

# **XDCAM Workflow**

## **Features, Benefits & Technology**

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## Industry Terms Used in this Document

**i.LINK™:** Sony's trademark for IEEE1394-compliant or 'Firewire' interfaces.

**i.LINK File Access Mode** or **FAM:** The i.LINK mode of operation where the i.LINK port on an XDCAM device is used to connect the XDCAM device as a removable media device (similar to connecting a 1394 CD-ROM drive). The i.LINK FAM connection mode is used when file based workflows are desired.

**AV/C — Audio, Video and Control:** Refers to the mode of operation where the i.LINK interface is used to perform linear video captures or “print to video” operations. In this mode, the i.LINK interface is configured as a standard Audio/Video/Control interface.

**Professional Disc:** The optical disc media used in the XDCAM system 23-GB single-layer disc and 50-GB double-layer disc are available.

**Metadata:** Descriptive and structural information embedded within a file. XDCAM adopts and supports many different types of metadata. The term is used in this document primarily refers to the different types of descriptive metadata (clip titles, markers, comments, etc.) that may be recorded along with the video and audio data.

*A comprehensive list of terms used within this document can be found in the Glossary on Page 27.*

## The XDCAM System

### **Overview**

The XDCAM™ family is a genre of Sony's tapeless acquisition products. Our first offering is a nonlinear, file-based recording system that uses blue-violet laser technology to record both SD and HD video onto Sony's Professional Disc™ optical media. Clips are stored as both full-resolution MXF files and lower-resolution MPEG-4 proxy files, both of which can be quickly uploaded to a nonlinear editing system via an i.LINK interface (IEEE1394) or a standard Ethernet connection for remote browsing and editing. This is a significant benefit to camera operators in the field that may be required to perform field edits either in-camera or in a remote truck equipped with an NLE. For example, a camera operator or reporter may rough edit a story in the field on a laptop, sending MPEG-4 proxies to the broadcast facility where a broadcast package may be assembled, and then high-resolution clips may be sent via Ethernet or hand-delivered at a later time, thus saving time and money, and getting to broadcast more quickly.

In addition to supporting the speed and flexibility of file based workflows enabled by current and future editing platforms, the XDCAM products also have a full complement of video, audio, and control interfaces for integrating the XDCAM products into existing linear, tape-based environments. This enables facilities to upgrade their infrastructure as well as their operations at their own pace. As a result, the XDCAM system is entirely compatible with all editing systems of the past present, and future.

The XDCAM system also offers multi-format support in both SD and HD with a wide variety of recording codecs and quality levels to choose from. The PDW530 XDCAM SD camcorder supports 25 Mbps DVCAM recording in addition to 30, 40 and 50 Mbps MPEG IMX recording. The XDCAM HD camcorder offers MPEG-2 HD recording at bit rates of 18, 25 and 35 Mbps and frame rates of 4-60 fps. Both systems can output material recorded in any format as a 25 Mbps DVCAM stream using the i.LINK AV/C interface. The operator is able to enjoy native NLE support of full-bandwidth MPEG IMX and MPEG HD and integrate XDCAM transparently into any DV or 1080i HDV workflow.

## Professional Disc Optical Media

### Professional Disc Technology

Professional blue-laser optical recording is a completely new implementation of technology that bears little resemblance to consumer Blu-Ray discs, which, along with DVDs, were rejected for professional and broadcast use due to their low transfer speeds and limited storage capacity. Sony's first generation Professional Disc media can store 23.3 GB of data with no preset limits on clip durations or file size, giving producers and videographers the ability to store over 60 minutes of 35 Mbps HD material, 90 minutes of HDV, 45 minutes of MPEG IMX 50 Mbps or 85 minutes of DVCAM footage on a single disc. Now 50-GB dual-layer disc media can also be used in new XDCAM HD products - the PDW-F355, PDWF335 and PDW-F75. The XDCAM disc is housed in a rugged plastic cartridge that eliminates the possibility of surface wear while giving the disc exceptional protection against shocks, vibration, and extremes of temperature. The discs can be recorded well over 1000 times (each disc is warranted for 1,000 read/write cycles) and played back over one million times. The disc housing may even be immersed in water, dried out, and used for playback. In other words, these discs are tough!

#### Professional Disc Media Specifications

Storage Capacity 50 GB (PFD50DLA)  
23.3 GB (PFD23A) Laser Wavelength 405 nm Data

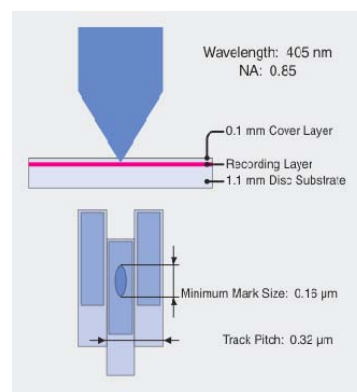
Transfer Rate (Max) 86 Mbps (PFD50DLA) Disc Diameter

120 mm (4 5/8 inches) Cartridge Dimensions 129 x 131 x 9

mm

(5 1/8 x 5 1/4 x 3/8 inches) Recording Format Phase

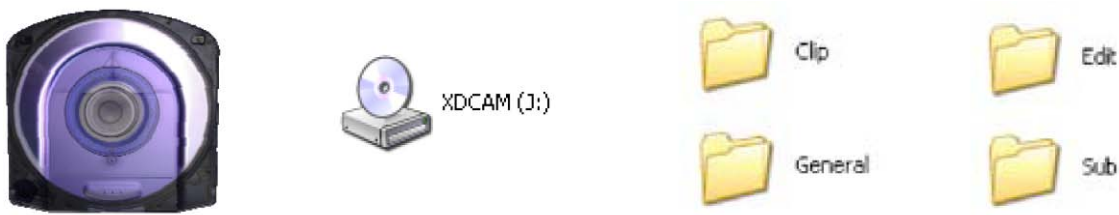
Change Recording



*Discs may be stored in existing shelving systems, stacked, or reused, depending on budget and user needs. Professional discs offer an advantage over static memory systems, as they may be stored independently of any HDD-based memory system. Professional discs may be cost-effectively used as an archival medium.*

## The Professional Disc Directory

Once the XDCAM camera, deck or drive unit is connected to an NLE the disc is mounted as a drive and is instantly available to both the OS and the NLE's media directories. You can browse the disc, rename it, create disc images, store generic data (such as documents or EDLs) in the General folder and drag clips directly to your editing bins. Once formatted, XDCAM discs support a simple, intuitive directory structure: full resolution MXF clips and their associated XML files are stored in the **Clip** folder; MPEG-4 Proxy AV files are stored in the **Sub** folder; EDLs and Sub Clips generated in the camera, deck, or using the bundled PDZ-1 software reside in the **Edit** folder; and the **General** folder provides roughly 500 MB for generic data (an excellent place to store, for example, NLE user settings, EDLs, graphics and document files).



