Audio Lab V1.1D

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Please see the What's New section at the end of this document for information on the latest features and fixes.

Description: Audio Lab is a waveform editing program for Windows 3.1 that is able to edit samples in Microsoft .WAV RIFF WaveAudio format, as well as Creative Labs (SoundBlaster) .VOC files. A number of special effects (such as echo, reverse, and invert), and utilities (Max Volume, Set Volume) are included. The Multiple Document Interface is used to make the program easy to use and to allow mixing of various source samples into one master, for example. All 8-bit samples are converted into 16-bit for processing, to minimise the effects of rounding errors on the background noise in the sample. This program also features a real-time spectrum analyser based on the Fast Fourier Transform. A 386DX/40 or better is recommended for this feature.

Audio Lab was written using *Borland C++* , donated by Borland (N.Z.) Ltd. for this purpose. It won the Under-18 division of the 1993 New Zealand Software Awards.

Requirements: Windows 3.1/NT/Win-OS/2/WABI
    800k free disk space.
    VGA or better display.
    386SX/16 CPU or better.

(Optional but Recommended) : A sound card and Windows driver (preferably not PC Speaker).
    386 Enhanced Mode (for editing waveforms > 1MB in size).

Features: Audio Lab uses many of the facilities available in Windows 3.1:
    Drag-and-drop .WAV files from the File Manager
    Common Dialog boxes (for File Open, Save and Save As)
    Borland Windows Custom Controls used in dialog boxes
    Full support for all Windows sound drivers including PC Speaker, printer port.
    Individiual (private) .INI file
    Toolbar making access to commonly used functions easier

Status Bar which gives interactive help on all menu options
Wave Window above the status bar -- a fully zoomed-out view of the sample currently being edited.

Using Audio Lab: Mostly, the user interface is fairly standard, but if you feel that any part of it is too obscure, please let me know. Those who have used Creative WaveStudio may notice the familiar appearance, this is just to prevent Not-Invented-Here syndrome from taking over. A couple of interesting ideas featured in GoldWave were used as well.

Spectrum Analyser: The spectrum analyser is not based on the same spectrum divisions as defined by the ISO (which are found on all stereos), but instead on the frequency co-efficients outputted by the Fast Fourier Transform. (If you don't like it, click the 'Off' Radio Button). The order is still the same (low to high frequency) but each bar represents the next highest harmonic of (sampling rate / 64), up to half the sampling rate for the right-most bar. This is the reason that the spectrum looks the same even when the sampling rate is changed. The right-most (dark red) bar represents total volume.

PC Speaker/Disney Sound Source/Printer port sound devices: These drivers limits the operation of Audio Lab and other programs because of the way they monopolise system resources when playing. This means that the spectrum analyser and oscilloscope will not function when using one of these drivers.

Marking blocks: To mark a block, click and drag on either the Wave Window (bottom of the screen) or the file window that contains the samples you want to mark.

Effects: The ring modulator will probably be familiar to some synth users, someone please tell me if it is working properly. It is designed to be used with relatively pure tones (ie sine waves). The Max Volume command may produce 'disappointing' results when a sound is amplified, because sounds recorded at a fairly low level have the background noise amplified along with them. Use the Noise Gate to get rid of low-level noise before using Max Volume, unless your sample is *really* quiet. The noise gate gets rid of background noise (and the rest of the signal) below a certain volume level. If used correctly it can reduce background noise between words when someone is talking, drumbeats. etc.

Note that if you try and use Set Volume to increase the volume too much, the sample values will become too large and will have to be 'clipped' to a range of -128 to +127. The result of this is distortion, the digital equivalent of turning your stereo up too loud. (Except that you won't melt any transistors this way). Try and keep the volume as high as possible without clipping while you are applying effects in order to minimise noise introduced by inevitable rounding errors in the integer mathematics. (All waveforms, even 8 bit, are treated as 16 bit to minimize rounding errors, etc).

