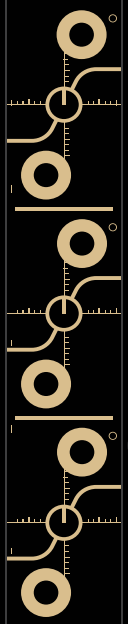
INSTRUO | SPECIALIST SYNTHESIZERS



tanh[3]

Waveshaper / Limiter

User Manual

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Description

The Instruō **tanh[3]** is a three channel waveshaper, limiter, overdrive, and feedback controller.

Each channel of the **tanh[3]** takes a signal input and outputs the hyperbolic tangent function (tanh (x)) for that input signal.

... In more musical terms, tangential distortion is a form of soft clipping which can produce signal amplitude limiting via analogue waveshaping. Driving a hot audio signal into it will add warm overdrive. Raw waveforms will be subtly shaped; softening or adding harmonic content based on input amplitude.

Understanding what the **tanh[3]** does to a signal, both mathematically and sonically can be hard to explain, but it essentially adds curves to signals.

For many Max/MSP and/or PD users, the [tanh~] object may be familiar and is likely a much used secret weapon in many contexts.

Features

- Waveshaper
- Limiter
- Distortion
- Feedback control
- 3 identical independent channels

Installation

1. Confirm that the Eurorack synthesizer system is powered off.
2. Locate 4 HP of space in your Eurorack synthesizer case.
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 power cable is connected to -12V.
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. Mount the Instruō **tanh[3]** in your Eurorack synthesizer case.
6. Power your Eurorack synthesizer system on.

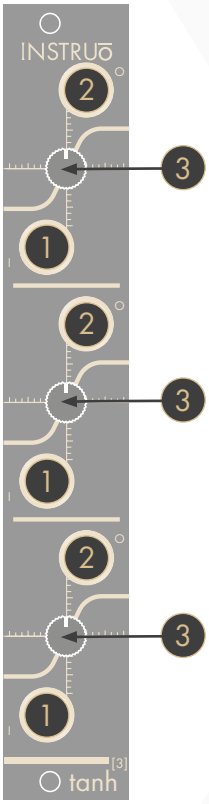
Note:

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

Specifications

- Width: 4 HP
- Depth: 27mm
- +12V: 15mA
- -12V: 10mA

tanh[3] | tænt | **noun** (mathematics) the hyperbolic tangent of (x);
or as a verb... "a'm gonna tan-h that"



Key

1. Inputs
2. Outputs
3. Level

There are three channels of identical **tanh[3]** circuits.

Input: Signal input.

- DC coupled input for audio or control voltage signals.

Output: Signal output.

- DC coupled output for audio or control voltage signals.

Level: Input signal level.

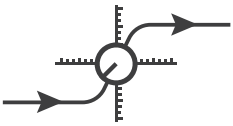
- Moving the knob clockwise will increase the amount of waveshaping.

Patch Examples

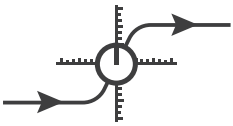
Waveshaping:

- Patching a triangle waveform through **tanh[3]** will allow for some interesting waveshape control.
- When the **Level** knob is fully anticlockwise, the resulting signal will be a slightly attenuated triangle wave.
- As the **Level** is increased, the corners will soften and the waveform will shape into a sine waveform.
- At higher levels, the sine waveform will soft clip and eventually settle into a unique pentagon waveform.

