## Overview of BrainWave Generator

BrainWave Generator is a brain stimulation application that works by generating binaural beat frequencies. With binaural beats, you can stimulate your brain to make yourself relaxed, help in meditation or self-hypnosis, enhance learning capabilities, induce sleep, help focusing attention, and so on.

BrainWave generator can also produce flashes to further stimulate the brain via eyes. Combined, aural and visual stimulation result in more efficient brain wave entrainment.

For more information, click one of the following links.

Online resources in World Wide Web

Important warning

Brain states and frequencies

Entraining brain to a desired state with binaural beats

Effects of altered brain states

Technical details:

    What are binaural beat frequencies?
    What is modulation?
    Available waveforms
    Available background voices
    Description of noise backgrounds
    Visual on-screen flashing
    Visual flashing with AudioStrobe

## Online resources in World Wide Web

All BrainWave Generator online resources can be found at http://www.bwgen.com.

Following are shortcuts to some interesting areas.

Frequently Asked Questions: http://www.bwgen.com/faq
Latest news about BrainWave Generator: http://www.bwgen.com/news
Presets submitted by other BrainWave Generator users: http://www.bwgen.com/presets
The BrainWave Generator mailing list: http://www.bwgen.com/list

## Important warning

Since BrainWave Generator uses flashes of high frequencies for external visual stimulation of the brain, the following people should **not** use BrainWave Generator in any case:

- People subject to any forms of seizures or epilepsy
- People using pacemakers
- People suffering from cardiac arrhythmia or other heart disorders
- People taking stimulants, psychoactive drugs, or tranquilizers

If you fall in any of these categories, do not use or even try BrainWave Generator!

## Registering BrainWave Generator

BrainWave Generator is distributed as shareware. You can use it free for one month, after which you must register. Registration costs $40 for a single-user license (for personal use only—for commercial and/or clinical license, please contact Noromaa Solutions). See also the BrainWave Generator License Agreement.

After registration, the following changes take effect immediately:

- The About window will not appear at startup anymore.
- The **Import** function in the **File** menu will be activated. For more information about the import functionality, click .

### Ordering on-line by credit card

The easiest way to register BrainWave Generator is via RegSoft.COM. Their server uses secure transactions to guarantee the confidentiality of your credit card information.

### Other ordering options

To order by telephone, call RegSoft.COM at 1-877-REGSOFT (for international orders 770-497-9126). Be sure to mention the product ID 8929.

**Note**
- **Please do not use the above phone numbers for any other purposes than ordering. For technical support, questions about BrainWave Generator, etc. contact Noromaa Solutions directly.**

You can also order by fax, by email or by regular mail (credit cards, checks and money-orders are all fine). For more information, see the RegSOFT.COM Web page.

## Brain states and frequencies

EEG (electroencephalography) technology is used to measure brain's electrical vibrations from the surface of the scalp. The resulting EEG pattern will contain frequency elements mainly below 30Hz. The frequencies are categorized into four states as follows.

| State | Frequency | State of mind |
| --- | --- | --- |
| Delta | 0.5–4Hz | Deep sleep |
| Theta | 4–8Hz | Drowsy (also first stage of sleep) |
| Alpha | 8–14Hz | Relaxed but alert |
| Beta | 14–30Hz | Highly alert and focused |

The dominant frequency in the brain's EEG pattern determines what shall be called the current state of the brain. If the amplitude of the alpha range frequencies is highest, then the brain is said to be in the alpha state. The purpose of BrainWave Generator is to affect the brain's state to achieve different results. For more information on how this is achieved, click ». For more information on the possible results, click ».

**Note**

- Brain's EEG pattern always consists of a wide range of different frequencies. The most dominant of them determines the current state of mind, but note that this is **not** any "exact frequency the brain is operating on". There are always also other frequency components present.

**Entraining brain to a desired state with binaural beats**

If external stimulus is applied to the brain, it becomes possible to *entrain* the brain frequency from one brain state to another. For example, if a person is in the beta state (highly alert) and a stimulus of 10Hz is applied to his/her brain for some time, the brain frequency is likely to change towards the applied stimulus. The effect will be relaxing to the person. This phenomenon is also called *frequency following response.*

When the brain's state is close to the applied stimulus, entrainment works more efficiently. Thus, when doing a sweep from one frequency to another, the starting frequency should be as close to the current brain state as possible. The sweep speed should be such that the brain's state changes steadily with it, so that the difference never gets very large. In practice, it is difficult to determine the brain state without complex EEG measurement equipment. However, you can quite safely assume that during the day your brain is in the beta state (about 20Hz) and you can start a frequency sweep from there. If you are already somewhat relaxed, you can use a start frequency of 15Hz or a few Hz lower.

## Stimulating the brain

The easiest way of applying stimulus to the brain is via ears and eyes. Since humans cannot hear sounds low enough to be useful for brain stimulation, special techniques must be used. One such special technique used is called *binaural beats*.

If the left ear is presented with a steady tone of 495Hz and the right ear a steady tone of 505Hz, these two tones combine in the brain. The difference, 10Hz, is perceived by the brain and is a very effective stimulus for brainwave entrainment. This 10Hz is formed entirely by the brain. When using stereo headphones, the left and right sounds do not mix together until in your brain. The frequency difference, when perceived by brain this way, is called a *binaural beat*.

To get a stimulus of 10Hz, you may use tones of 495Hz and 505Hz, or 400Hz and 410Hz, or 862Hz and 872Hz, or so on. The only requirements are that the tone is heard well enough and that it is below about 1000Hz. Below 1000Hz, the wavelength of the sound is sufficiently small so that the sound waves curve around the skull.

## Stimulating the brain with visual stimulus

Visual stimulation is easier than aural stimulation because low frequencies can readily be used. A frequency of 10Hz, for example, is generated when a led is flashed on and off 10 times a second in the front of your eyes.

When visual stimulus is in synch with aural stimulus, effects are highly increased over using only visual or only aural stimulus.

## Effects of altered brain states

Applying a <u>stimulus</u> to the brain will eventually bring the <u>brain's state</u> closer to the stimulus frequency. This topic describes some possible effects achievable by this.

**Note**
* Just passively listening to binaural beats does not necessarily alter your state of consciousness. For example, willingness and ability to relax and focus attention affects how effective the binaural beat stimulus is for inducing state changes.

### Helping in meditation

Meditation is essentially about willingly being able to alter one's brain frequency to a desired state. While meditators have traditionally used several years to learn the techniques of meditation, you can now attain the same effect with brainwave entrainment. No special training or great discipline is required. Good meditation frequencies are in the alpha range, from 8Hz to 13Hz.

When a certain brainwave state is experienced and practiced over a period of time, the brain will "learn" the state change and it will become easier to self-produce the desired brainwave state at will. Thus, using brainwave entrainment, you can expect to get some of its effects later even without any external stimulus.

### Reducing learning time

The theta state (4Hz–7Hz) has been found to increase learning capabilities. In fact, children spend more time in theta state than adults, which probably explains the accelerated learning capabilities of children.

Alpha frequencies are also useful for learning purposes. You can play language cassettes, subliminal tapes, etc. during an entrainment session for a maximum effect.

### Reducing sleep needs

Some people have found that half an hour a day of the Theta state can replace up to 4 hours of sleep.

### Treatment of certain mental diseases

Brainwave entrainment is used in treatment of depression, low self-esteem, attention deficit disorder, drug and alcohol addiction and autism, to name a few.

Brainwave entrainment has also been found helpful in alleviating headaches and migraines.

## How to use BrainWave Generator

This topic lists some tips for you to find the best way to use BrainWave Generator. Please note that the best practises are always up to your personal preference, and general guidelines are impossible to give.

- Use stereo headphones. <u>Binaural beats</u> are based on the fact that each ear hears a different sound.
- Adjust the volume to a comfortable level. If the sound starts to distract you, turn the volume down. The volume can be very low (even barely audible) and still have 100% effectiveness.
- Lie down. Use an extension cord so you can wear your headphones while lying on the bed. Be careful not to fall asleep! If you are familiar with different meditation positions, you may also try them.
- Some entrainment programs can be used while sitting at your computer and doing some work. Beta entrainment frequencies are best suited for this kind of use.

