

HD Resolutions and Frame Rates—A Quick Primer

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Resolution—The number of pixels horizontally across the image by the number of pixels vertically from top to bottom. Resolutions can be specified as WxH (as in 1920x1080) or are often abbreviated with just the number of vertical lines (as in 1080).

Frame rate—the number of frames going by in one second. In the US, most every frame rate that is going to be broadcast is a fractional frame rate, meaning 29.97 instead of 30. Often for ease of discussion, however, people round up to the even frame rate even though they most likely mean the fractional rate. Double check!

Scanning Mode: Interlaced/Progressive—Refers to how each frame is presented at a given frame rate. In progressive images, the whole image is drawn on screen at once. This is also the way that good old film works, so progressive HD images often remind us of film.

In interlaced video, the image is split up into two fields, each of which contains half the resolution of the full frame. The fields are called odd and even or top and bottom because one scans lines 1,3,5,7,... and the other scans lines 2,4,6,8,... During each frame, one field is displayed slightly before the other, usually resulting in smoother looking motion and in the case of 1080i29.97, the ultra-real video look.

Field Dominance—describes which field is displayed first. If the odd frames are displayed first, the interlaced video is said to be odd or top. If the even frame is displayed first, the video is said to be even or bottom dominant. It is common to have problems with this in importation of animation—if you do, the video will look stuttery because the fields will be reversed as they play. Pays to double check!

Aspect Ratio—The shape of the image. Standard definition started out 4x3, various schemes have been invented to make it 16x9. HD video is always 16x9. If **upconverting** stock or adding other SD material to HD, you have three choices:

Anamorphic stretch—stretches the left and right edges of the SD image to fill the HD screen. If doing film transfers to HD, this is a good intermediary option to get the highest quality and greatest flexibility in online, where its shape will be corrected.

Center Crop—Cuts off the top and bottom of the SD image evenly, then blows up to HD

Pillarbox—Leaves the SD video intact, adding black bars on the left and right

If **downconverting** HD to SD, you similarly have three choices:

Anamorphic Stretch—stretches the top and bottom of the HD image to fully fill the SD frame. This is the way you make DVD's for widescreen TV display.

Center Crop—Cuts off the left and right sides of the HD image to fully fill the SD screen

Letterbox—Inserts black bars on top and bottom of SD image to preserve full HD image (very common)

Compression/Tape or File Format

Too many to name them all here, but basically refers to the way the image is represented as (usually these days digital) bits, and sometimes its tape medium.

Common Compression/Tape or File formats:

DV—Popular standard def digital format, miniDV cameras record this way. Also easy to natively capture into edit systems.

DVCPROHD—Panasonic’s compression format, used on their cameras, decks, and natively captured in editing programs. P2 cameras shoot on this format. High quality.

HDCAM—Sony’s compression format, used on their cameras and decks. Not licensed for use natively with editing systems. High quality.

HDV—A consumer HD format, highly compressed, available across multiple cameras, manufacturers, and resolutions. Try to minimize its use due to quality issues.

XDCAM—A Sony compression format and set of tapeless camera systems—fairly high quality. Avid and FCP have workflows to edit but test before using.

Uncompressed—The highest quality compression level available in editing programs—its actually very lightly compressed. Avid and FCP uncompressed are different—Apple’s is called Uncompressed 8 or 10 bit, Avid’s is called 1:1. File sizes are large and it takes a RAID to play back.

ProRes 422—Apple’s broadcast quality compressed HD format. Comes in many different resolutions and frame rates. Very efficient filesizes at high quality.

DnxHD—Avid’s broadcast quality compressed HD format. Also comes in many different resolutions and frame rates. Very efficient filesizes at high quality. Also nice because if done correctly, it allows “fast importing” of graphics into the Avid in online.

Animation codec—A very high quality, near uncompressed codec sometimes useful for getting graphics into NLE’s, especially Avid. Large filesize and slow imports.

IMPORTANT: Proper Syntax for Fully Describing Video Formats:

Though often shortened, the proper syntax for fully describing video these days is:

[Resolution]+[Scanning Mode]+[Frame Rate], e.g. **1080p23.98**

It is also useful to specify the compression type and tape/file format (e.g. on HDCAM)

A list of common (but not all) video formats

Common name (s)	Full Name	Resolution	Aspect Ratio	Scanning	Frame Rate	Comments
Standard Definition, NTSC, 30i	480i	640x480	4:3	Interlaced	29.97	Standard def NTSC, as we've known TV for years
Standard Definition, PAL, 25i	576i	720x576	4:3	Interlaced	25	Standard def PAL
720p, sometimes called Varicam	720p23.976	1280x720	16:9	Progressive	23.976	720p at film frame rate
same as above	720p25	1280x720	16:9	Progressive	25	720p for PAL markets
same as above	720p29.97	1280x720	16:9	Progressive	29.97	Good compromise between film look and video look
same as above	720p59.94	1280x720	16:9	Progressive	59.94	Looks like 1080i, ultra-reality. Sports on FOX shot and broadcast in this format because of the high frame rate.
1080i, or just 1080	1080i29.97	1920x1080	16:9	Interlaced	29.97	This is the most common broadcast format. Ultra real, crisp video look. Often incorrectly called 1080i59.94-- that's the FIELD rate not the FRAME rate.
1080i PAL	1080i50	1920x1080	16:9	Interlaced	50	The PAL version of interlaced HD video
24p, Universal HD Master	1080p23.98	1920x1080	16:9	Progressive	23.98	Has film look combined with higher resolution. Often called "Universal Master" because easy to convert to any other common video formats-- speed up for PAL, add duplicate frames for NTSC, or speed up to 24 and filmout for theatrical release.