There are several different effects that you can produce with the Echo command. Delays of 1-20 milliseconds will give 'Chorus' effects, making music sound like it is being played on twice as many instruments (sort of, it isn't that great, I'll do a proper Chorus effect later). Repeatedly using a 20 msec delay on a speech sample will make the voice sound 'robotized'. Several echoes in the 20-1000 msec range will produce different kinds of reverb, some of which turn out very well. The human ear generally regards delays of greater than 20 msec as distinct echoes. Technically, the sample length should be increased each time there is an echo, but it is not possible to tell that Audio Lab is cheating by leaving samples the same length. If you don't like this, use the Tools |

Add Samples command to add some empty samples to the end of the waveform.

Paste RingMod: This works like the ring modulator, except that it multiplies each sample by the sample that is being pasted in. This gives a variety of 'robotized', 'science fiction' effects. It works best if you use a sine wave or something similar (eg a sample of some whistling), and it needs each waveform to be loud, otherwise the resulting waveform will probably be quiet.

GP Faults: If Audio Lab causes a GP Fault, Windows will may become unstable because of it. In the event of a GP Fault, your data could be at risk if any of Windows' internal data structures have been damaged. Save all of your work into *new* files and restart Windows before doing anything important. Please report what you did to cause a GP Fault, Dr. Watson logs are appreciated too.

Raw Files: If you load a file that does not have a .WAV or .VOC extension it will be assumed to be 'unsigned, 8 bit, 22.05 kHz' data. To change the sign (in case the waveform sounds terribly distorted) use Tools | Change Sign. To change the sampling rate use Tools | Sampling Rate...

Recording/Playback: Results may be disappointing, especially on Soundblaster V1.0 cards. On cards like the SB V1.0, there is a noticeable 'bubble' type sound that occurs regularly throughout anything that is recorded. This is unavoidable in any Windows multimedia program due to interrupt latency during DMA double buffering. (So now you know). To a lesser extent this applies to playback as well -- the effect is most noticeable when playing 'pure' tones such as sine waves and there is nothing that can be done about it unless an improved sound driver is used. Newer sound cards suffer less (or not at all) from this problem.

Bug reports/comments/questions:

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BBS: Enigma (+64-9-480-0951)
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Any feedback is greatly appreciated!.
Watch Powerlink or the comp.sys.ibm.pc.soundcard newsgroup for updates.

Revision History / What's New:

Version 1.1D

o Added support for loading and saving of RAW (unknown-format) files.
o Added Tools | Change Sign menu option.
o Prevented Audio Lab from running (but acting strangely) on EGA or worse displays.
o Re-built with Borland C++ V4.0.
o Dialog Boxes improved and BWCC 2D controls replaced with Ctl3D 3D controls.
o Removed the need for WICSCC.DLL.
o Improved the ability of Audio Lab to allocate big chunks of memory for large processing
                operations, reducing 'out of memory' errors.
o Removed the ability to mark a block of samples while a waveform was loading, which
            could potentially cause problems.
o Bugs in recording fixed:
            + Clean-up is done properly after recording has finished.

+ Crashes caused by recording before using Audio Lab to play a waveform are fixed.
+ The 'percentage recorded' indicator is now correct.
+ The main window is now correctly re-painted after recording, instead of leaving remnants of the old waveform.

o The screen is refreshed/repainted if necessary before effects processing begins.
o Improved Noise Gate tool
+ Faster
+ Now 'cuts in' after a short delay. This helps to prevent parts of the waveform intended to be preserved from being damaged.
+ Fades waveform in or out from silence to reduce possible clicks and pops.

o Fixed a bug that caused block marking to ignore the last few pixels of the waveform, making it difficult to 'cut' the last few samples from the waveform.
o Fixed crashes caused by WaveAudio drivers that cannot handle zero-length waveforms correctly.
o Effects | Spectrum Invert menu option implemented.
o 'Options' menu is now available when no files are open.
o Improved mouse-handling:
+ First mouse-click on a newly opened file is no longer ignored.
+ Double-click on a zoomed-in view to zoom-out and clear the marked block of samples.

