Signal Generator

A real-time audio generator

www.dr-jordan-design.de

Frequency 4991.854502Hz

2500   5k   7500   10k   12500   15k   17500   20k

☐ log

SignalGenerator

File   Edit   View   Help

range
◉ coarse   ◯ fine   4991.8545

10.000000   Frequency   20000.000

waveform
◉ sine
◯ rectangular
◯ triangular
◯ white noise
◯ pink noise
◯ MLS
◯ sine sweep
[sweep settings]

-3.00dB   Volume
☑ -3dB
☐ -5dB
☐ -10dB
☐ -20dB
☐ -50dB
☐ Mute

☐ -180°

Balance

Delay (phase   0.00 deg/0.0000 seconds)

0   samples

MLS length
1023

Ready

Frequency presets

Double click to configure

20.0	30.0	40.0	50.0
60.0	70.0	80.0	90.0
100.0	200.0	300.0	400.0
440.0	500.0	600.0	700.0
800.0	900.0	1000.0	2000.0
3000.0	3150.0	4000.0	5000.0
7000.0	9000.0	10000.0	16000.0

Signal Statistics

Peak   70.79%   Fs   -3.00 dB
RMS   50.06%   Fs   -6.01 dB
Crest   1.41

1.1 Key Benefits

The signal generator is a powerful 32-bit Windows application that can generate many test signals. They are mainly focused on audio systems but can also be used for other areas, e.g. control systems. Most of all parameters are adjusted in real-time. Every movement of the sliders directly modifies the output signal. The signal generator is based on DirectX, which allows to connect more than 2 outputs (multi channel up to 64 channels) and to mix the output of multiple generators.

- Waveforms: sine, rectangular, triangular, noise
- Maximum Length Sequences (MLS)
- Adjust frequency, phase, level, MLS length
- Volume can be adjusted variable or in fixed steps
- Adjust all parameters in real-time
- DirectX based
- Supports multiple soundcards
- Create .wav files
- No installation required

PRO Version

- Sine sweep: linear and logarithmic
- Pink and Gaussian noise
- Adjustable pulse widths for rectangular signals
- Burst signal generator
- Can be calibrated
- Run multiple instances to mix signals
- 24-bit support via ASIO or directX (optional)
- up to 64 channels via ASIO (optional)
- Various digital filters (RIAA, A,C, parametric) (optional)
- Command line interface for scriptings (optional)

1.2 Requirements

- Windows 95/98/ME NT40/NT2000/XP
- Pentium 100 with 16MB memory
- Windows compatible sound device with at least 16-bit
- DirectX 8.0 for multi channel support
- Screen Resolution 800x600, 256 colors or more

1.3 Installation

Copy the executable to your harddrive and create a shortcut to your desktop if required.

1.4 Deinstallation

Remove the directory where you installed the signal generator.

1.5 Selection of the Waveform

The signal generator supports the following waveforms

- Sine
- Triangle
- Rectangle
- White noise
- Pink noise
- Gaussian noise
- Maximum Length Sequences (MLS)
- Sine sweep
- Play waveform from a file

Note: Sine sweeps and pink noise are supported by the PRO version, only.

1.6 Frequency adjustment

For sine, triangle, rectangle waveforms you can adjust the frequency in different ways. The frequency slider directly changes the frequency. The actual value is displayed in the edit box. Every movement of the slider with the mouse immediately changes the output frequency. This feature is different to our competitors. Most other signal generators compute a while until the frequency changes take effect. Our program can be compared with a well known analog generator. The range of the slider can be switched between coarse and fine. If you select fine the frequency slider is centered and the upper and lower frequency limits are set to +/- 10% of the current value. The current frequency is displayed numerically. In this edit box you can enter the frequency manually with the keyboard. You can also enter the upper and lower limits for the frequency slider.

The PRO version offers additional tools:

- Resizable frequency slider
- Configurable presets.

