

Waves X-Crackle

Software Audio Processor

Users Guide



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1. Introduction

Waves X-Crackle reduces crackle sounds while preserving excellent audio quality. **X-Crackle** is part of the Waves **Restoration** bundle, which restores vinyl records and damaged recordings. X-Crackle and the other Restoration plug-ins have a friendly interface that is easy to learn and use. X-Crackle has just two parameters to adjust.

This user guide describes:

- the problems **X-Crackle** solves;
- how to use the software;
- the software user interface.

Click the ? on the toolbar for online help. Thanks for using **X-Crackle** and enjoy!

WHAT PROBLEMS DOES X-CRACKLE FIX?

Crackles are low-level transients or small clicks and pops interspersed in the audio. While clicks (removed with the Restoration Plug-in X-Click) are more obvious and usually overpower the actual audio, crackles are more subtle, damaging a couple of samples in the area in which they occur. This can add up to a very annoying disturbance.

The Waves **X-Crackle** Plug-In effectively removes *crackles* from old vinyl and shellac records. Unlike other noise-reduction systems, **X-Crackle** creates virtually no audible artifacts if the correct settings are used.

For complete restoration of vinyl records we recommend using **X-Crackle** after **X-Click**. These plug-ins can also be chained together (**X-Click->X-Crackle**) in a single process.

HOW DOES X-CRACKLE WORK?

X-Crackle employs the most recent psychoacoustic research and multilevel decision algorithms to remove crackle while preserving the sonic clarity of the source. It performs better than comparable DAW tools and as well or better than more expensive, dedicated-hardware solutions. **X-Crackle** reduces noise with the least possible damage to the source recording.

2. Using X-Crackle

X-Crackle uses two parameters:

- **Threshold** sets the amplitude for crackles targeted for removal. A Threshold value between 50 and 70 works well in most situations. More noisy sources can use a setting as high as 80 without introducing artifacts. The maximum setting of 100 should be used for the most corrupted sources and results in a smoothing of the input signal.
- **Reduction** sets the attenuation applied to the detected crackle.

The *X-Crackle Scope* (see Displays section) shows the crackles removed from the input signal in the bottom sonogram (green waveform).

Experiment with the *Threshold* and *Reduction* parameters by listening to different parts of the recording. Determine whether one setting is appropriate for the entire recording or whether several sections should be treated individually. We recommend using headphones to most accurately assess the best settings

For additional help, use the **Difference** feature in the monitor section (see Controls section). You can switch between monitoring the processed audio path (Audio) and the signal removed by **X-Click** (Difference). This differential signal should contain only crackle, not desirable parts of the audio signal. If it does contain audio, try lowering the Threshold and/or Reduction parameters to minimize the removal of audio transients.

3. Controls and displays

CONTROLS



THRESHOLD:

Sets the amplitude for crackles targeted for removal. As Threshold values increase, smaller crackles are selected.

Settings: 0–100; Default = 60

REDUCTION:

Sets the amount of attenuation applied to the detected crackles.

Settings: 0–100; Default = 0

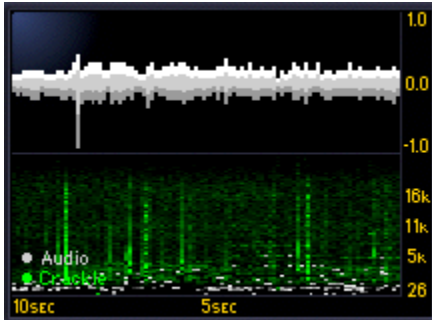
OUTPUT MONITOR



The Output Monitor control switches between **Audio** (the audio processed by X-Crackle) and **Difference** (the crackle removed with selected settings). **Audio** is the default setting and is used to evaluate the final settings. Use the **Difference** setting to hear whether the current parameters removed audio transients.

DISPLAYS

X-CRACKLE SCOPE



The X-Crackle Scope provides visual feedback for the last 10 seconds of processing history. The incoming waveform is shown in gray at the top. The bottom, green waveform shows frequency domain data in the y-axis and time across the x-axis. Higher Threshold values yield more green data in the scope.

CRACKLE ATTENUATION METER



Displays the amount of crackle removal. This display correlates with the audio level when monitoring the **Difference**.

OUTPUT METERS

The output meters display the output corresponding to the selected Output Monitor mode. They are logarithmically scaled, dBFS peak meters. The numeric field under the meters shows a peak hold value until it is reset by clicking anywhere in the meters area.

4. Important information and Useful Tips

LATENCY

To properly perform its task, **X-Crackle** needs to look ahead to into the future. It manages this incredible feat by delaying the source signal by 2624 samples (about 60 ms in CD quality material). This is particularly significant when the noisy track runs along with other tracks. To maintain sync, other tracks should be delayed by the same amount. There is no way to avoid this in live recording situations, therefore **X-Crackle** is not recommended when monitoring a singer or instrumentalist.

To use **X-Crackle** in a sound file editor, it is important to compensate for the plug-in's delay. If this feature is not available in your host application, add at least 2624 samples of silence at the end of the file and trim the start after the process is done.

MONO RECORDINGS

For best results when restoring and mastering mono vinyl or shellac records to CD, we recommend recording the signal to two channels and merging them to mono after using X-Click and X-Crackle on each channel individually. This process improves the signal-to-noise ratio by at least 3 dB (a factor of two) compared to processing one mono channel.

SIDE EFFECTS

X-Crackle minimizes audible artifacts but extreme settings can introduce some high-frequency smoothing. Either modify the settings or apply appropriate EQ after X-Crackle to compensate.