



XDCAM EX, What you really need to know

WHAT IS XDCAM-EX

XDCAM-EX was launched during 2007 as a new HD video production system and format which records onto high-speed non-volatile memory cards allowing up to 70 minutes of HD video to be captured on a 16GB memory card.

This is Sony's answer to Panasonic's P2 system and it is called XDCAM EX.



16GB SxS Xpress Card Media

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WHAT IS HOT ABOUT XDCAM EX?

It is small, very portable and very affordable with superb quality at its price. The XDCAM EX format uses the same basis for data compression system (codec) as HDV and its larger brother, XDCAM HD, which is the well-proven MPEG 2 long-GOP, so the format though fairly new relies on well-proven technology.

As the camera head has a true 1920x1080 CCD block, some HD Broadcasters have cleared this format for conditional use in HD deliverable productions – a great plus point as the format is really great value, although the limited bandwidth and heavy compression mean that the recording format is not cleared as an approved HD acquisition format for many Broadcasters.

The compression scheme is very efficient and achieves a high level of compression, so that 1 x 16GB card stores 50 mins at HQ mode in 1080 compared with just 16 mins using the Panasonic P2 system (or 30 mins using P2 at 720Pn mode).

The current camera range feature a native 3 x 1920x1080 1/2" CMOS camcorder (unlike the Panasonic HVX-201 model cameras which have a 1280x720 CCD block). The cameras have been extremely well received by producers and cameramen alike owing to the quality being the best of its category. Worth mentioning that XDCAM EX, unlike the Panasonic P2 format does capture the full 1920x1080 pixels when capturing to solid-state cards when recording in HQ format 35Mb mode. The P2 system and SP recording modes actually only record 1440x1080 – but still looks really good though!

The EX-3 has an HD-SDI output which is another very useful function, since it permits an uncompressed 4:2:2 image to be recorded onto other formats, such as HDCAM – I have even heard of EX-3 cameras being used to record to HDCAM SR for certain multi-camera

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applications (such as B cameras in film shoots and stunt shoots), owing to its quality, convenient size and relative low cost!

It also lends itself very well to multi-camera environments and we have designed a low-cost HD multi-camera shooting package based around the EX-3 and the Sony Anycast multi-camera production system, as the EX-3 also has genlock and timecode in/out functions not available to other cameras in its class. The Sony EX-3 also has interchangeable lenses using a new adapter that permits 2/3" HD lenses to be fitted for great versatility, so that for the first time, HD cine-style and HD Prime lenses and long HD lenses can be fitted to a camcorder in this class.

It interfaces extremely well with Final Cut Pro (FCP) and has AVID compatibility (see below) allowing you to easily shoot onto data cards and transfer the media to hard disk before editing on FCP in HD without using any tapes. There is even an archive function within the design of the Sony software and hardware which allows XDCAM EX data and edit archive to be stored to XDCAM-HD optical disks – a great and low-cost media format.

WHAT IS NOT?

Firstly, the 2 cameras in the product range although excellent quality are quite front-heavy – not a problem if they are tripod-mounted but this is very noticeable if you use large HD lenses and use the camera on the shoulder. Anton Bauer makes a powering option, which helps to balance the camera in this mode but then you must use Anton Bauer batteries.

XDCAM EX is based on the long-GOP MPEG2 compression codec. Although this compression codec is not new, the format is still relatively young, so you will need to have the latest version of FCP and AVID Media Composer version 3 for the XDCAM workflow to work properly. Although saying that, once the appropriate pug-ins are used, the system works very well.

The post-production workflow from XDCAM EX and XDCAM-HD are a little bit different – XDCAM EX works seamlessly with FCP and XDCAM HD works seamlessly with AVID but once again, once the appropriate Sony plug-ins are installed, the software takes care of this and you need not know that you are working from 2 x different formats. What is happening here is that the free Sony clip browser software quickly and easily 'rewraps' the respective XDCAM formats into versions which both FCP and AVID can both read directly but does this within the FCP or AVID applications so you don't have anything else to do!. Thus post-production is easy and compatible with all current formats.