1.7 Resizable frequency slider

The PRO version of the Signalgenerator includes a large frequency slider, that allows entering frequencies very precisely with the mouse. This tool is freely resizable and movable to fit your needs. It fully synchronizes automatically with the main dialog box. You adjust the upper and lower limits from the main dialog box.
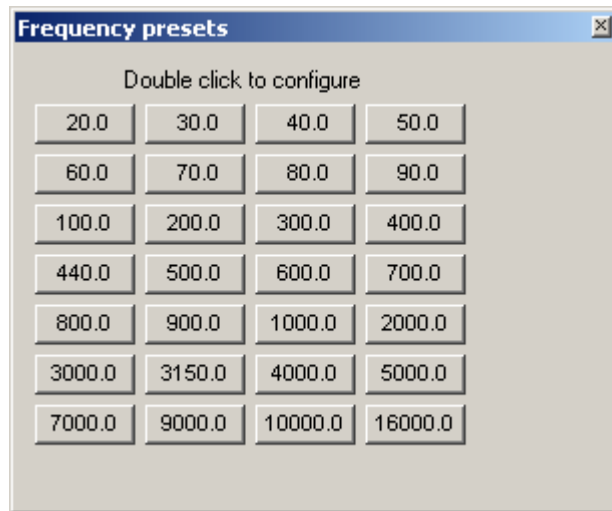You can open the frequency slider with view->frequency slider from the menu.
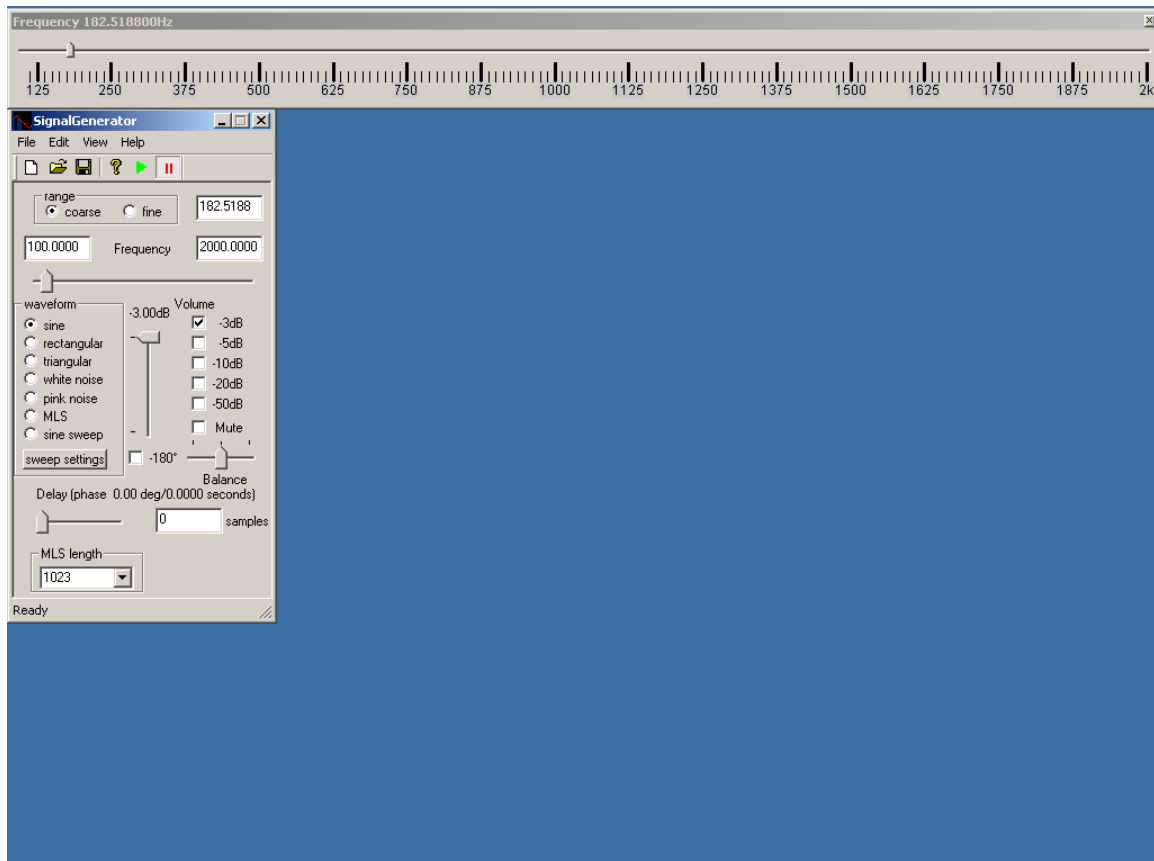
You can display the frequency axis linearly as well logarithmically.
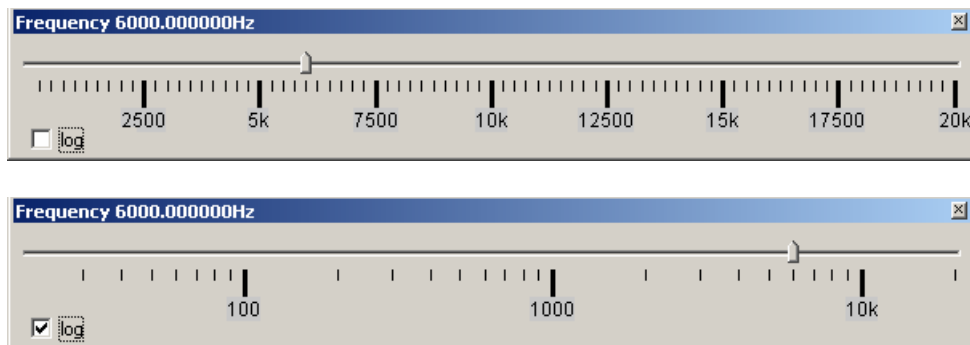
1.8   Frequency presets

The PRO version includes a tool to set user definable frequencies with one click. You can freely define the frequencies by double-clicking on the buttons.