**CLIP:** Full resolution MXF files, each of which is partnered with an XML file which passes descriptive data about the media and the disc to your NLE. As with Proxy AV files, XML files are generated automatically and should not be manually copied when moving/exporting media back to the XDCAM disc.

**EDIT:** Sub Clips and Clip Lists created on an XDCAM camcorder or deck.

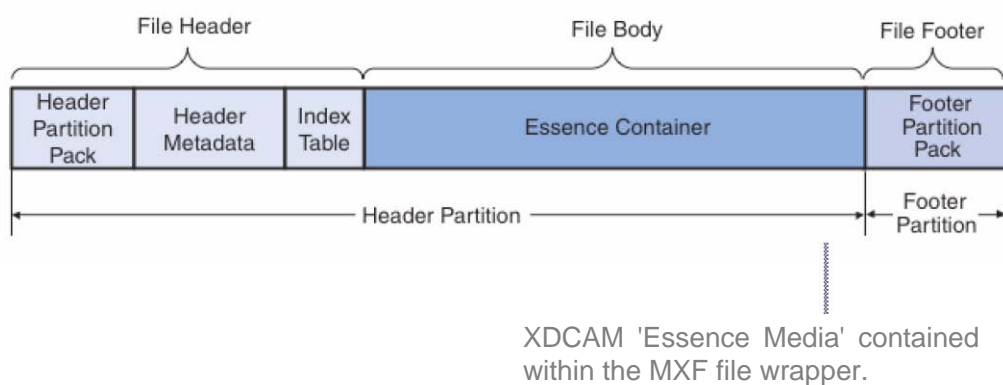
**GENERAL:** 500 MB of generic data storage for your documents, EDLs, NLE user settings, graphics, media databases for archiving, etc.

**SUB:** MPEG4 Proxy AV files that are automatically generated when full resolution clips are recorded or exported to the XDCAM Disc.

## HOW IT WORKS: MXF, XDCAM Metadata and Proxy AV

### MXF: Material eXchange Format

XDCAM systems store recorded material as MXF files. MXF is a metadata format that acts as a kind of file "wrapper" for media recorded using a variety of different codecs or formats. By embedding the media files (which are referred to as **Essence Files** or **Essence Media**) in a descriptive outer layer, MXF allows video and audio to be transferred between disparate systems without subjecting the content to any additional compression/decompression cycles or transcoding. This allows the editor to manipulate the XDCAM codecs natively within the editing system, using instructions contained within the MXF wrapper to interpret its contents.



MXF also supports Longitudinal Time Code (LTC) and multi-channel audio and has been SMPTE-standardized. Other common metadata "wrapper" formats exist—for example, Microsoft's *ASF* and Apple's *QuickTime*—but their usage is proprietary and bound by licensing agreements, whereas MXF is an open standard, available to anyone and supported by a large number of NLEs, Asset Management systems, media servers and other systems products. This means that MXF is compatible with virtually any NLE or asset management system.

### XDCAM Metadata

Metadata is essentially a file within a file, that describes the contents of the file, somewhat like a library referencing system. This means that users may instantly locate files with a name, date, timecode, or other key search format.

Metadata is an integral part of the XDCAM system. As it relates to editing workflow the term is used primarily to describe clip-based metadata such as Essence Marks, clip titles and comments that are appended to the media to

speed up the process of searching, organizing and editing your clips. There are, however, a number of different 'layers' of metadata used within the XDCAM system.

- The file format used for recording XDCAM media, MXF, is, as previously noted, a metadata format, defined by its ability to transfer a variety of different types of material by placing the contents in a descriptive outer shell.
- The PROXY AV files created with each full-resolution clip constitute another layer of metadata. (While the Proxy files are separate entities residing in their own directory, these low-resolution clones of your master clips are actually a form of metadata generated during recording to mirror the information contained in the full resolution MXF files.)
- Proxy and full resolution clips reference the same *Unique Material Identification Number* or UMID, another critical piece of metadata that links the different sets of media files not only to each other, but also to the disc on which they originated.
- XML metadata in the form of a file linked to each master clip is also generated when XDCAM clips are recorded. These files contain additional descriptive information about the master clips (such as codec information and audio channel mapping) and are referenced by editing systems when importing your media.
- XDCAM operators can create *Clip Lists* directly from the XDCAM hardware by arranging clip thumbnails into simple storyboards. Clip Lists are analogous (but not identical, as will be explained shortly) to EDLs in that they compile metadata from selected clips into a new metadata document representing an edited timeline of material.

As the XDCAM system is a file-based, metadata-intensive system, it is worth taking a closer look at some of these components and how they figure into editing workflow.

## 1. Essence Marks and Shot Metadata

An **Essence Mark** is an electronic marker or flag placed on a frame of video. Essence Marks can be added manually by the operator during shooting to 'bookmark' key events for quick reference later or they can be set to generate automatically whenever a particular condition or event— for example, a spike in the audio levels or an abrupt exposure change— occurs within the camera. They can also be added during review and ingest on any XDCAM deck or camcorder or using PDZ-1.

Essence Marks are supported by a number of NLEs, which translate them into their own types of shot metadata (e.g. the Avid *Locator*, the Final Cut Pro *Edit Marker*, the Vegas *Event Media Marker*). This allows them the same level of functionality as markers created natively within the system: they can be used to filter clip ingest, to sort media in your bins, to quickly assemble related clips and to snap events on the timeline.



Samples of Essence Mark support in various NLEs. Shown are Avid's *Import Essence Marks as Locators* setting and the Locator navigation buttons on the timeline; Vegas' XDCAM Explorer displaying the *Custom Essence Mark Filter*, and the Final Cut Pro clip browser displaying Essence Marks that have been translated into *Edit Markers*.

In addition to Essence Marks, shot metadata also includes the clip titles; comments and additional descriptors added using PDZ-1; and the name and UMID of the disc on which the clip originated.

## 2. Proxy AV

In addition to their primary acquisition format, all XDCAM camcorders and decks record low-bit rate MPEG-4 **Proxy AV** files that can be imported at speeds 1620x faster than real time over a standard Ethernet or i.LINK connection. A new Proxy is created when a clip is recorded or transferred to the disc irrespective of whether the new clip is created via acquisition in a camcorder, exported from an NLE, manual file copy or linear recording over any of the available digital and analog inputs.

