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Guide

# The art of loudspeaker placement


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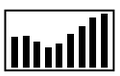
StereoLife 

Choosing a loudspeaker is a task that requires matching many factors at the same time - size, construction type, finish, performance, and, of course, price. When we have solved this puzzle, all we need to do is to carefully remove the new equipment from the box, connect the cables, and arrange speakers in such a way as to get the best possible sound out of them. However, the latter turns out to be quite complicated. Finding the optimal positioning of loudspeakers in the listening room costs pretty much nothing and can surely give a lot of satisfaction. All it takes is a little experience, intuition, and commitment to turn this „problem" into an exciting adventure.

One day in the editorial office, we pointed out that many music lovers don't know how to properly position speakers in their room. Shortly afterward we talked about it with a man who knows a lot about loudspeaker design - Mateusz Jujka, CEO of Pylon Audio. We concluded that the true problem here is a lack of knowledge, so we decided to jointly prepare a comprehensive guide, which on the one hand will be a collection of tips on how to set up speakers in the listening room, and on the other - an invitation to an experiment, which can turn into a fascinating hobby.

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Audiophiles place great importance on the selection of every component of a stereo system. Speakers are usually at the top of the hierarchy. We can spend a lot of time choosing the best speakers out of hundreds of available models and then match them with the ideal source, amplifier, and accessories. Often, however, loudspeakres' placement in the listening room is much more important, and it has to be addressed in order to achieve the optimal sound effect. It's not that difficult, but many music lovers forget about it, postpone the matter indefinitely or neglect it because even badly set up loudspeakers will work and play their favorite music. But the point here is not just to make the speakers emit sound, but to get the maximum performance and listening pleasure out of that. While changing the amplifier or cables is more or less expensive, setting up speakers doesn't cost a penny, and you can hear the effects immediately.

The correct arrangement of loudspeakers in the listening room is also crucial for each next step in expanding your hi-fi system. After all, it isn't easy to choose an amplifier or cable if our speakers do not stand where they should. We can compare it to the behavior of musicians during a live concert. They understand how important it is where they are in relation to one another, where they look, and whether they have enough space for themselves and their instrument. Unfortunately, many people do not bother to think about it - start noticing the problem when the echoing sound in an empty room makes it impossible to understand the news on the TV.

The situation is not only complicated by insufficient theoretical preparation. Most often, it's the fact that only a few people have such a large room that can be used exclusively for listening to music and be decorated accordingly. Usually, a room has several different functions, and the sound equipment has to fit into this situation. Unfortunately, it is often just pushed into the background because other matters take over. The biggest enemy of acoustics is the minimalist fashion in interior design. You can see it even in the advertising brochures of hi-fi equipment. At first glance, such rooms look beautiful, but any experienced music lover will quickly realize that something is wrong here. Equipment pushed right up to the wall in a room that looks

like a warehouse has no right to deliver a good sound. However, even audiophiles make the same basic mistakes - because we liked the architectural concrete because the living room cannot be used only for listening to music, because we had to make room for our kids' toys and our grandmother's china. Sometimes, the audio equipment is almost omitted, and the speakers end up in the corner or on the ceiling. In addition, information about the correct positioning of speakers in the listening room is usually presented in a very simplified form in the user manual, with one drawing and a few sentences about how improper placement of speakers in a room can cause bad sound. Right, thanks a lot.

That's why we created this guide. The issue is, of course, so complex that it could be explored endlessly. Some experts would undoubtedly put their two cents into this publication. In their opinion, this guide would be complete only if it included basic scientific definitions, formulas, datasheets, computer simulations, and sample measurement results. However, we didn't want to delve into the subject so deeply. Instead, our goal was to write a guide using an easy-to-understand language - a set of essential guidelines for positioning loudspeakers in the listening room. We hope you enjoy taking this journey with us, but before we get down to business, let us remind ourselves of a few basic terms.

## What is stereophony?

To understand why we should even bother with the correct positioning of loudspeakers in our room, we should know what stereophony is. Sounds trivial? Unfortunately, even decades after the stereo system became popular, not everyone knows what it is or how to use it properly. So let's get back to basics.

