ACON DIGITAL

Restoration Suite 3

User Guide

Four restoration processors in one plug-in window: repair clipping, clicks and crackle, hum and broadband noise in a single, re-orderable chain — or let Analyze build it for you.

DeClip 3
Clipping repair

DeClick 3
Clicks, crackle & thumps

DeHum 3
Hum & buzz

DeNoise 3
Broadband noise

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CHAPTER 1

Introduction

Restoration Suite 3 brings DeClip 3, DeClick 3, DeHum 3 and DeNoise 3 together in a single plug-in window. Instead of inserting four separate plug-ins, you build one processing chain containing the modules you need, in the order you want.

The quickest way to get started is the **Analyze** button. It listens to a few seconds of your audio, works out which of the four modules are needed, and sets their main parameters for you. From there you can fine-tune each module — or skip Analyze entirely and build the chain by hand.

The four modules

Module	What it repairs
DeClip 3	Distortion from analog or digital clipping, where peaks were flattened because the recording level was too high.
DeClick 3	Impulsive noise: clicks and pops, crackle (as on LP and 78 RPM records), digital dropouts, plus thumps and plosives.
DeHum 3	Hum and buzz from poorly grounded equipment and other tonal noise such as motors.
DeNoise 3	Broadband noise such as hiss, wind noise, buzz and camera noise.

CHAPTER 2

The User Interface

The Restoration Suite 3 window is divided into three areas.

Header

The header along the top contains presets, undo/redo, A/B comparison and the processor menu. A Restoration Suite preset stores the *entire chain*: which modules are present, their order, their on/bypass states and every module's settings.

Chain

Below the header, the chain shows one tile per module in processing order. To the right of the chain are the **Analyze** button and an input level meter.

Module area

The rest of the window shows the controls of the currently selected module. These controls are the same as in the standalone version of each plug-in.

> **Empty chain.** When no modules have been added, the module area shows one button per module. Click a button to add that module, or click **Analyze** to have the chain built automatically.

CHAPTER 3

Building the Chain

Adding modules

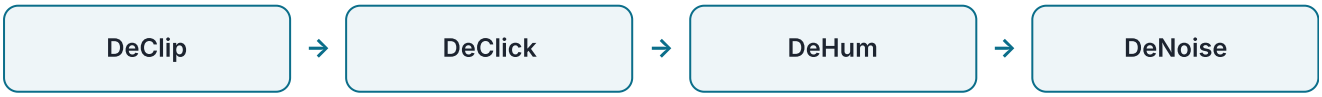
Click the **+** button at the end of the chain to open a menu of modules. Each module can be used once per chain, so modules already present are greyed out, and the **+** button is disabled once all four are in use. A newly added module is placed at the end of the chain and selected.

Selecting a module

Click a tile to show that module's controls in the module area. The selected tile is outlined in the accent colour.

Changing the order

Audio flows through the chain from left to right. Drag a tile sideways to move it to a new position.



> **Recommended order.** In most cases, repair clipping and clicks before tackling hum and noise. This is the order Analyze always uses.

Module tile buttons

Each tile carries four small buttons:

Button	Function
On / Off (top left)	Switches the module off. It stays in the chain with its settings intact and is shown dimmed, but processes no audio.
Bypass (bottom left)	Bypasses the module's output while it keeps running, so its displays stay live and the plug-in's latency does not change. Use this for A/B comparisons during playback.
Remove (top right)	Removes the module from the chain.
Presets (bottom right)	Selects the module and opens its preset menu, so you can load a factory or user preset for that module only.

If the tiles don't all fit, a scroll bar appears beneath them. You can also scroll the chain with the mouse wheel.

CHAPTER 4

Analyze

Analyze measures the audio for four problems in turn — clipping, clicks and crackle, hum, and broadband noise — and builds a chain to fix them. Each module analyses the audio *as already repaired* by the modules before it, so the settings work together.

What Analyze sets

Module	Parameters set by Analyze
DeClip	Positive threshold, Negative threshold and Output gain, derived from the measured clipping level.
DeClick	Crackle sensitivity (the lowest value that removes the crackle) and Click sensitivity (set to a fixed value).
DeHum	Added when hum is detected.
DeNoise	Noise Floor, set from the measured noise level.

All other settings are reset to their defaults and no module is left bypassed. A hand-drawn DeNoise reduction curve is not carried over. If the audio passes every test, Analyze still adds the single module whose problem came closest to being detected.

> **Replacing an existing chain.** If modules are already in the chain, a message asks whether to remove them and analyse, or cancel.

Analysing during playback

This is the method used in most hosts:

1. Click **Analyze**. If the host is stopped, the plug-in shows “Please start playback in your host to analyze audio”.
2. Start playback over a representative section. The input meter shows the signal arriving and the status reads *Analyzing…*.
3. Analysis finishes after ten seconds of audio or when playback stops. Click **Stop** to end it early.

