

DeVerberate 3

User Guide

Acon AS

DeVerberate 3 User Guide

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1 Introduction

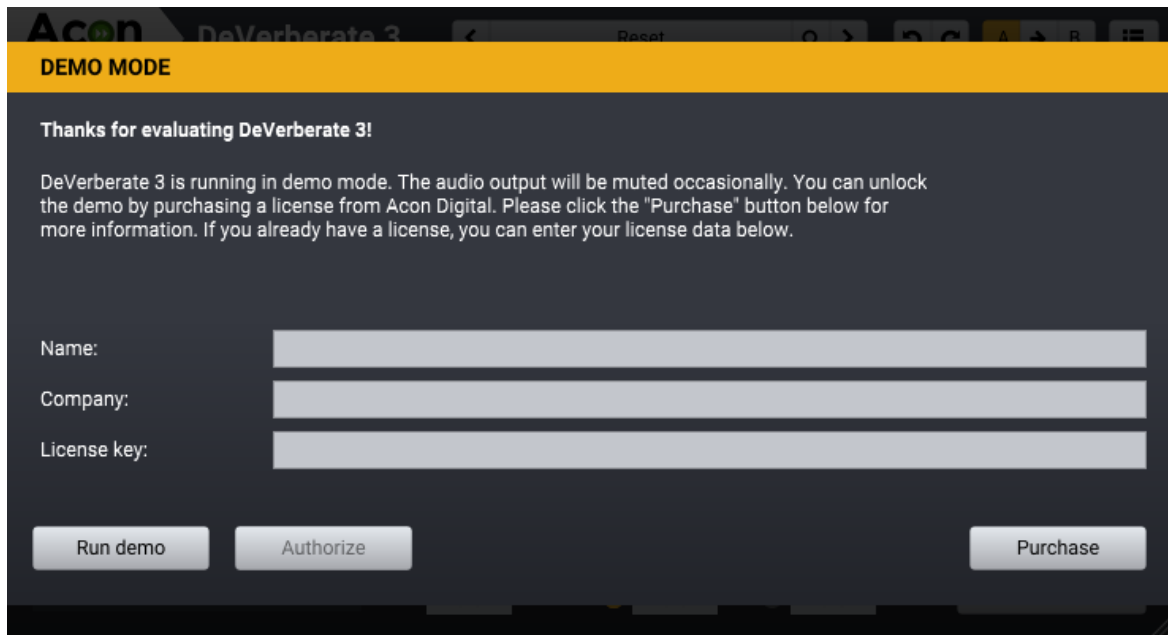
Acon Digital DeVerberate 3 is a plug-in that can attenuate or boost the reverb present in recorded material. Version 3 introduces a new algorithm for reverb reduction in voice and vocal recordings based on deep learning that was trained on thousands of high quality voice recordings and a wide range acoustical surroundings. The extensive training set enables the artificial intelligence to automatically distinguish voice from reverberation without user interaction.

The reverb estimation algorithm from earlier versions of *DeVerberate* with manual reverb time and reverb level settings is still available and useful when processing music or other sources. An improved early reflections filter can be used in addition to the late reverb attenuation to tame resonant frequencies caused by the first reflections occurring shortly after the direct sound.

1.1 Purchase and Authorization

Acon Digital *DeVerberate* will run in demo mode the first time you open it from your audio editor or digital audio workstation (DAW). The demo mode is fully functional with exception of short passages with muted audio output at irregular intervals. The demo version can be unlocked by purchasing a license key from Acon Digital (see Acon Digital online shop). When a plug-in is opened in demo mode, a dialog box appears where you can choose to continue with the demo version or enter a license key. There is also a purchase button which directs you to the Acon Digital online shop.

If you have purchased a license key from Acon Digital, please enter your name, company name if applicable and the license key you obtained. The *Authorize* button will remain deactivated until the license key has been accepted. After having successfully authorized *DeVerberate 3*, the demo dialog box will not appear again.



The demo dialog box appears when starting DeVerberate 3 prior to authorization.

