

# Hampshire Electronics

## Dual VCF



## LP / HP / BP and Notch in One Filter

Designed and hand-built in the United Kingdom

[www.hampshireelectronics.co.uk](http://www.hampshireelectronics.co.uk)

# Contents

|                                                   |           |
|---------------------------------------------------|-----------|
| <b>1. Introduction .....</b>                      | <b>3</b>  |
| <b>2. Installation.....</b>                       | <b>4</b>  |
| 2.1 Mounting.....                                 | 4         |
| 2.2 Power Connection .....                        | 4         |
| <b>3. Overview &amp; Features.....</b>            | <b>5</b>  |
| <b>4. Architecture &amp; Signal Flow .....</b>    | <b>6</b>  |
| <b>5. Front Panel Overview.....</b>               | <b>7</b>  |
| <b>6. Controls &amp; Inputs .....</b>             | <b>8</b>  |
| 6.1 Cutoff Controls (Red) .....                   | 8         |
| 6.2 Peak Controls.....                            | 8         |
| 6.3 CV Inputs.....                                | 8         |
| 6.4 TRACK Inputs (1V/oct) .....                   | 8         |
| 6.5 Input Jacks .....                             | 8         |
| 6.6 Outputs .....                                 | 8         |
| <b>7. Filter Modes .....</b>                      | <b>10</b> |
| <b>8. Usage Examples.....</b>                     | <b>11</b> |
| Example 1 – Classic MS-20 Squelch .....           | 11        |
| Example 2 – Band-Pass with Envelope Sweep.....    | 11        |
| Example 3 – Notch Phasing Effect .....            | 11        |
| Example 4 – Sine VCO Mode.....                    | 11        |
| Example 5 – Dual Filter Parallel Processing ..... | 12        |
| <b>9. Technical Specifications.....</b>           | <b>13</b> |
| <b>10. Safety &amp; Compliance .....</b>          | <b>14</b> |
| <b>11. Contact &amp; Support.....</b>             | <b>15</b> |

# 1. Introduction

The Hampshire Electronics **Dual VCF (“AGGRO” VCF)** is a compact yet powerful 100% analogue 10HP state-variable filter inspired by the iconic MS-20 filters of the late 1970s.

It features **two completely independent filter cores** – one **6 dB/oct high-pass** and one **12 dB/oct low-pass** – which may be used separately or together to create complex shapes including band-pass and notch responses.

With both **cutoff CV inputs**, **tracking CV inputs (1 V/oct)**, and **self-oscillation at high resonance settings**, the AGGRO VCF excels equally as a musical tone-shaper, aggressive resonant sweeper, or precision sine-wave oscillator.

Hand-built in England, this module is designed for stability, sonic character, and flexible routing in both compact and full-size Eurorack systems.

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## 2. Installation

### 2.1 Mounting

The AGGRO VCF occupies **10 HP** of Eurorack space and is only **20 mm deep**, making it suitable for skiffs and portable cases.

Use standard M3 screws to secure the module.

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### 2.2 Power Connection

Connect the supplied Eurorack ribbon cable to the keyed connector on the rear PCB.

**Important:** Align the **red stripe with -12 V** on both the module and your case.

| Rail | Current Draw |
|------|--------------|
|------|--------------|

|              |                         |
|--------------|-------------------------|
| <b>+12 V</b> | $\approx 28 \text{ mA}$ |
|--------------|-------------------------|

|              |                         |
|--------------|-------------------------|
| <b>-12 V</b> | $\approx 28 \text{ mA}$ |
|--------------|-------------------------|

|             |          |
|-------------|----------|
| <b>+5 V</b> | Not used |
|-------------|----------|

Reverse-polarity protection is included.

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### 3. Overview & Features

- Dual analogue **state-variable filter**, inspired by MS-20 topology
  - Two fully independent filter sections:
    - **High-Pass (HP)** – 6 dB/oct
    - **Low-Pass (LP)** – 12 dB/oct
  - When combined, provides:
    - **Band-Pass (BP)** output
    - **Notch** output
  - **Self-oscillation** at high resonance (“Peak”)
  - LP filter can serve as a **sine-wave VCO**
  - **Cutoff CV input** with attenuation
  - **1 V/oct tracking CV input** (“Track”)
  - Internal routing: LP output → HP input (normalised)
  - Black anodised aluminium faceplate with white and gold detailing
  - Fully analogue signal path
  - Diode-protected power input
  - Hand-built in England
-

## 4. Architecture & Signal Flow

The AGGRO VCF contains two independent state-variable filter cores:

### Low-Pass Section (Left)

- 12 dB/oct slope
- Voltage-controlled cutoff
- Voltage-controlled resonance (“Peak”)
- Self-oscillates at high Peak settings
- Output normalised into HP section (can be broken by inserting a cable into HP INPUT)

### High-Pass Section (Right)

- 6 dB/oct slope
- Independently controlled cutoff, resonance, and CV
- Can be used independently or cascaded after the LP for combined responses
- Provides **BP** and **Notch** outputs derived from the internal state-variables

### Combined Modes

Using the internal routing, the LP and HP stages may be cascaded to produce:

- **Band Pass** – via “Track Out (BP)”
- **Notch** – dedicated NOTCH output

Both are available regardless of whether the individual LP or HP outputs are used.

