BeoVision Televisions

Technical Sound Guide

Bang & Olufsen A/S
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Please note that not all BeoVision models are equipped with all features and functions mentioned in this guide.

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Introduction

Your Bang & Olufsen BeoVision television is equipped with an extremely powerful sound processing engine that can be customised to suit almost any configuration or listener preference. Internally, the digital signal processing (the computer that decodes and manages the audio signals coming into and out of your television) uses a proprietary 16.5-channel format that is compatible with an enormous variety of loudspeaker configurations. In spite of its complexity, it is extremely simple to use compared to other high-end surround sound processors, since almost all of the parameters are automatically configured when the television is “told” which Bang & Olufsen loudspeakers are connected to it. However, those parameters are all available in the menus to give experienced users the option of customising the settings for different setups.

The controls within the menus for the sound processing are divided into four general areas:

Global Controls are day-to-day adjustments such as the volume control.

Sound Modes are pre-programmed adjustments to suit different types of program material, and are factory-set for materials such as Drama, Music, or Speech. These can also be customised to suit personal preferences.

Speaker Groups are adjustments to suit different listening positions or situations. For example, these can be configured to change between stereo and surround listening, between one listening position and another, or between individual or group listening situations.

Speaker Connections or *Speaker Types* are used to initially set up your loudspeakers. This is only used as a first-time setup, or when adding new loudspeakers to your configuration.

Menu Maps

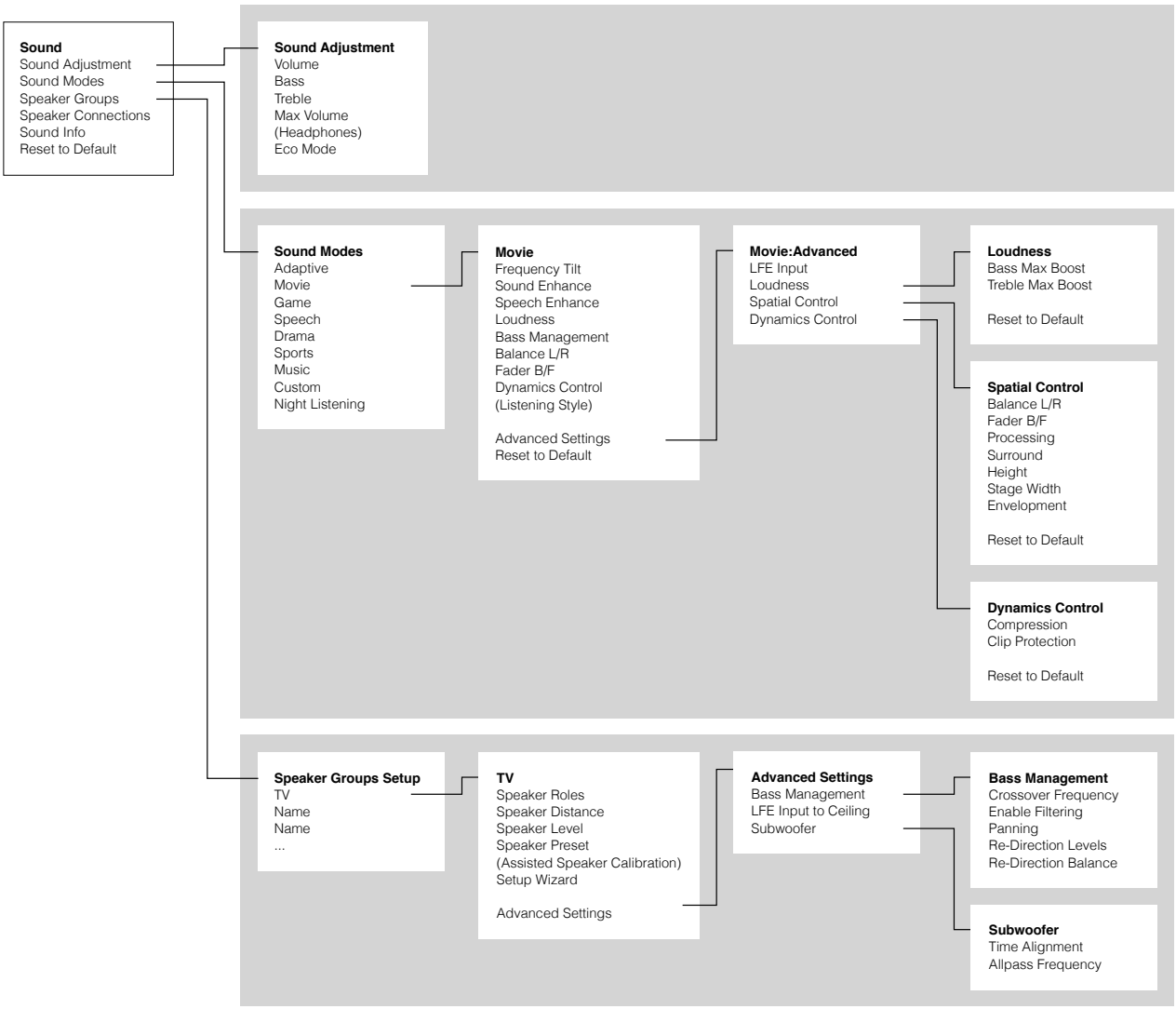


Figure 2.1: Menu map for BeoSystem 4, BeoPlay V1, BeoVision 11, and BeoVision Avant televisions. Options marked with parentheses are dependent on the capabilities of the specific system and may not be available on a specific product or software version.

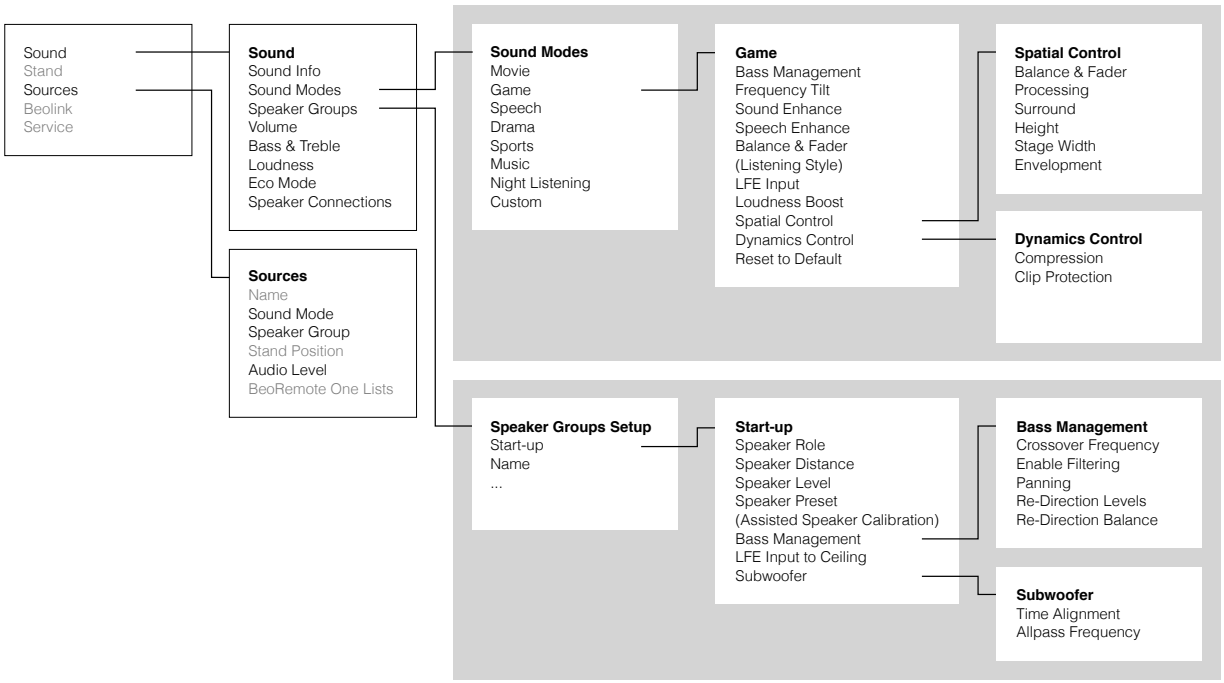


Figure 2.2: Menu map for BeoVision Eclipse and BeoVision Harmony televisions. Note that the list of available features are almost identical to those in Figure 2.1; only the organisation of items is different. Menu items not related to sound have been shown in grey. Options marked with parentheses are dependent on the capabilities of the specific system and may not be available on a specific product or software version.

