INSTRUŌ | SPECIALIST SYNTHESIZERS
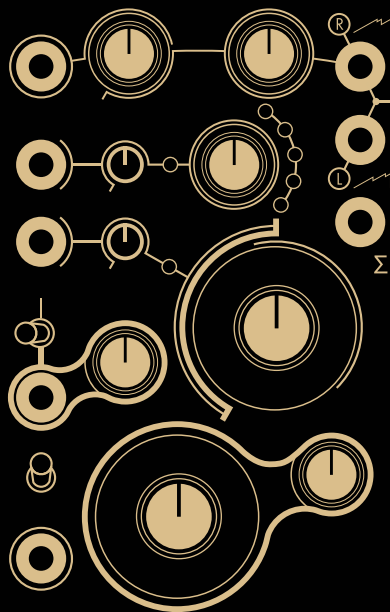
cruïnn

Analogue Stereo Oscillator

User Manual

Contents

Description

The Instruō **cruïnn** is an analogue stereo oscillator that utilises through-zero phase modulation to create deep, animated textures.

On top of its single sawtooth oscillator core, **cruïnn** produces five additional parallel phase-displaced sawtooth variants – each controlled by their own discrete internal triangle waveform LFO. With both on-board and external control over the LFO rates and modulation depths, **cruïnn** effortlessly creates, super-super-super-super-super saws, lush pads, phasey basses, and chaotic effects.

With **cruïnn's** included passive 4 HP Expander, access to all six waveforms are available. Add to that the ability to individually displace the phase of each waveform via CV and **cruïnn** becomes an amorphous swarm of harmonically rich sawtooths.

Features

- Stereo and summed outputs
- Six phase-displaced sawtooth variants
- Five internal triangle waveform LFOs
- Global rate and depth modulation controls
- Built-in stereo VCA
- Linear and exponential frequency modulation
- LFO functionality
- Includes 4 HP passive waveform and CV expansion module

Installation

1. Confirm that the Eurorack synthesizer system is powered off.
2. Locate 14 HP of space in your Eurorack synthesizer case. Locate an additional, but optional 4 HP of space in your Eurorack synthesizer case for the included expander.
3. Connect the 6 pin side of both IDC expansion cables to both of the 2x3 pin headers on the back of the main module, confirming that the red stripes on the expansion cables line up with the indicators on the main module.
4. Connect the 6 pin side of both IDC expansion cables to both of the 2x3 pin headers on the back of the expansion module, confirming that the red stripes on the expansion cables line up with the indicators on the expansion module.
5. 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 power cable is connected to -12V.
6. 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.
7. Mount the Instruō **cruïnn** in your Eurorack synthesizer case.
8. Power your Eurorack synthesizer system on.

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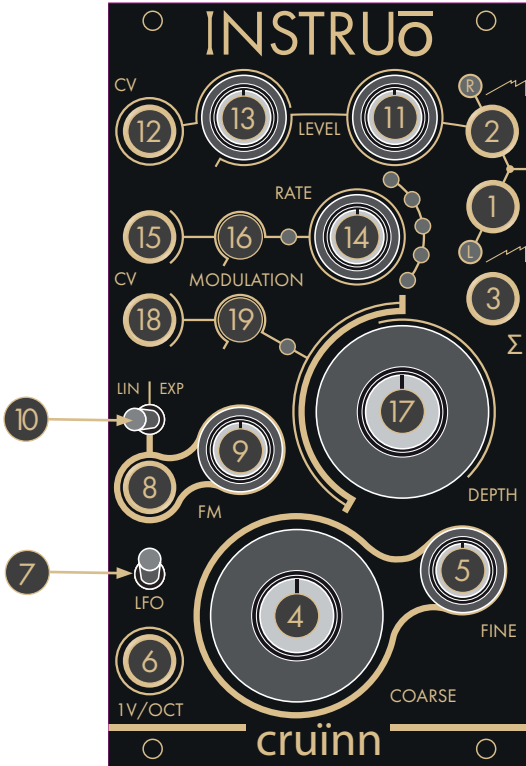This module has reverse polarity protection.
Inverted installation of the power cable will not damage the module.

