INSTRUO | SPECIALIST SYNTHESIZERS

øchd expander

Modulation Source

User Manual

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Description

Meet the Instruō [ø]4^2, an expansion module for one of Eurorack's most beloved modulation sources, øchd.

Launched in 2019 and designed in collaboration with Ben "DivKid" Wilson, the Instruō øchd has set a standard for compact and versatile modulation sources which can now be seen across thousands of eurorack systems. The Instruō [ø]4^2 adds 16 outputs and 4 new sets of functionality to øchd's normal operation.

Using øchd's LFOs as signal sources, [ø]4^2 adds full wave rectified unipolar positive LFOs, analog diode logic for minimum and maximum voltage mixing, cascaded stochastic trigger signals for interesting rhythmic patterns, and R-2R 4-bit random voltage sources for all things wild and chaotic – all of which are controlled by øchd's single frequency control and CV attenuverter.

8 LFOs in 4 HP is great and all, but 24 modulation sources in 8 HP is much, much better.

Features

- 16 additional outputs for øchd
- 4x full wave rectified unipolar positive LFOs
- 2x Analog diode logic pairs (AND/Min and OR/Max)
- 4x Cascading stochastic trigger signals
- 4x R-2R 4-bit logic random voltage sources (slow noise)

Installation

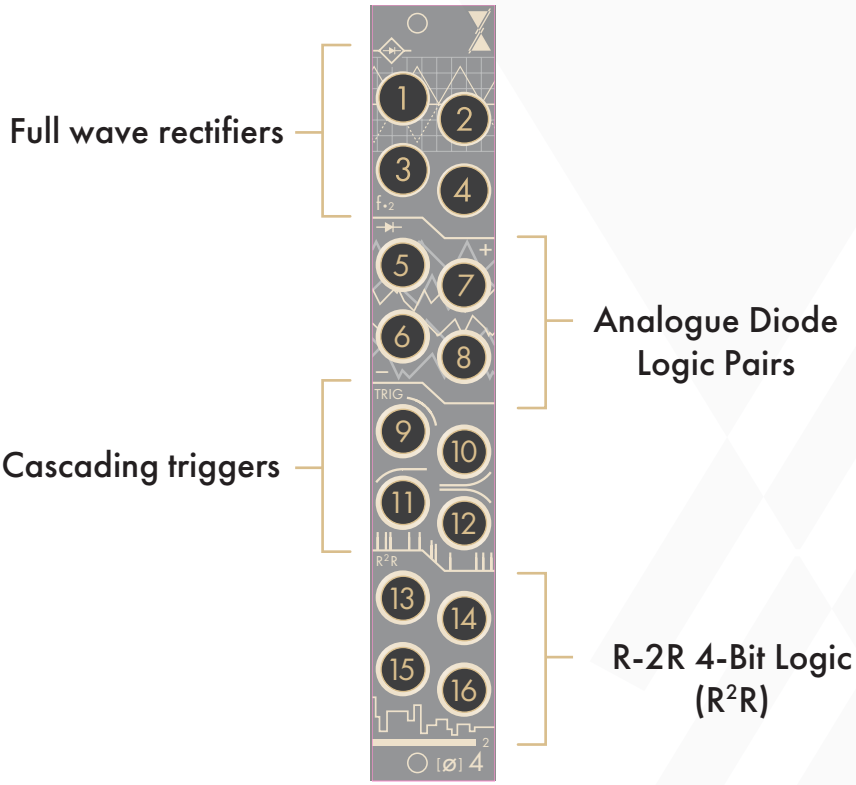
1. Confirm that the Eurorack synthesiser system is powered off.
2. Locate 4 HP of space (next to your øchd module) in your Eurorack synthesiser case for the module.
3. Connect the 10 pin side of the IDC power cable to the 2x5 pin header on the back of the module, confirming that the red stripe on the IDC power cable is connected to -12V, indicated with a white stripe on the module.
4. Connect the 16 pin side of the IDC power cable to the 2x8 pin header on your Eurorack power supply, confirming that the red stripe on the power cable is connected to -12V.
5. Connect both of the IDC expander cables to the 2x4 expander pin headers of [ø]4^2 and the 2x4 expander pin headers of øchd, confirming that the red stripe is pointed towards the bottom of [ø]4^2 and the back edge of øchd.
6. Mount the Instruō [ø]4^2 in your Eurorack synthesiser case.
7. Power your Eurorack synthesiser system on.