Frequency presets

Double click to configure

20.0	30.0	40.0	50.0
60.0	70.0	80.0	90.0
100.0	200.0	300.0	400.0
440.0	500.0	600.0	700.0
800.0	900.0	1000.0	2000.0
3000.0	3150.0	4000.0	5000.0
7000.0	9000.0	10000.0	16000.0

1.9   Level adjustment

The signal generator supports several techniques to enter the level.

1.9.1   Enter a value in a dialog box
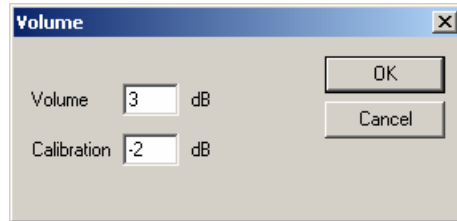
In this dialog box you can also a calibration offset that is applied to all levels.

1.9.2   Predefined attenuators

There are predefined attenuators for -3,-5,-10,-20 and -50dB. All attenuators can be combined, e.g. -10 and -20dB results in a total attenuation of -30dB.

1.9.3   Volume slider

The volume slider controls the total volume of all channels from zero to full scale.

1.9.4   Balance slider

The balance slider controls the level between the left and right channel. The levels of all other channels are not affected.

1.9.5   Mute

Sets all channel to digitally zero.

Both sliders use a logarithmic curve to get a more 'natural' control.
All level control is done digitally. If you decrease the volume you decrease the dynamic. With a 24-bit soundcard and our 24-bit version of our signal generator you have much more headroom.
You can adjust the level with the Windows mixer, too. Please make sure that you use the correct Windows mixer settings. Several soundcards use their own control program to change the mixer settings.

1.10   Signal statistics

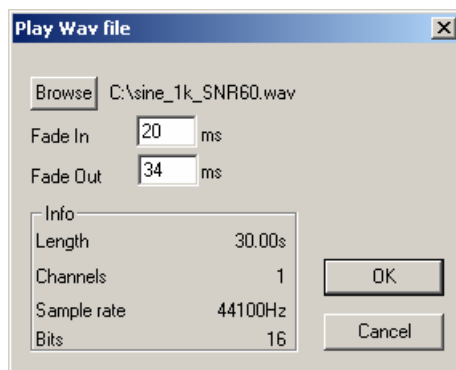The signal generator shows its signal statistics in separate window. It is updated automatically. It includes:

- Peak in % and dB
- RMS in % and dB
- Crest factor

For Peak and RMS value it also shows a bar meter for faster view.

Signal Statistics

Peak 70.79% Fs -3.00 dB

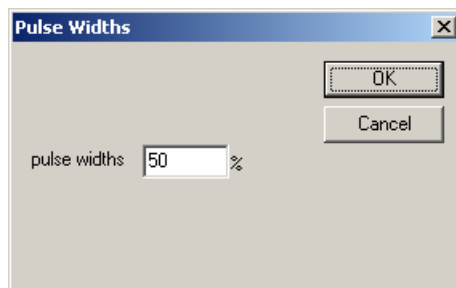RMS 50.04% Fs -6.01 dB

Crest 1.41
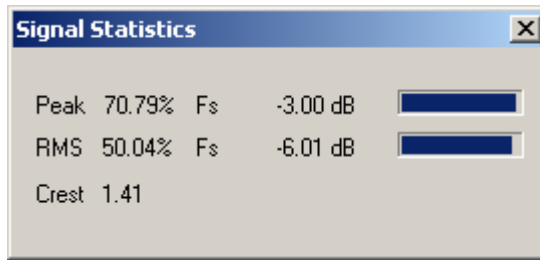
1.10.1 Play .wav files with reloop

You can play stored wave files from .wav files. At the end of the file it is restarted (Reloop). You can adjust a fade-in and fade-out time for smooth transitions. The effects are applied in real-time and do not change your files.

Play Wav file

Browse C:\sine_1k_SNR60.wav

Fade In 20 ms

Fade Out 34 ms

Info

Length 30.00s

Channels 1

Sample rate 44100Hz

Bits 16

OK

Cancel

1.11 Pulse widths

Pulse Widths

OK

Cancel

pulse widths 50 %

For rectangular signals you can modify the pulse widths between zero and 100%.

Note: This feature is supported by the PRO version, only.

1.12 Burst Generator

This burst generator allows to generate special burst signals in a very flexible way. Basically you define a rectangular signal. This signal can directly used as the output or to modulate the amplitude of any other generator signals. You can define the level of the on and off phase of a signal. With this feature you can generate signals that switch between two levels.

