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Preparation Guide for DVD Duplication

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This guide aims to highlight some of the problems with DVD Recordables, and to give pointers on how to reduce the risk of compatibility errors with DVD players.

Recordable DVDs vs. Pressed DVDs

There are two main types of DVDs that you are likely to come across; they are Recordable DVDs and Pressed DVDs.

A pressed DVD is the type of DVD that you would buy in a high-street shop. It is made at a replication plant from a process involving glass mastering and injection moulding. It is suitable is you are considering a run of 500 DVDs or more.

Recordable DVDs, including DVD-Rs and DVD+Rs, are suitable when a small quantity is required. They use light-sensitive dye technology, and the information is written to the DVD via the laser in a DVD burner. The copying process for DVD Recordables is called duplication.

Problems with DVD recordables

// Reflectivity

There are problems occasionally with DVD Recordables. The following is taken from the DVD FAQ: (http://www.dvddemystified.com/dvdfaq.html#4.3)

“The basic problem is that recordable discs have different reflectivity than pressed discs (the pre-recorded kind you buy in a store), and not all players have been correctly designed to read them”.

// Edge Effect

The edge effect describes the problem some DVD players have reading the information on the outer edge of the DVD. According to research undertaken jointly by the National Institute of Standards and Technology (NIST), the Optical Storage Technology Association (OSTA) and the DVD Association (DVDA): (http://www.itl.nist.gov/iad/894.05/gipwog/mar-9-05/DVDCC_GIPWoG%20March%202005.ppt)

- 38 out of 50 failures were in the outer edge of the disc
- “Edge” begins to appear around 10% from end of the disc and becomes significant around 5% from the end
- Ignoring errors outside the edge, compatibility rises to 98%

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Steps you can take to improve your master DVD for duplication

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To reduce the problems of reflectivity and read errors

- Encode your video with an average bit rate below 6.5 Mbps
- If using VBR encoding, set the maximum bit rate to 9 Mbps or below
- Compress your audio to AC-3

To reduce the edge effect

- Avoid filling up the DVD with data right to the edge

Further steps you can take to safeguard against possible disappointment

- If possible, find out what DVD player your DVD Recordable will be played on. You can then check compatibility lists, such as http://www.videohelp.com/dvdplayers, to see if the DVD player can play DVD Recordables.

- Media quality matters – There exists significant variation in DVD Recordable media quality. Make sure you choose a good brand. “Manufacturers make modifications to the dye to improve its stability or to make it less expensive. This process may result in similar dye types having considerably different qualities.” (http://www.itl.nist.gov/iad/894.05/docs/StabilityStudy.pdf)

- Media-Burner combinations matter – When choosing DVD Recordable Media, make sure that it is recommended for your DVD burner. Often manufacturers provide this information on their websites. It is also important to keep the firmware on DVD burners updated.

A good DVD authoring house, or duplication facility, will be able to advise you specifically on your project. They can also provide specialist services if needed.

- Professional MPEG-2 encoders – Used by DVD authoring houses, they will keep true to the bit rate you set. Some encoders allow higher, illegal data rate spikes, which can cause read errors on DVD players.

- Good quality DVD Recordables. Unfortunately, it is very difficult to identify good quality DVD Recordables. DVD Authoring Houses will often employ disc-checking procedures to analyse the quality of media that they use. They will also be aware of the performance of their DVD burners, and will replace them as they begin to fail.

For further information about DVD encoding, authoring and duplication, or to discuss an up coming project, please contact Will at Pink Pigeon on 020 7439 3266.

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Amazing technology - understanding DVD

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// The Physical Format
Let's start with a simple definition; DVD is an optical storage device. You can use a DVD to store data. The two main types of DVDs are; Recordable DVDs (DVD-R) and Pressed DVDs (DVD-ROM). These are physical formats.

// The Standard
In order for DVD to be used as a distribution format to allow people to watch broadcast quality video in their homes, the DVD-Video standard was defined. It specifies the exact type and structure of data to be stored on a DVD. This standard allowed an industry to flourish; electronics manufacturers could build DVD-Video players to play the discs, and software companies could build the video encoding and authoring applications to create them.

// Non-Linear
DVD-Video introduced non-linear functionality to home viewing, no longer did we have to spend time fast forwarding or rewinding through a video tape. Now we could jump directly to any portion of the disc in less than a second.

// Seamless
If you've ever looked at the contents of a DVD-Video on your computer you will have noticed a VIDEO_TS folder. Open that folder and you will see three types of files; information (.ifo), back-up (.bup) and multimedia (.vob) files. It's the .vob files that contain the basic building blocks of DVD-Video; Video Object Units. These small data packs are a multiplexed combination of video, audio, subpicture and navigation data streams that bring a DVD to life. They are small enough so that a DVD-Video player can switch playback streams in real-time, providing seamless playback from up to nine video streams, eight audio streams, and 32 subpicture streams.

// Burning The Spiral Path
When a DVD is burnt or manufactured, the data is converted into a bit stream suitable for use with a laser beam recorder. This process includes sector formatting, the generation of error correction codes, and 8/16 modulation. It may surprise you to learn that all discs generate errors on playback - even the best discs produce thousands of errors. The errors are partly due to the fact that playing a DVD is a process that pushes the limits of physical laws.

With both manufacturing and duplication, the bit stream is placed in a spiral path, similar to a vinyl record. The difference with DVD is that the path starts at the center and spirals out towards the edge, the opposite to vinyl. The laser writes the information in the spiral path by burning away some areas of the light sensitive surface to create microscopic marks known as "pits" and "lands". Both pits and lands represent strings of 0s, the transitions between them represent 1s. These are not the 1s and 0s of our original data, rather parts of the modulated bit stream signal.

// The Limit of Physical Laws
When reading a disc, a DVD player shines a laser beam on the surface and uses a lens to pick up the reflections. A weak reflection indicates a pit. Amazingly the width of the pits is smaller than the beam's focal spot size. Moreover, while the disc is spinning between 570 and 1600 rpm, the lens must stay focused on the spiral path, which is less than 1-micron wide! **If unwound, the spiral path would stretch to a staggering 11.8 kilometers!** The original data bits are reconstructed via a process including 8/16 demodulation, error detection and correction.

// Testing DVD Quality
Simply put, for a DVD to play, the DVD-Video player must be able to read the data on the disc.
The easiest way to measure disc quality is to measure error rates. However it's worth keeping in mind that errors are not necessarily physical features on the disc, but a measure of how well the total system (disc plus player) works.

For further information read Jim Taylor's "DVD Demystified" and "DVD Authoring and Production" by Ralph LaBarge.