Workflow for Final Cut Pro and the Panasonic AG-HVX200 HD Camera

Contents

Introduction

Panasonic's new AG-HVX200 camera is the first handheld HD camera to utilize the P2 card tapeless recording process. For Final Cut Pro editors, working in a tapeless environment offers new flexibility and speed in the post-production process. The HVX200 is a continued development of Panasonic's other successful cameras, including the DVCPRO HD VariCam series and the DVX100 series. If you've worked with either of these camera series, you'll be on familiar ground with the HVX200's shooting modes and formats. The HVX200 surpasses those cameras in that it can also shoot a 24p version of 1080.

With version 5.0.4, Apple's Final Cut Pro digital video editing application provides basic support for most of the HVX200 camera's shooting modes. Over time, Final Cut Pro will develop support for the other modes as well. Because not all modes are supported in version 5.0.4, and because some of the methods of capturing your material might require additional P2 devices, you should review the methods in which Final Cut Pro can handle each shooting mode before choosing one for production.

This paper begins by covering some of the new terminology and procedures involved with the P2 tapeless editing workflow. A chart of currently supported HVX200 shoot- ing modes is included to help you choose the best options for your production at this stage of Final Cut Pro support. And finally, a step-by-step tutorial guides you through the process of using P2 technology in a Final Cut Pro project.

Note: For additional information regarding the AG-HVX200 HD camera or Panasonic P2 products and production workflow, visit www.panasonic.com/hvx200.

P2 Cards and Card-Reading Devices

Final Cut Pro has supported P2 cards since the introduction of Final Cut Pro 5.0 in spring 2005. The P2 card is a new solid-state recording media that Panasonic developed to increase the flexibility of the production workflow. It stores large amounts of video and audio data in MXF-format files. The camera works with two P2 card sizes—4GB and 8GB. The recording time for each P2 card is dependent on what mode the camera is set to record. Please see the AJ-HVX200 FAQ at Panasonic's website for more information.

The P2 card-reading options include:

• P2 Card Slots—Located in the AG-HVX200 camera.

• P2 Card Reader—Mounts up to five cards and uses a USB 2.0 cable for data transfer.

• CardBus (32-bit) or PC Card (16-bit) slot—Reads P2 cards with the appropriate Panasonic drivers.

• P2 Store External Hard Drive—Includes one P2 card slot and a 60GB internal hard
drive used to offload media from the card to the hard drive in the field so the card
can be reused. Can also be connected via USB 2.0.

P2 Store Drive

Some P2 devices read P2 cards in real time; others read them faster or slower,
depending on the type of footage on the P2 card and the transport or storage rate
of the device. Panasonic also has a driver for a PowerBook G4 CardBus slot. You can
check the Panasonic website for additional information on P2 card devices.

In addition to the P2 card technology, a built-in tape drive on the HVX200 enables
you to record DV25 MiniDV tape. When you choose this process, you follow the typical
Final Cut Pro Log and Capture options.

Capturing vs. Ingesting

The standard protocol for inputting material into Final Cut Pro is to capture material from a tape source (DV, SD, or HD) via Apple's FireWire or through a third-party capture card. When the Panasonic HVX200 camera records footage to a P2 card, that material is recorded in digital file form. You can play back the material from the P2 card and capture as you do with videotape. Or you can simply transfer and ingest the footage, similar to the way you would with other files from a hard drive or a storage device. In the current HVX200 to Final Cut Pro workflow, it is recommended that you use the capture approach with some formats and the ingest approach with others. You can retrieve footage from a P2 card in one of the following ways:

• Log and capture via FireWire, using the camera as a VTR and the P2 card as though it were a tape (MCR/VCR mode).

• Ingest or copy from the P2 card via FireWire, using the camera as a P2 card reader (PC/Dub mode).

• Ingest or copy from the P2 card using the stand-alone P2 card reader or the P2 Store (via USB 2.0).

• Ingest or copy from the P2 card using the CardBus slot in a PowerBook.

Shooting Modes and Formats

The HVX200 has strong links to Panasonic's AJ-HDC27 VariCam, and it is the second Panasonic camera to offer variable recording speeds at 720p. Because it was developed from Panasonic's existing line of cameras, the video formats are the same: DV, DVCPRO, DVCPRO 50, and DVCPRO HD. And there are no new codecs, so you can use the familiar sequence preset options in Final Cut Pro, discussed in more detail later. The shooting modes are also similar to those of the VariCam, but the HVX200 includes almost every shooting possibility. You can choose resolutions of 1080, 720, or 480; and shoot at 24 frames per second (fps), 30 fps, or 60 fps. You can also choose interlace or progressive scan options. In addition, the HVX200 can record four channels of uncompressed 16-bit audio in certain formats.

