Content Creation Guide

Introduction to Encoding
(Version 2.8)

A guide to encoding content for Digital View media players.

For details of specific settings please see other document downloads available from:
http://www.digitalview.com/viewstream/documentation.php
Revision History

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<th>Amendment Date</th>
<th>Details</th>
<th>Version</th>
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1. Introduction

Digital View produces digital media players and display systems for digital signage, retail video promotion and information/education displays such as used in museums and galleries.

This guide seeks to provide an overview of the issues to be considered when creating and encoding content for use on a Digital View media player. It should be noted that Digital View media players use formats and standards most closely related to those found on disc based players, so for example MPEG-2 as used for DVD, MPEG-4 as used for Blu-Ray.

The challenge however is getting the results optimized for the display and the environment. So the very first guideline for optimal content creation results is:

- **Content should be created for and evaluated on the system(s) it is to be used on together with consideration of the viewing environment**

If there is a golden rule – that is it. Doubtless the same could be said regarding the creative aspects of content creation.

This guide introduces the codec and format standards together with some of the basics for the creation of reliably optimal content on Digital View media players. For details on the creation of interactivity on Digital View media players see DV Studio Plus, a Digital View application available for free download on www.digitalview.com.

1.1 Digital View Supported Formats

The Digital View media player range is designed to meet the media requirements of its target markets, this includes support for the following depending on model:

- Video formats (containers): MPG, MP4, MOV, AVI, WMV
- Video Codec’s: MPEG-1, MPEG-2, MPEG-4 (H.264, AVC), DivX, WMV
- Still images: JPEG
- Audio: Mono, stereo, digital audio
- Video resolutions: PAL/NTSC, 720p, 1080p

Starting with video formats the following sections introduce the various supported media formats and the required settings for optimal results.
2. Video Source

Starting at the beginning the first issue to consider is the source of the video to be encoded, here we consider the three most likely:

- Transcoded from another format
- Computer created, ie from computer animation software
- Edited content

The following sections consider each of these in turn.

2.1 Transcoded from another format

In this case the content being encoded is simply being converted into the desired digital format for the media player and display system. Some changes can be made during the process such as to de-interlace, or to a lower resolution of the same aspect ratio or a change in the bit-rate (data-rate) but otherwise the content is not altered. If the video will be edited see section 2.3 below.

Points to note:

- To begin it is important to ensure that the source content is of a quality (resolution, frame rate and data-rate) to meet the needs of the intended playback system – media player & display. There will be some quality loss during the transcoding process. Note:
  - Transcoding to a lower quality is fine,
  - Transcoding to a higher quality is not possible.
- If the source content aspect ratio is different from the playback display it is recommended to handle the process through an editor and make the required adjustments to the aspect ratio rather than simply transcoding, this will avoid unexpected results.
- This can be the simplest of the three processes or where it all goes wrong.
- Maintain the same frame rate as the original material.
- Use the appropriate bit-rate (data-rate) for the media player as detailed in the encoding guides.
- Either match or select a lower resolution output depending on the media player and display system.

Software for transcoding:

- QuickTime Pro (for PC or Mac)
- Telestream Episode (for PC or Mac)

Well-known sources for stock video:

- BBC Motion Gallery
- iStockPhoto
- Shutterstock
2.2 Computer Created Content

Most computer animation packages provide the ability to save or export to a compatible format such as H.264 or MPEG-2.

Points to note:

- It is important to create the content in the aspect ratio of the display that will be used when the content is ultimately played otherwise it will be shown with black bars (at top/bottom or sides) or cropped or stretched.
- Ensure the output resolution matches the playback display. It is unlikely that using a higher resolution than the target playback display will provide any advantages.
- Choose a suitable frame-rate, as a general rule use 30 fps (frames per second).
- Saving or exporting from a computer animation software package directly to a format supported by the intended Digital View media player is likely to produce the best results.
- If the software cannot save or export directly to a media player support format please refer to your available transcoding software to match the save format to a supported source format for transcoding.

Well-known animation software:

- Adobe Flash

2.3 Edited Content

All computer based video editors that we are aware of provide the opportunity to save or export in a number of digital media formats.