As this system uses the same long-GOP compression scheme as HDV (although with less compression), under certain rare conditions, the codec may struggle when a sequence of images does not follow a predicted pattern – (like a single bright frame illuminated by a solitary flash gun). Under conditions of strobe lighting, it may cause 'blockiness' on certain frames during the recording. This is because the compression scheme relies on the previous frames to build future frames and a problem may be caused if a previous frame breaks the predicted pattern. This may make the compression scheme unsuitable for certain types of programming, though I would stress that these conditions are rare.

In our opinion, the format is unsuitable for chroma-key as a consequence of heavy compression of colour information (4:2:0 colour space). This does not mean that you cannot use XDCAM EX for chroma key - it uses the same colour compression system as DV and HDV, so if you currently use these formats for chroma-key and you are happy with the performance, then there is no issue! However, it is worth knowing that the chroma-key cutout will not be as clean as when working in a 4:2:2 colour space format, such as XDCAM HD 4:2:2 or DVCPRO HD. There has to be a price to pay for efficient coding and this is it!

What this means in English is that if you compare images shot with Panasonic P2 with an HVX-201 vs. XDCAM EX with an EX-3, then aside from the technical and subjective comparisons of image production values, they will look very similar **but** the chroma-key will be



superior on the P2 system since twice the colour information is recorded on the Panasonic codec. Thus chroma-key and heavy grading will also be easier using 4:2:2 formats but this does not matter on most productions – worth being aware of though.

ABOUT XDCAM EX

This name is a bit confusing as it shares the XDCAM name with the larger XDCAM-HD format which is an entirely different format (although the coding and compression systems are shared)!

XDCAM HD is a format which shoots onto Magneto Optical disks (think of flat tapes...- see image) and XDCAM EX uses the same compression scheme as XDCAM but records instead onto low cost SxS Express Card media cards at a lower data rate than the XDCAM-HD format. (In fact, XDCAM HD and XDCAM EX can both shoot at the same 35Mb rate but the later PDW-F700 XDCAM HD Camcorder is capable of shooting at the higher 50Mb rate)

This very much competes with the Panasonic P2 system, and as so, this is only a practical system if the post-production workflow seamlessly integrates using the native compression scheme. All of the new systems do, but if your one doesn't, then the superior post-production workflow will be of little benefit to you.

It records using an MP4 file 'wrapper' format which although widely available is still a relatively new codec and not yet compatible with all current software packages. The Sony browser software is free to download and easily converts the MP4 format media into the more popular media industry adopted MXF wrapper which AVID can read, so conversion is easy enough – however, be aware of this before you begin shooting and CHECK!

XDCAM EX has a choice of High Quality (HQ) and Standard Quality (SP)

At HQ mode (35Mb/s), you can record 50mins per 16GB card (3.125 mins per GB @ 25P)

At SP Mode (25Mb/s), you can record 70mins per 16GB card (5.4mins per GB @ 25P)

For the technically interested readers, the SP 25Mb version actually only records 1440x1080 pixels of resolution in a 4:2:0 colour space and the HQ version records the full 1920x1080 resolution but still only in a 4:2:0 colour space.

The main advantage of using the EX series camcorders is the high recording capacity of the data cards. The cameras have using two memory card slots and a pair of 32 GB SxS PRO memory cards can record up to 280 minutes of HD footage. This is much greater capacity than P2 but with more highly compressed images. It also is capable of under and over-cranking images in 720 mode of up to 60 fps with the benefit of immediate playback.

Another unintended consequence of using a 'long-GOP' capture format is that if you have a clip which spans across 2 x cards, although the recording will be continuous and you will not lose any material, editing across the clip is not seamless as it is with P2. Instead, the post production systems will need to join the clips manually and will need to have access to the media on BOTH cards to play the second part of the scanned clip – this is because as a result of using the long GOP compression scheme, the data on the first card will be needed to play the opening frames of the second card. Not a problem to worry about but worth being aware of.