Proxy media provides several advantages. With its small file size and 2.0 Mbps data rate it can be quickly transferred to a laptop in the field or sent out over a standard IT network to multiple editing clients for remote browsing and editing. Most NLEs that support the XDCAM system take advantage of Proxy at key points in their respective workflows, and the supplied PDZ-1 software offers an additional layer of interoperability by allowing operators to export either .smi documents or standard EDLs from storyboards created with Proxies. In a time-challenged situation, the MPEG-4 proxy file may even be used for broadcast, although at reduced quality.

Additionally, when the online edit is completed and the project ready to be taken offline, you can delete the full-resolution media from your storage while keeping the Proxies with your EDL for backup or archiving. (One hour of Proxy requires only 1 GB of storage.) The UMID relationship between each full-resolution clip and its Proxy ensures that the two will be successfully re-linked when the project is brought back online. This recalls the benefit of archiving media on the Professional disc, saving HDD storage space, and providing offline backup media.

### 3. XDCAM XML Files

XML (*eXtensible Markup Language*) files are documents that use a text-based "tree" structure to pass information about their subject to a computer. There are a number of different types of XML formats for use with different applications. (For example, many NLEs allow the import and export of XML files which function much like EDLs, linking project metadata to different video clips.) The XDCAM system uses XML to record and store information that is duplicated from the MXF container.

```
- <clip clipId="C0001" umid="0D43130000008AA80D0037390580080046020118001E" title="C0001C01.SMT" fps="59.94" dur="846"
  ch="4" aspectRatio="4:3" playable="true">
  <video umid="0643130000008AA80D0037390580080046020118001E" file="C0001V01.MXF" type="DV25DATA_411"
    header="65536" clipBegin="0" />
  <audio umid="0843130000008AA80D0037390580080046020118001E" file="C0001A01.MXF" type="LPCM16" header="65536"
    trackDst="CH1" />
```



An XDCAM XML file represented as a text document. Notice the UMID, clip title and format info (e.g. "DV25", "59.94", "411") contained within the tree structure.

The above example shows an individual clip's XML file showing time code, format and UMID data. These files reside in the Clip folder with their related media and are referenced by the NLE when clips are imported. They are automatically generated when clips land on Professional Disc media and do not need to be manually imported or exported when performing file operations. Some NLEs support direct import of clip XML files in place of their media; in these instances, since the XML is basically an abstract of the clip itself, it is imported as a kind of offline clip file that can later be imported at either Proxy or Full resolution.

#### **4. XDCAM *Clip Lists* and EDLs**

In editing environments, an EDL is a text file that sequentially lists all the edits and individual clips (along with relevant reel/tape information) used in a project. EDLs are typically used to move projects from one system to another, usually as part of the online or finishing stages of the edit.

By selecting and arranging clips from a list of thumbnails displayed on the camcorder or deck, XDCAM operators can create simple storyboards or *Clip Lists*. Edit Lists can be streamed from the hardware in cut order and are also stored on the disc as *.smi* files. As with a timeline or project in an NLE (itself a type of "metadata" document) there is no actual trimming or deleting of the source material. By compiling UMID and time code information, the Clip List tells the XDCAM hardware where to begin and end playout of each source clip based on the order in which the project was built. Clip List.smi files can be imported into PDZ-1 and used to create standard EDLs in a variety of formats which can then be imported into any editing system for either linear or, in most cases, file-based ingest.

Although it may seem like metadata is a complex and deep subject, it might be easier to consider metadata to be similar to Post-it notes attached to various tape reels, providing information to anyone that may be working with the media. Metadata allows editors to access comprehensive information regarding several aspects of the media. This is beneficial not only in editing, but in post-edit archiving, logging, searching, and cataloging content.

#### ***XDCAM Codecs and Frame Rates***

##### **XDCAM HD**

XDCAM HD camcorders are capable of capturing video at five different frame rates—59.94i, 50i, 29.97P, 25P and 23.98P. Additionally, the PDW-F355 and PDW-F350 camcorders support variable frame rate recording in the progressive frame rates for creating fast and slow motion effects, commonly referred to as "Undercranking" and "Overcranking."

When "overcranking" or "undercranking" (a reference to the manual cranks on film cameras before they were motorized), images are recorded at higher or lower frame rates so that slow and fast motion effects are created when played back at a normal speed. Fewer frames per second = faster motion (undercranking) while higher frame rates = slower motion (overcranking). The PDW-F355/PDW-F350 enables both overcranking and undercranking at a range of frame rates from 4 fps to 60 fps in 1 fps increments. When viewed at 24 fps, 4 fps yields motion six times faster than normal, whereas 60 fps yields motion at 40% normal speed. XDCAM variable frame rate footage can be played back in

the camcorder and ingested into an NLE with no additional processing. In the past, overcrank/undercranking a camera had resulted in loss of resolution and image clarity. The XDCAM system eliminates loss of image integrity in an over/undercrank situation.

MPEG HD footage is acquired at a user-selectable bit rate of 35Mbps (Variable Bit Rate), 25 Mbps (Constant Bit Rate) or 18 Mbps (Variable Bit Rate). These are referred to in the camera as the HQ, SP and LP modes, respectively. 1080i HD video is recorded at a 4:2:0 sample rate using the MPEG HD codec with up to 4 channels of uncompressed 16 bit/48 kHz PCM audio. HD video can be output at full bandwidth, as a down converted 25 Mbps DVCAM stream, or, using a PDW-F75/F70 or PDW-F30 editing deck with the PDBK-102 MPEG TS option, as an HDV Transport Stream. While any i.LINK stream from XDCAM devices is, of necessity, subject to a 2:3 pulldown, the HD-SDI and HD Component Analog outputs on the PDW-F75/F70 enable true progressive output at 23.98 Pfs (Progressive Segmented Frames). Clips transferred in file operations such as NLE import are always output in their native frame rate. For example, if you shoot at 23.98 fps, clips are exported via FAM or Ethernet natively at 23.98 fps.

## **XDCAM SD**

XDCAM SD camcorders offer MPEG IMX and DVCAM recording at system frequencies of 59.94i, 29.97P and 23.98P (available with a 2-3 pull-down using an optional board installed in the camcorder). Both the DVCAM-only PDW-510 and the MPEG IMX/DVCAM model PDW-530 are 4:3 and 16:9 switchable in all record modes. On the PDW-530, IMX footage can be recorded at data rates of 30, 40 and 50 Mbps with up to 4 channels of uncompressed 24 or 16 bit/48 kHz PCM audio. DVCAM recording is also supported on the higher-end model, at a data rate of 25 Mbps with up to 4 channels of uncompressed 16 bit/48 kHz audio. The SD models offer the same proxy and metadata support as the HD models, with no variance in the offline/online process for NLEs that support proxy and metadata in their workflows.