o Ring modulator now preserves more of the original signal quality at the expense of a small amount of speed.
o Very small marked blocks are now visible against the waveform background.
o Improved waveform display:
+ Increased speed of waveform drawing by 1.1 to 1.5 times on unaccelerated graphics cards, and by up to twelve times on graphics accelerators.
+ Waveforms are now drawn with 'up' representing positive sample values.
+ Eliminated unnecessary screen re-draws.
+ Increased accuracy in waveform display.

o Fixed bug that caused 'impossible' menu options to be available on zero-length files.
o New code for the Spectrum Analyser:
+ Faster.
+ 8 times more accurate.
+ Twice as many bars.
+ Flicker is eliminated.
+ Volume level indicator.
+ Minimised the amount of unnecessary oscilloscope redrawing.

o Implemented 'Loop' button in Media Controller.
o Added 'Zoomed' note to the title bar of all files when a block has been marked, reducing confusion when very small blocks have been marked.
o Distortion (caused by clipping of very loud signals) in the Echo command is reduced.
o Samples not affected by the Echo command are now reduced in volume to match the amount of the original sample remaining, giving a better sounding effect.
o Removed intermittent crashes when Audio Lab was closed while the Media Controller was open.
o Bug fix: Can now create New files with 4000->48000 Hz sampling rate.
o Fixed GP Faults on drag/drop of a file onto Audio Lab when it was iconized.

o New message box that gives help on why recording won't work on New files.

Version 1.1C1 24/9/93

o Properly implemented Edit | Paste RingMod.

Version 1.1C   22/9/93

o Fixed bugs caused by having no sound drivers installed.
o Fixed keyboard handling in Media Controller.
o Improved bitmaps used for Toolbar buttons.
o Improved layout/text in the online help.
o Spectrum Analyser is now at least 400% more accurate.
o Fixed memory leaks that were eating up system resources.

Version 1.1B

o Total re-write from scratch. Faster, more efficient, less bugs. Lots of new features. Better user-
                interface.
o This version entered in the 1993 New Zealand Software Awards (Under 18 Divison).

Version 29:

o Fixed GP Fault/strange behaviour when closing files while sound was playing.
o Added Effects | Quantize command.
o Added Edit | Set Marked Block command (for precise block marking/adjustment)
o Improved dialog boxes, now with better (smaller) font and better edit boxes.
o Added capability to resize marked blocks.
o Created a 'code morgue' which now contains 1,000 lines of code that is no longer necessary,
          or obsolete. Result is speed + size improvements.
o Implemented 3D Common Dialogs for consistency with other dialogs.
o Fixed the Tools | Volume display.
o Fixed GP Fault when recording ran out of memory.
o Implemented a real-time oscilloscope monitor display for use during recording.
o Fixed GP Faults when a file was opened and the main window was below a certain size.
o Re-wrote the bitmap display, now contains no floating-point maths:
        - Now uses 50-85% less memory (up to several hudred k less per open file).
        - Draws several times faster, especially on slower displays.
        - Up to 8 times more accurate than the previous displays.
o Fixed GP Faults/ghost windows left after cancelling 'Do you wish to save?' process.
o Fixed GP Fault relating to Spectrum Analyser and a bug that ate CPU time even when it was
off.
o Fixed main window positioning error after being maximised from an icon.
o Fixed GP Fault when pressing the 'play' button when something was already playing.

Version 28:

o Implemented saving of VOC files, loading of VOC files up to 44.1 KHz.
o Fixed bug in Save As where the new filename was not being displayed in the title of the
window.
o Implemented real-time 15-point FFT based Spectrum Analyser.

o Filter | Low Pass now has a dialog box to choose the cutoff frequency.
o Implemented Help | Index command and a simple help file.
o Generally improved the user interface to the recording functions.
o Added support for the PC Speaker driver, although this limits the functionality of the status bar.
o Replaced sample processing code with a 16 bit ('CD Quality') library to reduce mathematically
   caused noise, even in 8-bit samples.
o Optimised and streamlined many of the special effects.
o Fixed bug where part of the status bar in file windows was being erased in files with no
samples.
o Fixed bug that caused a GP Fault whenever the main window was resized and it contained file
   windows that had no samples in them ('new' files).
o Fixed bug where main window was not being drawn correctly if Audio Lab started off
   maximised.
o Fixed GP Faults when quitting Audio Lab with multiple 'New' files open.

