

Vulpus Labs

Torment Nexus

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Introduction

Torment Nexus is a signal mangler offering six modes of combination between two input signals, plus a lot of options for shaping both the inputs and the resulting output.



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Each input is *ampliverted* (i.e. a selected amount of gain ranging from -200% to +200% is applied, with negative amounts inverting the signal). A controllable amount of feedback signal is mixed in, and the mix is hard-clipped, folded or saturated to fix it within a -5v to +5v range, then optionally rectified (switching negative voltage to positive ones). The resulting signals are then fed into the *torment circuit*.

The six varieties of torment offered are:

1. **Sum:** both inputs are added together (then divided by two, to keep the result within range).
2. **Amplitude Modulation:** the *carrier* input is multiplied by the *modulation* input after it has been shifted and scaled to be between 0v and 1v.
3. **Ring Modulation:** the *carrier* input is multiplied by the *modulation* input after it has been shifted and scaled to be between -1v and 1v.
4. **Analog Ring Modulation:** emulates the nonlinear behaviour of an analog 4-diode circuit performing ring modulation.
5. **Delta Amplitude Modulation:** the difference between the previous output sample and current sample of the *carrier* input is multiplied by the *modulation* input shifted and scaled to be between 0v and 1v, and added to the previous output sample.
6. **Delta Ring Modulation:** the difference between the previous output sample and current sample of the *carrier* input is multiplied by the *modulation* input shifted and scaled to be between -1v and 1v, and added to the previous output sample. If the *modulation* input is not rectified, then the resulting value is mixed 50/50 with the *carrier* input to keep the output stable.

The output of the torment circuit is once again ampliverted, then clipped, folded or saturated before being sent to the feedback lines (which feed back a selected amount into the two inputs) and the main output.

Usage



Each of **Torment Nexus**'s input channels, **CARRIER** and **MODULATION**, has an identical set of controls at the top of the module:

- An **IN** jack, receiving the input signal.
- A “shaping” selector choosing which of **CLIP**, **FOLD** and **SAT**uration is applied after gain has been applied and feedback mixed in, to ensure the input remains within the range -5v to +5v.
- An **AMP** knob and **AMP CV** input controlling the gain/inversion applied to the input, with a little red CV Amount knob between them controlling how much the **AMP CV** signal modifies the value of the **AMP** knob.
- A **RECTIFY** switch controlling whether the input is rectified.

- A helpful *gain meter*.

In the centre of the module is the **TORMENT SELECTOR**, which chooses between the six flavours of signal combination. The red button labelled **8X** controls whether 8x oversampling is applied, and the **DC BIAS** switch controls whether DC bias correction is applied to the output signal.

At the bottom left are the two **FEEDBACK** circuit controls, with a CV input, a red CV Amount knob and a white Gain knob controlling the gain applied to the feedback signal sent to the **CARRIER** and **MODULATION** inputs respectively.

At the bottom right, the **OUTPUT** section has the same controls as the **CARRIER** and **MODULATION** sections (minus the rectification switch), with the **OUT** jack receiving the output signal.

Credits and Acknowledgements

Torment Nexus was written by Dominic Fox in July 2023. It uses Chris Neuberger's resampling filter, and I cribbed an approximate wave shaping function from [Paul Bacon's implementation](#) of [Julian Parker's diode-emulating Ring modulation circuit](#).

Thanks as always to the developers at Cherry Audio for their great products, especially Voltage Modular.