The right monitors. The correct setup. Perfect sound.

Monitor setup guide

GENELEC®

2013 version

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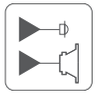
Genelec Key Technologies

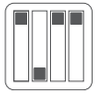
Over 35 years of experience in developing the monitors for professionals in broadcast and post-production, Genelec has developed several technologies, which are the key to the success of our products. Learn more about them on our website by scanning the QR code below or through the link.

Active Crossover



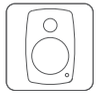
Dedicated Amplifiers

Protection Circuitry



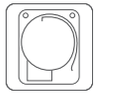
Room Response

DCW Waveguide



MDE Enclosure

Iso-Pod Stand



LSE Enclosure

Reflex Port

Mounting

Intelligent Signal Sensing

www.genelec.com/learning-center/key-technologies

What is a monitor?

A monitor is, by definition, a person or a device that observes, checks, controls, warns or keeps continuous record of something. Hence an audio monitor is much more than just a loudspeaker that sounds good. It is a surveillance device of the process of recording, mixing or transmitting, or any situation where critical audio work is performed. A monitor is a professional tool.

What is a reference monitor?

Reference monitor has a neutral sound - it does not add coloration and does not take anything out from the audio signal. Monitor is placed in optimal place, distance, heigth and angles are correct and the influence of the surrounding surfaces have been minimized by calibration- resulting that the listener, the monitor and the room are all in harmony.

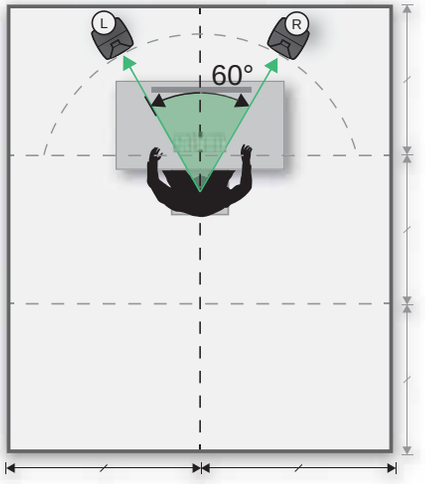
Select the right Genelec monitor to serve as a perfect tool for your situation at www.genelec.com/learning-center/speaker-selection

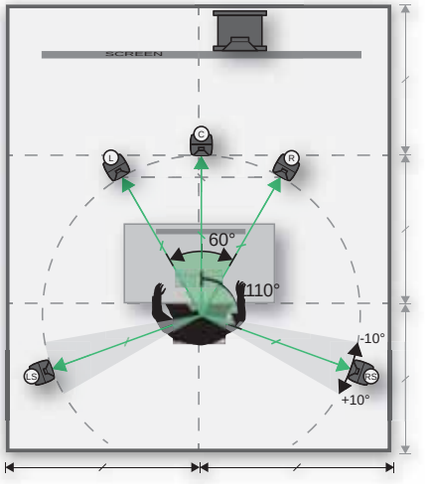
Selecting the correct monitors

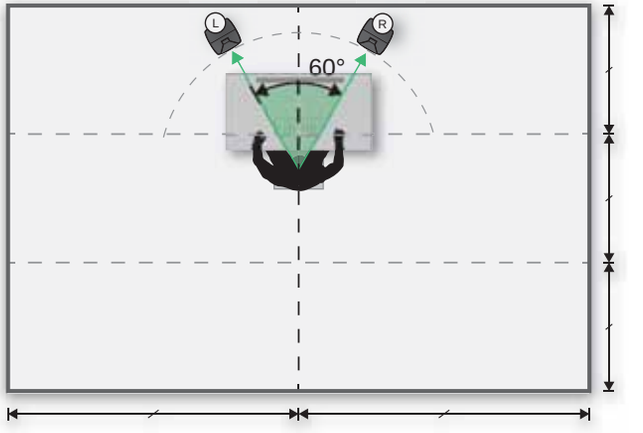
Every monitor has a listening distance recommendation and matching subwoofer. Refer to our online Step by Step guide or ask your local dealer or distributor for advice. Here is how you can define your listening distance and identify your listening area.

Identifying your listening area

Divide your room in 3 equal size sectors; front-center-back.
For music production, consider listening position within the front sector. Place the monitors in 60° angle and point them to listening position. For film production, consider listening position within the center-back sectors.