Stereophony is a method of recording and reproducing sound in two channels in such a way as to give the listener the impression of hearing a surround sound. Stereo sound is traditionally recorded using two independent microphones for the left and right channel and transmitted through two separate channels to two different speakers. Unlike a mono recording with only one microphone and one speaker, the microphones recording the stereo sound are put at a distance

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from each other - just as the speakers in the listener's home should be positioned. Figuratively speaking, we want everything that „goes into" each microphone to „come out" of the speakers at the other end of the chain. Why? Above all, to enable the listener to determine the location of sound sources, such as instruments or vocals, by interpreting the difference between the sound perceived by the left and right ear. The stimuli received by the brain from the left and right ear differ primarily in their frequency characteristics and intensity, but - and this is crucial from our point of view - they reach the ears with a specific time shift, which allows us to determine the position of the sound sources in space. Bear in mind that the human auditory system is susceptible to these matters. After all, tens of thousands of years ago, being able to determine the direction a sound was coming from could be a matter of life or death.

Most of us know that the frequency range that the average person registers is between 20 Hz and 20 kHz, but knowledge of the accuracy of our hearing in locating sound sources is uncommon. Suppose our head is 20 cm (0.2 m) wide. The speed of sound is 340 m/s. If the source is precisely to our left or right, the delay between one ear and the other is approximately 588 µs or 0.0006 seconds! However, we are talking about an extreme situation - the easiest possible one. In reality, we can determine the position of speakers standing in front of us with a high degree of accuracy. Let's imagine that we are in a soundproofed room, circling a person understudy with a loudspeaker or a musical instrument. The average person can detect a change in the position of a sound source with an accuracy of 3 degrees, which corresponds to a delay of 20 µs (0.00002 s). Professional musicians and people with exceptionally sensitive hearing can narrow this down to 1 degree. So if you belong to this group and are sitting in front of audio equipment 3 m away from you, you should notice displacement of the speakers to the left or right by 5 cm!

Stereophony is not a new and unknown phenomenon to us. The term was introduced in the late 19th century by Alexander Graham Bell following an article on binaural hearing. The first practical experiment with such a system was carried out in 1881 in Paris using two telephone

lines that collected sound from the opera stage. The recipient could hear the effect by putting two earphones to his ears. In 1929, English electronics engineer Alan Blumlein replaced headphones with a pair of loudspeakers. The first stereo recording was made in 1938 by Judy Garland, but Duke Ellington had done it accidentally six years earlier. To ensure that his work would be preserved, RCA Victor used two recording devices with two amplifiers and microphones placed at a distance from each other. Since records were pressed from both matrices, it became possible to match the two versions and achieve a stereophonic effect. Many years later, we should know this technology very well and benefit from it. Unfortunately, some people still do not understand why they should install two speakers in their living room instead of one.

You will probably think that since stereophony is an invention older than penicillin, nylon stockings, or the jet engine, humankind should have invented something better long ago. Well, yes and no. The first exciting concept to extend this system was quadrophony - a surround sound system that used four microphones instead of two. The first quadrophonic recordings appeared in the early 1970s. However, the interest of music lovers in quadrophony was negligible. The next stage was the spread of multi-channel sets we now know as home theater. The first documented use of such a system took place in 1940. Walt Disney Studios used up to 54 speakers during the screening of the animated film „Fantasia". Today, 5.1 systems (using five channels and an active subwoofer) are the most popular, and true surround sound enthusiasts can build a Dolby Atmos 7.1.4 system in their living room with seven speakers at listeners ear height, one subwoofer, and four ceiling speakers. Creating the appropriate spatial experience is handled by decoders, DSP processors, and other „instruments of the devil". However, while the impression of being surrounded by sound and effects like bullets whizzing overhead may seem attractive, let's remember that sound processed by complex algorithms has as much in common with the natural perception of space as cheap plastic speakers with a hi-end tube amplifier. This is why we should focus on good old stereo.