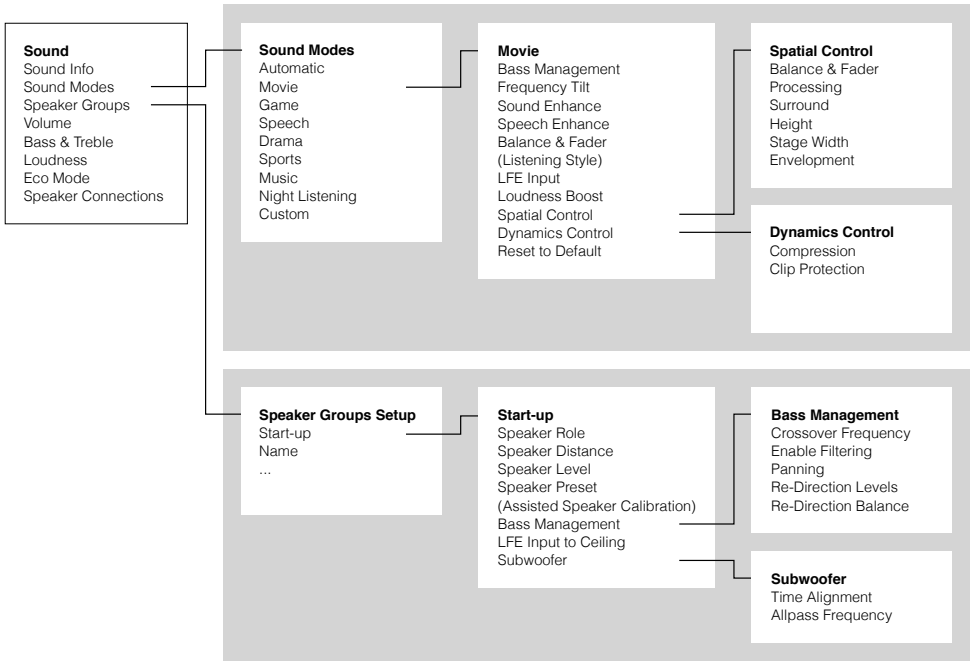


Figure 2.3: Menu map for BeoVision Horizon and BeoVision Avant NG. Note that the list of available features are almost identical to those in Figure 2.1; only the organisation of items is different. Options marked with parentheses are dependent on the capabilities of the specific system and may not be available on a specific product or software version.

Menu Items

3.1 Global controls

3.1.1 Volume

This menu displays the current volume setting on a scale of 0 to 90 in 1 dB steps.

3.1.2 Max Volume

The Max Volume is the highest volume setting that is allowed in normal usage. This can be used to limit the maximum output of the television.

3.1.3 Bass

The Bass adjustment allows you to change the relative amount of low-frequency sound using a low shelving filter with a turnover frequency of 120 Hz.

This is a global control, meaning that the setting of the Bass control is applied to all Sound Modes and Speaker Groups, and is independent of the settings of the Frequency Tilt and Sound Enhance controls. The range of the controller is $\pm$8 dB in steps of 0.8 dB.

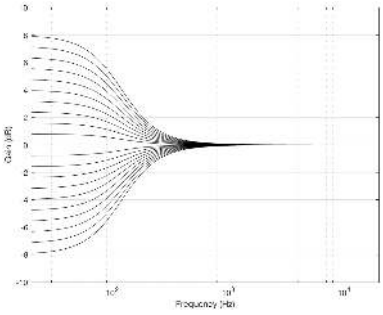


Figure 3.1: Magnitude response measurements of all settings of the Bass control. Note that this response is applied to each input channel.

3.1.4 Treble

The Treble adjustment allows you to change the relative amount of high-frequency sound using a high shelving filter with a turnover frequency of 8 kHz.

This is a global control, meaning that the setting of the Treble control is applied to all Sound Modes and Speaker Groups, and is independent of the settings of the Frequency Tilt and Sound Enhance controls. The range of the controller is $\pm$8 dB in steps of 0.8 dB.

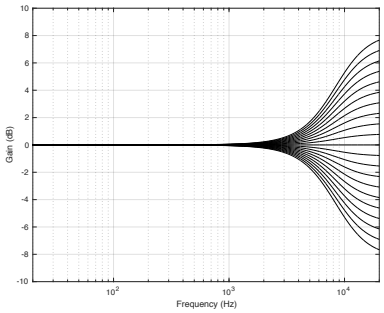


Figure 3.2: Magnitude response measurements of all settings of the Treble control. Note that this response is applied to each input channel.

3.1.5 Loudness

Sadly, human hearing is imperfect. One of the issues that we all suffer from is that our perception of the timbre or ‘tone colour’ of a sound is not constant with listening level. We are less sensitive to low frequencies when they are played at low listening levels. In other words, if you are listening to music at a high level and you turn down the volume, you will notice that, the lower the volume, the less bass you can hear. This is also true of high frequencies, albeit to a lesser extent.

The Loudness setting in your television counteracts this effect. As you reduce the volume, the bass and treble levels are automatically increased to compensate for your reduced perception in the outer frequency bands.

If you do not wish this setting enabled, Loudness should be set to OFF.

Note that, in some BeoVision models, the loudness boost toggle (whether it is on or off) is stored with the Sound Mode, so different modes can have different settings.

3.1.6 Eco Mode

When the Eco Mode is turned on, then loudspeakers that are not currently in use will be switched off automatically by the television. If Eco Mode is off, then all loudspeakers associated with the current Speaker Group will be switched on by the television.

Note that the behaviour of the Eco Mode setting is also dependent on the input signal. For example, if you have a 7.1 loudspeaker configuration and the Spatial Processing is set to 1:1, the loudspeakers that are currently switched on, are those that are associated with the input channel assignments. So, if you are watching a program mixed in 2.0-channel audio from a television broadcast, only two loudspeakers will be on. If you then change to watching a movie mixed in 7.1 on a Blu-ray disc, then the remaining five of your main loudspeakers and your subwoofer will switch on.

3.1.7 Headphones

Different brands and models of headphones produce different output levels for the same input depending on their ‘sensitivity’. The Headphones menu allows you to make adjustments for this sensitivity.

For example, if you have headphones with a high sensitivity, then they will sound louder than your loudspeakers at the same volume setting. Therefore the headphones value should be turned down to offset the headphone output to a lower level, matching the loudspeakers' output levels.

Note that not all Bang & Olufsen televisions are equipped with a headphone output. In the case where your device does not have this feature, this menu item will not be displayed.

3.1.8 Sound Info

Select this menu item to display information about the incoming and outgoing audio signals, including the encoding type and the number of audio channels in the incoming stream. Also displayed are the current Sound Mode and Speaker Group.

