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Screen Trends
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by A. Grimani

These days the world is full of trends. Take mobile communication devices, for example. Remember when we used to simply call them cell phones? We can't anymore, because some take messages, some send messages, some take pictures, some play music, some surf the internet, some send/receive e-mail, and some organize your life. I even saw one "phone" advertised the other day that's not really a phone! It's a camera, MP3 player, PDA, and hi-speed web interface, but you're out of luck if you actually want to *talk* to someone.

While the general public is battling the burgeoning telecommunications industry, home theater is waging its own trend war on projection screens. As with anything new, some screen trends are great, and some are potentially hazardous. Let's take a quick look at the current state of affairs before someone tries to sell us a screen that does everything but display an image!

Transparent Trends

Acoustically transparent screens are all the rage in home theater - and for good reason. Dubbing stages (movie mix rooms) and cinemas all have acoustically transparent screens hiding the three screen speakers. Besides making a home theater look more like the real thing, an acoustically transparent screen has other advantages. Placing the Center speaker behind the screen is very important for sound-to-picture correlation. Having a voice come from a spot three feet above or below an actor is distracting. Further, the Left, Center, and Right speakers will only create an ideal soundstage when they're all at the same height. And let's not forget how much better the Center speaker sounds when it's away from boundaries like the floor and ceiling! Unfortunately, perforated screens exhibit lower gain and objectionable moiré patterns when they're used in conjunction with fixed-pixel projectors. On the, um, bright side, new fabric screens have eliminated the moiré problem, and most bulb projectors have very little trouble overcoming the loss of light through the screen. You still have to control the light that passes through the screen, though. The area behind the screen needs to be non-reflective black, or else you'll need to put a black backing (also acoustically transparent) on the screen itself.

A Grey Area

Another hot trend is the grey screen. Grey screens were originally intended to lower blacks in LCD and DLP projectors with poor dark resolution. The visual resolution of most early-generation fixed-pixel devices was poor in the 0 IRE to 20 IRE region. It was customary to bury the dark portions of the picture into a uniform black with no detail to hide the fact that blacks and dark grays were displayed identically. Grey screens are now used for lowering perceptible ambient light reflections off the screen. Of course, the black levels from the projector are also lowered, but that is corrected by turning up the brightness, preferably using a PLUGE test pattern to nail the exact level of black cutoff. Peak white levels are also diminished by the grey screen tone. It is considered by many to be an acceptable compromise since human eyes are more sensitive to detail in blacks than whites, and a loss of 6dB of light (50% light level) is not really detrimental to the enjoyment of a movie.

With a reflective coating adding beaming (a.k.a. gain) to a grey screen, the peak white levels from a projector can be perceivably the same as a white screen with no coating. Additionally, a directional coating will result in rejection of off-axis light. Therefore, the black picture detail in rooms with some ambient light or with light-colored surfaces will be improved, leading to perceptibly better contrast ratios.

But screens with a reflective coating almost inevitably suffer from hot spots in the image. Hot spots occur when the screen illumination is uneven as seen from the viewing position. On a screen with mild directivity, they aren't too problematic, but once the reflective coating corresponds to a gain increase of two or more, the hot spot will be plainly visible on bright scenes. Look for an area in the middle of the screen where the picture is brighter, with a gradual falloff as you move to the edges of the image.

As stated earlier, a grey screen causes lower brightness. Directivity-enhancing coating helps recover the light levels, but the image quality invariably suffers to a certain degree. The ideal solution for high-performance screening rooms is to make them pitch dark and use dark tones for all the surfaces (walls, ceiling, floor, and furnishings).

Is it Flat or Curved?

Curved screens, which exist thanks to the super-cool, but short-lived Cinerama craze of the 1950s, have also started popping up in home theaters. Some people are of the persuasion that curved screens have an enveloping feel that is more cinematic than a flat screen, although most cinema screens in the US today are, in fact, flat. Curved screens will focus more light back to the viewing area if the screen material is coated for directionality, so you get a brighter image. Aside from the above, there are no real technical advantages to curved screens. There are a number of potential drawbacks, however. Picture distortion is a real possibility, if the projector is not precisely on-axis with the screen. The picture can exhibit a serious hot spot. The concave nature of the screen will also focus sound reflections into a specific area, creating a "hot spot" of

sound energy. The resulting imbalance of sound pressure in the room is very uncomfortable, as I recently experienced during a curved-screen presentation of *Chicken Little* in 3D. (I have a young daughter; what's your excuse?) The lower mids were excessively loud, and the sound field was inaccurate. In the long run, it's probably better to avoid curved screens entirely if you can possibly live without them!

The best advice for choosing a screen is to be cautious and know all the side effects of the various technologies. Remember that one type of screen will work better in one application and another type in another application. Then, of course, there are the screens that really don't work in *any* application. When trends run amok, things get complicated. Choose wisely.

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