



# BATUMI

QUADRUPLE  
LOW FREQUENCY  
OSCILLATOR

*Model of 1974*

**OPERATOR'S MANUAL** rev. 1974/5.2

## SALUT

Thank you for purchasing this Xaoc Devices product. Batumi is a fully voltage-controlled quadruple digital low frequency oscillator module with lots of interesting user-customizable features. Each LFO channel can be used independently or in one of three synchronized modes (fig. 3). The total frequency range spans from 28 hours (in voltage controlled divide mode) up to 500Hz.

## INSTALLATION

The module requires 10hp worth of free space in the eurorack cabinet. The ribbon type power cable must be plugged into the bus board, paying close attention to polarity orientation. The red stripe indicates the negative 12V rail and should align with the dot, **-12V** or **RED STRIPE** marks on both the unit and the bus board. The module itself is secured against reversed power connection, however reversing the 16-pin header **MAY CAUSE SERIOUS DAMAGE** to other components of your system by short-circuiting the +12V and +5V power rails. The module should be fastened by mounting the supplied screws before powering up. To better understand the device, we strongly advise the user to read through the entire manual before using the module.

## MODULE OVERVIEW

Batumi features four identical LFO channels (fig. 1). Each channel's slider pot **1** controls one of the four main parameters as determined by the global mode setting. In **FREE** mode, each slider determines its own channel's frequency (from 0.01Hz to 100Hz). In the other three modes, slider **1** acts as a master to the remain-

ing channels' frequency, allowing the remaining sliders to perform other actions. For example, in **PHASE** mode, sliders **2-4** define the phase shift, in **QUAD** mode, sliders **2-4** define the amplitude, and in **DIVIDE** mode, sliders **2-4** define the division of the master frequency. Frequency can also be set with increased precision by entering **ZOOM** mode, described later in this manual.

The **FRQ/PH/DIV** input **2** allows the corresponding slider parameter to be voltage controlled (1V/oct). Doing so allows for an extended frequency range from 500Hz all the way down to 53 minutes! Expected voltage is  $-5V$  to  $+5V$ . Above 100Hz, the waveforms tend to lose some precision and amplitude.

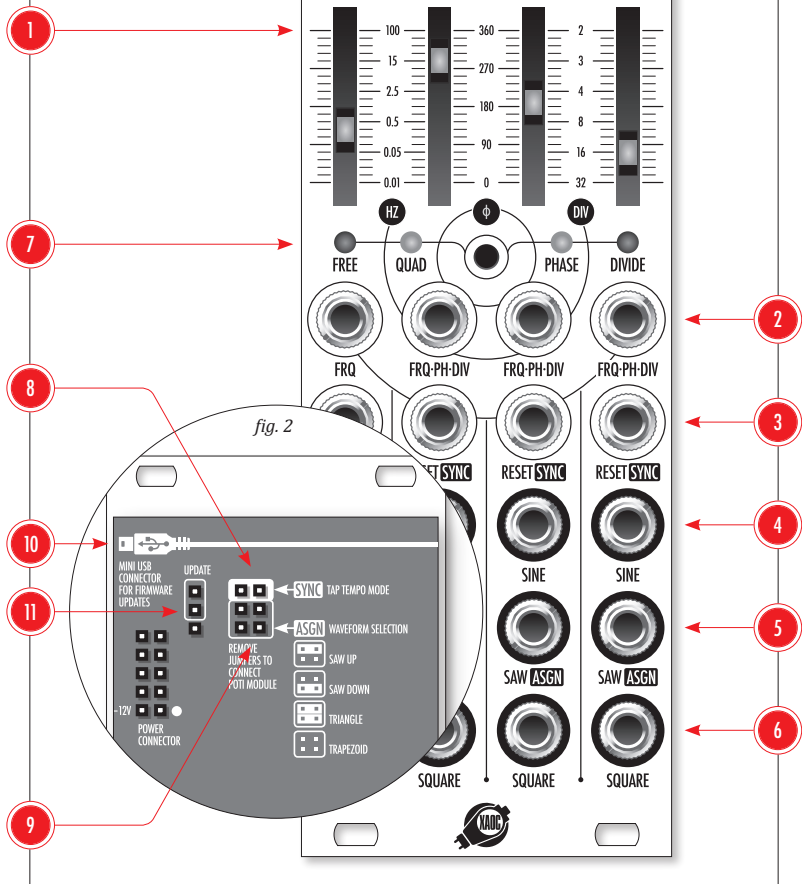
The **RESET/SYNC** input **3** is a user-defined trigger input that can serve as either cycle reset or external tempo sync depending on the jumper settings described later in this manual. The **SINE** output **4** produces a sine waveform ( $-5V$  to  $+5V$ ). In **QUAD** and **PHASE** modes, the sines are shifted in relation to one another. The **SAW/ASGN** output **5** produces either a default upwards saw (ramp) waveform ( $-5V$  to  $+5V$ ) or one of the user-selectable shapes described later in this manual. The **SQUARE** output **6** produces a square waveform ( $-5V$  to  $+5V$ ).