Points to note:

- It is important to modify the content to the aspect ratio of the display that will be used when the content is ultimately played otherwise it will be shown with black bars (at top/bottom or sides) or cropped or stretched.
- Ensure the output resolution matches the playback display. It is unlikely that using a higher resolution than the target playback display will provide any advantages.
- Choose a suitable frame-rate, as a general rule use 30 fps (frames per second).
- Saving or exporting from a video editing software package directly to a format supported by the intended Digital View media player is likely to produce the best results.
- If the software cannot save or export directly to a media player support format please refer to your available transcoding software to match the save format to a supported source format for transcoding.

Well-known video editing software includes:

- Adobe Premier
- Apple Final Cut
- Ulead Video Studio (now part of Corel)
- Pinnacle Studio
3. Video Encoding Issues

This section looks at:

- Compatible Video compression codec’s
- Recommended codec settings by player
- Various issues:
  - Video & display aspect ratios
  - Text in video
  - TV display ‘safe area’
  - Interlaced & progressive considerations

3.1 Compatible Video Compression Codec’s

This guide assumes that users are aware of digital video file formats such as MPEG, QuickTime, DivX and WMV so rather than explaining them in detail the focus is on issues relating to their usage. As a note, Wikipedia is a reasonable source of explanation and history of various digital video formats.

The following table provides a quick guide to the video file formats supported by the current range of Digital View media players:

<table>
<thead>
<tr>
<th>Player</th>
<th>MPEG-1</th>
<th>MPEG-2</th>
<th>MPEG - 4</th>
<th>WMV</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3-100</td>
<td>PAL/NTSC</td>
<td>PAL/NTSC</td>
<td>-</td>
<td>PAL/NTSC</td>
</tr>
<tr>
<td>VS-100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M3-300</td>
<td>PAL/NTSC</td>
<td>PAL/NTSC</td>
<td>-</td>
<td>PAL/NTSC</td>
</tr>
<tr>
<td>VS-300</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VS-400</td>
<td>PAL/NTSC</td>
<td>PAL/NTSC 720p</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>RP-400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RM-DN5</td>
<td>PAL/NTSC 720p</td>
<td>PAL/NTSC 720p</td>
<td>PAL/NTSC 720p</td>
<td>PAL/NTSC 720p</td>
</tr>
<tr>
<td>VS-500</td>
<td></td>
<td>1080p</td>
<td>1080p</td>
<td>1080p</td>
</tr>
<tr>
<td>RP-500</td>
<td></td>
<td>1080p</td>
<td>1080p</td>
<td>1080p</td>
</tr>
</tbody>
</table>

3.2 Recommended Codec Settings by Player

Given the choice, our recommendations are:

- For 100 & 300 series models we recommend MPEG-2 or MPEG-4.
- For 400 series models we recommend MPEG-2.
- For 500 series models we recommend H.264.
- MPEG-1 is not recommended due to its lower resolution and quality; other codec’s provide better quality.

The following sections provide recommended encoder settings for each of the current Digital View media player models. Users can try other settings and depending on the content being encoded they may produce better results with other settings. It is important to verify results on the system it will be used with, as playback on an ordinary PC or Mac is not a guarantee or necessarily a good indication of the final results.
3.2.1 M3/ViewStream 100/200/300

The following are the recommended encoding specifications for video content on the M3/ViewStream 100/200/300:

**MPEG-2:**
- PAL: 720 x 576
- NTSC: 720 x 480
- Screen size: 4:3 screen, e.g. 640x480, 800x600, 1024x768, etc.
- Bit Rate: 5 Mbit/s
- Audio Bit Rate: 224 Kbit/s, 48 kHz at 16 bits sample rate
- Frame Rate: PAL: 25 Hz / NTSC: 29.97 Hz
- Codec: MPEG-2
- Supported filename extension: .mpg

**MPEG-4:**
- PAL: 720 x 576
- NTSC: 720 x 480
- Screen size: 4:3 screen, e.g. 640x480, 800x600, 1024x768, etc
- Bit Rate: 2 Mbit/s
- Audio Bit Rate: 224 Kbit/s, 48 kHz at 16 bits sample rate
- Frame Rate: PAL: 25 Hz / NTSC: 29.97 Hz
- Codec: MPEG-4 DivX 5.2 or higher
- Supported filename extension: .avi