Specifications

- Width: 14 HP + 4 HP Waveform and CV Expansion Module
- Depth: 27mm
- +12V: 180mA
- -12V: 180mA

cruïnn | krˠiːnʲ | adjective (shape) well developed in all aspects; complete and balanced, plump, fat, full-toned or sonorous

Module

Expander

Key

1. Left Output
2. Right Output
3. Sigma Output
4. Coarse
5. Fine
6. 1V/Oct Input
7. LFO Toggle
8. FM Input
9. FM Attenuator
10. Lin/Exp Toggle
11. Level

12. Level CV Input
13. Level CV Attenuator
14. Rate
15. Rate Modulation CV Input
16. Rate Modulation CV Attenuator
17. Depth
18. Depth Modulation CV Input
19. Depth Modulation CV Attenuator
20. Individual Waveform Outputs
21. Individual Rate Modulation CV Inputs

Waveforms ▬

Right: The **Right** jack outputs bipolar sawtooth waveforms 1, 2, and 3.
Left: The **Left** jack outputs bipolar sawtooth waveforms 4, 5, and 6.
Sigma (∑): The **Sigma (∑)** jack outputs of all bipolar sawtooth waveforms.

Frequency / Pitch ▬

Coarse: The **Coarse** knob controls the fundamental frequency of the oscillator's core. It determines the fundamental pitch of the core waveform.

- Turning the knob anticlockwise will decrease the frequency.
- Turning the knob clockwise will increase the frequency.

Fine: The **Fine** knob is used for minute control of the oscillator's fundamental frequency and is relative to the frequency value set by the **Coarse** knob. It also determines the fundamental pitch of the core waveform.

- Turning the knob anticlockwise will decrease the frequency.
- Turning the knob clockwise will increase the frequency.

1V/Oct: The **1V/Oct** input is a bipolar control voltage input that is calibrated to 1 Volt per Octave.

- This is traditionally used with pitch-related control voltages sent from a sequencer or keyboard.
- Control voltage is summed with the values set by the **Coarse** and **Fine** knobs.

LFO: The **LFO** toggle lowers the frequency ranges of the waveforms, allowing for oscillations within subsonic territory.

Frequency Modulation ▬

FM: The **FM** input is a bipolar control voltage input for the frequency parameter.

- Control voltage is scaled by the **FM Attenuator** and summed with the values set by the **Coarse** and **Fine** knobs as well the value set by the **1V/Octave** input.

FM Attenuator: The **FM Attenuator** determines the depth of frequency modulation applied to the fundamental frequency.

- Turning the knob anticlockwise will decrease the depth of frequency modulation if an external signal is present at the **FM** input.
- Turning the knob clockwise will increase the depth of frequency modulation if an external signal is present at the **FM** input.

Lin/Exp: The **Lin/Exp** toggle sets the **FM** input to have either a linear FM or exponential FM response curve.

- If the toggle is set to the left position, the FM signal will apply with linear scaling.
    - When modulated with a linear FM response, negative voltage will result in an increase in frequency while positive voltage will result in a decrease in frequency.

- If the toggle is set to the right position, the FM signal will apply with exponential scaling.
    - If the toggle is set to exponential FM and the **FM Attenuator** is fully clockwise, the **FM** input will essentially track at 1V/Octave (Its tracking may slightly differ from the calibrated **1V/Oct** input).

Amplitude Modulation

Level: The **Level** knob determines the amplitude of the stereo and **Sigma (Σ)** outputs.