3.2 Sound Modes

As was described in the Introduction, the Sound Modes on the television allow you to have different audio settings for different types of signals. For example, you may wish to have a larger sound stage and enhanced bass response while watching movies, but a more purist signal path when listening to music. Sound Modes allow you to have up to seven different presets for these changes.

All Sound Modes have factory-default settings that have been optimised for materials such as Movies, Games, Speech (e.g. TV News), Drama (e.g. regular television programmes), Sports, and Music. In addition, the Custom sound mode in its factory-default setting is designed as a purist 'direct mode' music setting.

It is possible to customise the settings of all Sound Modes. In addition, it is possible to alter the name of the Custom sound mode.

If you save changes to any of the Sound Modes used by the "Adaptive" or "Automatic" mode, then your custom settings are used instead of the factory settings.

Automatic

The Automatic mode is, in fact, not a sound mode. Rather, it is an auto-selector that chooses the best sound mode using metadata in the signal stream (in the case of DVB) or for a given source (i.e. Blu-ray player, PC, game console etc.).

Sound Modes available for selection by the Automatic setting are: Movie, Game, Speech, Drama, Sports, Music.

Note that, on older BeoVision televisions, this item is labelled "Adaptive".

Movie

The Movie Sound Mode is designed for use when watching movies, either from local media (such as DVD or Blu-ray), streaming sources, or television broadcasts.

Timbral settings are flat and bass management is on. The True Image processing is on and all of its controls are set to the middle position.

Game

The Game Sound Mode is designed for use for audio with game consoles.

The Frequency Tilt and Sound Enhance settings give a slight bass and treble enhancement and bass management is on. The True Image processing is on and its controls are set to elevate the image and give an increased impression of envelopment and surround.

Speech

The Speech Sound Mode is designed for signals where an increased speech intelligibility is desirable, for example, television news programmes.

The Speech Enhance setting is increased, bass management and loudness are off, and spatial controls are set to present a more narrow sound image.

Drama

The Drama Sound Mode is designed primarily for use when watching television broadcasts.

Timbral settings are at and bass management is on. The True Image processing is on and all of its controls are set to the middle position. Dynamic range compression is set to medium to reduce the volume changes encountered during advertising breaks in the broadcast.

Sports

The Sports Sound Mode is designed for use when watching broadcasts of sporting events.

The Frequency Tilt and Sound Enhance settings are increased slightly and bass management is on. The True Image processing is on and its controls are set to increase the sensation of surround and envelopment in the audio signal.

Dynamic Range compression is set to medium.

Music

The Music Sound Mode is designed for use for music sources, either with or without accompanying video.

Note that this mode is not designed as a 'purist' setting. However, it is intended to have a minimal effect on the audio signals, while still up- or down-mixing to all loudspeakers in your current Speaker Group.

Note that the factory settings for the Custom mode can be used as a purist 'direct' mode.

Night Listening

The Night Listening Sound Mode is designed for situations where it is desirable to hear all components of the audio signal without large jumps in dynamics or bass. In this mode, the television's dynamic range compression is set to maximum and the speech enhancement is increased slightly.

Note that this setting may also be useful in a "party" situation where it is desirable to maintain a constant (but relatively high) listening level. However, if this is the intention, it should be modified to include the LFE channel input (by setting LFE Input to "on") and to set the Spatial Controls to their middle settings.

Custom

The settings and the name of the Custom Sound Mode can be tailored to your requirements and preference.

In its default settings, the intention of this mode is to deliver the same signals that the artist and the recording and mastering engineers heard during the recording process.

All timbral settings are set to flat, the bass management is off, and the processing is set to 1:1.

3.2.1 Frequency Tilt

Frequency Tilt can be considered to be a combination of Bass and Treble settings in a single parameter. When Frequency Tilt is set to a low value, the low frequency content of your audio signal is increased and the level of the high frequency content is reduced. If the Frequency Tilt is set to a high value, then the opposite will be true.

The Frequency Tilt function will have no effect on the audio signal at its middle setting.

Note that Frequency Tilt can have different settings for different Sound Modes.

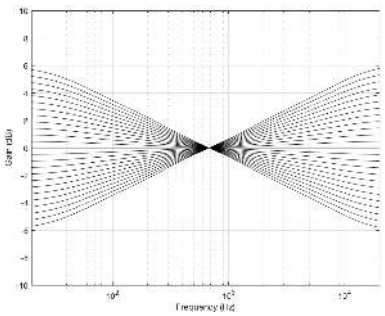


Figure 3.3: Magnitude response measurements of all settings of the Frequency Tilt control. Note that this response is applied to each input channel.

3.2.2 Sound Enhance

The Sound Enhance setting is similar to the Frequency Tilt setting in that it affects the low and high frequency bands with a single slider. Increasing the Sound Enhance value will increase the level of the bass and treble bands while reducing the midrange. Decreasing the Sound Enhance value will have the opposite effect.

The Sound Enhance setting will have no effect on the audio signal at its middle setting.

Note that Sound Enhance can have different settings for different Sound Modes.

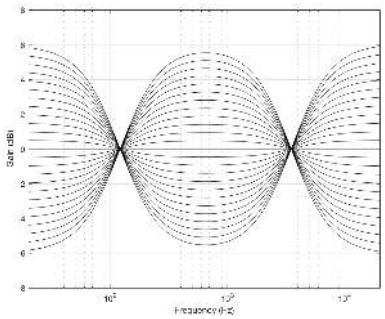


Figure 3.4: Magnitude response measurements of all settings of the Sound Enhance control. Note that this response is applied to each input channel.

3.2.3 Speech Enhance

The Speech Enhance setting allows you to increase the intelligibility of dialogue, making speech and voices easier to understand.

Note that the Speech Enhance setting will have no effect on the audio signal when it is at its lowest setting.

3.2.4 Balance

The Balance setting can be used to re-direct input signals to different output channels in your loudspeaker configuration. For example, setting the Balance all the way to the left on the display will result in signals being directed only to the loudspeakers in your configuration that have a Speaker Role on the left (i.e. Left Front, Left Surround, Left Front Height, etc.)

3.2.5 Fader

The Fader setting can be used to re-direct input signals to different output channels in your loudspeaker configuration. For example, setting the Fader all the way to the left on the display will result in signals being directed only to the speakers in your configuration that have a Speaker Role in the rear (i.e. Left Surround, Right Back etc.) Note that, if you do not have a surround configuration of loudspeakers (i.e. if you have only a Front Left and Front Right loudspeaker in your current Speaker Group) then the Fader B/F setting will not operate correctly and should be set to the middle position (the factory default setting).

3.2.6 Listening Style

Note that the Listening Style parameter is not available on all models and software versions.

The television has the option of modifying the audio signal depending on your listening style. If your primary activity is listening to the audio signal

(either with or without video), for example, if you are sitting and listening to music or watching a movie, then you should set this setting to Active However, if listening to the audio signal is a secondary activity, as in the case of background music during a party or dinner, then this option can be set to Passive.

Traditionally, audio systems and most recordings are designed for 'active' listening, with the assumption that the listener and loudspeakers are positioned correctly, and that the primary activity of the user is to listen to the audio signal. In this situation, each loudspeaker produces its own dedicated signal (for example, the left front input channel is produced by the left front loudspeaker). This results in the optimal reproduction of the spatial characteristics of the recording (for example, the image locations of the instruments and voices in the sound stage).

However, in cases where the listener is not positioned correctly and the audio is used as environmental or background sound, it may be noticed that instruments' locations will move into the loudspeaker that is closest to the listener. In this case, it may be preferable to re-distribute audio signals to different loudspeakers using the 'Passive' setting to reduce this effect.

