

## Digital Movie Making CineAlta™ Production Guide

### Introduction

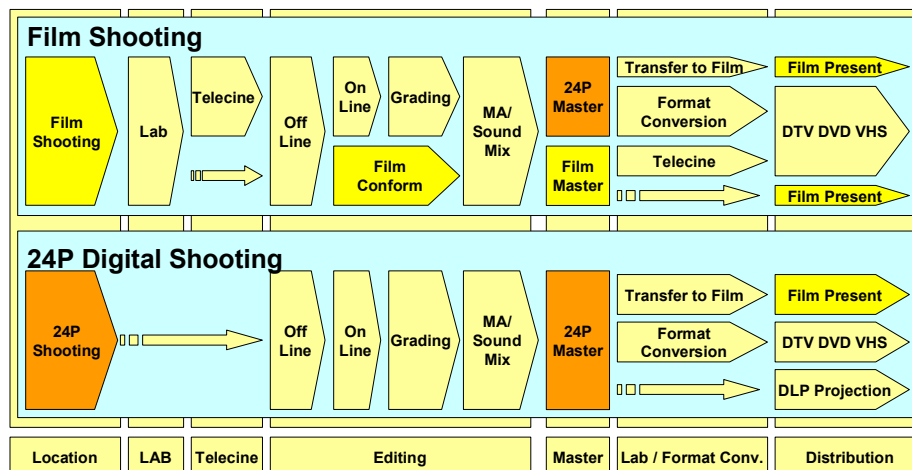
The arrival of digital 24P, epitomised in Sony's CineAlta™, is poised to change the way that movies, commercials and high quality television programmes are produced and distributed in a quite profound way. 24P is a generic name for a real time digital high definition environment with 2k x 1k resolution running at the native film frame rate of 24 progressive frames per second. It has already been accepted by many as the most appropriate medium for film mastering and high quality programme production and exchange. The flexibility and convenience of digital HD delivering cinema quality pictures simplifies exchange of programmes on the world-wide basis as well as opening new possibilities for global co-production and project collaboration.

The intention of the following pages is to explain basics and terminology associated with 24P production.

The familiar production stages are still valid: principal photography, either on film or on digital 24P is followed by off line editing. Post production includes auto-conforming, effects creation, grading, sound dubbing, etc. resulting in a creation of a 24P digital master which has a very universal appeal. This 24P master can be used to feed wide range of distribution channels and also for transfer to film for theatrical film exhibition or emerging digital d-cinema presentation.

The sure sign on the exciting journey from a script to screen that you are on the right track is CineAlta. CineAlta is a name Sony introduced to symbolise the bond between cinematography and digital high definition imaging. It distinguishes a Sony family of products and systems that offer new creative possibilities for production, post production and global exchange of motion pictures.

### Workflow - Film Shooting and 24P Digital Shooting



## 1. Shooting

The choice of shooting medium is determined by many factors. The available budget, artistic requirements, time-scales, type of location, etc. will certainly determine how to plan this stage of production. Depending on how camera is configured and crew organised it can be run as a very conventional cinema style production as well as a fast moving “Cinema Verite” shooting.

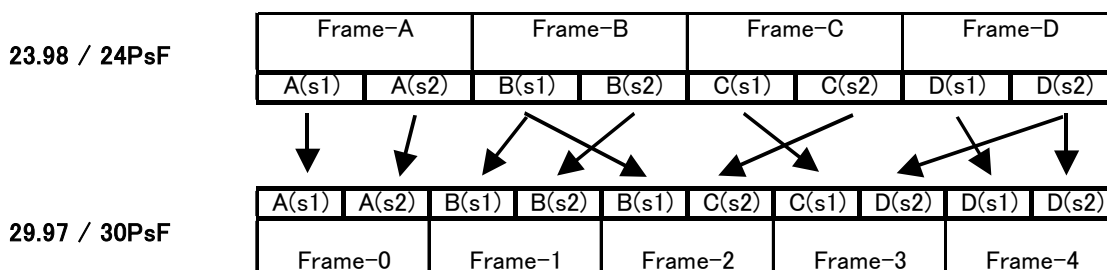
The choice is either to shoot on film, which can be 35 or in some cases even Super 16, or to go digital and use 24P HDCAM™ camcorder.

