



d16 group
AUDIO SOFTWARE

DECIMORT2

HIGH QUALITY BIT CRUSHER



User Manual

Overview

Decimort is a stereo high quality (ultra low aliasing) bit crusher.

After loading the plug-in within a host application, the GUI will appear:



Decimort graphical interface

There are two sections:

- **Configuration and preset management**



Configuration and preset selection section

- Signal processing control section consists of the all remaining controls

Signal flow

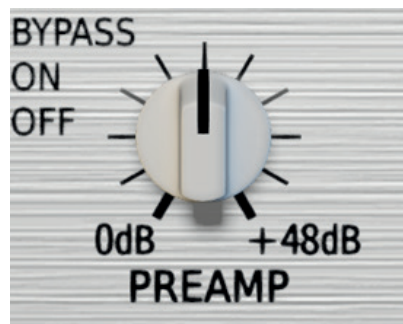
This chapter describes the path of the signal's flow through the Decimort plug-in, presents the basic components of this effect unit and its control parameters.

Basic modules

The inside of Decimort consist of a few basic components, that correspond to the sections on the graphical interface:

Pre-amplifier

Preamplifier, controlled by **Preamp** knob, boosts the input signal within *0dB* to *+48dB* range.



Preamp Parameter

Quantizer

Responsible for signal's amplitude quantization. In other words it divides the amplitude to specified (**Resolution** display) number of levels.



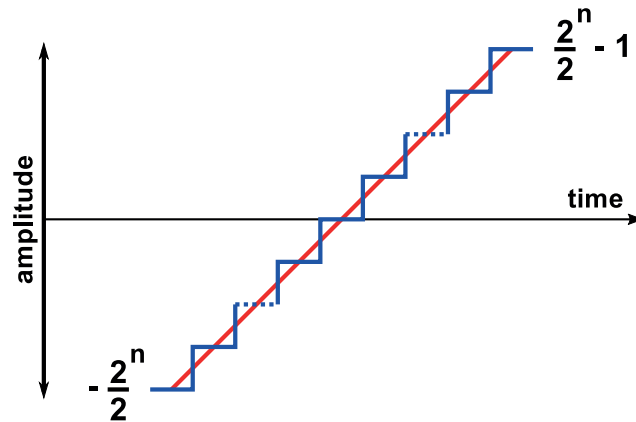
Quantizer module

The quantizer is controlled by the following parameters:

- **Resolution** - The number of bits the input signal's amplitude is degraded to, which corresponds to $2^{\text{Number of bits}}$ actual quantization levels . ▣ Selecting "--" value deactivates the whole **Quantizer** module.
- **DC Shift** - Quantization mode

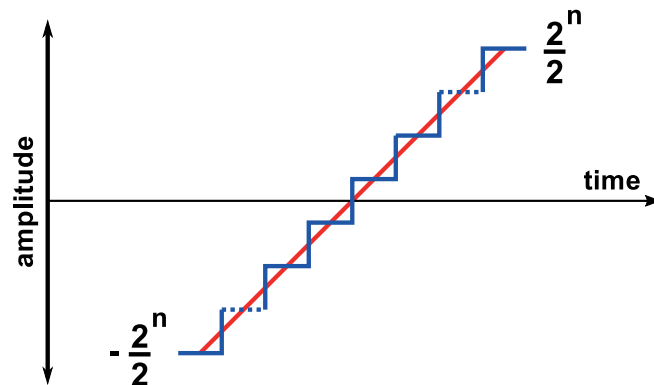
▣ For example, when the **Resolution** is set to 8 bits, it means **Quantizer** discretizes the amplitude to 256 different levels.

- DC Shift LED off enables the *mid-riser* quantization mode.