Here are some examples of signals you can generate with this tool:
- Sine bursts
- Noise bursts
- Rectangular signals for Jitter measurements

These signals are widely used for loudspeaker power measurements or Jitter analysis.

You can adjust the time duration of each phase starting from sample units to days. The precision is one sample. The level is adjusted in a linear way. 1.0 is full scale. 0 is off. 0.1 is equivalent to -20dB. You can also enter negative values to change the phase. Please note that the final volume is set by the level control elements. If you enter 1.0 and set the attenuators to 0dB the output will be full scale.

You can force the generator to start each burst with zero phase.

Below you will find some examples of settings and the resulting signal type.

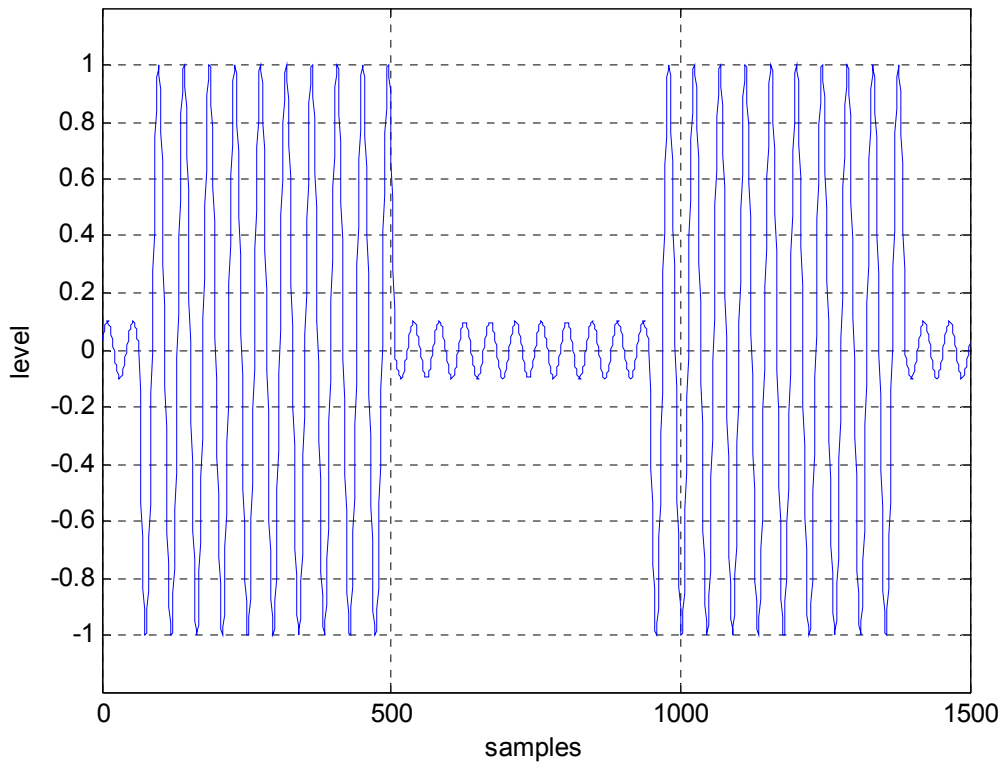## 1.12.1 Sine burst with 10ms on at full scale.

These settings generate a sine signal that is on for 10ms at full scale and off for 10ms. It starts with zero phase.
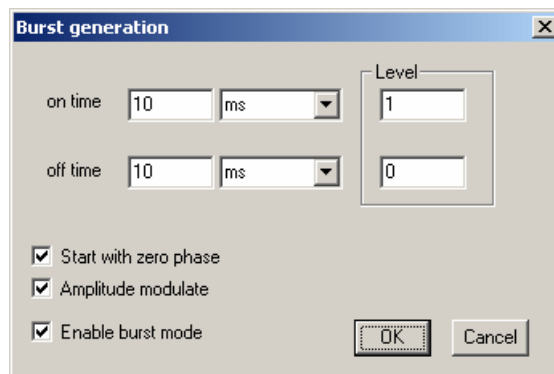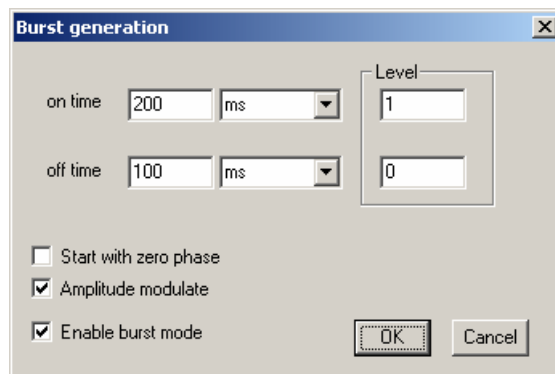