File transfer speeds of 800Mb per second are commonly quoted by Sony but in reality the speed of transfer will be governed by the bus and drive speeds. The speed of transfer from the camera is MUCH slower (more than 3x slower) than the transfer from an SxS slot. In tests we have found that an 8GB drive containing 30 mins of HQ media took the following time to transfer to hard drive using a Macbook Pro:



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- 8GB transfer to firewire hard drive via SxS Xpress slot: 5.30 mins. **5.4x real time**
- 8GB transfer to firewire hard drive via external card reader (USB) to USB drive: 11 mins. **2.7x real time**
- 8GB transfer to firewire hard drive via external card reader (USB) to firewire drive: 7.30 mins **4.1x real time**
- 8GB transfer to firewire hard drive via EX-3 using USB2 cable: 17.30 mins. **1.7x real time**

These speeds were measured by VMI using a Power mac

There are many variants, but the fastest transfer speeds are via the Express 34 card slot in a PC or Mac but these transfer speeds are surprisingly comparable with the transfer of P2 media, given that the data is much smaller.

Most modern laptops contain Express 34 slots (commonly pronounced 'S by S Express Pro') as part of their architecture. If they are not present, then inexpensive SxS Xpress Pro readers are readily available – VMI XDCAM EX Camcorder kits include these as standard without charge. They are very easy to connect using the USB-2 connection.

SxS Pro Drivers

The SxS Driver is available for download at <http://support.sonybiz.net/software/search.aspx>

Other XDCAM EX Benefits

Slow Motion Ramping

The XDCAM EX camcorders offer a powerful Slow & Quick Motion function – commonly known as over-cranking and under cranking by filmmakers – that enables users to create unique 'looks' or slow- and fast-motion special effects. The XDCAM EX camcorders can capture images at frame rates selectable from 1 fps (frame per second) to 60 fps in 720P mode and from 1 fps to 30 fps in 1080P mode, in increments of 1 fps.

For example, when viewed at 23.98P, images captured at 60 fps will appear 2.5 times slower than normal. Conversely, images captured at 4 fps will appear 6 times faster than normal. With the Slow & Quick Motion function of this camcorder, images are recorded natively with no padded frames and at full resolution. The obtained quality of the slow- and quick-motion images is extremely high from those created in the editing process. In addition, these slow- and quick-motion images can be played back immediately after shooting, without using any converters or processing on non-linear editing systems – another benefit of using non-linear capture technology. It also means that you can see the slow motion effect on location without having to wait for the post-production phase.

Slow Shutter Function

The XDCAM EX camcorders offer a Slow Shutter function for capturing clear images in low-light environments. The Slow Shutter function not only increases camera sensitivity but also produces a special blurring effect when shooting a moving object, for enhanced shooting creativity. The shutter speed is selectable from 2-, 3-, 4-, 5-, 6-, 7-, 8-, 16-, 32-, and 64- frame accumulation periods.

Selectable Gamma Curves

The XDCAM EX camcorders offer a wide variety of gamma curves to flexibly handle contrast, and give a specific 'look' to an image. In addition to four types of standard gamma curves, the XDCAM EX camcorders provide four types of CINE Gamma (CINE 1, 2, 3, and 4), which are identical to those on high-end CineAlta camcorders. Operators can select the best-suited preset gamma curve depending on scenes.

Interval Recording Function

The XDCAM EX camcorders offer an Interval Recording function that records one frame at pre-determined intervals. This is convenient for shooting over long periods of time, and also when creating special effects of extremely quick motion.

Frame Recording Function

Frame Recording is a unique feature of the XDCAM EX camcorders that is especially useful for clay animation shooting. Using this function, images for pre-determined frames are recorded every time the Record button is pressed.