1.2 Requirements

Before you install *DeVerberate 3*, please make sure your computer fulfills the following requirements:

PC Version (Windows)

- Windows 10 / 8 / 7
- Intel Core i5 or AMD multi-core processor (Intel Core i7 or faster recommended)
- 1366 x 768 display resolution (1920 x 1080 or higher recommended)
- 1 GB RAM (4 GB or more recommended)
- 1 GB free HD space
- A host application that is compatible with 32 bit or 64 bit VST, VST3 or AAX (Pro Tools 10.3.5 or higher)

Macintosh Version (macOS)

- OS X 10.9 or later
- Runs natively on ARM64 and Intel
- 1 GB RAM (4 GB or more recommended)
- 1 GB free HD space
- A host application that is compatible with AU, VST, VST3 or AAX (Pro Tools 11 or higher)

2 Host Integration

You can access *DeVerberate* from your host application (audio editor or DAW) of choice. The plug-in is available as a 32 or 64 bit VST, VST3 or AAX plug-in on the Windows platform or as a 64 bit VST, VST3, AU or AAX plug-in on macOS. Both Intel and Apple Silicon processors are supported natively. Some host applications will require a rescan and possibly adding the *DeVerberate* installation directory to the list of VST2 directories. Please consult the manual for your host application for further details.

3 About Reverb Reduction

What is Reverberation

Reverberation occurs when sound is produced in an enclosed acoustical environment. The sound propagates through the air before it arrives at the listener, but the sound is also reflected when it hits walls or other objects. Due to the propagation time, these reflections arrive at the listener later than the sound from the direct path. After a certain build-up time, there are usually so many reflections that no distinct echoes are distinguishable, but rather a smoothly decaying sound. The first few reflections, usually called early reflections, are important cues for our perception of an acoustical environment. These first reflections also changes the *timbre* of the sound by attenuation some frequencies and amplifying others. For that reason, it is helpful to differentiate between early reflections and the dense late reverberation that occurs after the first 20 to 100 milliseconds.

Reverb Reduction

Reducing reverberation from a recording based on the recording alone is a difficult task that was long considered impossible. However, recent advances in digital signal processing now make it possible to split reverberated audio recordings into an estimate of the direct and the reverberated sound. At *Acon Digital*, we introduced a powerful tool for reverb reduction with the release of *DeVerberate 1.0* back in August 2013. The tool successfully focused on the late reverberation and quickly found it's way into post production studios all around the world.

DeVerberate 3 introduces an entirely new algorithm for reverb reduction in voice and vocal recordings based on deep learning. This leads to even better reverb reduction and works fully automatic without any user interaction. The neural network was trained on thousands of clean, high quality voice recordings and a large range of acoustical surroundings.

Divide and Conquer

In addition to the late reverberation tail, smaller rooms often suffer from strong and annoying resonances caused by the very first reflections. By dividing the task into suppression of early reflections and of late reverberation, we can treat the two with entirely different algorithms that are better suited. The *Early Reflections Filter* introduced with *DeVerberate 2* and further improved in *DeVerberate 3* uses sophisticated statistical methods to estimate the so called *impulse response* of the early reflections. The impulse response can be utilized to calculate an inverse filter to reduce the impact of the early reflections.

4 Using DeVerberate

One of the most common use cases for *DeVerberate* is the reduction of unwanted reverb when editing dialogue. A new algorithm based on deep learning makes reverb reduction for voice and vocal recordings very easy and effective. The algorithm automatically detects and separates voice from reverb without user interaction. It also adjusts instantly if there are any changes in the reverb due to movements or change of location. For music or other audio material, the algorithm from earlier versions of *DeVerberate* is available. In this case, the algorithm relies on the user's reverb time and reverb level settings to separate dry audio from the reverb. These two different modes of operation are called *Voice* and *Other* modes.

In addition to the reverb tail, strong resonances in the frequency spectrum are often a problem when dealing with unwanted reverb in small rooms. The resonances are caused by the first strong reflections arriving shortly after the direct sound. *DeVerberate* has a separate *Early reflections filter* that estimates the impulse response of the first reflections arriving up to around 50 milliseconds after the direct sound. *DeVerberate* optionally applies an inverse filter to reduce the effect of these early reflections which decrease the intelligibility and fidelity of the signal.

DeVerberate allows independent manipulation of the direct and the reverberated sound and you can adjust the output levels of these two signal components independently so that you can attenuate or emphasize the reverb.



The DeVerberate plug-in running in **Voice** mode. The graph shows the estimated spectrum of the reverb as well as the frequency spectrum of the input and output signals.

