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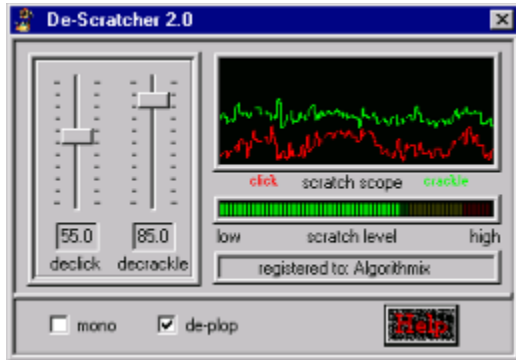


Fig.1: Screenshot of the **De-Scratcher PlugIn** window.

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Overview

Algorithmix® De-Scratcher PlugIn

The **De-Scratcher PlugIn** effectively removes clicks and crackles from old vinyl or shellac records, or from audio equipment arising due to switching, digital cross-talk, or thyristor buzz. Unlike other systems, **Algorithmix® De-Scratcher PlugIn** works virtually without artefacts, providing the correct setting for all parameters. Since the CPU requirement of the **De-Scratcher PlugIn** is very low (about 20% on a 133 MHz Pentium for a 16 bit, stereo, 44.1kHz .WAV file) you can optimize all the parameters while listening to the processing in real-time. Additionally, other PlugIns, like the **DC-Removal PlugIn** and **De-Noiser PlugIn**, can be chained to the **De-Scratcher PlugIn** for complete real-time filtering of your audio material. You can even use this combination for cleaning live old records, by connecting your turntable to the input of your sound card and its output to your stereo system!

The *de-scratching* algorithm consists of two main parts: the *de-clicking* filter and the *de-crackling* filter. While the [De-Clicking](#) filter is used to remove heavy clicks from old vinyl records or switching noise coming from audio equipment, the [De-Crackling](#) filter removes any remaining crackles.

The [Scratch Scope](#) and the [Scratch Level Meter](#) help you find the optimal setting for the *declick* and the *decrackle* parameter, thereby minimizing the occurrence of artifacts. Perform further precise [real-time parameter optimization](#) with a critical listening to the signal removed with the *de-scratching* algorithms by using the *difference* feature of the **PlugIn-Station** (see **PlugIn-Station** help for details).

A [De-Plop Filter](#) has been integrated for efficient removal of the interferences introduced to the original audio signal by large clicks and plops. The *de-plop* function can be switched on by default, since it is unusual to find audio material that sounds better without this filter.

Selecting the [Mono Mode](#) checkbox forces the **De-Scratcher PlugIn** to merge both stereo channels, but only after completing the de-scratching process for every stereo channel individually. This usually provides a 3 dB improvement in signal-to-noise (S/N) ratio against pure mono processing. Therefore we recommend using a stereo record player when processing old mono records, especially if they are intended for transfer to CD.

For further advice about restoring old records and the correct parameter set-up, see [Application Tips](#).

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The *de-clicking filter* of the **De-Scratcher PlugIn** removes clicks from old records as well as any impulse-like noises arising from analog or digital audio equipment. The higher the *declick* parameter is set, the more clicks are removed. At a setting of zero, virtually all clicks pass through the filter. For the *de-clicking* of typically polluted vinyl records transferred to the digital domain, a *declick* value of approximately 50 works well in the most cases.



Fig.2: Typical click in the signal taken from a vinyl record (left) and restored signal (right).

The number of clicks removed for a certain set-up of the *declick* parameter is displayed in the [Scratch Scope](#) by the red line. This provides for monitoring the click's detection level. The final setting of the *declick* parameter should be adjusted by carefully listening to different parts of the material intended to be processed.

For additional help, we highly recommend using the *difference* feature of the **PlugIn-Station**, allowing for intuitive optimal parameter setting. You can switch between the original input signal and the input/output difference, i.e., the part of signal taken out by the *de-clicking* algorithm. Normally, this different signal should not contain parts of the original signal you want to preserve. For further remarks on how to optimally set up the *declick* parameter, look at [Application Tips](#).

