

TerraTec



Vinyl Restoration Solution



Manual (English)

# Contents

1. Overview .....	3
2. Getting Started .....	4
3. Playback Section .....	5
4. Processing Section .....	6
5. Descratcher .....	7
6. Denoiser.....	8
7. Application Tips.....	9
8. Keeping in Touch .....	11

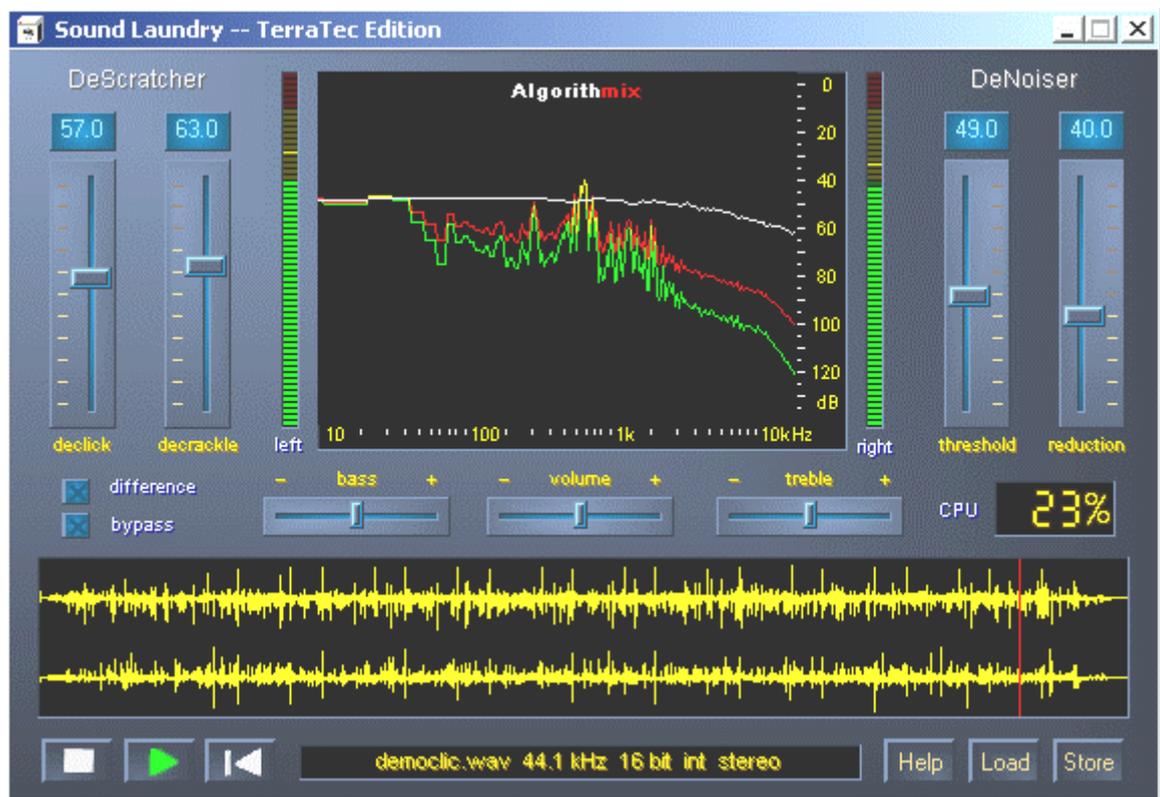


Fig.1: The Sound Laundry™ TerraTec Edition window.

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## 1. Overview

### *Introduction*

**Sound Laundry™ TerraTec Edition** is a powerful tool for cleaning up problematic and historic recordings directly on your PC. It helps you remove or significantly reduce unwanted audio, maintaining authentic sound with almost no degradation of its original quality.