3.2.7 LFE Input

Almost all music produced for multichannel playback is recorded in 5.0 or 7.0, without an LFE channel. This is primarily because the LFE channel is intended for Low Frequency Effects as the name implies, and there are no such effects in music.

Frequently, however, you will notice that in multichannel music releases, whether on DVD-Audio, SACD or Blu-ray discs, there is a signal on the LFE channel. This is, in almost all cases, generated in the post-production process at the mastering studio using a system very similar to bass-management. In fact, the only real differences are (1) that the low frequencies are not removed from the main channels, and (2) that the bass extraction is tuned by a mastering engineer instead of using an automated process. There are some record labels who (correctly) choose to not put any information in the LFE channel. Other labels use the LFE channel for alternative purposes (see the 'LFE Input to Ceiling' option).

Consequently, when listening to multichannel music-only materials, it is recommendable that the LFE input to the television be turned off to ensure that extra unwanted audio does not bleed into your system. Note that it is not adequate to switch off your system's subwoofer to achieve this effect, since (unless programmed to do otherwise) the television's bass re-direction may re-route the LFE channel to the smaller loudspeakers.

Options: ON / OFF.

3.2.8 Loudness Boost

The Loudness setting of the television increases the level of the high- and low-frequency content when the volume is decreased. The maximum amount of increase in level applied to the bass frequency bands can be set by the user with the Treble Max and Bass Max boost setting. This shows, in dB, the amount of boost applied in the low frequency bands at the lowest volume levels.

Range: 0 dB to 12 dB.
Step size: 1 dB.

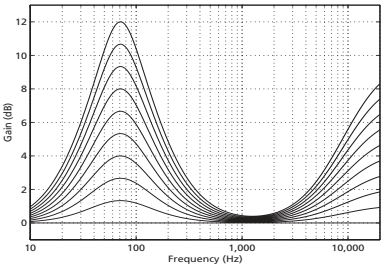


Figure 3.5: An example of the effect of the Loudness on the Magnitude response of the system at different volume settings. The lowest curve is for a high volume setting. The highest curve represents the response at a low volume setting. In this example, the Bass Max Boost is set to 12 dB and the Treble Max Boost is set to 9 dB.

3.2.9 Spatial Control

Processing

There are many cases where the number of input channels in the audio signal does not match the number of loudspeakers in your configuration. For example, you may have two loudspeakers, but the input signal is from a multichannel source such as a 5.1-channel DVD or a 7.1-channel Blu-ray. In this case, the audio must be 'downmixed' to your two loudspeakers if you are to hear all components of the audio signal. Conversely, you may have a full surround sound system with 7 main loudspeakers and a subwoofer (a 7.1-channel system) and you would like to re-distribute the two channels from a CD to all of your loudspeakers. In this example, the signal must be 'upmixed' to all loudspeakers.

Bang & Olufsen's True Image is a processor that accomplishes both of these tasks dynamically, downmixing or upmixing any incoming signal so that all components and aspects of the original recording are played using all of your loudspeakers.

Of course, using the True Image processor means that signals in the original recording are re-distributed. For example, in an upmixing situation, portions in the original Left Front signal from the source will be sent to a number of loudspeakers in your

system instead of just one left front loudspeaker. If you wish to have a direct connection between input and output channels, then the Processing should be set to '1:1', thus disabling the True Image processing.

Note that, in 1:1 mode, there may be instances where some input channels will not be heard. For example, if you have two loudspeakers but a multichannel input, only two input channels will be audible. These channels are dependent on the speaker roles selected for the two loudspeakers. (For example, if your loudspeakers' roles are Left Front and Right Front, then only the Left Front and Right Front channels from the multichannel source will be heard.)

Similarly, in 1:1 mode, if you have a multichannel configuration but a two-channel stereo input, then only the Left Front and Right Front loudspeakers will produce the sound; all other loudspeakers will be silent.

If True Image is on and if the number of input channels and their channel assignments matches the speaker roles, and if all Spatial Control sliders are set to the middle position, then the True Image processing is bypassed. For example, if you have a 5.1 loudspeaker system with 5 main loudspeakers (Left Front, Right Front, Centre Front, Left Surround, and Right Surround) and a subwoofer, and the Spatial Control sliders are in the middle positions, then a 5.1 audio signal (from a DVD, for example) will pass through unaffected.

However, if the input is changed to a 2.0 source (i.e. a CD) then the True Image processor will upmix the signal to the 5.1 outputs.

In the case where you wish to have the benefits of downmixing without the spatial expansion provided by upmixing, you can choose to use the Downmix setting in this menu. For example, if you have a 5.1-channel loudspeaker configuration and you wish to downmix 6.1- and 7.1-channel sources (thus ensuring that you are able to hear all input channels) but that 2-channel stereo sources are played through only two loudspeakers, then this option should be selected. Note, however, that the four advanced Spatial Controls (Surround, Height, Stage Width and Envelopment) will be disabled in the Downmix processing mode. Also note that, in Downmix mode, there are two exceptions where upmixing may be applied to the signal. The first of these is when you have a 2.0-channel loudspeaker configuration and a 1-channel monophonic input. In this case, the centre front signal will be distributed to the Left Front and Right Front loudspeakers. The second case is when you have a 6.1 input and a 7.1 loudspeaker configuration. In this case, the Centre Back signal will be distributed to the Left Back and Right Back loudspeakers.

Surround

The Surround setting allows you to determine the relative levels of the sound stage (in the front) and the surround information from the True Image processor.

Note that changes in the Surround setting will have no effect on the signal when the Processing is set to 1:1 or Downmix.

Height

This setting determines the level of the signals sent to all loudspeakers in your configuration with a 'height' Speaker Role. It will have no effect on other loudspeakers in your system.

If the setting is set to minimum, then no signal will be sent to the 'height' loudspeakers.

Note that, if the LFE Input to Ceiling setting is ON, then the Height setting will determine the level of the ceiling loudspeaker. In this case, to ensure that the ceiling loudspeaker is calibrated to the correct level, the Height setting should be set to maximum.

See also 'LFE Input to Ceiling'.

Stage Width

The Stage Width setting can be used to determine the width of the front images in the sound stage. At a minimum setting, the images will collapse to the centre of the frontal image. At a maximum setting, images will be pushed to the sides of the front sound stage. This allows you to control the perceived width of the band or music ensemble without affecting the information in the surround and back loudspeakers.

If you have three front loudspeakers (Left Front, Right Front and Centre Front), the setting of the Stage Width can be customised according to your typical listening position. If you normally sit in the 'sweet spot', at roughly the same distance from all three loudspeakers, then you should increase the Stage Width setting somewhat. since it is unnecessary to use the centre front loudspeaker to help to pull phantom images towards the centre of the sound stage. The further to either side of the sweet spot that you are seated, the more reducing the Stage Width value will improve the centre image location.

Note that changes in the Stage Width setting will have no effect on the signal when the Processing is set to 1:1 or Downmix.

Envelopment

The Envelopment setting allows you to set the desired amount of perceived width or spaciousness from your surround and back loudspeakers. At its minimum setting, the surround information will appear to collapse to a centre back phantom location. At its maximum setting, the surround information will appear to be very wide.

Note that this setting has no effect on the front loudspeaker channels. Changes in the Envelopment setting will have no effect on the signal when the Processing is set to 1:1 or Downmix.

3.2.10 Dynamics Control

The Dynamics Control can be used to reduce the dynamic range of audio signals. This will reduce the difference in level between the quietest and loudest portions of the music. In other words, it makes quiet sounds louder and loud sounds quieter. Consequently, it is designed primarily for a ‘night listening’ situation where it is desirable to reduce peaks in the signal to avoid waking family members, while still allowing you to hear the quieter moments in the music or movie. This setting can also be used for a ‘party’ setting where it is desirable to play music at a more constantly loud level.