Nonzero quantization (*mid-raiser*)

- DC Shift LED on, enables the *mid-tread* quantization mode

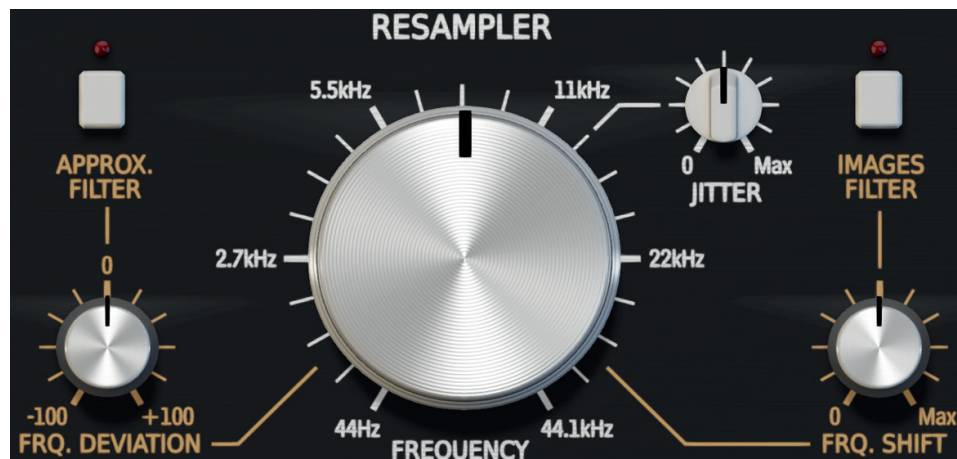


Quantisation including zero (*mid-tread*)

- **Dithering** - The intensity of the half-bit white noise, that is added to the signal just before the quantization. It reduces the harmonic distortions, being a result of signal's amplitude degradation, by masking the side effects of quantization.

Resampler

This section controls the discretization process of the input signal in the time domain



Resampling unit

Main parameters are located in the center of this section, and these are:

- **Frequency** - The frequency the signal is discretized to (resampled). This parameter ranges from 44 Hz to 44.1 kHz
- **Jitter** - Controlling the intensity of random, short-period **Resampler's** deviations ▢.

▢ Jitter is the deviation from true periodicity of a presumed periodic signal, often in relation to a reference clock source

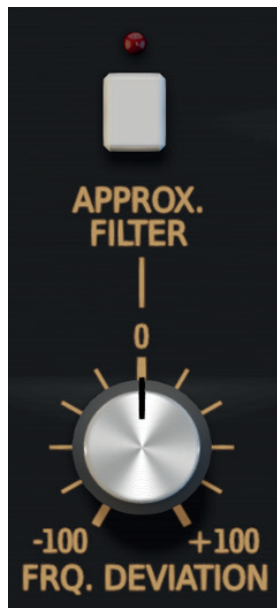
Additional parameters located aside the main controls, supervise processing the signal before and after time discretization (**Resampling**). These include:

- **Approximative Filter** - Processing signal before resampling
- **Images Filter** - Processing signal after resampling

Approximative Filter

Optionally activated filter, which removes part, or entire harmonic content, above the **Resampler's Nyquist frequency** ▣ from the input signal. Therefore controlling the amount of aliasing that occurs at the output (below the resampling frequency).

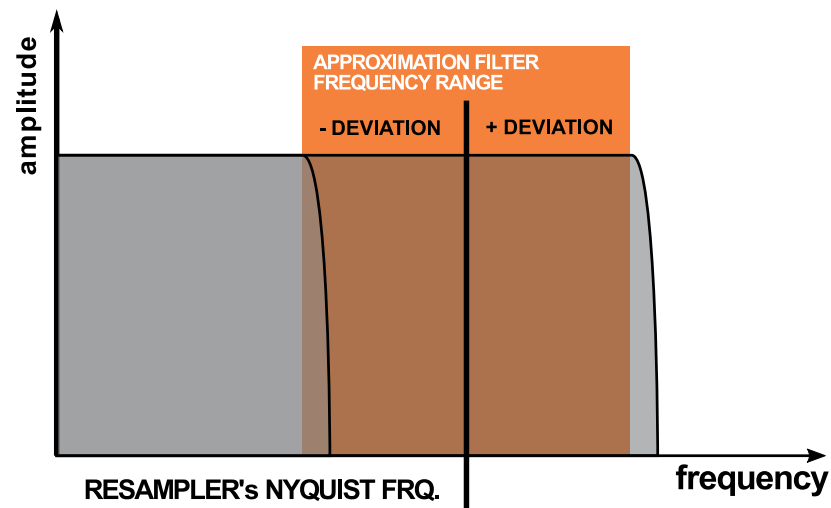
The **Approximative filter** module processes the input signal before it gets onto **Resampler**.