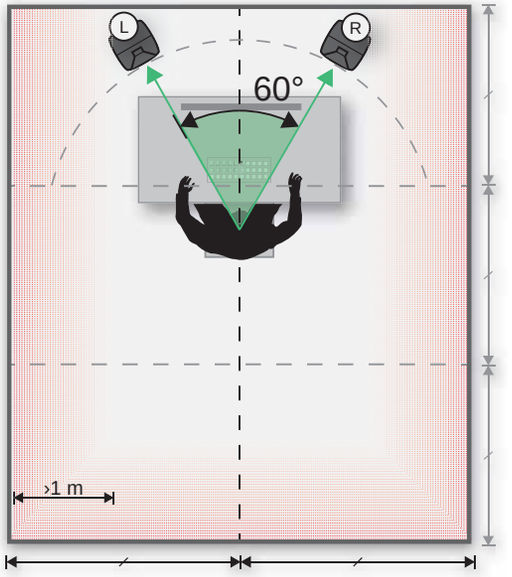




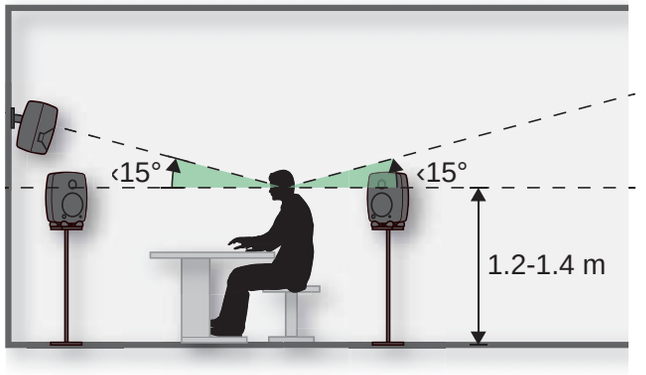


We recommend your listeing position to be a minimum 1 metre from the walls. This way you avoid early reflections from the walls.

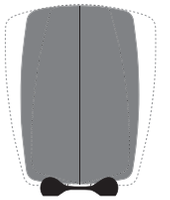
Find the left-right symmetry axis of your room. Your listening position should be symmetrical in relation to the room and location of your monitors.



The optimal height of the monitor is at ear level, normally between 1.2 and 1.4 metres from the floor. If the floor reflection causes problems, lift the monitors higher. Use the IsoPod to aim the monitors towards your listening position. However, do not tilt them more than 15 degrees.

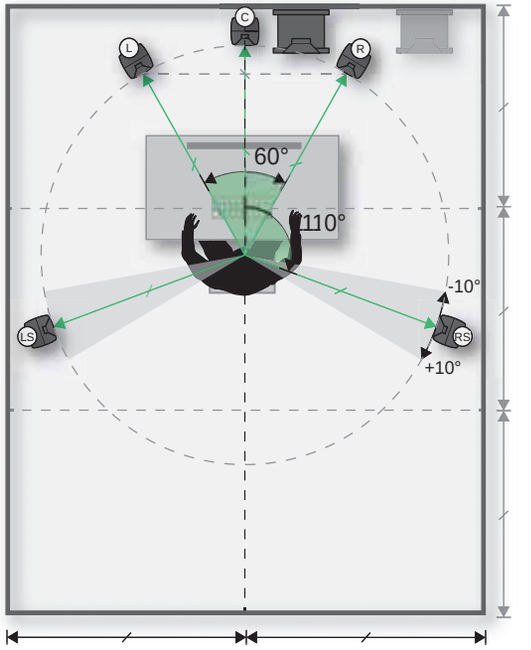


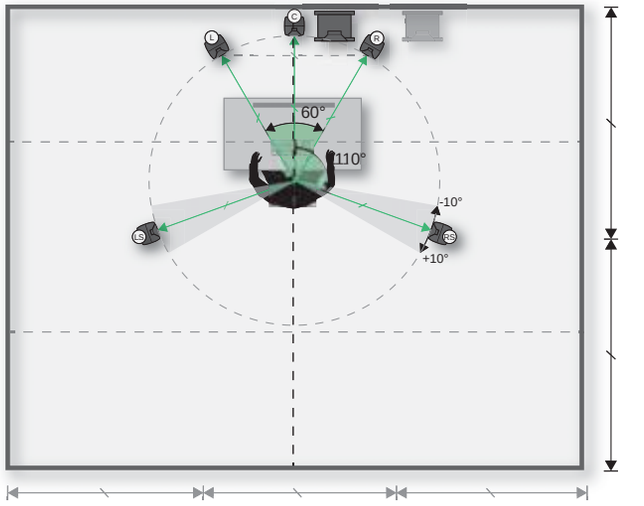
Monitor height (ITU-R BS.775-1 standard)



IsoPod tilting

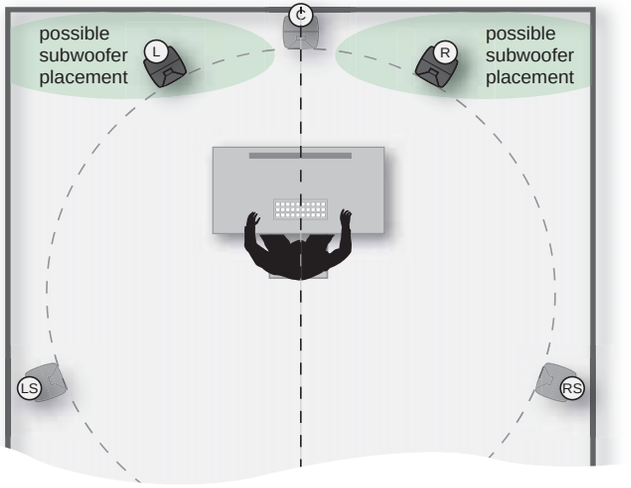
Here are two examples of an ideal 5.1 setup in different room layouts:





Subwoofer placement

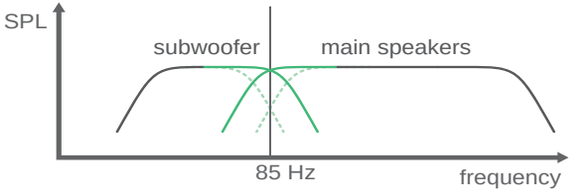
Finding an optimal subwoofer position can be difficult. Try to find a location between L - C or C - R area at the front wall, as shown in the picture below. Avoid exact centre position, as room modes may cause problems if the subwoofer is placed there.