De-Crackling

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The *de-crackling filter* of the **De-Scratcher PlugIn** removes crackles and small clicks left after the *de-clicking* process, or other crackle-like disturbances included in audio signals. The higher the *decrackle* parameter is set, the more crackles are removed from the original signal. The extreme setting, close to 100, results in a smoothing of the input signal. In general, this parameter can safely be set to 80 without any audible artifacts. In some cases, even an extreme setting up to 100 can still improve the quality of processed audio material.

The amount of crackles removed from the input signal and parameter setting influence is monitored by the green line in the [Scratch Scope](#). For audio material containing a high crackle background noise, the results may be better with the green line in the *scratch scope*, hitting the top of the display. As in the *de-clicking* process, the final setting of the *decrackle* parameter should be performed by critically listening to different parts of the audio file to be de-crackled. We highly recommend using the *difference* feature of the **PlugIn-Station**, allowing optimal parameter set-up in a very intuitive way. You can switch over between the original input signal and the input/output difference, i.e., the part of signal removed by the *de-crackling* algorithm. This difference signal normally should not contain parts of the original signal you want to preserve. For further remarks on how to optimally set up the *decrackle* parameter, see [Application Tips](#).

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The *scratch scope* allows monitoring and reproducible set-up for the *declick* and *decrackle* parameters controlling the activity of the **De-Scratcher PlugIn** algorithms. The vertical axis of the display is scaled in clicks (red) or crackles (green) removed from the input signal per time unit. The scratch scope shows the last 12 seconds of the *De-Scratcher* activities. The current click and crackle level is displayed on the right side and conveyed to the left side of the *scratch scope* display.

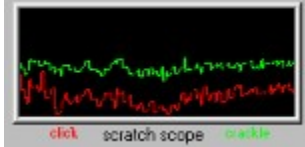


Fig.3: Screenshot of the *scratch scope*.

In general, you will find that the click level (red) rises from the bottom only if significant clicks are present in the input signal. For records in good condition with the correct setting of the *declick* parameter, the red line should normally stay in the bottom half of the *scratch scope*.

The green line, indicating the crackle level, is usually more sensitive to the setting of the *decrackle* parameter. Even for audio material without any crackles, there will be a significant de-crackle level displayed in the *scratch scope* if the setting of the *decrackle* parameter is above 80. In this case, the output signal is a smoothed version of the input signal and there may be some loss in high frequencies.

For very bad audio material with a high crackle level, it may be necessary to use parameter set-up corresponding to the green crackle level reaching the top of the *scratch scope* display.

If you have problems correctly interpreting the levels displayed in the *scratch scope*, always ask your ears. For further advice about correct parameter settings look at [Application Tips](#).

Scratch Level Meter

Algorithmix® De-Scratcher Plugin

The *Scratch Level* Meter offers an at-a-glance option for evaluating the overall click and crackle level. The more clicks and crackles detected, the higher the scratch level displayed.

This meter can help examine the influence of the [De-Clicking](#) and the [De-Crackling](#) function on the audio material being processed. For higher settings of the *declick* and *decrackle* parameter, the scratch level meter may display removal activities, even when working on audio material without any noticeable clicks and/or crackles. This is due to the exaggerated, material non-adequate algorithm sensitivity set up. These high sensitivity levels blur the distinction between scratches and attack regions of the original audio signal. Nevertheless, high settings are sometimes useful for heavily damaged audio material. However, it is up to you to find the proper compromise between the level of disturbances and the relative audio quality of the signal after processing.

For more on how to correctly adjust the *declick* and *decrackle* parameters, see our [Application Tips](#).

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Mono Mode

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Enabling the *mono* switch forces the **De-Scratcher PlugIn** algorithms to merge both channels of a stereo file back to mono, but only after clicks and crackles have been removed. For genuine mono input files, or if selecting only the left or right channel in the *Input* section of the **PlugIn-Station**, this switch has no function.

