DeVerberate 2

User Guide

Acon AS

DeVerberate 2 User Guide

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1   Introduction

Thanks for using *Acon Digital DeVerberate*. *DeVerberate* is a plug-in from *Acon Digital* that can attenuate or boost the original reverberation present in recorded material. The novel real-time algorithm is not dependant on stereo or multi-channel audio and splits the incoming audio into an estimation of the direct sound and the reverberated sound which can then be recombined freely. A new early reflections filter can estimate and attenuate the first reflections occurring after the direct sound.

1.1   What's new in DeVerberate 2

The new version of DeVerberate introduces a completely new early reflections filter that can be used in companion with the late reverb suppression found in earlier versions of DeVerberate. The early reflections filter can estimate the impulse response of the early reflections and optionally applies an inverse filter to improve the sound quality.

Highlights
- New and unique early reflections filter
- Improved automatic estimation of the source reverb time

1.2   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 the 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 you 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 Acon Digital DeVerberate, the demo dialog box will not appear again.
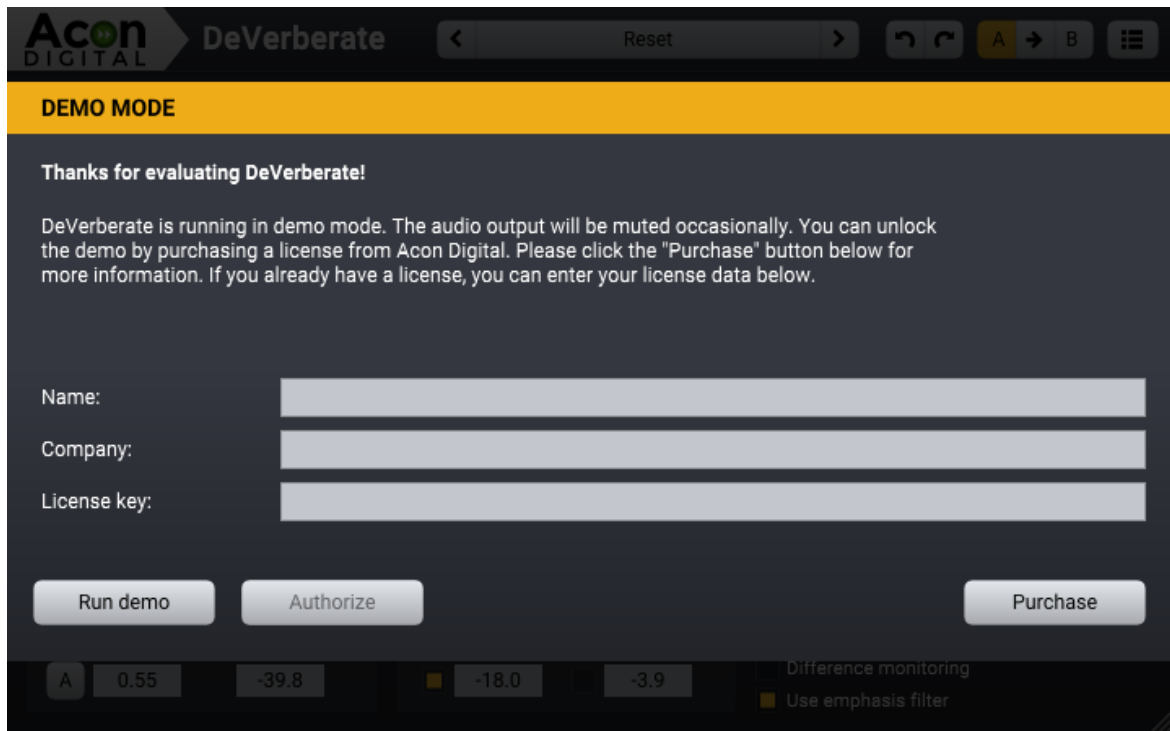
The demo dialog box appears when starting Acon Digital DeVerberate prior to authorization.