Things to choose are; frame rate for your production, type of lens, lighting and camera setting.

### i) What to do if go with Film Shooting?

In case of film shooting, telecine transfer is required in order to get film elements converted to 24P HDCAM tapes. During the process of telecine transfer in 50 Hz countries, film is run at 25 fps or 24fps. If it is for television, shooting at 25 fps will produce a perfect match between film frames and video fields. If, however, shot at 24 fps it is still often run during telecine transfer at 25 fps to maintain simple frame-field correspondence, but produces 4% faster-running video and sound.

In 60 Hz countries “3:2 pull-down” sequence is normally used to convert 24 film frames into the 60 Hz (or more precisely 59.94) video signal, where film frames are alternatively scanned with two and three video fields. This is the working practice that calls for extra precaution during editing.



In that respect telecine transfer to 24P makes perfect sense resulting in creation of a digital replica of the original film elements at the high definition resolution and at the native film frame rate of 24 fps. Sony Vialta™ telecine does the justice to film delivering highly stable pictures characterised by subtle tonality as well as with reach and fateful colours and naturally fine details.

### ii) Go Digital with 24P Digital Shooting

The alternative is to go digital and shoot with CineAlta camera. The ground braking HDW-F900 is capable to deliver outstanding visual performance out of a small and compact body that closely resembles to widely popular Digital BETACAM™. Movie

making has been liberated with the creative empowerment of the cinematographer. It is facilitated by real-time HD image evaluation on-set, instant replay of a full-colour-resolution digital “take”, real-time image optimisation while shooting, a 50-minute shooting load and, most importantly, by the significant cost-benefits associated with this digital medium. If you like to use with Steadicam™, it is required to have either downconverter for composite video monitoring fitted to the camera, or an LCD monitor with HD component input fitted to the Steadicam™ rig.

### iii) Which Frame Rate to choose for Your Production?

It is very important to choose which frame rate to shoot at. 24P camcorder HDW-F900 has a switchable frame rate and it can run at 24, 25 and 30 progressive frames per second as well as at 50 and 60 interlace. Appropriate shooting frame rate is to be chosen up to type of production that you intend and territories that you belong to.

For those emulating film production that intends the market of theatrical projection, the choice is 24P. If you want to maximize potential for world-wide sales in various shape of distribution, the choice is 24P, too. You can use 3:2 pull-down to create a NTSC down-converted version as well as run it just a little (4%) faster to create PAL version.

However, here’s one tip for those in 60Hz countries. If you intend downconverting to NTSC format for off-line editing or if main use of the image is for TV on-air either on SDTV or HDTV, off-set version will be useful, which runs 0.1% slower. Shooting at 23.98P is recommended choice to keep the exact match of time code in downconverting and syncing the sound (that is running at 29.97 NDF on external recording device).

23.98P	Off-set version of 24P, progressive scan
24P	24 frames per second, progressive scan
25P	25 frames per second, progressive scan
29.97P	Off-set version of 30P, progressive scan
30P	30 frames per second, progressive scan
50i	50 field per second, interlaced
59.94i	Off-set version of 60i, interlaced
60i	60 fields per second, interlaced

All is possible and what is even more important HDCAM like film allows various frame rates to be intercut to achieve desired visual effect, i.e. speeding up and slowing down.

### iv) Need somebody having digital video skill and knowledge?

What is the most important for making a good shot with CineAlta camera is lighting and picture composition skills rather than familiarity with the camera. If a Director of Photography has not much experience in digital shooting, you are recommended to hire a Video Engineer with digital experience. If you have ever used Digital Betacam Camocorder, you may be able to take advantage of the past experience in getting on with CineAlta camera. The conversion of knowledge and experience is straightforward.

All you have to pay attention to is choice of frame rate, use of the shutter, time code and monitoring.

v) What Type of Lens is Available for Digital Shooting?