1.12.2 Sine burst with alternating levels.

These settings generate a sine signal that is on for 10ms at full scale and with a level of 0.1 for 10ms. Phase is continuous.
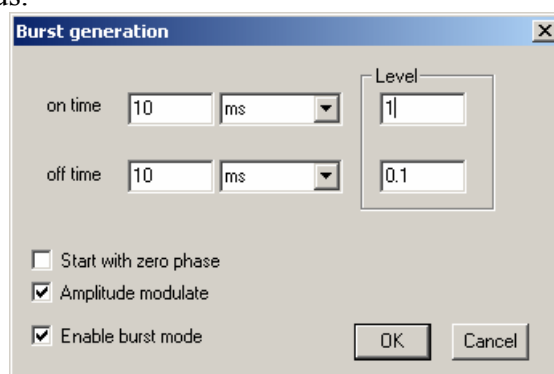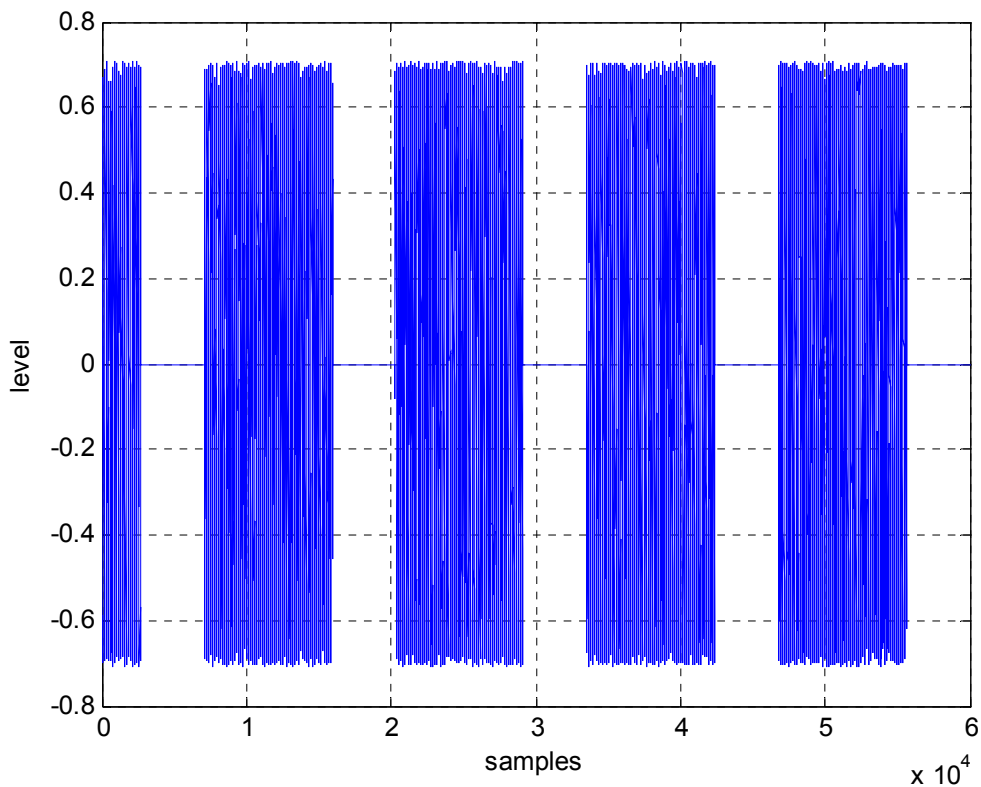
1.12.3 Noise burst with 200ms on at full scale.

These settings generate a noise burst that is on for 200ms at full scale and off for 100ms.

1.12.4 Jitter test signals

There exist a lot of different Jitter test signals. The AES3 is widely used. It contains a rectangular signal at ¼ of the sample rate with a level of 0.5. The second component is a rectangular with 192 samples on and off. The level is 1 LSB. Both signals are added.

With the generator you can create such signals in a very flexible way, since you can define the timing on sample basis and the level as a direct value.