## What would we see if we saw sound?

When we listen to music in a closed room, sound waves reach us directly (from the speakers to our ears) and indirectly (in the form of reflections). The reason is that the vast majority of loudspeakers generate sound in multiple directions so that only a tiny portion of their work reaches us via the shortest route. Everything else is reflected by the walls, ceiling, floor, and all the objects in the room. Most materials absorb or scatter the waves to a greater or lesser extent. You can imagine it as if, instead of loudspeakers, there were two cannons in front of us firing lots of little rubber balls every second. Some will hit us in the head, but most will bounce at least several, if not a dozen, times off walls, windows, and furniture. A bullet that reaches our head will feel faster than one that bounces off the walls several times. In other words, when a sound wave is repeatedly reflected, it arrives at our ears with a longer delay, and at the same time, it is attenuated by objects and people in the room. This is where sound delays (caused by reflections) come from. To get a reasonably realistic picture, let's also add other phenomena related to wave propagation, such as diffraction and interference. At the center of events will be ourselves. We will probably want all the desired sounds to reach our ears - in the right quantity, without loss of energy, with correct proportions, and the possibility of reproducing realistic spatial impressions.

## What would the ideal room look like?

Before we get into placing the speakers, we should look at the listening room itself. This is usually the most immutable part of the whole puzzle. We often have no influence on the surface, shape, height, or location of windows and doors. Even when it comes to the décor or the materials used for the floor, walls, and ceiling, most of us have limited options. The theory is that the ideal listening room should resemble a miniature concert hall - well-proportioned, with uneven or curved walls, constructed of materials that do not generate unnecessary reflections or absorb sound in an uncontrolled manner. On top of that, we

should place acoustic panels on almost all surfaces. Diffusers, absorbers, polyurethane foams, bass traps, etc. Just like in a recording studio. Such a special room is usually lined with thick pieces of foam and is isolated from the outside world for obvious reasons. As it often happens, solutions designed for professional use do not always work at home. Therefore, overdoing it with the number of damping materials and acoustic panels can end just as badly as avoiding the issue and pretending that music sounds great in an empty living room made of concrete, metal, and glass. Experts say that during the building or arrangement of a listening room we should aim for natural, optimal reverberation (good listening conditions prevail in living rooms with echoes around 0.6-0.8 s).

## Is my room perfect? Probably not.

Every room is unique, so we should do a bit of detective work at the beginning. First, we should consider the total floor space and its shape - the proportions between height, width, and length. In a small room, it will be more challenging to control low tones and position the speakers in such a way as to obtain a reasonable space. In a room less than 10 square meters, you may be tempted to try non-standard solutions, such as hanging the monitors on the wall or using a setup encountered in recording studios, where the speakers are placed on the console. Although the soundstage will be less impressive, you may get better depth and maintain the correct proportions. On the other hand, it's the opposite problem in large living rooms - you will need larger speakers and a powerful amplifier. In addition to proper positioning of the equipment, we will also have to find a solution to the reverberation.

To find out about our listening room, we should measure its length, width, and height. Between pairs of parallel walls, there are resonances called room mods. These are amplified frequencies because the distance between walls coincides with the sound wavelength or a multiple of it. To calculate their value, let's divide the speed of sound (340 m/s) by twice the distance between the walls. Thus, for 5 m we get 34 Hz, for 4 m 42.5 Hz and for 3 m 56.6 Hz. We can therefore expect sounds at this frequency to be noticea-

bly louder than others. It is also worth comparing all three dimensions of our room with each other. For clear proportions, we will assume that the height of our room is 1. A problematic situation will arise when the individual dimensions are multiples of each other. If the ratio of height to length or length to width of our room is, for example, 1:1, 1:2, 1:3, or 2:3, we will have to overcome the problem of induced resonances. We should therefore avoid, as far as possible, square rooms or rooms that are 5 m long and 2.5 m wide and high.

The specialist literature gives examples of bad ratios and even presents desirable ratios based on calculations and experimental trials. Examples of such ideal ratios are 1:1.14:1.39 or 1:1.28:1.54 and 1:1.75:2.2. If we convert the first example into meters - assuming that the standard height of a living room is 2.60 m - we come out with 2.96 m wide and 3.61 m long. A room with a width of 4.55 m and a length of 5.72 m will comply with the last proportions. These are just some suggestions, and no one claims that shortening or lengthening one dimension by 5 cm will lead to unmanageable resonances. However, suppose we would like to carry out a professional analysis of the acoustics of our listening room and go beyond calculations on a piece of paper. In that case, the only solution is to perform professional measurements with a microphone and specialist software.