Note that, on older BeoVision televisions, if the Dynamics Control is set to OFF in the advanced settings, then turning the Dynamics Control ON in the menu will have no effect on the signal. Similarly, if, in the advanced settings, the Compression is set to Medium or Maximum, but the Dynamics Control in the basic menu is turned off, then no dynamic range control will be applied to the audio signals.

Compression

There are many instances where it is desirable to reduce the dynamic range of the audio signal. For example, television advertisements are typically much louder than the programme they interrupt, and should be tamed. Films on DVD or Blu-ray often have large differences between the quietest and loudest moments, making it difficult to watch movies late at night without disturbing the rest of the family. At a party, the music should be kept at a constant level.

Consequently, the television has the ability to reduce (or compress) the dynamic range of audio signals by making quiet passages louder and loud passages quieter. The amount of compression applied to the audio signal for the current Sound Mode is determined using the Compression setting in the advanced settings of the Dynamics Control.

Note that, in the older television models, the Dynamics Control must be turned ON in the basic menus in order for the Dynamics Control advanced settings to have an effect.

Options: OFF / MEDIUM / MAXIMUM.

Clip Protection

Each of the television’s audio signal paths has a customised soft clip function protecting its outputs to ensure that the loudspeakers’ signals are not hard-clipped (and thus audibly distorted) at high listening levels. The ‘price’ of this protection is that output signals approaching the upper limits of the digital-to-analogue converter (DAC) are increasingly modified with higher levels.

This soft clip function has a threshold of âĂŞ3 dB FS. Signals with a peak level lower than this will be unaffected.

It is possible to disable this protection by setting the Clip Protection to OFF, which will allow high-level signals to pass, unmodified to the DAC.

Note that, if Clip Protection is set to OFF, then there may be cases, depending on your input signal, settings, and volume level, where one or more output signals will be clipped and distortion will be generated by the system. The audibility of this problem is dependent on the exact conditions, and is thus unpredictable. Consequently, it is highly recommended that, unless you are certain of your intentions, you should have Clip Protection set to ON at all times.

Options: ON / OFF.

3.3 Speaker Groups

A Speaker Group is a configuration of loudspeakers that determine which speakers are playing, what audio channels they are assigned to, and their calibration levels and delays for a given listening position.

It is possible to assign up to 20 or 30 different Speaker Groups on the television (depending on the television model). On the older televisions, 9 Speaker Groups are initially displayed: moving the cursor to the ninth Speaker Group reveals a “show all” option which can be used to display the remaining available Speaker Groups.

3.3.1 Speaker Role

This menu allows you to enable the loudspeakers that are used in the current Speaker Group. In addition, you can set the desired channel allocation for each loudspeaker (or Power Link output channel).

When configuring a 5.1-channel surround system, note that the rear loudspeakers should be set as Left Surround and Right Surround (not Left Back and Right Back).

Note that there are no restrictions on how many copies of a given speaker role that may be distributed in a Speaker Group. For example, if you have 10 loudspeakers connected to the television, it is allowed (although perhaps not advisable...) to have 10 Left Surrounds and nothing else.

Two of the Speaker Roles are not traditional speaker roles: these are the Mix Left and Mix Right options. These are outputs from a two-channel ‘downmix’ of the input signal, and are intended for users wishing to send a signal to a second room or to a pair of headphones connected to a Power Link output. If your input signal is from a two-channel stereo source, then the Mix Left and Mix Right outputs will match the Left and Right inputs respectively. However, if you have a 5.1 or 7.1 input from a DVD or Blu-ray disc, then these channels will be combined into the two-channel Mix Left and Mix Right output. Note that this downmixing algorithm is the same one that is used for the television’s headphone output.

If you have only two loudspeakers in your main configuration, it is recommendable that you assign the Left Front and Right Front (instead of the Mix Left and Mix Right) roles to those loudspeakers and allow the True Image processing to do the automatic downmixing.

The positions corresponding to the various Speaker Roles are shown in Figures 4.4 and 4.5.

Options: Centre Front / Left Front / Right Front / Left Wide / Right Wide / Left Surround / Right Surround / Left Back Right Back / Centre Back / Centre Height / Left Height / Right Height / Left Surround Height / Right Surround Height / Ceiling / Sub / Sub Front / Sub Rear / Sub Left / Sub Right / Mix Left / Mix Right.

3.3.2 Speaker Distance

This setting is used to ensure that the times of arrival of the loudspeakers' signals at the listening position are matched, despite them being placed at different distances from the listening position. The value displayed on the menu should be the distance from the listening position to each loudspeaker. The result of this alignment is that all loudspeakers' signals are individually delayed to match the time of arrival of the sound from the most distant loudspeaker.

Note that, since the Listening Position can be different for different Speaker Groups, these distances may not necessarily be the same from Speaker Group to Speaker Group. In addition, the small differences in latency between various Bang & Olufsen loudspeakers, connected either wirelessly or with Power Link cables, are automatically compensated for internally in the system.

3.3.3 Speaker Level

The Speaker Level setting is used to align the perceived or measured loudness of the loudspeakers at the listening position. Although Bang & Olufsen loudspeakers are all factory-calibrated to give the same output level, different loudspeaker (or listener) placements and different room conditions have an effect on the speaker level at the listening position. As a result, you will most likely require some adjustments to optimise your system. In order to achieve the optimal settings for the Speaker Levels, it is highly recommended that you use a sound pressure level meter. This can either be an app on a smart phone or (preferably) a dedicated unit. Note that, if you are considering purchasing a sound pressure level meter for this purpose, a low-priced device (less than $100) will produce acceptable results.

The calibration procedure is as follows:

1. Ensure that the correct speaker types have already been entered for each loudspeaker in your system.
2. Set the sound pressure level meter to a 'C' weighting and 'Slow' setting. It should be placed near the listening position with the microphone pointed towards the ceiling.
3. Select a loudspeaker from the menu. You should hear a noise signal coming from the loudspeaker you selected.
4. Set the volume (not the Speaker Level) so that the reading on the sound pressure level meter is 65 dB SPL.
5. Select a different loudspeaker from the menu and set its Speaker Level so that it also produces a reading of 65 dB SPL at the listening position.
6. Continue this process for all loudspeakers. Note that subwoofers should also give the same reading when the SPL meter is set to a 'C' weighting.

If you have more than one loudspeaker assigned to a single output channel (for example, if you have two Left Surround loudspeakers) you should calibrate the two loudspeakers using the same method as all other loudspeakers. The television automatically compensates the speaker levels for the fact that more than one speaker is used for the same channel. This compensation is not shown on-screen.

If you have a mono centre loudspeakers (for example, a BeoLab 7-4 or a BeoLab 10) you will be asked to calibrate its speaker level twice; once for each Power Link channel to which it is connected.

It should be stated that it is not unusual for Speaker Level differences to be required in a given configuration. This can be due to aspects of the system such as loudspeaker distances from the listening position and placement in the listening room.

3.3.4 Speaker Preset

Some Bang & Olufsen loudspeakers such as the BeoLab 90 have user-programmable "Presets" that can be used to customise specific characteristics such as Beam Width or Beam Direction. It is possible to associate a given preset in the loudspeaker with a Speaker Group in the BeoVision television using the "Speaker Preset" number.

Any Speaker Preset can be associated with any Speaker Group – in other words, it is not necessary that the two numbers match each other.

Note that the television can only transmit one Speaker Preset value to all Power Link and Wireless Power Link outputs. Consequently, in cases where there are multiple pairs of loudspeakers (e.g. four BeoLab 90's) connected to the television, the parameters within the loudspeakers' presets should be carefully selected to match each other.