Below you will find such an example which is a signal with 4 samples on and 4 samples off.
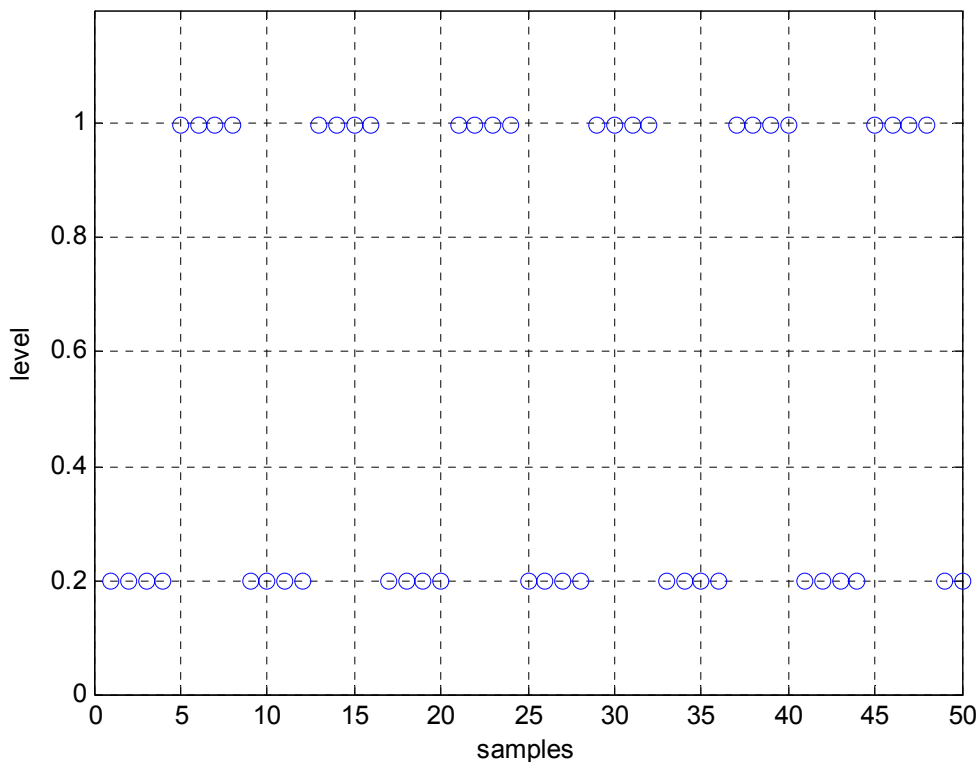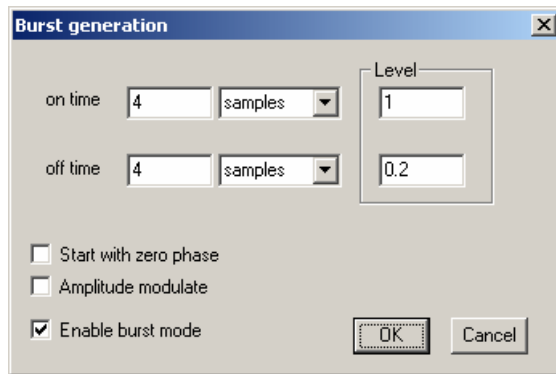
Note: This feature is supported by the PRO version, only.

1.13 Phase adjustment

You can change the phase between the left and right channel in multiple of samples. The current phase shift is displayed in samples and degrees. You can directly enter the desired sample offset. All other channels in a multi channel environment are not affected.
You can add a phase shift of 180 degrees (sign inversion) between the left and the right channel.

1.14 Soundcard configuration

The signal generator supports multiple soundcards in your PC. Select the desired soundcard from the selection box. You can also adjust the sample rate. If you enter a value, which is not supported by your hardware you get an error message or no signal output. This behavior depends on the soundcard driver. Typical sample rates are 32000, 44100 and 48000Hz.

Your soundcard must support at least 16-bit. Old 8-bit devices are not supported.

If you own the 24-bit version of our generator you can activate a high resolution mode. You can enter the bit resolution between 8 and 24 bits. Of course you need a soundcard that supports more than 16 bits. Please note that these high resolution modes of the soundcard must be available via DirectX or ASIO drivers.

1.15 Multi channel setup
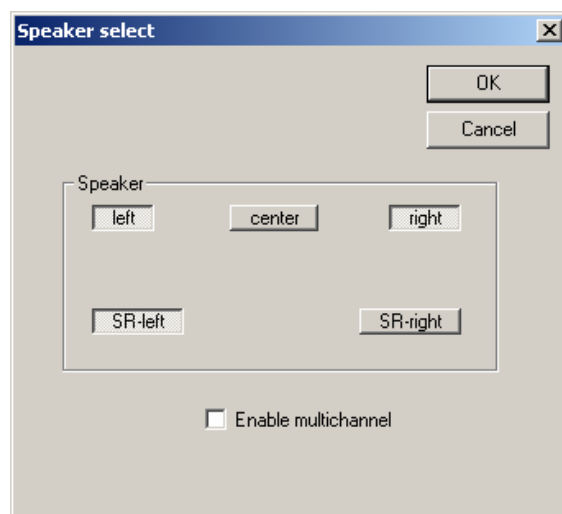
The signal generator supports up to 5 output channels. You can disable this feature to run on stereo soundcards. From a selection matrix you can disable or enable all speakers.

1.16 Audio device control

On the toolbar there are two buttons to control the audio hardware.