## How to tame the acoustics?

As we delve deeper and deeper into the subject, we realize that everything plays music in our room - not just the speakers, but - to some extent - walls, floor panels, even a chandelier with glass shades. All surfaces and doors, nooks, and passageways to other rooms also significantly impact the sound propagation in the listening room. No one said we couldn’t arrange them, but the fact is that the glazed interiors of modern flats can make life miserable for audiophiles. Unfriendly acoustics can be combated in several ways - the simplest and least questioned is to fill the interior with various materials and objects with damping or dispersing properties. Furniture is also a fundamental issue. In an empty room with perpendicular walls, it will be challenging to achieve the ideal effect.

The situation changes significantly when we put in furniture that more or less absorbs sound. Let's add all sorts of accessories and additions such as curtains, blinds, potted plants, paintings, lamps, and other items, remembering that lightweight materials tend to absorb high frequencies, while heavier and thicker ones will mainly absorb the bass.

If you have used all the methods listed above, installed a thick carpet on the floor, put bookshelves against every wall, and hang thick curtains in the windows. However, if the effect still falls short of our expectations, there is still option number three - a professional soundproofing system. It doesn't mean covering the entire room with an ugly grey foam. Today, many companies offer products that do the job and look great: soft panels imitating wood or concrete, unique thick wallpapers, ceiling systems, or flat wall absorbers in the form of a striking, colorful mosaic. However, if you have a problem with booming bass, this treatment will not eliminate it. In this case, bass traps, which are acoustic systems designed to absorb the lowest frequencies, could be the solution. Some of them, called Helmholtz resonators, work a bit like an ‚inverted' bass-reflex speaker. Others neutralize the low tones by extinguishing the vibrations of a special membrane. The only difficulty is that bass traps are built to attenuate a specific frequency, so we must know precisely which frequency we're trying to reduce.

The so-called first reflection points may help achieve good results without covering the entire room with an acoustic system. These are the places where the sound coming out of the speakers first bounces off the walls, floor, and ceiling, then goes straight to our ears and blurs the surrounding image. We will have 12 such points in a standard room - two on the back wall, two on the sidewalls, and another on the floor, ceiling, and back wall. Of course, we are talking about a highly simplified situation, as such lines should be drawn from each speaker. It already gives us 24 points. However, we don't need to be accurate to the centimeter during the installation of diffusers or absorbers at the first reflection points. These are unlikely to be the size of bottle caps or fridge magnets. To mark out these points, we need a mirror and the help of another person. Sit down on an armchair or a sofa and ask


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our helper to put the mirror to the wall at our eye level and move it back and forth along the wall. When you see one of the speakers, mark this spot on the wall. If you don't like such a trick, you can, of course, mark these places with a tape measure. You can even use a bookcase as an acoustic panel and a thick carpet on the floor. Controlling the first reflections should significantly sharpen the stereo image. Unfortunately, in many rooms, all you'll see is a shiny parquet floor and bare walls, with concrete behind the speakers and a giant TV. In such a situation, you can even put the speakers back to front. Or buy a soundbar and stop pretending that you care about the sound quality.

## Speakers: the second piece of the puzzle

Before we start placing our loudspeakers, it is worth taking a closer look at them. For some music lovers, this will come as a big surprise, but individual loudspeakers can differ not only in size but also in the type of cabinet, the way it is ventilated, the number and specificity of drivers, etc. Therefore, we will approach the positioning of typical bass-reflex sets slightly differently from closed speakers, ones with the transmission line, electrostatic or magnetostatic panels, and other concepts that have something unusual in them. Even if we choose vented speakers, we should be interested in the location and shape of the ventilation port. Generally speaking, closed boxes and loudspeakers with a bass-reflex at the front are the easiest to set up. Theoretically, they can be placed directly to the rear wall of the room. While you can then expect boosted and booming lows, you won't create some weird design where the air has to squeeze between the speaker cabinet and the wall. An exciting alternative is set with bass-reflex radiating downwards - towards the floor or plinth being an integral part of the speaker. Here the manufacturer determines that distance and the user can decide only whether the boxes will stand on a hard surface or a carpet. Of course, there's still the problem of finding the proper distances from the walls and the toe-in angle, but this solution works well in many cases. If we have chosen speakers with a bass-reflex on the rear wall, we will probably have to give them some free space at the back and that's all. Then we should position

them so that we get healthy, well-controlled bass, correct tonal balance, and three-dimensional soundstage.