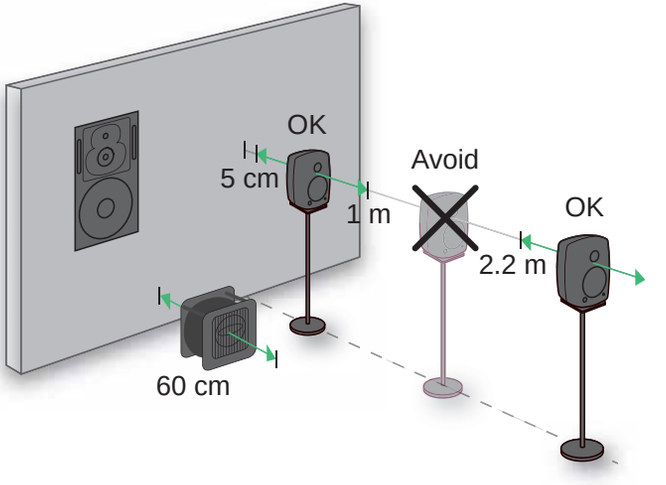
Placing the subwoofer to a corner or near the front wall boosts the low frequencies. Use the Sensitivity control to compensate the bass boost.

The crossover frequency in analog Genelec subwoofers is fixed to 85 Hz. This means that the subwoofer reproduces low frequencies up to 85 Hz and main monitors reproduce frequencies from 85 Hz all the way to highest frequencies. In Genelec's Smart Active Monitor or SAM (DSP) systems, crossover is adjustable from 50 to 100 Hz.

You can select the LFE channel bandwidth either from the lowest frequency up to 85 Hz or 120 Hz by using the DIP switch on the sub or the GLM software when using a SAM (DSP) system. You can also set the subwoofer to redirect LFE content above 85 Hz to the center channel monitor, providing you with full range LFE monitoring.

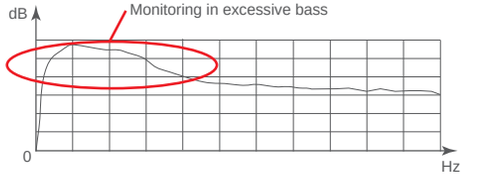


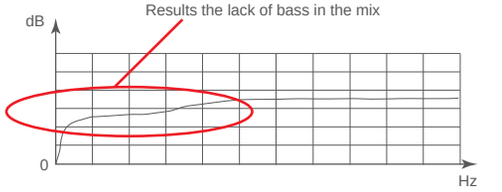
Recommended distance from the front wall including the subwoofer is pictured below. You can adjust the subwoofer phase and level according to the procedure described in the operating manual.If the phasing is not aligned well, result is a loss of bass at the crossover frequency.



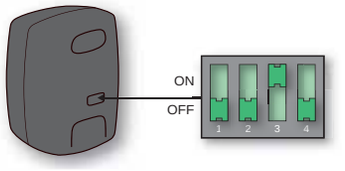
Why is calibration needed? The room itself has a major influence on perceived sound at listening position. Large surfaces such as walls, ceiling, floor and furniture typically cause reflections. Calibration aims to minimize the room influence and result in a flat frequency response, i.e. mixing in the room with too much bass can result a lack of bass in the mix.

Coloured listening conditions.



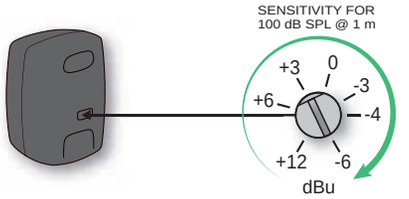


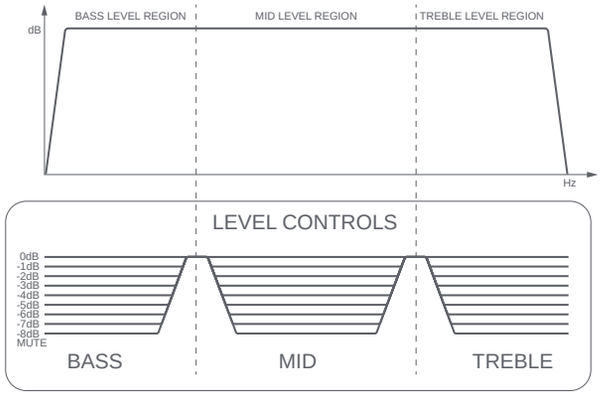
All Genelec monitoring speakers have electronic room response controls at the back panel. Digital SAM products (DSP) can be calibrated using AutoCal™ software system, giving excellent results.

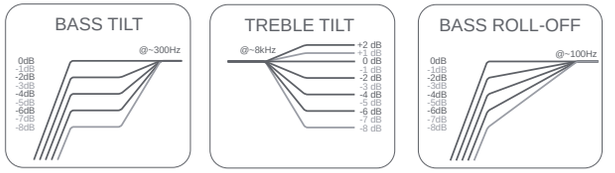


If you use an acoustic measurement software like RoomEQ Wizard, measure at ear height at the listening position. Analyse the results and adjust DIP-switches to achieve as flat and consistent frequency response as possible in each monitor.

