ATC Labs
Audio Technologies and Codecs

AutoAudioDenoizer User Manual

System Requirement

Operating System: AutoAudioDenoizer is currently available for **Windows XP** and **Windows Vista** operating systems.
Hardware: Because of high processing requirement we recommend a high end PC/Server for running the AutoAudioDenoizer. For example, a **Dual/Quad Core processor with clock speed of 2.2 GHz** (or higher) or a **single core Pentium with a clock speed of 3.6 GHz** (or higher) is recommended. System RAM of at least 1 GB is recommended.
Audio Hardware: AutoAudioDenoizer has been tested with a variety of professional and consumer grade sound cards with both digital and analog inputs. As described in other sections of the user manual, it automatically detects all available sound input/output options present in the system and lets the user select from the available options.

Quick Start

The quickest way to getting started with AutoAudioDenoizer is:

1. Run the AutoAudioDenoizer exe to start the application.
2. Select the input/output devices using the drop down menus (the default devices are already shown selected). If the selected input is an audio device, you will be prompted for an additional selection of sampling rate (currently AutoAudioDenoizer supports two sampling rates: 44.1 kHz and 32 kHz).
3. Select the Profile from the drop down menu (Default is shown selected)
4. Press the Play button.

Important Note for Windows Vista Users: Vista users may need to go to Control Panel->Sound->Playback, select the device and click on Properties->Advanced and select the sample rate and bit depth. While the bit depth should be chosen as 16 bits, the selected rate should match rate of input as selected above. The same steps should be repeated for recording devices. Distortions in audio, like clicks and pops may be heard if this step is not performed.

In case of any lingering performance issues like clicking, distortion etc. please contact: **support@atc-labs.com**

Beginners Guide to AutoAudioDenoizer

AutoAudioDenoizer incorporates five different tool sets: Wideband Automatic Noise Removal (WANR), Voice Enhancement (VE), Incoherent Component Suppression (ICS), Dynamic Listening Fatigue Reduction (DLFR) and Hum Removal. These five different tools managed judiciously can provide crystal clear, pleasant, noise free high quality audio and offer the user flexibility for creating a customize *signature* sound. However, an experts work is not required to handle the product satisfactorily. The product is designed with a simple and easy to use interface and it should not take more than few minutes for one to master the essential controls after the software installation.

The main function of the AutoAudioDenoizer, as the name suggests, is to clean-up any noisy audio and to make it free from many kind of distortions like a scratch or a hiss or a hum. Apart from its prime functionality, i.e., noise removal, the product comes with other audio conditioning tools, like VE, ICS and DLFR; to enhance and enrich the listeners experience of the audio. ICS and DLFR are complex signal processing algorithms based on psychoacoustic principles which smoothen the audio to better a listeners overall experience. More information regarding these tools may be found in the Tuning Guide section.

See Also:
Display Screen
Input, Output And Profile Options
Tuning Guide

Display Screen

The monitor has three display modes namely Spectrum mode, Spectrogram mode and Display OFF mode. In Spectrum mode the display provides a graphical representation of frequency spectrum. The spectrum displays a graph of magnitude (in dB) versus frequency values (KHz). In Spectrogram mode the display provides a graphical representation of the spectrogram of the signal. The spectrogram displays the energy distribution of signal over frequency and time. One can switch between the input and output signal displays in the above modes.

Input, Output and Profile Options

Input :

There are two methods to feed an input. Input could either be from a stored file from a storage disk or could be fed in live from an audio card. The supported sampling rates for the input are 32 KHz stereo and 44.1 KHz stereo.

File Based Input:

Only Wave format (.wav) files are supported in this mode. **At this time mono files are not supported (please convert mono files into stereo before processing).**

Audio Card Input:

The software automatically detects and lists a set of sound cards installed in PC. On choosing a desired sound card the audio could be fed-in directly from the input and be processed real time.

Output:

The output of a processed audio could be stored in a file or could be fed-out in real time to an audio card.

File Based Output:

Only wave format (.wav) files are supported in this mode.

Audio Card Output:

The software automatically detects and lists a set of sound cards installed in PC. On choosing a desired sound card the processed audio is fed-out real time.