- Turning the knob anticlockwise will decrease the output amplitude.
- Turning the knob clockwise will increase the output amplitude.
- To eliminate any chance of hard clipping that may occur when parallel sawtooth waves sum with perfect phase alignment, a soft clipping circuit is implemented and limits the amplitude range to ~10Vpp. This essentially turns the built-in VCA into a voltage-controlled saturator that can accentuate a nonlinearity of the sawtooth waveforms.
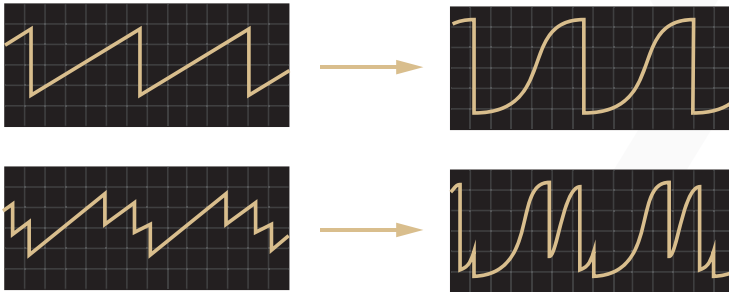
Level CV: The **Level CV** input is a bipolar control voltage input for the **Level** parameter.

- Control voltage is summed with the **Level** knob position.

Level CV Attenuator: The **Level CV Attenuator** determines the depth of modulation applied to the **Level** parameter.
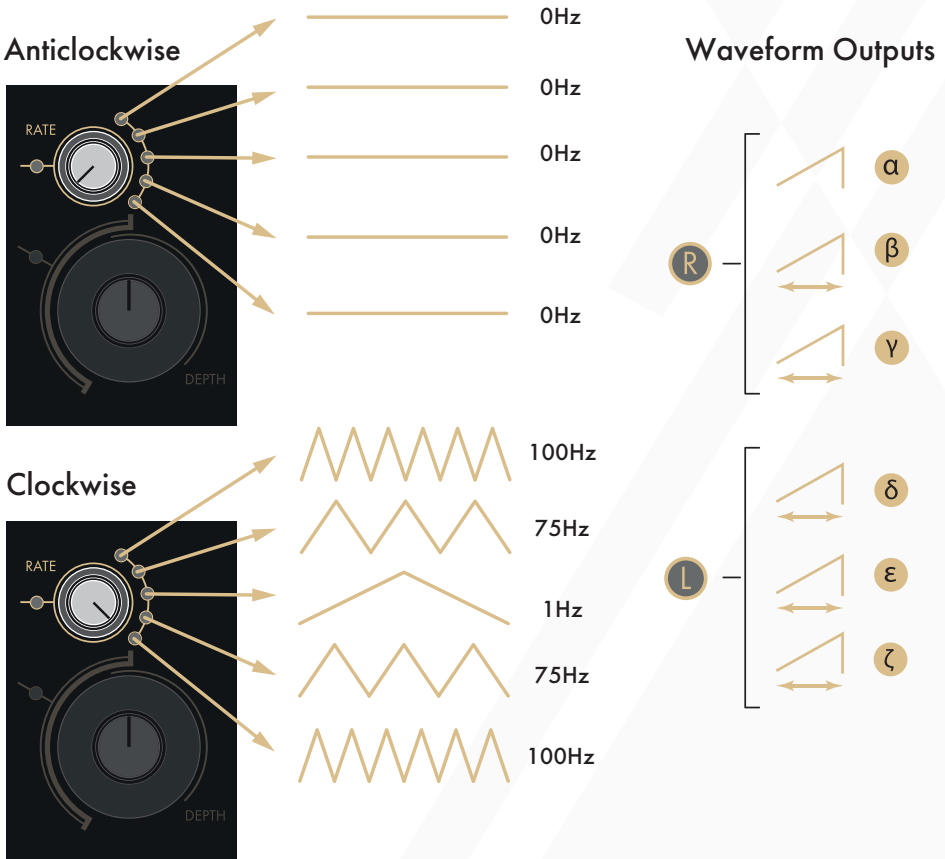
- Turning the knob anticlockwise will decrease the depth of amplitude modulation if an external signal is present at the **Level CV** input.
- Turning the knob clockwise will increase the depth of amplitude modulation if an external signal is present at the **Level CV** input.

Phase Modulation ▬

Rate: The **Rate** knob controls the rate of the five triangle waveform LFOs used for phase modulation of the five phase-displaced sawtooth variants.