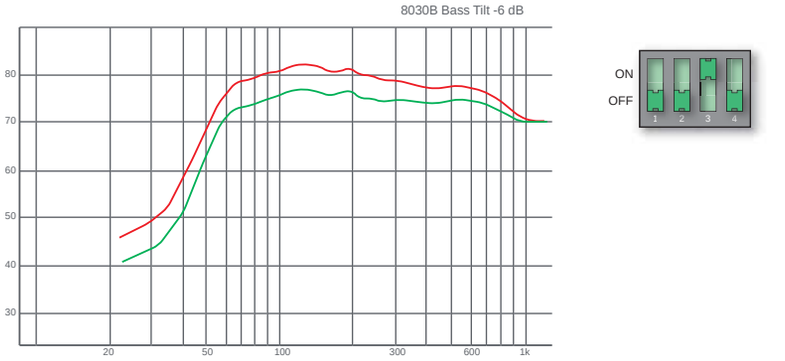
Set the sensitivity control on all speakers clockwise to full (-6 dBu) to begin with. Adjust all monitors and subwoofers on the same output level. More information can be found in operational manual of each product.



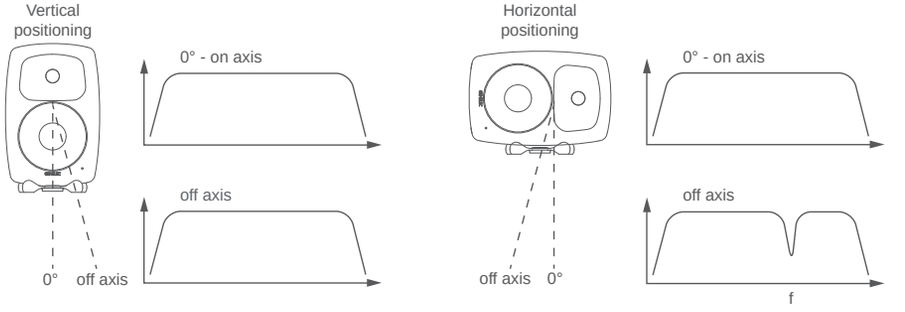




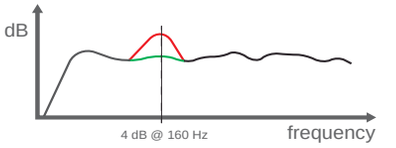
In the example of tone control use below, the bass tilt has been used to compensate the wall loading on bass frequencies.



Placing the monitor in a horizontal position may cause a comb filtering effect when the listener is off axis in relation to the monitor. We recommend placing the monitor in a vertical position for the best results.



If you place your monitors on a table or other large horizontal surface, a bass boost around 160 Hz typically occurs.

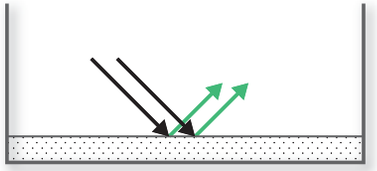


Some Genelec monitors have a desktop control DIP switch, which compensates the 160 Hz boost by -4 dB. AutoCal™ takes care of this automatically.

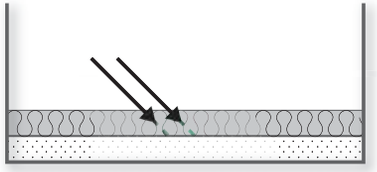
Acoustic treatments

Calibration alone does not help, if the room is not acoustically treated. Some improvements can be made with a little effort. There is plenty of information in the internet and you can ask acoustic professionals for help with acoustical issues.

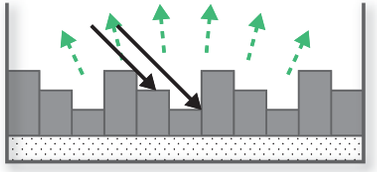
Wall surfaces, ceilings and floors can be reflective, diffusive or absorptive. Combinations of these are often used.



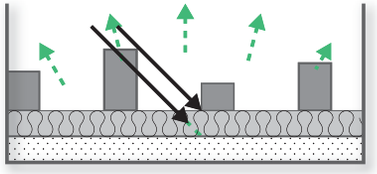
Hard surfaces such as glass, concrete, dry wall or MDF reflect the sound.



Soft materials such as rock/mineral wool, carpets and curtains absorb the sound. The thicker the layer is, the better is the absorption.



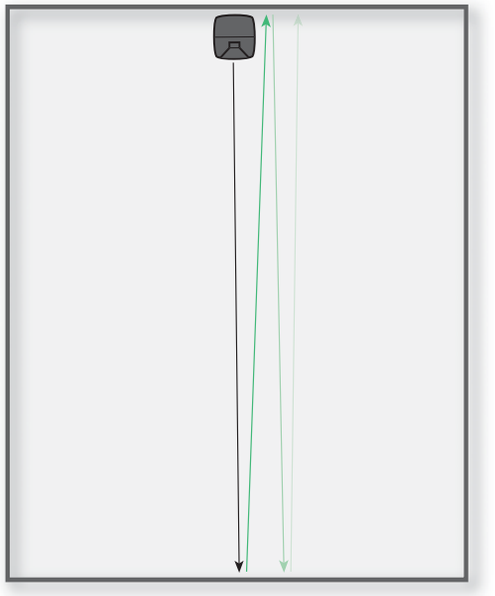
Irregular surfaces such as diffusers or bookshelves diffuse and spread the sound around.