The cases mentioned above are not the only ones we can come across. Many audiophiles choose closed loudspeakers, and they appreciate this solution precisely for the ease of setup and predictable, linear operation of such sets in the low-frequency range. The transmission line is also an attractive idea. Replacing a typical tube with a complex maze, usually occupying the entire enclosure volume, is quite demanding from a technical point of view but gives good results. Electrostatic or magnetostatic panels, as well as dipoles based on dynamic loudspeakers, are a subject for a separate article. Their owners usually have to reckon that their listening room will require a specific acoustic adaptation. Other solutions may make the process of setting up our speakers not go as we imagined. In most cases, however, these are hi-end designs - intended for people who know exactly what they bought and how to deal with such equipment.

So, is there any easy way for beginner audiophiles to see if the speakers they choose will be trouble-free in this regard, or if setting them up will be like fighting windmills? Well... The safest option would be to select sets with a bass reflex placed on the front or bottom or possibly closed speakers. However, no one can guarantee that everything will be fine then. It may turn out that we have taken unnecessary precautions, and our speakers will end up in a place where a rear bass-reflex design would work just as well. Each situation is unique, as individual speakers have a distinctive sound character. So we can take two pairs of three-way floorstanding rear-firing bass-reflex speakers, but if one has a lot of bass and the other presents an even, fast and well-arranged sound, we will set them up entirely differently. In the first case, even moving the speakers 60-70 cm from the wall will not eliminate the bass boost. In the second, it may turn out that even 30 cm is enough to enjoy the natural sound. It should also be mentioned that many speakers available on the market have a bass reflex blowing backward, and nobody is deterred from buying them. Practice shows that no model should be disregarded because of a single aspect of its construction, such as the loca-

tion of the resonance tunnel, nominal impedance, or the material from which the diaphragm of the woofer is made. That's why it's a good idea to read a few reviews before you buy, arrange an audition or even ask about the possibility of borrowing selected speakers to take home.

## Listening spot: the third element

It may surprise some people, but the place where we sit during listening has a tremendous influence on the correct positioning of the speakers. These are two sides of the same coin. It may turn out that sometimes it's enough to slightly move our armchair or sofa, instead of moving the speakers another twenty centimeters. Otherwise, the sound will be shifted to one side, and you can put proper spatial perception out of your mind. Secondly, the seat should guarantee the correct position of our head while listening. Blocking out the surrounding acoustic world with a high headrest is not a good idea. Neither is pushing the sofa or armchair as far as possible towards the back wall of the room. In that case, you are likely to hear a lot of booming bass, and the soundstage will be as flat as a flounder.

One more parameter is crucial - height. Looking at drawings and diagrams, it is easy to forget that sound waves propagate in all three dimensions, not just horizontally. It means that the height at which the speakers and our ears are placed can play a significant role in this puzzle. If you don't believe it, try getting up from your couch or chair while listening. Because most speakers use several loudspeakers mounted vertically, one above the other (the exceptions being sets with broadband and coaxial drivers), the reference point will usually be the tweeter. This driver should be placed at the height of our ears. If this is not possible for some reason, our head should be placed slightly higher, or at least this is the recommendation of most speaker manufacturers.

Of course, it's just a theory. In practice, we rarely have any influence on how high the tweeters in our speakers will be. Monitor speakers can still be supplied with appropriate stands, but

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in floor-standing models, the designer sets the distance between the floor and the tweeter, so the end-user can only screw longer spikes into their plinths, put them on granite slabs, or use some other trick, but if it turns out that it's necessary to go the other way, the only thing left is to buy a higher seat. The rule of placing tweeters at the listener's ear level doesn't seem to apply in the hi-end world, where we are confronted with equipment of entirely different dimensions. However, the most expensive loudspeakers on the market are usually designed to work in huge rooms, so their designers don't have to worry about many technical and financial limitations.