If the Speaker Preset value in the television is set to "0", then no preset value will be transmitted to the loudspeakers.

It should also be noted that there are some parameters in the loudspeaker (e.g. Latency Mode) that are automatically overridden by the BeoVision television in order to ensure proper integration with other loudspeakers in the configuration.

3.3.5 Assisted Speaker Calibration

Some televisions in the Bang & Olufsen portfolio give you the option to use an external microphone to automate the loudspeaker calibration process. This procedure works by sending measurement signals out of each loudspeaker that has been enabled for the Speaker Group and measuring their responses at the listening position.

The assisted calibration process is started from this menu item. You will be guided through the process by on-screen instructions.

Note that only the Speaker Distances and Speaker Levels are adjusted by the Assisted Speaker Calibration process. The resulting values are entered into the respective menus, and can be manually adjusted afterwards if you wish to do so.

3.3.6 Bass Management

In a perfect sound system, all loudspeakers are identical, and they are all full-range. However, most often, this is not an option. Luckily, it is possible to play some tricks to avoid having to install a large-scale sound system to listen to music or watch movies.

Humans have an amazing ability to localise sound sources. With your eyes closed, you are able to point towards the direction sounds are coming from with an incredible accuracy. However, this ability gets increasingly worse as we go lower in frequency, particularly in closed rooms.

In a sound system, we can use this inability to our advantage. Since you are unable to localise the point of origin of very low frequencies, it should not matter where the loudspeaker that's producing them is positioned in your listening room. Consequently, we are able to remove the bass from our 'main' loudspeakers and send them to a single large loudspeaker that can produce the bass for the entire system. This loudspeaker is called a 'subwoofer' since it is used to produce frequency bands below those played by the woofers in the main loudspeakers. The process of removing the bass from the main channels and re-routing them to the subwoofer is called 'bass management'.

Note that, although a bass management system requires at least one loudspeaker with low frequency capabilities such as a subwoofer, it should not be confused with an LFE or a '.1' channel. However, in most cases, the LFE channel from your media (i.e. DVD or Blu-ray) will be combined with the low-frequency output of the bass management system and the total result routed to the subwoofer.

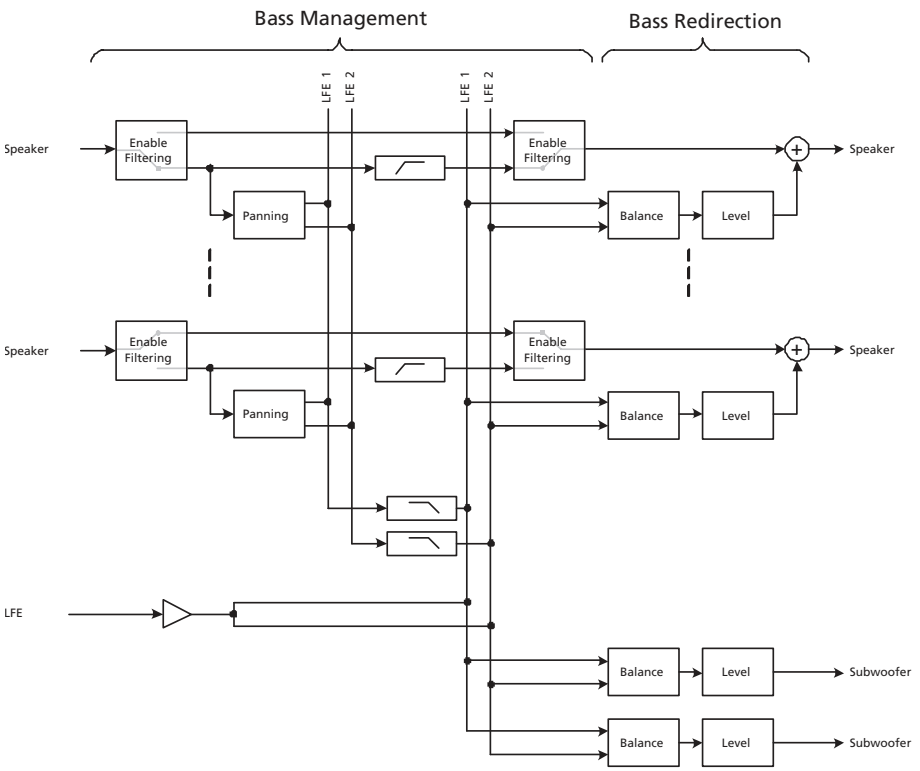


Figure 3.6: Block diagram of the Bass Management and Bass Re-direction processing in the television.

The television has a logic table included in its Bass Management and Re-direction section that makes intelligent decisions regarding the routing of bass to the various loudspeakers. When the loudspeakers in the current Speaker Group have been chosen, the settings for the Bass Management and the Bass Re-direction are automatically entered into the Advanced menus by the system. These settings are based on measurements of the bass capabilities of all loudspeakers in the Bang & Olufsen portfolio. Consequently, the bass and LFE information will be directed to the loudspeakers in your system with the greatest potential to deliver low-frequency information. These automatic settings can be overridden simply by entering new values in the advanced settings for the Bass Management and Bass Re-direction.

It is possible to turn the Bass Management on or off for a given Sound Mode. When the Bass Management is ON, the low frequency content in your audio signal may be re-routed to different loudspeakers, depending on their capabilities.

For example, if you have two small loudspeakers and a subwoofer, and Bass Management is on, then the low frequency signals will be directed to your subwoofer instead of to your smaller main loudspeakers. If Bass Management is OFF, then low-frequency content in your main audio channels will not be re-directed to larger loudspeakers in your system. Note, however, that this will not have any effect on the routing of the LFE channel to the subwoofer(s) or the larger speakers.

Turning Bass Management on will not merely re-direct low-frequency content from the main audio channels to subwoofers in your system. It will re-direct low frequencies to the most capable loudspeakers in your current configuration (or Speaker Group). For example, if you have full-range loudspeakers (such as BeoLab 90's) for your Left Front and Right Front channels, and smaller loudspeakers (such as BeoLab 17's) as the surround loudspeakers, then the low frequency components of the surround channels will be re-directed to the front loudspeakers, since the BeoLab 90's have a higher capacity to play low frequencies louder than the BeoLab 17's.

There are cases where bass will be re-directed to a full-range loudspeaker instead of to a subwoofer in your system. This is because some full-range Bang & Olufsen loudspeakers have a greater capability to play low-frequency materials than most subwoofers. For example, if you have a system that includes two BeoLab 20's and a BeoLab 19 subwoofer, all bass (whether from the main input channels or the LFE input) will be directed to the BeoLab 20's. In other words, the BeoLab 19 will receive no signals. This is because a single BeoLab 20 is capable of playing louder than a BeoLab 19 in most low-frequency bands. Consequently, routing low frequencies to your BeoLab 19 will be equivalent to downgrading your loudspeaker system. If you wish to do so, this can be overridden using the advanced settings of the Bass Management and Bass Re-direction.

Crossover Frequency

The crossover used in the Bass Management system is a 4th-order Linkwitz-Riley type. All output signals use the same crossover frequency to ensure that coherent signals on multiple output channels have matched phase responses when passed through the Bass Management and Bass Re-direction processing.

Range: Bypass, 20 Hz to 300 Hz.
Step size: 1 Hz.

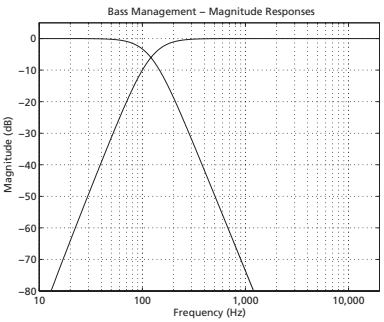


Figure 3.7: Magnitude response of the crossover used in the Bass Management system, showing an example with default frequency of 120 Hz.