Reverb Estimation

You can switch between the *Voice* and *Other* processing modes using the corresponding buttons in the *Reverb Estimation* group box, and the other parameter controls in the group box depend on the selected processing mode:



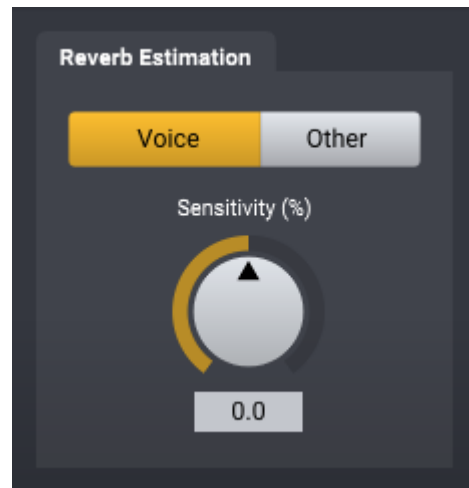
Click the buttons to switch between **Voice** and **Other** processing modes

Voice Mode

There is only one parameter control available when using *Voice* mode:

Sensitivity (%)

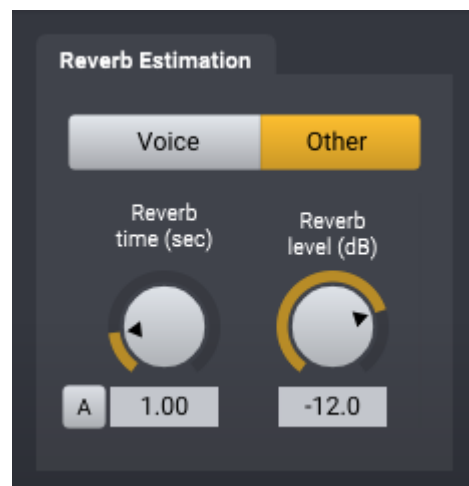
You can use the *Sensitivity* parameter to give a bias to the reverb estimation algorithm and positive values will result in more reverb being detected at the expense of degradation of the wanted signal. We recommend to start with 0% and only change if necessary.



*There's only one parameter available when operating DeVerberate in **Voice** mode.*

Other Mode

The reverb estimation when operating in *Other* mode is more manual. In order to separate the direct sound from the reverb, an estimate of the reverb time and level in the source is required. *DeVerberate* includes an automatic estimation of the reverb time that you can activate if you are unsure. The reverb level is best adjusted by manually increasing the level until the reverb is sufficiently reduced without affecting the direct signal noticeably.



*You will need to manually set reverb time and reverb levels when operating in **Other** mode.*

While adjusting the source reverb settings, we advise you to disable the output reverb by clicking the toggle button left of the numerical entry field and enable and set the output dry level to 0 dB. This makes it easier to hear how the settings affect the signal and would also be the most common settings when using *DeVerberate* to

attenuate unwanted reverb. The de-reverberation process can be monitored visually using the spectrum display showing the input and output spectra as well as the spectrum of the estimated reverb.

Reverb time (in seconds)

The reverb input time should be set to an estimate of the reverb time in the input signal. The visual representation of the reverb spectrum can be very useful monitor that the reverberation time matches the input signal. This works particularly well if there are fragments in the recording containing only the reverberation decay. The reverb profile should then decay with the same rate as the input signal.

Automatic reverb time estimation ("A" button)

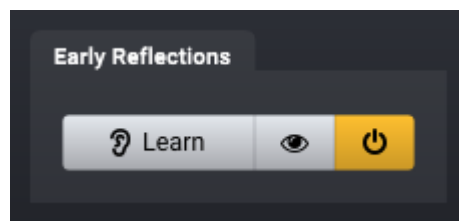
DeVerberate can also estimate the reverb time automatically. The algorithm works best when you have pauses or sharp attacks in the input signal where the reverb is heard clearly. We recommend you to select such a region, click the **A** button to activate the estimation and play the audio through *DeVerberate*. The reverb time knob will be disabled and moves automatically according to the estimation. Please make sure that you deactivate the estimation prior to the actual processing.

Input reverb level (in dB)

The input reverb level should correspond to the level of reverb present in the input signal. It is advisable to start with a low level and increase the level until you reach the desired reduction.