## **XDCAM Modes of Operation**

### **i.LINK: *File Access Mode (FAM)* and *AV/C***

The i.LINK interface on XDCAM cameras and decks can be easily menu-configured to act as either a data port, enabling direct access to the file contents of the disc, or as a traditional AV/C interface through which you can operate the device as a player/recorder.

When connected in **File Access Mode (FAM)**, clips are imported as files through the NLE's native import functionality or manually dragged to your editing bins from Windows Explorer. This allows for significant speed gains over real-time ingest. During file operations no transcoding or additional compression/decompression cycles are applied to the MPEG IMX, MPEG HD, or DVCAM essence media, as the MXF file format ensures that the media is always manipulated natively within the NLE system. File transfers are also lossless, with bit-for-bit copying of the original XDCAM data.

FAM also allows you to perform Windows copy/paste operations to and from the Professional Disc media. Clips can be dragged to external media storage, and new disc images can be created and written back to the disc. When writing clips back to the disc, new Proxy and metadata files are generated automatically by the XDCAM system. FAM also enables extensive metadata and logging support using the PDZ1 software, which allows you to browse proxy clips and add descriptive metadata that can be written back to the full resolution clips.

In i.LINK **AV/C mode**, the i.LINK port is changed from a data port to a standard video I/O, through which you can capture and record material as DVCAM or MPEG HD at the 25 Mbps 'SP' setting. On the PDW-F75, PDW-F70 and PDW-F30, an HDV Transport Stream option adds HDV TS up and down conversion capability to the i.LINK.

## **FTP Mode**

XDCAM's **FTP (File Transfer Protocol) Mode** extends lossless file operations to include FTP transfer of media over a standard Ethernet connection in both Peer-to-Peer and LAN configurations. In other words, the camera may operate similar to an Internet server, providing on-demand access to files contained on the Professional disc. An operator can connect a laptop to a properly enabled XDCAM device and transfer files directly to their PC, or multiple XDCAM devices or editors, and browse/ingest stations can be placed on a LAN for IT-collaborative workflows. Full resolution and Proxy files (as well as all their associated metadata) may be transferred via FTP, as can virtually anything residing in the *Edit* or *General* folders in the Professional Disc directory.

FTP Mode shares with File Access Mode the ability to import XDCAM clips as data files while adding a secondary layer of collaborative workflow flexibility. The XDCAM hardware does not have to be connected locally and can be accessed over a standard IT infrastructure or even over the Internet. A producer or editor can log in to a camera or deck from anywhere on the network, and multiple XDCAM devices may be placed on a network with each unit assigned its own specific IP address (and, where applicable, Default Gateway and Subnet Mask).

Using PDZ-1, an FTP Client, or the Command Line Interface on a PC or Mac, you can perform FTP file transfers to and from properly enabled XDCAM devices. You can also use available third party applications to import and, if necessary, 're-wrap' or re-encode XDCAM MXF files as Windows Media or QuickTime files. Many NLEs support FTP transfers using their own native import functionality or an FTP plug-in interface.

The benefits of FTP Mode are fully realized in broadcast and ENG environments, so Ethernet interfaces are standard on both the PDW-1500 and PDW-V1 SD decks. An optional interface offers the same functionality to the PDW-530 SD camcorder and the PDW-F75, PDW-F70 and PDW-F30 HD editing decks.

### **Additional Options for Linear Input, Output and Serial Device Control**

XDCAM decks support linear VTR operations using traditional digital and analog interfaces, RS422 VTR control and time code I/O. As with their tape-based counterparts, the XDCAM family is loosely divided into studio/recorder decks and player/feeder decks. Portable field player/recorder models and a compact drive-only unit are also available. All (with the exception of the drive unit) can be controlled from compatible software/hardware using standard 9-pin RS422 VTR control.

It is worth emphasizing here that a number of exceptions apply to the traditional Recorder/Player distinction. As noted earlier, all XDCAM hardware can perform FAM operations in both directions, which means you can write video back to the disc using any XDCAM player, recorder or camcorder. The same can be said of FTP file transfers, which can be performed in both directions on properly equipped XDCAM hardware. FAM and FTP modes are considered file transfer modes as opposed to "recording" modes.

Additionally, the PDW-D1 XDCAM SD drive unit can be configured to operate as an AV/C device for linear capture and recording (using the i.LINK port as a DV interface), and the PDW-F30 XDCAM HD player is capable of recording an incoming HDV Transport stream (from, for, example an HDV VTR or similarly equipped XDCAM HD deck) using an optional input adaptor.

## Appendix

### Appendix 1: Configuring the i.LINK MODE on XDCAM devices

#### HD Decks PDW-F75/F70 and

PDW-F30

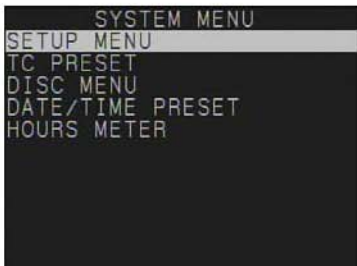


The i.LINK setup for both machines follows the same steps.

Also, while the F30 is a 'player' model, it accepts the PDBK-102 MPEG-2 TS IN/OUT Board, which enables AV/C recording of an incoming HDV Transport Stream.

To access the Enhanced Menu items, including the i.LINK Mode selection, change the deck's MENU GRADE setting from *Basic* to *Enhanced*.

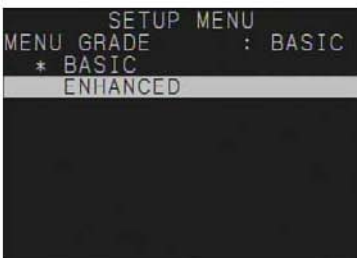
1. Press the MENU button to enter the system menu.



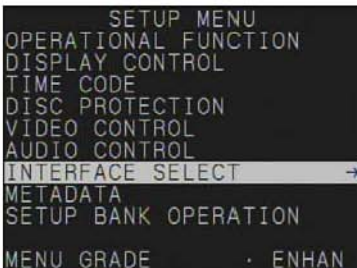
2. Using the right/left and up/down arrow buttons, navigate to the Setup Menu and choose *Menu Grade*.