**MPEG-1:** As MPEG-1 quality is lower than other codec’s it is not recommended and only shown for support purposes
- PAL: 352 x 288
- NTSC: 352 x 240
- Display resolutions: 4:3 screen, e.g. 640x480, 800x600, 1024x768, etc.
- Bit Rate: 1.15 Mbit/s
- Audio Bit Rate: 224 Kbit/s, 44.1 kHz at 16 bits sample rate
- Frame Rate: PAL: 25 Hz / NTSC: 29.97 Hz
- Codec: MPEG-1
- Supported filename extension: .mpg

3.2.2 ViewStream/RemotePlayer 400

The following are the recommended encoding specifications for video content on the ViewStream 400 and RemotePlayer 400:

**MPEG-2: High Definition**
- HD: 1280x720
- Wide Screen size: 16:9 screen, e.g. 1366x768, etc.
- Bit Rate: 12 Mbit/s
- Audio Bit Rate: 224 Kbit/s, 48 kHz at 16 bits sample rate
- Frame Rate: 25 Hz / 29.97 Hz
- Codec: MPEG-2
- Typical filename extension: .mpg
MPEG-2: PAL/NTSC
PAL: 720 x 576
NTSC: 720 x 480
Screen size: 4:3 screen, e.g. 640x480, 800x600, 1024x768, etc.
Bit Rate: 5 Mbit/s
Audio Bit Rate: 224 Kbit/s, 48 kHz at 16 bits sample rate
Frame Rate: PAL: 25 Hz / NTSC: 29.97 Hz
Codec: MPEG-2
Supported filename extension: .mpg

3.2.3 RM-DN5/ViewStream 500/RemotePlayer 500

The following are the recommended encoding specifications for video content on the **RM-DN5 and ViewStream 500**:

**AVC/H.264 (MPEG 4 part-10): High Definition**
720p: 1280x720
1080p (Full HD): 1920x1080
Wide Screen size: 16:9 screen, e.g. 1366x768, 1920x1080.
Bit Rate: 10-30Mbit/s (recommend using 10,000-15,000 kbit/s)
Audio Bit Rate: 224 Kbit/s, 48 kHz at 16 bits sample rate
Frame Rate: 25 / 29.97 / 30 fps
Codec: MPEG-4 Part 10 AVC/H.264
Typical filename extension: .mp4 / .mov

**MPEG-2: High Definition**
720p: 1280x720
1080p (Full HD): 1920x1080
Wide Screen size: 16:9 screen, e.g. 1366x768, etc.
Bit Rate: 12-15 Mbit/s
Audio Bit Rate: 224 Kbit/s, 48 kHz at 16 bits sample rate
Frame Rate: 25 Hz / 29.97 Hz
Codec: MPEG-2
Typical filename extension: .mpg

**MPEG-2: PAL/NTSC**
PAL: 720 x 576
NTSC: 720 x 480
Screen size: 4:3 screen, e.g. 640x480, 800x600, 1024x768, etc.
Bit Rate: 5 Mbit/s
Audio Bit Rate: 224 Kbit/s, 48 kHz at 16 bits sample rate
Frame Rate: PAL: 25 Hz / NTSC: 29.97 Hz
Codec: MPEG-2
Supported filename extension: .mpg

**MPEG-4 specifications**
PAL: 720 x 576
NTSC: 720 x 480
Screen size: 4:3 screen, e.g. 640x480, 800x600, 1024x768, etc.
Bit Rate: 2 Mbit/s  
Audio Bit Rate: 224 Kbit/s, 48 kHz at 16 bits sample rate  
Frame Rate: PAL: 25 Hz / NTSC: 29.97 Hz  
Codec: MPEG-4 DivX 5.2 or higher  
Typical filename extension: .avi

Note: Depending on the features desired, customer/purchaser may be required to apply and obtain a video codec license with the respective organizations.

**CF Card Use**

HD resolutions (e.g. 1080p) require higher transfer rates. It is recommended to use newer, high-speed CF cards. 100x, 15Mb/s cards have been found to be suitable in tests.