- Turning the knob anticlockwise will decrease the rate of the triangle waveform LFOs down to stalling.
- Turning the knob clockwise will increase the rate of the triangle waveform LFOs.

Rate Indicators: The **Rate Indicators** are LEDs that show the rate of each triangle waveform LFO.

Anticlockwise

0Hz
0Hz
0Hz
0Hz
0Hz

Waveform Outputs

R — α, β, γ

Clockwise

100Hz
75Hz
1Hz
75Hz
100Hz

L — δ, ε, ζ

Rate Modulation CV: The **Rate Modulation CV** input is a bipolar control voltage input for the **Rate** parameter.

- Control voltage is summed with the **Rate** knob position.

Rate Modulation CV Attenuator: The **Rate Modulation CV Attenuator** determines the depth of modulation applied to the **Rate** parameter.

- Turning the knob anticlockwise will decrease the depth of LFO rate modulation if an external signal is present at the **Rate Modulation CV** input.
- Turning the knob clockwise will increase the depth of LFO rate modulation if an external signal is present at the **Rate Modulation CV** input.

Depth: The **Depth** knob controls the depth of phase modulation applied to the five phase-displaced sawtooth variants by the five triangle waveform LFOs.

Depth CV Modulation: The **Depth CV Modulation** input is a bipolar control voltage input for the **Depth** parameter.

- Control voltage is summed with the **Depth** knob position.

Depth Modulation CV Attenuator: The **Depth Modulation CV Attenuator** determines the depth of modulation applied to the **Depth** parameter.

- Turning the knob anticlockwise will decrease the depth of **Depth** modulation.
- Turning the knob clockwise will increase the depth of **Depth** modulation.

Waveform and CV Expansion ——

Individual Waveform: The **Individual Waveform** outputs provide discrete access to the core sawtooth waveform, as well as the five parallel phase-displaced sawtooth waveform variants.

- All **Individual Waveform** outputs are unipolar positive.

Individual Rate Modulation: The **Individual Rate Modulation** inputs are bipolar control voltage inputs for the **Rate** parameters of the five parallel phase-displaced waveform variants.

- Negative voltage will displace the phase forward from the core waveform.
- Positive voltage will displace the phase backward in time core waveform.

Patch Examples

East Coast Synth Voice:

Summary: The sequencer or keyboard sends voltages to **cruïnn** while simultaneously triggering the envelope generator. The CV output of the envelope generator opens a filter and VCA, allowing **cruïnn** to pass through. More traditional East Coast patches would incorporate separate envelope generators for the filter and VCA.
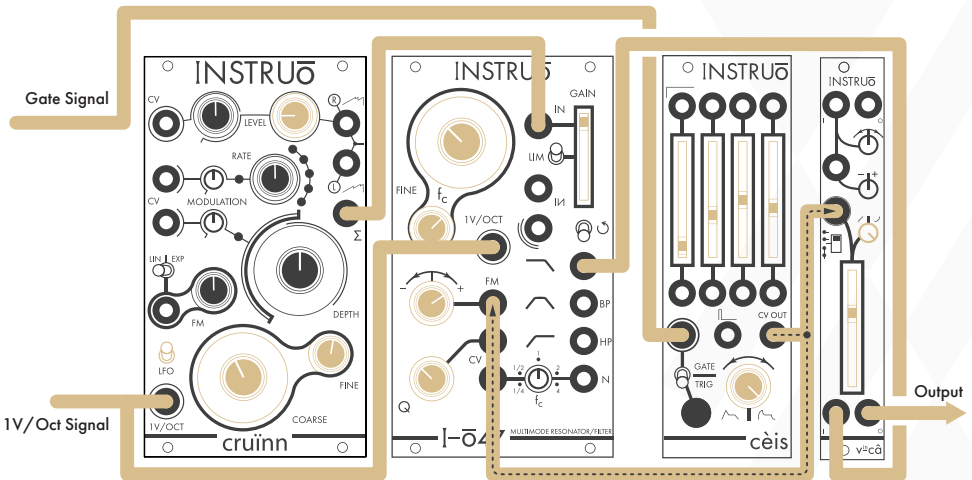
Audio Path:

- Set the **LFO** toggle to its up position, so that the module oscillates at audio rate.
- Set the **Level** knob to 9:00 so that signal is present at the various waveform outputs.
- Connect the **Sigma (Σ)** output to the audio input of a filter.
- Connect the audio output of the filter to the audio input of a VCA.
- Monitor the audio output of the VCA.
- Set the fundamental frequency to a desired position using the **Coarse** and **Fine** knobs.

