

Wavelab 6: The DeNoiser

The DeNoiser plug-in lets you suppress noise without affecting the general sound quality. Or, in tech talk, the DeNoiser removes broad band noise from arbitrary audio material without leaving any "spectral finger print". The algorithm that this plug-in is based on has the ability to track and adjust itself to variations in background noise. This means the noise can be diminished without side effects, preserving the spatial impression, and without letting the result become "colorless". Many years of research were invested in developing the methods used.

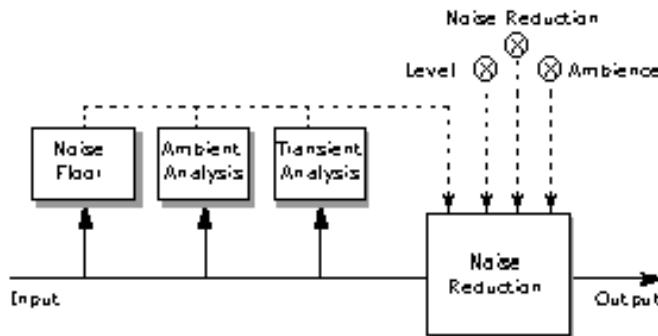
Typical applications for the DeNoiser include cleaning or remastering recordings from old tape or vinyl, or noisy live recordings.

How DeNoiser works



DeNoiser is based on spectral subtraction. Each section of the frequency spectrum, that has an amplitude below the estimated noise floor, is reduced in intensity by use of a spectral expander. The result is a noise reduction that does not affect the phase of the signal.

The figure below shows the signal flow:



The solid line represents the actual audio signal, while the dotted lines represent control signals

The signal is continuously analyzed by the first module in the chain, to estimate the noise floor at any given time. This is sufficient when the noise level is constant or modulates slowly. *When the noise level varies rapidly, the Ambience- and Transient-analysis help adjust the response of the noise reduction unit, allowing transient-rich material to maintain its liveliness and natural ambience.*

When you process audio in DeNoiser, the plug-in will need a short time (less than a second) to analyze the material and set its internal parameters.

Since you would not want to include this short "startup sequence" in the final result, you should make it a habit to first play back a short section of the audio, thereby letting DeNoiser "learn" the noise floor, and then stop and start over again from the beginning. The plug-in then remembers the settings internally.

The Noise floor Display

The display to the left in the DeNoiser window is crucial when making settings. It contains the following three elements:

***The dark green spectral graph.**

This shows the spectrum of the audio currently being played back. The horizontal axis shows the frequency (linear scale). The low frequencies are visible on the left side, the high ones on the right side. The vertical axis shows the signal amplitudes, thus the level (displayed as a logarithmic dB scale).

***The yellow line.**

This is a spectral estimation of the noise floor. The average of this value is shown numerically below the display.

***The light green line.**

This is simply a graphic representation of the Offset parameter.

The light green Offset line should be adjusted so that it appears as close above the yellow noise floor graph as possible. The dark green spectrum plot is there to help you fine-tune the Offset setting, so that only the noise is removed, not parts of the signal (ideally, the light green line should be between the yellow line and the spectrum plot).

Parameters

Parameter	Description
Freeze	If you activate this button, you "freeze" the noise floor detection process. The yellow noise floor graph in the display will hold its current value (as will the numeric noise floor value display below) until you deactivate Freeze. This allows you to take a closer look at the readings.
Reduction	Governs the amount of noise reduction. The display below this fader shows the amount of dB by which the noise level is being reduced. The final result also depends on the Ambience parameter, and on the automatic Ambience and Transient analysis of the original material, as described above.
Ambience	This parameter is used to specify a balance between the noise suppression and the amount of natural ambience, which is essential for a natural result. With a low Ambience setting, the sound can become somewhat lifeless and sterile. A high setting, on the other hand, preserves more of the ambient character of the sound, but the noise suppression is less effective.
Offset	This parameter serves as a threshold, governing the overall level at which the noise reduction is performed. For optimal noise reduction with a minimum of sound coloration, this parameter should be set to a value slightly above the noise floor level. To help you do this, the offset value is shown as a light green line in the noise floor display, while the noise floor is shown as a yellow line.
A/B/Store	These are described below this table.
Classic	When this is activated, a less CPU-intensive version of the DeNoiser algorithm is used. Use Classic mode if you are short on processing power. However, for optimum noise suppression, we recommend that you deactivate Classic mode.
Bypass	When this is activated, the signal passes through the plug-in but you don't hear the results of the processing. Use this to compare the sound with and without processing. Note: the analysis is always performed, regardless of the Bypass switch. This allows you to monitor the noise floor, spectrum and level in the spectrum display.

Using the A/B setups

With the A/B buttons you can make instantaneous switches between two different DeNoiser setups, allowing you to quickly try out and compare different configurations. You can also use this feature for separate settings for two different sections of an audio recording. Proceed as follows:

1. Make the settings you want for setup A.
2. Click on [Store] and then on the [A] button.
3. Make the settings you want for setup B.
4. Click on [Store] and then on the [B] button.

Now the two setups are stored, and you can switch between them simply by clicking [A] or [B].