

Optimizing Speaker Placement

A systematic approach to achieving the best sound from your speakers and system

Fine tuning the precise placement of your speakers in the listening room can have profound effects on the musical performance of your system as a whole. Shifts as small as half a centimetre/quarter of an inch are readily heard, while with genuinely wide bandwidth speakers much smaller increments can be critical. However, before embarking on the final placement of your speakers (and any acoustic materials you wish to use) it is necessary to achieve a good basic position from which to start. Below, we have outlined several different approaches to this problem that we hope will help you reach a good starting point for the speaker optimization process. After that it's down to a systematic application of small shifts, a repetitive but rewarding process as you zero in on the perfect position.

Whichever approach proves most useful (and often it is a combination of two or more) then you should start by gathering the necessary tools: masking tape, a marker pen, tape measure, spirit level and any tools specific to the speaker itself, such as a spanner for locking spikes or chocks to help with their installation. We will also refer to various tracks from the Nordost System Set-Up and Tuning Disc. These (especially the all important LEDR tracks) are also available elsewhere, but the Nordost disc does a good job of grouping a bunch of useful tracks into a single place.

On a carpeted floor:

The easiest way to move the speaker and position it is without the spikes installed. Particularly with wide bandwidth speakers, spike installation will raise the woofer slightly further from the floor, affecting the bass

balance, so take this into account when making initial positional judgments.



the way the speakers interact with the room to assess their contribution and ideal placement.

On a wood floor or similar:

The spikes can be fitted, with spike shoes placed between them and the surface. If you ensure that these shoes have smooth bottoms and deep recesses to accept the spikes, you'll find that they allow you to slide the speaker very precisely across the floor without marking it. DO however, experiment first and make sure that when moving the speaker, it doesn't "walk" off of the shoes or leave one behind on an uneven or rough patch of flooring.

Always remove any acoustic treatment or devices from the room (if possible) before you start. The idea is to achieve the best results you can with the speakers working in the room as is. Once you have got that, you can start reintroducing the acoustic treatment, a step at a time, using your newly learnt skills and familiarity with

Finally, please note that these techniques are suggestions only. They cannot possibly embrace all products or situations. Also be aware that many speakers are heavy and moving them should be undertaken only with great care and sufficient manpower for the task. Struggling to move a large speaker on your own could result in serious injury or even death if it fell on you! Don't risk damaging your valuable equipment or yourself and treat large, heavy objects with the respect they deserve. An extra pair of hands (and ears) will make adjustments much easier, more precise and safer too.

In the case of really large speaker systems, you should seek professional help from your dealer – who should be responsible for installing them anyway. If you are moving house then be prepared to pay the local dealer for his time.

Achieving an initial position

Method 1 - "Voicing The Room"

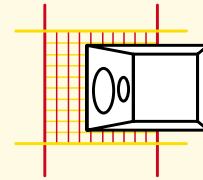
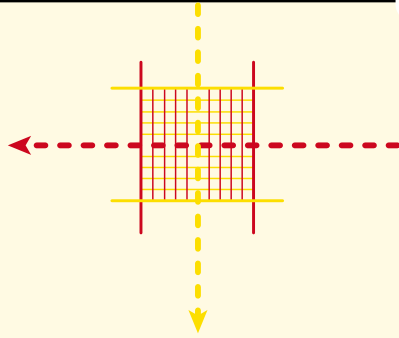
This approach is loosely based on a technique first developed and popularized by Wilson Audio and it is the one we generally apply first. It is simple, repeatable and uses the sound of your voice to find a sympathetic starting point for speaker placement. You will need to start by clearing the space where the speakers will stand. Then, starting with your back against the front wall (the wall that will be behind the speakers) and roughly one fifth of the way across it – about the width at which you might expect the speaker to stand – move slowly down the room, speaking in a loud but even voice as you do so. I tend to repeat the count, "Three, Four, Five" as the regular vowel sounds help pin down any changes in the sound of your voice. At first it will sound chesty and thick, but as you advance into the room it will become more natural in balance. Once it sounds correct, mark the floor with a strip of masking tape parallel to the front wall. Now continue your advance until it starts to sound hollow and diffuse. Again, mark the boundary where your voice starts to lose its natural balance. You will probably now have two strips of tape, between 15 and 45cms apart. Don't be afraid to

repeat the process several times to check the results, and to shuffle back and forth on each pass until you are really happy with the changes you are hearing. Often, a second pair of ears at the listening position is also really helpful.

Next, starting on the side-wall, centrally between the two pieces of tape you've already laid, move across the room, again speaking until your voice achieves its most natural balance, marking this point and the subsequent point where it loses it again. This should leave you with a rectangular space marked out on the floor.

Repeat the process for the other side of the room where the second speaker will stand. Now place the speakers centrally, a third of the way back into the rectangles you've defined. Finally, once you've achieved initial placement of your speakers, level them precisely. Yes, small movements will disturb their level and you'll need to repeat the operation again, but having them level to start with will make the effects of each shift in position much easier to hear.

At the RMAF and TAVES shows we demonstrated a simpler technique that involves concentrating on the



center of this neutral zone, marking a single point on each axis. This is quicker but somewhat less accurate and generally requires larger initial movements to get a better balance from the speaker. The object of the exercise is to get a feel for how the balance of the speaker changes as it moves within the marked zone. What you are doing is playing with the position of the speaker in relation to the room nodes. These form a regular grid and your rectangular zone should approximate that grid, with a null in its center, so if your rectangle is eight inches deep and six inches wide, moving the speaker forward eight inches or sideways six, should shift it to the same place relative to the next node. When it comes to deciding just how far into the room the speaker should be that's a useful trick to remember.