**Sound Laundry™ TerraTec Edition** is an ideal enhancement for audio editing and CD recording programs, especially, if you are interested in transferring all your treasures from tape, vinyl or even shellac records to CD using **TerraTec PhonoAmp**. The **Sound Laundry™ TerraTec Edition** offers almost full functionality comparing to our **Sound Laundry Compact™**. It was developed especially for the multi-media user who does not want to spend hours learning complicated processing procedures, as well as the meanings and uses of the never-ending parameter adjustments needed by other professional software. Both processing modules, *Descratcher* and *Denoiser* require setting up only two parameters for optimization, usually within a few seconds. You can easily do this during real-time playback. In addition, you can adjust the volume and the timbre (bass/treble) of the cleaned output signal.

### *Features:*

- real-time operation with 166 MHz MMX Pentium under Windows® 95/98/Me/NT/2000
- high stability because of stand-alone operation
- 44.1 kHz / 16 bit "red book" WAV format accepted
- the world's fastest off-line processing
- easy, intuitive interface
- remove transient noises like clicks, spikes, static discharge, crackles, pops, surface noise
- reduce constant background noise like hiss, hum, and thyristor buzz
- soften digital distortion and mask drop-outs
- real-time preview while fine-tuning the parameters
- unique difference function for monitoring the noise being removed
- all calculations with up to 80-bit floating-point accuracy

### *Typical Applications:*

- archiving and restoration of historic audio materials
- remastering old recordings to CD: shellac, vinyl, tape
- removing noise from demos recorded onto cassette decks
- cleaning up noisy dialogs or telephone cuts
- reducing noise for AM radio, short-wave radio, and FM broadcast
- removing broadband noise from video tracks

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## 2. Getting Started

### Installation

Sound Laundry™ TerraTec Edition is delivered on a CD configured for automatic installation. If the AutoStarter application does not start automatically, simply double-click autorun.exe (to be found within the root directory of the CD) and follow the on-screen instructions.

For a quick check of the Sound Laundry™ TerraTec Edition installation, simply click  and select the democlic.wav file for processing. Sound Laundry™ TerraTec Edition supports wave files according to the red book standard: 16-bit / 44.1 kHz.

### Operation

Sound Laundry™ TerraTec Edition features an intuitive interface. Following the steps below you can get professional-quality results when cleaning up scratchy or noisy recordings in minutes.

1. Open the File Menu by clicking the **[LOAD]** button.
2. Chose the WAV file you intended to process. The desired file will be loaded and its waveform will appear in the waveform window.
3. Start playback with the  button. At this point you should be able to hear the sound and observe the peak-level meter as well as the Analyzer windows showing input signal, output signal and noise profile. You can stop the playback with the  button and "rewind" to the beginning with the . During the playback it is possible to restart from any point you like by snapping the cursor in the waveform window and placing it at the desired position.
4. If your recording is contaminated with strong transient noises like spikes or clicks, set up the *declick* fader.
5. If your audio material contains crackles or thyristor buzz, set up the *decrackle* fader.
6. If you need to remove broadband noise like tape hiss or remaining vinyl surface noise, use the **Denoiser**; set up *threshold* and *reduction* faders.
7. To compare the original sound with the restored sound, click the box [bypass all].
8. To hear only the "garbage" being removed, activate our unique [difference] feature.
9. Adjust *volume* and *bass/treble* sliders according to your taste.
10. Click **[STORE]** to store the final processed audio material to a new file. Such files (in 16-bit format) can be then written to a CD using any recording program capable of burning audio CDs.
11. How to adjust the parameter of the Descratcher and the Denoiser to gain the best possible audio quality is described in the sections Descratcher, Denoiser and **Application Tips**

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### 3. Playback Section

The **Playback Section** is placed in the lower part of the **Sound Laundry™ TerraTec Edition** window. You can load a WAV file for processing, start and stop playback, as well as jump to the desired position in the WAV file by moving the cursor in the *waveform display*.

After loading a WAV file, its name and format is shown in the *status window* below the **Analyzer** and its waveform is displayed in yellow in normalized view, i.e., properly squeezed to the width of the *waveform display*.