The LFO sync mode toggle section **7** allows the four oscillators to run free or sync to the master, as follows:

### 1. FREE LFO MODE

To enter this mode, click the central button until the red, **FREE** LED lights up. Now, all four LFO channels work independently.

fig. 1



## 2. QUADRATURE LFO MODE

Click the central button until the yellow, **QUAD** LED lights up. The first LFO is a master controlling the frequency of all the remaining LFOs. Each subsequent LFO generates a wave that is 90° shifted in relation to the preceding one (90°, 180°, 270°). In this mode, sliders 2–4 and the CV inputs control the respective channel's amplitude. The **RESET/SYNC 2–4** inputs allow for additional control described later in this manual.

## 3. PHASE LFO MODE

Click the central button until the yellow, **PHASE** LED lights up. **PHASE** mode is similar to **QUAD** mode, except that the amount of phase shift can be set arbitrarily. Sliders 2–4 and **FRQ** inputs are active. The **RESET/SYNC 2–4** inputs allow for additional control described later in this manual. A tip: in **PHASE** mode, patch one of the LFOs to control the phase shift of another. Stacking LFOs results in new, complex waveforms.

## 4. DIVIDE LFO MODE

Click the central button until the blue, **DIVIDE** LED lights up. LFOs 2–4 are synced to LFO 1 with their frequencies occurring at divisions of the master. Sliders 2–4 define the division ratio. Resulting cycle rates can be 2, 3, 4, 8, 16 or 32 times slower than the primary, master LFO's cycle. The **RESET/SYNC 2–4** inputs allow for additional control described later in this manual.

### RESET & SYNC INPUT

The **RESET/SYNC** input can serve two different purposes. In **RESET** mode, an incoming trigger impulse resets the LFO cycle to zero state

(hard sync). In **SYNC** mode (default setting) the LFO frequency can be slaved to an external clock source or tapped via manual gate so that waveform phase is aligned to the external clock. These modes are selectable by the jumper 8 on the back of the module (fig. 2: no jumper for **RESET**, jumper present for **SYNC**) or via the Poti module.

### SYNCED MODES ADDITIONAL CONTROLS

In **QUAD**, **PHASE** and **DIVIDE** modes, the second **RESET** input holds (pauses) all the LFOs, the third **RESET** input reverses the direction of the waveform, and the fourth **RESET** input selects the next waveform (see “Assignable Waveforms”). Switching modes resets the waveform to the default set by the jumper.