Resampler's Approximation filter

The **Approximative filter** is controlled by the following set of parameters:

- **Approx. Filter** - The toggle button activates / deactivates the filter
- **Frq. Deviation** - Cut-off frequency of the **Approximative filter** is coupled with the **Nyquist's frequency** of the **Resampler**. The offset between the filter's cutoff frequency and the **Resampler Nyquist frequency** is controlled by **Deviation** parameter.
 - **Deviation = 0** (*the default*) - Sets the **Approximative Filter's** cutoff frequency, exactly at the *Nyquist frequency* (no offset). This results in the removing the entire harmonic content above the *Nyquist frequency*, which prevents the artifacts from appearing below the *Nyquist*. The only type of artifacts occurring are images (harmonics occurring above the *Nyquist*).
 - **Deviation < 0** (*negative offset*) - Sets the **Approximative filter's** cutoff frequency below the *Nyquist frequency*. Consequently, at the output, as for **Deviation = 0** value, the only type of occurring artifacts will be images (no aliasing). Additionally a part of the original harmonic content below the *Nyquist frequency* will also be removed (proportionally to the negative **Deviation**) as well as some images near the *Nyquist*.
 - **Deviation > 0** (*positive offset*) - Sets the cutoff frequency above the *Nyquist frequency*. As the result aliasing starts to appear (artifacts below *Nyquist frequency*) in proportion to positive **Deviation**.

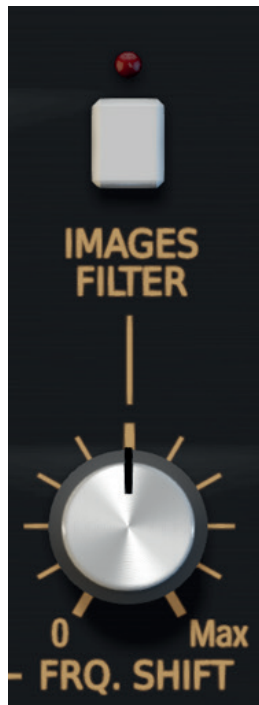


The cutoff frequency range of the approximative filter.

Images filter

Images are the artifacts resulting from **Resampler's** activity, that is the result of projecting a signal from a higher sampling rate to a lower / reducing signal's sample rate. **Images Filter** allows to remove part, or all of these artifacts from the spectrum after discretization process. As a result, Decimort can also serve as a *alias-free brickwall lowpass filter*.

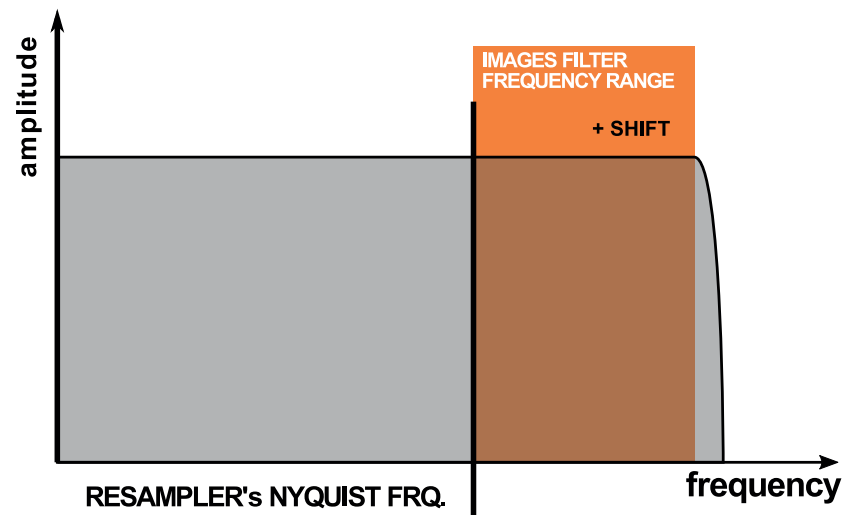
Images Filter's module processes the signal after it passes the **Resampler**.