Now, along the inner edge of each speaker run a long strip of masking tape and mark it off in \pm half-inch/one

centimeter increments, extending it in front of and behind the front baffle from the front baffle. This is to help you make small but repeatable moves with the speaker. Starting with just one channel, using your mono switch, a mono disc or just connecting one speaker at a time, using a piece of appropriate music (I often use the Analogue Productions disc of This One's For Blanton, CAPJ 015, with its extended acoustic bass passages) adjust the speaker forwards and back until you achieve the best bass balance, sense of energy and attack for the instruments and musical integration of the whole. The reason I use the Blanton is that it is a super-critical recording yet features only piano and bass. The bass runs are perfect for establishing not just bass depth, weight and evenness, but also the sense of energy and attack in the low frequencies. Meanwhile, the strident piano notes can sound brash and glassy until you balance the bass properly, while the closer you get to the ideal position

Method 2 - "Changing Places"

If method one proves inconclusive or delivers conflicting results then a surprisingly effective way of achieving an initial placement for speakers involves quite literally changing places with them. Put the speakers side by side at the listening position and play some music. Then, on your knees so that your ear approximates the height of your listening

position, move around the area where each speaker will be placed, until you find the point that delivers the best musical results. Mark that point and once again, follow the grid procedure laid out above – obviously moving the speakers into their correct places and restoring yourself to the more comfortable perch of your listening seat.



the greater the sense of communication, of call and response, of a musical conversation taking place will become. Be prepared to work through the point of best balance and return to it and be prepared to make tiny, final adjustments. At this point you should concentrate only on moving the speaker forwards and backwards. Once you have fixed the position of one speaker, repeat for the other. Don't assume that the placement will be symmetrical. Unless the room is physically and acoustically symmetrical, any variation will be reflected in the speaker positioning.

In particularly difficult cases, you can use the low frequency tones on the Nordost System Tuning and Set-Up Disc to identify the main room frequencies and then, placing that frequency on repeat, you can move the speaker for minimum output. This approach is also useful for placing sub-woofers, although in that case you maneuver the sub for maximum output and exploitation of room gain. With two subs you'd work with the separate lateral and longitudinal modes, tuning one to each. This will necessarily produce a non-symmetrical set-up, but it will also maximize low-frequency reinforcement. Just remember, that this is about bass energy and timing as well as linearity. You need the low frequencies to be musically communicative.

Once you have good positions, mark them and then

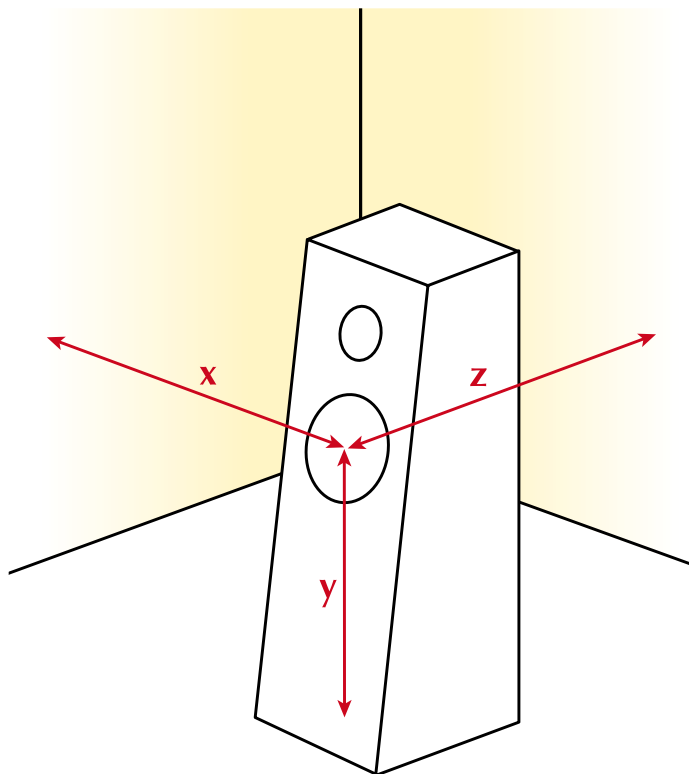
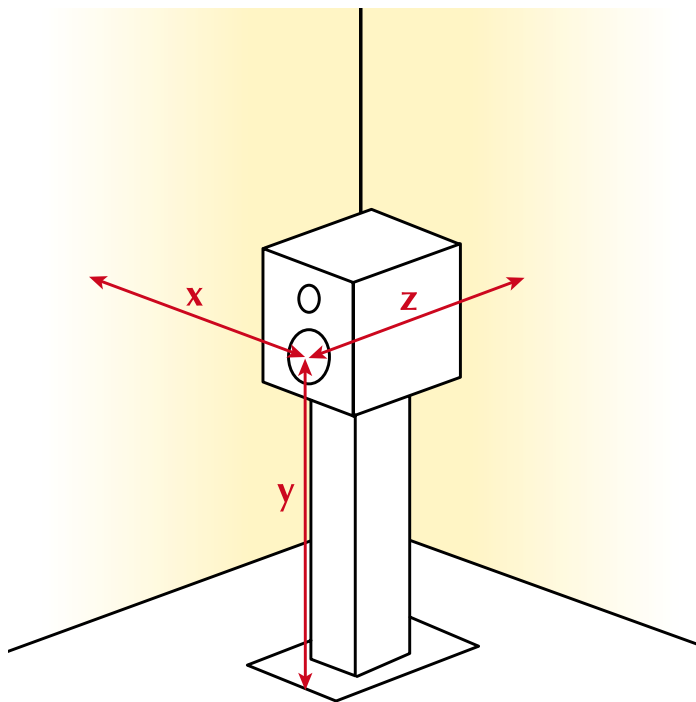
continue. The taped increments mean that you can always return to a better place. The tape will allow you to move the speakers on a predictable and repeatable "grid". Above all, don't be afraid to move on to another position; you can always go back. Speaker placement is all about precision and repeatability – so be precise in what you do, and be prepared to repeat the steps as often as necessary. Once you have the best, most musically integrated and communicative placement, you are ready to start looking at toe-in using the LEDR tests.