Profile :

Profile options allow users to save a specific set of parameters to customize the AutoAudioDenoizer for their own specific usage.

Save a Profile:

Save a profile after customizing the parameters of AutoAudioDenoizer, i.e., after setting the required parameter value for WANR, ICS, DLFR, Voice Enhancement and Hum removal. The profile could be saved under a profile name.

Load a Profile:

Any saved profile could be loaded by a simple point and click from the list under profile tab.

Remove a Profile:

A saved profile can be deleted by using remove profile option.

Description of Preset Profiles

Preset Name	Preset Description
Pure –WANR-Light	Light noise removal using the WANR wide-band noise removal algorithm.
Pure-WANR-Heavy	High grade noise removal using the WANR wide-band noise removal algorithm.
Pure Music – Very Light	A small of level of ICS and DLFR. Attempts to reduce listener fatigue.
Pure Music - Light	Small level of WANR, VE, ICS and DLFR. Attempts to reduce listener fatigue.

Vocal Music – Very Light	Small level of WANR, ICS, VE and DLFR. General purpose very light noise removal/conditioning for music. Attempts to make voice more clear, improve coherence and reduce listener fatigue. Relies primarily on VE, ICS and DLFR tools.
Vocal Music –Light	Small level of WANR, medium levels of ICS, VE and DLFR. Attempts to make the voice more clear and reduce listener fatigue.
Music-Oldies-Light	Light noise removals targeted towards 60s/70s music or similar recordings with noise and make the voice more clear using VE.
Talk-NewsRadio-Light	Light noise removal for talk, news, voiceovers, type material with occasional music. Small levels of ICS, VE and DLFR.
Talk-NewsRadio-Medium	Medium noise removal for talk, news, voiceovers, type material with occasional music. Medium levels of ICS, VE and DLFR to make the voice more clear and reduce listener fatigue.
Talk-NewsRadio-Heavy	Heavy noise removal for commentary, talk, news, voiceovers, type material with occasional music. Focused towards cleaning up voice material. High levels of ICS, VE and DLFR to make the voice more clear.
Talk-Clear voice	Heavy noise removal for commentary, talk, news, voiceovers, type material with occasional music. Focused towards cleaning up voice material. Medium levels of ICS, VE and DLFR to make the voice more clear and reduce listener fatigue.
WANRPlus-Medium	WANR algorithm in combination with DLFR tool for listener fatigue reduction in addition to noise removal. Applied at a medium level.
WANRPlus-Heavy	WANR algorithm in combination with DLFR tool for listener fatigue reduction in addition to noise removal. Applied at a heavier level.

Tuning Guide

This chapter briefs the use of different tools by explaining their functionality.

Bypass Processing:

By checking the bypass processing button the processing done in the AutoAudioDenoizer is bypassed. This helps the user judge the quality of audio before and after processing instantaneously by switching between modes.

WANR (Wideband Automatic Noise Removal Toolkit):

The dial runs values from 0.0 to 1.0. A user can choose the level of noise filtering by varying the value of the dial. An increasing dial value increases the level of noise filtering in the audio. A user who is uncertain of the level of noise for an input can conveniently leave the dial in the 0.5-0.6 range.

ICS (Incoherent Component Suppression):

This module detects the Sibilant/Fricative sections of the input audio and smoothes the corresponding audio section. The slider reads the Start frequency, which specifies the frequency threshold above which the processing is done. The

dial controls the intensity of processing done by the algorithm. The frequency scale is divided between 4 and 8 KHz. A novice user can set safely set the dial at 0.6 and the start frequency at about 6-8 kHz.
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DLFR (Dynamic Listening Fatigue Reduction):

This module conditions temporal envelope in multiple frequency bands. To smoothen the audio the dial value should be at high end and to let in more dynamics dial value should be at lower end. The 10 vertical bars below the dial provide finer control over envelope conditioning in individual frequency bands (with indicated center frequency values). The higher the sliders the smoother is the audio in that band. There are two associated slider controls which control respectively the tonal characteristics of overall audio and the refinement level of envelope conditioning. For a novice user, good initial setting for all the DLFR controls may be found by selecting the "Music-GeneralPurpose-Light" preset profile from the profile menu. The other controls like WANR and ICS may then be modified while maintaining these values for DLFR control.

