



PERFORMANCE MEDIA INDUSTRIES, LTD.

Home Theater Chef
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by A. Grimani

All these years I've been preaching that paying attention to acoustics, calibration, and engineering will enhance the quality of a home theater, and I even believed it! So how true is it all? Let me tell you; it just blew me away how much difference it can make.

As I write this I am flying back from CEDIA Expo, the custom home theater industry's largest get-together. Around 27,000 folks descend upon Indianapolis to check out all the latest goodies, sit through the educational programs and - let's be honest - hang out with old friends until much too late at night, consuming beverages that make them happy.

A Tasty Dish

This year a group of my old friends decided to set up a demonstration to show the importance of this engineering/acoustics /calibration thing (probably after ingesting some of those happy drinks). We took two identical rooms in a hotel and equipped them with identical A/V systems. One was set up in a traditional way, matching the characteristics of a typical home theater installation. The other room was engineered, acoustically treated, and equipped with room-tailoring equalization. Attention was paid to a whole host of other little details to optimize the room's performance. Visitors to the demo first got to hear a few clips of multi-channel music and film in the traditional room, and then they quickly shuffled into the engineered room to experience its effect on the same program material.

The difference in quality was staggering. Everyone agreed that the improvement was huge. I, too, was amazed! How come? Even after all this time, I had never had a chance to hear the A/B comparison so directly. The traditional room sounded OK; some people would be perfectly happy with it. But the engineered room was superior in many ways: sharper soundstage, clearer dialog, better articulation, tighter bass, and even cleaner picture quality. (Yes, we dealt with that, too.)

The Recipe

The recipe for improvement was pretty straightforward. It called for some preparation time, some added ingredients, and some special care in mixing it all together. Follow this recipe and you can get that extra spice out of your A/V system:

- Analyze the room dimensions to check for any strong bass resonances. If you find some, be prepared to incorporate bass treatments.
- Treat the room with absorption, diffusion, and low frequency absorption. Use just enough to bring the reflection decay time down to about 0.3 seconds. Usually, that takes 25% coverage of wall surfaces with absorption and 25% with diffusion. Make sure that the first reflection points of the front speakers are all treated. The absorption and diffusion should be broadband so they don't just suck all the high frequency energy out of the room. Use at least 3" thick absorption and 4" deep diffusion.
- Place the seats so that they are neither in peaks nor dips of bass resonances in the room. Make sure that the back row(s) are raised up so that everyone has good sightlines and "soundlines."
- Use multiple subwoofers distributed throughout the room to reduce resonances. Hook them up in mono, and adjust their position for smoothest frequency response by using a spectrum analyzer, if possible
- Place the Left/Right speakers to form a 45 degree angle to the seating area, and keep them away from corners, floors, and walls. Place the Center speaker behind an acoustically transparent screen. That gives you a picture-to-sound match and gets the Center height to match the Left/Right speakers. Aim the front speakers toward the center of the seating area.
- Choose speakers with directivity that matches the room acoustical character. In a large, live room, use speakers with a focused radiation pattern. In smaller, well-damped rooms, use speakers with broader dispersion. How do you know the speaker directivity? Try asking the speaker designer. If they don't know, they didn't do their homework all the way...
- Use a room-tailoring equalizer. This device connected between the A/V controller and the amplifiers is a crucial part in tweaking the system to the room. You can't forget it! You will, of course, need to own a good spectrum analyzer and know how to use it, so that you can tune out the room issues.

- Keep the projector quiet by putting it in a hush box. Any noise levels above 25dB in the room will cut down the soundtrack's 100dB dynamic range.
- Use dark colors on the walls, floor, and ceiling. A room with light colors will reflect light from the screen back onto the screen, washing out the contrast. There's no point in specifying a high contrast display device if it's going to be limited by the room.
- Choose a screen size that's not too large and not too small. Too large and you will be constantly distracted by image softness, motion artifacts, and excessive eye motion. Too small and you just don't get drawn into the movie. A target for viewers watching mainly DVD is a screen width 0.55 times the seated distance. HD users can push up to 0.71 times the seating distance.
- Plan on spending some time in final system verification, configuration, and tuning to eek every ounce of performance out of the room.

My group of friends, also known as the Acoustics Guild, followed this recipe in setting up the engineered room. It was nothing super tricky, just a good way to cook up a great-sounding and great-looking theater.

You can learn about all these recipe points by following the courses offered at CEDIA events, as well as by going to ISF, HAA, and THX seminars. Next CEDIA Expo I hope to do the theater cook-off again; be sure to come sink your teeth into it! All this talk about cooking is making me hungry. Time to eat the snack-in-a-box that the flight attendant just dropped on my laptop!

This article is based on a column published by A. Grimani in Residential Systems magazine October 2005. Chase Walton contributed to this article.