3. Change the Menu Grade from *BASIC* to *ENHANCED*.



4. Press the SET button to store your changes.



5. Press the Menu button to reenter the menu. Use the left/right arrows to navigate to the Setup Menu and choose *Interface Select*.

```
SETUP MENU
INTERFACE SELECT
D-SUB OUTPUT : XGA60
AUDIO OUTPUT : CH1/2
REMOTE I/F   : 9P/232
BAUDRATE    : 9600
← i.LINK MODE : AV/C →
NETWORK ENABLE: NET
WIRELESS RMT : ENA
```

6. Navigate to *i.LINK MODE*.

```
SETUP MENU
INTERFACE SELECT
i.LINK MODE  : AV/C
* AV/C
← FAM (PC REMOTE)
```

7. Change the *i.LINK MODE* selection. For this example we'll change the setting from *AV/C* to *FAM*.

```
SETUP MENU

System will be changed.
Are you sure you want
to execute?

EXECUTE : SET KEY
ABORT  : RESET KEY
```

8. When asked to confirm the setting, press the **SET** button.

```
SETUP MENU

COMPLETE !!

Turn off/on POWER !!
```

9. To complete the change, reboot the deck when prompted.

```
PC REMOTE!
```

*After enabling the XDCAM device for File Access Mode, connect it to the PC using an i.LINK cable. When a disc is inserted the controls are disabled and 'PC REMOTE' is displayed on the LCD and/or the viewfinder.*

## SD Decks

### PDW-1500

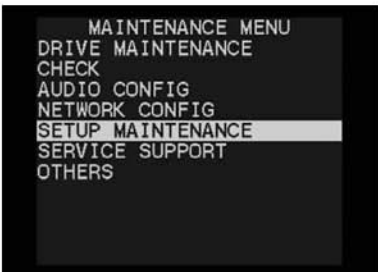


*You will first need to access the Maintenance Menu to enable the Extended Menu.*

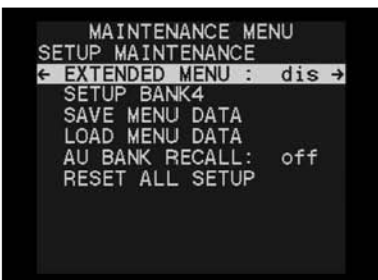
*Changes made to the i.LINK Mode Setting require that the deck be powered off/on. Change the setting before connecting the i.LINK cable.*



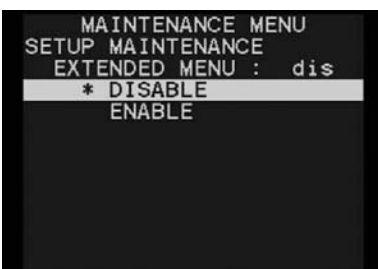
**1. Press the MENU button to enter the basic menu. Then, while holding down the Counter Select button, press the Set button. This enables the Maintenance Menu.**



**2. Maintenance Menu navigation utilizes the up/down arrow buttons. Use the down arrow button to scroll to SETUP MAINTENANCE and then enter this layer using the right arrow button.**



**3. Use the right arrow button to access the EXTENDED MENU setting.**



**4. Use the down arrow to navigate to ENABLE and press the SET button. You now have access to the extended menu items.**

```

REMOTE INTERFACE
130: DIMMER - 6
131: AUDIO VOLUME - each
142: REPEAT MODE - off
143: INDEX POS - 0sec
214: REMOTE I/F - 9PIN
*215: i.LINK MODE - FAM
257: NETWORK ENA - net
258: LIVE LOGGING - off
301: VAR RANGE - -2~+2
308: STD/NON-STD - STD
310: REC INHIBIT - off

```

Re-enter the menu and navigate to item 215, *i.LINK MODE*, and make your selection. Press and hold the shuttle button to modify item 215 and then make the change by turning the jog/shuttle dial. Confirm the setting by pressing the SET button, and cycle the power on the unit when prompted.

*Note: Set ITEM 214 REMOTE I/F to i.LINK if you want to control the deck in AV/C Mode using the i.LINK connection.*

## PDW-R1 and PDW-V1



*The procedure for navigating the menus and changing the i.LINK Mode selection on the PDWR1 and PDW-V1 is identical to that of the PDW1500. Once the Extended Menu is enabled, change menu item 215 and cycle the power on the deck.*

*The PDW-R1 has both RS-422 and i.LINK control interfaces. As with the PDW-1500, change Item 214: REMOTE I/F to i.LINK if you want to control the deck in AV/C mode using the i.LINK connection.*

*This is the default mode on the PDW-V1 and ITEM 214 is not present.*

**Camcorders PDW-F355/F350 and  
PDW-F335/F330 PDW-530 and  
PDW-510**

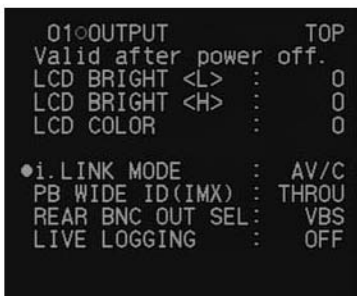


*The camcorders must be powered off and back on for the i.LINK Mode change to take effect, but you are not forced into a reboot after making the selection (as with the decks).*

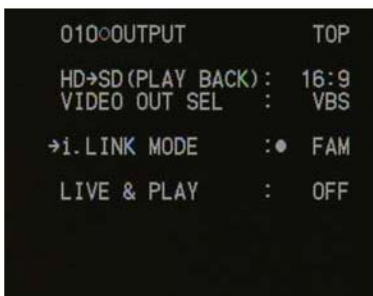


**Press and hold the Rotary Encoder and toggle the MENU switch to enter the top menu. Using the Rotary Encoder, select *Operation* to enter the Operational Menu.**

*Spinning the Rotary Encoder will move the cursor up/down. Press the Rotary Encoder in to make a selection.*



On the PDW-530 XDCAM SD camcorder, the *i.LINK Mode* setting is located on page 1 of the Operational Menu.



On the PDW-F355/F350 HD camcorder, the *i.LINK Mode* setting is located on page 10 of the Operational Menu.

*Press the Rotary Encoder in to make your selection. Note the Valid After Power Off message that appears when you change the i.LINK Mode setting. The selection will not take effect until you do this.*

**A few things to keep in mind when working with the hardware:**

- To safely terminate File Access Mode—for example, if you need front panel or menu control—use the "Safely Remove Hardware" button on the Windows taskbar, browse to the XDCAM device, and remove it from the system. The camera/deck will now function normally.
- To re-enable File Access Mode, cycle power on the device or disconnect and then reconnect the i.LINK cable.
- As long as the i.LINK Mode is set in the menu to FAM, the XDCAM device will change automatically to File Access Mode when re-connected to your computer. If you work primarily in FAM, there is no reason to change the setting back to AV/C.
- Until a disc is inserted, the FAM-enabled XDCAM device is not assigned a drive letter or path, nor does it appear in the My Computer directory.