## Binaural beat frequencies

For a general description of what binaural beats are and how they can be used to entrain brain state to a specific state, click ⟫.

BrainWave Generator generates sound output with different audible pitch frequencies for each ear. The frequencies generated by BrainWave generator are defined by two parameters (settable in the **Preset Options** dialog): Binaural Beat Frequency and Audible Pitch. The sound generated for the right ear is always Audible Pitch minus half of Binaural Beat Frequency. The sound generated for the left ear is Audible Pitch plus half of Binaural Beat Frequency. The average is effectively equal to the Audible Pitch value, and the difference is of course equal to the Binaural Beat Frequency value.
For example, consider the following settings:

| | |
|---|---|
| Audible Pitch | 450Hz |
| Binaural Beat Frequency | 7Hz |

These would result in the following frequencies generated by BrainWave Generator:

| | |
|---|---|
| Right ear | 446.5Hz |
| Left ear | 453.5Hz |

## Modulation

Modulation is applied on top of the generated waveforms (see Binaural beat frequencies and Waveforms). You can configure the modulation depth (100% depth would cycle the output between full volume and zero volume) and the modulation frequency (expressed as modulation time).

The following illustration shows an output waveform (sine wave) with modulation applied to it. In this case, the audible frequency is 500Hz, modulation depth is 50% and modulation time is 50 milliseconds (resulting in a frequency of 1000/50ms = 20Hz).
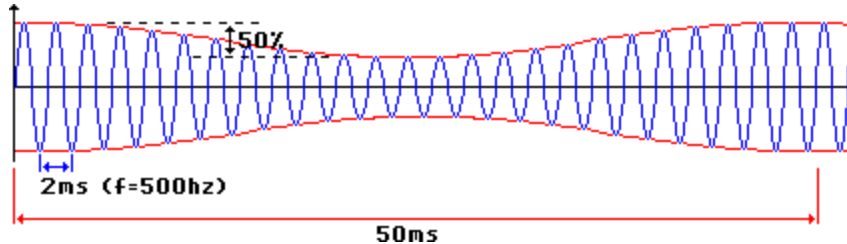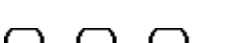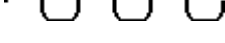


Modulation phase can also be set in BrainWave Generator. It affects the way left and right sound channels are modulated in relation to each other. If the phase is 0 degrees ("In phase"), both left and right channels are modulated equally. If the phase is difference, the other channels "leads" in modulation. This will create a sensation of the sound circulating around your head.

**Notes**
- If you want modulation to play a part in brain stimulation, convert the modulation times to frequencies by dividing 1000 by the modulation time (for example, 1000/143ms   7.0Hz).
- In addition to sound output, modulation can also be applied to the background voice, background noise and visual output. Modulation for different voices (up to 10) in a preset can, of course, be specified separately.

# Waveforms

You can set the basic waveform of the generated output on the Waveform tab of the **Preset Options** dialog. The selectable waveforms are illustrated below.

| Waveform | Waveform shape |
|---|---|
| Sine wave | |
| Sine^2 wave | |
| Sine^3 wave | |
| Triangular wave | |
| Rectangular wave | |
| 25% smoothed rectangular wave | |
| 50% smoothed rectangular wave | |

In addition to these predefined waveforms, you can also create you own waveforms. The waveform parameter is a special three-dimensional parameter. By normal dragging, you can change the Y value of the waveform. The Y value affects the curve flatness at the top of the waveform as follows:

| Y value | Waveform |
|---|---|
| 0 | Triangular wave |
| 50 | Sine wave |
| 100 | Rectangular wave |

The Z value of the waveform parameter can be changed by holding down the CTRL key while dragging. It affects the curve sharpness at the top of the waveform as follows:

| Z value | Waveform |
|---|---|
| 0 | Sine^2 wave |
| 50 | Sine wave |
| 100 | Rectangular wave |

By combining the different Y and Z values, you can also create other combinations.

You can further modify the waveform by applying filtering. For more information, click ≫.

**Note**

- There is a waveform graph at the bottom of the Waveform tab in the Preset Options dialog. It shows the form of the output waveform without filtering taken into account. You can use the graph to test how changes to the Waveform parameter affect the appearance of the waveform.

## Waveform filtering

You can filter the <u>output waveform</u> by specifying the Waveform Filter parameter in the **<u>Preset Options</u>** dialog.

You can set the filter cutoff frequency by modifying the Waveform Filter parameter. The cutoff frequency is set in terms of <u>harmonics</u> above the current Audible Pitch frequency. Cutoff value of 0 corresponds to the current Audible Pitch frequency.

Waveforms that have sharp edges (like the rectangular waveform) cause strong harmonics in the output. This does not usually sound pleasing to the ear. Filtering can be used to reduce the amplitude of these higher unwanted harmonics.

**Note**
* There is a spectrum graph at the bottom of the Waveform tab in the Preset Options dialog. It shows the spectrum of the output waveform. Black bars show the spectrum without filterin, and blue bars show the spectrum with filtering taken into account.

## Background voices

You can add backgrounds to your presets. Backgrounds can be voices (wave files) or noise, or a combination of both. For more information on background noise, click ».

For information on background parameters (Background Phase Shift and Background Interval), click ». The available background voices are listed below. "Parametric" after the name means that the background parameter is available on the Background tab of the **Preset Options** dialog. Location shows the file in which the background is stored. For more information, see Installing new backgrounds. The cycle length (sample length) is shown in case you want to make use of it as a stimulation aid.

| Background | Location | Cycle length (s) |
|---|---|---|
| Animals: Baaing sheep (parametric) | Bgextra.dll | One-time |
| Animals: Birds | Bgextra.dll | 3.414 |
| Animals: Galloping horse | Bgextra.dll | 4.337 |
| Animals: Howling dog (parametric) | Bgextra.dll | One-time |
| Animals: Mooing cow (parametric) | Bkgnd.dll | One-time |
| Animals: Pigeons | Bgextra.dll | 3.576 |
| Animals: Seagulls | Bkgnd.dll | 4.477 |
| Animals: Tropical birds | Bgextra.dll | 3.330 |
| Nature: Babbling brook | Bkgnd.dll | 1.394 |
| Nature: Gushing river | Bgextra.dll | 2.638 |
| Nature: Heavy rain | Bkgnd.dll | 1.332 |
| Nature: Night noises | Bkgnd.dll | 1.257 |
| Nature: Roll of thunder (parametric) | Bkgnd.dll | One-time |
| Nature: Wind | Bgextra.dll | 4.627 |
| Man-made: Chopping wood (parametric) | Bgextra.dll | One-time |
| Man-made: Explosions (parametric) | Bgextra.dll | One-time |
| Man-made: Traffic | Bgextra.dll | 4.344 |

**Notes**
- In addition to the backgrounds listed here, you can use your own wav files as backgrounds.
- You can apply modulation to any background. All three modulation parameters can be set for background modulation.

## Background parameters

You can specify a background phase shift and background interval for most background voices. Both are specified on the Background tab of the **Preset Options** dialog.

The Background Phase Shift parameter sets a delay for the left or right background sound channel. Background shift has little effect on stereo backgrounds but it can make a mono background sound a lot different. Use positive values to have the right sound channel lead, and negative values to have the left sound channel lead.

The Background Interval parameter sets the repeating rate of some backgrounds. It is not available for most built-in backgrounds because they are continuous in nature. For example, the Babbling brook background is a short sound sample which sounds as a brook only because it is repeated over and over without gaps between the repeats.

For other types of backgrounds, you can specify a background interval. If set to 0 (or "Continuous"), the background is repeated over and over without gaps between the repeats. The value of the Background Interval parameter sets the number of seconds between the **start** of one repeat and the next repeat. Thus, it must be set higher than the background length to have any effect.

## Noise backgrounds

In addition to underline background voices, you can add noise to your presets. Noise can be used to smooth the output of BrainWave Generator so that it will sound more natural.