Note:

This module has reverse polarity protection.
Inverted installation of the power cable will not damage the module.

Specifications

- Width: 4 HP
- Depth: 32mm
- +12V: 5mA
- -12V: 5mA



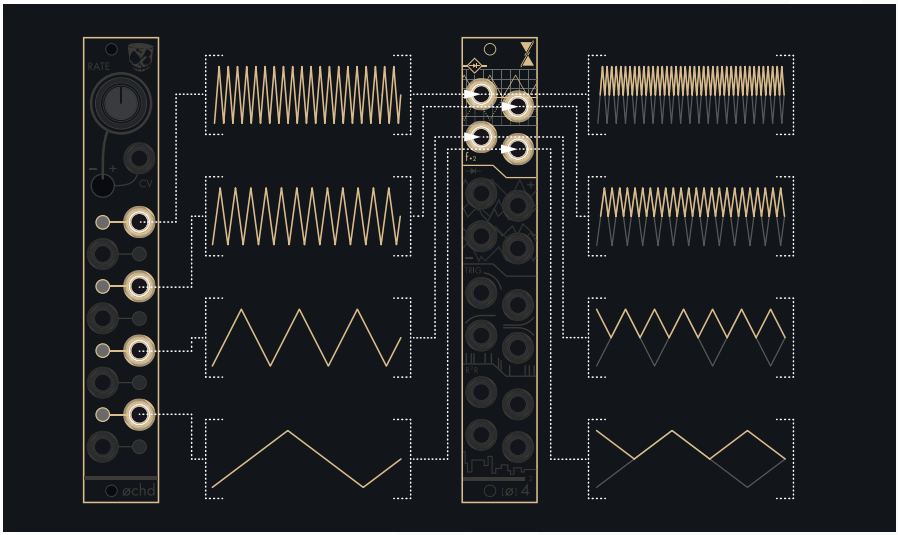
Key

1. LFO 1 full wave rectifier
2. LFO 3 full wave rectifier
3. LFO 5 full wave rectifier
4. LFO 7 full wave rectifier
5. LFO 2 and LFO 3 OR logic
6. LFO 2 and LFO 3 AND logic
7. LFO 6 and LFO 7 OR logic
8. LFO 6 and LFO 7 AND logic
9. LFO 2 trigger signal output
10. LFO 4 trigger signal output
11. LFO 6 trigger signal output
12. LFO 8 trigger signal output
13. LFOs 1, 2, 3, 4 DAC output
14. LFOs 5, 6, 7, 8 DAC output
15. LFOs 1, 3, 5, 7 DAC ouput
16. LFOs 2, 4, 6, 8 DAC output

Full Wave Rectifiers (f·2)

Full wave rectified versions of all odd-numbered LFOs are generated at the first set of 4 outputs. The negative portion of the corresponding bipolar triangle waveform is inverted to be unipolar positive. This creates fully unipolar positive triangle waveforms at twice the frequency of the original bipolar waveform at the corresponding outputs.

