Introduction

With AudioWave 2.0 your soundcard becomes a comfortable LF-signal-generator, which produces signals from 1Hz to 20 kHz with a resolution of 1 Hz. Phase shift between left and right channel is adjustable from –180° to +180° and an attenuator can be used for steps of 0dB, -3dB, -6dB, -10 dB, -20 dB, -30dB. Frequency, level and attenuation can be adjusted independently for left and right channel and optionally left and right channel can be chained. AudioWave produces sine and noise signals, as well as modulated signals. Automatic frequency and level progress is programmable. Complex adjustment can be stored as presets with clear names.
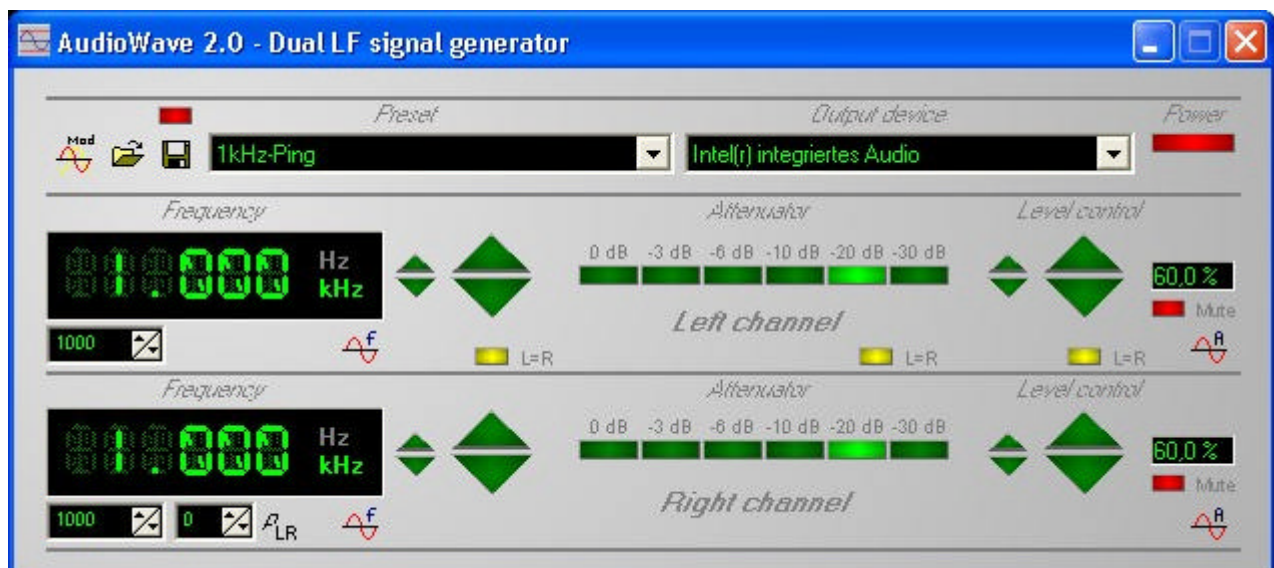
Improvements of version 2.0:

- Frequency adjustment 1Hz...20 kHz; 1 Hz resolution
- Direct frequency input via keyboard
- Soft frequency change
- Independent or chained control of frequency, level and attenuation for left and right channel
- Channel mute function
- Duration up to 60 seconds for modulated signals
- Unlimited number of presets stored with clear names
- Clear and trendy design with user-editable colours
- Programming interface
- 32-Bit version on CD-ROM with English and German version included

System requirements:

- Windows 95, 98, NT, 2000, ME, XP
- CD-ROM drive
- Soundcard 44,1 kHz, 16-Bit, stereo

Signal generator

Click on the picture, to find corresponding help topic...

Selecting the output device

Use the listbox OUTPUT DEVICE to select a driver for the sound output. Install a soundcard and the corresponding driver, if the listbox offers no drivers. Refer to the soundcards manual for further information about hardware and driver installation. AudioWave won't produce sounds, if NONE is selected as output device.

Power on/off

Click to the red power switch to turn AudioWave on and off. The selected audio driver will be opened, when AudioWave is switched on. Depending on your driver, this may prevent other applications from accessing the audio driver, as long as AudioWave is turned on.

