

## Acoustic Treatment for Control Rooms

Good room acoustics is critical to the success of control rooms, mixing studios and mastering studios. It certainly won't replace the engineers skill, but it will make their job easier. Good room acoustics is reasonably simple to achieve if you follow a few very practical rules and keep the objective in mind.

The goal is a room with a suitable reverb time, reasonably flat frequency response, tight bass and a client couch where the sound is close to what the recording engineer hears. The room layout, the placement of speakers and listeners, is fundamental to the acoustics of the recording studio. The appropriate use of acoustic treatments (absorbers, low/mid traps, bass traps and diffusers) will ensure an optimum final result.

As a starting point, keep in mind that the overall design of the room should be dictated by the functional requirements of a listening space. It must allow the engineer to make a recording that captures the artists intent and relay it to the listener, the client. Avoid being distracted by visual aesthetics and the temptation to incorporate other functions like entertainment and marketing. Install the bar fridge, coffee maker and the framed awards, elsewhere.

Also note that soundproofing is a key component in ensuring that the engineer can work without the distractions of external sounds or the worries of the upsetting the neighbours. We've written about this topic elsewhere.

Here's some practical principles to follow.

### **Left Right Symmetry**

There just is no alternative! As our ears are symmetrically left to right in our head, so everything should be done to ensure that the room is symmetrical left to right.

### **Listening Position**

The listening position should be in a place where sound pressure nodes are stacked as little as possible. This occurs at 0.33 and 0.38 of the length of the room from the front and back walls. As we've already stated you need to be in the middle of the room left to right, but if you can, try not to be in the middle of the room, floor to ceiling (which makes a 2.4m ceiling height very undesirable as your ears will be at about 1.2m above floor level, when sitting). The same factors, 0.33 and 0.38, work, so ceiling heights of 3.6m and 3.15m are desirable. Alternatively use a low chair or a platform to try to achieve the 0.33 or 0.38 listening height.

## Speaker Placement

The next step is to get the speakers in the right place. You want them at about 30 degrees from centre; the positions of speakers and the engineers head forming roughly an equilateral triangle. Since the seating position is already set, the speakers need to be moved back and forward along the 30 degree line to get a reasonable spread without positioning them too close to the walls.

Keep in mind that the position of speakers in respect to the nearest walls affects the frequency of the first comb filter dip (destructive interference from reflections). The further the speaker is from the wall, the lower the frequency and the more difficult the interference is to absorb. If you keep speakers at about 600mm from front and side walls, the lowest frequency from the comb filter effect will be treatable with a standard acoustic absorber.

## Reverberation Time

Don't worry about reverberation time until the end. Firstly, reverberation time (RT60) is very hard to measure in small rooms. The best approach is to get the key acoustical issues sorted out and then if reverberation time is still a bit high, or more to the point, if the room still sounds a bit too bright, then add some more absorption or diffusion.

## Treat Bass First

Start with the bass. Broadband bass traps are the only practical option. You can treat all but the very lowest frequencies with one simple lightweight device. You should start with the front room corners, which may be enough in a small room and then added to the rear corners. They can be stacked to the ceiling, if needed.

Avoid resonant devices like Helmholtz and membrane absorbers as they are extremely hard to tune and very inefficient. Without going into the math, you couldn't physically fit enough resonant devices into a room to treat the full low end.

## Treat Reflection Points

Once positions for speakers and engineer are fixed, the points for acoustic treatment are easy to find – yes, the mirror trick. For this purpose, the sound can be thought of like light. Use a mirror (and a friend) to locate the points on the side walls and the ceiling where the engineer can see the tweeter of the speaker in the mirror when sitting in the listening position. Mark these spots and place acoustic absorbers there. You'll need at least one square metre at each of these points; walls and ceiling. A little more is usually good (unless its a very small room). Any size and shape can be used as long as it is at least one metre high and one metre wide.

## **Treat Low-Mid Range**

Low-Mid traps should be placed in the wall/ceiling corner in the front centre of the room and on the sides where a reflection would go speaker to wall to ceiling to listener. The side ones take a bit of experimenting but the results are obvious once correctly positioned. One or two in the rear wall/ceiling corner may also be required.

## **Add a little Diffusion**

If there are any flutter echoes and/or reflections from the back wall, a diffuser will cure these. Just place them on the surface with flutter or on the rear wall.

## **Final Tune**

By now the room should be fairly well balanced.

If the room is quite small, it may even be too dead. If so, try placing a thin plastic sheet, like disposable drop sheet, over the rear bass traps and see how that sounds. The bass traps will still work like this, but they will absorb less highs.

If the room is still too bright, place more acoustic absorbers around the room wherever you like; keeping the left right symmetry. At this point rugs and soft furnishings can also be used to marginally modify the feel of the room.

With some listening tests and a bit of thought about the process we've just gone through, you should be able to get the last few tweaks done with ease.