Version 27:

o 9,000 lines of C++ code written.
o Improved user interface - bitmaps, etc for 3d effect.
o Implemented block marking and zooming in via the file windows for better ease of use.
o Implemented a Status Bar for all the file windows to show the marked block information.
o The zero-level line in the file windows is now centered more accurately.
o Replaced position indicator for Play operation with a 'bar chart' below the Wave Window.
o Added 'Play Looped' checkbox to the Toolbar.
o Converted VOC File loading to use the C++ 'iostreams' library.
o Fixed bug in mouse pointer handling in Wave Window.
o Implemented Edit | Paste Difference functionality.
o Fixed GP Fault when closing main window with unsaved work.
o Fixed intermittent 'Divide by Zero' error on loading a file.
o Added Edit | Paste Mix functionality.
o Added Tools | Set Sampling Rate command and dialog box.
o New customised Edit boxes now no longer accept numbers being typed into them.

Version 26:

o 7,500 lines of C++ code written.
o File | Open now supports simple .VOC files (without silence markers, < 22222 Hz).
o Implemented Edit | Clear, Edit | Copy, Edit | Select All.
o Added Cut/Paste system and Paste command.
o Improved layout and position of dialog boxes.
o Implemented Waveform Zooming in the MDI 'document' windows when a block is marked.
o Fixed a bug which caused marked blocks to be faulty if main window hadn't been resized.
o Wave Window is now functional and apparently bug-free.
o Added Edit | Repeat Marked Block command.
o Added 'New File' Toolbar button.
o Fixed some bugs relating to new files.
o Added Sample | Play Marked Block command - find out what you are about to edit more easily.
o Added Edit | Cut Unmarked Areas command.
o Added three new ways to display waveforms to the Tools menu.
o Status Bar now fully implemented.
o Edit | Cut command now re-vamped, no crashes apparent, dramatically faster.

o Sample | Record command and Toolbar button now fully functional, two dialog boxes have been
        created to support recording, which works at long last.
o Added Tools menu and Tools | Preferenes option with dialog box to choose media devices.
o Added Effects | Silence command.
o Fixed bug in volume decrease.
o File | Save menu option is now operative.
o Added Effects | Volume Ramp and created a dialog box and info-string for it. Only works
        for increases in volume presently.

Version 25:

o 5,000 lines of C++ code written.
o Added Noise Gate dialog box and fixed problem that stopped it from doing anything.
o Fixed bug in Noise Gate for >64k samples.
o Added Effects | Set Volume command and dialog box.
o Waveform bitmap displays are now much better, especially for short samples. Faster, too.
o Echo dialog box now works (almost fully, except for the up/down buttons).
o Intro dialog box is now drawn in the center of the screen.
o Problems with the Edit | Cut command have been removed (but do not remove the 32,767th
        sample!).
o Help window now closes when Audio Lab closes.
o AUDIOLAB.INI is now updated and read correctly.

Version 24:

o Fixed File | Save As menu option so that it saves the file in the last open directory.
o Echo... command now works correctly if a block is marked.
o Low Pass Filter implemented (fixed at 100 Hz cutoff point).
o Filter menu fixed - no longer does other functions at random.
o Effects | Max Volume command now works properly.
o Reverse command now works with improperly saved samples (those with an odd number of
        samples, such as those made by the Sound Records applet).
o Got rid of orphaned Position Bars (used to show current position when playing) when an effect
        is applied or the main window is resized.
o Changed the bitmaps on the 'Open File' and 'Save' Toolbar buttons to prevent legal action. :-)
o Windows inside the main window are now slightly faster to update at the expense of a little
        memory.
o Implemened Edit | Cut command.