Frequency adjustment

Different frequencies are adjustable for left and right channel. The current frequency is displayed clearly on two large frequency displays. Optionally frequency adjustment for left and right channel can be coupled. Click to the yellow L=R switch in the frequency section. While the switch is on, left and right channel will produce the same signal frequency. Turn this switch off to adjust different frequencies for left and right channel.

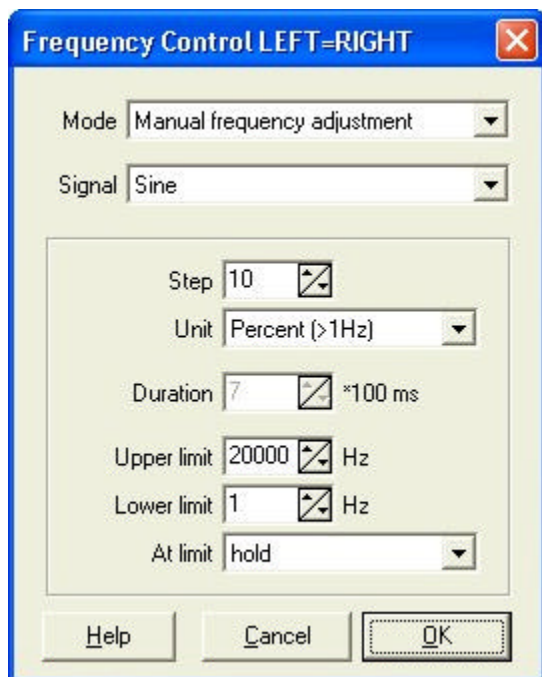There are different ways to adjust the frequency for a channel:

Direct input via keyboard:
Click to the small input field under the frequency display and enter the new frequency (Hz). When the ENTER button is pressed, the new frequency is produced and displayed immediately.

Using the mouse for frequency control:
A small and a large frequency controller can be found on the right of each frequency display, to increase or decrease frequency. The small frequency controller causes frequency changes of 1Hz,
Each button is equipped with a repeat function, which is activated after a few moments, when the mouse button is hold down on the control.

The large frequency control offers larger changes of frequency, with user editable step width. Click on the button FREQUENCY CONTROL SETUP below each frequency display.

The dialog FREQUENCY CONTROL offers several options. The listbox MODE allows you to select two different modes.
Mode – Manual frequency adjustment
Select this mode to use the frequency controllers on the AudioWave front panel to change frequency. The input fields STEP and UNIT determine the step width, when one of the frequency control buttons is pressed. Use the fields UPPER LIMIT and LOWER LIMIT to enter frequency limits, if necessary.

The listbox AT LIMIT offers several actions that can be executed, if frequency exceeds one of the limits.

HOLD holds the frequency on the upper or lower limit.
REPEAT resets the frequency to the lower limit when the upper limit is reached - and the other way round.
REVERSE inverts the progress direction. This is only useful with stepped frequency progresses.
MUTE stops the signal output, when a frequency limit is reached.

Mode – Stepped frequency progress
Use this mode to step trough the frequency range automatically. Enter the DURATION of a step in units of 100ms (A value of 10 results in a duration of 10 * 100ms = 1second). In this mode the frequency controller on the front panel is used to trigger the frequency progression. All other options are the same as for manual frequency control.

All options apply to both channels, as long as the L=R function is active for the frequency section. Deactivate L=R to make different adjustments for left and right channel.

The listbox SIGNAL offers several shapes for the output signal:

Sine, Rectangle, Triangle, Ramp up, Ramp down and Noise.