2 Host Integration

You can access *Acon Digital DeVerberate* from your host application (audio editor or DAW) of choice. The plug-in is available as a 32 or 64 bit VST or AAX plug-in on the Windows platform or as a VST, AU or AAX plug-in on Mac OS X (32 / 64 bit fat binaries). Some host applications will require a rescan and possibly adding the *Acon Digital DeVerberate* installation directory to the list of VST 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 an impossible task. 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.

Divide and Conquer

The original version did not make an attempt at taming annoying resonances caused by the first reflections, though. We have put huge efforts into improving upon this limitation. 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 new *Early Reflections Filter* in *DeVerberate 2* uses sophisticated statistical methods to estimate the so called *impulse response* of the early reflections. The impulse response can be utilized to calculated an inverse filter to reduce the impact of the early reflections. The impulse response length is limited to around 100 milliseconds. The *Early Reflections Filter* is followed by the late reverberation suppression similar earlier versions of *DeVerberate*.

4   Using DeVerberate

DeVerberate 2 targets early reflections and late reverberation separately in two different algorithms. The *Early reflections filter* estimates the impulse response 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 alter the frequency response of the signal and decrease the intelligibility and fidelity of the signal.

The dense or *late reverberation* that arrive later are separated in the late reverberation unit which work somewhat similar broadband noise reduction algorithms. *DeVerberate* allows independent manipulation of the direct and the reverberated signals and you can adjust the output levels of these two signal components independently so that you can attenuate or emphasize the reverberated signal. In order to separate the direct from the reverberated signal, an estimate of the reverberation time and the reverberation level in the source recording 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.

The DeVerberate plug-in window. The graph shows the estimated spectrum of the reverberation as well as frequency spectrum of the input and output signal.
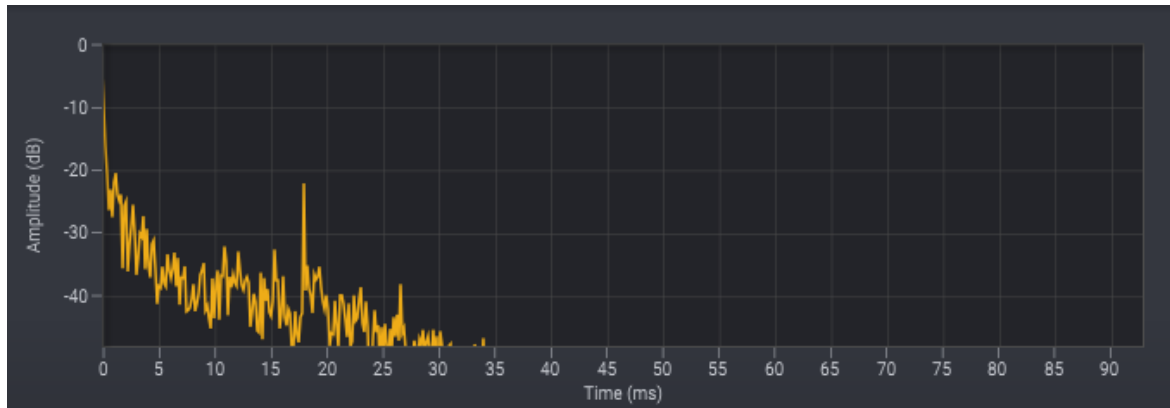
The Early Reflections Filter

