



ELEKTROAKUSTISCHE MANUFAKTUR

fourMulator

User Guide

Introduction

Do you really need four LFO units in a single module? Let's "fourMulate" it like this: You cannot really have enough LFOs, can you? Even a classic synthesizer easily offers four targets for LFO modulations. To name a few: vibrato, pulse width, the filter's cutoff frequency and tremolo. In a modular synthesizer there are even significantly more options. Now add the options deriving from a combination of multiple LFOs to create interaction between the units to make these applications more thrilling.

We could have simply named this module Quad-LFO. However, this felt too boring on the one hand and it wouldn't describe the fourMulator's full feature-set on the other. Its four sync-able, phase-variable and CV-controllable LFOs are able to create trigger-sequences that can be varied in real time thanks to a comfortable user interface. fourMulator acts as a modulation- as well as clock-central and is capable of being your new clock-reference for your modular synthesizer.

Your VERMONA crew from the
Elektroakustischen Manufaktur, Erlbach

Getting Started

To ensure op quality we carefully checked the module before packaging. Nevertheless, we cannot fully exclude damage during transportation. Therefore, we kindly ask you to inspect the fourMulator by yourself, once you receive the module. In case there is anything unusual about the unit or its packaging, do not hesitate to contact us, so we can take care of the problem.

You should find the following items in the box:

- the fourMulator module
- a ribbon-cable (10-pole to 16-pole)
- four screws 3 x 6 mm with matching plastic washers
- two VERMONA PatchMate 30 cables
- this user guide

Setup

The fourMulator was designed to work in modular synthesizer systems using the common eurorack format. Its power supply, connectors and dimensions match the typical specifications (VERMONA Modular Case, Doepfer A-100 and compatible systems). Installation is carried out just like for any module:

1. **Switch off the power supply!** For safety reasons, also remove the detachable power cable from your frame before mounting the module!
2. Connect the supplied ribbon-cable with its 10-pole connector to the corresponding multi-pin connector on the fourMulator's rear. (*see "Figure 1: fourMulator rear with connector" on page 4*)



The corresponding plug socket is protected against reverse polarity. Therefore, the 10-pole connector will only fit in one direction into the module. The supplied ribbon-cable is color-coded at the -12 volts position. Note, that this may differ from other manufacturers. Therefore, only use the supplied ribbon-cable to connect the fourMulator to your frame's system bus!

3. Connect the ribbon-cable's 16-pole connector to an empty plug-socket of your frame's system bus. **Make sure the color-coded side of the cable points towards -12 volts!**



Connecting the ribbon-cable with reverse polarity can lead to damage of the fourMulator or other modules when powering the system! Double check the connections before continuing - safe is safe!

4. Mount the fourMulator to your modular frame using the supplied screws. To protect the unit's surface from scratches, use the supplied flat plastic washers.
5. Reconnect the power cable to your frame and switch on the power-supply. The fourMulator is now ready to operate.

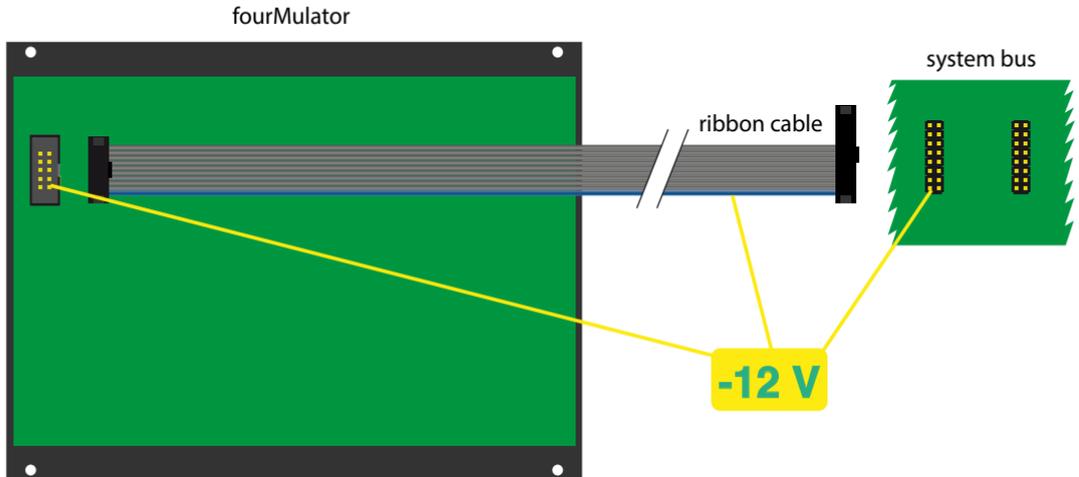


Figure 1: fourMulator rear with connector

In the following chapters we'll explain how to use the module's different connectors and how to use these in a modular system.