The reproduction of sine and noise signals (called music) is exactly what your soundcard was made for, but 'sharp-edged' signals like rectangles, ramps and triangles are distorted by the low-pass filter (approx. 22kHz), which is part of every soundcard. These signals are only practical for frequencies up to approx. 1 kHz. Nevertheless we decided to implement these functions, which can be useful in some cases. Some clever hobbyist may even find a way to switch off the low-pass…
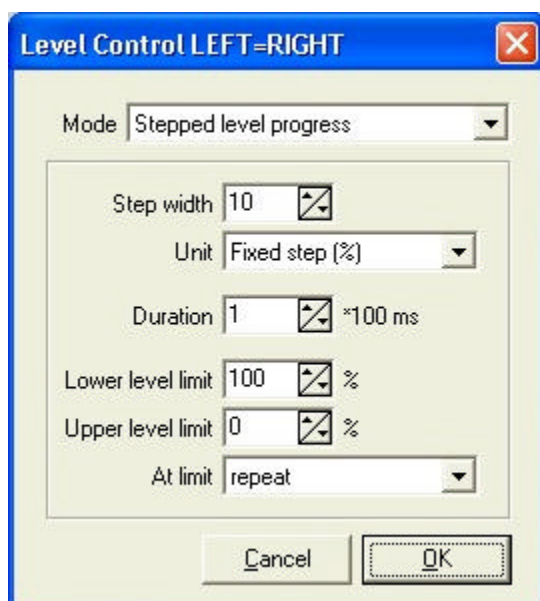So please be not too disappointed, if a rectangle signal of 10 kHz appears as a sine signal at the output. Soundcards were built to sound good, and not for reproduction of sharp-edged signals.

Level adjustment

Different levels are adjustable for left and right channel. The current level is displayed on two level displays on the right of the level control. Optionally level adjustment for left and right channel can be coupled. Click to the yellow L=R switch in the level section. While the switch is on, left and right channel will produce the same level. Turn this switch off to adjust different levels for left and right channel.

A small and a large level controller can be found in the level section, to increase or decrease output level. The small frequency controller causes frequency changes of 0,1%. Each button is equipped with a repeat function, which is activated after a few moments, when the mouse button is hold down on the control.

The large level control offers larger changes of level, with user editable step width. Click on the button LEVEL CONTROL SETUP below each level display.

The dialog LEVEL CONTROL offers several options. The listbox MODE allows you to select three different modes.

Mode – Manual level adjustment
Select this mode to use the level controllers on the AudioWave front panel to change level.
The input fields STEP and UNIT determine the step width, when one of the level control buttons is pressed. Use the fields UPPER LEVEL LIMIT and LOWER LEVEL LIMIT to enter level limits, if necessary. The listbox AT LIMIT offers several actions that can be executed, if level exceeds one of the limits.

HOLD holds the level on the upper or lower limit.
REPEAT resets the level to the lower limit when the upper limit is reached - and the other way round.
REVERSE inverts the progress direction. This is only useful with stepped level progresses.
MUTE stops the signal output, when a level limit is reached.

Mode – Stepped level progress
Use this mode to step trough the level range automatically. Enter the DURATION of a step in units of 100ms(A value of 10 results in a duration of 10 * 100ms = 1second). In this mode the level controller on the front panel is used to trigger the level progression. All other options are the same as for manual level control.

All options apply to both channels, as long as the L=R function is active for the level section. Deactivate L=R to make different adjustments for left and right channel.

Attenuator adjustment

You can use the attenuator to decrease the current output level (0dB), using the following steps:

- 3dB
- 6dB
-10dB
-20dB
-30dB

The attenuated signal is computed by the software, and is therefore independent from the level control of the sound hardware. To reach high accuracy, the attenuator can be calibrated. The corresponding function is available from the local popup menu (right mouse button). You can enter an individual factor for each attenuation. The factor is the ratio of the 0dB signal to the attenuated signal.
All options apply to both channels, as long as the L=R function is active for the attenuator section. Deactivate L=R to make different adjustments for left and right channel.
To activate the attenuator, click on the corresponding switch. Select 0dB to deactivate the attenuator.

Modulator

Click on the picture, to find corresponding help topic…

Use the modulator to produce sine signals with modulated frequency or amplitude.

LFO adjustment

The LFO (Low Frequency Oscillator) offers ramp, triangle, rectangle and sine oscillations. Select a LFO MODE from the listbox. The DURATION T of an oscillation is adjustable in units of 100ms. A value of 10 results in a duration of 10 * 100ms = 1 second.

The maximum signal duration is limited to 10 minutes (6000*100ms). Please consider that it takes

some time to calculate such long signals. Depending on your system performance you may have to wait some minutes until the signal is calculated and played in worst case.

Frequency modulation

Click on the yellow FM switch to turn the frequency modulation on/off. The fields MIN and MAX determine the highest and the lowest frequency of the modulated carrier signal.