- Start processing
- Stop processing

1.17 Saving a waveform

You can easily create a stereo .wav files from your current settings. You can select the file length and name. Please note that these uncompressed .wav files consume 12MB per minute. With the 24-bit extension you can also write 24-bit .wav files.

1.18 Maximum Length Sequences (MLS)

The signal generator can generate special sequences, which are used for a wide range of measurements. They are very powerful to measure e.g. frequency responses. An appropriate signal analyzer is required.
Our measurement solution WinAudioMLS offers a full set of analysis techniques.
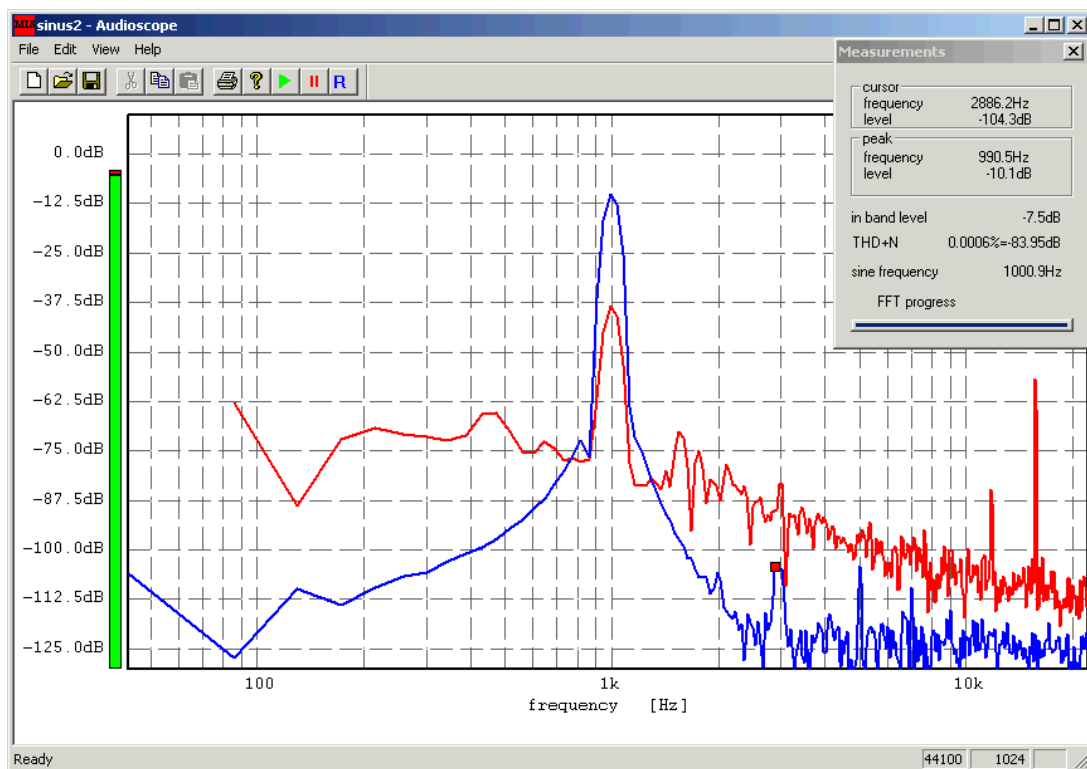

The only parameter for the ML-sequence is the length of the sequence itself. The frequency slider has no effect. Select the desired length from the selection box and press 'Apply' to use this setting.
Note: Please make sure that you use the same MLS-length and sample rate in the generator and analyzer. The analyzer controls the generator and sets the values appropriate. But you can override these automatic settings.

1.19 Sine sweeps

A widely used technique to measure the behavior of e.g. a loudspeaker is sine sweeps. The signal generator creates sweeps, which change the frequency continuously. You can select the start and stop frequency and the sweep time.
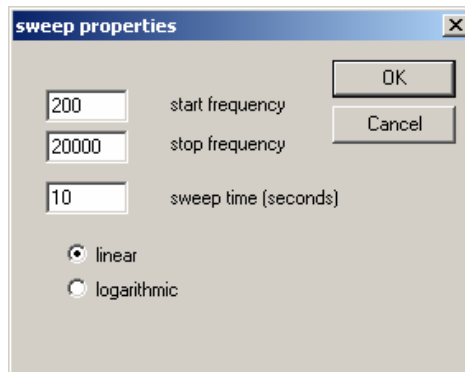
You can also choose between a linear and logarithmic sweep. A linear sweep increases the frequency by a constant value every second. The logarithmic sweep instead starts slowly and speeds up. This results on a typical logarithmic frequency scale in a constant speed. The sweep time of one octave is constant.

With the signal analyzer WinAudioMLS you can easily measure transfer functions. WinAudioMLS supports a tracking measurement mode (stepped sines), where the analyzer itself control the signal generator automatically.