Shutter Angle Settings

In addition to traditional electronic shutter speed controls adjustable in fractions of a second, the XDCAM EX camcorders also have a “shutter angle” control – which is familiar to filmmakers. By setting the shutter adjustment mode to “angle”, the XDCAM EX camcorders automatically set the proper exposure time, based on the selected frame rate and shutter angle.

Wide Array of Interfaces

The XDCAM EX camcorders come equipped with a wide range of interfaces optimised for a variety of operational needs, wide interoperability and flexible workflow. These include an HD-SDI output, down-converted SD-SDI output, i.LINK (HDV) input/output, and analogue composite/component output. Additionally, the PMW-EX3 camcorder is equipped with the time-code input/output and genlock input, allowing the camcorder to be used in the multi-camera system.

Sony PMW-EX1 XDCAM EX Camcorder



The PMW-EX1 was Sony's first XDCAM EX camcorder, which unusually for a small camcorder shoots in all of the frame rates including 25p, 50i, 59.94i and native 23.98P, as well being 1080i/720P switchable.

It shoots in with 3 x native 1920x1080 CMOS sensors onto SxS cards and has 2 x SxS Pro slots for solid-state image capture.

Sony PMW-EX3 XDCAM EX Camcorder

This is the big brother to the EX-1 and offers the same frame-rates and quality to the EX-1 but sports a greatly superior viewfinder and most importantly, an interchangeable lens.

The standard lens is a Fujinon 14x Zoom Lens specifically designed for the XDCAM EX camcorder. It is quite a wide lens offering a field of view of 5.8 mm (equivalent to 31.4 mm on a 35 mm lens) and the 14x zoom means that it perfectly acceptable for many applications.

The lens interchange ability of this camera though is a real winner, but the wide-angle lens actually designed for this camera is very expensive and really limiting (since it can only be used with this model!).

However Fujinon also make a B4 adapter which is really useful; it permits 2/3" HD lenses to be fitted to really increase the range of optics considerably. With this adapter, compatible



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lenses for the EX-3 include all Broadcast and HD video and cine-style 2/3" zooms plus all HD Prime lenses including Zeiss DigiPrimes. Although you can fit a Movietube or Mini-35 adapter to the standard lens, the results are a bit disappointing.

P+S Technic make a special 35mm adapter for this camera but nobody is likely to stock it since it is only really useful for this camera, so for the real deal, use the Fuji lens adapter fitted to a P+S Pro35 adapter plus 35mm Primes, as it performs excellently, though it is a pricey option.

The camera is a bit front-heavy for comfort and VMI do provide an Anton-Bauer battery kit option, which helps to restore the centre of gravity to improve the balance of the camera somewhat, but it remains stubbornly front-heavy, especially when used with the larger and heavier B4 mount HD lenses.



Unusually, this model camera is also compatible with the Sony camera control unit, RMB-750 or RMB-150. This is unusual since this level of control allowing the user to manipulate various camera settings in the menus, including iris, black balance, gamma etc, is only usually available on high specification cameras such as HDCAM and above.

It might be useful though if the camera is on a high jib and out of reach since all main camera functions are completely available including camera trigger and iris level at the end of a long CCU cable. There is even a composite video transmitted down the multi-core cable which permits a small preview image to be visible on the small LCD and a composite output from the unit can display this signal on a separate external composite monitor, running only one cable from the camera!

Another great touch is that the EX-3 includes an HD-SDI output and genlock function as standard, which permits it to be used in a proper multi-camera environment when using the Sony Anycast or other multi-camera shooting kit. It also means that you can easily view digital HD images with a professional HD monitor without having to resort to analogue HD component.

POST PRODUCTION WORKFLOW

- Plug in your data cards via an SxS Pro device (you can even use the camera as an SxS reader).
- Select file import > Sony XDCAM on the Mac.
- Edit.
- Job done.

Go to File on the Mac
Select Import – XDCAM; The software opens all media automatically and then you set your destination disk in the preferences and final cut will automatically import it.

