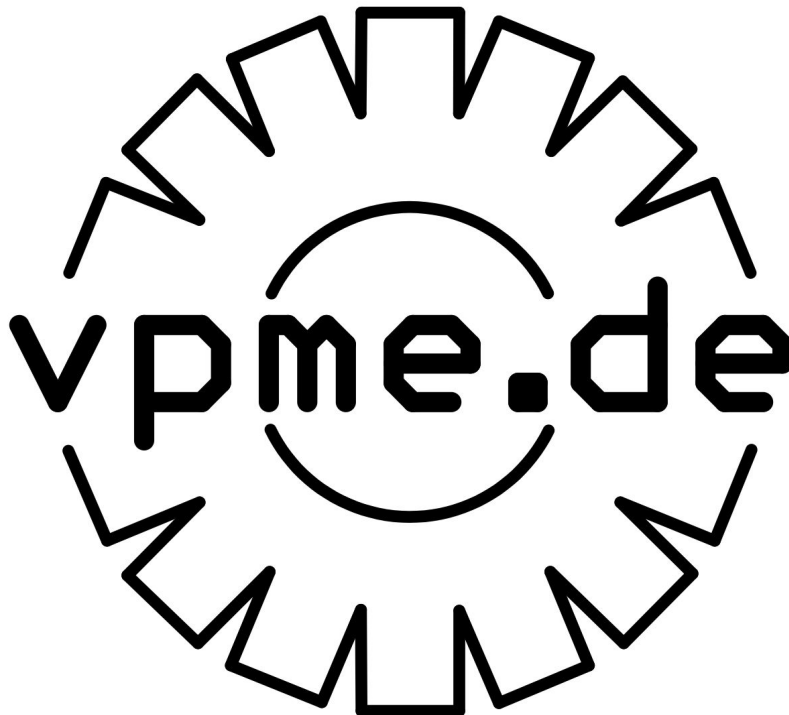
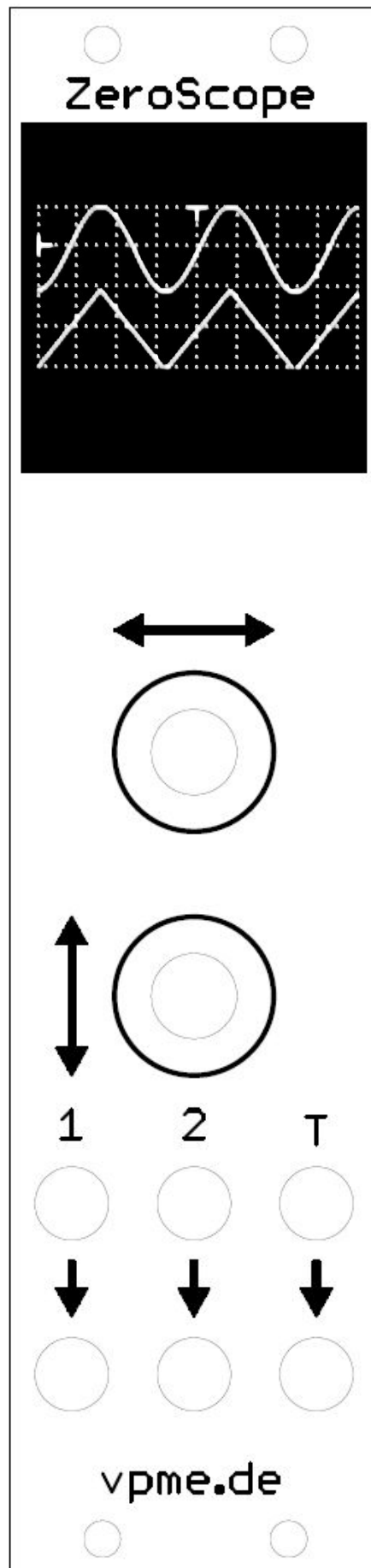


## FIRMWARE UPDATES

- check <http://vpme.de/zeroscope/> for firmware updates, download and save the update **WAV** file to your PC
- Connect the output of your mixer/soundcard to the external trigger **EXT** input.
- Press and hold the **lower** button and power on your system, 4 squares (let's call them **LEDs** from now on) will appear on the screen. LEDs 2, 3 and 4 will blink.
- Make sure your speakers are muted before you play the update **WAV** file. Disable all other sounds and notifications as they can disturb the update process.
- Play the **WAV** file at full volume, you need at least **2Vpp** on the external trigger **EXT** input. If needed boost the volume with an outboard mixer or VCA. You can check the correct level with LED 1, it will light up when the unit receives the update data correctly.
- To start the update process, stop and rewind the **WAV** file and press the **upper** button, LED 2 will blink. Now play the file, LED 2 will light up and LED 3 will blink to show the update in process.
- in addition a bar at the bottom of the screen will show the upgrade progress
- When the update is complete all 4 LEDs will light up. press the **lower** button to leave the updater and start the unit in normal mode