Method 3 - "Audio Arithmetic"

Because of the way that bass is propagated in a room and the effect of the room boundaries on that process, it is possible to define a mathematical relationship between the speaker and those boundaries.

If we take all measurements from the center of the bass driver (or the mid-point between them if there are two placed close together), we can define the distance to the first boundary – normally the floor, but not always – as X. The distance to the next closest boundary is Y and to the furthest one, Z. These measurements can be related by the following equation:

$$Y^2 = XZ$$





So, if your speaker is a stand-mounted design that has the centre of its bass unit 75cms from the floor, but you can only get it 60cms from the front wall you will have two options as regards spacing from the side-wall:

Either $X=60$, $Y=75$ and Z is unknown, or;
 X is unknown, $Y=60$ and $Z=75$

The first scenario would give you an equation in which

$5625 = 60Z$ or, 93.75cm to the side-wall.

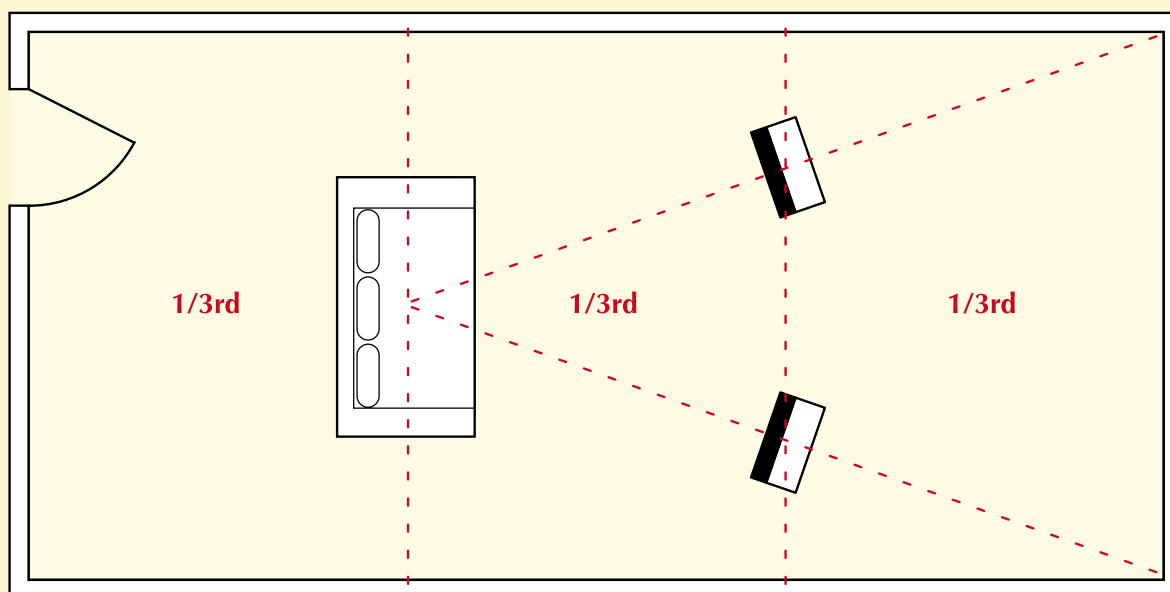
The second would give you $3600 = 75X$ or, 48cm to the side-wall.

Used in conjunction with either of the first two approaches these figures can actually provide a useful guide once you have fixed one of the variables (either sonically or “domestically”).

Method 4 - “The Rule Of Thirds”

This approach is especially productive with dipole designs such as the majority of electrostatics, and suggests a simple formula where both the speakers and listening seat are placed at the one-third intervals down the room. The speakers can then be adjusted laterally and with toe-in for