Together, the shooting modes include:

• 1080/60i, 1080/30p, 1080/24p

• 720/60p, 720/30p, 720/30pn, 720/24p, 720/24pn

• 480/60i, 480/30p, 480/24p

• Variable frame rates in 720p mode: 12 fps to 60 fps

• Variable frame rates in 720pn mode: 12 fps to 60 fps (No audio recorded in variable frame rate modes.)

Note: The NTSC HVX200 camera always shoots in the NTSC-derived versions of all the frame rates; for example, 24p = 23.98p, 30p = 29.97p, 60p = 59.94p, and 60i = 59.94i.

The last shooting mode listed above, 720pn, is a new native mode. In this mode, only the true frames that were shot are recorded onto the P2 card. Because the P2 card is not tied to a videotape rate, the frames are recorded with no pulldown pattern. This rate also extends the recording time of a P2 card.

As is always the case, the format you choose for shooting and editing depends in large part on what format you need to deliver when the project is finished. If you need to deliver in NTSC 29.97, you would probably shoot 30p or 60 (some multiple of 30), so you won't add or lose any frames during editing. If you were delivering to D5 at 24 fps, you would shoot everything at 24 fps.

Pulldown Method

When shooting in 1080 or 480 progressive modes, the camera records 60 fields, or 60i, by using a pulldown pattern. In the HVX200, you can choose from two types of pulldown patterns. One is the standard 3:2 (or 2:3) pulldown method, in which you can translate the 24p footage to 60 fields of video. In this process, one progressive frame is recorded to two interlaced fields, the next frame to three fields, the next frame to two, the next to three, and so on. This process creates two mismatched frames that are combined into a composite frame in Final Cut Pro using Cinema Tools. This method is the current legacy approach in Final Cut Pro.

Field 1	A	B	B	C	D
Field 2	A	B	C	D	D

Standard 3:2 Pulldown Pattern

In Panasonic's new advanced pulldown mode, denoted by the letter "a" (as in 1080pa), the pulldown cadence is 2:3:3:2. One progressive frame is transferred to two fields, the next frame to three, the next to three again, and the next to two. This method creates just one mixed frame. Final Cut Pro can read the metadata recorded with the footage to identify and remove the third frame, which is the mixed frame.

Field 1	A	B	B	C	D
Field 2	A	B	C	C	D

New 2:3:3:2 Advanced Pulldown Pattern

Recommended Capture and Ingest Options

The following chart details the different shooting modes and recommended capture or ingest options. Keep in mind that "a" refers to the advanced pulldown method, and "n" refers to the native 720p recording process.

For the Panasonic AG-HVX200
All formats are NTSC (PAL camera available in spring 2006)

HVX200 FORMAT	INGEST	INGEST NOTES	CAPTURE	CAPTURE NOTES
480i 60/480p 30	Yes	Ingests at 30 or 60 fps	Yes	Captures at 30 or 60 fps
480p 24	Yes	Ingests at 30 fps (29.97)*	Yes	Captures at 30 fps (29.97)
480pa 24	Yes	Ingests at 30 fps*	Preferred	Captures at 24 fps
720p 60	Yes	Ingests at 60 fps	Yes	Captures at 60 fps
720p 24/30	Yes	Ingests at 60 fps	Yes	Captures at 24 or 30 fps
720pn 24/30	Yes	Ingests at 24 or 30 fps	No	Not supported at this time
720p [x] (variable)	Yes	Ingests at 60 fps	Yes	Captures at 60 fps
720pn [x] (variable)	Yes	Can be ingested at 24pn or 30pn and footage will appear under- or over-cranked	No	Not supported at this time
1080i 60/1080p 30	Yes	Either is fine	Yes	Either is fine
1080p 24	No	Not supported at this time	No	Not supported at this time
1080pa 24	No	Not supported at this time	No	Not supported at this time

* 480pa 24 contains advanced pulldown, which can be removed on capture without Cinema Tools.

Working with P2 Footage

The tapeless approach to shooting with the HVX200 offers many exciting possibilities in the editing workflow. You can shoot, then capture or ingest, and then edit. The shoot/capture/edit approach has been the typical NLE (nonlinear editing) process. But with the use of P2 cards and additional P2 card readers, you can dovetail your shooting and editing by offloading one P2 card to a drive while you continue shooting onto another P2 card. You can also use the HVX200 camera in the field to offload your P2 footage after you've finished shooting, or pop the P2 card directly into your laptop, import it, and begin editing immediately, without having to go through a lengthy capture process.