Amplitude modulation

Click on the yellow FM switch to turn the amplitude modulation on/off. Amplitude modulation is adjustable from 0% to 100% with the corresponding field.

Noise signals

Click to the NOISE switch to produce a modulated noise signal. Only amplitude modulation is available with noise signals.

Modulator control

The modulator computes and plays a wave file (TEMP.WAV) from the current modulation parameters. The default output device, as configured in the Windows system control, is used to produce the sound. It may take some time to calculate the modulated signal, depending on performance of your system and on the signal duration. Imagine that 44100 samples have to be calculated and stored for each second of sound production. Calculation starts whenever START or LOOP is pressed, and changes were made to the modulation parameters. When START is pressed, the signal is played only once. Use the LOOP button to play the signal continuously, until the STOP button is pressed. The output signal is the same on left and right channel.

Depending on your sound driver, it may be necessary to turn the signal generator off, when the modulator is used, but today most drivers are able to produce more than one sounds simultaneously.

Working with presets

All adjustments that can be made for the signal generator and the modulator can easily be stored and recalled in any directory of your disc drive, using clear names. Preset files use .PST as file extension. A directory \PRESTS was installed in the installation path of the software. It already contains some example presets for demonstration.

All presets of this directory are listed in the listbox PRESET at the AudioWave front panel. Simply select an entry of the list, to recall a preset.

You may create your own preset directories. The preset list is updated automatically, when a preset is loaded or saved from/to another directory. We recommend saving presets to your own directories, corresponding to the project they belong to. This makes the use of the listbox PRESETS most effective.

Whenever changes are made to a loaded preset, the red lamp PRESET CHANGED on top of the button SAVE PRESET starts flashing. This indicates that the preset has been changed and should be save, if necessary.
The current setting of all parameters are saved to a special file automatically, when the program is terminated. So you will find the same settings, when AudioWave is started again. This has no effect on the preset files that you have saved to disc. These files are only changed, if you call the function SAVE PRESET.

How to save presets

Click on the button SAVE PRESET to save all settings of the signal generator and the modulator to a single file. Select a directory in the file dialogue and enter a clear name for your preset.
When a preset is saved the listbox PRESET is filled with all other preset files that are in the same directory. So you can easily recall presets, that are in the same directory.

How to load presets

Click on the button LOAD PRESET to recall a setting from a preset file. Select a file from the file dialogue. When a preset is loaded, the listbox PRESET is filled with all other preset files that are in the

same directory. So you can easily recall presets, that are in the same directory.
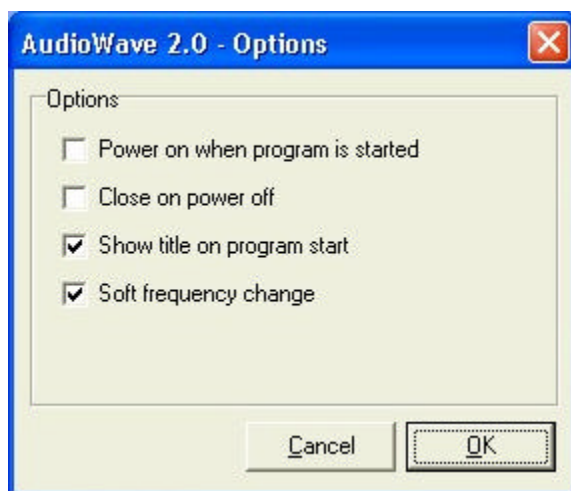
Background bitmaps

You can load a bitmap file to the background of the AudioWave front panel to change the design. Click to the front panel with the RIGHT mouse button at a position with no control element. Select the entry BACKGROUND… from the local popup menu. A directory \BACKGROUNDS has been installed in the installation path of the software. It offers some bitmap files that can be used as front panel background. Use a graphic program to create other backgrounds, if you like.

Changing the text colour

The text colour of the labels on the front panel can be changed, if you like. Click to the front panel with the RIGHT mouse button at a position with no control element. Select the entry TEXT COLOUR… from the local popup menu and select a new colour from the dialogue.

General options

Click to the front panel with the RIGHT mouse button at a position with no control element. Select the entry OPTIONS… from the local popup menu.

- Power on when the program is start
Use this option to start sound output immediately, when AudioWave is started.

- Close on power off
Use this option to close the AudioWave window automatically, when the power button is turned off.