Then it is seamless into FCP.

Once you download the log and transfer programme on your PC or Mac, then importing XDCAM media to your Mac will



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open the XDCAM software program within final cut as soon as you import XDCAM and when you set your destination folder in the in your xd-cam software your clips will be automatically imported into final cut.

**** Important note: **** XDCAM EX is a cross-platform media format using the XDCAM transfer software but large files need special treatment when editing with a Mac on FCP.

When using solid-state cards (SxS Pro or P2), the data format works using on a fat32 platform so this means that data files over 4GB are automatically split into segments of 4GB each. This is not a problem for editing but the XDCAM application changes these files from .mp4 format to .smi format when using FCP, which need to be opened in the logged window and clip-checked prior to transfer.

This automatically happens with large files and may have something to do with the long-GOP compression.

XDCAM EX Clip Browser Software

The XDCAM EX products come with two application software packages that provide powerful yet easy and intuitive management of recorded content. Included are two versions of Clip Browser (Mac and PC versions) as well as the XDCAM Transfer application software for Apple Final Cut Pro non-linear editing systems.

Downloads

Clip Browser Software

<http://www.sony.co.uk/res/attachment/file/10/1193315621810.zip>

XDCAM EX Log & Transfer Utility -

<http://www.sony.co.uk/res/attachment/file/00/1214313427700.zip>

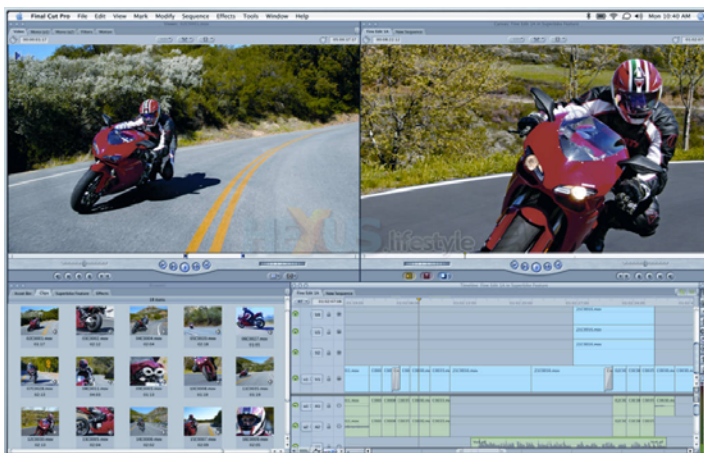
SxS Drivers

<http://support.sonybiz.net/software/search.aspx>

Clip Browser Version 2 (for the PC and MAC)

- Plug in your data cards via an SxS Pro device (you can even use the camera as an SxS PRO reader).
- Transfer media to hard disk.
- Open the clip browser software for pc and run format conversion utility (to rewrap the .MXF wrapper).
- Point the AVID to the location of the media and import media.
- Edit.

Job done.



The Clip Browser software for the XDCAM EX products is a simple-to-use PC application software that allows users to easily browse and copy video clips recorded by the XDCAM EX camcorder or deck to other devices such as hard disk drives.

It also serves as a bridge tool between a variety of formats - converting XDCAM EX clips to other file formats. The Clip Browser software is available for both Windows-based PCs and Macintosh computers.

Features

- Browsing of video clips recorded by the XDCAM EX products
- Copy XDCAM EX clip files from the SxS PRO memory card to hard disk drive
- Combine segmented clips recorded across two SxS PRO memory cards
- File format conversion from MP4 to other file formats:
 - MXF format for export to XDCAM HD discs or MXF-based non-linear editing systems* (option)
 - DV format for export to DV-based non-linear editing systems
 - AAF format for export to Avid non-linear editing systems
 - H.264/AVC format for field viewing on Sony PSP™, Apple iPod/iPhone as well as WMV format* (option)
- Create sub clips with Mark IN/OUT operation
- Registration of metadata such as “title”, “creator” and “comments” for a clip
- Registration of “Shot Mark” metadata for instant cue-up to desired scenes
- Capture and create a still image file (BMP) for a desired scene



To download the Clip Browser Software:

<http://www.sony.co.uk/res/attachment/file/10/1193315621810.zip>

{NOTE: Separate plug-ins (PDZK-LT1) – not PDZK-P1 which is the Sony XDCAM Transfer Tool. PDZK-LT1 is for EX only – PDZK-P1 is for EX and HD422}.