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

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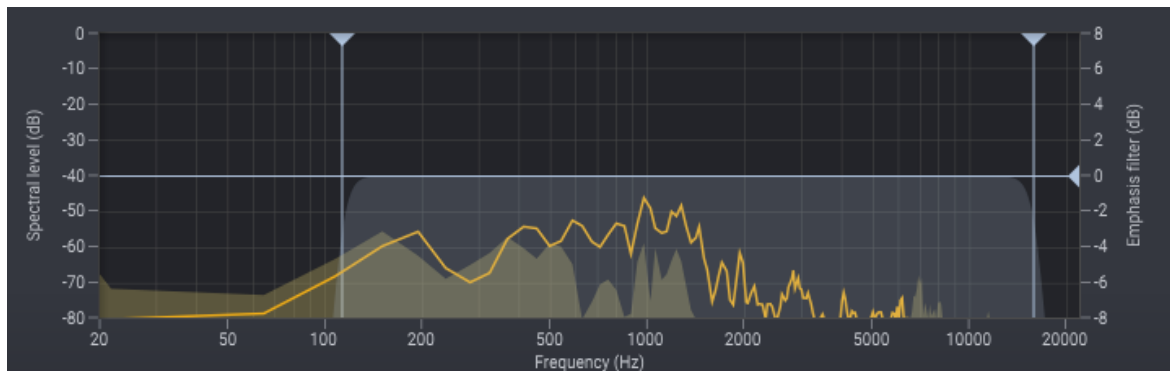
The spectrum display with the early reflections filter's band controls. You can adjust the cut-off frequencies (handles with vertical lines) as well as the correction strength (handle horizontal line).

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

Acticate 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.

Source Reverb Settings

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 (both settings found in the output reverb settings group box). 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 reverberation signal (the reverb profile).

Reverb time (in seconds)

The reverb input time should be set to an estimate of the reverberation decay time in the input signal. The visual representation of the reverb profile 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 reverberation time automatically. The algorithm works best when you have pauses or sharp attacks in the input signal where the reverberation is heard clearly. We recommend you 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 reverberation present in the input signal. It is advisable to start with a low level and increase the level until you reach the desired reduction.

Output Reverb Settings

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 reverberation signal to send to the output. You can use the toggle button to exclude the estimated reverberation completely.

Spectral smoothing

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

Difference Monitoring

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.

Emphasis Filter

The emphasis filter allows you to apply frequency weighting to the reverb profile. This is very useful if you wish to make manual corrections to the estimated reverb profile. 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.
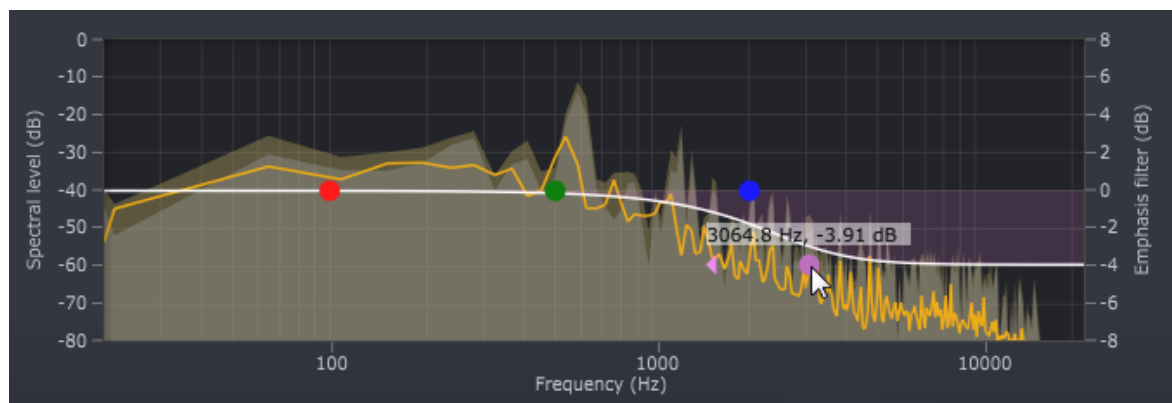

Acon Digital DeVerberate running with the emphasis filter enabled.

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:
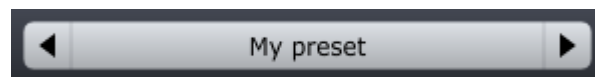
The preset management section in DeVerberate.

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.
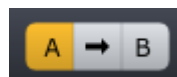
Undo and redo

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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