- Show title on program start
A title is displayed on program start for a few seconds, when this option is selected.

- Soft frequency change
This option suppresses noises that physically appear when frequency is changed abruptly. The signal is faded out before frequency is changed, and the faded in again. Deactivate this option if necessary.

Keyboard control

The following hotkeys are available for controlling the AudioWave software. All other hotkeys can be found in the menu items of the (popup) menus.

Key	Generator functions
P	Power on/off
M	Mute on/off left
M + Shift	Mute on/off right
Q	L=R for Frequency
W	L=R for Attenuator
E	L=R for level
A,S,D,F,G,H	Attenuator left

A;S;D;F;G;H	Attenuator right
Arrow up	Frequency up left
Arrow down	Frequency down left
Arrow up + Shift	Frequency up right
Arrow down + Shift	Frequency down right
Arrow right	Level up left
Arrow left	Level down left
Arrow right + Shift	Level up right
Arrow left + Shift	Level down right

Key	Modulator functions
A	Amplitude modulation on/off
F	Frequency modulation on/off
N	Noise on/off
S	Start
L	Loop
SPACE or ESC	Stop

Remote control with messages

AudioWave is equipped with a simple, but very effective programming interface, for users that have some experience in programming. If you are not interested in programming, simply skip this chapter.

Programmers can use the programming interface to control AudioWave function from their own applications. You can use any programming language that allows to the call Windows-API functions SENDMESSAGE and FINDWINDOW.

While AudioWave is started, you can call the function FINDWINDOW to receive a handle, which is necessary for the SENDMESSAGE call. FINDWINDOW needs one of two parameters, either the classname or the caption of the window, you are looking for. AudioWave uses the classname TAudioWave. An example in Delphi would look like that:

```
Handle:=FindWindow(´TAudioWave´,nil);
```

Take care of the capital letters in the classname! Make sure that AudioWave is started, to receive a valio handle.

Now you can call the SENDMESSAGE command, to control AudioWave functions. You need four parameters for the SENDMESSAGE command. The first is the handle, the second is the Windows command (we use 1024 (=WM_User)). The last parameters Wparam and Lparam are used to control an AudioWave function. An example in Delphi would look like that:

```
SendMessage(Handle, 1024, wpar, lpar);
```

The values for wpar and lpar are listed in the following table:

Function wpar	Parameter lpar	Command
0	0	Frequency Left up
1	0	Frequency Left down
2	0	Frequency Right up
3	0	Frequency Right down
4	0	Frequency Left +1Hz

5	0	Frequency Left -1Hz
6	0	Frequency Right +1Hz
7	0	Frequency Right -1Hz
8	0=off; 1=on	Function L=R for frequency
9	0	Level Left up
10	0	Level Left down
11	0	Level Right up
12	0	Level Right down
13	0	Level Left +0,1%
14	0	Level Left -0,1%
15	0	Level Right +0,1%
16	0	Level Right -0,1%
17	0=off; 1=on	Function L=R for level
18	0	Attenuator Left 0dB
19	0	Attenuator Left –3dB
20	0	Attenuator Left –6dB
21	0	Attenuator Left –10dB
22	0	Attenuator Left –20dB
23	0	Attenuator Left –30dB
24	0=off; 1=on	Mute Left
25	0	Attenuator Right 0dB
26	0	Attenuator Right –3dB
27	0	Attenuator Right –6dB
28	0	Attenuator Right –10dB
29	0	Attenuator Right –20dB
30	0	Attenuator Right –30dB
31	0=aus; 1=ein	Mute Left
32	0=off; 1=on	Function L=R for Attenuator
33	0=off; 1=on	Power on/off
34	0	Modulator Start
35	0	Modulator Stop
36	0	Modulator Loop
37	0=off; 1=on	Modulator FM
38	0=off; 1=on	Modulator AM
39	0=off; 1=on	Modulator Noise
40	1…20000	Frequency Left (1Hz…20kHz)
41	1…20000	Frequency Right (1Hz…20kHz)
42	0…65535	Level Left (0…100%)
43	0…65535	Level Right (0…100%)
44	-180…+180	Phase L/R (-180°….+180°)
45	0…4	Modulator LFO Mode (Ramp up/down, Triangle, …)
46	1…600	Modulator LFO Duration (T=0,1…60 seconds)
47	1…20000	Modulator Upper frequency limit 1Hz…20kHz
48	1…20000	Modulator Lower frequency limit 1Hz…20kHz
49	0…100	Modulator AM Percentage 0%…100%
50		

