Performance Media Industries, Ltd.

The Custom Home Theater Experience, Part 4
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by A. Grimani

The Disposable Projector Ploy

Two years ago, one of my employees bought a very nice 1280x720 video projector. Last year, he upgraded to a 3-chip model. Just the other day, he told me that he is yet again looking to upgrade – this time to a substantial 1920x1080 machine. After thinking that I might be paying him too much, I began to cogitate on how difficult it is to buy video equipment in today's technology super-world. Realistically, how can you possibly expect to find future-proof video equipment? You can't, so my suggestion is to focus as much as possible on the things that *don't* change. Take, for example, a projection screen. Moreover, take a dedicated home theater with themed interior where the screen is integrated into the décor by means of a proscenium, drapes, etc. You can design a visual look that will last ten years or more – and you'd better, or else you'll be doing more construction work!

The Screen

Since we're on the topic of screens – and this is supposed to be an article on selecting video equipment – let's start by talking about how to pick the right screen. The first thing you have to consider is *Screen Size*. You might think this part is easy, but I must inform you that the correct screen size is not *always* the largest possible screen that will fit in the space provided. Determining the appropriate size is actually a complex endeavor that requires you to consider the resolution of the display device, the seating distance, the video codec format, the source material, and the human eye's visual acuity of 1/60 of a degree. All of that really boils down into the following question: What do you watch? Video is currently in a major transition from standard definition to high definition. This is true for TV, movies, and gaming. Even though HD DVD and Blu-ray are available, you aren't going to be watching them all the time. But what about five years from now? Perhaps by that time you will be watching mostly 1920x1080 material beautifully compressed with the latest codecs. Whether or not that happens, you can't afford not to plan for it. The overall size of the screen frame and fabric should be based on viewing a high quality 1920x1080 image. With that established, things start to fall into place. The widest subtended viewing angle 1920x1080 will support without appearing to lose resolution is 40 degrees. That corresponds to a screen width (not

diagonal) of 0.73 x seating distance. To illustrate, a 105 inch wide screen would be ideal for viewers 12 feet away. Now, realize that SD cable will look awful on a screen that big. I guarantee that you will think your projector suddenly broke when you turn on M.A.S.H. re-runs. Even DVD will look really soft, noisy, and full of artifacts. Your play here is to find a way to reduce the picture size (not the screen) and mask the unused screen area for low resolution sources. Currently, there are two ways to accomplish this.

The first is an anamorphic lens approach, also known as constant height. In a constant height system, the aspect ratio of the screen is 2.35:1, which corresponds to the widest theatrical aspect ratio in common use. Video processing and an anamorphic lens are employed to display 2.35 movies on the whole screen using the full resolution of 1.78 imaging chips. Other aspect ratios are projected without the anamorphic lens at the same image height as 2.35, just not as wide. For true film buffs, nothing beats constant height because it works essentially the same way as a cinema. Runco's CineWide/AutoScope system is probably the most ergonomic implementation of constant height, but a number of other video processors and projectors offer constant height modes. If you go the latter route, be careful. A specific type of anamorphic lens may be required.

The second option for shrinking the picture is to, well, actually shrink the picture. You do this by zooming the projector in and out, re-focusing and re-masking for each size. For sports buffs, gamers, and HDTV junkies, this is probably the best solution. If you were to go constant height, HD sports would end up being shown on the 2.35 screen as a smaller 1.78 image. Actually, it can be embarrassingly small. If you take the above example of a 12 foot viewing distance and a 105 inch wide screen and make it constant height, the viewable area would only be 80x45 inches for 1.78. That's downright disappointing for a big game! Furthermore, some of the best high definition material available is not even film-based, but rather video game computer graphics and direct digital photography. These are basically all 1.78, so having the second-smallest picture for potentially the sharpest, highest-quality material seems like a waste. When you zoom the image, all those concerns go out the window. The actual picture size increases and decreases based on resolution, source quality, and production values. A TV show or game is going to have too much close-up motion to view at a large size, so the picture is zoomed down and the screen masked to 20-25 degrees (0.35 x seating distance) to make it easier to watch. On the other hand, a big event like the Super Bowl is blown up to a nice, tall, 40-degree-wide image. Movies at 2.35 would also be zoomed up to 40 degrees.

The bottom line is this. Plan for 1920x1080 and a screen that subtends 40 degrees. Go constant height if you like film or zoom if you're a sports or gaming fan.

After you've sized the screen, you have to choose the *Screen Gain*. With the advancements in digital projectors, a flat white screen is ideal for home theaters that

have control over lighting and wall colors. Screens with a gray substrate or high gain are really for compromised situations with ambient light or bad projectors. You just don't need them for high-quality home theater applications. I talked about all of this in detail in a January 2006 article, so take a look back if you want a refresher.

You should also use a screen with *Acoustical Transparency*. I talked about AT screens in January 2006 as well, so I won't repeat much here. Suffice it to say that the screen should be invisible to sound, and the center speaker should go behind it to avoid acoustic problems. And please, don't tell me the picture and sound quality will suffer! Some manufacturers now build AT screens that don't negatively impact either one in a noticeable way.

The Projector

It may seem like picking the screen and then the projector is putting the cart before the horse, but it's not. The screen is the starting point because it's the most likely to remain in service over time. Once you have the screen in place, it's pretty easy to figure out what you need from the projector.

The first thing to look at is *Light Output*. The projector should be able to produce between 16 and 20 foot Lamberts (fL) off the screen. Since you already know the screen surface area and gain, you can figure out how many lumens the projector must output by using this calculation:

Projector Lumens = Target foot Lamberts x Screen Area in $ft.^2$

There is such a thing as a picture that's *too* bright. I recently worked on a Runco VX-44 that got 30 fL calibrated on a moderately-sized screen. It was screaming bright and had to be turned down.

Other things to look for in the projector are adjustable *Primary Colors* and *Grayscale*. Along those lines, investigate ISF and THX approved products. I highly recommend that you research what it means for a product to meet their standards. It will assist you greatly in picking the right projector.

Video Processors

A complete discussion of video processors would take way more space than I have, but here are the nuts and bolts. The final picture quality doesn't just depend on the video processor; it's a combination of all the video devices in the signal path. It's impossible to predict which one will do the best job scaling, de-interlacing, etc. You've got to find out for yourself by using test patterns. Get some test discs like Digital Video Essentials, AVIA, and HQV Benchmark, and go to town trying different combinations of settings. Avoid the urge to only use program material. You will miss some problems if you do.

The Sources

You know all the usual suspects like DVD, satellite, cable, etc., so I'll leave them to you. What you may not realize is that some of today's best HD comes from surprising places. For a long time, satellite, cable, and broadcast were all we had, so we thought they were awesome. The new kids on the block, though, have blown those old standbys back into last century. You need to have one of these new HD sources in your theater, if for no other reason than to demonstrate the kind of picture the video system is capable of producing. HD DVD and Blu-ray obviously come to mind. Files on a video server are also a good idea. Possibly the most intriguing new HD source comes from the gaming industry. HD cinematics in next-generation games are stunningly detailed, providing the perfect "wow" factor for a demo. In addition, the PlayStation 3 and Xbox 360 offer downloadable HD material that looks surprisingly good. The Xbox 360 uses Wi-Fi in conjunction with Windows Media Player and Windows Media Center PCs to send HD video wirelessly throughout the home. Don't just blunder through stacks of old DVDs, wondering where all the money you spent on video went. Get some new sources and go to town!

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