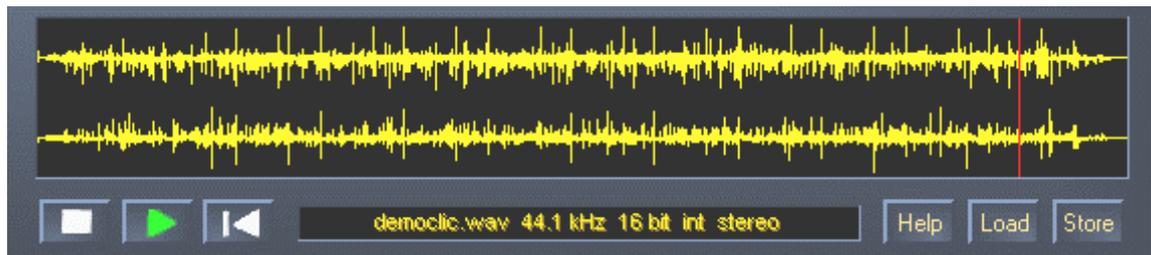


Fig. 2: The Playback Section of Sound Laundry™ TerraTec Edition.

The processed audio material can be stored off-line by opening the file dialog with the **[STORE]** button. The sampling frequency of the output file is the same as the input file (44.1 kHz). File format conversion or sampling rate conversion like 96 kHz to 44.1 kHz should be done by the appropriate high-quality tool in your editing or soundcard software.

#### List of the buttons and switches in the Playback Section

-  opens this help file
  -  stops the playback
  -  starts the playback
  -  moves the playback cursor to begin
  -  opens the load file dialog
  -  opens the store file dialog
- CPU [XX %]** shows the computer load, i.e., how much computational **Sound Laundry™ TerraTec Edition** is using
- difference** allows listening to only the noise being removed during processing
- bypass all** allows listening to the input only bypassing the **Descratcher** and **Denoiser**

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## 4. Processing Section

The Processing Section of the **Sound Laundry™ TerraTec Edition** consists of four main parts: **Descratcher** (left), **Denoiser** (right), **Analyzer** (in the middle), as well as *Bass/Treble* and *Volume* controls (below). Two level meter allow you to monitor the final output level while setting up the volume and bass/treble controls.

Since the CPU requirement of the **Sound Laundry™ TerraTec Edition** is very low (about 30% on a 300 MHz PentiumII for a 16 bit, stereo, 44.1kHz .WAV file) you can optimize all the parameters while listening to the processing in real-time.

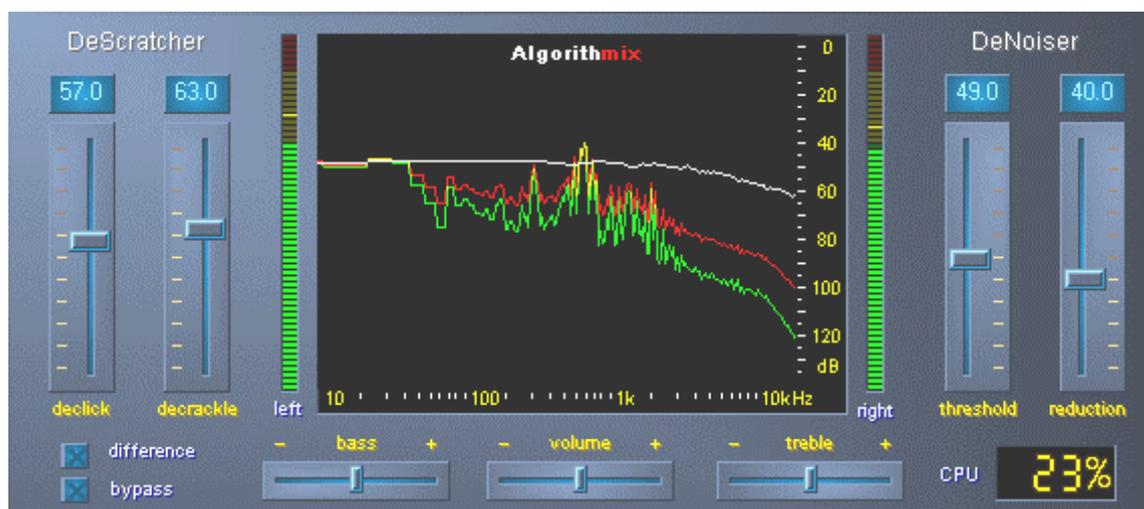


Fig. 3: The Processing Section of Sound Laundry™ TerraTec Edition.