1.20 Filter

The PRO version of the signal generator offer several digital filters. These filters include:

- RIAA and inverse RIAA
- A and C weighting curves
- Free filter (high pass, low pass, band pass and band stop) with Butterworth, Chebychev and Elliptic characteristic.

Dialog box for the free filter
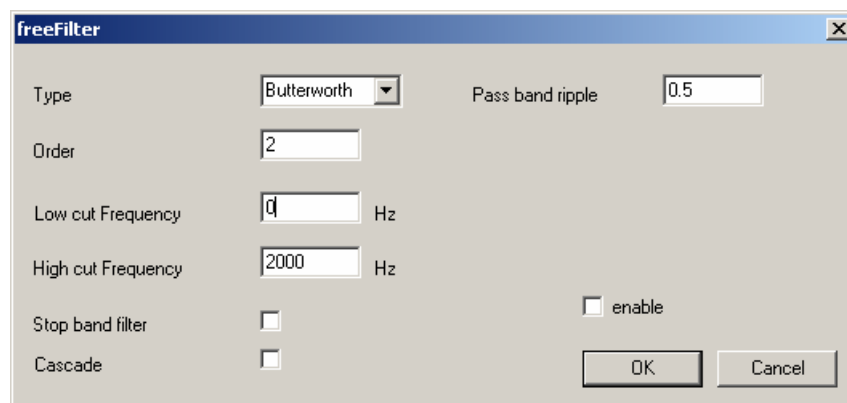
1.21 DC Offset

With the DC offset you can shift the output signal. Normally, the output signal is symmetric. A full-scale sine has a range of -1.0 to +1.0. To set the range to e.g. 0 to +1.0 you have to decrease the level first by 6dB. This results in a range of -0.5 to +0.5. With a offset of 0.5 you get the desired range.

Most soundcards have a low cut frequency of 10…20Hz. Any DC component is removed due to capacitive coupling at the analog outputs.

Please note that you can overload the output very easily with the DC offset.
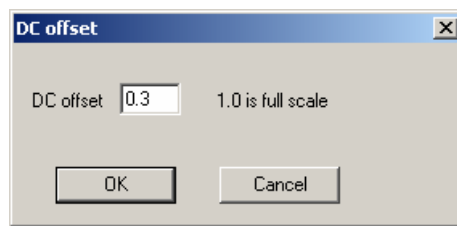
1.22 Frequency modulator

The signalgenerator contains a FM-modulator. The output frequency is determined by its input signal level. This function is also called VCO (Voltage Controlled Oscillator).

The signal type you configured (sine, rectangle etc.) is modulated before it is send to the output. The level control always sets the final output volume. You can adjust the frequency shift of the modulator to set the output frequency range. With a frequency shift of e.g. 1000Hz you get an output frequency of 1000Hz for full-scale output (1.0).
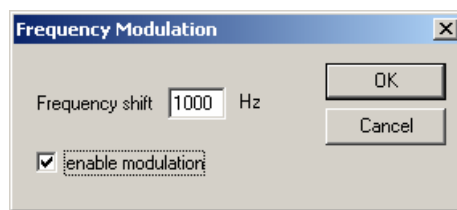
With the FM-modulator you can generate many different signal types. The following example shows how to generate a signal that switches every second between 500Hz and 1000Hz.
First we need a rectangular signal with a frequency of 0.5Hz. With a DC offset of 2.0, we shift the signal to a level range of 1.0 to 2.0. In FM-mode there occurs no overdrive, because the DC offset is handled in a special way. The frequency shift has to be set to 500Hz.

The freeware version has a fixed frequency shift of 1000Hz.

1.23 Dual tones

Certain applications require dual tones to measure e.g. intermodulation effects. To create a dual tone with 1 and 2 kHz start two instances of the signal generator. Set both to the desired frequency (one with 1kHz the other to 2kHz). Set both attenuators to at least -3dB to avoid clipping.

1.24 Sine with noise

Similar to the scenario mentioned above you can start one signal generator with a sine and one other with noise. If you run multiple instances make sure that you use the same sample rate. If not, you will increase the CPU load or even worse add additional distortion

Note: This feature is only available with the PRO version.

1.25 24-bit support

Many soundcards on the market support more than the typical CD quality (16-bit 44.1kHz). The normal version of the signal generator addresses all devices in 16-bit mode, only. The increased dynamic range is unused. A special version of the signal generator with 24-bit support can activate these modes. You can enter the bit resolution between 8 and 24 bits.
On our website you will find a special 24-bits test version of the generator. It is limited to a sine with 777Hz, but it allows to check for compatibility. Of course, the 24-bits full version supports all frequencies.

Note: The high resolution modes of the soundcard must be available via DirectX drivers or ASIO.