## ***Appendix 2: FTP Operations and Ethernet Mode***

### **FTP Workflow using XDCAM Ethernet Connectivity**

Another means of transferring files to and from XDCAM devices that have Ethernet connectivity is the *Network Mode* of operation. Using File Transfer Protocol (FTP), MXF files can be sent from the XDCAM device to a standalone editor or shared across a workgroup environment. In both scenarios, the file transfer is managed by the Avid Transfer Manager application, outside of the NLE itself; this enables the ingest to proceed as a background task that does not lock up the NLE or otherwise impede editing workflow.

The XDCAM FTP mode supports the transfer of all files to and from the Professional Disc. This includes the full resolution files, Proxy files, and files in the *General* and *Edit* folders. Once both sets of assets are in your editing bin, the Re-link operation enables you to conform the Proxy sequence to full resolution (and back to Proxy again, if necessary) or to create a new Full Resolution sequence alongside the original, "offline" sequence.

Using PDZ-1, an FTP Client, or the Command Line Interface on a PC or Mac, you can perform FTP file transfers to and from properly enabled XDCAM devices. You can also use available third party applications to batch-import and, if necessary, 're-wrap' XDCAM MXF files as Windows Media or QuickTime files.

## Configuring XDCAM Devices for Ethernet Mode

The **PDW-F75/F70** and **PDW-F30** XDCAM HD decks support Network operations using an optional PDBK-101 Network Adaptor. This adapter is a 1000BaseT gigabit Ethernet interface.

The **PDW-1500**, **PDW-R1** and **PDW-V1** XDCAM SD decks come fitted with standard Ethernet ports and support Network file operations with no additional hardware. The PDW-1500 has a 1000BaseT gigabit Ethernet port. The PDW-R1 and PDW-V1 have 100BaseTX ports.

The **PDW-530** and **PDW-510** XDCAM SD camcorders support Network operations using an optional CBK-NC01 Network Adaptor. This adapter is a 100BaseTX Ethernet interface.

Where applicable, optional Network Adaptors add additional Menu items for managing Network settings.

### **Network Menu Locations on Sony XDCAM Devices**

To access the Network Menu:

- **PDW-F75/F70 and PDW-F30**  
*Setup Menu* ⇨ *Interface Select* ⇨ *Network Control*
- **PDW-1500 and PDW-V1**  
*Maintenance Menu* ⇨ *Others* ⇨ *Network Configuration*
- **PDW-530**  
*Maintenance Menu M18* ⇨ *Network*

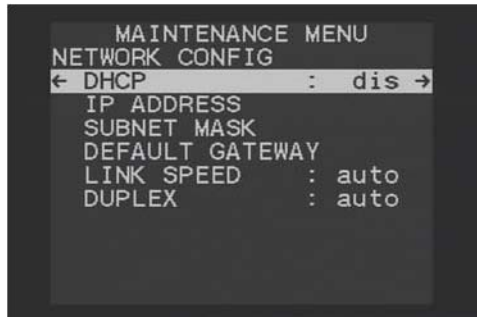
### **Maintenance Menu Locations on Sony XDCAM Devices**

To access the Maintenance Menus:

- **[PDW-1500, PDW-R1 and PDW-V1]** Press the MENU button to enter the basic menu. Then, while holding down the *Counter Select* button, press the *Set* button. This enables the Maintenance Menu.
- **[PDW-530]**  
From the Top menu, select *Maintenance*

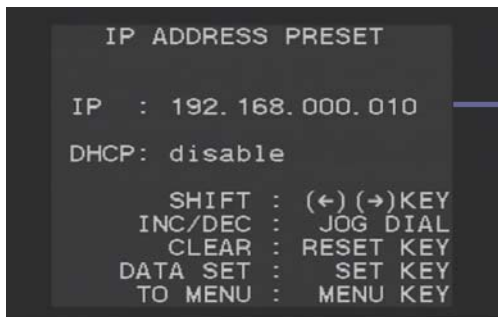
The steps required for setting the Network Configuration on XDCAM camcorders and decks are the same for each unit. The only difference between units is the location of the Network Menu (see above).

A unique IP address must be assigned to the device either manually or automatically if DHCP is enabled. In most cases (and in the following peer-to-peer examples) you will disable DHCP and assign the XDCAM device a unique IP address manually. Consult your IT administrator if you require the Default Gateway and Subnet Mask setting to be changed to any setting other than the defaults of 255.255.255.000 and 0.0.0.0, respectively.



The *Network Config* Menu on the PDW-1500 XDCAM SD deck.

- **DHCP** can be enabled or disabled, depending on how you want the unit's IP address to be assigned. With DHCP enabled, the DHCP Server assigns the IP address automatically. For this example we will leave DHCP set to *Disabled* and assign the device a unique IP.
- The **IP ADDRESS PRESET** selection becomes active when **DHCP** is disabled. Select this setting and assign the XDCAM device its own IP address. You can also leave it set to the default setting of 192.168.0.10 if that IP address is available and does not cause any conflicts on the network.



The *IP Address Preset* Menu. Assign a unique IP or use the default setting of 192.168.0.010.

- The **SUBNET MASK** and **DEFAULT GATEWAY** submenus allow you to change these values if so required.

- The **LINK SPEED** setting will depend on the PC network adaptor you are connecting to. In most cases you will select AUTO. Some systems may require manually selecting the Link Speed.

#### **A note on the *Network Control* settings for XDCAM HD devices:**

The PDW-F75/F70 and PDW-F30 Network Control Menus feature an additional item referred to as *Jumbo Frame*, with available settings of *9014*, *488* and *Off*, with *Off* as the default value. A *Jumbo Frame* is a frame larger than the maximum 1514 bytes of the standard Ethernet frame. This enables the XDCAM device to deliver larger payloads per packet. Since fewer packets need to be routed, overhead is reduced and Network throughput is potentially improved. For this setting to be effective, all other devices connected to the network must support *Jumbo Frames*. In most instances this can be left in the *Off* setting.