fourMulator - overview and functions

Simply described, the fourMulator is a quadruple LFO, with all LFO units (herein after referred to as *Modulators*) being able to run freely or synchronized to each other. All four *Modulators* are equipped equally with one exception: *Modulator* 1 can only act as sync reference to the other three *Modulators*, while these may act as sync reference or being synced to their left counterparts.

In addition, fourMulator offers a clock/trigger section. Using this, the unit can be synced to other clock sources, e.g. our qMI 2 - quad MIDI interface's clock outputs, or may act as a sync reference. Furthermore, the unit's user definable and editable trigger-sequence is a perfect partner to a variety of gate dependent modules.

The fourMulator has been designed to work with almost any available module. It outputs CV-voltages with a range between +5 and -5 volts, a total range of 10 volts. Note that some modules are not designed to handle negative voltages. In this case, only the positive voltage will affect the controlled function. There are also CV-inputs, e.g. for cutoff control of certain filters, that work within a range of 0 to 10 volts. Although the total range is identical, the fourMulator's *Modulators* cannot sweep the full range. In these cases modules with the possibility of generating offset such as our Dual Buffered Multiplier/Inverter or twinVCamp will help.

Triggers and clock impulses are output with 12 volts with positive slope and 10 ms duration. This specification is accepted by almost all available modules that accept trigger or gate signals, e.g. envelopes, switches, reset-inputs for LFOs, start/stop inputs for sequencers etc.

The reset and clock inputs accept signals ranging between +3.5 and +12 volts.

Connections and Controls

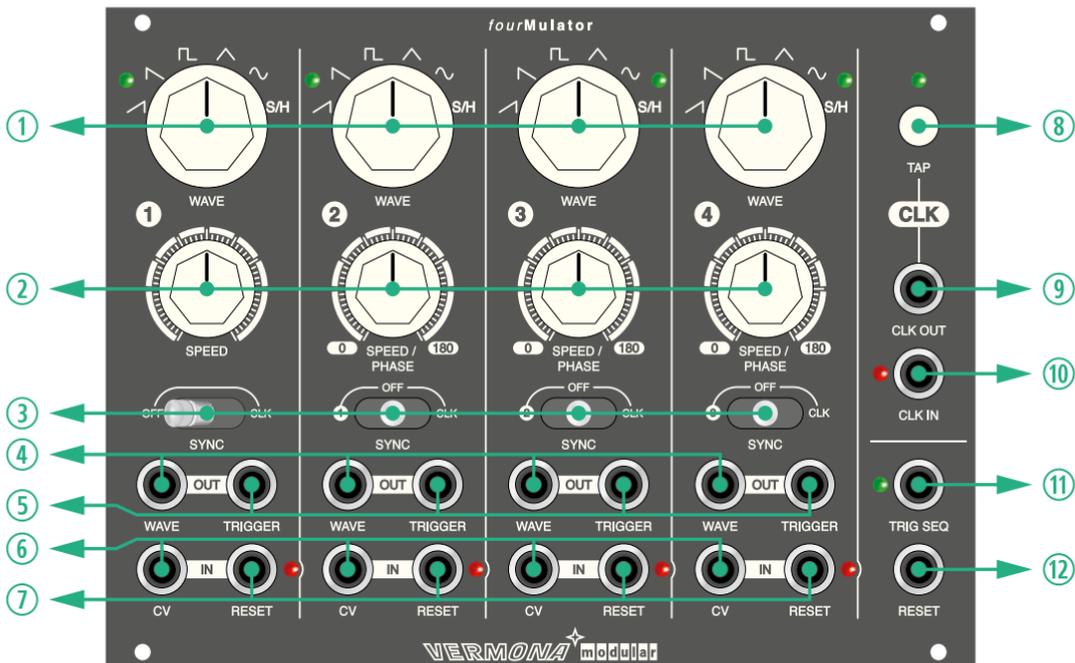


Figure 2: Controls and Connectors of the fourMulator

The Modulators' control elements

The four *Modulators* are built identically, so we will describe identical functions just once, while we will describe the differences in synchronization and phase shift separately.

