaneously provide the initial transients for our bass drum, as well as initiate a pitch envelope on each hit.

Set Flow 3's initial frequency knob to about 8 o'clock, resonance to 3 o'clock (just below self-oscillation), range to 1 o'clock and centre the decay slider. Enable the auto switch. Now fire a trigger and listen to the lowpass output.

The filter is now both pinged and pitch-modulated, creating a classic electronic bass drum sound. Fine-tune the parameters to taste. Add external overdrive or distortion for a heavier sound.

Listen to the different outputs, to hear the timbral character of each filter response. Experiment with different triggers, as their shape, length and peak voltage will affect the amplitude and tone of the generated bass drum sounds. Try modulating the trigger voltage using a sequenced VCA to add dynamics, resulting in both prominent 'accented', and subdued 'ghost' kicks.

SPECIFICATIONS

MODULE FORMAT

Doepfer A-100 ‘Eurorack’ compatible
3 U, 6 HP, 30 mm deep (including power cable)
Milled 2 mm aluminium front panel with non-erasable graphics.

MAXIMUM CURRENT DRAW

+12 V: 45 mA
–12 V: 45 mA

POWER PROTECTION

Reverse polarity (MOSFET)

I/O IMPEDANCE

All inputs: 100 kΩ
All outputs: 0 Ω (impedance compensated)

OUTER DIMENSIONS

128.5 x 30 x 52 mm (H x W x D)

MASS

Module: 90 g
Inc. packaging and accessories: 175 g

SUPPORT

As all Joranalogue Audio Design products, Flow 3 is designed, manufactured and tested with the highest standards, to provide the performance and reliability music professionals expect.

In case your module isn’t functioning as it should, make sure to check your Eurorack power supply and all connections first.

If the problem persists, contact your dealer or send an email to support@joranalogue.com. Please mention your serial number, which can be found on the product card or on the module’s rear side.

Joranalogue
AUDIO DESIGN

Flow 3 User Manual
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https://joranalogue.com/

LAB GRADE
SYNTHESIS.

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