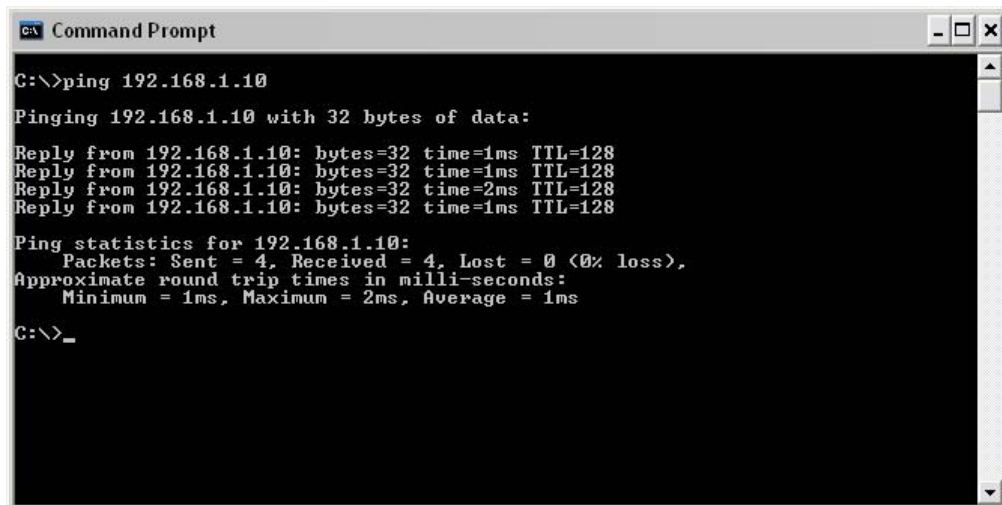
Once these settings have been assigned:

- Cycle the power on the XDCAM device. *You are not forced into an automatic reboot, but the new Network settings are not valid until the device has been power-cycled.*
- Connect the unit to your PC using an Ethernet cable. For peer-to-peer connections using XDCAM devices that use a 100BaseTX interface, a Crossover cable is required. XDCAM decks with 1000BaseT gigabit interfaces can use either a Straight Through or Crossover cable. When connecting to an Ethernet switch or network hub you can use a Straight Through cable. (Most switches and hubs are auto sense, so you could also use a crossover cable.)
- Set the **Remote** switch on the device to *Network*.
- Insert a Professional Disc.
- 

- Verify the physical connection by pinging the XDCAM device. To do this:
  1. Open a CMD window by selecting *RUN* from the **START** menu of the PC.
  2. Type the word CMD and press <Enter>.
  3. When the Command Prompt window opens, type: ping aaa.bbb.ccc.ddd, where aaa.bbb.ccc.ddd is the IP address assigned to the XDCAM device. Using the default address of 192.168.1.10, the command line would look like this:

**ping 192.168.1.10**

4. If the connection is working properly, you will see four responses indicating replies from the deck:



```
C:\>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:
Reply from 192.168.1.10: bytes=32 time=1ms TTL=128
Reply from 192.168.1.10: bytes=32 time=1ms TTL=128
Reply from 192.168.1.10: bytes=32 time=2ms TTL=128
Reply from 192.168.1.10: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 2ms, Average = 1ms

C:\>_
```

- Verify login credentials by logging into the HTTP server built into the XDCAM device. To do this:

1. Open Microsoft Internet Explorer.
2. Type the IP Address of the XDCAM device into the address bar. Note that you do not need to prefix the entry with the letters www.
3. When prompted for the **User Name** and **Password**, enter the following *using only lower case characters and including the hyphen where indicated*.

- **User Name:** admin
- 
- For the **password**, enter the model number of the XDCAM device. Some examples:
  - **Password:** pdw-1500
  - **Password:** pdw-r1
  - **Password:** pdw-530
  - **Password:** pdw-f350

- FTP functionality only works if:
  - ○ The **Remote** switch is set to **Network**.
  - ○ There is a non-blank disc in the unit.
  - ○ The unit is in STOP or STILL mode.
  - ○ Thumbnails are not displayed.
  - ○ Menus are not active or displayed.

### **Appendix 3: PDZ-1 Proxy Browsing Software**

PDZ-1 is a proxy browsing and metadata-management application supplied with all XDCAM HD and SD products. It can be used to access an FTP or FAM-enabled XDCAM device directly, or operators can access XDCAM disc images stored locally or across a network. Users can browse recorded footage; edit clips into simple EDLs (which can then be imported into an NLE); add comments and user-defined Essence Marks; and perform a range of disc and media management operations. As PDZ-1 figures only tangentially into actual NLE workflow, it will be covered in greater detail in a separate document. The application does, however, offer substantial workflow enhancements for newsgathering, field production and networked content sharing, as well as being the only item in the XDCAM tool kit capable of fully exploiting XDCAM's rich metadata components. When installed on a Windows PC, PDZ-1 adds the following functionalities, all of which are NLE-independent and do not require 3<sup>rd</sup> party software or a workstation-grade PC:

- High-speed ingest of XDCAM proxy (up to 50x) over i.LINK or Ethernet.
- Proxy A/V import from Memory Stick or USB Drive.
- A "Live Logging" module, which allows operators to add notes, Essence Marks and other metadata to the XDCAM clips while they are being recorded to an XDCAM deck or camcorder.
- Extensive Metadata input: Add titles, comments, Essence Marks and other descriptive information to your media files. This information stays with the clips until it is manually changed, and it is readable by NLEs.
- Simple storyboard editing of clips and sub clips; storyboards can be written back to the disc as *Clip Lists* to be played back in cut order or used to generate new full resolution .MXF files.
- EDL export of Proxy sequences in BVE9100, Avid Log Exchange (ALE) or NewsBase XML format. EDL can also be exported in AAF format, which enables you to instantly import the EDL with associated clips into Avid project.
- Full-resolution transfer of XDCAM files across a network.
- XDCAM disc image creation for archiving and sharing media. XDCAM Disc Images containing an exact replication of a disc's UMID and directory structure (but with only the Proxy and XML files stored within) can be exported locally, to a Memory Stick or other removable storage.
- Partial or Entire Disc Copy.
- FAM↔FAM disc duplication.
- Standalone MXF PROXY VIEWER.

## Glossary

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### 1080i

Refers to the HDTV standard defined by a vertical resolution of 1080 TV lines recorded using Interlace Scan.

### AV/C

Short for *Audio, Video and Control*. AV/C is an IEEE 1394 specification that defines a set of commands for controlling audio/video devices using an IEEE 1394 (also referred to as 'i.LINK' or 'Firewire') bus. The *i.LINK AV/C Mode* on XDCAM devices enables the operator to capture and record 25 Mbps DVCAM, DV and HDV streams as one would using a traditional DV deck. Both MPEG IMX and HD material are down-converted to the DVCAM format when playing out the i.LINK port in AV/C Mode. The optional PDBK-102 board for the PDW-F75, PDW-F70 and PDW-F70 decks allows HDV transport streams to be recorded from or transmitted over the i.LINK port.

### Conform

Originally a filmmaking term that referred to the process of matching the original film to the final edited workprint. In video editing workflow, *Conforming* refers to the process of replacing lower or 'offline' resolution Proxy media with the equivalent full resolution clips. *See also Batch Import.*

### Disk Label

A unique name given by the editor to each XDCAM disc so that it can be tracked and managed within the NLE's media directories. If necessary, Disk Labels can be modified during editing workflow without breaking the link between the clips and the discs from which they were imported.