### ZOOM MODE

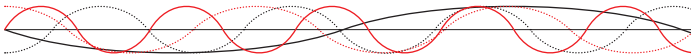
To enter **ZOOM** mode, hold the central button for a second until the current mode LED starts to blink. This mode upscales the slider travel around the central value to allow for precise adjustment. To exit **ZOOM** mode, press the central button again. Upon exiting **ZOOM** mode, any flashing LED indicates that the parameter value and slider position do not match. In **DIVIDE** mode, the fine setting adds or subtracts 0–3 to the division set outside of **ZOOM** mode.

### ASSIGNABLE WAVEFORMS

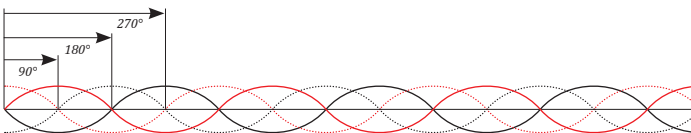
The **SAW/ASGN** output may be configured to provide one of the alternate waveforms. The default firmware provides four waveforms: ramp, saw, triangle and trapezoid. To assign the desired waveform, use the jumpers cluster 9 on the back.

fig. 3

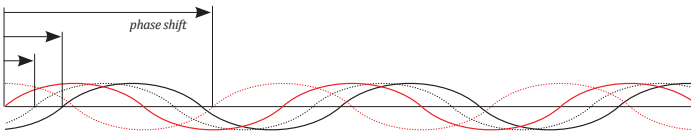
**FREE** • four free running LFOs



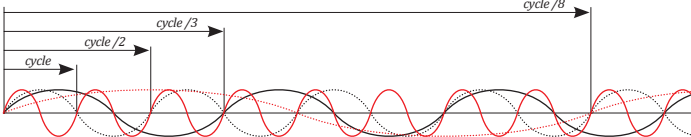
**QUAD** • fixed quadrature phase shift



**PHASE** • variable phase shift



**DIVIDE** • divisions of the master LFO frequency rate



## EXPANDABILITY: POTI & SAMARA

The functionality of Batumi can be greatly enhanced by adding two Xaoc modules: Poti and Samara. Poti is a simple breakout module providing an immediate panel access to the Batumi functions originally selected by jumpers. Samara II is an independent multi-function module offering four channels of attenuation, inversion, offsetting, mixing, minimum-maximum selection and basic waveshaping.

## FIRMWARE UPDATES

The MiniUSB standard port ⑩ allows an update procedure. Instructions are bundled with the firmware packages available online. Mind the position of the UPDATE jumper ⑪.

## ACCESSORY

Our Coal Mine black panels are available for all of Xaoc Devices modules. Sold separately. Ask your favourite retailer. •

## WARRANTY TERMS

XAOC DEVICES WARRANTS THIS PRODUCT TO BE FREE OF DEFECTS IN MATERIALS OR WORKMANSHIP AND TO CONFORM WITH THE SPECIFICATIONS AT THE TIME OF SHIPMENT FOR A PERIOD OF ONE YEAR FROM THE DATE OF PURCHASE. DURING THAT PERIOD ANY MALFUNCTIONING OR DAMAGED UNITS WILL BE REPAIRED, SERVICED, AND CALIBRATED ON A RETURN-TO-FACTORY BASIS. THIS WARRANTY DOES NOT COVER ANY PROBLEMS RESULTING FROM DAMAGES DURING SHIPPING, INCORRECT INSTALLATION OR POWER SUPPLY, IMPROPER WORKING ENVIRONMENT, ABUSIVE TREATMENT, OR ANY OTHER OBVIOUS USER-INFLICTED FAULT.

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## MAIN FEATURES

*Four digital voltage controlled LFOs*

*Free, Quadrature, Phase and Divide modes*

*Wide range, from 28 hours to 500 Hz*

*Assignable waveform outputs*

*Zoom mode for precise frequency setting*

*Mini USB connector for easy updates*

*Alternate firmware option*

*Expandable via Poti module*

## TECHNICAL DETAILS

*Eurorack synth compatible*

*10hp, skiff friendly*

*Current draw: +45mA / -15mA*

*Reverse power protection*