To achieve the highest possible performance when restoring and mastering old mono vinyl or shellac records to CD, we recommend using a stereo pick-up to record the signal in stereo mode.

Applying the stereo recording mode to mono records and merging both channels to mono first after de-clicking and de-crackling each channel individually improves signal-to-noise ratio by at least 3dB (which is actually a factor of two) compared to restoration procedures applied to pure mono files.

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De-Plop Filter

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The *De-Plop Filter* of the **De-Scratcher PlugIn** improves the removal of low-frequency disturbances brought into the signal due to mechanical resonances of the pick-up caused by large clicks or crackles from heavily damaged records.



Fig.4: Large click followed by resonance tail (left), de-clicked without (middle) and with (right) the *De-Plop Filter*.

Unlike other restoration systems, **Algorithmix® De-Scratcher PlugIn** does not use the *De-Plop Filter* implemented as a simple *highpass*, but rather as a special extension of the *de-clicking* algorithm itself. Therefore, in general, the *De-Plop Filter* can be enabled by default, since there is almost no risk of artifacts or loss of high frequencies. You may check this easily using the *difference* function of the **PlugIn-Station** (see **PlugIn-Station** help for details).

However, there are certain kinds of musical material which may sound better when using *the de-clicking* filter with the *de-plop* function disabled. Whether this applies to your audio signal or not can best be determined by listening carefully to different parts of your .WAV file (e.g., parts with silence, with low-level signals and different types of musical contents) and switching the *Dee-Plop Filter* on and off subsequently.

If you are in doubt about using the *de-plop* function, it would probably be best to leave it permanently switched on.

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The **De-Scratcher PlugIn** is an easy-to-use audio restoration tool based on extremely efficient signal processing algorithms. In most cases you will automatically achieve good results. To get the maximum, especially when working with heavily damaged audio material, there are some practical rules:

- Use a stereo record player if you restore old mono vinyl or shellac records and process both channels individually before merging again to mono. This improves the signal-to-noise ratio by at least 3dB (actually a factor of two) when compared to the de-scratching procedure applied to pure mono files.
- Transfer recordings to be restored directly to .WAV file without using any processing device like a limiter or compressor prior to *de-scratching* procedure.
- If the audio material to be restored contains very strong clicks, you may allow some clipping while transferring to the digital domain. We recommend you make a few versions recorded with different input gain and compare the results after the *de-scratching* process.
- Use the **DC-Removal PlugIn** to remove the *DC-offset* before going into the **De-Scratcher PlugIn**. This may improve the audio quality for the low-level signal in the whole processing chain.
- To complete the restoration process for old records, first use the **De-Noiser PlugIn** to remove broadband residual noise and eventually the **High-Lowpass PlugIn** to modify the frequency range.
- Do not exaggerate with the *declick* and *decrackle* parameter to avoid artifacts. When working on heavily disturbed material, use a good acoustical compromise between the level of remaining disturbances and artifacts introduced to the output signal. Be indulgent if you have hopelessly damaged material; nobody can restore original data from nothing.
- For the best results, use your own ears in combination with the *difference* feature of the **PlugIn Station**. Switch between the original input signal and the input/output difference, i.e., the part of the signal taken out by the *de-scratching* algorithms. This difference signal normally should not contain any parts of the original signal you want to preserve.

Important Remark:

The **De-Scratcher PlugIn** is a very fast and very effective tool. You will be amazed by how dramatically the audio quality of old records can be improved. But please do not expect miracles if you process material with long gaps or jumps. The information theory says that once the information is lost and there is not enough redundancy in the remaining material, the restoration process for the original material is impossible. In such hopeless cases, experienced mastering engineers try to transfer similar recording parts into gaps using very precise audio editors.

For further information about our other PlugIns and new products visit us on the Internet at:

<http://www.algorithmix.com>

or send e-mail to:

support@algorithmix.com

- if you need any information about installation and performance of this product.

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- if you have general suggestions and questions concerning our product line.

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