### DVCAM

Sony's professional DV format. DVCAM is an 8-bit component digital format with a chroma subsample structure of 4:1:1 (NTSC) or 4:2:0 (PAL). Both XDCAM SD and HD camcorders can acquire in the DVCAM format.

### Essence Mark

A type of XDCAM metadata placed on a specific frame of video. The camera/deck operator can add Essence Marks manually during shooting/recording or afterwards while reviewing the material. XDCAM SD cameras have the ability to automatically generate specific Essence Marks whenever a particular event or condition occurs (e.g a filter change or a sudden spike in the audio levels). Thumbnails representing the Essence Mark positions are generated each time a new Essence Mark is set, and camera/deck operators can cue the marked portions of clips by selecting their respective thumbnails from a list.

### **Ethernet Mode**

Refers to XDCAM's network/FTP mode, in which the XDCAM device acts as an FTP server and files are transferred using an FTP client PDZ-1, or a command line interface on the host computer.

### **File Access Mode (FAM)**

The i.LINK mode of operation is used for transferring clips as data files.

### **FTP**

*File Transfer Protocol*, an application layer extension of TCP/IP protocol that is used for transferring large files over networks.

### **i.LINK**

Sony's trade name for IEEE 1394-compliant or 'Firewire' interfaces. See also *AV/C; File Access Mode*.

### **Metadata**

Literally 'Data about Data,' metadata is descriptive or structural information contained within a file. XDCAM systems and Professional Disc media adopt a variety of different types of metadata including text-based descriptors (Essence Marks, clip titles, comments etc), UMIDs and Proxy AV data. See also *Essence Mark; MXF; Proxy AV; UMID*.

### **MPEG IMX**

An MPEG-2 SD codec from Sony, utilizing the MPEG-2 4:2:2 Profile @ Main Level with selectable data rates of 30, 40 or 50 Mbps. The MPEG IMX formats use *Intraframe* or "I-Frame Only" compression, which means that all the information needed to recreate each frame is stored within the frame itself, as opposed to *Interframe* compression, which relies on information stored across adjacent frames. As the MPEG IMX data rates exceed the bandwidth available for i.LINK AV/C capture and recording, XDCAM devices output a down-converted DVCAM stream over i.LINK during MPEG IMX playback. i.LINK-based transfer of full-quality video/audio recorded in any of the MPEG IMX codecs requires File Access Mode.

### **MPEG HD**

An HD recording codec that utilizes MPEG-2 Main Profile @ High 1440 compression. XDCAM devices are capable of recording MPEG HD at data rates of 18, 25 and 35 Mbps (the *LP*, *SP* and *HQ* modes, respectively). The LP and HQ modes of 18 and 35 Mbps are recorded at Variable Bit Rates (VBR), while the 25 Mbps SP mode is recorded at a Constant Bit Rate (CBR). XDCAM devices output a down-converted DVCAM stream over i.LINK AV/C mode during MPEG HD playback. An optional adaptor for the PDW-F75, PDW-F70 and PDWF30 enables a 25 Mbps HDV transport stream to be output during playback of any of the XDCAM HD record codecs. Full-quality transfer of MPEG HD material

requires either file transfer by i.LINK File Access Mode (FAM) or Ethernet FTP. Real-time capture can also be accomplished with HD-SDI or Component Analog HD I/O. See also *MPEG IMX*.

#### **MPEG-4**

The MPEG standard used for XDCAM's Proxy AV files. MPEG-4 is commonly used for web streaming, offline editing and other applications where bandwidth is limited.

#### **MXF**

Short for *Material eXchange Format*. MXF is a standard file interchange format commonly used for A/V material and metadata. MXF is a format that is essentially a 'package' used to 'wrap' A/V material of any given format. ASF and QuickTime™ are examples of similar file-wrappers, though they are not standardized and their use requires a license agreement. MXF, on the contrary, is an open standard that can be used by anyone.

#### **Overcranking and Undercranking**

Also referred to as "Slow and Quick Motion," this is the process of shooting at higher/lower frame rates to achieve in-camera motion effects. Fewer frames per second = faster motion (undercranking) while higher frame rates = slower motion (overcranking). The term refers to the manual cranks used to control the frame rate on early film cameras. XDCAM HD achieves motion effects in much the same way as a motion picture camera—in both cases it's the difference between the shooting frame rate and the playback frame rate that creates the effect. This is also what enables overcranked and undercranked footage to be played back in the camcorder; while a given scene might have been shot with 'Slow and Quick Motion' set to 18 fps, the record/playback frame rate of the camcorder is still 24 or 30.

#### **Professional Disc**

The Optical Disc recording media used by the XDCAM system. Sony Professional Discs have a storage capacity of 23.3 GB and 50 GB. Available record times for Professional Disc media are as follows:

Format	Bitrate (Mbps)	Audio Channels	Recording Time (Minutes)	
			23.3-GB Disc	50-GB disc
DVCAM	25	4	85	185
MPEG IMX	30	4 or 8	68	150
	40	4 or 8	55	120
	50	4 or 8	45	100
MPEG HD	18 (VBR*)	2	122	265
		4	112	248
	25 (CBR)	2	90	200
		4	85	190
	35 (VBR*)	2	68	150
	4	65	145	

\*When recording HD in any of the VBR formats, recording time may be higher than the figures listed depending on the actual bit rate adopted during Variable Bit Rate encoding.

### Proxy AV

Proxy AV files are low resolution, time code synchronized copies of high-resolution video files. Proxy AV data is a type of MXF metadata and is composed of 1.5 Mbps MPEG-4 video data and 0.5 Mbps 8 kHz audio data.

### PsF

Short for *Progressive Segmented Frames*. Frames recorded in PsF on XDCAM and HDCAM camcorders are captured progressively and then separated into segments, with the odd lines in one segment and the even lines in another segment. This allows a progressive image to be processed on the same circuitry used for interlaced video. This is different from adding a pulldown in that the image remains progressive and the frame rate is not changed to 60i or 50i. Additionally, segmented frames lack the interfield motion of interlaced video. Interlaced frames are made up of fields recorded separately and then combined, whereas segmented frames are captured progressively.

### SBP2

Serial Bus Protocol 2, an IEEE 1394 protocol that allows data transfer between a computer and an external SBP2 capable device. *See also File Access Mode.*

### UMID

Unique Material Identifier. Each XDCAM disc has its own UMID, and within each disc the clips have their own set of UMIDs containing format and ownership information. UMIDs are shared between Proxy and Full resolution clips.