The range of available lenses for this digital movie camera is impressively wide and includes greatest names of the motion picture industry led by Panavision. Also, various types of lenses are available including cinema style zooms and fixed focal lenses as well as EFP style portable lenses. Adapter for 35MM Ultra Prime Lens is available as a combination of Carl Zeiss and Angenieux.

**Available Lenses**

<b>Type</b>	<b>Lens Manufacture</b>
Prime Lens (Fixed Focal Lens)	Panavision Carl Zeiss Fujinon Canon (to be available in January '02)
Zoom Lens	Panavision Fujinon Canon
Cinema Short Focal Lens	Carl Zeiss

vi) When to use an electronic shutter?

When shooting at 24P, each frame is normally exposed for 1/24th second. If shooting with a film camera, a 180 degrees shutter means that you still take 24 frames per second but each frame is exposed 1/48th second. This is exactly the way that a film image is exposed. Therefore it reproduces the motion effect of film, by using electronic shutter at as twice speed as the frame you set. For instance, if shooting at 24P, you might set the shutter to 1/48th second to give the effect of a film camera running at 24 frames per second with a 180 degrees shutter.

vii) What about Monitor Setting?

Monitor should work as the only and absolute principle to adjust images in a consistent way to serve to be reference. This is the very necessary condition to ensure the possession of desired images, continuous lighting, exposure etc. Sony has wide range of 24P supported monitor from 9 inch up to 32 inch size. You can make a choice of the size depending on your purpose and budget.

viii) Where can I find CineAlta products?

There are an ever-increasing number of rental and production companies offering production services with HDW-F900. Panavision is among the first to provide Panavised version of Sony HDW-F900 with wide range of Primo Digital® zoom and fixed focal lenses. Many other prominent Digital Cinematography specialised hire companies will also be quick to augment their services by introducing 24P HDCAM camcorders. For

the current list of hire companies, please see the appendix of this booklet or contact your local Sony office.

## 2. Off-line editing

Off-line editing is the process to work out EDL that will be used for On-line editing process. After shooting, you make sure you choose a 24P compatible off-line system in the same way that you do as a process in film production.

### i) What do I need to have in working on Off-line editing?

HDCAM 24P digital recorder HDW-F500 has a built-in down converter ideal for providing perfect standard definition copies for viewing and off-line editing. Through its SDI standard definition 601 output, an HDW-F500 can be used to feed directly off-line system or to be hooked up with appropriate standard definition video recorder for making required PAL or NTSC copies.

Avid Media Composer (version 9.0), Film Composer and Symphony can both handle 24P based time code and deliver 24P-based EDL. Apple's Final Cut Pro is also capable of editing at 24 fps. This way created 24fps based EDL can be used as the basis for on-line editing in the suite controlled by the well-known Sony edit controller BVE-9100 for 24P on-line editing.

### ii) How can I off-line in PAL?

The 24P capable off-line systems should be able to track video time code (25fps or 30fps) and create compliant 24P EDL based on the original 24P time code. This is particularly important point. In Europe it is to be expected that 24P master will have the exact sync relationship with 625/50i PAL format. This 24P images will be down-converted and fed to an off-line editing system together with the 25 fps based TC. In this environment, the 25 fps picture runs at 4% faster speed. But, the 24P compliant software will convert it to original 24P TC as well as offer a choice to get the other EDL at different frame rates i.e. 25fps.

### iii) How can I off-line in NTSC?

In USA and other 60 KHz countries, the off-line editing will be somewhat different. 3:2 pull-down method makes NTSC version stay at the same duration as 24P master, therefore making off-line editing very similar to that of 24 fps film with NTSC telecine transfer. If a sequence is edited at 30fps, the match back process needs to happen in order to translate the relationship between the 30fps based EDL and 24P EDL. There are several application software available on the market that enables this functionality.

NTSC standard is not precisely 30 frames per second, but rather 29.97 frames per second. 24P to NTSC down-conversion makes 4 progressive frames into 5 interlace frames, which means that the 24P images should run at 23.98 frames per second

instead of 24. Consequently, the original images slow down by 0.1%. This difference will not be enough for human eyes to perceive. However, the important thing is that if the sound needs to keep synch with the picture it should be slow down by an equal amount.