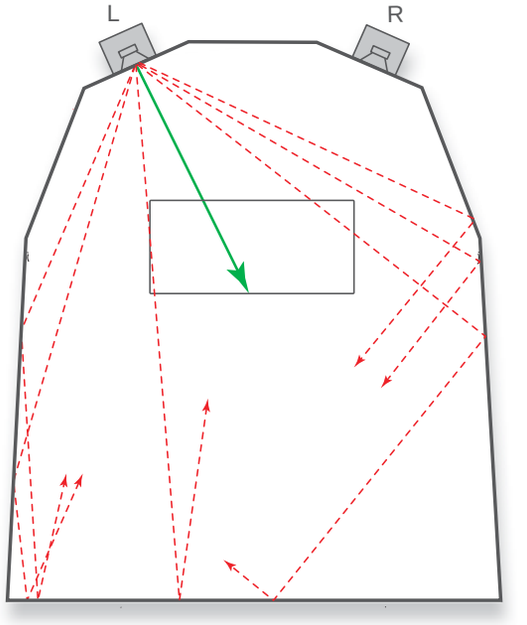
Combination of diffusive and absorptive surface.

Reflections can also occur between three or more surfaces. Optimal acoustic situation is when you receive a natural direct sound from the speakers to your listening position i.e. the sweet spot without the room reflections colouring the sound and the stereo imaging.

Flutter echo



Multiple reflections



The picture shows a 5.1 system and the acoustical room improvement steps we recommend on the previous page. The same rules apply to a stereo setup.

You can improve the acoustics in your room by following these steps:

Step 1
Cut the corners, use MDF or drywall and fill the empty space with mineral wool.

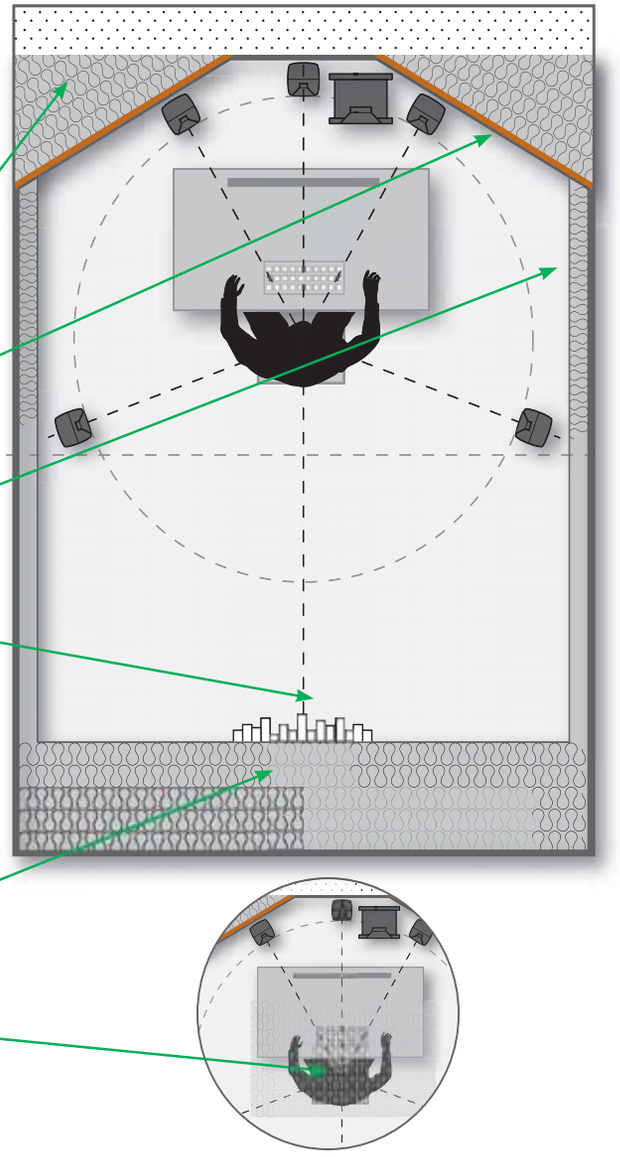
Step 2
Use damping material on the front wall surfaces.

Step 3
Use damping material on the side walls.