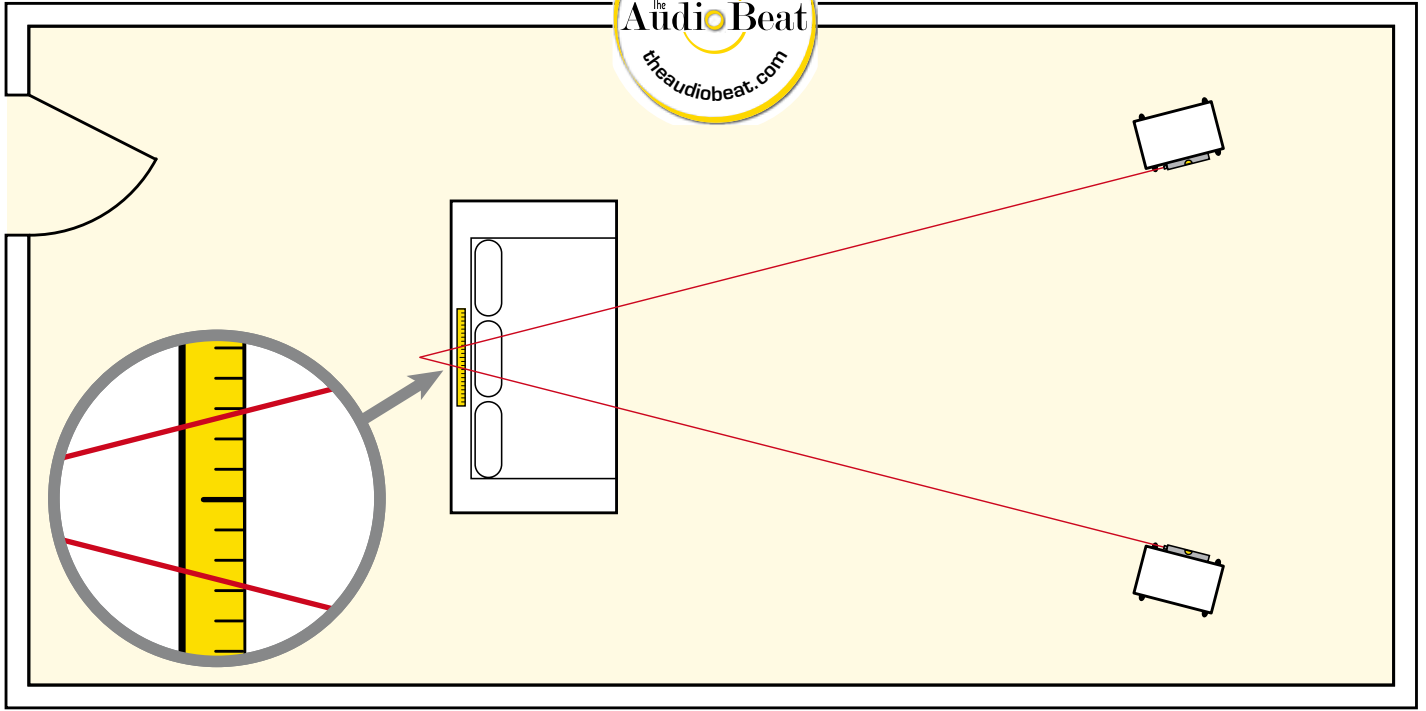
soundstage width, depth and focus. Undoubtedly effective in sonic terms, the domestic impact of such placing in a shared space often rules it out, but in a dedicated listening room it is an ideal starting point with most panel speakers – and not a few boxes.



Toe-In and Lateral Spacing Using the LEDR tracks

For these parameters you will ideally need the LEDR test tracks. You can do it with a familiar recording that has a well-developed soundstage, but why not take the guesswork out of the process? The Listening Environment Diagnostic Recordings are a series of computer-generated tones or pink-noise bursts, remarkable tools created by EASI to assess speaker positioning and room interaction (available on the

Nordost system optimization and set up disc, as well as other test kits). Their predictable motion and symmetrical paths allow you to hear how adjustments to speaker placement and listening room acoustics affect the reproduction of the stereo soundfield. Their objective, repeatable nature makes them a uniquely powerful device when it comes to optimizing speaker placement and acoustic treatment.