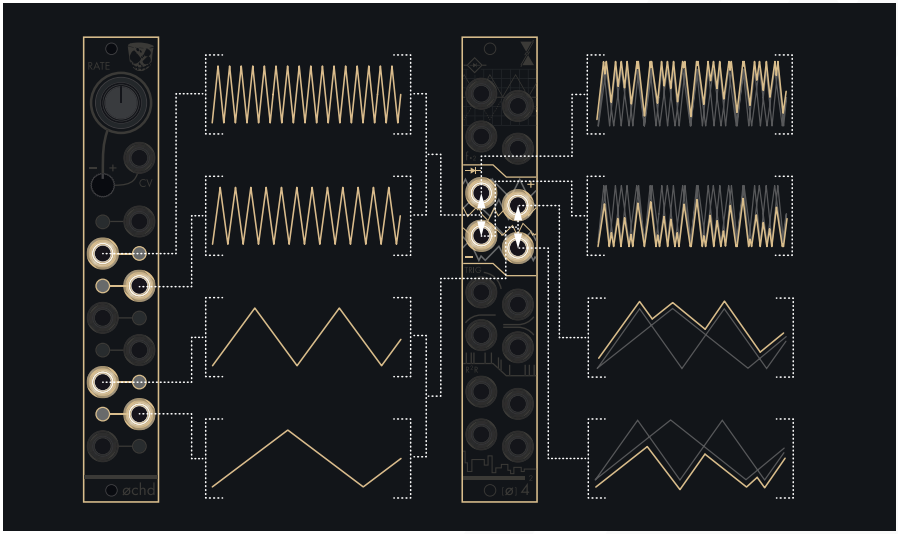
- LFO 1 is full wave rectified with output generated at the top left jack in this set of 4 outputs.
  - Voltage range: 0V-5V
- LFO 3 is full wave rectified with output generated at the top right jack in this set of 4 outputs.
  - Voltage range: 0V-5V
- LFO 5 is full wave rectified with output generated at the bottom left jack in this set of 4 outputs.
  - Voltage range: 0V-5V
- LFO 7 is full wave rectified with output generated at the bottom right jack in this set of 4 outputs.
  - Voltage range: 0V-5V



Analogue Diode Logic Pairs (+/-)

The maximum and minimum voltages of two separate LFO pairs produce bipolar signals at the second set of 4 outputs.

- The maximum voltage (OR logic) between LFO 2 and LFO 3 is generated at the top left jack in this set of outputs.
  - Voltage range: +/- 5V
- The minimum voltage (AND logic) between LFO 2 and LFO 3 is generated at the bottom left jack in this set of outputs.
  - Voltage range: +/- 5V
- The maximum voltage (OR logic) between LFO 6 and LFO 7 is generated at the top right jack in this set of outputs.
  - Voltage range: +/- 5V
- The minimum voltage (AND logic) between LFO 6 and LFO 7 is generated at the bottom right jack in this set of outputs.
  - Voltage range: +/- 5V

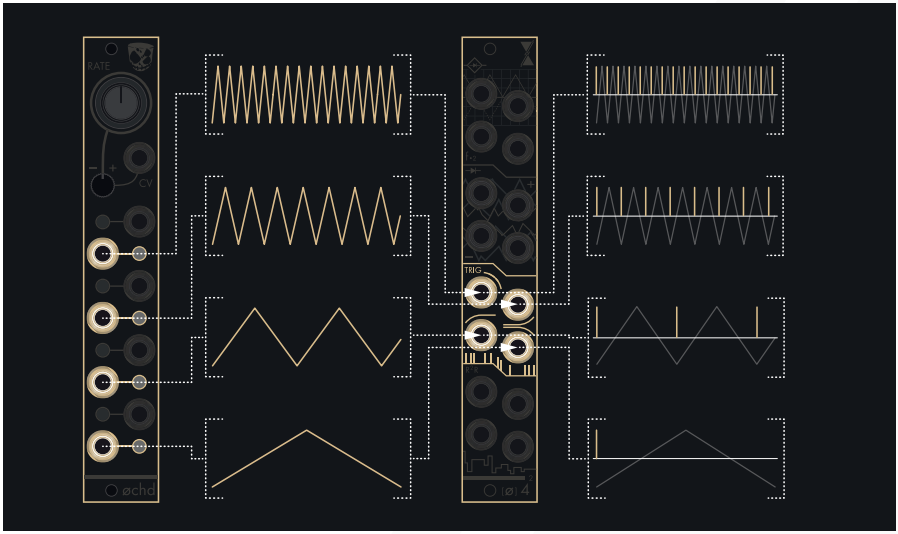


Cascading Triggers (Trig)