### 24P capable off-line NLE Systems

Manufacturer	Model Name	Remarks
Avid	Media Composer v9.0	Standard on MC 9000 XL, Film Composer XL Option on MC Offline XL, MC 1000 XL
	Symphony Universal v3.5	
Apple	Final Cut Pro 2	

#### [Example Case]: Off-Line on Avid Media Composer

1. Shoot at either 24P or 23.98P
2. Make NTSC dub at 29.97 fps
3. Digitize the NTSC dub into Media Composer version 9.0.
4. In source clip bin, duplicate the Start column into the TC 24 column.
5. Edit the project
6. Using EDL Manager 10.1 (or later), select Source and Output format as 24 or 23.98. You can get EDL in the shape that you want.

### 3. On-line Editing

The type of programme and its duration will influence which kind of post-facility to use for postproduction. Already many postproduction houses are offering film related services. Thanks to their existing resolution independent CGI systems they can easily adopt CineAlta and handle 24P HDCAM projects. The interfaces between HDW-F500 studio HDCAM recorder and workstations are readily available. This will allow treatment of 24P productions in the same manner as it is now the case with current 601 video or film works. It should not be forgotten however that the 24P file sizes are much bigger than for 601 SDI so things may get slower.

#### i) Want to On-Line on Resolution Independent NLE System

Discreet and Sony are collaborating on an HDCAM software codec enabling input/output, storage and manipulation of HDCAM signal over conventional SDI interfaces. The HDCAM signal can be moved directly into "fire\*" or "inferno\*" through the video input card on the ONYX2. This enables real-time playback, editing and effects work on full-resolution pictures. The resulting sequences are then encoded by the software codec in HDCAM format and then output throughout the standard 601 interface in real-time. Sony's designed editing workstation "XPRI" is also available as a popular tool for editing on either HDCAM or baseband. This development is further widening the range of available options for postproduction promising a cost-effective interface with existing software applications.

Furthermore, the new SGI real-time HD I/O board provides an alternative approach of interfacing SGI workstations with HD equipment. In this way base-band, full-resolution images can be moved in real-time for any required editing or effects work.

### HDCAM 24P Ready NLE System

Manufacturer	Model Name	Remarks
Sony	XPRI	
Discreet	Fire Smoke Inferno flame	
Pinnacle	Cinewave Ver 1.2	
Avid	Symphony Film Composer MC9000 XL MC1000 XL	Option Required
Quantel	Edit Box Henry Infinity	

#### ii) Is there Linear On-Line Editing System yet?

For long form programmes, linear on-line editing will remain the most efficient way of auto conforming for a while. A simple linear edit suite can quickly auto-assemble the rough-cut version using as a starting point a 24P EDL from the off-line. The 24P on-line edit suite controlled by the well known Sony edit controller BVE-9100 will provide resourceful environment for many types of productions. Its new 24P upgrade brings this legendary editor to the centre stage of 24P linear and hybrid postproduction.

Sony also provides a wide range of HD video switchers (HDVS Series and MVS-8000) and DVEs (HDME series) incorporating fully switchable frame rate capability. All models are able to work at 24P, 25P, 30P, 50 Hz and 60 Hz interlace. They incorporate a wide range of familiar features, including colour correction and 3D effects, all in real-time making on-line editing as efficient as ever.

#### iii) How can I inter-cut Standard Definition Footage?

In some instances 24P production may require insertion of a footage coming from a standard definition such as Digital BEATACAM. Emerging up-converters from Sony and other manufacturers provide simple and straightforward solutions. However it is important to remember that if the standard definition footage is interlaced it will keep that footprint when up-converted. Also 625/50 standard definition material will smoothly up convert to 1080/50i or even to 1080/25P if originated on film and for inter-cutting into the main 24P edit it would require speed change of 4% to compensate for the frame rate difference.

The HDCAM format is very robust and provides consistent picture performance even in multi-generation situations. This way the original picture quality can be maintained throughout the entire post production.

iv) Do we see more manufacturers/solution providers serving HD24P production?