When finished, the first module in the new chain is selected. Silence before the audio arrives is not counted.

Analysing a selection (Acoustica and Pro Tools AudioSuite)

- **Acoustica:** select a passage and click **Analyze**, next to **Process**. The button is greyed out for selections shorter than half a second.
- **Pro Tools AudioSuite:** open the plug-in from the AudioSuite menu, select audio and use Pro Tools' own **Analyze** button.

The analysis uses the beginning of the selection. If no selection is long enough, the plug-in falls back to playback analysis.

CHAPTER 5

Automation and Control Surfaces

Every module control can be automated. Automation parameters are prefixed with the module name — for example *DeNoise Reduction* or *DeHum Frequency* — so they are easy to find in your host's automation list. Automated controls are indicated in the interface.

In Pro Tools, the controls map to Avid control surfaces including S6, S4 and Avid Control, as well as the older D-Control and C|24.

> **Not supported:** the knobs on the Avid S1 and Avid Dock.

DeClip 3

DeClip 3 restores recordings distorted by analog or digital clipping, which happens when the recording level is too high and the waveform peaks are flattened. It replaces the clipped peaks with an estimate of the original signal curve, preserving the frequency content of the unclipped audio as far as possible.

A histogram shows the distribution of signal levels and helps you set the thresholds. Samples above the upper threshold and below the lower threshold are replaced. Set the thresholds with the sliders or by dragging the coloured handles in the histogram.

Settings

Control	Description
Positive threshold (dBFS)	Samples above this level are replaced.
Negative threshold (dBFS)	Samples below this level are replaced.
Link threshold values	Moves the positive and negative thresholds together. Useful when clipping is symmetrical.
Detect	Detects the thresholds automatically from the incoming audio, and sets Output gain: −12 dB for audio clipped at 0 dBFS, −8 dB for audio clipped at −4 dBFS, and 0 dB for audio clipped below −12 dBFS.
Input gain (dB)	Adjusts the level before de-clipping to create headroom.
Output gain (dB)	Compensates for the higher peak levels produced by restoring the clipped peaks.
Quality (%)	Trades CPU load against algorithm quality. Higher values use more CPU.

Analyze

In Acoustica or Pro Tools AudioSuite, select a passage with clipping and click **Analyze**. Positive threshold, Negative threshold and Output gain are set as with Detect, but from the whole selection. In Acoustica, only the first five seconds of a longer selection are analysed. In other hosts, or when the plug-in is inserted on a track, set the thresholds manually or use Detect.

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DeClick 3

DeClick 3 removes impulsive noise such as clicks and crackle — common on LP and 78 RPM records, and also caused by digital dropouts or corrupt data packets. It contains three algorithms:

- **Declicker** — removes larger clicks and pops.
- **Decrackler** — removes frequent, very short clicks that are heard as crackle.
- **Dethump** — reduces low-frequency thumps and plosives, for example from scratched vinyl or “P” and “B” sounds in vocals.

Each detected click is replaced with an estimate built from the surrounding undistorted audio. The reduction meter shows the last ten seconds of activity: the red line is clicks removed per second, the green line is crackles removed per second.

Settings

Control	Description
Crackle sensitivity (%)	Sensitivity of the decrackler; higher values remove more crackle. A toggle switches the decrackler on or off.
Click sensitivity (%)	Detection sensitivity of the declicker; higher values remove more clicks. A toggle switches the declicker on or off.
Thump sensitivity (%)	Sensitivity of the dethump; higher values remove more thumps. A toggle switches the dethump on or off.
Click expand (ms)	Smoothing applied to the click-detection signal (0.1–5.0 ms). Keep it as small as possible while still covering the full length of the clicks.
Click time skew (%)	The shape of the clicks. 0% is symmetrical; positive values suit clicks with more post-ringing.
Thump cut-off (Hz)	Upper frequency limit for the dethump (20–350 Hz).
M/S mode	Stereo only. Converts to Mid/Side before processing and back to left/right afterwards. Button at the bottom left of the display.
Solo noise	Lets you hear only the signal being removed — an audible version of the reduction meter. Button at the bottom right of the display.

Analyze

In Acoustica or Pro Tools AudioSuite, select a passage containing crackle and click **Analyze**. The decrackler is switched on and Crackle sensitivity is set to the lowest value that removes the crackle. In other hosts, set the controls manually.

> **Tip.** Use Solo noise while adjusting sensitivity. If you start hearing parts of the music or speech in the removed signal, the sensitivity is too high.

DeHum 3

DeHum 3 removes hum and buzz caused by poorly grounded electrical equipment, as well as other tonal noise such as motors. Hum normally consists of a fundamental frequency plus harmonics; an adaptive algorithm follows fluctuations in the fundamental over time.

Operating modes

Choose one of three modes with the **Automatic**, **Precision** and **Notch** buttons.