## How not to arrange the speakers?

The web is full of pictures that will immediately raise any audiophile's blood pressure. Most of them are cases of incorrect or completely pathological positioning of loudspeakers. So what not to do? We certainly shouldn't push them into the walls as much as possible. Regardless of the type of enclosure, no speaker will sound good when squeezed into a tight space or placed in a corner. To achieve a proper soundstage, it is mandatory to maintain symmetry between the speakers and our listening position. Importantly, we are not talking about symmetry in relation to the room, but the distances between our head and the left and right channel. These should be identical. The loudspeakers must be placed at the same height. It is pretty evident in floor-standing models, but with monitor speakers, some people assume that the left one can be placed on the table under the TV and the right one on the dresser half a meter higher, which is obviously a mistake. It is also essential to ensure that nothing is covering our speakers or standing in their direct surroundings. If we have a living room joined with a dining room and the tabletop completely covers the tweeter, we should rethink this arrangement. Similarly, if we want to place a coffee table in front of our sofa, it would be best to choose a small, simple, openwork construction rather than a big piece of solid wood.

What about the option of hanging speakers on the wall? With a bit of luck, this setup can work, but you should aim for a configuration that looks more like

a standard stereo system than an attempt to get rid of equipment. Think of it as an idea of interior designers and people for whom music isn't that important. In a bar - okay, in a beauty salon - fine, in a dentist's waiting room - no problem, but it's not a good idea at home. There are wall-mounted speakers, which work well for home cinema systems, but for typical stereos, it's better to stick to the classic recipes and make the most of the available space.

Some believe that errors in loudspeaker positioning can be easily corrected with knobs on the amplifier or an equalizer in the app. However, it is essential to remember that this doesn't eliminate the problem, only reduces its effects. When we shift the balance, we adjust each channel's volume, not the time shifts between them. Such tricks are only offered by some processors or amplifiers equipped with a room correction system. However, the biggest sin committed by users is to treat speakers as if they were air fresheners. This box has to stand somewhere, so let it stand here... Let's be honest - you wouldn't cut your TV in half, put one half in the corner, hang the other on the ceiling and let your eyes adjust. Having such an approach to hi-fi equipment, it's better to buy a small network speaker and place it wherever you like.

## First try, the second try, the third try...

Arranging the listening room is usually a process. We can't assume that the speakers will be placed where we thought they will be comfortable. It's good to give yourself time to experiment because, in the end, you never know which option will work best for you. Nobody can predict this from pictures, dimensions, or plans. It's a bit like taking a baby cat home. You can buy a lot of things in a pet shop, prepare bowls, scratchers, toys, and a soft bed, but later it may turn out that our cat likes to play with a strip of a coat hanging in the hall and its favorite bed would be a cardboard box the microwave came in. Loudspeakers are not so moody, but you have to be prepared for the fact that your first choice will not suit them for some reason, and you will have to come up with something else. Naturally, you can't always move the speakers

around indefinitely. Something can always get in the way. A door, a window, a staircase, or a wardrobe that cannot be moved... After all, audio equipment cannot dictate where we should sit, how the furniture should be positioned, and in what strange ways we should bend our bodies to get into another room. Therefore, nothing should be planned blindly. Assuming that speakers will stand in an accurately defined place is asking for trouble. It cannot work. It's almost always necessary to make smaller or larger adjustments. This is perfectly normal, and we should not be afraid of it because the joy of the resulting improvement should reward us for the effort of rearranging the listening room.

## How do I place the speakers to get it right?

There is only one answer - experiment. A tactic used in one room will not necessarily work in another. Still, it's a good idea to start with some universal principles to avoid making obvious mistakes and to establish a good starting point for further attempts. The priority is to find the proper position for our speakers, considering the distance from the walls. Manufacturers like to put some guidelines or recommended placement options in the user manuals. It is certainly worth following these instructions or at least checking that they give the best results. Most companies consider the pretty common situation where speakers stand in a rectangular room, usually near its shorter wall. Some, however, prefer placing them against a longer wall or even in a corner. The distances between the speakers and the room's sidewalls may be identical, but no one said that the asymmetrical option is unacceptable. By placing speakers in such a way, we additionally „break up" resonances and standing waves. In irregularly shaped rooms, a corner variant can also be used - each speaker stands against a different wall and faces roughly the center of the room where our listening point is located.