An increasing number of 24P capable disc recorders is emerging. Many already incorporate the HD-SDI interface. Moreover, any 601 non-compressed disc-recorder is capable of storing HDCAM signal using the SDTI interface. They are welcome additions to non-linear suites providing important operational flexibility.

Only in a year after the 24P introduction, there is such an impressive list of high profile companies that support production in 24P environment.

Accom  
Apple Computer  
Avica  
Avid Technology, Inc.  
Chyron Corporation  
Da Vinci Systems  
Digital Origin  
Digital Vision  
Discreet Logic  
Dolby Laboratories  
DPS  
Evertz Microsystems Ltd  
Faroudja Labs  
Film Logic  
Leader Denshi  
Leitch/ASC  
MTI  
NothingReal  
Nvision  
Pandora International Ltd.  
Philips  
Pinnacle Systems  
Pluto Technologies  
Post Imporessions  
Quantel  
Shibasoku  
Sierra Design Labs  
Silicon Graphics Inc.  
Snell & Wilcox  
Sony Tektronix  
SyntheSys Research  
Tektronix  
YEM

v) How to make Slow Motion Sequence

The CineAlta product family allows total freedom in frame rate switchability. Importantly, CineAlta camera can run at various speeds. This makes possible to create effective

slow motion sequence without any picture degradation simply by changing its speed. If you play back 30P shot images at 24P mode, it shows 20% slow down.

If you want to have more variety of sequences, you could shoot at 60i and convert it to 60 P in post production process. By playing back the images at 24P, you could have x2.5 slow motion.

It is even possible that you have slow motion sequences at variable speeds on NLE system. The "Over/Under Cranking" can be added at the post process. By using the inferno's "TimeWarp" or Quantel's "Stretch" function, HDCAM produces the same effect. Also, there are several Windows based time-warp software available at reasonable price in the market, that enables change the motion speed such as RealViz's Retimer.

#### 4. Grading

HDCAM format has plenty of headroom and allows great deal of tape-to-tape grading to be carried out in order to bland sequences and create final version. It gives similar performance in terms of how fare the signal can be altered to well proven Digital BETACAM.

##### i) What Grading System is available?

The wide range of tools is readily available and well suited to meet demanding expectations for finishing production. HD capable colour correctors from companies like da vinci, Pandora, Pogle and Digital Vision can provide sophisticated level of colour manipulation for HDCAM tape-to-tape grading.

High quality 24 and 32-inch multi-format master monitors from Sony (BVM-D series) are indispensable in determining the final look of the production.

#### 5. Audio

Audio handling has great deal of similarity with current working practices for film and television productions. Its frame rate switchability opens a possibility to even create a 24 fps sound track by synching 24P player and audio environment.

The HDCAM format records 4 digital audio channels (AES/EBU). HDW-F500 recorder can accommodate Dolby-E over 2 audio channels, which can be editable by frame. This function effectively works for digital surround audio distribution. Dolby-E bit stream can be configured for 5.1+2, 5.1+1+1, 3x2 and 6x1.

It is important to remember that a 24P master when played back at 60i will maintain the same duration and sound pitch. As with film, when run at 50i for European audience, it will require a change of speed of 4% and also change of pitch if and when requested. However, when transferred to 24 fps film the sound track will remain unchanged.

#### 6. Distribution

24P digital master is multi-usable for such various purposes as TV on-Air (both in 50Hz countries and 60 Hz countries), master for package mediums such as VHS and DVD, Digital Cinema Projection as well as film recording master.

i) Want to TV On-Air or make Package Mediums?

24P digital master is directly usable in both 50 and 60 Hz countries and does not require any standard conversion. The HDW-F500 recorder has a built in down converter (HKDV-501A) which provides simultaneous standard definition 601 SDI output at the same frequency as the main HD output. This output also has various modes of aspect ratio conversion.

In Europe the same 24P HDCAM master can be played back at 25P or 50i. This produces change of speed, same as with film, and the total duration becomes 4% shorter. The HD output in this case is 1080/50i (or 25P depending on its origination) while standard definition output provides Digital BETACAM quality 625/50 (PAL) output. The External Multi Format Converter (MFC) such as Sony's HKPF-9000 is required for obtaining all other scanning formats compliant with American DTV. This includes 720P, 480P, etc. at relevant frame rates. The same unit also provides wider range of options for handling aspect ratio conversion.

ii) Want to Present at Theater (Film and Digital)?