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## 5. Front Panel Overview

### Top Row – Cutoff Controls

- **CUTOFF (LP)** – red knob, left
- **CUTOFF (HP)** – red knob, right

### Middle Row – Peak (Resonance)

- **PEAK (LP)**
- **PEAK (HP)**

### Lower Row – CV Attenuation

- **CV (LP)** – black knob
- **CV (HP)** – black knob

### Jacks – Lower Section

Each filter has:

- **INPUT** – audio/CV input
- **CV** – cutoff modulation input
- **TRACK** – 1 V/oct input
- **OUT** – output (LP out or HP out depending on side)

Plus shared outputs:

- **NOTCH**
  - **TRACK OUT (BP)** – Band-Pass output
-

## 6. Controls & Inputs

### 6.1 Cutoff Controls (Red)

Set the filter cutoff frequency manually.  
Full clockwise = highest cutoff.

### 6.2 Peak Controls

Adjust resonance from subtle emphasis to full self-oscillation.

- At extreme settings the LP section produces a clean sine wave.
- High resonance settings strongly characterise the MS-20 sound.

### 6.3 CV Inputs

Each filter has a **CV input with attenuator**.

Useful for envelopes, LFOs, random modulation, sequencers, and audio-rate FM.

### 6.4 TRACK Inputs (1V/oct)

Each filter includes an unattenuated exponential response input.

- Track oscillators for consistent timbral sweeps
- Used for sine-wave VCO mode
- LP oscillator tracking is especially musical

### 6.5 Input Jacks

The LP and HP **INPUT** jacks accept audio or CV in the –5 V to +5 V range.

### 6.6 Outputs

- **OUT (LP)** – low-pass output
- **OUT (HP)** – high-pass output

- **NOTCH** – notch response
- **BP (Track Out)** – band-pass output

Outputs may be used simultaneously.

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## 7. Filter Modes

### Independent Modes

- **Low-Pass (12 dB)** – classic smoother MS-20 style LP
- **High-Pass (6 dB)** – aggressive HP with bite

### Combined Modes

Because the LP output is internally routed to the HP input:

- **Band-Pass** – use BP output
- **Notch** – use NOTCH output

If a cable is inserted into the HP INPUT jack, the normalled connection is broken, and the filters operate independently again.

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## 8. Usage Examples

### ***Example 1 — Classic MS-20 Squelch***

- Send audio to LP INPUT
  - Increase PEAK until near oscillation
  - Modulate cutoff with envelope
  - Add some HP to sharpen the attack
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### ***Example 2 — Band-Pass with Envelope Sweep***

- Audio → LP INPUT
  - Take output from BP
  - Modulate both LP and HP cutoffs for shifting centre and width
- 

### ***Example 3 — Notch Phasing Effect***

- Audio → LP INPUT
  - Output → NOTCH
  - Modulate LP and HP at different rates
  - Creates moving phase cancellation textures
- 

### ***Example 4 — Sine VCO Mode***

- No input required
  - Set LP PEAK to self-oscillate
  - Patch TRACK input from keyboard or sequencer
  - Use LP OUT as sine wave oscillator
-

### ***Example 5 — Dual Filter Parallel Processing***

- Patch audio to both LP and HP simultaneously
  - Combine outputs in an external mixer
  - Sculpt custom hybrid curves
-

## 9. Technical Specifications

| Parameter        | Specification                              |
|------------------|--------------------------------------------|
| Format           | Eurorack                                   |
| Width            | 10 HP                                      |
| Depth            | ≈ 20 mm                                    |
| Power            | +12 V @ 28 mA / -12 V @ 28 mA              |
| Circuitry        | 100% analogue                              |
| LP Slope         | 12 dB/oct                                  |
| HP Slope         | 6 dB/oct                                   |
| Filter Type      | State-Variable                             |
| Modes            | LP, HP, BP, Notch                          |
| Inputs           | IN, CV, TRACK (1 V/oct) per channel        |
| Outputs          | LP OUT, HP OUT, BP OUT, NOTCH              |
| Self-Oscillation | LP section                                 |
| Faceplate        | Black anodised aluminium, white/gold print |

# 10. Safety & Compliance

## Electrical Safety

Operates exclusively from a **±12 V DC Eurorack supply**.

Contains no user-serviceable parts. Always power down your case before installation or removal.

## Compliance

Designed and tested to comply with:

- **UKCA:** Electrical Equipment (Safety) Regulations 2016 and EMC Regulations 2016
- **CE:** Low Voltage Directive 2014/35/EU and EMC Directive 2014/30/EU

Meets the requirements of **EN 55032 (emissions)** and **EN 55035 (immunity)** under self-certification.

## Disposal

Do not dispose of with household waste.

Recycle in accordance with **WEEE Directive 2012/19/EU**.

## **11. Contact & Support**

For documentation, firmware, and technical support, visit:

[www.hampshireelectronics.co.uk](http://www.hampshireelectronics.co.uk)

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