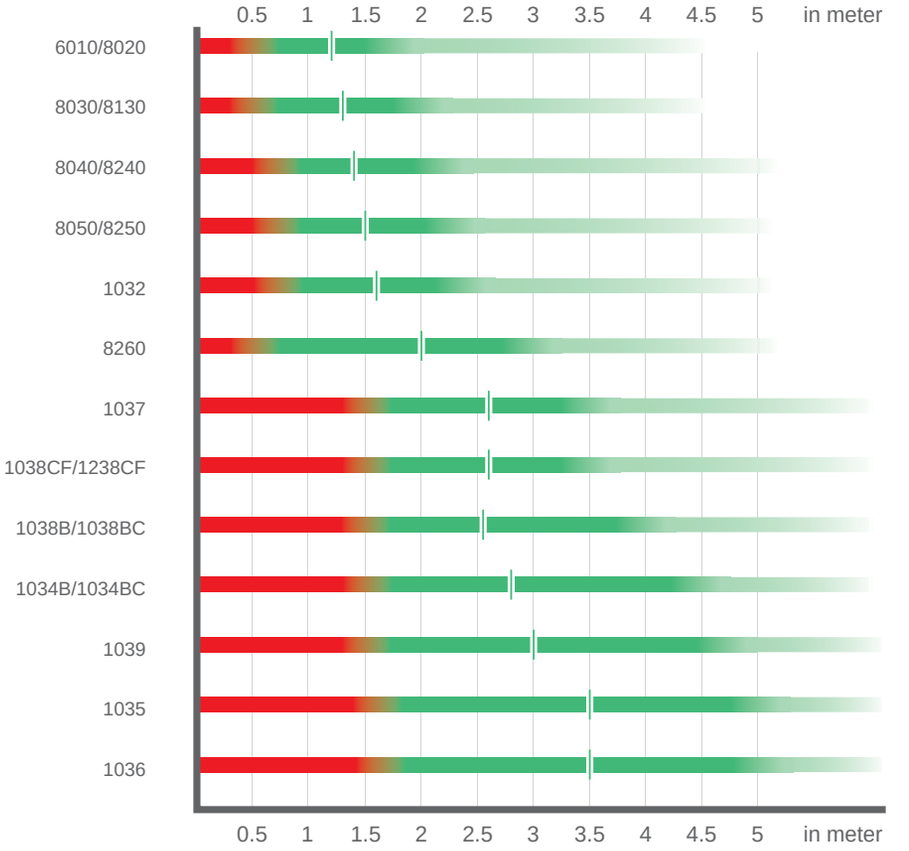
Step 4
Use diffusive element(s) on the back wall. This can be, for example, a regular bookshelf.

Step 5
Massive layer of damping material at the back of the room, up to 40-50 cm or more is recommended.

Step 6
Use damping and diffusive material above the listening position.



Listening distance recommendations



Not recommended

Recommended

Typical listening distance in studio control rooms

Decreasing recommendation

Selection guide

Monitors	-3 dB LF extension	SPL short term RMS @ 1 m *)	Room volume up to	Subwoofers for 2-channel (Stereo)	Subwoofers for 5-channel (Surround)
6010	73 Hz	93 dB	55 m^3	5040	5040
8020	66 Hz	95 dB	65 m^3	7050	7050
8030 / 8130	55 Hz	100 dB	75 m^3	7050	7060 / 7260
8040 / 8240	45 Hz	105 dB	85 m^3	7060 / 7260	7070 / 7270
8050 / 8250	35 Hz	110 dB	95 m^3	7070 / 7270	7071 / 7271
1032	40 Hz	113 dB	100 m^3	7070 / 7270	7071 / 7271
8260	26 Hz	113 dB	115 m^3	7071 / 7271	7071 / 7271
1037	35 Hz	116 dB	125 m^3	7071 / 7271	7073
1038CF / 1238CF	55 Hz	118 dB	125 m^3	7071 / 7271	7073
1038	33 Hz	120 dB	170 m^3	7071 / 7271	7073
1034	32 Hz	123 dB	200 m^3	7073	2 x 7073
1039	29 Hz	126 dB	240 m^3	7073	2 x 7073
1035	29 Hz	131 dB	400 m^3	2 x 7073	3 x 7073
1036	19 Hz	131 dB	400 m^3	2 x 7073	3 x 7073

*) Maximum short term sine wave acoustic output on axis in half space, averaged from 100 Hz to 3 kHz @ 1m

Subwoofers	Frequency +/-3 dB	SPL short term RMS @ 1 m
5040	35 - 85 Hz	96 dB
7050	25 - 85 Hz	100 dB
7060 / 7260	19 - 85 / 120 Hz	108 dB
7070 / 7270	19 - 85 / 120 Hz	112 dB
7071 / 7271	19 - 85 / 120 Hz	118 dB
7073	19 - 85 / 120 Hz	124 dB

Sound basics

Sound travels approximately 340 m/s. It takes 3 ms to travel 1 meter.

Ideally the sound volume drops by 6 dB when the distance doubles.

1 m	100 dB	0 dB
2 m	94 dB	-6 dB
4 m	88 dB	-12 dB

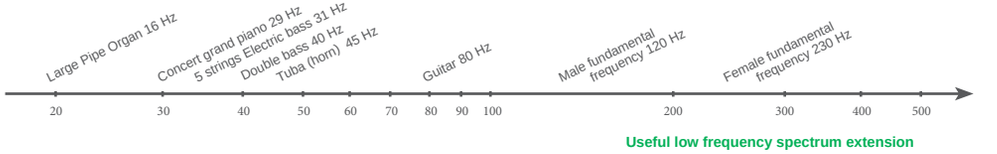
Sound volume increases 3 dB when the power doubles.

100 W	85 dB	0 dB
200 W	88 dB	+3 dB
400 W	91 dB	+6 dB

Industry standard SPL for cinema mixing work is 85 dB at the listening position.

Definitions of frequency spectra:

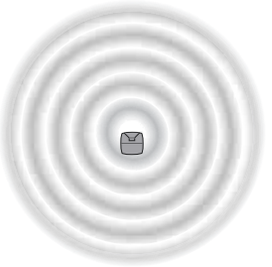
Subsonic frequencies	1 Hz - 20 Hz	Not audible to humans.
Subwoofer frequencies	20 Hz - 120 Hz	Lowest audible octave to humans. Music low frequencies, here are the kick drum, bass and low register of grand piano.
Woofer frequencies	120 Hz - 400 Hz	Middle C of piano is here.
Midrange frequencies	400 Hz - 2.5 kHz	Low-order harmonics of most instruments.
Tweeter low frequencies	2.5 kHz - 5 kHz	Ear most sensitive to this range. Presence, voice frequencies are here.
Tweeter mid frequencies	5 kHz - 10 kHz	Brightness and harmonics are here.
Tweeter EHF	10 kHz - 20 kHz	Highest harmonics are here.
	20 kHz and above	Not audible to humans.



