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Guide to DVD encoding - why encode?

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The point of encoding is to compress video so that it can be viewed on DVD

Uncompressed video has a high data rate and requires a large amount of storage space.
Data Rate is the speed at which data is transferred.
Generally speaking the higher the data rate, the higher the quality of the video.
DV video, which includes Mini-DV and DVCAM, has a data rate of 3.6 MB/sec. 1 min takes up 216 MB of disc space.
Uncompressed video from Digibeta or Beta SP has a data rate of 26 MB/sec. 1 min takes up 1.6 GB of disc space.
The need for compression becomes apparent when one considers that the capacity of a DVD is only 4.38 GB.

Can Video Be Improved When Encoding?

It is not possible to improve video in the encoding process. That's not entirely true, but certainly the basic rule of thumb is - you get out what you put in. Therefore **always use the highest quality source available.** Be that the master tape or an uncompressed video file from the edit suite.
There are some encoders, such as those by Cinema Craft, that use pre-encoding filters to improve poor quality video. They can help to cut down on noise levels but don't expect miracles. It's also about getting the balance right - if you apply too strong a filter setting you'll find the image becomes too soft. You may find it easier to correct poor quality video in the edit suite before exporting or laying off to tape.

Preparing Video For Encoding

Often the most important part of the process. To get an accurate idea of what your video is going to look like once it is encoded, watch it on a TV. Or, better still, a grade monitor. This is much better than judging on a computer monitor as you will see accurate colours and pick up any interlacing problems. **DVD-Video is designed for playback on a TV**. Therefore it is a good idea to use a calibrated TV for tasks such as colour correction.
Remember also **Video on DVD is Standard Definition**. If you have a High Definition source this will be down converted either before or during encoding. Check the SD version to make sure you are happy, look at fine details - the image might appear sharp but does it flicker on an interlaced monitor? or perhaps it doesn't flicker but has become too soft? Different algorithms can be used for resizing if necessary, though often it will look great first time.

Creating Video For Encoding

The following shooting and editing techniques take into account the way compression works.
Reduce movement: Using a tripod keeps the camera steady and reduces the amount of unnecessary motion.
Proper lighting: Low-lighting will increase the amount of video noise thereby reducing the quality of the image.
Reduce detail: Reducing the amount of detail in a shot will make it easier to encode.
Careful Editing: Elaborate transitions and lots of fast cuts make the video more complex and harder to encode.
Good quality audio: Often overlooked, audio should be as noise free as possible if professional results are desired.
High-end encoders are very sophisticated and will invariably produce great results no matter what. However a well produced video will most likely look better than, for instance, a hand-held video of people dancing in a disco replete with zooms, jerky and sudden camera movements, generally murky light levels, flashing lights and changing colours.

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how compression works

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Video & Compression

Video is made up of a rapid succession of still images or frames. PAL video plays these frames at a rate of 25 per second. This is too fast for the naked eye to perceive the individual frames and creates the illusion of movement. Compression works by looking for repetition within a video, making use of similarities to store the information more efficiently. Compression removes redundant information. This is achieved with spatial and temporal compression.
Spatial compression looks for similarities within an individual frame. Each PAL frame is made up of 720 by 576 pixels. The frame is scanned for adjacent pixels with similar brightness and colour. Areas of pixels that are very similar to each other can be easily compressed. Spatial compression is sometimes called Intra-Frame compression.
Temporal compression looks for similarities in sequential frames. The same idea as spatial compression applied to a sequence of frames. Neighbouring frames are scanned for areas of similarity and only the changes between them are stored. Temporal compression is sometimes called Inter-Frame compression.

Data Rate

Data Rate is the speed at which data is transferred. It is measured per second in either bits or Bytes. A bit is a single computer digit (either 1 or 0). For historical computing reasons there are 8 bits in a Byte and, even though there are 1000 bits in a kilobit (kb), there are 1024 Bytes in a KiloByte (KB).
For simplicity it's easier to think of 1000 Bytes being a KiloByte. In fact, in DVD world rather than computing world, these simplifications are used as standard. Hence a DVD is often referred to as being 4.7 GB rather than 4.38 GB.
Be aware that data rate units can have different abbreviations; for instance Megabits per second can be shortened to mbits/sec, Mb/sec, or Mbps. However Mb/sec is not the same as MB/sec, a capital B always indicates Bytes not bits.
Incidentally, because 8 bits are called a "Byte" somebody decided that 4 bits should be called a "Nibble"!

Compressing Video for DVD

When you watch a DVD-Video you are watching video that has been encoded into MPEG-2. MPEG-2 is a compression format that produces broadcast-quality files that are virtually indistinguishable from the uncompressed video source. MPEG stands for the Moving Picture Experts Group, an organisation who jointly developed compression algorithms to handle video and audio.
The data rate of MPEG-2 varies depending upon the amount of video that needs to be encoded. Single layer DVDs have a capacity of 4.38 GB and, depending on the source, can store over 120 minutes of high quality video. While a DVD player can handle a data rate up to 9.8 Mbps, the average data rate is often between 5-6 Mbps. Quality is maintained using Variable Bit Rate (VBR) encoding, which allows an efficient distribution of data between complex and simple portions of the video. With DVD, MPEG-2 data rate is often referred to as the bitrate, measured in Mbps and not MB/sec. 9.8 Mbps is 1.17 MB/sec, a significant reduction on the 26 MB/sec of uncompressed video.

Understanding Compression

Key to understanding compression is grasping the relationship between the data carrier (DVD) and the compression format (MPEG-2). In the digital world everything is finite, a DVD has a fixed capacity and video must be compressed to fit onto it. **The motivation for DVD came from Hollywood's desire to release feature films on an optical disc.** DVD is the same physical size as a CD but able to hold seven times more data. MPEG-2 is capable of producing high quality video files at small sizes, allowing a feature film to fit on a DVD. MPEG-2 is the basis of the DVD-Video standard, which turns a DVD from a simple data carrier into the most successful distribution medium in history.