### 3.3 Codec Recommendations

Our recommendations:

- **H.264 / AVC**: The newest and most efficient in terms of file size for quality, also it is the mainstream trend. For media players where this is available it is the recommended codec.
- **DivX**: Quality and file sizes are good (small) but it is a proprietary codec.
- **WMV**: Quality and file sizes are good but it seems to be primarily a Microsoft Windows PC standard.
- **MPEG-4**: Quality and file sizes are good. MPEG-4 is the underlying technology for WMV, DivX and H.264/AVC.
- **MPEG-2**: Quality is good but file sizes are considerably larger than the MPEG-4 related codec’s.
- **MPEG-1**: Resolution is low and file sizes are relatively inefficient for the quality, generally not recommended if a better quality alternative, ie one of the above, is available.

For more information about the various codec’s see the appendix

### 3.4 Some General Principles

In general the following is important:

- **Quality of the original material**: It is a cliché but ‘garbage in, garbage out’. MPEG decoders and the display circuitry will do what it can to improve the quality of the picture but if the original material is of poor quality the result is likely to be poor or worse.
- **Resolution of the input and the output**: In general higher resolution will be better but this may be one of the key compromises made in a system and display choice. If a low resolution video standard such as PAL/NTSC is being used or the display is low resolution then content needs to be designed accordingly and fine details such as small text should be avoided.
- **Choice of codec and data rate**: MPEG-4 related codec’s generally provide the optimal mix between quality and data-rate. This benefit increases with higher resolution video.
- **Transcoding**: All these codec’s are lossy and therefore repeated transcoding will result in generational quality loss. This is most apparent when the resolution and bit-rate are equivalent. Transcoding to a lower resolution or bit-rate will minimize noticeable transcoding quality loss.
3.5 Text

Digital View media players are designed for applications such as digital signage that frequently contain text. There are both creative and technical considerations to the effective use of text:

- The size needs to be sufficient to be legible or illegible as desired when viewed on the intended playback display with consideration of the environment it will be located in, i.e., will viewers be close to the display or further back.
- Scrolling text can be difficult to read and factors such as scrolling speed, font size, text color and background are important considerations. Indeed for both scrolling and static text it can usually help to have a border around the text of a contrasting color to the text, for example a black border on white text. There is however a new factor coming in which is higher refresh rate displays such as 120Hz with smooth motion processors (Digital View produces an LCD interface enabling this functionality), this can improve the legibility of scrolling text– again the content needs to be evaluated on the playback system.

Text with MPEG-1 was always more of a challenge because of both the low resolution and the risk of artifacts around the text. It was considerably better with MPEG-2 or MPEG-4 at DVD resolutions & data-rates, and has again leapt forward with high-definition video.

3.6 Safe Area

Another legacy issue that still needs watching out for. Depending on the display being used there may be a requirement to consider what is known as the ‘safe area’. This is a border of approximately 10% of the picture area should be left free of important detail and text..

Safe areas originated with analog domestic televisions and even though it is unnecessary with modern digital displays many TV’s which often find their way into commercial video installations still have this ‘legacy’ support.

3.7 Interlaced & Progressive Scan Video

Interlaced video, where two fields of alternate lines make up a full frame of the video image, is still very prevalent and relevant. As a general guideline, where possible, use progressive scan video for best results unless the display system requires interlaced video input.

De-interlacing (converting interlaced video into progressive scan video):

- There is no single answer or recommendation regarding the handling of interlaced video:
  - It can be de-interlaced (converted to progressive scan video) as part of the encoding process
  - It can be de-interlaced as a separate process using specialist de-interlacing software
  - It can be de-interlaced by the player equipment or display interface controller (inside the display)
  - It can be played and displayed as interlaced video thus letting the eye do the de-interlacing.
- If content is interlaced Digital View media players can handle de-interlacing for displays that require progressive type input.
3.8 Analog & Digital Output

Analog outputs are: Composite, S-Video, VGA (ARGB), Component (YPrPb).

Digital outputs are: DVI, HDMI

From a content encoding perspective there is not a great deal to note other than consideration of issues such as safe areas which are more likely to be implemented if the connection is analog though some digital system also implement safe areas (for no good reason in our opinion).