WAVE selector ①

The six-stage **WAVE** knob ① selects the desired wave form. Available are ascending saw tooth (↗), descending saw tooth (↘), square (⏏), triangle (△), sine (∩) and random (**SM** = sample & hold).

SPEED- and SPEED/PHASE controls ②

The **SPEED** control ② adjusts the *Modulators'* frequency. **SPEED** ② covers a range from 0.05 Hz to 100 Hz. Therefore, modulations with audible frequencies are only possible within limits. The four *Modulator's* focus within the sub audio range is intended because higher frequencies would not make sense for use of the unit as clock-/trigger-generator or for reciprocal modulations.

For *Modulator* ❶, the **SPEED** control ② is limited to this function. For *Modulators* ❷, ❸ and ❹, this control can also shift the phase of the selected wave form when being synchronized to the left neighboring unit (**SYNC** switch ③ set to left position, [see "SYNC switch" on page 9](#)). Here, the *Modulator* being synchronized runs with the same speed as the reference *Modulator*. Use **SPEED/PHASE** ② to adjust the phase of the wave for the synchronized *Modulator* between 0° and 180°, shifting the wave form's start-point

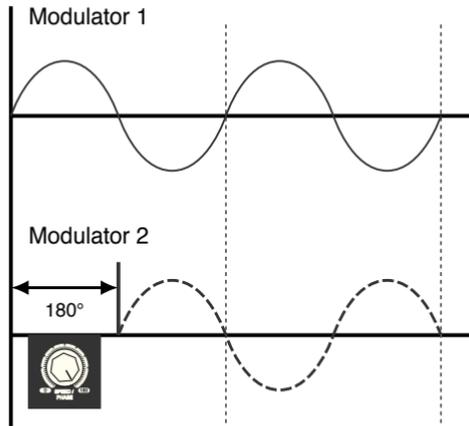


Figure 3: Phase Shift

SPEED and **SPEED/PHASE** ② offer a third control function. With **SYNC** ③ set to the **CLK** position (Clock), the controls set the clock division in respect to the incoming clock signal. Find more details in the next section.

The tempo is displayed using the corresponding LEDs for every **SPEED** control ②. With every commencing new wave-form-cycle, the LED will be lit. For *Modulators* being synchronized and being shifted in phase, the LEDs flash with the same tempo but with a corresponding delay.

SYNC switch ③

The **SYNC** switch ③ offers three positions: **OFF**, **SYNC** and **CLK**.



Modulator ❶ only offers **OFF** and **CLK** positions since it can only be used as a sync reference but cannot be synchronized itself.

OFF: The *Modulator* runs at the speed set with the corresponding **SPEED** ② control.

SYNC (indicated by the numbers ❶, ❷ and ❸): The *Modulator* is synchronized to its left counterpart. It follows the clock-reference's speed. By this, multiple *Modulators* can be varied in frequency at once using the **SPEED** control ② of the *Modulator* acting as clock-reference. In sync-mode, **SPEED** ② controls the phase of the synchronized *Modulator* (see "[Figure 3: Phase Shift](#)" on page 8).



It is possible, to synchronize two or even three *Modulators* with *Modulator* ❶ by setting the adjacent sections to sync (left position). Also, *Modulators* ❶ and ❷ as well as *Modulators* ❸ and ❹ can be used as independent synced pairs.

CLK: The *Modulator* is either synchronized to an internal or external clock signal (see "[Clock input \(CLK IN\)](#)" on page 12). Use **SPEED**- or **SPEED/PHASE** ② to select one of eight available clock division settings - the *Modulators*' speed will only move within a clock related grid.

Neither the internal clock nor an external signal is predefined. A clock can work with any resolution, e.g. with 4, 16 or 96 impulses per bar. Therefore, the clock division needs to be regarded relatively to this base.