The most common method of positioning speakers is to form an equilateral triangle with the listening position. While no one claims this configuration works best, it's a good starting point for fur-

ther testing. It may turn out that we will obtain much better results with a wider setting, but in many cases, the distance between the listener and each speaker is greater than the base, which is the distance between them. The key to determining the correct distance between a speaker system and the rear wall of a room is to get the best possible compromise between the amount and depth of bass and a realistic, three-dimensional soundstage. In other words, so the sound should spread freely from side to side. At some point, we will undoubtedly face the limitations of our room. If we want to place the speakers on a shorter wall, it may be a good idea to widen the base and install large diffusers or absorbers on the side walls. In the opposite situation - when we still have a lot of space at the sides but cannot afford to move the speakers closer to us - we should focus our attention on the acoustic development of the rear wall. Covering it with damping material should make the wall „disappear" and allow the speakers to create more convincing surround effects.

Most audiophiles follow these guidelines, but - as in every community - some have a different opinion. For example, Audio Physic was once known for its rather radical views. The Germans recommended placing the speakers on the longer wall of the room so that the stereo base would be extensive indeed. The recommendations of Cardas, a company specializing in cabling, are also fascinating. The method developed by its founder, George Cardas, is based on the well-known architectural principle of the golden ratio. The primary dimension here is the length of the rear (shorter) wall of the listening room. The distance between the speakers and the side walls should be exactly 0.276 of this dimension, and the distance between the speakers and the rear wall - 0.447. Interestingly, the length of the side walls is almost irrelevant in this method. The positioning of the speakers always depends on the length of the rear wall. So let's go back to the ‚optimum' proportions quoted in one of the former paragraphs and assume we have a room measuring 4.55 x 5.72 m. According to the Cardas method, our speakers should be placed at a distance of 2.03 m from the rear wall (measured from the drivers) and 1.26 m from the side walls. It's not difficult to see that few people will

be able to afford such extravagance. In order to do that, the listening room should not have any other function. Nevertheless, many audiophiles follow George Cardas's recommendations.

## Twisting and turning

After determining the position of the loudspeakers in relation to the walls and the listening position, we should deal with setting the speaker angle (toe-in). There are several starting points here. Some say to begin by directing the speakers straight at our head. Others believe it's best to place them parallel to the walls so that their axes never cross. The third school says that the initial positioning should be such that the speakers are gently but not wholly facing us - so that their axes cross about a meter behind our heads. During listening, we should then be able to see the inner panels of the boxes at a slight angle. In most cases, such an angle works well, as it gives both a good soundstage extension to the sides and a sufficiently dense sound on the baseline, with a clear foreground and good sense of depth. Depending on our electronics and the room's acoustics, other variants may also work well. Some speakers need to be „encouraged" to surround the listener with the sound by decreasing the toe-in angle so that the speaker axes cross even a few meters behind the listening position. In contrast, others respond well to being bent inwards. Sometimes the best results are obtained when the axes of the speakers intersect in front of the listener. You may also find that radically changing the angle requires moving the speakers closer together, spacing them apart, or changing the distance between them and the rear wall of the listening room. All these dimensions and values are inseparably connected. Perhaps this is why finding the perfect setting requires time and patience in the first place.

## Can a speaker manufacturer make our life easier?

Sure! At this point, it is worth mentioning three aspects of loudspeaker design that can undoubtedly give a hand with positioning. The first is the ability to tilt the boxes, usually with adjustable spikes. The sloping front panel is a clever way of bringing the acoustic centers

of the speakers closer together, which results in better time alignment. In loudspeakers whose designers have decided on this solution, this inclination is usually between 5 and 7 degrees. It certainly doesn't hurt to try as long as you have the option and are not worried about the boxes tipping backward. The second feature is asymmetrically mounted drivers. This usually concerns the tweeter unit, which gives the user two options to test - with the tweeters inwards and outwards. Most companies recommend the first option, but it will only take a moment to swap channels, and you may always find that the reverse setting produces a sound that better suits your preferences. A third good option is the possibility of making appropriate adjustments to the speakers themselves. Unfortunately, this is still not a popular solution. Still, some manufacturers install various switches or jumpers in their sets, thanks to which the user can, for example, change the number of lows or highs (Graham Audio LS5/9, Opera Grand Callas, Sonus Faber Aida, Focal Grande Utopia EM). Suppose the designers of our loudspeakers did not foresee anything like that. In that case, it's worth checking whether the sound will change after connecting the cables differently or swapping the factory jumpers for something better (in the case of models with double or triple sockets). You should also remember that some speakers (JBL L100 Classic, Wharfedale Linton Heritage) are designed to work with grilles. Removing them can change a lot, and nobody claims that it is forbidden.