Resampler's Images Filter

Images Filter is controlled by the following set of parameters:

- **Images Filter** - Toggle button for its activation / deactivation
- **Frq. Shift** - Cut-off frequency of the **Images Filter** is coupled to the **Resampler's Nyquist frequency**. **Frq. Shift** parameter is a distance (offset) between **Images Filter's** cutoff frequency and **Resampler's Nyquist frequency**. The higher the value of this parameter, the higher harmonics (above **Resampler's Nyquist**) are passed onto the output.



Images filter cutoff frequency range

Filter

After (or before) crushing signal we can also filter it a bit by analogue-like (pass/reject) filters with adjustable resonance.



Filtering section

Filter section is controlled by a following parameters:

- **Filter type** – There're 4 types of filters we can choose from: **LP** (*low pass*), **BP** (*band pass*), **HP** (*high pass*) and **BR** (*band reject*). **OFF** position – turns the filter off.
- **Cutoff** – Cutoff frequency for **LP** and **HP**, and center of the band for **BR** and **BP**.
- **Reso/B.Width** – Resonance for **LP** and **HP**, and band width for **BR** and **BP**.
- **Order** – This switch has two values: when switch set to **Pre**, signal is filtered then quantized and resampled, **Post** – in this position, signal is first quantized / resampled and then filtered.

Master section

This section controls the end of signal's flow.

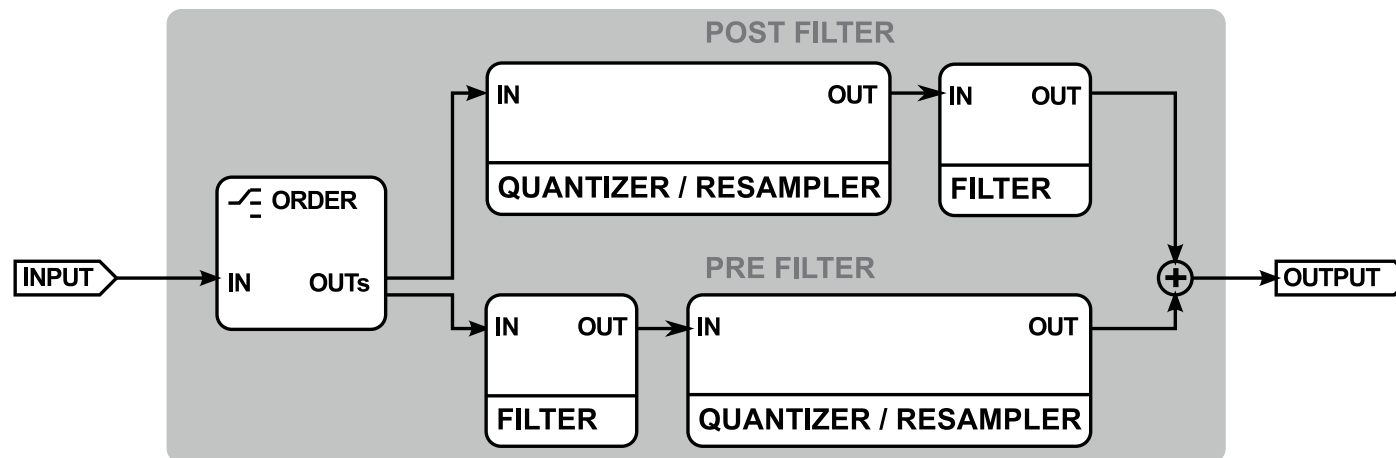


Master section

The **FX** knob defines the ratio between the processed/unprocessed sound that is sent to an audio out. **Output volume** controls the final amplification.

Path of the signal's flow

See diagram below, that show the signal path inside Decimort.



Signal flow through quantizer / resampler and filter only

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