3.9 Frame Rates

When transcoding it is important to maintain the same frame rate as the original with the following exceptions:

- Original content with 60 fps (frames per second) should be encoded at 30 fps.
- Original content with 50 fps should be encoded at 25 fps.

Digital View media players typically support 24, 25, 29.97 and 30 fps. Most editing software and free utilities applications like MediaInfo (Mac & PC) will show full video file details.

3.10 Aspect Ratios

Aspect ratios are one of the big challenges of the day. PAL/NTSC content is all 4:3, the resolution is in the ratio of 4 horizontal by 3 vertical. High definition video is all 16:9. And the market remains in transition to high definition. The result is that if the content and the display are not matched:

- 4:3 content played on a 16:9 display will be either stretched horizontally or cropped top & bottom or displayed with vertical black bars on either side. Most often it is stretched horizontally.
- 16:9 content being played on a 4:3 may be shown with horizontal black bars top & bottom or cropped left and right or squashed horizontally. Most usually it is shown with black bars top & bottom.

None of the fixes are ideal and the only general guide is that the trend is towards widescreen though some small screens, ie less than 10 inches, 4:3 is still common. Again, content is best designed for the display system that will be used.

As a note, encoders such as QuickTime Pro give an option to change aspect ratio but make it clear that this is a letterbox technique, ie black bars will be used to fill the spaces.

3.11 Pixel Aspect Ratios

The following is a legacy topic and only relates to PAL/NTSC:

Pixels on a computer end up showing a different “shape” to those on a video screen. While a CRT has “virtual pixels”, an LCD you have absolute pixels. That explains why, for instance, an NTSC video (720x480) looks thin and flat on a PC-screen, but almost square on a TV, where the “virtual pixels” are higher than they are wide. Looked at another way, a TV appears to “stretch” content vertically (NTSC more so than PAL).
We recommended that content be created in *square* pixel aspect ratios in image software such as Photoshop. Animated or video content should then be resized later to the equivalent PAL or NTSC aspect ratios for export in software such as After Effects, Final Cut Pro, or Avid. This will not result in loss of data quality, as the pixels are just a different shape, rather than an actual resize. Widescreen content should be created in square pixels at full size, and then encoded at standard PAL or NTSC size. This quick guide outlines these numbers:

- 768x576 = 720x576 PAL
- 1024x576 = 720x576 PAL Widescreen
- 960x576 PAL = 720x576 PAL Widescreen
- 720x540 NTSC = 720x480 NTSC
- 864x486 = 720x480 NTSC Widescreen

Examples of JPG file creation:

If you create a JPG file for displaying on an NTSC video screen, create it in “square pixels” (e.g. In Photoshop) at 704x540, then scale (“squish”) it (still in Photoshop) to 704x480 before uploading to the player. That way when the player “stretches” the signal vertically, it will once again look right (and a circle will be circular).

If you create a JPG for displaying on an LCD screen using the player's VGA output, no scaling will be done. Simply create the JPG at the VGA resolution (e.g. 800x600 for SVGA output).
4. Still Images

4.1 JPEG

This is a compressed still image format. JPEG images have a size, expressed in pixels (e.g. 800x600 pixels, 1024x768 pixels). These are “square pixels”. JPEG images have a filename that ends in .JPG (e.g. “picture5.jpg”).

JPEG files must be created to match the output resolution of the Media Player to ensure there is no image loss or cropping. The following provides a resolution guide:

<table>
<thead>
<tr>
<th>Selected output</th>
<th>M3-100 VS-100</th>
<th>M3-200 VS-200</th>
<th>M3-300 VS-300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite / S-Video</td>
<td>PAL: 720x576</td>
<td>720x576</td>
<td>720x576</td>
</tr>
<tr>
<td>NTSC: 720x480</td>
<td>720x480</td>
<td>720x480</td>
<td></td>
</tr>
<tr>
<td>VGA output</td>
<td>800x600</td>
<td>800x600</td>
<td>1280x960</td>
</tr>
<tr>
<td>Component Video (YPbPr)</td>
<td>N/A</td>
<td>N/A</td>
<td>1280x720</td>
</tr>
</tbody>
</table>