~8ms trigger signals are produced at the start of all even-numbered LFOs' rising edges and are generated at the third set of 4 outputs.

Clockwise cascading normalisation through the outputs results in a layering of trigger signals if the previous output is left unpatched. This can be used to create stochastic trigger signal patterns.

- Trigger signals produced by LFO 2 are generated at the top left jack in this set of outputs.
- Trigger signals produced by LFO 2 and LFO 4 can be generated at the top right jack in this set of outputs depending on the connection state of the top left jack
- Trigger signals produced by LFO 2, LFO 4, and LFO 6 can be generated at the bottom right jack in this set of outputs depending on the connection state of the top left jack and top right jack
- Trigger signals produced by LFO 2, LFO 4, LFO 6, and LFO 8 can be generated at the bottom left jack in this set of outputs depending on the connection state of the top left jack, top right jack, and bottom right jack.

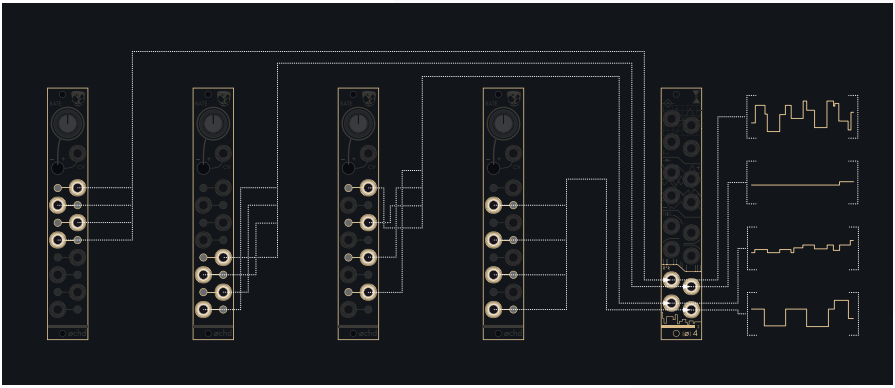


R-2R 4-Bit Logic (R2R)

R-2R ladder circuits are used to create simple digital-to-analog converters (DACs). This makes it possible to generate random-stepped voltage signals at the fourth set of 4 outputs.

There are two factors at play that impact the DAC outputs.

- Firstly, the rate of the corresponding LFO's set the rate of the random signals. Secondly, the ordering of Most Significant Bit (MSB) to Least Significant Bit (LSB) affects the size and rate of voltage change. The following clusters from øchd will produce four different flavours of random voltage (slow noise) from [ø]4^2.
- LFOs 1 through 4 are used to generate slow noise at the top left jack in this set of 4 outputs, where LFO 1 is the MSB and LFO 4 is the LSB.
- LFOs 5 through 8 are used to generate slow noise at the top right jack in this set of 4 outputs, where LFO 5 is the MSB and LFO 8 is the LSB.
- All odd-numbered LFOs are used to generate slow noise at the bottom left jack in this set of 4 outputs, where LFO 1 is the MSB and LFO 7 is the LSB.
- All even-numbered LFOs are used to generate slow noise at the bottom right jack in this set of 4 outputs, where LFO 2 is the MSB and LFO 8 is the LSB.



Manual Author: Collin Russell
Manual Design: Dominic D'Sylva

This device meets the requirements of the following standards: EN55032, EN55103-2, EN61000-3-2, EN61000-3-3, EN62311.