For film applications, film recordings and D-Cinema presentations, 24P HDCAM master should be played back at the native 24P frame-rate. In this mode HD-SDI output delivers 1080/24P signal while standard definition output gives 525/60 (NTSC) with 3:2 pull-down sequence. For D-Cinema presentation, there are several types of technology being developed for theatrical large venue projection, which are DLP, D-iLA and GLV.

## 7. Transfer to film

Converting from 24P master to film produces footage that can easily be associated with the quality originated on film. After all having the same motion capture of 24 fps as original film ensures that transfer has a familiar footprint.

i) What choice do I have for Transfer from 24P to Film?

Many companies are already providing the service for anyone who can handle 2K film resolution transfer as well as handle 24P HDCAM. The most common technology for video-to-film transfer is the film recorder.

ii) What type of Film Recorder do they have?

There are two types of film recorders. One is a camera that exposes film by shooting light from a high-resolution cathode ray tube (CRT) monitor through red, green and blue filters. The other one uses lasers. The red, green and blue lasers scan the film frame in order to reconstruct the images. Both CRT and laser film recorder could work at a real time, depending on the resolution of the images.

iii) What is EBR?

The EBR system developed by Sony is the only one that uses electron beam recording for the video-to-film transfer. EBR fires electrons at unexposed film, one pass, or exposure, for each of red, green and blue elements. The result is much like color separation used in the print media prepress industry, in that the individual red, green and blue separations are printed in layers to create the color images. EBR produces outstanding picture quality and its service is available at Sony Picture HD Center in Culver City and Sony PCL in Tokyo.

iv) What else is coming up as the latest development?

The recent development in the field of film recording is the introduction of Arrilaser, which is gaining popularity and market acceptance.

There are also companies like Swiss Effects who have developed their own systems offering well-reputed service.

v) Tips

The important consideration in deciding which facility to use for film recording is the total duration of the production. Some systems are slower than others and that could impact delivery and completion.

It is important to remember that every film-recording facility will master their own approach to transfer to film and only by running a test one can see what quality and cost could be expected. It is also highly recommendable to approach film-recording facilities as early as at the pre-production stage and to keep close contact with them during the entire production.

## 8. “The proof of the pudding”

The first programme ever produced in CineAlta was “The Ground Beneath Her Feet”. Directed by Wim Wenders, it harmoniously intercuts film-originated sequences from his latest movie “The Million Dollar Hotel” and material shot in Dublin with the HDW-F900 camcorder. This CineAlta camcorder was modified by Panavision to accommodate its newly developed Primo Digital zoom, as well as standard 35 mm film accessories. The zoom is the first in a series of Primo Digital lenses being developed by Panavision to deliver optimal image performance while shooting with 24P HDCAM. Elaborate and sophisticated post production was carried out by Das Werk in Germany. Their own computer-graphics environment was configured to handle 24P HDCAM material. Off-line was carried out at 24P using their Avid film-composer and on-line and effects work were done in their discreet\* “fire\*”. “The Ground Beneath Her Feet” had a digital premier at the Berlin Film Festival in February 2000, just 2 weeks from the day it was shot.

Lucasfilm, Panavision and Sony set out to develop a system for shooting next two episodes of Star Wars. 24P was logical choice and HDW-F900 was developed to meet the requirements of this very demanding production. The direct digital shooting is expected to increase production efficiency skipping timely stage of film scanning required for effects work.

“Vidocq” a French movie epic starring Gerard Depardue and directed by Pitof is also produced by CineAlta. Duboi, leading French Digital Effects company has undertaken the 24P postproduction of this ground-braking movie.

In Japan, Shunji Iwai has taken HDW-F900 for shooting his latest masterpiece “All about Lily-Chou-Chou”. The movie features a number of scenes that takes advantage of CineAlta’s unique characteristics.