Selected output | VS-400 | RM-DN5/ VS-500 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16:9 output</td>
<td>4:3 output</td>
</tr>
<tr>
<td>Composite / S-Video</td>
<td>PAL: N/A</td>
<td>720x576</td>
</tr>
<tr>
<td>NTSC: N/A</td>
<td>720x480</td>
<td>N/A</td>
</tr>
<tr>
<td>VGA output</td>
<td>1280x720</td>
<td>1280x768</td>
</tr>
<tr>
<td>HDMI</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>DVI</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Note:** Progressive JPEG is not supported

4.2 MPEG Still

This is a compressed still format intended mainly for video players. Using Digital View’s DV-STUDIO PLUS (available for free download on www.digitalview.com), images can be converted into the mpeg still format, which will give a better look for text heavy content.

If you wish to use MPEG-still format, you should generate it at the following sizes:

- MPEG STILL - PAL: 704x576 (Full screen Analogue Under scan)
- MPEG STILL - NTSC: 704x480 (Full screen Analogue Under scan)
5. Video CODECS

5.1 MPEG-1

The principle issue with MPEG-1 is that it is an interlaced only format constrained to a resolution of 352x288 for PAL and 352x240 for NTSC. Consequently is best suited to smaller displays such as below 20”. In addition as it was designed for PAL and NTSC, which have an aspect ratio of 4:3, it is not well suited to wide screen 16:9 displays though some manipulation can produce acceptable results.

MPEG-1 format is different depending on whether it is NTSC format (used in North America and Japan) or PAL format (used in most of Europe and other areas).

**PAL MPEG-1 FORMAT:**

<table>
<thead>
<tr>
<th>Video:</th>
<th>Size: 352x288</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAL Pixel Aspect Ratio (4:3)</td>
<td></td>
</tr>
<tr>
<td>2 Fields Interlaced 25fps</td>
<td></td>
</tr>
<tr>
<td>Field order must match input file if transcoding from Quicktime or AVI</td>
<td></td>
</tr>
<tr>
<td>Audio:</td>
<td>44.1 kHz Stereo</td>
</tr>
<tr>
<td>Mpeg must be encoded with an audio stream, even if audio is silent.</td>
<td></td>
</tr>
<tr>
<td>Data Rates:</td>
<td>Video: 1.15 Mbit/s (bps)</td>
</tr>
<tr>
<td></td>
<td>Audio: 224 kbit/s</td>
</tr>
<tr>
<td></td>
<td>Multiplex: 170 kbit/s</td>
</tr>
</tbody>
</table>

**NTSC MPEG-1 FORMAT:**

<table>
<thead>
<tr>
<th>Video:</th>
<th>SIZE: 352x240</th>
</tr>
</thead>
<tbody>
<tr>
<td>NTSC Pixel Aspect Ratio (4:3)</td>
<td></td>
</tr>
<tr>
<td>2 fields Interlaced 29.97fps</td>
<td></td>
</tr>
<tr>
<td>Field order must match input file if transcoding from Quicktime or AVI</td>
<td></td>
</tr>
<tr>
<td>Audio:</td>
<td>44.1 kHz Stereo</td>
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<td>Mpeg must be encoded with an audio stream, even if audio is silent.</td>
<td></td>
</tr>
<tr>
<td>Data Rates:</td>
<td>Video: 1.15 Mbit/s (bps)</td>
</tr>
<tr>
<td></td>
<td>Audio: 224 kbit/s</td>
</tr>
<tr>
<td></td>
<td>Multiplex: 170 kbit/s</td>
</tr>
</tbody>
</table>

Notes on MPEG 1:
- The maximum data rate of the multiplexed (i.e. video & audio) content is 270kbps.
- Increasing the resolution of MPEG 1 beyond these specifications will not make a better quality MPEG, and in most cases will make playback worse.
- Increasing data rates will also not create significantly better MPEG-1 as the format can only hold a limited amount of information.
- MPEGs must be tested on target machines: testing on a different machine, such as a PC, is no guarantee of compatibility or of quality. This is a media player, like a Video-CD or DVD player, and just as that equipment is not compatible with all PC content, nor is the DV Media Player.
- 16x9 Aspect ratios can be used but due to lack of industry standardization of hardware, there is no guarantee that a Digital View media player, or any other
hardware, will auto-detect this flagging. Content must therefore be previewed on the player.