## INSTALLATION

- ZeroScope is a **6 hp** Eurorack 2-channel oscilloscope module
- The module consumes **30 mA** from the 12 V and **10 mA** from the -12 V supply, it does not use the +5 V rail.
- Carefully check the **orientation** of the 16-pin power connector, the **red stripe (-12V)** should be at the bottom of the module, see the labeling on the PCB.
- To **protect** the exposed OLED display, use the supplied longer M2.5/M3 mounting screws to fasten the **acrylic shield** over the display.
- **remove** the protective film from the OLED display and the acrylic shield
- **DO NOT APPLY INPUT SIGNALS LARGER THAN +10 V/-10 V**
- Further information and contact details at: <http://vpme.de/zeroscope/>

## BASIC OPERATION

- Connect CV or audio signals to the inputs labeled **1, 2 or T**:
  - **1:** **CH1**, channel 1 input
  - **2:** **CH2**, channel 2 input
  - **T:** **EXT**, external trigger input
- All input signals are through-connected to the jacks below so you can pass signals through the scope without a multiple
- Inputs **1** and **2** accept signals between **-10 V** and **+10 V**, input **T** is a trigger input and switches at about **+1 V**, all input signals are **DC coupled**
- Rotate the upper knob to change the scope timebase between **10 s/div** and **10 µs/div** (note that at **10 µs/div** only channel 1 is shown, even in **DUAL** mode)
- **Note that there is no sophisticated anti-aliasing filter, if your input signal is at a frequency higher than the timebase the resulting waveform can be misleading**
- Rotate the lower knob to change the scope gain between **10 V/div** to **0.5 V/div**
- Press the lower knob to toggle the gain setting from **CH1** to **CH2**
- Press the upper knob to enter the **SETTINGS** menu

## SETTINGS MENU

In the settings menu, the upper knob selects a setting and the lower knob changes the value of the selected setting. Press the upper knob to leave the **SETTINGS** menu again

### SCOPE MODE

- **SINGLE:** only **CH1** is active and displayed
- **DUAL:** dual channel mode, **CH1** and **CH2** are displayed
- **X-Y:** **CH1** drives the X axis and **CH2** drives the Y axis
- **FREQ:** frequency measurement and tuner
- **FRQ3:** triple frequency measurement and tuner

### TRIGGER MODE

- **Trg off:** no trigger, scope is free running
- **Trg \_/:** trigger on **rising** edge of **CH1**
- **Trg \\_:** trigger on **falling** edge of **CH1**
- **Ext \_/:** trigger on **rising** edge of **EXT**
- **Ext \\_:** trigger on **falling** edge of **EXT**

### TRIGGER LEVEL

- Rotate lower knob to set the **trigger level**
- Press and rotate lower knob to set the **trigger position**

### CH1/2 OFFSET

- Rotate lower knob to change the **CH1/CH2 offset**

### GRID

- Rotate lower knob to change the **grid display**
- Press and rotate lower knob to toggle **inverse display** on/off

### HOLD mode

**Press and hold** the lower button in single, dual or XY mode to **freeze** the display, a solid frame around the display area will indicate this. Press either button to leave **HOLD** mode.

### FREQ - frequency measurement and tuner

To measure the frequency of a periodic signal connect it to the **EXT** input, make sure the signal amplitude is high enough to exceed the **1 V** threshold reliably (to check this you can daisy chain the signal from **CH1** to **EXT** and use **external trigger** mode). Please note that the frequency measurement inside the ZeroScope is not highly accurate, do not base your PhD thesis on it.

- Press and rotate upper knob to change the averaging speed, the frequency display is more stable with longer averaging but also takes longer to update. When changing the input frequency the scope might display an intermediate value during the averaging interval, wait for the display to settle.
- The tuner will display the note closest to the current frequency and the tuning difference in a range of **-45** to **+45** cent. A vertical line left of the note name means that the frequency is too low, a line right of the note mean the frequency is too high.
- Rotate lower knob to change the tuner reference between **430 Hz** and **450 Hz**
- Press and rotate the lower knob to adjust the **trim**. This allows you to adjust the internal reference frequency relative to some other known good frequency meter, like e.g. a guitar tuner or an accurate signal generator. The internal reference frequency will drift a bit with changing temperatures, so make sure you adjust the trim at your standard room temperature.

### FREQ3 - triple frequency measurement and tuner

measure frequency and tuning of **three** signals connected to **CH1**, **CH2** and **EXT**.

- rotate upper encoder to switch between **frequency** and **tuner** display

**All ZeroScope settings are automatically saved after 5 s**

**Enjoy!**