## A quick word on monitor speakers

Regarding stand-mount loudspeakers, we should follow the same principles as we discussed above. The first and fundamental problem will be choosing where to place our speakers - whether it be a chest of drawers under the TV, a desk or a bookcase, or perhaps special stands that allow us to control the position of the drivers as we would do with floorstanding boxes. The last option is the best. Not only because you can freely set the distance from the walls and the toe-in angle, but also to give the monitors solid support, which translates into a more transparent, more focused sound with stronger and well-controlled bass. Monitors placed on an unstable surface



will (marginally, of course) vibrate, so some of the signal delivered to them will be wasted, and we won't get what we need to hear. For this reason, high-quality stands are usually made of relatively heavy materials - steel, cast iron, wood, or stone. Many of them can be weighed down by filling them with sand or gravel. If buying special stands is not an option, we should ensure that the monitors work correctly - have some free space around them, are placed at the same height, symmetrically to the listening spot, etc. When squeezing monitors into a bookcase or other tight space, the first thing we should consider is whether their bass-reflex ports will be able to pump air freely. Either way, it will probably be a sort of compromise.

## Is that all?

Of course not. There are several details that experienced audiophiles do not forget. One such detail is the contact between the speakers and the ground. In the case of floorstanding loudspeakers, the issue seems to be less complicated, as we usually have to choose the right feet for the type of floor. It is safer to use flat feet covered with soft material or something like rubber balls on hard floors. On carpets, it's indispensable to use sharp spikes, which will give our speakers proper support. The basic rule is that the speakers should not wobble or tilt to the sides. The ability to screw feet or spikes into the plinths sleeves and adjust their height is therefore invaluable.

Suppose the manufacturer of loudspeakers forgot about it, or we think that our speakers would need additional stabilization. In that case, we can put, for example, granite or marble slabs under them, which will provide excellent support and at the same time will allow us to experiment with spikes or anti-vibration platforms without the risk of scratching the parquet or ruining the carpet. In the case of monitor speakers, we will have more work to do, because apart from the area where the stand touches the floor we need to think about coupling our speakers to stands. If you buy factory stands, you will most likely gain the possibility of screwing the two elements together. In this case, we will see threaded sleeves in the monitors and holes in the top of the stands that fit them. How-

## Epilogue

ever, nothing stands in the way of isolating the speakers from the stands by using special pads or spikes. If we care about the safety and stability of the whole construction and do not have the possibility of screwing the speakers to the stands, we can use a soft adhesive, such as Blu Tack.

Many audiophiles have struggled with this subject for quite a long time. Still, eventually, they come to one optimal configuration - a granite slab on spikes and pads, metal stands filled with ballast up to 2/3 of their height, rubber anti-vibration discs, and then, on top of it all - their beloved monitor speakers. Some people add various accessories that are placed on the speakers, such as leather bags filled with fine aggregate that absorbs vibrations, metal beaks, metal bowls, magic bricks, etc. To some, it seems ridiculous, but when we hear the effects, it's extremely easy to get caught up in it.

Placing loudspeakers in a listening room is not as easy as one might think. It cannot be done in five minutes based on a few simple calculations. There is also no one-size-fits-all recipe that works with every speaker and in every room. If, when reading this guide, you got the impression that it is made up of ambiguous indications along the lines of „you have to check it yourself", „it is worth experimenting" and „you can do it this way, but you can also do it quite differently", that is precisely what it looks like. As much as we would like the world around us to be a little simpler, trying to outrun the laws of physics will not get us anywhere. However, it's enough to avoid basic mistakes and learn from every change we make so that the whole operation is a success and our hi-fi equipment sounds as good as possible. It's worth trying because while buying new speakers involves more or less expense, rearranging them is a pleasure we can get for free. Whether the improvement in sound quality is minor or truly immense, the basic rule is always the same - if you enjoy listening to music, you have achieved your goal.

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