- Since data transfer cost is a major element of total network cost, always try MPEG-1 before concluding you must use MPEG-2, which is many times larger.

## 5.2 MPEG-2

Most famously known as the format behind DVD’s however is scalable and is also used for HD (high definition) video. File sizes will be considerably larger than for MPEG-1 due to the increased picture resolution.

MPEG-2 format is different depending on whether it is NTSC format (used in North America and Japan) or PAL format (used in Europe etc).

**PAL MPEG-2 FORMAT:**

| Video: | Video Size: 720x576  
| PAL Pixel Aspect Ratio (4:3)  
| 2 Fields Interlaced 25fps  
| Field order must match input file if transcoding from Quicktime or AVI |
| Audio: | 48 kHz Stereo  
| Mpeg must be encoded with an audio stream, even if audio is silent. |
| Data Rates: | Video: 4-6 Mbit/s (*)  
| Audio: 224 kbit/s |

(*) the format supports higher bit rates but these will not work reliably on DV Video Players

**NTSC MPEG2 FORMAT:**

| Video: | Video Size: 720x480  
| NTSC Pixel Aspect Ratio (4:3)  
| 2 fields Interlaced 29.97fps  
| Field order must match input file if transcoding from Quicktime or AVI |
| Audio: | 48 kHz Stereo  
| Mpeg must be encoded with an audio stream, even if audio is silent. |
| Data Rates: | Video: 4-6 Mbit/s  
| Audio: 224 kbit/s |

(*) the format supports higher bit rates but these will not work reliably on DV Video Players

**A word about data rates:** A good standard overall data rate for PAL/NTSC MPEG-2 is 5.5 Mbps (this is what DVD’s use). Maximum data rates of up to 8 Mbps can be reached but depending on the media player engine this may not be reliable and is dependent on content and playlist complexity. 6 Mbps is the highest data rate recommended for PAL/NTSC media players. Variable bit rate encoding can be used, but a fixed rate is recommended for general use.
HI-DEFINITION MPEG-2

| Video: | • Video Size: 1280x720 or 1920x1080  
|       | • Aspect Ratio (16:9)  
|       | • Progressive/Interlace 30fps/60fps  
|       | • MPEG-4 (Part 10) codec’s: AVC/H.264 |
| Audio: | • 48 kHz Stereo  
|        | • Mpeg must be encoded with an audio stream, even if audio is silent. |
| Data Rates: | • VIDEO: 12 Mbits/s  
|           | • AUDIO: 224 kbit/s |

5.3 MPEG-4

The newest of the adopted MPEG standards MPEG-4, particularly in the variant known as H.264 or AVC, is well known for having smaller files for equivalent quality compared to MPEG-2. It is also the basis of the compression used in Blu-Ray and is increasingly being adopted as the codec of choice for high definition but is equally suitable for lower resolutions as it is fully scalable.

PAL example encode at:

| Video: | • Video Size: 720x576 (Input size is still 720x576)  
|       | • PAL Pixel Aspect Ratio (4:3)  
|       | • 2 fields Interlaced 25fps  
|       | • MPEG-4 codec’s: DivX 5.2 or higher |
| Audio: | • 48 kHz Stereo  
|        | • Mpeg must be encoded with an audio stream, even if audio is silent. |
| Data Rates: | • VIDEO: 2 Mbits/s  
|            | • AUDIO: 224 kbit/s |

NTSC example encode at:

| Video: | • Video Size: 720x480 (Input size is still 720x480)  
|       | • NTSC Pixel Aspect Ratio (4:3)  
|       | • 2 fields Interlaced 29.97fps  
|       | • MPEG-4 codec’s: DivX 5.2 or higher |
| Audio: | • 48 kHz Stereo  
|        | • Mpeg must be encoded with an audio stream, even if audio is silent. |
| Data Rates: | • VIDEO: 2 Mbits/s  
|            | • AUDIO: 224 kbit/s |
5.4 H.264 / AVC

The H.264/AVC is also known as "MPEG-4 (Part 10)". This is a standard designed specifically with HD (High Definition) video. The Digital View ViewStream 500 series can support this H.264/AVC format with the resolution of 1920x1080.