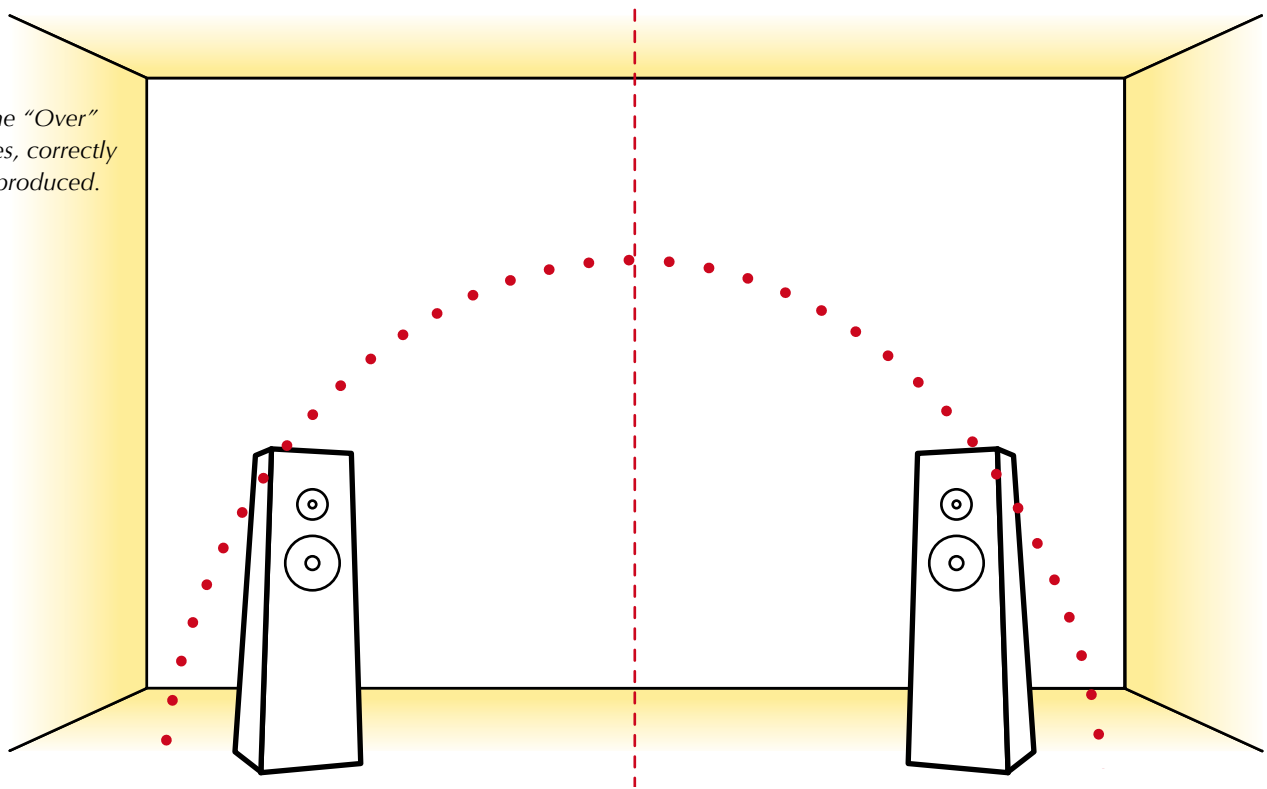


There are three different LEDR tracks, in each case they demonstrate a different aspect of speaker positioning. The most useful is dubbed "Over":

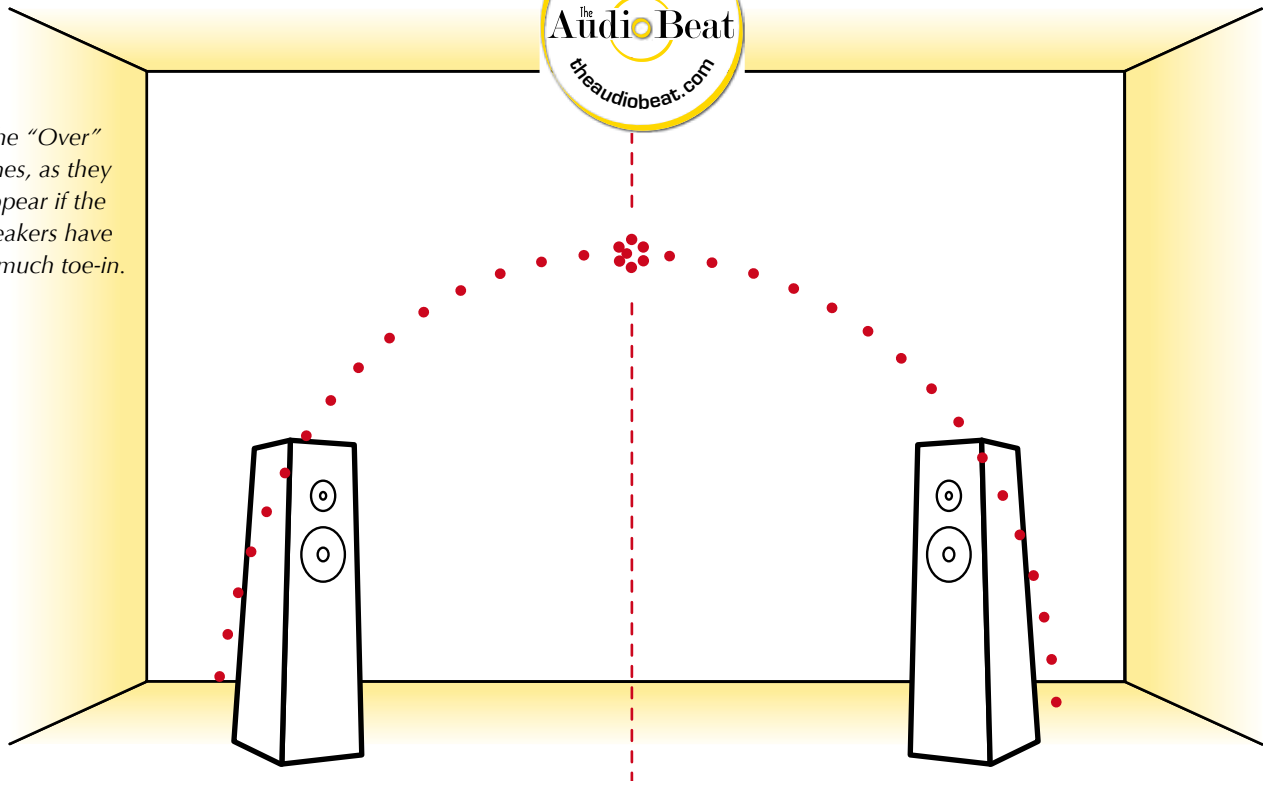
The computer generated "chuffing" sound should start low, outside the left hand speaker, moving up and over in an even arch to finish at the same point outside

the right hand speaker. The sound then repeats in reverse. The motion should be smooth and the arc even and symmetrical. Any tendency to hang up outside the speakers suggests that either speaker placement is too wide, or toe-in inadequate; Likewise, a tendency to jump or speed up across the middle of the arc.

The "Over" tones, correctly reproduced.



The “Over” tones, as they appear if the speakers have too much toe-in.



Start by working with toe-in, revolving the speakers’ angles by rotating them around their inside front foot/corner. A strip of tape with clearly defined increments on it, placed horizontally across the listening seat will allow you to use a laser pointer to make angular adjustments with considerable precision.

Once you have adjusted the speakers a few times you’ll quickly recognize the affect of toe-in as opposed to spacing, but in essence, a stop/go halt in movement across the center of the arc suggests a spacing problem whereas a reluctance to move followed by a sudden rush across the center suggests that it’s toe-in that’s at fault. Too much toe in will also produce a stop in the center of the arc, but always analyze that by adjusting toe-in rather than lateral spacing. If lateral spacing seems to be the issue, then it’s time to switch to the “Lateral” tracks.