You can set the background noise smoothness on the Background tab of the **Preset Options** dialog. A setting of 0% means rough white noise, 50% means softer pink noise and about 80−90% means very soft brown noise. The illustrations below show the noise waveforms resulting from some noise smoothness settings.

**Noise Smoothness 0%**

**Noise Smoothness 50%**

**Noise Smoothness 90%**
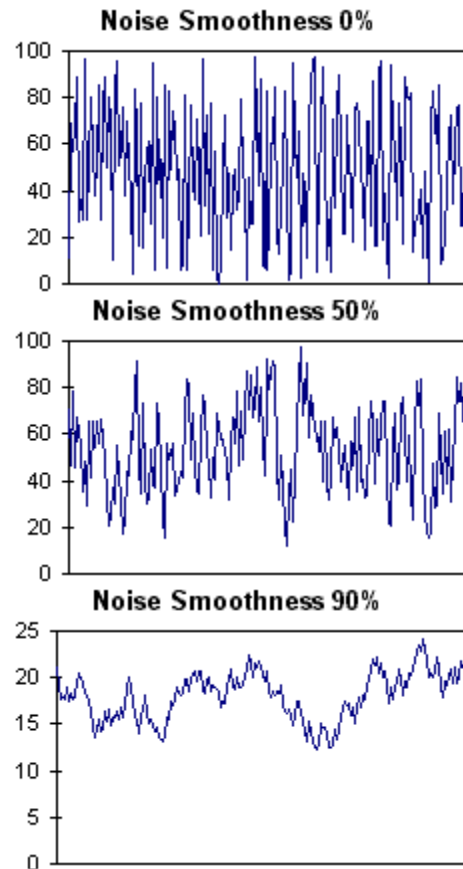
You can also set the noise source to be inside your head. However, this setting does not sound as natural as having the source outside your head. If you use the "Noise source inside the head" setting, you should set the volume very low.

**Notes**

- The noise smoothness parameter does not change uniformly across the whole range 0%−100%. For example, a change from 0% to 10% is hardly noticeable, but a change from 80% to 90% is easily noticed.
- Due to the formula used for noise generation, higher smoothness settings produce noise with lower volumes. To maintain uniform noise volume, you will have to modify the background volume parameter accordingly.
- You can apply modulation to the noise background. All three modulation parameters can be set for background noise. By using different modulation depth/period values with different noise smoothnesses, you can create some very interesting effects. For example, there are ocean wave types of backgrounds built-in into BrainWave Generator.

## Visual on-screen flashing

BrainWave Generator can flash the computer screen at a desired frequency. This flashing can be used to enhance the brain wave entrainment effect. However, there are some severe limitations on using the computer screen for visual stimulation (see the bottom of this topic). To overcome these limitation, BrainWave Generator also supports AudioStrobe. See Visual flashing with AudioStrobe goggles.

You can set the visual flashing frequency on the Visual tab of the **Preset Options** dialog. You can also set the brightness of the visual flashing, apply modulation, and specify a phase difference between the left and right eyes (only applicable to AudioStrobe flashing). Visual flashing is then turned on by selecting the desired flashing option from the Options menu before starting to play a preset: Flash Window, Flash Window (Always on Top) or Flash Full Screen.

The colors used while flashing the screen can be defined in the **Visual Color Options** dialog. There are two ways to get into this dialog.

1. Select Visual Color Options from the Options menu and deselect the "Override visual color options of individual presets".

    Then click the **Preset options**  button to modify the settings of the preset. On the General tab, click the Visual Color Options button.

2.     Select Visual Color Options from the Options menu and select the "Override visual color options of individual presets".

**Limitations**

- The screen flashing frequency is not very precise. This is because the refresh rate of the computer monitor affects the precision of the on-screen flashing.
- When flashing the window, the colors may seem to change in the middle of the screen. This may distract the viewer. This problem can be solved by using full-screen flashing with DirectX. DirectX support can be turned on in the **Advanced Options** dialog.

## Visual flashing with AudioStrobe goggles

BrainWave Generator can control goggle devices which support AudioStrobe. AudioStrobe compatible goggles are available from several sources. See http://www.bwgen.com/links for some providers.

AudioStrobe works by embedding control signals into the audio output. These signals have such high frequencies (19,200 Hz) that they are not heard by the human ear. Instead, they control the AudioStrobe goggle device to flash at specific rate and brightness.

You can set the visual flashing frequency on the Visual tab of the **Preset Options** dialog. You can also set the brightness of the visual flashing, apply modulation, and specify a phase difference between the left and right eyes. Visual flashing through AudioStrobe is then turned on by selecting Use External Goggles (AudioStrobe) from the Options menu before starting to play a preset.

**Known Problems**
- The normal sound output of BrainWave Generator may interfere with the AudioStrobe control signals. This may happen if other than pure sine wave signals are used. You should use only the sine waveform when using AudioStrobe.

## Starting and stopping an entrainment session

BrainWave Generator contains several built-in brainwave entrainment programs (presets). To start a session with one of them, follow the steps below.

  **1**  Browse the **Preset name** list to find the preset you want to use.

  **2**  Click the **Play** button to start the output.

      - or -

      Click the **Preset options** button to view and modify settings of the selected preset. For more information about modifying preset settings, click .

  **3**  To stop playing the preset, click the **Stop** button.

**Note**

- To get more information about a preset, click the **Preset options** button and read the description of the preset.

## Modifying parameters of a preset

To modify parameters of the currently selected <u>preset,</u> click the **Preset options** ⏩ button.

The parameters you can modify are listed below. For more information on the parameters, click the name of the parameter in the list.

<u>Setting segment parameters (length and repeat count)</u>
<u>Setting voice parameters (binaural beat frequency, sound volume and audible pitch)</u>
<u>Specifying modulation of a preset</u>
<u>Selecting a background for preset</u>

<u>Changing parameter envelopes</u>

<u>Setting a parameter to track another parameter</u>

## Deleting unneeded presets

You can delete a <u>preset</u> that you do not need any longer by following the steps below.

   **1**  Select the preset in the **Preset name** list.

   **2**  Click the **Delete preset** ✕ button.

**Note**

- Once you delete a preset, you can not get it back. However, you can get the built-in presets back by importing the file Default.bwg. For more information on importing presets, click ≫.

## Renaming a preset

You can change the name of a <u>preset</u> by following the steps below.

**1** Select the preset whose name you want to change in the **Preset name** list.

**2** Click the **Preset options** ⏩ button to modify the settings of the preset.

**3** Enter a different name into the **Name** box on the **General** tab and click **OK.**

**4** Click the **Save** 💾 button to save the preset with the new name.

**Note**

- To save a copy of a preset to another name, select **Save As** from the **File** menu.

## Importing presets

You can import a <u>preset</u> from an external bwg file by following the steps below.

1  Select **Import** from the **Presets** menu.
2  Select the bwg file you want to import. Bwg files can be created by exporting them from other installations of BrainWave Generator. For more information, click ⏩.

- or -

1        Double-click the bwg file you want to import in **Windows Explorer.** BrainWave Generator will open and import the file.

**Notes**

- Usually you import presets given to you by other people. For example, a friend of yours may have developed a preset which he or she wants to share with you. In this case, your friend would export his/her preset, transfer it to you via email, FTP, diskette or any other means. Then you would import that preset to be able to use it on your computer.
- There are presets available for download at <u>http://www.bwgen.com</u> (select the Presets link). You can also submit your own presets there.
- Importing presets is only available in the registered version of BrainWave Generator.

## Exporting modified presets

You can export a <u>preset</u> you have modified by following the steps below.

**1** Select the preset you want to export in the **Preset name** list.
**2** Select **Export** from the **Presets** menu.
**3** Specify the file into which you want to export the preset, and click **Save.**

**Notes**
• You can export presets into files for moving them to other computers or for distributing to other people. You can also make backups of your presets by exporting them. For instructions on how to import a preset back into BrainWave Generator, click ⯈⯈.
• You can only export one preset into one file. However, BrainWave Generator stores all presets into the file Presets.bwg (including the built-in presets). If you want to move ALL of your presets to another computer, you can simply import the file Presets.bwg onto the other computer.