H.264/AVC example encode at:

<table>
<thead>
<tr>
<th>Video:</th>
<th>Video Size: 1280x720 or 1920x1080</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aspect Ratio (16:9)</td>
</tr>
<tr>
<td></td>
<td>Progressive/Interlace 30fps/60fps</td>
</tr>
<tr>
<td></td>
<td>MPEG-4 (Part 10) codec's : H.264/AVC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Audio:</th>
<th>48 kHz Stereo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mpeg must be encoded with an audio stream, even if audio is silent.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data Rates:</th>
<th>VIDEO: 12-15 Mbits/s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AUDIO: 224 kbit/s</td>
</tr>
</tbody>
</table>

Note: If content is encoded with VBR (Variable Bit rate), the peak bit rate must not exceed 30Mbit/s. Some variable bitrate encodings may average in 15Mb but have peak at 30M+ which can result in playback glitches.

<table>
<thead>
<tr>
<th>Formats</th>
<th>MPG, MOV, MP4, AVI</th>
</tr>
</thead>
</table>

5.5 DivX

DivX is a proprietary codec based on MPEG-4 and thus offering similar benefits. It is supported on the ViewStream 100 & 300 media players.

PAL example encode at:

<table>
<thead>
<tr>
<th>Video:</th>
<th>Video Size: 720x576 (Input size is still 720x576)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PAL Pixel Aspect Ratio (4:3) • 2 fields Interlaced 25fps</td>
</tr>
<tr>
<td></td>
<td>MPEG-4 codec's : DivX 5.2 or higher</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Audio:</th>
<th>48 kHz Stereo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mpeg must be encoded with an audio stream, even if audio is silent.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data Rates:</th>
<th>VIDEO: 2 Mbits/s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AUDIO: 224 kbit/s</td>
</tr>
</tbody>
</table>

NTSC example encode at:

<table>
<thead>
<tr>
<th>Video:</th>
<th>Video Size: 720x480 (Input size is still 720x480)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NTSC Pixel Aspect Ratio (4:3) • 2 fields Interlaced 29.97fps</td>
</tr>
<tr>
<td></td>
<td>MPEG-4 codec's : DivX 5.2 or higher</td>
</tr>
</tbody>
</table>

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Audio:
- 48 kHz Stereo
- MPEG must be encoded with an audio stream, even if audio is silent.

Data Rates:
- VIDEO: 2 Mbits/s
- AUDIO: 224 kbit/s

## 5.6 WMV

WMV is a proprietary codec developed by Microsoft based on MPEG-4 and thus offering similar benefits.

<table>
<thead>
<tr>
<th>Video:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Size:</td>
<td>1280x720 or 1920x1080</td>
</tr>
<tr>
<td>Aspect Ratio (16:9)</td>
<td></td>
</tr>
<tr>
<td>Progressive/Interlace</td>
<td>30fps/60fps</td>
</tr>
<tr>
<td>Codec's:</td>
<td>VC-1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Audio:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>48 kHz Stereo</td>
<td></td>
</tr>
<tr>
<td>MPEG must be encoded with an audio stream, even if audio is silent.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data Rates:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>VIDEO:</td>
<td>8-10 Mbits/s</td>
</tr>
<tr>
<td>AUDIO:</td>
<td>224 kbit/s</td>
</tr>
</tbody>
</table>
FAQ – Frequently Asked Questions

<table>
<thead>
<tr>
<th>Q: What are the settings required when encoding with particular software for a DV media player.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Q: When playing back on the media player the video is not smooth, it judders.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Possible causes are:</td>
</tr>
<tr>
<td>• The video was created at one frame rate but encoded at a different frame rate.</td>
</tr>
<tr>
<td>• The encoding bit-rate (data-rate) is too high for the media player.</td>
</tr>
<tr>
<td>• The original video frame rate is too slow.</td>
</tr>
</tbody>
</table>
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