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## 5. Descratcher

The **Descratcher** effectively removes *clicks* and *crackles* from old vinyl or shellac records, and from audio files contaminated during recording due to switching, digital cross-talk, or thyristor buzz.

The *descratching algorithm* consists of two main parts: the *declicking filter* and the *decrackling filter*. While the *declicking filter* is normally used to remove heavy clicks from old vinyl records or switching noise arising from analogue or digital audio equipment, the *decrackling filter* removes any remaining, mostly small but dense clicks called crackles.

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 declicking of typically polluted vinyl records transferred to the digital domain, a *declick* value of approximately 50 works well in the most cases.

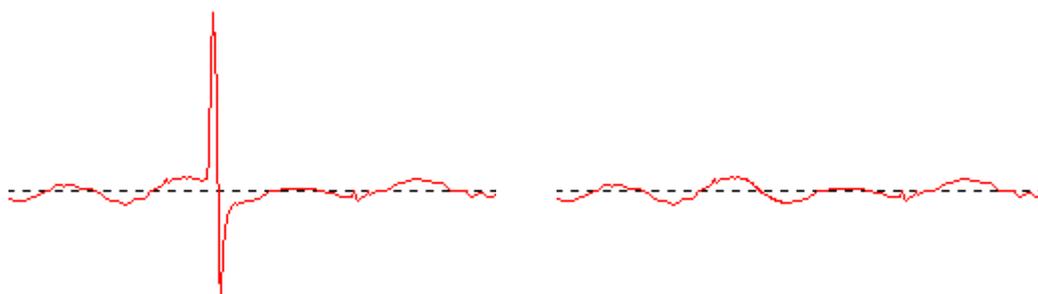


Fig.4: Typical click in the signal taken from a vinyl record (left) and restored signal (right).

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 artefacts. In some cases, even an extreme setting up to 100 can still improve the quality of processed audio material.

In order to minimize the occurrence of artefacts in the descratching process, the final setting of the *declick* and *decrackle* parameters should be performed by critically listening to different parts of the audio file to be cleaned up. We highly recommend using the difference feature of the Playback Section, allowing optimal parameter set-up in a very intuitive way. You can switch between the original input signal and the input/output difference, i.e., the part of signal removed by the descratching algorithms. 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 *declick* and *decrackle* parameter, see Application Tips.

Please note that the difference feature works for both **Descratcher** and **Denoiser** simultaneously. Therefore if you want to *concentrate* only on **Descratcher** performance, leave both **Denoiser** faders (*threshold* and *reduction*) at zero.

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## 6. Denoiser

The **Denoiser** belongs to the so-called single-ended noise reduction systems. This means it does not need any special coding procedure before recording, like in the famous tape noise reduction system from DOLBY™ Lab. It is a tool that efficiently removes any kind of *broadband noise* from pre-recorded audio tracks. The **Algorithmix® Denoiser** is a weapon against tape hiss, noise from telephone-call cuts, and residual noise from old records after processing with the **Descratcher**.

In a single-ended noise reduction systems, the user decides which noise characteristics have to be applied to the *denoising process*. A typical *broadband noise profile*, optimized for surface noise of vinyl records as well as tape hiss, is used in this version of the **Denoiser**.

The *noise reduction* process in the **Denoiser** is controlled by just two parameters, allowing an easy search for optimal results, depending on the given input signal.

The frequency spectrum of the input signal (red), the *noise profile* (white) applied to the processed audio material, as well as the spectrum of the output signal after processing (green) can be followed in the **Analyzer** window.

The *noise profile* (white) marks the threshold border, above which no noise reduction is applied. The *threshold* parameter moves this *noise profile* up and down and can be used to set up the profile just above the background noise level. For a given *threshold*, the second parameter, called *reduction*, decides the amount of removed noise below the chosen *noise profile*.

