



PERFORMANCE MEDIA INDUSTRIES, LTD.

The High Definition Frontier
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There can be no doubt about it now, my friends. The high definition frontier has arrived: HD DVD is here, and Blu-ray Disc is just around the corner. For years we have wished for high definition on a 5" optical disc, and finally our wish has been granted...twice, in fact. Let the format war begin!

Now, you may have decided to play it safe and sit on the sidelines until the shooting stops. That's all well and good, but you're missing a golden opportunity to experience the best picture quality that has ever been available to consumers at home. Regardless of which format eventually prevails, you can benefit right now by installing one or both in your system. However, make sure that you install them correctly, or you'll end up spending your time fighting bugs rather than watching movies!

HD DVD is not without its growing pains. Audio and video integration issues abound, but take heart. It's easy to understand the basics and avoid the pitfalls that early supporters have already uncovered.

Fortunately, things are looking pretty rosy in the video department. Aside from its usual HDCP handshake issues, HDMI is doing an admirable job with HD DVD. If you have mastered the implementation of HDMI in your installations, you should be able to get a glorious image from an HD DVD player in no time at all. The same picture quality is currently available from players' Component video outputs, because movie studios have graciously released their initial HD DVD titles without the Image Constraint Token (ICT). The ICT forces players to downscale their Component outputs to a maximum resolution of 960x540. However, the studios can, at their discretion, begin using the ICT. You have been forewarned.

Things get a bit more complex on the audio side. While it is nice that HD DVD supports high-bit-rate Dolby Digital Plus, Dolby TrueHD, DTS-HD and even uncompressed soundtracks, they do you no good if you can't get them out of the player. Here, the trouble begins.

The multi-channel digital audio output from current HD DVDs is limited to PCM via HDMI 1.1 and Dolby Digital or DTS via S/PDIF (common optical or coaxial digital connections). Why, you may ask, is that? Well, all the HD DVD discs we are likely to see in the US are mastered as Advanced Content, meaning that they support special interactive features like menu sound effects and streaming audio. Something has to mix these audio streams together with the soundtrack while preventing the digital signal path from overloading. That duty falls to the players. Since players' internal mixers only operate in the PCM world, every audio stream, whether it is a blockbuster soundtrack or a simple button click, must be decoded to PCM. Once the streams are mixed, they can be output from the players as PCM through HDMI or re-compressed by a real-time Dolby Digital or DTS encoder and output over S/PDIF.

If you plan to use an HD DVD player with a controller that accepts one of these two connections, you've got it made. Understand, though, that there are some HDMI-equipped controllers that do not support digital audio and a number of legacy controllers that only decode Dolby Digital. Since HD DVD players are not required to use Dolby Digital real-time encoders, you might face a scenario where the player will only output DTS over S/PDIF, and the controller will only decode Dolby Digital. If you think that's unlikely, just look at the first generation Toshiba HD DVD players: DTS-only encoders. Check product specifications before you assume devices will work together!

You might be thinking that the forthcoming HDMI 1.3 standard is the ultimate answer, because it will support direct transmission of all the new audio formats. Think again. Unless studios start mastering HD DVDs as Basic Content instead of Advanced Content, the audio will still have to go through the player's mixer, necessitating the PCM conversion stage. Even HDMI 1.3 won't be able to output the original soundtrack bitstream from an HD DVD unless the authoring allows the player to bypass the mixing function - thereby losing all the interactive audio features.

When digital connections simply won't work, you can always fall back on your old friend the multi-channel analog connection. As you should have learned with DVD-Audio and Super Audio CD players, multi-channel analog connections have their own problems, requiring extra care during setup. Unless you have a controller that will digitize and process incoming analog signals - and you trust the controller's analog-to-digital converters (ADCs) not to mangle the sound - delay and bass management must be performed in the player. If you elect to have the player perform bass management, remember that the subwoofer output will probably have to be boosted by 15dB after leaving the player. Even if you do not have the player perform bass management, its subwoofer output (now containing only the LFE channel) will still have to be boosted 10dB. Many controllers provide either selectable or fixed gain boost for incoming analog

subwoofer signals, regardless of whether the signals pass through ADC. If the gain boost is selectable, you should have the option of +10dB or +15dB depending on whether or not the player is performing bass management. If the gain boost is fixed, you have to figure out if it is fixed at the right amount and then come up with additional gain if it is insufficient. An external analog bass management device with +10dB LFE channel gain is a possible solution, if the controller does not apply the correct amount of boost. One such device is the ICBM by Outlaw Audio.

To discover whether the subwoofer output level of the player/controller combination is correct, you will need a digital RMS multi-meter and a test disc. The test disc must have a 30 Hz sine wave at (-20dBFS) in the LFE channel and a 1 kHz sine wave at the same level in any main channel. With all level controls at their default positions, play the test signals. Measure the voltage at the controller's subwoofer output and a main channel output. If the subwoofer output is not 10dB higher, the controller is not adequately boosting the subwoofer signal. Use the following equation to compare the two voltages: $\text{dB difference} = 20 \log (V_{\text{subwoofer}} / V_{\text{main channel}})$.

Channel levels can usually be adjusted by the controller even if it doesn't digitize the analog signals. Be sure to use Dolby Digital or DTS test discs with narrow-band pink noise to calibrate levels. Avoid players' internal test noise generators since they are often inaccurate. The test noise may even be so loud that it could damage the speakers!

Like any new format, HD DVD has its challenges, and so will Blu-ray. Some of the issues we are seeing with HD DVD will translate to Blu-ray, but there are bound to be new ones as well. When the time comes, we'll talk about these, too. Until then, enjoy the stunning images afforded by HD DVD!

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