Enable Filtering

The Enable Filtering setting for each loudspeaker in your configuration allows you to determine whether or not the low frequency components of its signal should be re-routed to the two Bass Management low-frequency channels.

When this parameter is set to ON for a given loudspeaker, this means that its low frequency content will be re-directed to another loudspeaker in the Speaker Group.

Note that turning Enable Filtering to OFF will not disable the potential of re-routing the two Bass Management low-frequency channels back to a given loudspeaker using Bass Re-direction, as can be seen in the block diagram in Figure 3.6.

If you wish to disable the entire bass management processing, this should be done using the Bass Management ON/OFF parameter in the basic settings for the current Sound Mode.

Note that initial settings of this menu are automatically chosen based on information from the Speaker Connections menu.

Panning

Selecting this menu brings you to the menu where you adjust the left/right panning of the Bass Management signal derived from each output channel into the two Bass Management low-frequency channels.

The Panning setting allows you to determine the relative distribution of the low frequency components from a given audio signal to the two Bass Management low-frequency channels.

If the Bass Management Enable Filtering for a given loudspeaker is set to OFF, then the Bass Management Panning for that output channel is irrelevant.

Setting this parameter to the centre will result in equal levels being directed to the internal left and right LFE channels. Negative values result in the signal being panned to the left low-frequency channel. Positive values pan to the right.

Initial settings of this menu are automatically chosen based on information from the Speaker Roles for the current Speaker Group.

Re-direction Levels

Selecting this item brings you to the menu where you adjust the level of the two Bass Management low-frequency channels being added back to the individual output channels.

It is possible in the television to use any loudspeaker to reproduce the LFE channel and low-frequency content from the bass management system. This is done using the Bass Redirection. Typically, in a bass-managed 5.1 or 7.1 system, the LFE and the bass management output will be directed to a single subwoofer. However, if you desire, it is possible to send that information to any loudspeakers in the current Speaker Group by increasing the Redirection Levels.

Note that initial settings in this menu are automatically chosen based on information from the Speaker Connections menu and the Speaker Roles for the current Speaker Group.

Re-direction Balance

As described above, the bass management system in the television produces two channels of low-frequency content. The Bass Redirection Balance is used to control the relative level of each of these two channels in the signal sent to each loudspeaker. Typically, if you are using a single subwoofer, then the Balance will be set to the middle position (0), ensuring that both low-frequency channels are present in the subwoofer. However, if you have two subwoofers and they are set to have Speaker Roles of Sub Left and Sub Right, then the left subwoofer will have a Redirection Balance set to LEFT (-1) and the right subwoofer to RIGHT (1). This will ensure that the stereo information from the bass management output is maintained as a stereo signal in the listening room.

Note that initial settings of this menu are automatically chosen based on information from the Speaker Roles for the current Speaker Group.

3.3.7 LFE Input to Ceiling

Five-channel recordings for music without accompanying video are almost always produced in 5.0. In other words, there is no need for an LFE channel, since most music does not contain low frequency effects such as explosions or dinosaur footsteps (in fact, some record labels do not include any signal on the LFE channel on their multichannel releases).

Some formats, such as SACD, DVD-Audio and Blu-ray discs, do not limit the content of the LFE channel to low-frequency information only.

As a result of these two facts, some record labels use the LFE channel on their discs for height information instead of low frequency effects. This means that the LFE input channel should be directed to a ‘full range’ loudspeaker placed above the listener.* This can be accomplished in the television by setting the LFE Input to Ceiling parameter to ON. This will direct the audio signal on the LFE input to a loudspeaker with a ‘Ceiling’ Speaker Role. Range: ON / OFF.

**Consult the liner notes for your disc(s) for correct loudspeaker placement of the ceiling speaker.*

3.3.8 Subwoofer

Selecting this menu moves you to the advanced settings for the subwoofer output.

Note that, if you have more than one subwoofer, the parameters in this menu are applied to all subwoofer outputs.

Time Alignment

The Time Alignment setting allows you to adjust the relative delays of the subwoofer(s) and the main loudspeaker channels. When this value is positive, then the subwoofer is delayed relative to the main loudspeaker channels. When the value is negative, then the subwoofer output precedes the main loudspeaker channels by the displayed value.

This may be useful, for example, when a wireless subwoofer is used and it is necessary to delay all main loudspeakers in the Speaker Group to wait for the transmission time of the wireless connection to the subwoofer.

Note that the small differences in latency between various Bang & Olufsen loudspeakers, connected either wirelessly or with Power Link cables, are automatically compensated for internally in the system.

Range: -30 ms to 30 ms.
Step size: 1 ms.

Allpass Frequency

There is a first-order allpass filter in the signal path of the subwoofer output. This can be adjusted to better match the subwoofer to the main loudspeakers in cases where either the placement or the phase responses of the loudspeakers result in poor matching of the upper- and lower-frequency components through the crossover band. Since this is a first-order allpass filter, its output is 90° out-of phase with its input at the centre frequency displayed on-screen, and approaches 180° out-of phase at its maximum phase deviation (at 10 times the filter's centre frequency).

Range: Bypass, 20 Hz to 300 Hz.
Step Size: 1 Hz.

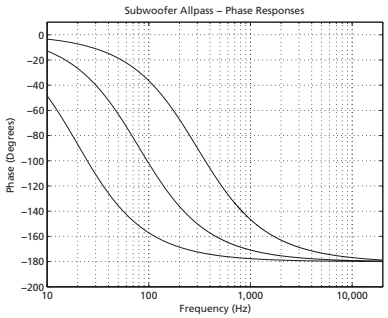


Figure 3.8: Phase response corresponding to three values for the Allpass Frequency setting, 20 Hz, 80 Hz, and 300 Hz.

3.4 Speaker Connection

This menu is used to indicate the type or model of loudspeaker connected to each output of the television. All current Bang & Olufsen loudspeakers are listed in this menu, including some discontinued models such as the BeoLab 1 and BeoLab Penta loudspeakers.

Two additional options are included in this list.

- 'Other' is used to indicate a loudspeaker that is not included in the list of Bang & Olufsen loudspeakers, for example, a loudspeaker from a different manufacturer. Note that, in this case, the output will be volume-regulated.
- 'Line' is used to indicate that the output signal is destined for the line input of another amplifier with its own volume control (for example, in a second listening room). Note that the output level of the Power Link output, when in a 'Line' speaker role, is not volume-regulated. Its output level is calibrated to correspond to a -10 dBV consumer line level with a 2 V rms maximum output, and thus is compatible with consumer-level audio-video devices with a line input.

WARNING! If you have a BeoLab loudspeaker connected to a Power Link output and you set the Speaker Role for that output to 'Line', the resulting output will not be volume regulated and therefore may produce very loud outputs! Use this Speaker Role with caution.

Note that the television automatically enters settings in other menus (for example, Bass Management advanced settings) based on the information entered in this menu.

On some software versions, this menu is labelled "Speaker Types" instead.

Note that BeoLab loudspeakers connected using Wireless Power Link will have the speaker type automatically set by the system. This cannot be overridden by the user menus.

Options: BeoLab / BeoVox / Line / Other / None.

3.5 Sources menu

The Sources menu in the BeoVision Eclipse and BeoVision Harmony give you the option of setting the default Sound Mode and Speaker Group for each source (e.g. Live TV, HDMI 1, etc.). This is also true in all BeoVision televisions described in this document.