## 9. Conclusion

The 24P high definition is about large picture, its 2k x 1k images look stunning when blown on the large cinema screen. 24P is uniquely film, computer and video friendly. It is firmly supported by many industry-leading companies providing creative tools for even the most demanding production requirements. It is universally exportable, exceptionally mobile and extremely budget-friendly. So no surprise that it is so well received and already adopted for a large number of mainstream productions.

The so-called 1080/24P has been approved by ITU as the most suitable format for the international high definition programme exchange (recommendation ITU-R BT.709-3). With CineAlta and 24P, it is now possible to create a single digital master from which all other video formats or film recordings can be derived. Simply, this is the first global digital format ever created specifically to suit the needs of Motion Picture, HDTV, 50 & 60 Hz television, DVD, Internet, future D-Cinema and all other electronic and digital distribution media.

So, Welcome to the future with CineAlta!!!

## Glossary

### 1035/60i

The high definition signal with 1035 vertical active scanning lines and 1920 active pixels horizontally at 60 Hz interlace. Superseded by 1080/60i.

### 1080/24P

The high definition signal with 1080 vertical active scanning lines and 1920 active pixels horizontally at 24 progressive frames per second. Endorsed by ITU as the most suitable format for international programme exchange.

### 1080/25P

The high definition signal with 1080 vertical active scanning lines and 1920 active pixels horizontally at 25 progressive frames per second. Progressive version of 1080/50i and more suitable for presentation in 1080/60i.

### 1080/30P

The high definition signal with 1080 vertical active scanning lines and 1920 active pixels horizontally at 30 progressive frames per second. Progressive version of 1080/60i. Suitable for over- cranking when producing in 24P.

### 1080/50i

The high definition signal with 1080 vertical active scanning lines and 1920 active pixels horizontally at 50 Hz interlace. Adopted by Australia as the main HDTV format, also endorsed by EBU as the HDTV format for Europe.

### 1080/60i

The high definition signal with 1080 vertical active scanning lines and 1920 active pixels horizontally at 60 Hz interlace. Because of its good motion portrayal consider as very appropriate format for American and Japanese HDTV service. Format of HDTV choice of some major USA networks.

### 24P

Short for 1080/24P.

### 24PsF

24 Progressive, segmented Frame. The way 1080/24P is packaged and send around. Basically the same thing as 24P, but written in engineeringly more specific manner.

### 2k – film resolution

2,000 pixel (actually 2,048) resolution. Accepted as the practical film resolution, i.e. 2048 active pixels across are used to scan each open gate film frame. For the frame formats that allow space for sound track, the horizontal pixel count is below 1920 of HD.

### 50i/60i

Short for 50 or 60 Hz interlace.

### 601

Short for ITU-R 601. This standard defines the encoding parameters of digital television for studios. It is the international standard for digitizing component television video in both 525 and 625 line systems and

is derived from the SMPTE RP125. ITU-R601 deals with both color difference (Y, R-Y, B-Y) and RGB video, and defines sampling system. RGB/Y, R-Y, B-Y matrix values and filter characteristics. ITU-R 601 is normally taken to refer to color difference component digital video, for which it defines 4:2:2 sampling at 13.5MHz with 720 luminance samples per active line and 8 or 10-bit digitizing.

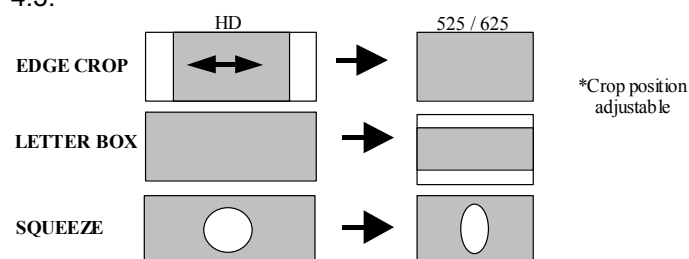
### Aspect Ratio

To convert 16:9 pictures to 4:3 pictures, there are three common ways to derive 4:3 deliverables from 16:9 pictures.

[Edge Crop]: Source and target share common top and bottom; most cropping is horizontal.