## Saving output as a .WAV file

You can save the output of a <u>preset</u> to a .wav file by following the steps below.

**1** Select the preset you want to save in the **Preset name** list.
**2** Select **Play into .WAV file** from the **Wave** menu.
**3** Specify options for the .WAV file, and click **OK.**
**4** Specify the file into which you want to save the preset output, and click **Save.**

**Notes**

- If you want to store BrainWave Generator output onto a CD, you should select the Default CD settings checkbox. You will then have to use another software to process and convert the :WAV file for storing it onto a CD.
- If you want to store BrainWave Generator output as an MP3 file, you must first save the desired output as a .WAV file. You will then have to use another software to convert the :WAV file to MP3 format.

## Creating new presets

You can create a new preset by following the steps below.

1  Click the **New preset**  button.
2        Modify the preset settings as desired and click **OK.**

3  Click the **Save**  button. If you did not enter a name in the **Preset Options** dialog, BrainWave Generator will ask you for the name of the new preset.

**Note**
• To create a preset with settings copied from another preset, select **Save As** from the **File** menu.

## Setting segment parameters

Presets are divided into parts called *segments.* Each segment contains parameters which can be set independently of other segments. When playing a preset containing several segments, the segments are played one after another.

You can create a new segment into your preset by following the steps below.

**1** Open the **Preset Options** dialog by clicking the  button. Select the **General** tab.

**2** Click the **Add** button under the **Segments** section.

**3** Enter an identification letter into the **ID** field. By default, segments are assigned letters A, B, C, etc.

**4** Enter the length of the segment (in minutes) into the **Length** field. All other durations you set on other tabs of the **Preset Options** dialog will be relative to this length.

**5** If you want to repeat this segment several times before moving to the next segment, enter the number of repeats into the **Repeat** field. For an example on how to create a preset with repeating segments, click .

**6** Use the **Move up** and **Move down** buttons to change the order of your segments as desired.

**7** Switch to the **Output, Sound,** and **Background** tabs to configure the parameters of the new segment in detail. For more information, click .

**Notes**

- When you have more than one segment in your preset, the tabs in the **Preset Options** dialog will show the segment whose settings they contain. You can easily change the segment to edit by pressing Ctrl+Shift and the identification letter of the segment you want to edit.
- One preset may contain a maximum of 16 segments. Each segment may contain a maximum of 4 voices, which can be different in each segment.

## Setting voice parameters

Presets are divided into parts called *segments.* For more information on setting segment parameters, click ⏩. Each segment, in turn, may contain different *voices* which have parameters that can be set independently of other segments and voices. When playing a segment containing several voices, all the voices are played at the same time on top of each other.

You can create a new voice into a segment by following the steps below.

**1** Open the **Preset Options** dialog by clicking the **Preset options** ⏩ button. Select the **General** tab.

**2** Select the segment into which you want to create the voice, and click the **Add** button under the **Voices** section.

**3** Switch to the **Output** and **Sound** tabs to configure the parameters in detail. For more information on configuring parameter envelopes, click ⏩. The parameters you can configure are listed below.

| Parameter | Description |
|---|---|
| Binaural Beat Frequency | Frequency of the generated binaural beats. |
| Sound Volume | Output volume in percents. 100% is maximum volume and 0% mean no output. |
| Audible Pitch | The frequency of the sound heard from earphones. |
| Modulation | See Specifying modulation of a preset. |

**4** Select the desired waveform of the output with the **Waveform** list-box on the bottom of the **Sound** tab. For graphical illustrations of the different waveforms, click ⏩.

**Notes**
- When you have more than one voice in a segment, the **Output** and **Sound** tabs in the **Preset Options** dialog will show the number of the voice whose settings they contain. You can easily change the voice to edit by pressing Ctrl+Shift (or just Ctrl) and the number of the voice you want to edit.
- You can not change the order of the voices, because they are all played at the same time. Therefore, their order makes no difference.
- If the current segment has two voices, and the next segment has only one, the last node of the sound volume can't be moved. This is because the missing voice in the next segment means that its sound volume is essentially zero.

## Selecting a background for preset

In addition to the binaural beat output of presets, they can also specify a background. The background may be one of the 19 build-in backgrounds, or an external wav file. The built-in backgrounds are divided into four categories: Nature, Animals, Man-made and Noise.

You can select a background for your preset by following the steps below.

**1**   Open the **Preset Options** dialog by clicking the **Preset options**  button. Select the **General** tab.

**2**       Select the desired built-in background from the **Background** list. To specify an external wav file, select **Other...** and select the wav file you want to use.

**3**       Switch to the **Background** tab to configure the envelope of the background volume. For more information on configuring parameter envelopes, click .

**4**   If you selected a built-in background voice which was designated as being *parametric*, you can also configure the envelope of that background parameter. The parameter varies depending on the selected background voice as shown in the list below.

| Background | Background parameter |
| --- | --- |
| Nature: Roll of thunder | Seconds between rolls of thunder |
| Animals: Mooing cow | Seconds between cow's moos |
| Animals: Baaing sheep | Seconds between sheep's baas |
| Animals: Howling dog | Seconds between dog's howls |
| Man-made: Explosions | Seconds between explosions |
| Man-made: Chopping wood | Seconds between chop sounds |
| Noise: Outside the head | Smoothness (or color) of the noise. 0% means rough white noise, 50% soft pink noise and about 80% very soft brown noise. 100% smooth noise can not be heard. The noise source is outside of your head. For more information on background noise, click . |
| Noise: Inside the head | Same as above, but the noise will sound as if coming from inside of your head. |

**Notes**

- If you use an external wav file as the background, be careful not to use too large files. BrainWave Generator converts all wav files to the output sample rate (set in the **Advanced Options** dialog) so if your wav file is 1MB with a 10kHz sample rate, it will consume 4MB of memory if BrainWave Generator's sample rate is set to 40kHz.
- You can only specify one background for a preset. Background can not be changed between

segments of a preset.

## Specifying modulation of a preset

The steady sound output of BrainWave Generator may sound somewhat boring as such. You can make it more "lively" by adding some modulation to it. For more information on modulation, click ⏩.

You can specify modulation for your preset by following the steps below.

**1** Open the **Preset Options** dialog by clicking the **Preset options** ⏩ button. Select the voice you want to modify on the **General** tab, and switch to the **Sound** tab.

**2** Specify modulation by setting the Modulation Depth parameter envelope. For more information on configuring parameter envelopes, click ⏩. A modulation depth of 0% means that no modulation is in effect. A depth of 100% means that the output will cycle periodically between full output volume (as set by the Sound Volume parameter on the **Output** tab) and zero volume.

**3** Specify modulation period by setting the Modulation Period parameter envelope. Modulation period indicates the time (in milliseconds) between the full output volume peaks. For a graphical illustration of this effect, click ⏩.

**4** Check the **Circular modulation** check-box if you want the modulation to be circular. Circular modulation means that the modulation of the left and right sounds are 180° apart, thus creating an illusion of the sound circling around your head.

## Changing parameter envelopes

All parameters of BrainWave Generator (binaural beat frequency, sound volume, audible pitch, modulation and background) have associated _envelopes._ An envelope lets you specify the value of the parameter as a function of time.

The steps below show an example of how to modify different aspects of an envelope.

  1  Open the **<u>Preset Options</u>** <u>dialog</u> by clicking the **Preset options** button. Switch to the tab containing the parameter you want to modify.
  2      Click between two existing nodes to select the line between them.
  3      Click the right mouse button on the line, and select **Insert New Node.** Drag the new node to the position you want.
  4  Click and drag one of the node's _weight handles_ (small red boxes) to change how the line between the two nodes should go. Note, that all lines change their shape, because all nodes are _symmetric_ by default. To make a node non-symmetric, right-click it and deselect the **Symmetric** option. When you now drag the weight handles, the lines beyond the non-symmetric node will not change.