However, the BeoVision Eclipse and the BeoVision Harmony have an extra feature that some users may find useful. This is the Audio Level adjustment, which gives you the opportunity to offset the gain of the audio signal by source. For example, most movies are mastered to a level where the dialogue is 31 dB below full scale (the maximum possible digital level in an LPCM delivery system). However, it is not unusual for modern pop music to be mastered to a level close to full scale. This means that you may notice a significant jump in the audio of your television when switching from a watching a film to listening to music. However, the actual difference between sources will vary from customer to customer and between different types of program material. Consequently, the Audio Levels adjustment gives you the possibility of reducing the differences between your sources accordingly.

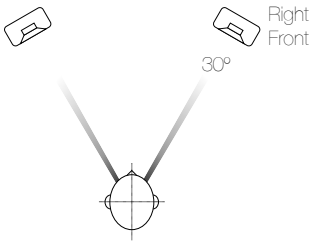


Figure 4.1: Standard loudspeaker configuration for two-channel stereo.

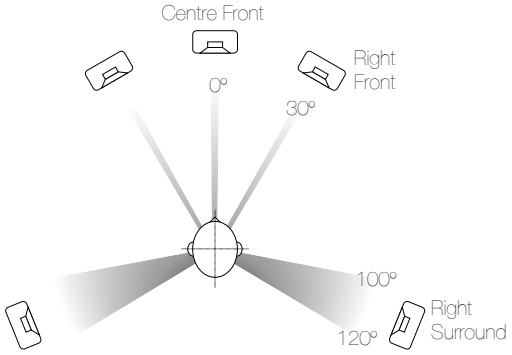


Figure 4.2: Standard loudspeaker configuration for 5.1 multichannel audio. The actual positions of the surround loudspeakers at 110° shows the reference placement used at Bang & Olufsen for testing and tuning. Note that the placement of the subwoofer is better determined by your listening room's acoustics, but it is advisable to begin with a location near the centre front loudspeaker.

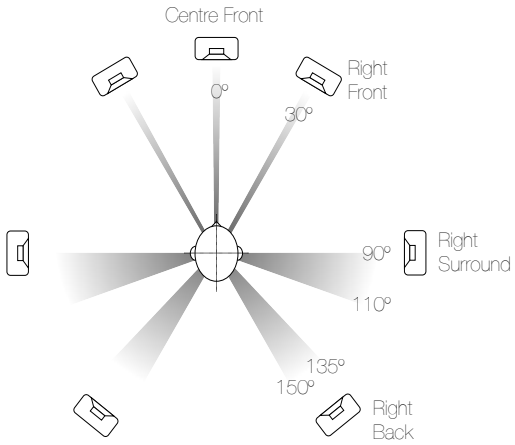


Figure 4.3: Recommended loudspeaker configuration for most 7.1 channel audio signals. The actual positions of the loudspeakers shows the reference placement used at Bang & Olufsen for testing and tuning.

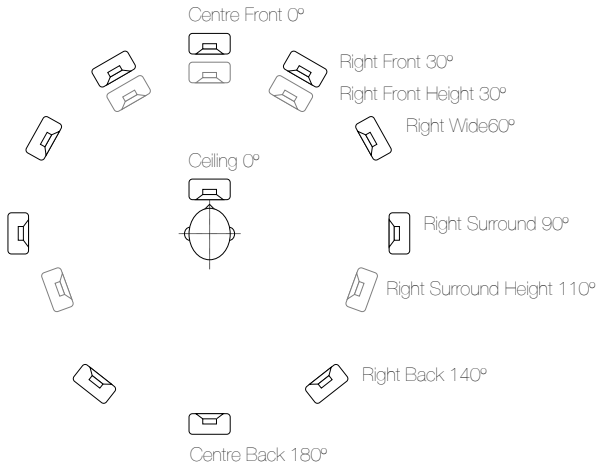


Figure 4.4: Loudspeaker positions associated with the speaker roles available in the television. The True Image processor delivers a unique output to each of these output channels.



Figure 4.5: Side view of the loudspeaker positions associated with the speaker roles available in the television

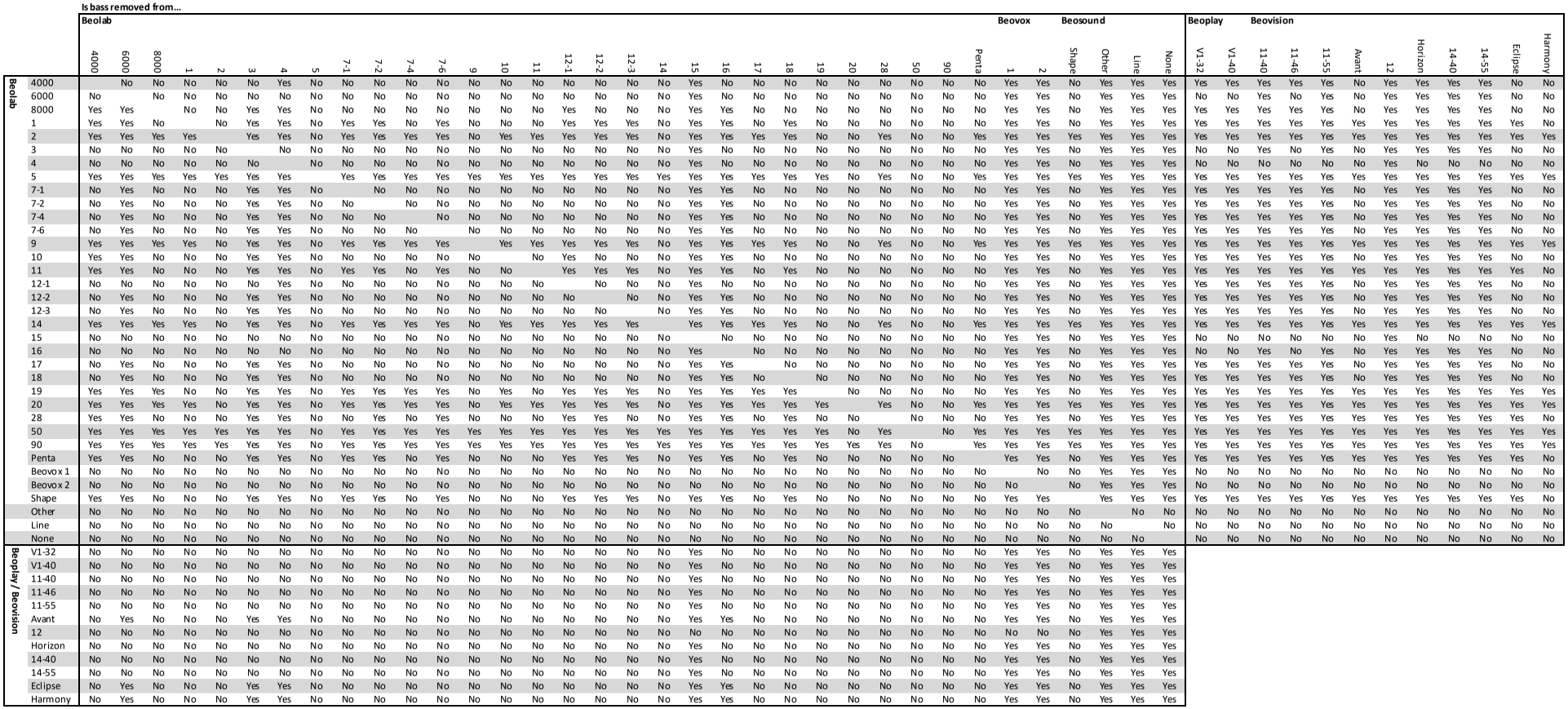


Figure 4.6: Bass Management logic table for supported televisions and loudspeakers.

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