- Set the cutoff frequency of the filter to a desired position.
- Set the resonance of the filter to a desired position.
- Set the gain of the VCA to its minimum position if applicable.

Control Path:

- Connect the 1V/Oct output of a sequencer or keyboard to the **1V/Oct** input.
- Connect the gate output of the sequencer or keyboard to the trigger input of an envelope generator.
- Connect the CV output of the envelope generator to a multiple.
- Connect one copy of the envelope generator CV signal to the CV input of the filter and set the corresponding CV attenuator to a desired position.
- Connect a second copy of the envelope generator CV signal to the CV input of the VCA and set the corresponding CV attenuator to a desired position.
- Set the envelope stages to desired positions.

Super Saw Synth Voice:

Summary: The sequencer or keyboard sends voltages to **cruïnn** while simultaneously triggering the envelope generator. The CV output of the envelope generator opens a filter and VCA, allowing **cruïnn** to pass through. **Depth** and **Rate** parameters are increased to apply phase modulation. More traditional East Coast patches would incorporate separate envelope generators for the filter and VCA.
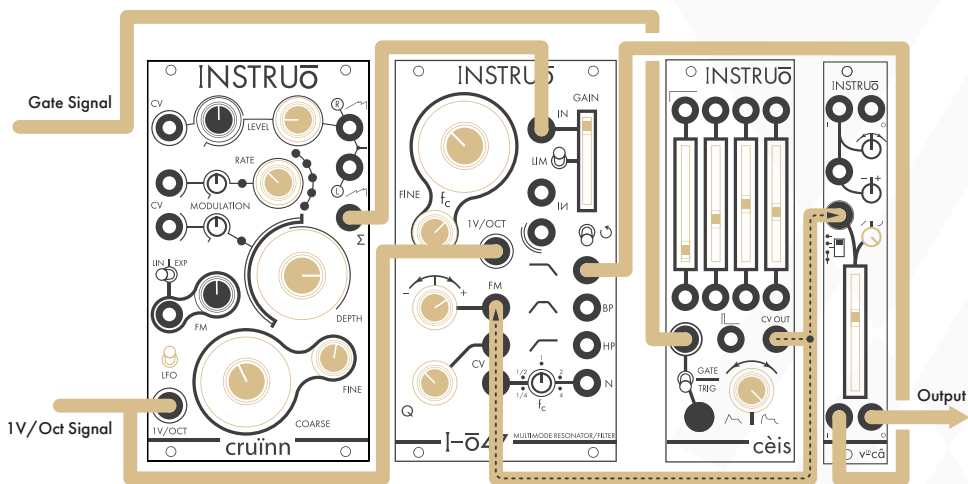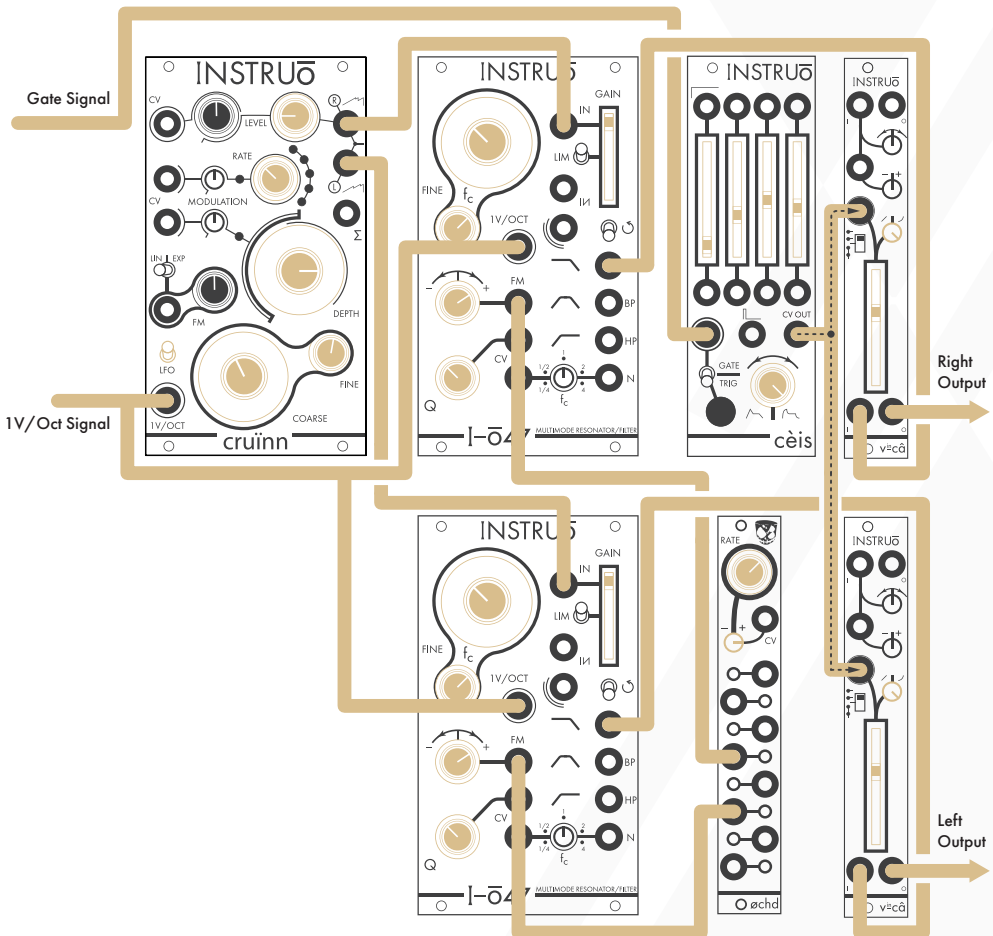