You will quickly discover just how easy it is to hear the affect of even small changes in toe-in angle using the LEDR tones. Work towards a nice, evenly spaced arc with predictable movement and regular spacing. If you have problems achieving decent height or the arc is irregular in shape, move to the “Up” tracks.

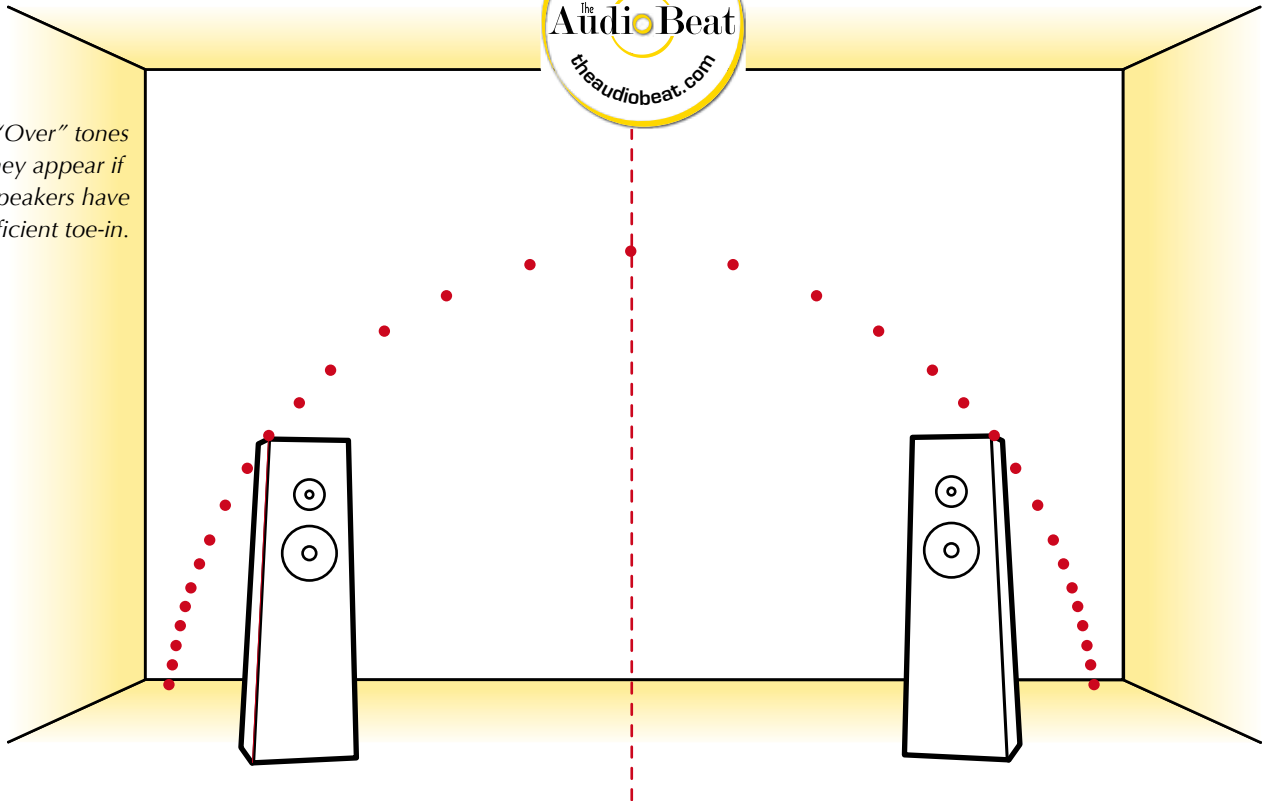
The “Up” Track

You should hear the computer generated “chuffing” sound start behind and at the base of the left-hand speaker. The noise should slowly climb, vertically, behind and above the top of the speaker. It will then repeat behind the right-hand speaker. Any irregularity or tendency to bend or deviate from a vertical path suggests either problems with a tweeter or strong side-wall reflections. Likewise, the paths should be symmetrical and the movement evenly spaced. A lack of height in particular suggests that there are strong reflections from the ceiling, an often-overlooked source of “first-reflection” problems. You often see acoustic treatment on the sidewalls of listening rooms or at shows, but often and especially with tall speakers, the ceiling can be as close or closer to the tweeters than the sides of the room. What’s more, ceiling are often highly reflective, with hard, flat finishes that can be highly destructive yet they can be easily and unobtrusively treated.

The “Lateral” Track

This is the only LEDR test that involves four sets of tones as opposed to two. The first set start in the left speaker and move across to the right one. The second set starts from outside the right hand

The "Over" tones as they appear if the speakers have insufficient toe-in.