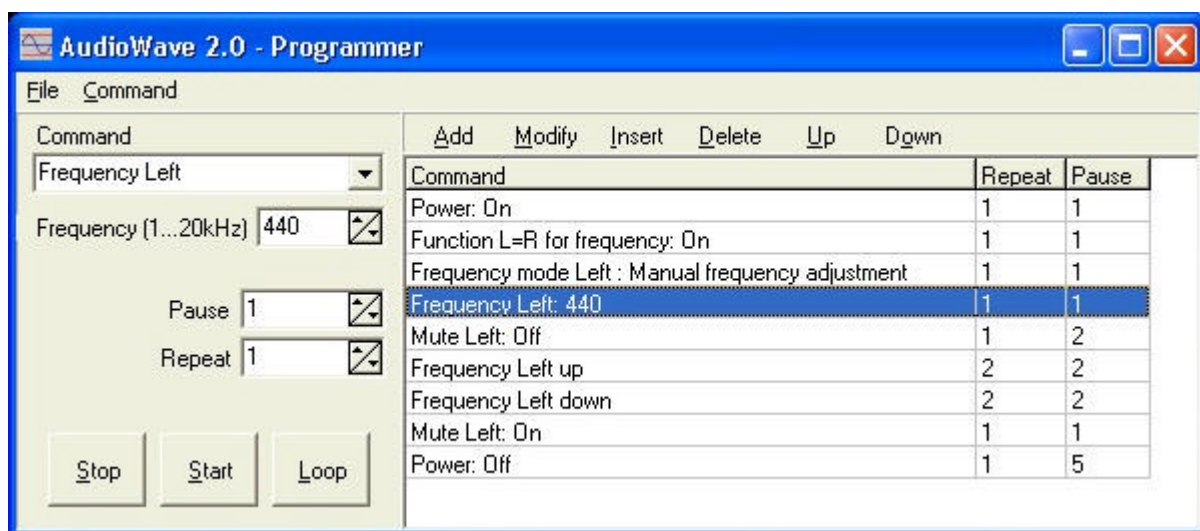|	0…1	Frequency setup left mode (manual, progress)
51	0…1	Frequency setup right mode (manual, progress)
52	0…5	Signal shape left (Sine, Rectangle, …)
53	0…5	Signal shape right (Sine, Rectangle, …)

An example application AW_REMOTE.EXE was installed with the software to test and demonstrate the functions of the programming interface. Simply start AudioWave, enter values for wParam and lparam and press SEND….

Tip: Also the latest version of our **ProfiLab** software, takes advantage of the AudioWave programming interface. More information about **ProfiLab** is available from our homepage www.abacom-online.de .

The AudioWave 2.0 - Programmer

The *AudioWave 2.0 –Programmer* is a useful tool for programming command sequences. The program is based on the AudioWave programming interface.

The commands from command list on the right are executed one after another. Press START to start a program. STOP immediately terminates a sequence. LOOP restarts a program, when the end of a program is reached. Make sure that AudioWave is started, before executing a program.

Use the commands on top of the list to edit a program sequence.

ADD: Adds a new command to the end of the list.
MODIFY: Changes the current row, using the parameters given parameters.
INSERT: Adds a new command at the current position.

DELETE: Deletes the selected list entry.
UP: Moves the current row upwards.
DOWN: Moves the current row downwards.

The command and its parameters appear in the input fields on the left. Select a command from the listbox COMMAND. Depending on the command some additional may be necessary. Each command is processed with a pause of 0,1 second minimum. Enter other values to the PAUSE field, to increase this time. A value of 10 waits 10 * 0,1 s = 1 second, before the next command is executed. The field REPEAT determines how often a command (and its pause) is executed.

The main menu offers functions for loading and saving a program. Some examples (*.AWP) have been installed with the software.

Tip: Also the latest version of our **ProfiLab** software, takes advantage of the AudioWave programming interface. More information about **ProfiLab** is available from our homepage www.abacom-online.de .