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# Chapter 1

## in

### 1.1 AudioScope.Guide Table of Contents

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### 1.2 AudioScope Spectrum Analyzer

#### INTRODUCTION

This program computes and displays a real-time frequency spectrum analysis of audio signals. It requires an accelerated Amiga (68020 as a minimum) and an 8 bit audio digitizer (PerfectSound3, Sound Magic, Sound Master, DSS 8, or Generic digitizer). A 512 point Fast Fourier Transform (FFT) is used to analyze the frequency content of the input audio signal, resulting in a very high resolution spectrum analysis. AmigaDOS 2.0 or 3.0 is required.

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## RUNNING AUDIOSCOPE

Connect your parallel port audio digitizer to your Amiga and an audio source to your digitizer. Then run AudioScope to display an audio frequency power spectrum showing the level (decibels or DB) and frequency (cycles per second of Hz) of the audio signal.

Menu items are available to select the proper audio digitizer. You may also select left or right channel and line or microphone input provided you are not using a generic digitizer.

## DISPLAY MODES

You are also given menu items for choice of either the "Immediate" or "Historical" display modes. The Immediate mode gives a real-time display of audio signal amplitude vs. frequency. The Historical mode gives a scrolling color time history display of audio signal amplitude vs. frequency. If you are using AmigaDOS 3.0, you can call for a screen color requester which allows you to customize color-amplitude scaling of the Historical display. Choose "Palette" from the Project Menu for to bring up the screen color requester.

## GAIN SETTING

If you are using the PerfectSound 3 or DSS 8 audio digitizer, you may use the keyboard Up and Down arrows to adjust digitizer gain to the maximum level possible without clipping of the input audio signal. Clipping occurs if amplitude of the audio signal is too great for the 8 bit capacity of the audio digitizer. Clipping is indicated by the word "Clip" which appears at the upper right corner of the display.

## FREQUENCY SETTING

Use the keyboard Left and Right arrows to adjust the digitizer sampling rate to the desired value between 2000 Hz and 24000 Hz. The frequency range of the spectrum display will be 1/2 of the selected sampling rate. Choose a sampling rate appropriate to the frequency content of the audio source. For example, if you expect no frequency components above 8000 Hz, a sampling rate of 16000 Hz is appropriate. If the audio source contains large components at frequencies higher than 1/2 the sampling rate, these components will appear at false (aliased) locations on the frequency spectrum display.

## CURSOR POSITION

Moving the mouse pointer over the frequency spectrum display will give a cursor position readout of the signal power level and frequency at the pointer location.

## DISPLAY RATE

Display rate, or the number of times per second that a frequency analysis and plot is completed, is also shown. The 512 point FFT is a severe computational task. A standard Amiga 3000 at 25 MHz in Immediate Mode is able to achieve a display rate of 17 Hz at a sampling rate of 16000 Hz. An Amiga 4000 achieves a display rate of about 32 Hz under the same conditions. Use of very low sample rates will decrease display rates

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significantly.

The scrolling color Historical Mode is an even heavier system load that is best handled by a fast CPU and AGA. An Amiga 4000 can achieve an update rate of 22 Hz in Historical Mode at a sampling rate of 16000 Hz. With AGA interleaved bitmaps, the color display is steady and free of any flashing that can occur with older machines.

Display rate is an indicator of the shortest duration of sounds that AudioScope will detect. For a display rate of 10 Hz, AudioScope may not pick up sounds shorter than 1/10 second in duration.

#### DISPLAY FREEZE

You can freeze the display at any time by tapping the spacebar. Tap the spacebar again to resume processing. Processing and display is also suspended when the AudioScope window becomes inactive.

#### IN CASE OF DIFFICULTY

AudioScope will not run under AmigaDOS 1.3, if the parallel port is busy, or if it cannot allocate Audio Channel 0 for its own use. AudioScope takes control of Audio Channel 0 for use as the timer for digital sampling. Thus any program running in parallel with AudioScope will lose the use of Audio Channel 0. Otherwise, AudioScope multitasks well and will run in parallel with other programs.

The digitizer gain control adjustment (keyboard up/down arrows) only work for the PerfectSound 3 or DSS 8 digitizers which allow software control of digitizer gain.

In order to open this AmigaGuide document from within AudioScope, the AudioScope.guide file must be present in the same directory as AudioScope, and the AmigaGuide or Multiview program must be present in your sys:utilities directory.

#### PROGRAM USES

AudioScope can be used to experiment with sounds of all kinds, to examine the frequency response of audio equipment, and to determine the proper sampling rate to be used in sampling and recording of an audio signal. Any audio signal can be used as an input, including the Amiga's own output audio from mod players or other programs.

#### CREDITS

AudioScope was written by Richard Horne for the enjoyment of the Amiga community and to demonstrate the power and flexibility of the Amiga computer. Send comments or questions to [RHorne@cup.portal.com](mailto:RHorne@cup.portal.com).

Dozens of friendly Amiga users on Internet participated in debug of this program. Without their help, AudioScope would not have been possible.

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