[Letter Box]: Maintains the original aspect ratio of the image inside the target ratio by adding black bars to the top and bottom of the frame.

[Squeeze]: Picture is squeezed in the horizontal direction in accordance with the conversion from 16:9 to 4:3.



### CCD (Charge Coupled Device)

The heart of digital cameras- converts an optical image into an electrical signal. Light is focussed onto a CCD array, consisting of a large number of individual photosensors (pixels). Each pixel produces an electrical signal proportional to the intensity of the light. A scanning system enables the electrical signal to be read out sequentially through a suitable amplifier. Modern CCDs offer low noise, wide dynamic range, high resolution, and freedom from picture artefacts. CCD sensors are also used in telecines, some have line array and some, like Sony Vialta, full area array.

### CIF

Common Image Format, endorsed by ITU as the world wide high definition standard. It consists of 1920 active pixels horizontally by 1080 vertical scanning lines. The worldwide HDTV format.

### Data compression

The process of reducing the original data rate. The original pictures are analysed and redundant and repetitive information discarded. This allows moving or still images to be transported and stored more efficiently. The compression ratio indicates the level of compression applied. Greater compression can be expected to result in worse quality, but different techniques give widely differing quality of results for the same compression ratio. Since early days, compression techniques improved immensely.

### Drop-frame (timecode)

The 525/60 line/field format used with NTSC color coding system does not run at exactly 60 fields per second but 59.94 fields, or 29.97 frames per second – difference of 1:1000. Timecode identifies 30 frames per second. Drop-frame timecode compensates by dropping two frames at every minute except tenth.

### EDL

Edit Decision List created in off-line and used for auto-conforming in on-line.

## HDCAM

½-inch format developed by Sony for recording high definition signals. Extremely efficient scheme similar to Digital BETACAM characterised by high picture quality and multi generation capability. Allows real time recording of “2k x 1k” progressive or interlaced images at various frame rates. Line-up includes mobile, lightweight and compact products including camcorder (HDW-F900) and editing studio recorder (HDW-F500).

## HD-SDI

High Definition Serial Digital Interface with data rate of 1.4 Gbps. Carries base-band HD signal with accompanying Audio channels and time-code.

## Interlace/Progressive

Manner in which moving images are captured. Film is progressive and entire frame- picture content is capture at the same time. Video is interlaced and each frame consists of two fields (odd and even lines) with different temporal content. 24P camera is capturing pictures in the same manner as film. Progressive signal is characterised by strobbing, while interlaced signal has smooth motion portrayal.

## ITU

International Telecommunication Union (formerly CCIR), Body of United Nations responsible for global standardisation. Both, SMPTE and EBU are part of it.

## Non-Drop-Frame Timecode

Timecode that does not use drop-frame and always identifies 30 frames per second. This way the timecode running time will not exactly match normal time. The mismatch amounts to 1:1000, an 18 frame overrun every 10 minutes. This applies to 525/60 systems only as 625/50 systems have an exact number of frames per second.

## RS-422

Standard for serial data communications defined by EIA standard RS-422. It uses current-loop, balanced signalling with a twisted pair of conductors per channel, two pairs for bi-directional operation. It is widely used for control links around video production and post areas for a range of equipment; VTRs, mixers, editing controllers, NLEs etc.

## SDI

Serial Digital Interface- 270 Mbps video interface allows digital interface of 601 SDI equipment. Carries video, audio and time-code information.

## SDTI

Serial Data Transport Interface- 270 Mbps data interface allows digital interface. Carries data. HDCAM signal can be routed through the existing SDI infrastructure.

## SMPTE

Society of Motion Picture and Television Engineers, responsible for standardisation and technological harmonisation in USA and beyond. All HDCAM products and other HD equipment is fully compliant with SMPTE standards.

First edition (English): January 2002  
Second edition (English and Japanese): October 2002

©2002 Sony Corporation. All rights reserved.  
Reproduction in whole or in part without written permission of Sony is prohibited.  
Features and specifications subjects to change without notice.  
Sony is a registered trademark of Sony Corporation, Japan.  
CineAlta is a trademark of Sony Corporation, Japan.  
All other trademarks are property of their respective owners.