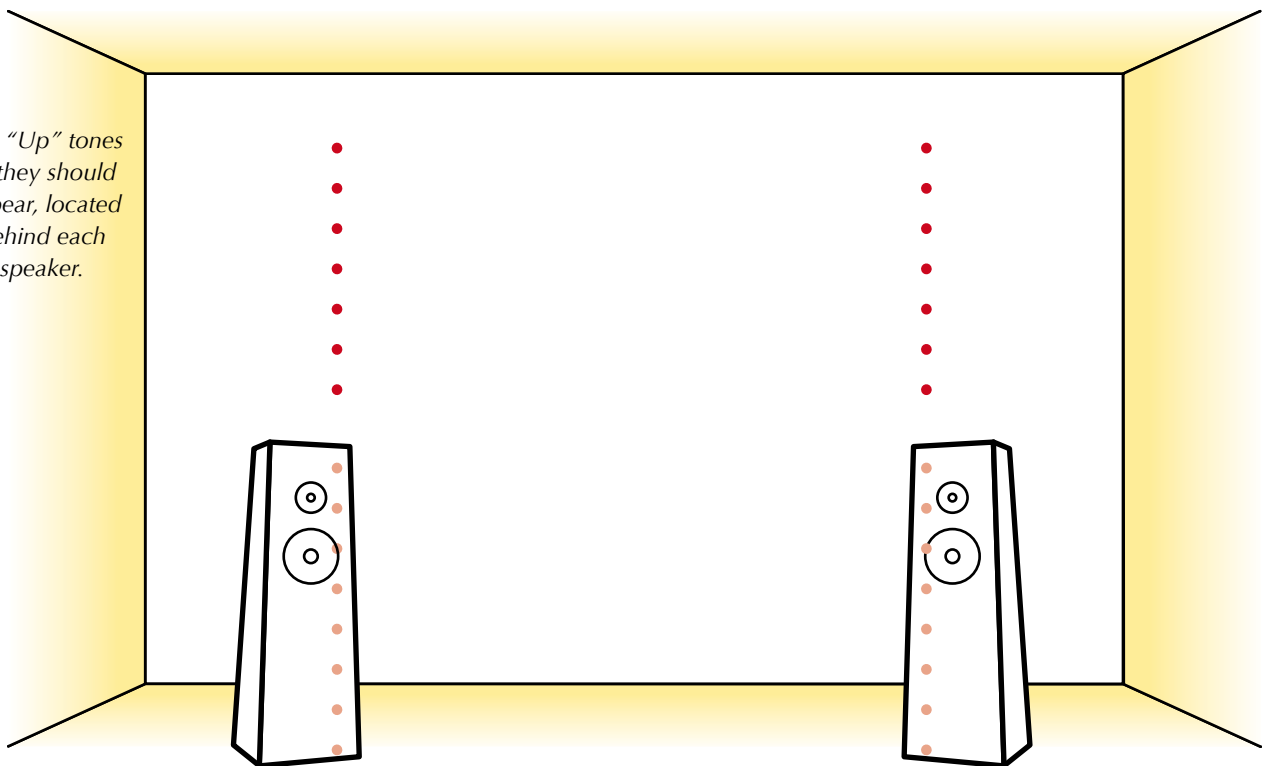


speaker and moves across to outside the left hand one. Then it's right to left and finally outside the left to outside the right.

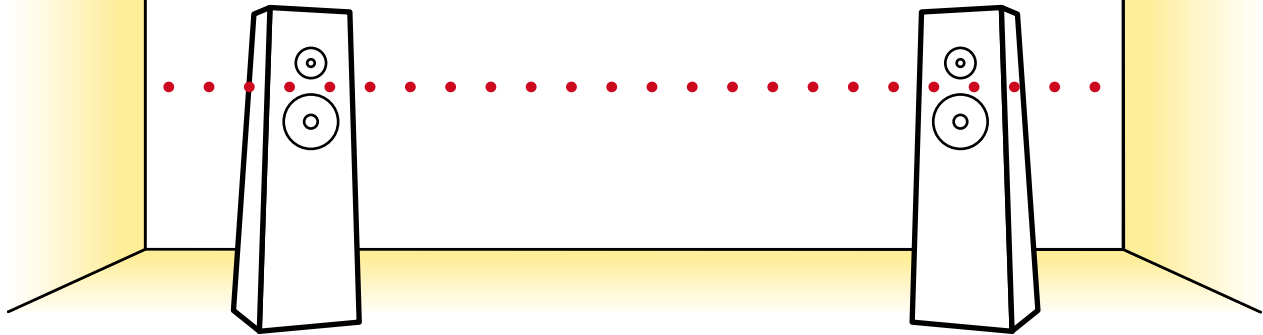
This series is particularly useful for fine-tuning speaker spacing and toe-in once you've established a decent,

symmetrical path for the "Over" track, although it's important to keep track of the various tones, those that start and finish at the speakers and those that start and finish outside them. If clumping at the center of the speakers indicates a spacing problem, try shifting one, the other and then both speakers

The "Up" tones as they should appear, located behind each speaker.



