When you have spent a lot of your hard-earned cash on your hi-fi system and paid careful attention to your mains supply, interconnect cables and loudspeakers, it is easy to overlook the last link in the audio chain terminating at your ears – the listening room!

There are, of course, many myths circulating concerning what you should do to your room to make it suitable for listening to your hi-fi. Some people say that you should aim to create what is essentially an anechoic chamber, ie a room where all sound reflections are completely absorbed by the surfaces. This does not address other issues like reverberations, rattles and other unwanted sounds. Indeed, we have also seen it written that you should consider enlarging your room as stretching the length of the walls and increasing the available space will lessen the effects of both reflections and reverberations. Clearly not a practical solution! Nor is it generally domestically acceptable to fix egg boxes to your ceiling, so that’s not going to be a good idea either for diffusing resonances. What’s more, they don’t even do a good job of that!

Given that very few of us are likely to have a listening area the size of the Royal Albert Hall, we will limit discussions to cover issues that we consider to be both practical and suitable for the home environment. However, before we start to discuss solutions, let’s first see what problems you are likely to encounter at home.

Music and movement
Let’s first assume that, the signal flowing to your loudspeakers is about as perfect as possible and what you are trying to do is hear the music precisely the way that the recording engineer intended. Your loudspeakers now convert this perfect electrical signal into movements of air and this is where all the fun starts.

Sound waves are longitudinal waves, the result of the compression and rarefaction of air that occurs in the same direction as the direction of travel of the sound wave. The wave travels at a speed of 330m/s in air at normal temperature and pressure. This speed is an important parameter as this determines what room dimensions are likely to cause problems. The sound wave itself is transmitted by molecules of air vibrating at the audio frequencies that range from about 20Hz to 20kHz. It is, therefore, no surprise that these vibrations, apart from reaching your ears directly, can be reflected around the room and reach your ears a split second later, causing all sorts of undesirable effects. Furthermore, the vibrations can cause sympathetic rattles from the most unlikely of places. For example, listening to a splendid recording of...
hatches, as it were, it is time to look
been known to jive noisily along to
may well be surprised by the culprits
level and walk around your room,
range of bass notes at a moderate
So that brings us nicely to our
Shake rattle and roll
Saint-Saëns’ Organ Symphony No. 3 we found that the sustained organ
notes in the
fi
first movement produced


factor. This, and all the sub-harmonics will
cause nasty peaks in the bass response if untamed by other factors.
If the Eigentones are causing problems, a well-designed bass trap can be the
answer. Also, changing your listening
and speaker positions can help.

and Richard Small from their work
in the sixties and seventies) is the
‘Q’ factor: This is the name of the
‘goodness’ or ‘magnification’ factor
by which resonance is magnified or attenuated by the loudspeaker. If the
damping is too great, the system Q is
low and a dead and thick sound will be the result. If there is not enough
damping to control the Q resonance sufficiently, the sound will be boomy.
A good loudspeaker will take the
domestic environment into account
and often have a Q factor of about 0.6 – 0.8. Obviously, some loudspeakers
are better than others at this.

The other way to test the room is to
use a program like Room EQ Wizard.
This is more complicated, but will
show you frequency response, decay
times and so on. There is a video
tutorial on our website: gikacoustics.co.uk/room-eq-wizard-tutorial/


are one of the main causes of acoustic
distortion below the fundamental
frequency of the Eigentone and
result in peaks and troughs in the
frequency response. These can be
as much as 20dB or more – but
more about these later.

Some of these negative effects can be
mitigated by good loudspeaker design.
For example, these unwanted room
resonances store energy and decay
slowly compared to nearby frequencies
causing audible problems such as ‘one
note bass’ and ‘boominess’. One of
the many parameters involved in
loudspeaker design (called Thiele-
Small parameters, after Neville Thiele

Any useful bass traps for
maximum effect?
We always recommend trapping in
each speaker. As you find areas that
have the greatest build up you can
place bass trapping there.

What is the first thing to address
when setting up your room?
The first thing is your listening spot.
Whenever possible, we recommend
facing the short wall in the room and
sitting 38 percent from the front wall
or 38 percent from the back wall.
Your speakers should be equal
distance from the side walls and you
should try to avoid having openings
on one side of your speakers and a
closed area on the other. Symmetry
from where you’re sitting to the front
wall is vital.

Q&A
Glenn Kuras
President, GIK Acoustics

HFC: Are there any simple tests you
can do to identify trouble spots?

GK: There are two ways I would
recommend. As we all know, rooms
have mostly low-end problems and
corners are the best way to deal with
them. We have a pink noise file on our
website (download at: gikacoustics.com/pink_noise.mp3) to test each
corner to find which have the most
bass problems. You play the file
through your speakers and use a SPL
meter to walk around the room to test
each speaker. As you find areas
that have the greatest build up you can
place bass trapping there.

The other way to test the room is to
use a program like Room EQ Wizard.
This is more complicated, but will
show you frequency response, decay
times and so on. There is a video
tutorial on our website: gikacoustics.co.uk/room-eq-wizard-tutorial/
tend to reinforce the bass at particular frequencies – not a good thing! Obviously, having them too far away from the wall is impractical, but try to aim for at least 30cm as a starting point. Also, ensure that the distances of the speakers from the back walls and the side walls are different. If they are the same, the inevitable reflections from the back walls will tend to either reinforce or cancel the reflections from the sides, creating another potential source of peaks and troughs in frequency response. Another issue is the apparent soundstage depth. Increasing the distance from the speaker to the wall behind will increase depth, but this can have a detrimental effect on instrument focus. A trial and error approach will help determine the best positioning for your combination of room and loudspeakers.

Pay attention to your manufacturer’s recommendations regarding which

**Aim to have your ears at a similar height above the floor as your tweeters**

Speaker should be on the left and which on the right. Many designs place the tweeter off to one side in the cabinet and the speakers are often arranged so that each tweeter is on the side walls, creating another potential source of peaks and troughs in frequency response. Another approach that can be quite effective is to use acoustic panels from a reputable manufacturer. Such items are known as bass traps and, when used correctly, can be extremely effective at taming the most excitable reflections from the stage and increase centre focus. If your hi-fi is situated in the same room as your speakers, the sound can be fed back into the audio chain from your other items of audio equipment, so are sited on isolation plinths to minimise this effect.

**On reflection**

Accurate image placement within the sound stage is compromised by reflected sounds. Direct sound from your loudspeakers is the first to arrive and, fortunately, your brain tends to use this to form a view about the positioning of an instrument. The Haas effect, also called the precedence effect, is a psychoacoustic effect described in 1949 by Helmut Haas. This states that when a sound is heard in both ears but arrives at different times, the brain localises it based upon the first arriving sound. This holds true if the subsequent (often reflected) sound arrives within 40 milliseconds of the first, even if the second sound is louder than the first. However, sound arriving later does tend to blur the image and, therefore, reflected sound should be minimised where possible. Here again, furniture and acoustic panels strategically placed can help with this – this is always a case of trial and error.

It is important to remember that room tuning is not an exact science as there are so many factors that have an effect. Of course, your listening room is likely to be one used for other purposes, such as a family or sitting room and, therefore, any changes you make to a room layout must also be domestically acceptable. The important thing to remember is that experimentation and a little common sense are the keys to success. Even an apparently small change in the speaker or listener positioning can have a huge effect and may even save you money if you are thinking of replacing your speakers to counteract a deficiency that is actually caused by your listening environment. Happy tweaking!