Sound radiation

The monitor radiates omnidirectionally at low frequencies. At higher frequencies, the energy radiated becomes increasingly directional: midrange frequencies radiate in a hemispherical pattern and high frequencies in a beam- or ray-like pattern. All this sound energy reflects from the walls around and should be controlled.

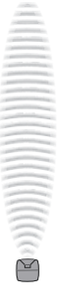
Soundwave spread patterns for various frequency ranges



Freq ≈ 20 – 400 Hz
Spread ≈ 360°

Freq ≈ 400 Hz – 2,5 kHz
Spread ≈ 120°

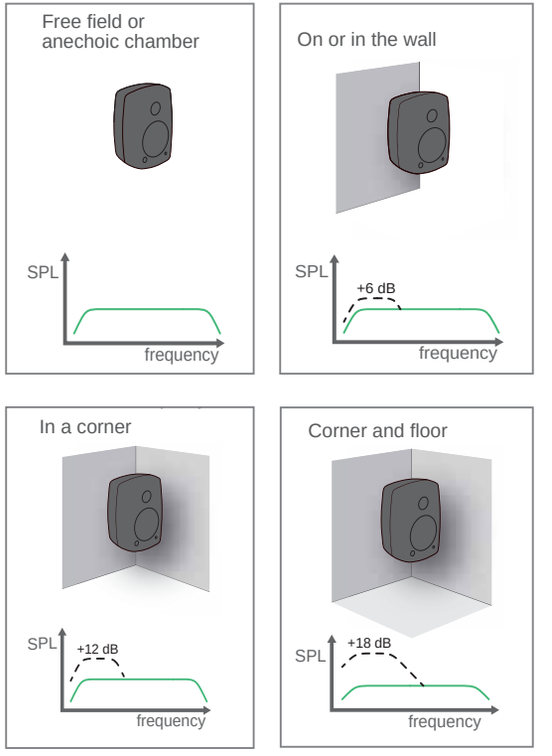
Freq ≈ 2,5 – 10 kHz
Spread ≈ 40°



Freq ≈ 10 – 20 kHz
Spread ≈ 10°

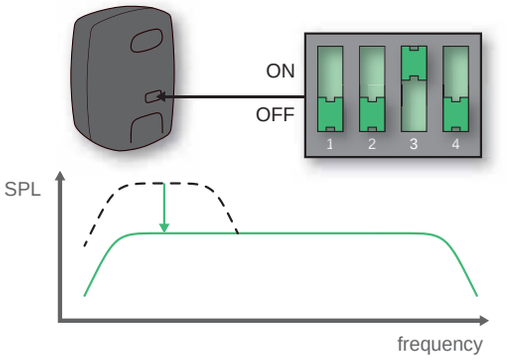
Radiation load

Ideally, free standing monitor has a flat frequency response. Placing the monitor near the wall boosts the low frequencies; one wall up to +6 dB, a two-wall corner (or wall and desk) up to +12 dB and a two-wall corner with floor, desk (or even ceiling) boosts up to +18 dB. Genelec monitors come with room response controls, which are designed to compensate this boundary load effect. AutoCal in SAM (DSP) systems.



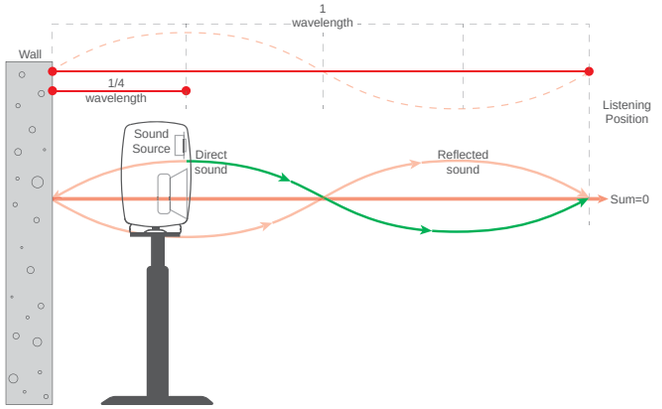
Low frequency boost correction

Each room is different and behaves differently when monitors are placed in the room. Calibration minimises the colouration caused by the room. Ideal calibration results in a flat frequency response with minimum boosts/bumps, dips/notches or ripples across the entire frequency response. Ideal situation is when the room, the monitor and the listener are in harmony.



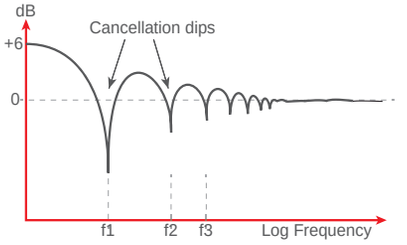
Wall cancellation

The mechanism of cancellation is very simple: If the loudspeaker is a quarter wavelength away from a reflective wall behind it, (low frequency) reflected wave returns back to the loudspeaker and further on to listening position in opposite phase, cancelling the direct signal at this certain frequency.



When two identical signals are in anti-phase (180° degrees out of phase), they cancel each others. How complete the cancellation is, depends on the distance and the reflection coefficient (material) of the wall.