With a clock signal based upon quarter impulses, the eight available click divisions equal the following values (as indicated on the outer ring of the control):

1. 1/1 note = a quarter of the speed of the incoming clock
2. 1/2 note = half the speed of the incoming clock
3. 1/4 note = the speed of the incoming clock
4. 1/4 triplet
5. 1/8 note = twice the speed of the incoming clock
6. 1/8 triplet
7. 1/16 note = four times the speed of the incoming clock
8. 1/32 note = eight times the speed of the incoming clock

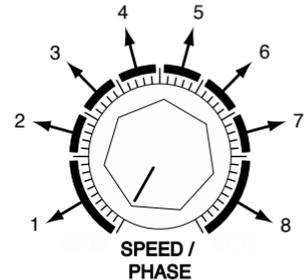


Figure 4: Clock Divider

The Modulators Connections

Each *Modulator* offers four jacks to be connected to other modules.

WAVE ④

This jack outputs the selected waveform. Connect this output to a CV-input of any module. Typical applications would be modulations of a filter's cutoff frequency, an oscillator's pulse width or an oscillator's pitch.

TRIGGER ⑤

This jack outputs a trigger signal with the start of each new wave form cycle, allowing to trigger modules such as envelopes, electronic switches or sequencers.

CV ⑥

This input allows connecting a positive or negative control voltage (+5 volts to -5 volts) to modulate the *Modulator's* frequency. With **SYNC** or **CLK** being active for the respective *Modulator*, this CV will modulate the phase shift or the clock division. The control voltage is added respectively subtracted from the current value set with **SPEED/PHASE** ②. However, it is not possible to exceed a frequency of 100Hz.

RESET ⑦

This input allows connecting a gate/trigger signal that immediate resets the wave form to its start point. With the modulation speed matched to a song tempo, sending reset commands every bar, allow to achieve long term beat-synchronized modulations.

Control elements of the clock-generator **CLK**

The clock-generator **CLK** allows synchronizing fourMulator to other clock-dependent modules, such as step-sequencers. fourMulator can either work as beat reference or follow an external reference in sync.

TAP button ⑧

Use this button to set the tempo for fourMulator's internal clock. A tempo change will occur after tapping the button four times. For predictable results, tap in a constant rhythm.

Clock output (CLK OUT) ⑨

This jack outputs the clock signal. It can be connected to modules such as step-sequencers, clock dividers or sequential switches.

Clock input (CLK IN) ⑩

This jack allows feeding an external clock signal into the fourMulator. With this input being used, the internal clock is automatically disconnected from the *Modulators*. By setting the **SYNC** switch ③ to **CLK**, the external clock will be used.



The internal clock remains and is still present on the CLK OUT ⑨ jack. By removing the cable from CLK IN ⑩, the internal clock regains control using the previous tempo. This tempo setting will only be lost when switching off or powering down the system.

Further connections

Trigger-sequence output (TRIG SEQ) ⑪

The trigger-sequence being available on this output is a deduction of the trigger-signals of all synchronized Modulators. At least one of the Modulators ❶, ❷ or ❸ needs to be synchronized for the trigger-sequence to be active. Modulator ❶ can run freely or being set to **CLK**. With multiple Modulators being synchronized, the corresponding trigger-signals are combined with respect to the selected clock division factors. This might sound abstract, but is logic. Otherwise, the proof of the pudding is in the eating. Here, a little practice is more helpful than a detailed description.

Global Reset-Input (RESET) ⑫

By using this input, all wave forms of all Modulators can be reset with a single trigger/gate-signal. Note that each Modulator that uses its dedicated **RESET**-input ⑦ ([see "RESET" on page 11](#)) will not be reflected by the global reset.

Technical Specification

Modulator	
Frequency range	0.05 Hz .. 100 Hz
Control elements	WAVE, SPEED, SYNC
WAVE outputs	-5 V .. +5 V
TRIGGER outputs	+12 V, 10 ms
CV inputs	-5 .. +5 V
RESET inputs	min. +3.5 V, max. +12 V
Clock-Generator (CLK)	
Control elements	TAP button
CLK OUT output	+12 V, 10 ms
CLK IN input	min. +3.5 V, max. +12 V
Further connectors	
TRIG SEQ output	+12 V, 10 ms
RESET Eingang	min. +3.5 V, max. +12 V
Power Consumption	
+12 V	120 mA
-12 V	10 mA
Dimensions / Weight	
Width / Height	34 HP (ca. 173 mm) / 3 U
Depth	25 mm
Weight	365 g



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