**Note**
*  The time scale on the x axis is the length of the current segment. This length can be set on the **General** tab of the **Preset Options** dialog. For more information on setting segment parameters, click.

## Setting a parameter to track another parameter

Instead of specifying all 7 parameters of a preset separately, you can set some of them to track others. For example, you may want the modulation period to depend on the binaural beat frequency so that with low values of binaural beat frequency, the modulation period will be long and for high values it will be short.

You can set this kind of tracking by following the steps below.

1   Open the **Preset Options** dialog by clicking the **Preset options** button. Switch to the **Sound** tab.

2      Check the **Track another parameter** check-box above the Modulation Period parameter. A list-box with all parameters appears.

3      Select the parameter you want the modulation period to track from the list-box. In this case you select Binaural Beat Frequency.

4      Click the **Parameters** button.

5   Specify the following parameters in the **Tracking Options** dialog:
    When Binaural Beat Frequency changes from **15.00** to **5.00**
    Change Modulation Period from **50** to **2000.**

6   Switch to the **Output** tab, modify the binaural beat frequency envelope and note how the modulation period parameter changes accordingly. For more information on configuring parameter envelopes, click .
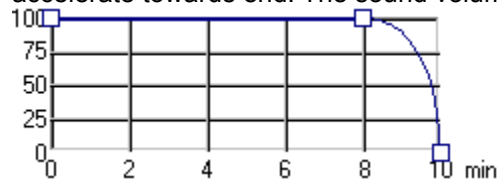
**Note**
- If you have several voices in your preset, voice parameters can only be set to track other voice parameter in the same voice. Other parameters (like background volume) track voice parameters of the currently selected voice.

## Creating a preset with a fadeout at the end

You can create a preset which gently fades out at the end by following the steps below.

**1** Click the **New preset** button to create a new preset.

**2** Specify any parameters you want for the binaural beat frequency, sound volume, audible pitch, modulation and background.

**3** Modify the sound volume parameter so that it stays near 100% in the beginning of the preset, but at a certain point drops down to 0%. Specify a weight less than 50% to make the fadeout start slower and accelerate towards end. The sound volume envelope might look as follows:



**4** Click **OK** to close the **Preset Options** dialog.

**5** Click the **Save** button and enter a name for your new preset.
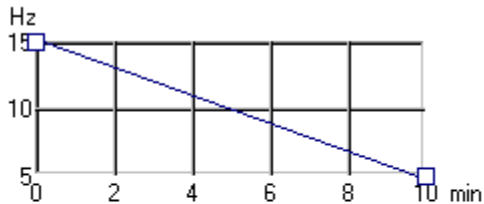
**Note**

- When the sound volume of a preset is zero at the end, sound output will automatically end when the preset has played.

## Creating a preset with steady audible pitch

You can create a <u>preset</u> in which the binaural beat frequency changes, but the audible pitch stays the same. This way you won't notice the change as actively as you do if the audible pitch also changes. You can do this by following the steps below.

**1** Click the **New preset** [»] button to create a new preset.

**2** Specify any parameters you want for the binaural beat frequency, sound volume, audible pitch, modulation and background.

**3** Modify the audible pitch parameter so that it is equal for the whole duration of the preset segment. The binaural beat frequency and audible pitch envelopes might look as follows:
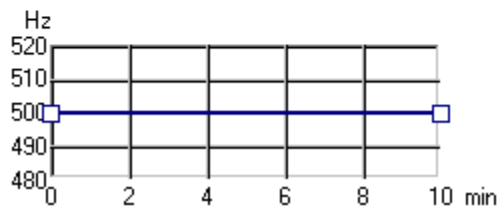


**4** Click **OK** to close the **Preset Options** dialog.

**5** Click the **Save** [»] button and enter a name for your new preset.

**Note**

- You can also experiment with an increasing audible frequency while the binaural frequency decreases. This creates a confusing effect as the brain would assume the binaural frequency to increase based on the audible pitch.

## Creating a preset with repeating segments

You can create a <u>preset</u> which repeats a certain pattern several times by following the steps below.

**1** Click the **New preset** >> button to create a new preset.

**2** On the **General** tab, enter a number greater than 1 in the **Repeat** box. Modify the parameters of the <u>segment</u> as desired. When played, this segment will be repeated the number of times specified by the **Repeat** setting.

**3** Add a new segment to the preset and modify its parameter so that it acts as the end of your preset. The end segment is not required, but normally you want to fade out the output after the repeating segment, or leave it playing at some different rate than at the end of the repeating segment.

**4** Click **OK** to close the **<u>Preset Options</u>** dialog.

**5** Click the **Save** >> button and enter a name for your new preset.

**Note**

- The end node of a segment and the start node of the succeeding segment are always equal. For repeating segments, the end node is equal to the start node. When changing the start or the end node, the other node will move accordingly.

## Creating a complex preset with several stimulation options

This topic demonstrates how you can create a preset with several ways to stimulate the brain. Note, that this preset will probably be useless as such, so you should use only some of these techniques in a single preset.

**1** Click the **New preset** ⏩ button to create a new preset.

**2** Set the binaural beat frequency to a constant of 10Hz. This is the basic way of stimulating the brain with a frequency of 10Hz.

**3** Add more voices and set their binaural beat frequencies as desired. This way you can have up to 4 independent brain stimulation frequencies.

**4** Set the modulation depth to 50–100% and modulation period to 500Hz. This will add a stimulation effect of 2Hz (=1000/500ms) to any voice.

**5** Select a parametric background on the **General** tab (for example, baaing sheep). Then set an interval of 10s for the baas on the **Background** tab. This will add a stimulation effect of 0.1Hz (=1/10s).

**6** Select a continuous background on the **General** tab (for example, babbling brook). Check the length of the background cycle to determine the stimulation effect. In this case, it would be 0.717Hz (=1/1.394s).

**7** Create a repeating segment and modify any envelope(s) to include a desired stimulation effect. Since the minimum repeat time is 1 minute, you may have to create the envelope(s) so that they repeat the desired shape several times. For example, with a 1 minute repeat setting, you can get a stimulation effect of 0.1667Hz (=1/6s) with the following envelope:
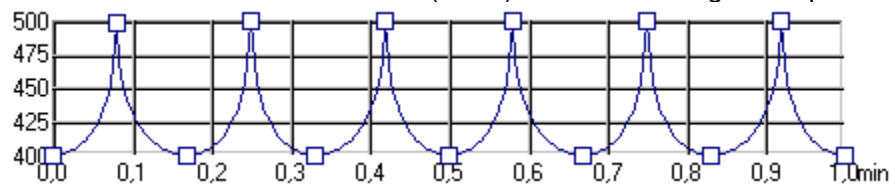


**Notes**

- Simultaneous voices of different audible frequencies may mask each other out quite effectively. Make sure to experiment with different volumes for the voices for the best effect.
- Complex stimulation options usually help in alleviating headaches and migraines, so you might want to experiment with several stimulation options in one preset.
- One nice stimulation effect is to keep the binaural beat frequency constant and only change the audible pitch frequency. The illustration above is taken from one such preset.

## Resetting default presets

If you have inadvertly modified and saved built-in <u>presets</u> of BrainWave Generator, you can reset them by following the steps below.

**1**  Select **Import** from the **Presets** menu in BrainWave Generator.
**2**  Select the file **Default.bwg** and answer **Yes** when asked whether you want to overwrite the existing presets. For more information on importing presets, click ![»].

- or -

**1**  In **Windows Explorer,** open the folder into which you have installed BrainWave Generator (by default, this is **C:\Bwgen).**
**2**  Delete the file **Presets.bwg.** When BrainWave Generator is restarted, it will create a new **Presets.bwg** file containing the default presets.

**Note**
• Importing presets is only available in the registered version of BrainWave Generator.

## Improving sound quality and/or improving performance

Sometimes BrainWave Generator output sound quality may not be high enough, there may be gaps in the sound output, or BrainWave Generator may use too much processor time. There are several options which affect this kind of behavior (for more information, click ⟫ ), but if you do not know how to optimize them, follow the steps below.