*The wider
"Lateral" tones,
as they should
appear.*



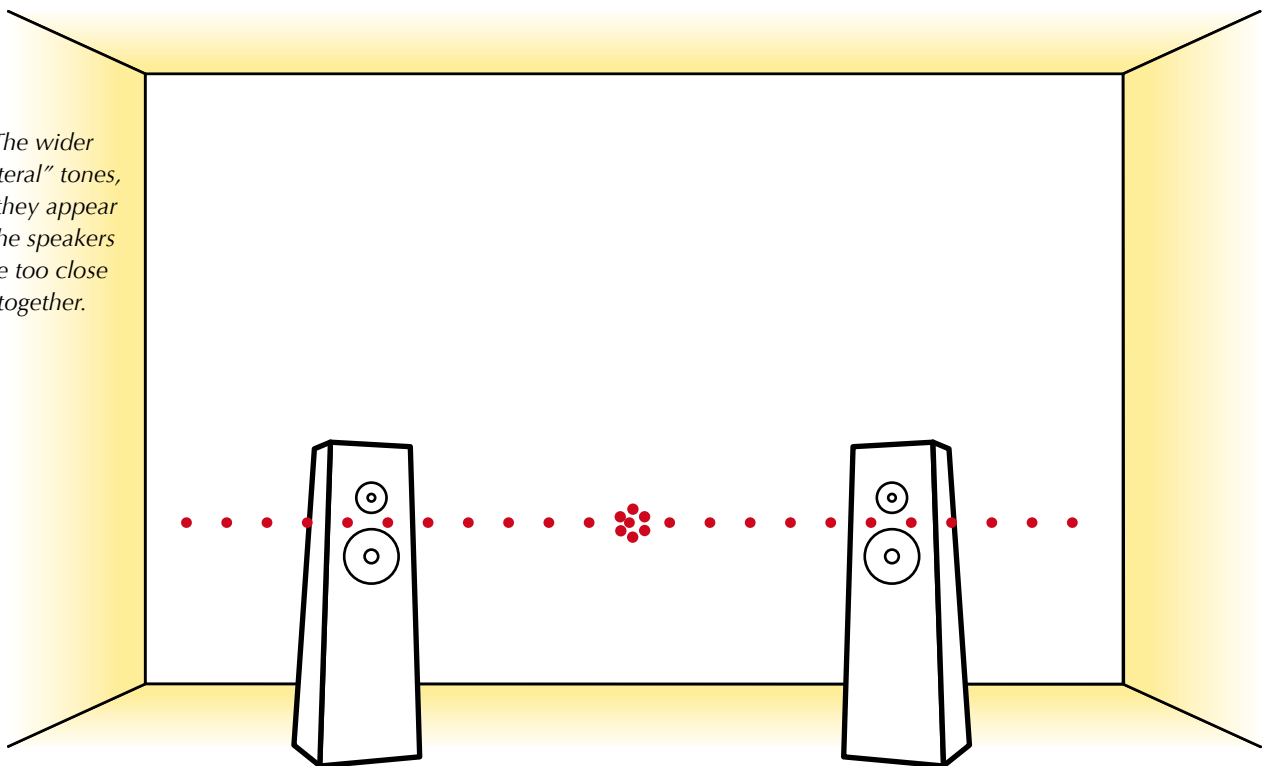
apart, each by the nodal interval defined by your initial rectangle or grid.

Leveling and Rake Angle

Once you have all three sets of LEDR tracks performing

as they should (or as best they can) it is time to spike the speakers if you haven't done so already and get them absolutely level. We recommend a Machinist's Level for this, which should have a stated angular error. Level the speaker in one direction, normally front to back and then reverse the spirit level itself to ensure that it gives

*The wider
"Lateral" tones,
as they appear
if the speakers
are too close
together.*



*The wider
“Lateral” tones,
as they appear
if the speakers
are spaced too
far apart.*



identical readings in both directions. Now repeat in the side-to-side direction. If your speakers have no horizontal surface, then the easiest solution is to securely tape a piece of board or stiff card to the underside, extending out beyond the speaker footprint so that it will support a lightweight level. Far from perfect, it's still way better than guess work. One other option is to attach a small, purpose made platform behind the binding posts. With a little ingenuity, a plumb line and protractor you can easily create a purpose built tool that can be reused again and again.

Many of the spikes supplied with speakers are of relatively poor quality. They are hard to turn, often lose their points and shift every time you try to lock them in place. It's tempting to make do, leave the lock nuts loose and hope for the best. **DON'T DO IT!** You will be severely limiting the performance of your speakers. If the supplied spikes aren't up to the job then replace them with something better. We like the Track Audio stainless steel spikes, beautifully presented and machined, fluted designs with smooth running threads and locking collars that sound better than standard items but also make leveling your speakers considerably easier. Not only are small, incremental adjustments easy, they don't shift as you lock the collars in place, meaning that you will have speakers that are stable and

upright. But we're getting slightly ahead of ourselves...

Before you lock the spikes or feet in place there's one more parameter to adjust – rake angle, or the forward or backward tilt of the speaker. This will alter the tweeter axis relative to the seated listener's ears and has a pretty dramatic impact on transparency, focus and presence. Adjust the angle of both speakers by a defined amount – half a turn on the front spikes is a good starting point – and listen to the results. Once the rake angle is correct you will hear the music really lock into both time and space, with a more clearly defined soundstage and a more purposeful sense of pace and rhythm. Once you have fine-tuned that angle, lock the feet in place and you are all done.

Do you need to lock the feet? Yes. If you don't then the constant vibration coming from the cabinet risks altering the height of the spikes or feet over time, either altering the speaker's angle or its stability. Having just taken the time and trouble to get your speakers just so (and having experienced the far from subtle impact this has on the sound of your system) you'll want to keep them that way. So yes, you need to lock the feet in place. If they don't have a specific tool supplied for the job, invest the pocket change necessary to get a spanner the right size; it makes it easier and does a proper job.

And a few final warnings...

Whilst an album like Blanton is great for establishing initial speaker placement, especially as you get further into the process, it's worth checking the results with a range of different material. You don't want to set the system up to sound great on just one album – and “pants” on most of the others!

Likewise, change anything in the system and you may have to adjust the speaker position. Alter the amp and you will change bass damping and the spectral balance, but change anything else (cables, a source component or support) and you need to think about compensating for that at the speaker. This is a crucial but often overlooked consideration when assessing potential upgrades.



The approach that we have outlined relies on CD, but if you listen predominantly to vinyl then you should do your final tweaking with records not CD, simply because the bass energy off these two sources can be so different. Change your cartridge and you definitely need to consider moving your speakers.

But the good news is that once you get a feel for the technique it is not just easy to execute, you'll also recognize the symptoms of poor placement, so if you do need to move the speakers it should be obvious. That's why it is so important to become familiar with the way small shifts in position impact the sound of your speakers in your system and room. Once mastered, proper speaker placement can deliver astonishing performance from your system – performance you probably didn't know it possessed.