Audio Path:

- Create an **East Coast Synth Voice** audio path.
- Set the **Depth** knob to 3:00.
- Set the **Rate** knob to 10:00.

Control Path:

- Create an **East Coast Synth Voice** control path.

Stereo Super Saw Synth Voice:

Summary: The sequencer or keyboard sends voltages to **cruïnn** while simultaneously triggering the envelope generator. The CV output of the envelope generator opens two VCAs, allowing **cruïnn** to pass through. Two LFOs modulate the cutoff frequencies of two filters, creating a stereo modulation. **Depth** and **Rate** parameters are increased to apply phase modulation
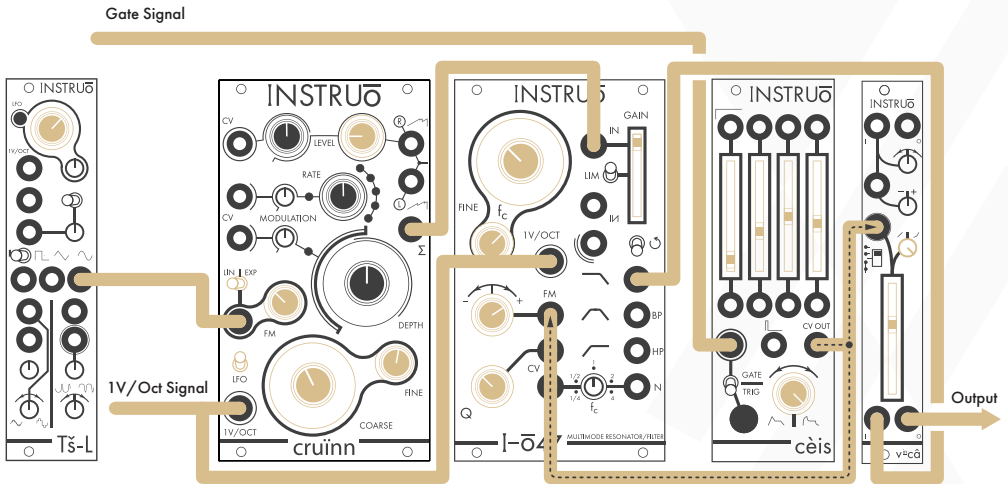
Audio Path:

- Create an **East Coast Synth Voice** audio path using the **Left** and **Right** outputs.
- Use two filters and two VCAs instead of one filter and one VCA
- Set the **Depth** knob to around 3:00.
- Set the **Rate** knob to around 10:00.

Control Path:

- Create an **East Coast Synth Voice** control path, but instead of controlling the filters with the envelope generator, use two unsynced LFOs.

FM Synth Voice:

Summary: The secondary oscillator, called the **Modulator** in an FM patch, is modulating the frequency of **cruïnn**, called the **Carrier** in an FM patch. The sequencer or keyboard sends voltages to **cruïnn** while simultaneously triggering the envelope generator. The CV output of the envelope generator opens the filter and VCA, allowing **cruïnn's** signal to pass through. More traditional East Coast patches would incorporate separate envelope generators for the filter and VCA.
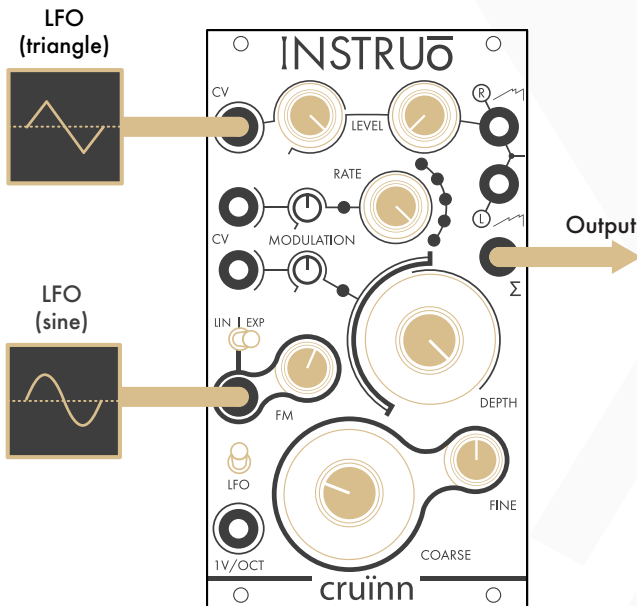

Audio Path:

- Create an **East Coast Synth Voice** audio path.

Control Path:

- Create an **East Coast Synth Voice** control path.
- Connect the sine waveform of a separate oscillator to the **FM input** of **cruïnn**.
- Set the **FM Attenuator** to a desired position.
- Set the **Lin/Exp** toggle to a desired position.
- Most East Coast synthesizers were traditionally limited to linear frequency modulation only.

Apocalypse Helicopter:

Summary: This patch utilizes phase modulation, frequency modulation, and unbalanced amplitude modulation to create a helicopter sound effect.

Audio Path:

- Set the **LFO** toggle to its up position, so that the module oscillates at audio rate.
- Set the **Level** knob fully anticlockwise so that signal is not present at the various waveform outputs.
- Set the **Depth** knob fully clockwise.
- Set the **Rate** knob fully clockwise.
- Set the **Coarse** knob between 9:00 and 10:00.
- Set the **Fine** knob to 12:00.
- Monitor from the **Sigma** output.

Control Path:

- Connect a triangle waveform LFO to the **Level** input and set the **Level CV** input fully clockwise.
- Connect a sine waveform LFO with the same rate and phase as the previously used triangle waveform LFO to the **FM** input and set the **FM Attenuator** to 1:00.
- Tune the frequency of the LFOs to desired positions.
- Set the **Lin/Exp** toggle to its right position to set exponential FM.

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