A good starting value for *threshold* is to set the *noise profile* just above the background noise level (approx. 10 dB). A subsequent increase of the *reduction* parameter should significantly reduce the background noise. If noticeable artifacts in the form of so-called singing or robot-like sounds appear (*time aliasing* phenomenon), decreasing the *reduction* parameter and increasing the *threshold* level (up to about 30 dB above the background noise) usually helps.

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## 7. Application Tips

The **Descratcher** and the **Denoiser** are easy-to-use audio restoration tools 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:

1. 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 descatching procedure applied to pure mono files.
2. transfer recordings to be restored directly to .WAV file without using any processing device like a limiter or compressor prior to the descatching procedure.
3. 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 descatching process.
4. Do not exaggerate with the declack and decrackle parameters to avoid artefacts. When working on heavily disturbed material, use a good acoustical compromise between the level of remaining disturbances and artefacts introduced to the output signal. Be indulgent if you have hopelessly damaged material; nobody can restore original data from nothing.
5. Very strong changing noise level and noise characteristic may be problematic. In such cases professional mastering engineers try to cut the original piece in parts and treat them individually with different de-noising parameters. Later the denoised pieces are joined together.
6. Do not exaggerate the parameters threshold and reduction to avoid artefacts in the form of singing or robot-like sounds (time aliasing). Begin with a moderate adjustment by setting the noise profile to just above the background noise level (approx. 10 dB) and gradually increasing the reduction parameter. Finally try to recursively find the best relation between these two parameters.
7. If you are working on heavily disturbed material, find a good acoustical compromise between the level of remaining noise and artefacts introduced to the output signal. Be indulgent if you have hopelessly noisy material. Nobody can restore the original signal without having enough original information.
8. It helps sometimes to apply the denoising process two or more times consecutively with a moderate parameter setting rather than one pass with an extreme setup.
9. A recommended tool that significantly helps to adjust the **Denoiser** parameters is the **Analyzer**. It allows for following the denoising process, especially the influence of the noise profile and parameters.

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10. If you feel that the output signal is not enough loud increase volume watching the left and right level meters. If you realize that the most highest red LEDs shine the volume is already too high; you have reached so called clipping level which may results in audible distortions.
  11. It is possible to smoothly increase (+) or decrease (-) the amount of high and/or low frequencies in the final output signal according to your sound timbre preferences using bass and treble sliders. It is possible that the raising of the bass or treble controls increases output signal volume up to the clipping level. In such case you need to lower the volume slider until clipping disappears (the most highest red LEDs does not shine anymore).
  12. Low-cost sound cards used for A-D/D-A conversion may themselves introduce severe artefacts and noise to an audio signal. For professional applications, use high-quality audio cards like the TerraTec EWX 24/96.
  13. If you record and process your audio files using 48 kHz or even 96 kHz sampling frequency, you have to be sure to use a high-quality conversion tool if going down to the CD sampling rate frequency, 44.1 kHz.
  14. For the best results, use your own ears in combination with the difference feature of **Playback Section**. Switch between the original input signal and the input/output difference, i.e., the part of the signal taken out by the descrambling and denoising algorithms. This difference signal normally should not contain any parts of the original signal you want to preserve.

#### **Important Remark:**

The **Sound Laundry™ TerraTec Edition** is a very fast and very effective tool. You will be amazed by how dramatically the audio quality of old records and problematic audio files 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. The same is if you process material containing so much noise that the original signal is no longer distinguishable. Also here the information theory says that once the information is sunk in noise (very bad signal-to-noise ratio) and there is not enough information about the properties of the original signal, or even worse, the original signal is in addition non-linearly distorted, the *denoising* process can deliver only limited-quality results.

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## **8. Keeping in Touch**

For further information concerning enhancements, updates and new Algorithmix® products, visit us on the Internet at:

**<http://www.algorithmix.com>**

or send e-mail:

to **[support@algorithmix.com](mailto:support@algorithmix.com)**

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

or to **[info@algorithmix.com](mailto:info@algorithmix.com)**

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

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