1   Create a new preset for testing purposes. This preset must be as simple as possible (one voice, no background, no modulation). You can create this kind of preset by clicking the **New preset** ⟫ button.

2      Select **Advanced Options** from the **Options** menu. Enter the following settings:
Samples per second = 44100
Bits per sample = 8
Number of memory blocks = 2
Length of memory blocks = 200

3   If the output quality is not satisfactory, try varying the **Samples per second** value in the range 30000–50000.

4   If there is too much noise in the output, try using 16 bits per sample instead of 8.

5   If there are gaps in the sound output, first try increasing the **Number of memory blocks** to 4, and if it does not help, up to 8. At the same time, try increasing the **Length of memory blocks** up to about 500.

**Notes**

- Some newer sound cards may have features that somehow "enhance" the sound output. For best results with BrainWave Generator, you should turn all such features off. This includes features like bass boost, 3D sound, bass/treble adjustments etc.
- If you are going to run other applications at the same time with BrainWave Generator, do that at the time when optimizing the output. Other applications affect the performance of BrainWave Generator (and vice versa).
- The complexity of presets affects the performance of BrainWave Generator. Voices, modulation, background and background parameter all contribute to the processing power required to play a preset.

## Installing new backgrounds

BrainWave Generator backgrounds are stored as DLL files. To install new backgrounds, follow the steps below:

1. Close BrainWave Generator.
2. Use **Windows Explorer** to copy the new background DLL file into the same directory with BrainWave Generator. By default, this directory is **C:\Bwgen.**
3. Restart BrainWave Generator. You should now have backgrounds from the new DLL shown in the Background dropdown in the **Preset Options** dialog.

**Note**
- The standard backgrounds provided with BrainWave Generator are contained in Bkgnd.dll. The extra backgrounds provided with BrainWave Generator are contained in Bgextra.dll.

## Configuring AudioStrobe output

AudioStrobe devices are controlled by signals embedded into the output sound (for more information, see Visual flashing with AudioStrobe goggles). Use the following procedure to configure your AudioStrobe goggles to work optimally for you.

1  Select **Configuration Wizard** from the **Options** menu. Click **Next** four times to get to the Check AudioStrobe output screen.
2  Connect your goggles to the computer sound system, and click the **Test AudioStrobe** button. The LED's on your goggles should start blinking.
3  Check the "I have an AudioStrobe device attached to my sound system" checkbox, and click **Next.**
4  On the Configure AudioStrobe output 1/2 page, click the **Start Testing** button, and observe how the lights on your goggles blink. Adjust the maximum brightness level to a value that is enough to light the LED's to their maximum brightness. Note that the actual brightness of the LED's during a session is set by the corresponding preset's Visual Brightness parameter. When finished, click the **Next** button.
5  On the Configure AudioStrobe output 2/2 page, click the **Start Testing** button, and observe how the lights on your goggles blink. Adjust the brightness zero level so that the blinking looks good. The brightness zero level should be set so that it is the maximum possible value with which the LED's are still off. You can test the current value without any blinking by clicking the **Test Zero Level** button. The LED's on your AudioStrobe goggles should remain off while the Zero Level test is running.

**Notes**
- You can also configure your sound system for AudioStrobe by keeping the maximum and minimum levels constant, and adjusting the sound volume instead.
- The AudioStrobe zero level cannot be set higher than the AudioStrobe maximum level. If it is, the LED's will always stay on at a constant brightness, no matter what the value of Visual Brightness parameter is.

## Preset Options Dialog

In the **Preset Options** dialog, you can configure all settings of a <u>preset.</u> The tabs of this dialog are described below. For more information on the options and parameters on each tab, click the ⬚ button in the top-right corner of the dialog, and click the option/parameter on which you want more information.

**General**

Settings on this tab specify options for the whole preset. This includes the name, description, background, <u>segments,</u> and <u>voices</u> in each segment.

**Sound**

This tab contains the most important output parameters of one voice: binaural beat frequency, audible pitch and sound volume.

**Waveform**

This tab contains the <u>waveform</u> setting of one voice.

**Background**

This tab contains options for the background of the preset. This includes background volume, phase shift and possible a background parameter, depending on background selected on the **General** tab.

**Noise**

In addition to a normal background, presets can contain noise as their background. This tab contains options for noise background of the preset.

**Visual**

If you want to use visual flashing as part of the brain wave entrainment session, use the settings on this tab. For more information on visual flashing options, see <u>Visual on-screen flashing.</u>

## Modulation Dialog

In the **Modulation** dialog, you can configure modulation parameters. For more information on a specific modulation parameter, click the  button in the top-right corner of the dialog, and click the parameter on which you want more information.

## Sweep Parameters Dialog

In the **Sweep Parameters** dialog, you can set the parameters of two nodes in a parameter <u>envelope.</u> For more information on configuring parameter envelopes, click . Note that you can set all of these options directly in the **<u>Preset Options</u>** dialog by using mouse and right-click menus.

**<parameter>**
> Sets the range of the parameter values. The parameter may be binaural beat frequency, sound volume, etc. The start value represents the node you have selected, and the end value represents the next node.

**Constant**
> Check this check-box if you want the end value to be the same as the start value.

**Sweep time**
> Sets the times of the start node and the end node.

**Sweep weight**
> Sets the shape of the curve by which the start node value changes to the end node value. Use values 0–100 where 50 means a linear change.

**Linear sweep**
> Check this check-box if you want the start node value to change linearly to the end node value. This is the same as setting Sweep weight to 50.

**Symmetric node**
> Check this check-box if you want the weight value of the next node to be automatically changed to be the same as the weight of this node. By using symmetric nodes, it will be easier to create your parameter envelope so that there are no too steep changes in it.

**Note**
- Note that you can change the values of **two** nodes in this dialog. The "from" values are those of the selected node, and the "to" values are those of the next node. You can change them both.

## Tracking Options Dialog

In the **Tracking Options** dialog, you can set the parameters which affect how the selected parameter tracks another parameter. There are two ways of specifying the tracking formula. The easiest one is to select the **Specify change ranges** option and set the following two pairs of from/to values.

**When <tracked parameter> changes from/to**
These from/to values specify the "base" range of the tracked parameter.

**Change <tracking parameter> from/to**
These from/to values specify what the corresponding change in the tracking parameter will be.

The other way of specifying the tracking formula is by entering **Y intercept** and **Y/X slope** values directly. The value of the tracked parameter is calculated with the following formula: $P2=a+b*P1$ where *a* is the value of **Y intercept** and *b* is the value of **Y/X slope.** This method is only recommended if you understand the preceding description.

You can also specify limits for the tracking parameter. If the calculated tracking value would be out of the **min/max** limits, the minimum/maximum value will be used instead.

## Visual Color Options Dialog

In the **Visual Color Options** dialog you can specify the used for visual screen flashing. For more information on visual flashing options, see <u>Visual on-screen flashing.</u> The fields in this dialog are described below.

**Override visual color options of individual presets**

If checked, visual color options set for preset have **no effect.** Instead, the options set in this dialog are always used. This checkbox is only visible if you selected Visual Color Options from the Options menu. It will not be visible if the Visual Color Options button was clicked in the Preset Options dialog.

**Colors**

Specifies the colors which are flashed in sequence when visual flashing is on. Use the **Modify Color, Add** and **Delete** buttons to modify the colors. Use the **Move up** and **Move down** buttons to change the order of the colors.

# Advanced Options Dialog

In the **Advanced Options** dialog you can specify options related to the sound output quality, memory usage of BrainWave Generator and visual flashing. The fields in this dialog are described below.

**Samples per second**
Specifies the output sample rate of BrainWave Generator. The higher the sample rate, the better the output quality. For example, CD-quality sound uses 44100 samples per second, which is the default setting.

**Bits per sample**
Specifies the depth of each output sample. 16-bit sound has much less noise than 8-bit sound. The default is 16 bits.

**Number of memory blocks**
Specifies the amount of internal output buffers used by BrainWave Generator. The higher this number, the more output BrainWave Generator can buffer, thus being able to tolerate higher loads on the computer without gaps in the output. The default is 4.