HUM REMOVAL:

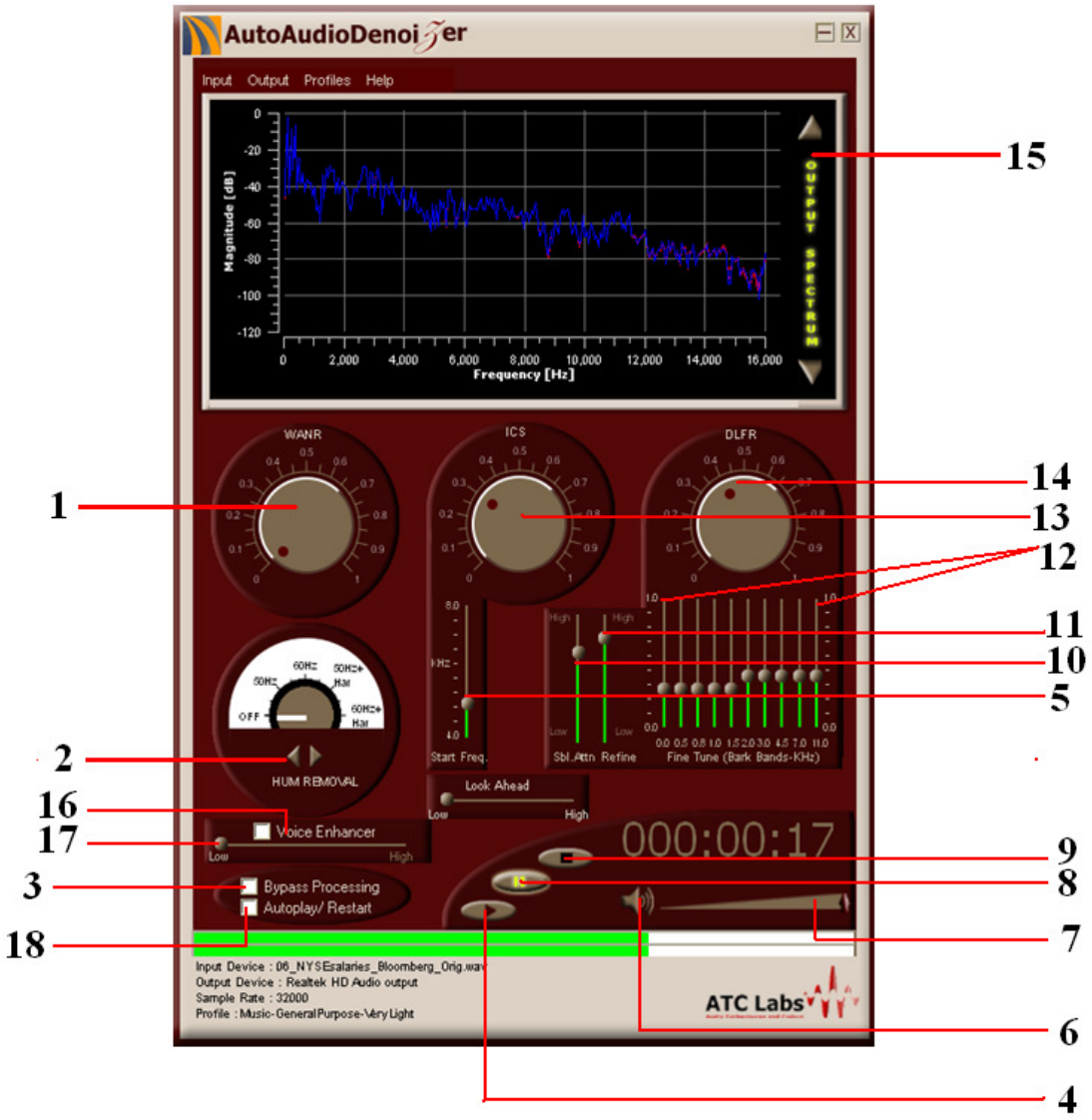
This module filters any hum at 50Hz/60Hz and optionally a first harmonic. To filter the first harmonic the controls 50Hz+Har and 60Hz+Har should be enabled.