The Early Reflections Filter

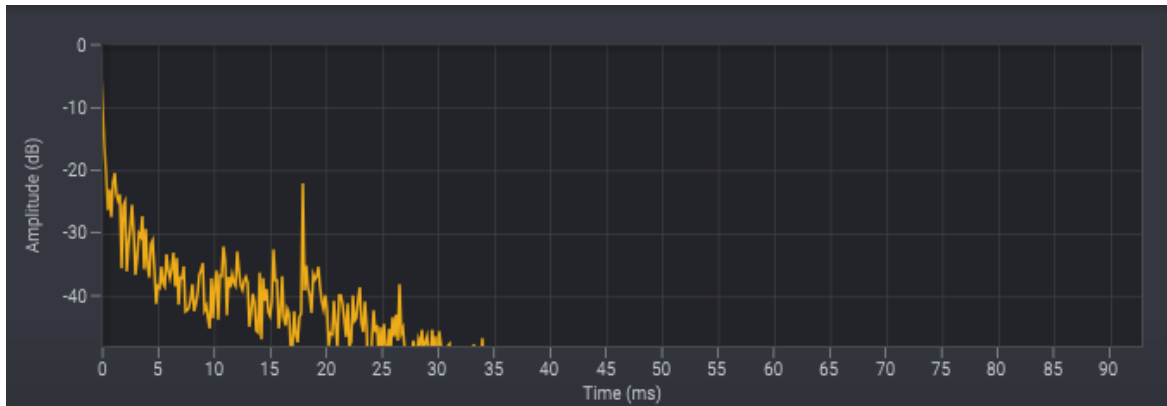
Despite the internal complexity, the *Early reflections* module is very simple to use and is operated using three buttons:



The early reflections filter in DeVerberate with the learn, view and activate buttons

Learn Button

The *Learn* button enables the estimation of the early reflections impulse response. *DeVerberate* depicts the current impulse response estimation during the learning phase:

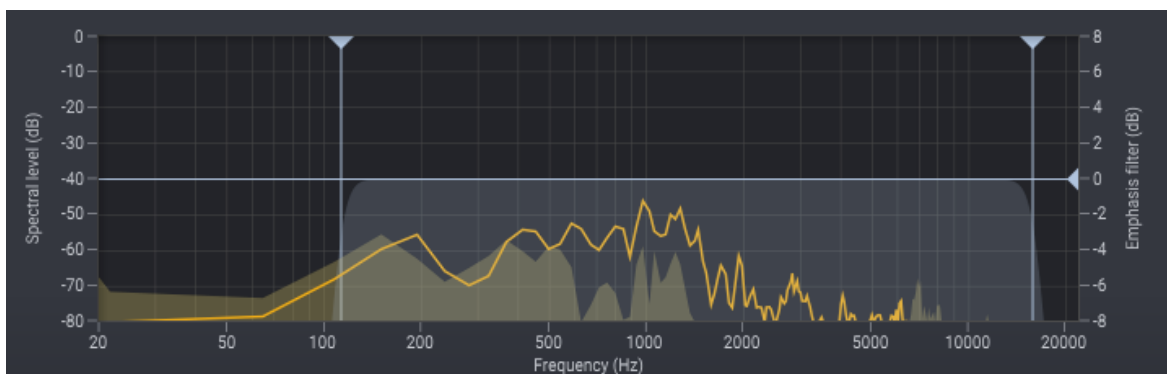


The estimated early reflections impulse response is displayed during the early reflections learning. This is from a dialog in a reverberant room with an audible echo after around 18 milliseconds.

The early reflections filter does not process the audio while the learn mode is activated. When the estimated impulse response curve seems stable you can disable the learning mode by clicking the learn button again which immediately activates the early reflections filter.

View Band Controls Button

The view band controls button shows or hides the frequency band controls for the early reflections filter. This is the frequency band in which the early reflections are corrected and it is specified using lower and upper cut-off frequencies indicated with handles in the spectrum display:



The spectrum display with the early reflections filter's band controls. You can adjust the cut-off frequencies (handles with vertical lines) as well as the correction strength (handle horizontal line).

You can also adjust the strength of the correct filter in Decibel with 0 dB representing maximum correction.

Activate Button

The activate button can be used to toggle audio processing through the early reflections. The button will be disabled until the early reflections impulse response has been measured using the learn button.

Other Settings

Spectral smoothing

Spectral smoothing can be used to mask artifacts after reducing the reverb tail. In most cases, this should be set to 0%, but if short fragments of tonal noise are still present after reverb reduction, you can try to increase the level of spectral smoothing.