PDZK-P1* Ver. 2.7 XDCAM Transfer

The Log and Transfer plug-in software utility for XDCAM EX allows any resolution of current XDCAM EX file to be easily imported into Apple's Final Cut Pro using its standard Log and Transfer interface.

Requires Mac OS X 10.4.11 or later and Final Cut Pro 6.03 or later.

Installation Instructions:

- 1) Create a new folder to copy dmg file to.
- 2) Copy file to your Mac.
- 3) Double click on the icon in the folder you have created.
- 4) Installer will launch. Follow the installation instructions.
- 5) Use the Log and transfer window to ingest EX files into FCP.

Note: XDCAM Transfer has the following advantages over Log and Transfer:



- Supports both XDCAM EX & XDCAM Disc
- Handles XDCAM EX and XDCAM Disc clips
- Can mount SxS & Professional Disc media at the same time
- MXF export capability
- Can write edited material back to Professional Disc in MXF files
- Standalone browser/viewer
- Browsing/viewing are possible without running Final Cut Pro

Download: XDCAM EX Log and Transfer software V1.00 -
<http://www.sony.co.uk/res/attachment/file/00/1214313427700.zip>

PMW-EX-30 XDCAM EX Deck

The PMW-EX30 deck is a highly versatile and affordable compact recording deck, and can be used for many different applications.

It allows simple viewing of recorded materials with a monitor, dubbing to other format/media such as HDV, XDCAM HD and HDCAM™, and feeding to non-linear editing systems. In addition, the PMW-EX30 deck can be used as an affordable full HD recorder for event recordings - it can record HD signal outputs from a switcher.



The PMW-EX30 deck is equipped with a wide array of interfaces including HD-SDI input and output, HDMI output, HD analogue component, composite outputs and more. Equipped with two SxS PRO memory card slots, the PMW-EX30 deck can record up to 140 minutes of HD footage using two 16-GB SxS PRO memory cards.* The recording time can be further extended up to approximately 260 minutes when an optional PHU-60K Professional hard disk unit is attached to the PMW-EX30.

Features

- Highly compact design - can be placed either horizontally or vertically
- MPEG HD recording and playback at 35 and 25 Mb/s
- Equipped with two SxS PRO memory card slots
- Built-in 3.5-inch* LCD monitor
- Comprehensive range of HD interfaces –
 - HD-SDI input/output,
 - i.LINK (HDV) input/output and component output
- Down-converted SD outputs for migration to SD environments
 - SD-SDI, i.LINK (DVCAM),
 - component,
 - S-Video and
 - composite
- HDMI output for digital connection to a range of consumer displays
- Adjustable audio input volume (CH1 and CH2)

CONCLUSION

The quality and functionality of these cameras and the XDCAM EX format produces great pictures, even if the cameras are a bit front-heavy. However on the plus side, there is really great versatility with the EX-3 with the lens interchange ability and optional 2/3" B4 lens mounts and the post-production workflow works really well with FCP and AVID.

In my opinion, the cameras are great and the workflow works really well and magnificently, some HD Broadcasters have cleared this format for conditional use in HD deliverable productions – a great plus as the format is really great value.

The quality is great but the long-GOP compression may not suitable for all applications and I personally would not recommend it for chroma-key shoots.

Maximum bang for your buck –if the limitations work for you!

Barry Bassett,

Managing Director, VMI January 2009