**Length of memory blocks**
Specifies the length of output buffers in milliseconds. Effects are same as above, but longer buffer lengths may slow down the computer because they take longer to fill. The default is 200 milliseconds.

**Memory consumed**
Shows the amount of memory consumed with the options set in this dialog.

**Invert left and right sound channels**
If checked, swaps the left and right sound channels.

**Use DirectX for smooth full-screen flashing**
If checked, BrainWave Generator uses DirectX for visual flashing of the screen. If this check-box is grayed, you do not have DirectX installed. For more information on visual flashing options, see Visual on-screen flashing.

**AudioStrobe brightness zero level**
Sets the zero-level of AudioStrobe lights when visual flashing with an AudioStrobe device is used. For more information on configuring your AudioStrobe compatible device, see Configuring AudioStrobe output.

**AudioStrobe maximum brightness level**
Sets the maximum level of AudioStrobe lights when visual flashing with an AudioStrobe device is used. For more information on configuring your AudioStrobe compatible device, see Configuring AudioStrobe output.

**Number of nodes in a new parameter**
Sets whether parameters of a new preset will have 2 or 3 nodes after being created. This affects creation of new presets, as well as adding segments and voices to existing presets.

**Link adjacent segments automatically together in Preset Options**
If checked, the Preset Options dialog will make sure that the end node of a segment is always the same as the start node of the next segment. If not checked, this rule is not applied. Note that in this case presets can easily have unwanted "bumps" (abrupt parameter value changes).

**Notes**
- To maximize the sound quality, use 16-bit sound with a sample rate of 44100.
- To minimize unwanted gaps in the output when your computer runs other applications as well, use as many memory blocks as possible and as long memory blocks as possible.
- Following the above two points will lead to high memory usage, which will in turn decrease performance. Experiment with different settings to find the optimum. For more information, click ⏩.
- The length of memory blocks set the minimum change rate of the output parameters. If you have a rapidly changing parameter (for example, an audible frequency sweep from 10,000Hz to 100Hz), you

will have to decrease the length of memory blocks to make the change sound natural enough.

**Preset**

*Preset* is a set of parameters which define a brain entrainment session. There are several built-in presets included with BrainWave generator, and you can also create your own presets.

**Segment**

*Segment* is a building block of a <u>preset.</u> A preset may contain just one segment, or several segments. Segments are played one after each other in the preset. Segments may contain one or more <u>voices.</u>

**Voice**

*Voice* is a building block of a <u>segment.</u> All voices play simultaneously in one segment, so their order is of no importance.

**Waveform**

*Waveform* denotes the format of the sound output. The most basic waveform is a sine wave, which produces a pure one-frequency output. Other waveforms (sine^2, triangular, rectangular and smoothed rectangular waveforms) introduce harmonic frequencies into the output. For more information on how to set your own waveform, click ⏩.

**Envelope**

*Envelope* means the set of output parameters as a function of time. The output parameters may change any way you like as time goes on. For example, you can define the binaural beat frequency to start at 15Hz, then descend to 5Hz during 8 minutes, and last increase to 7Hz during the last 2 minutes. The resulting curve is called the binaural beat frequency *envelope.*

**Binaural beat**

If a steady tone of 395Hz is applied to your left ear, and a steady tone of 405Hz to your right ear, the difference, 10Hz, will be perceived by your brain. Since inaudibly low frequencies (like 10Hz) are required for <u>brain stimulation,</u> binaural beats are the way of applying such stimulus.

For more information, click .

**Brain stimulation**

Brain stimulation is a way of altering your state of consciousness. BrainWave Generator uses binaural beat frequencies for brain stimulation.

For more information on brain states, click ».

For more information on brain stimulation, click ».

**Harmonic**

*Harmonic* (short for *harmonic frequency)* is a multiple of a base frequency. For example, if the base frequency (Audible Pitch) is 440 Hz, the first harmonic is 880 Hz, the second harmonic is 1320 Hz, the fourth harmonic is 1760 Hz, and so on.

The **New Preset** command creates a new preset. After having changed the desired options, use the **Save** command to save the preset. For more information on creating new presets, click ⏩.

The **Save** command saves the modified preset.

The **Save As** command saves the modified preset with a different name.

The **Delete** command deletes the currently selected preset. For more information on deleting presets, click ≫.

The **Export** command exports the currently selected preset to a file. For more information on exporting presets, click ⏩.

The **Import** command imports an external preset file into BrainWave Generator. For more information on importing presets, click ⏩.

The **Exit** command quits BrainWave Generator.

The **No Visual Effects** setting specifies not to use any visual flashing. For more information on visual flashing options, see Visual on-screen flashing.

The **Use External Goggles (AudioStrobe)** setting specifies to use an external AudioStrobe compatible device for visual stimulation. For more information on visual flashing options, see <u>Visual on-screen flashing.</u>

The **Flash Window** settings specifies to flash the BrainWave Generator window for a visual stimulation effect. For more information on visual flashing options, see <u>Visual on-screen flashing.</u>

The **Flash Window (Always on Top)** settings specifies to flash the BrainWave Generator window for a visual stimulation effect. The window will remain on top of all other windows on the screen. For more information on visual flashing options, see <u>Visual on-screen flashing.</u>

The **Flash Full Screen** setting specifies to flash the entire screen for a visual stimulation effect. For more information on visual flashing options, see <u>Visual on-screen flashing.</u>

The **Visual Color Options** command brings up the **Visual Color Options** dialog for setting options of screen flashing stimulation. For more information on visual flashing options, see Visual on-screen flashing.

When the **Show Parameters While Playing** option is enabled, the sound volume and frequency are shown in the BrainWave Generator window. With this option disabled, the parameters are not shown in the window.

The **Configuration Wizard** command opens the BrainWave Generator Configuration Wizard which allows you to set up your sound system for optimal performance.

The **Advanced Options** command brings up the **<u>Advanced Options</u>** dialog.

The **Play** command starts playing the currently selected preset.

The **Play With Delay** command waits a specified number of minutes and then starts playing the currently selected preset. This command can be used to allow you to get comfortably situated before starting playback.

The **Stop** command stops playing the currently playing preset.

The **Freeze/Restart** command freezes the currently playing preset so that its parameters don't change. If already frozen, this command restarts advancing all parameters as defined by the preset.

The **Play into .wav file** command starts playing the currently selected presets, but instead of playing it through the computer sound system, BrainWave Generator will save the output to a file. For more information on playing BrainWave Generator output to a file, see <u>Saving output as a .WAV file.</u>

The **Preset Options** command lets you modify parameters of the currently selected preset. For more information, click .

The **Help Topics** command shows the BrainWave Generator Help.

The **About** command shows generic information about BrainWave Generator.

The **Edit** command opens the **<u>Sweep Parameters</u>** dialog where you can specify parameters for the selected node.

The **Delete** command deletes the currently selected node from the parameter envelope.

The **Insert** command inserts a new node after the selected node into the parameter envelope.

The **Symmetric** command lets you toggle the selected node between symmetric and non-symmetric. For symmetric nodes, the weights on both sides of the node are always made equal.

The **Play Here** command starts playing the current preset at the position pointed to by the mouse. As opposed to normal playback, the playing position does **not** advance in time. You can make changes to the preset and get immediate feedback of how the changes affect the output.

The **Stop Playing** command stops the playing of the current preset.

The **Refresh Minimum and Maximum** command refreshes the Y axis range. If you have changed the parameter envelope values so that the range is wider than necessary, you can use this command to reset the range to the minimum possible range.

Specifies the output sample rate of BrainWave Generator. The higher the sample rate, the better the output quality. For example, CD-quality sound uses 44100 samples per second.

Specifies the depth of each output sample. 16-bit sound has much less noise than 8-bit sound.

Specifies the number of memory blocks BrainWave Generator will use when generating sound output. For more information, click >>.

Specifies the length of each memory block BrainWave Generator will use when generating sound output. For more information, click ».

If checked, swaps the left and right sound channels.