Mode	How it works
Automatic (default)	Uses a machine-learning model to identify and remove hum, so no fundamental frequency needs to be set. The recommended starting point.
Precision	Reconstructs the hum using sinusoidal re-synthesis and subtracts it, keeping distortion of the wanted signal to a minimum. Requires a fundamental frequency (equivalent to the default mode in DeHum 2).
Notch	Uses conventional notch filters. Usually effective but more prone to artifacts; uses less CPU and adds no latency.

Settings common to all modes

Control	Description
Noise Floor (dB)	The maximum attenuation DeHum 3 can apply. If you hear artifacts, raise this slider to reduce the attenuation.
M/S mode	Stereo only. Processes in Mid/Side to avoid the stereo image drifting.
Solo Hum	Lets you hear only the signal being removed.

Automatic mode

Control	Description
Reduction Curve	Low shelf, mid bell and high shelf filters shape the algorithm's sensitivity across the spectrum. Toggle each filter with the buttons at the bottom left of the graph. Drag the circle to change frequency and gain, the arrows to change Q, and the handles to change slope.

Precision mode

Control	Description
Frequency (Hz)	The hum's fundamental frequency — typically 50 Hz (Europe and most of the world) or 60 Hz (North America), depending on where the recording was made. Click **Scan** to fine-tune it automatically.
Sensitivity (%)	Higher values classify more frequency components as hum.
Adaptivity (Hz/s)	The maximum fluctuation of the fundamental per second. Keep it as low as possible while still tracking the hum.
Harmonics	How many harmonics to detect and remove. Keep it as low as possible while still removing all audible harmonics.
Odd harmonics	Removes only odd harmonics — common with symmetrical non-linear distortion.

Notch mode

The same controls as Precision mode — Frequency (with Scan), Adaptivity, Harmonics and Odd harmonics — but without Sensitivity.

Analyze

Available in Precision and Notch modes. In Acoustica or Pro Tools AudioSuite, select a passage containing hum and click **Analyze**; the fundamental is measured and Frequency is set accordingly. In other hosts, set the frequency manually or use Scan.

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DeNoise 3 Premium & Ultimate

DeNoise 3 reduces broadband noise such as hiss, wind noise, buzz and camera noise. Since Acoustica 8 it includes a machine-learning **Automatic** mode that needs no noise profile, alongside a **Manual** mode that works like DeNoise 2 and uses a learned noise profile.

Operating modes

Mode	When to use it
Automatic	Recommended starting point for typical broadband noise. Usually more effective and quicker to set up.
Manual	Gives more control for complex or unusual noise, based on a noise profile you capture.

General settings (both modes)

Control	Description
Noise Floor (dB)	The maximum attenuation DeNoise 3 can apply. If you hear artifacts, raise this slider to reduce the attenuation.
Reduction Curve	Low shelf, mid bell and high shelf filters shape the reduction across the spectrum. Toggle them with the buttons at the bottom left of the graph; drag the circle for frequency and gain, the arrows for Q, and the handles for slope.
M/S mode	Stereo only. Processes in Mid/Side to avoid stereo-image drift.
Solo Noise	Lets you hear only the signal being removed.

Manual mode

Capturing a noise profile

1. Click the **Noise Profile** button. It turns yellow to show it is learning.
2. Play a section of the recording containing only the noise. No reduction is applied while learning.
3. Click the button again. It turns dark blue to show a profile has been captured.

Noise profiles can be saved and loaded from the **DeNoise menu** at the top right of the interface.

Control	Description
Soft knee (%)	Softens the transition between noise and wanted signal. Higher values sound more natural.
Reaction time (ms)	The maximum time the algorithm takes to respond to level changes in each band. Longer times reduce tonal and burst-like artifacts.

Analyze

Available in Manual mode. In Acoustica or Pro Tools AudioSuite, select a passage containing only noise and click **Analyze**; DeNoise 3 learns the noise profile from the selection. In other hosts, capture the profile with the Noise Profile button.

CHAPTER 10

Quick-Start Workflow

1. **Insert Restoration Suite 3** on the track, or open it in Acoustica or Pro Tools AudioSuite.
2. **Click Analyze** and play (or select) a representative section — ideally one that contains each problem you want to fix.
3. **Review the chain.** Analyze adds the modules it thinks are needed, in the order DeClip → DeClick → DeHum → DeNoise.
4. **Fine-tune each module.** Click a tile to show its controls. Use Solo noise / Solo Hum to hear what is being removed; if you can hear wanted signal, back off the sensitivity or raise the Noise Floor.
5. **Compare.** Use each tile's Bypass button during playback to A/B individual modules without changing latency, or the header's A/B for whole-chain comparisons.
6. **Save a preset** from the header to store the entire chain for similar material later.

> **Rule of thumb.** Less is usually more in restoration. Apply the minimum processing that makes the problem inaudible — over-processing tends to introduce artifacts that are more distracting than the original noise.

For the latest documentation, visit acondigital.com/help/acoustica8/restorationsuite3/