These options will save an enormous amount of time and open doors to many exciting production and post-production possibilities as people begin to work with this camera. In the meantime, however, make sure you choose the best Final Cut Pro operating procedures to ensure that you create a successful project.

The how-to steps in this section cover the following topics:

• Offloading clips from the HVX200

• Importing P2 footage into Final Cut Pro

• Using Log and Capture for P2 Footage

• Choosing an Easy Setup

• Editing P2 footage

• Outputting a P2 project

• Workflow tips

• Frequently asked questions

Offloading Clips from the HVX200

One way of offloading footage from a P2 card is to use the HVX200 as a FireWire device. To do so, you connect the camera to your computer via a FireWire cable (4-pin to 6-pin) and transfer or copy the footage onto your computer or another external FireWire device using the PC/Dub mode.

Note: You can also import clips from the P2 card in the camera into Final Cut Pro; follow the steps in the "Importing P2 Footage into Final Cut Pro" section.

Here are the steps for offloading footage using the HVX200 as a FireWire device:

1 Connect the camera to your computer using a FireWire cable and turn on the camera.

2 In camera mode, press the Menu button and navigate to 9–Other Functions. Press Set to view these options.

3 Navigate to the PC Mode option. Press the Set button and choose 1394 Device. Exit the Menu mode.

4 On the back of the camera, make sure the Media switch is set to P2. Press the Mode button to switch the camera to MCR/VCR mode. You will see clip thumbnails in the viewer. Press the Mode button again and hold it a few seconds until the PC/Dub mode light goes on.

   The camera viewfinder will go through the following sequence when connecting via FireWire in PC/Dub mode:

   • 1394 device

   • 1394 device disconnect

   • 1394 device connect

Tip: You can rename a P2 card when it's in the PowerBook computer's internal PC slot.

5 On your computer desktop, you will see an icon representing the camera as a drive. If two P2 cards are in the camera, you will see two icons.

6 To copy the contents of the P2 card, first create an empty folder on your desktop or in a specific location on your hard drive or FireWire drive. Then hold down Option as you drag the P2 card icon onto the folder.

   Note: In PC/Dub mode, Final Cut Pro sees the camera as a FireWire drive. To switch out of PC/Dub mode, you must eject or remove the P2 icons from the desktop, as you would any FireWire device, and turn off the camera.

Importing P2 Footage into Final Cut Pro

You can import footage into Final Cut Pro directly from a P2 card, using a P2 card reader, the PCMCIA CardBus slot in your laptop, or the HVX200 camera itself. You can also import footage from a P2 card image that was offloaded to a hard drive. Final Cut Pro sees the P2 card as a volume and also sees the path to the card. The process for importing P2 clips is similar to standard importing, with some important differences. For example, importing P2 footage actually copies the media from the P2 card into your Capture Scratch folder and places a QuickTime wrapper around it to edit in Final Cut Pro.

1 Load a P2 card into your laptop PCMCIA slot or connect the camera via FireWire as in steps 1 through 4 in the previous section.

   Note: You can also attach a P2 card reader using USB 2.0; make sure the P2 card is write protected and is in the Read Only mode.

Tip: If you are going to be importing a lot of P2 footage, create a button for this option and place it in the Browser button bar for easier access.

2 In Final Cut Pro, choose File > Import > Panasonic P2.
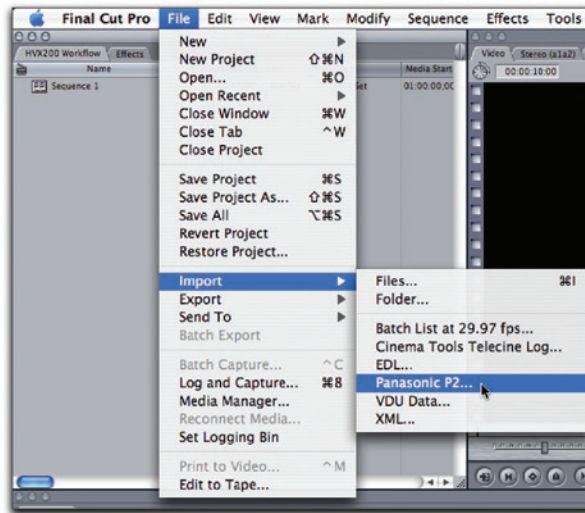
When you choose Import > Panasonic P2, an Import Panasonic P2 browser window appears. Enter your P2 reel name and select your source or footage location.
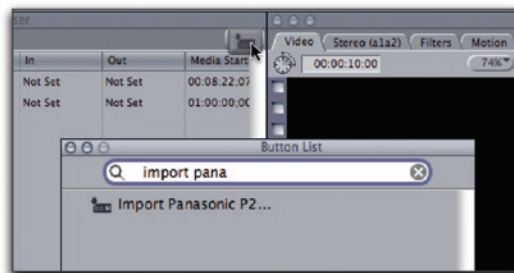