If checked, BrainWave Generator uses DirectX for visual flashing of the screen. If this check-box is grayed, you do not have DirectX installed. For more information on visual flashing options, see <u>Visual on-screen flashing</u>

Sets the zero-level of AudioStrobe lights when visual flashing with an AudioStrobe device is used. For more information on configuring your AudioStrobe compatible device, see Configuring AudioStrobe output.

Sets the maximum level of AudioStrobe lights when visual flashing with an AudioStrobe device is used. For more information on configuring your AudioStrobe compatible device, see Configuring AudioStrobe output.

If checked, the Preset Options dialog will make sure that the end node of a segment is always the same as the start node of the next segment. If not checked, this rule is not applied. Note that in this case presets can easily have unwanted "bumps" (abrupt parameter value changes).

Sets whether parameters of a new preset will have 2 or 3 nodes after being created. This affects creation of new presets, as well as adding segments and voices to existing presets.

Specifies the name of this preset.

Specifies a textual description of this preset.

Specifies the background of this preset. Select **Other...** to specify a separate sound file.

Lists the segments in this preset.

Lists the voices in this segment.

Specifies the identifier of this segment. The identifier should be a letter A–Z in which case you can change to this segment easily by pressing the ID letter with CTRL and SHIFT depressed.

With these buttons, you can reorder the segments into the desired order.

Specifies the length (in minutes) of this segment.

Specifies the number of times this segment will be repeated.

Adds a new segment into the preset.

Deletes the current segment from the preset.

Adds a new voice into the preset segment.

Deletes the selected voice from the preset segment.

Opens the **Visual Color Options** dialog for setting options of screen flashing stimulation. These options are used only when playing this preset. For more information on visual flashing options, see Visual on-screen flashing.

If checked, this preset will continue playing even after all the segments have been played (with the last parameters). If not checked, playback will stop after the last segment.

Starts playing the current preset from the beginning. As opposed to normal playback, the playing position does **not** advance in time. You can make changes to the preset and get immediate feedback of how the changes affect the output.

The Binaural Beat Frequency parameter sets the difference between the sound output of the left and right ear. For more information on binaural beat frequencies, click ⏩.

The Audible Pitch parameter sets the pitch of the audible sound heard from the headphones. The exact pitch for the right ear is Audible Pitch minus Binaural Beat Frequency divided by 2, and the pitch for the left ear is Audible Pitch plus Binaural Beat Frequency divided by 2. For example, Audible Pitch 400Hz and Binaraul Beat Frequency of 10Hz yield 395Hz for the right ear and 405Hz for the left ear.

The Sound Volume parameter sets the volume of the sound output. 100% means the maximum volume as set in your sound system volume settings.

The Waveform parameter sets the output waveform. This parameter employs a special 3-D chart for setting the waveform between sine wave, triangular wave, rectangular wave and sine^2/sine^3 wave.

The Waveform Filter parameter adjust the output waveform by cutting off frequencies above a specified frequency. Cutoff frequency is specified in terms of harmonics above the current Audible Pitch frequency.

Non-existent parameter.

The Background Volume parameter sets the volume of the background voice. If None has been selected for background (on the **General** tab), this parameter has no effect. For more information on backgrounds, click ».

The Background Shift parameter sets a delay for the left or right background sound channel. Background shift has little effect on stereo backgrounds but it can make a mono background sound a lot different. Use positive values to have the right sound channel lead, and negative values to have the left sound channel lead.

The Background Parameter depends on the selected background voice. If a non-parametric background has been selected, it is not is use. If a parametric background has been selected, it reflects the parameter settable for that background. For more information on backgrounds, click >>.

The Noise Volume parameter sets the volume of the noise background. 100% means the maximum volume.

The Noise Smoothness parameter sets the smoothness of the background noise. Smoothness of 0% means rough white noise, 50% means softer pink noise, and about 80–90% means very soft brown noise.

Non-existent parameter.

The Visual Frequency parameter sets the frequency of visual flashing (either on-screen or via AudioStrobe). For more information on visual flashing options, see <u>Visual on-screen flashing.</u>

The Visual Brightness parameter sets the brightness of the visual flashing (either on-screen or via AudioStrobe). With on-screen flashing, reduced brightness means darker colors. For more information on visual flashing options, see Visual on-screen flashing.

The Visual PhaseDifference parameter sets the relation of the left visual channel to the right channel. Since on-screen flashing only has one channel, this parameter has no effect when used with on-screen flashing. This parameter is only supported with AudioStrobe output. For more information on visual flashing options, see Visual on-screen flashing.

Specifies whether this parameter tracks another parameter or is specified independent of other parameters.

Specifies which parameter this parameter tracks, i.e. which parameter the envelope of this parameter is based on.

Click this button to change the options by which this parameter tracks another parameter.

Click this button to change the modulation options related to this item. Modulation means changing the volume periodically between two values. A simple sound can often be made much richer and more complex by using some modulation.

Use these radiobuttons to toggle the graph below to show the value of either the left or right channel.

If this checkbox is selected, you can specify the parameter values separately for the left and right channels. When checked, you can use the Left/Right radiobuttons to toggle the chart display between the left and right channel.

Use this slider to set the position at which the <u>waveform and spectrum</u> will be shown.

Shows the waveform set by the <u>Waveform</u> and <u>Waveform Filter</u> parameters. The first bar in the spectrum graph is the base frequency (Audible Pitch). The black bars show the spectrum without filtering and the blue graphs show the resulting spectrum after filtering has been applied.

Select this check to make the left and right noise channels inverse of each other. This will create an illusion as if the noise were coming from inside your head. Otherwise it will sound as if coming from outside of the head. Note that having the noise source inside the head is usually not as pleasant as having it outside.

This checkbox is disabled if you have chosen to specify the noise smoothess separately for left and right ear.

The Modulation Depth parameter sets how deep the volume (or brightness) will be modulated. 0% means no modulation and 100% means that the output will cycle between the full value (as set by the volume or brightness parameter) and zero. For more information about modulation, click ».

The Modulation Period parameter sets the time between two successive modulation peaks. This parameter has no effect if modulation is not in use (Modulation Depth is zero). For more information on modulation, click .

The Modulation Phase parameter set the relation of the modulation applied to the left channel and the right channel. Phase of 0 degrees means that modulation occurs is applied to both channels at the same time. Phase of 90 degrees means that the left channel leads by one fourth in modulation, and 180 degrees means that modulation is exactly oppisite for each channel. For more information on modulation, click ⏩.

Specifies the start value of the node you are modifying.

Specifies the end value of the node you are modifying.

Specifies the Z component of the start value of the node you are modifying. For more information on specifying the waveform parameter in the XYZ-coordinate system, see Waveforms.

Specifies the Z component of the end value of the node you are modifying. For more information on specifying the waveform parameter in the XYZ-coordinate system, see Waveforms.

Select this check-box if you want the end value to be the same as the start value.

Specifies the start time of the node you are modifying.

Specifies the end time of the node you are modifying. This is equal to the start time of the next node.

Specifies the sweep weight of the node you modifying. If the node has been set as symmetric, this may also affect weights of other nodes.

Specifies whether the node you are modifying is symmetric or non-symmetric. For symmetric nodes, the weights on both sides of the node are always made equal.

Select this check-box to make the sweep weight fixed at 50%.

These edit-boxes specify how the tracked parameter is mapped to the current parameter. The mapping is specified by selecting how the current parameter will change when the tracked parameter changes. For more information, click .

Select this button to specify tracking options by entering change ranges. For more information, click ⯮.

Select this button to specify tracking options by entering *a* and *b* parameters directly. For more information, click ⏩.

Specifies the *a* parameter of the tracking options. For more information, click ⏩.

Specifies the *b* parameter of the tracking options. For more information, click .

Specifies limits for the current tracking parameter. If a value calculated by the tracking options would exceed these limits, it is set to the limiting value.

If checked, visual color options set for individual presets have no effect. Instead, the options set in this dialog are always used.

Specifies the colors which are flashed in sequence when visual flashing is on.

Changes the selected color.

Adds a new color to the list.

Deletes the selected color from the list.

Moves the selected color up or down in the list.