VOICE ENHANCEMENT:

This module enhances the speech/vocal content of an audio file if the corresponding box is checked. The slider is used to adjust the level of enhancement for the vocal portion of the audio. A novice user can set safely a value of 0.4 to 0.7 for speech files and 0.2 to 0.4 for music files. For high energy audio files, a lower gain is preferable.

User Interface

1. WANR Knob
2. HUM Removal
3. ByPass Processing
4. Play Button
5. Start Frequency Controller
6. Speaker Mute/ UnMute button
7. Volume Controller
8. Pause Button
9. Stop Button
10. Refine Controller
11. Tonal Controller
12. Frequency Band Controllers
13. ICS Knob
14. DLFR Knob
15. Display Selections
16. Enable Voice Enhancement
17Voice Enhancement Level
18. Enable Auto Restart


AutoAudioDenoiser
Input Output Profiles Help
Magnitude [dB]
Frequency [Hz]
OUTPUT SPECTRUM
WANR
ICS
DLFR
HUM REMOVAL
OFF
Start Freq.
Sbl.Attn Refine
Fine Tune (Bark Bands-KHz)
Look Ahead
Low
High
Voice Enhancer
000:00:17
Bypass Processing
Autoplay/ Restart
Input Device : 06_NYSEsalaries_Bloomberg_Orig.wav
Output Device : Realtek HD Audio output
Sample Rate : 32000
Profile : Music-GeneralPurpose-VeryLight
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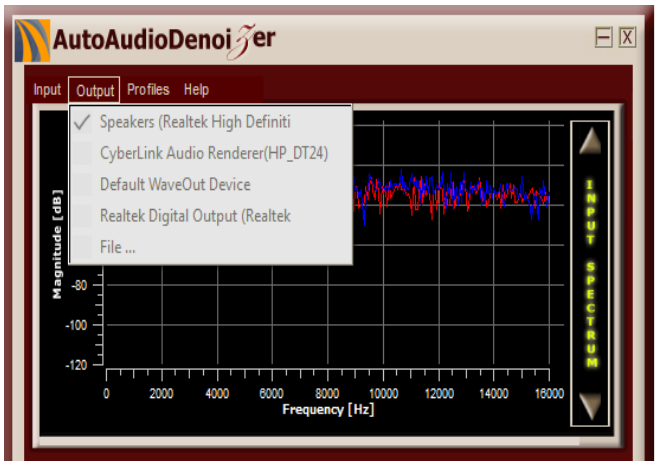
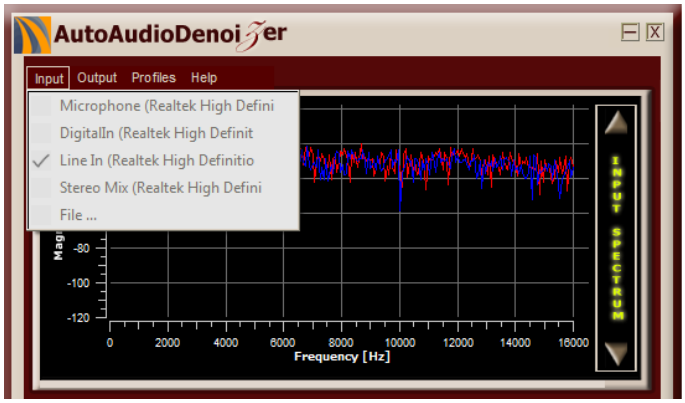

AutoAudioDenoiser
Input Output Profiles Help
Speakers (Realtek High Definiti
CyberLink Audio Renderer(HP_DT24)
Default WaveOut Device
Realtek Digital Output (Realtek
File ...
Magnitude [dB]
Frequency [Hz]
INPUT SPECTRUM


AutoAudioDenoiser
Input
Output
Profiles
Help
Microphone (Realtek High Defini
DigitalIn (Realtek High Definit
Line In (Realtek High Definitio
Stereo Mix (Realtek High Defini
File ...
-80
-100
-120
0
2000
4000
6000
8000
10000
12000
14000
16000
Frequency [Hz]
INPUT SPECTRUM