Wall cancellation typically generates a set of cancellation dips (comb filtering). First cancellation dip can be 6 – 20 dB deep.



Equalization does not help at the dip frequency, as changes apply also to reflected sound. Solution is either to move monitors or improve the acoustic treatment.

To minimise back wall cancellation, the monitors should be placed as close as possible to a wall. If this is not possible, try to fill the back wall as much as possible with, for example, mineral wool or similar material to minimise the impact. Additionally, you can add a subwoofer to your system: that can prevent the reflections significantly.

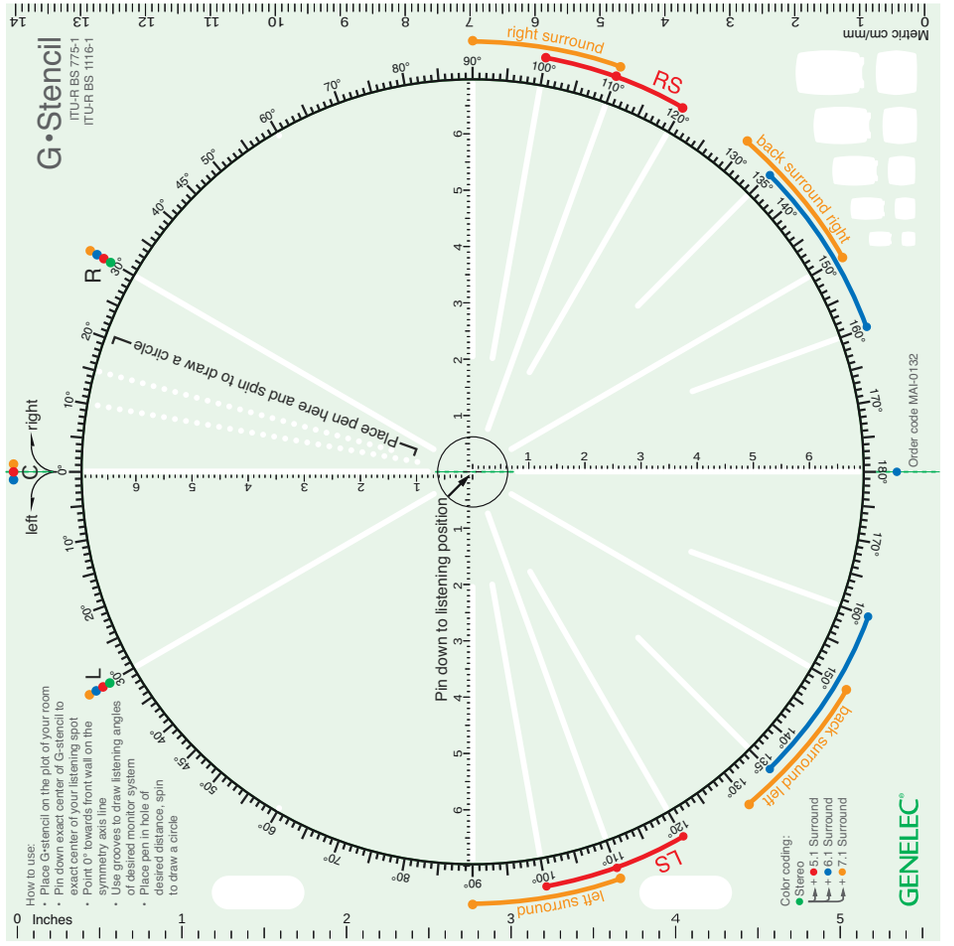
Genelec 8000 Series
the industry standard in professional monitoring

The Genelec 8000 Series represents the culmination of two-way active monitor design with several groundbreaking innovations combined into a single product line. With the 8000 Series, Genelec introduced the Minimum Diffraction Enclosure™ (MDE™) with its rounded edges curving gently and seamlessly into the shape of the Advanced Directivity Control Waveguide (DCW™) and the rear-mounted reflex port. Made out of die-cast aluminium, the 8000 Series enclosures offer excellent vibration damping and sturdy structure with thin walls to maximize the internal volume.

Designed to perform

The rounded edges in the 8000 Series products are there not just for the fancy looks, they also give the loudspeakers several acoustical benefits. The curved MDE™ cabinet significantly contributes to the product's unsurpassed frequency and power responses. The minimized cabinet edge diffraction yields superb imaging qualities. The long, curved reflex tube is flow optimized to increase the woofer's low frequency extension and SPL capacity. Low distortion drivers combined with carefully designed filters improve resolution and minimize listening fatigue over the entire audio spectrum. All Genelec 8000 Series monitors come with an elastic Iso-Pod™ (Isolation Positioner/Decoupler™) which prevents colouration caused by conduction of unwanted vibration to the mounting surfaces. The Iso-Pod™ also features adjustable tilt for precise aiming of the acoustical axis.

Find the correct monitor angles with G • Stencil



How to use the G • Stencil?
Place the G • Stencil on the center of your listening position on an even surface. Tie a line around tack or pin and hold it to the exact centre of the stencil. Point 0° (Centre) towards exact Centre of the front wall. Tighten the line and turn the line to any desired angle and read the degrees from the circle.
http://www.youtube.com/watch?v=ZDGhPvpfmoY

The original G • Stencil is available at Genelec Webshop. Order code MAI-0132

Learn more about Genelec products available for different markets!

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