Dry level (dB)

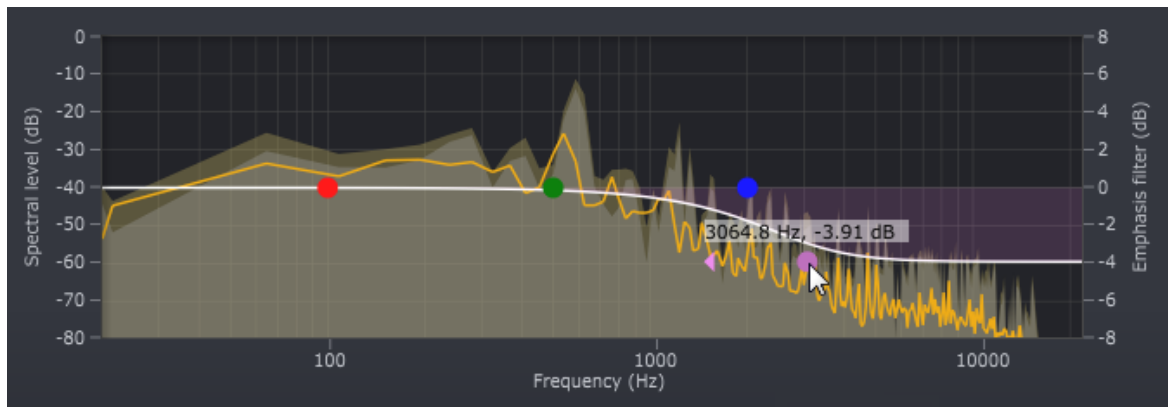
The amount of the estimated dry signal to send to the output. You can use the toggle button to exclude the estimated dry signal completely.

Reverb level (dB)

The amount of the estimated reverb to send to the output. You can use the toggle button to exclude the estimated reverb completely.

Emphasis Button

You can click the *Emphasis* button to toggle the *emphasis filter* on or off. The emphasis filter allows you to apply frequency weighting to the reverb spectrum. This is very useful if you wish to make manual corrections to the estimated reverb. The frequency weighting curve consists of a low shelf filter, two peak filters and a high shelf filter, similar to a parametric equalizer. You can modify the filter characteristics by clicking the handles (colored bullets) in the curve and move them around. Press *Ctrl* key on your keyboard to see the current frequency and gain settings of the selected frequency band. You can also change the filter slope of the shelving filters or the bandwidth of the peak filters. Click handle of for the filter you wish to modify. Arrows appear surrounding the handle. Move these to change the bandwidth for peak filters or the filter slope for the shelving filters.



Acon Digital DeVerberate running with the emphasis filter enabled.

Difference Button

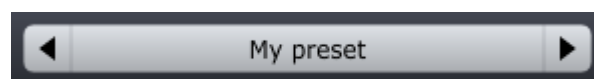
You can click the *Difference* button to toggle *difference monitoring* on or off. The difference monitoring makes it possible to listen to the signal being removed. When this option is activated, *DeVerberate* outputs the difference between the incoming and the processed signals.

The Plug-in Header

The upper region of the *DeVerberate* plug-in window lets you manage presets, undo or redo changes or quickly compare different settings using the A / B compare tools:

Preset section

DeVerberate is shipped with a set of factory presets that serve as a starting point for further adjustments. You can browse through preset categories and presets as well as create and manage your own presets using the preset management section in *DeVerberate*:



The preset management section in DeVerberate.

You can browse through the presets using the arrow buttons. Alternatively, you can click the current preset name and a drop-down menu appears. You can also save your own presets by choosing "Save user preset file..." from the menu. A file chooser dialog box appears where you can enter the name of the preset you wish to save. You can create sub folders and place your preset files inside, and these will appear as categories in the user presets.

Undo and redo

You can undo (or redo) any changes to the parameter settings by clicking the circular arrow back or forward buttons:



Undo and redo buttons

A / B comparisons

It is frequently useful to be able to quickly compare different parameter settings. You can do this using the A / B comparison buttons:



The A / B comparison buttons allows you to quickly compare different settings

You can keep two independent sets of parameter settings, the A and B settings, and switch between them using the corresponding buttons. The arrow button copies the settings from A to B or the other way around depending on which parameter set that is currently active.

The plug-in menu

The last button in the plug-in header displays the plug-in menu:



You can click the plug-in menu button for the plug-in specific menu

From the plug-in menu you can among other choose different visual themes, show this help or information about the plug-in.

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