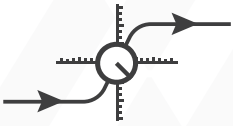
Resulting Waveshapes:



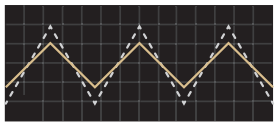
Triangle Wave



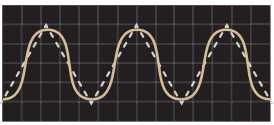
Triangle Wave



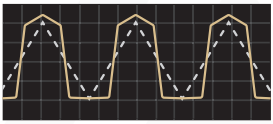
Triangle Wave



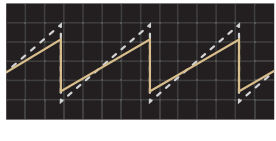
Sawtooth Wave



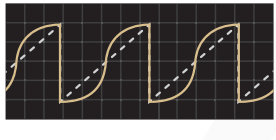
Sawtooth Wave



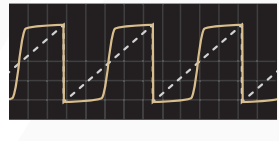
Sawtooth Wave



SineWave



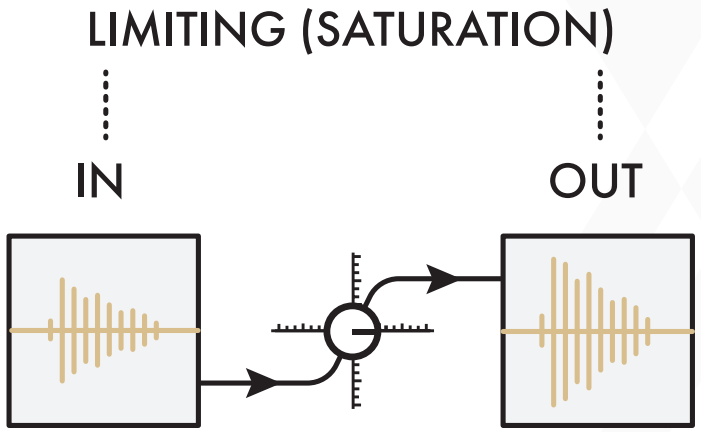
SineWave



SineWave

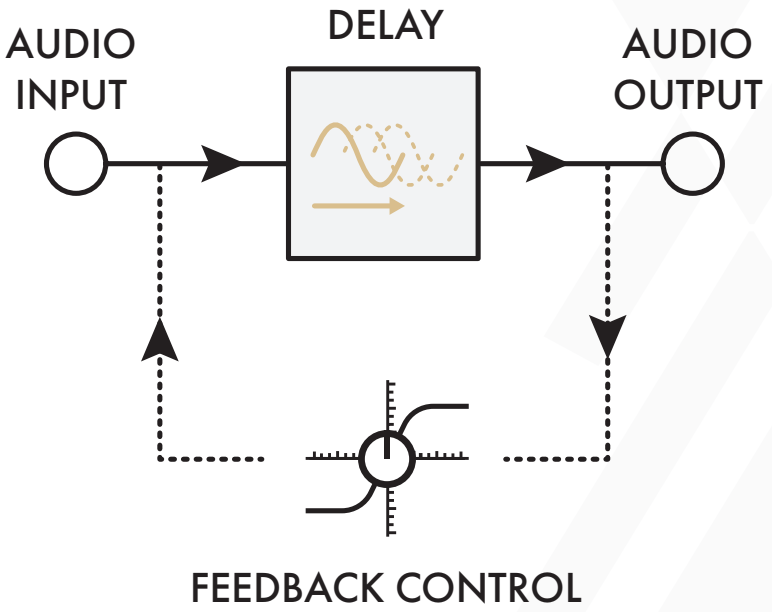
Limiter/Distortion:

- Patching complex audio signals through **tanh[3]** will result in signal boosting, limiting, and distortion.
- Sounds such as kick drums, bass patches, and chordal pads work particularly well.
- The effect is sonically similar to compression but achieved through waveshaping as opposed to gain reduction.
- Increasing the **Level** will introduce soft clipping distortion/overdrive.



Feedback Control:

- **tanh[3]** can be inserted in a feedback path to reign in runaway feedback.
- This concept works in all feedback contexts, including delay loops, reverbs, filters, and microphones.
- In this context, it functions as a limiter on feedback amplitude.
- In this scenario, there is a much wider range at which a feedback oscillation will stabilise musically.



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

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