



PERFORMANCE MEDIA INDUSTRIES, LTD.

Through a Glass...
11/2006

by A. Grimani

I have a tradition every year at CEDIA Expo. At some point during the show, I find a quiet corner (an increasingly difficult task) and pull out one of my endless copies of the CEDIA Designer's Choice Awards booklet. You know the one I'm talking about - it contains beautiful glossy pictures and glowing descriptions of all the projects that have been submitted for awards. Once settled, I search through it from cover to cover looking for front projection video systems where the noise from the projector has been properly controlled. Guess what? There aren't that many - and thus my tradition continues. Every year, I hope to discover that the message we teach in the acoustics classes has gotten across: *No projectors without noise control in home theaters.* Unfortunately, I'm still waiting.

Why is projector noise control so important that I would give it this much attention during the hectic CEDIA week? Two words: dynamic range. By definition, a front projector must be in front of the screen, which usually puts it out in the room with the viewers. Because projectors generate heat, they have noisy cooling fans, and those fans create an instant dynamic range problem. Consider for a moment that the potential dynamic range (the difference between the loudest and softest sound) of a 20 bit movie soundtrack is 120dB! A home theater will be stretched to reproduce the entire range of that soundtrack under the best of conditions. A good home theater sound system should produce 105dB peaks, and the noise floor should be somewhere around 15-20dB, weighted on the NC scale. Even the quietest projectors produce around 30dB of noise, which is more than enough to raise the noise floor to an unacceptable level.

In the golden era of CRT front projection, *hush boxes* were used to control fan noise and restore dynamic range. The projector had to be in the room, so a soundproof box was built around it with port holes for the light to pass through. Glass was put in the port holes to contain the fan noise. The same thing can be done with modern lamp-based projectors. In fact, it is often easier because they are smaller and lighter. Unfortunately, hush boxes have a big ventilation problem, especially with lamp projectors that produce more heat than CRTs. Many times the hush box itself must have cooling fans, and then you're right back where you started. The most common remedy is to vent the hush box

through the ceiling or the floor directly into the HVAC system. If you do this, be sure to clear it with the HVAC engineer. You don't want your tap into his/her system to create a pressure problem that will cause the whole system to crash!

The ultimate solution for front projector is a projection room, just like the cinema. The projection room houses all the sound and video equipment in a soundproof environment with its own climate control. The equipment has no aesthetic impact on the room whatsoever, so even the most décor-conscious individuals will have nothing to complain about. A projection room doesn't have to be big – something as small as a dormer window will usually suffice.

Projection windows (called ports) are the key to making both hush boxes and projection rooms work effectively. Ordinary window glass is inadequate for projection ports because it lacks color purity and has very high refractance. If you shine a projector through it, the color balance of the image will be tinted green because of iron in the glass. A good portion of the light will reflect off the glass and land somewhere besides the screen. The light loss is about 10%, which is completely unacceptable. You would never seriously consider subjecting a projector with a camera-grade lens to such treatment! For a projection port, you need low-iron, high-transmission float glass, such as Optiwhite, Eurowhite or Starphire, that has been coated with a high-efficiency, anti-reflection layer. This type of glass only shaves off 2-3% of the light. Home Depot is *not* going to have it, so start looking for a specialty glass supplier. They will know what you're talking about.

Once you've got the glass, you have to mount it in such a way that it blocks the most amount of sound and the least amount of light. Typically, you want to use two pieces of glass with different thicknesses. They should be a few inches apart and slightly angled so that they are not parallel to each other or perpendicular to the projection beam. Ideally, the space between them should be a vacuum, and the framing should be sealed with acoustic caulk or expanding foam. If that kind of construction project sounds a little ambitious, you can always opt for a ready-made projection port from the same manufacturers that make them for the cinema. In most cases, you'll get the added advantage of being able to slide the glass out of the way if you ever want an unobstructed path to the screen.

Given how important dynamic range is to home theaters, it's amazing how many people use front projectors with no thought to noise control. If you think I'm fibbing, just grab the CEDIA Designer's Choice Awards booklet like I do and look at the projectors in the home theater entries. If you find one that is properly sound isolated, I promise to vote for your home theater entry next year...but only if you've controlled the noise from your projector!

This article is based on a column published by A. Grimani in Residential Systems magazine November 2006. Chase Walton contributed to this article.