If Final Cut Pro detects a P2 card in your laptop's PC slot, or from a card reader or a connected camera, it will display that path and the P2 clips on that card in the clip area of the window.
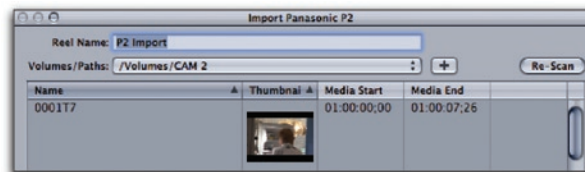

3 In the Reel Name field, enter the reel name or number you want Final Cut Pro to use as a reference for this set of P2 clips.

4 If more than one P2 card is connected to the computer, click the Volumes/Paths pop-up window to select the appropriate volume or P2 card.
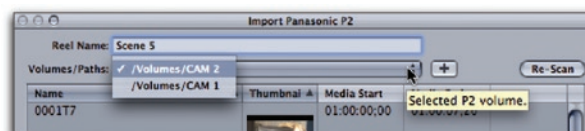
When you select a volume, the clips from that volume appear in the clips of the
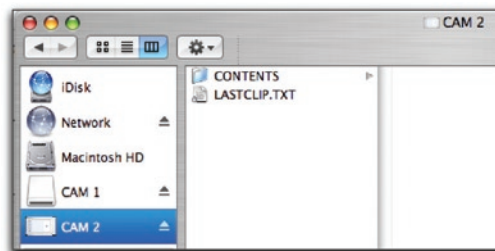window.
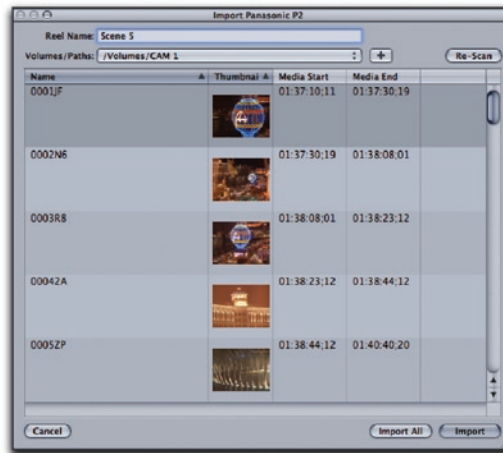
5 If the P2 clips were transferred to your hard drive before importing, they will appear
in a separate folder named after the P2 card. To identify those clips, click the Plus (+)
button next to the Volumes/Paths pop-up window and, when the Open window
appears, manually navigate to the correct footage location.
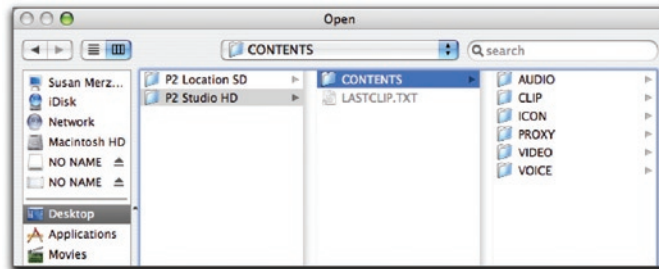
When you see the P2 footage in this window, you'll find that the clips are organized
into separate folders contained within a Contents folder. If the footage was transferred
to your hard drive, the Contents folder will be contained within another folder most
likely named for the footage you shot. In the image above, the Contents folder is
located on the P2 Studio HD folder, which was transferred from a P2 card.

Note: If you are importing directly from a P2 card in your laptop PC slot or from an
HVX200 camera, you will see a P2 card icon, which the Contents folder will be on.

White Paper   **13**
Workflow for Final Cut Pro and the
Panasonic AG-HVX200 HD Camera

6 To import the P2 footage onto your hard drive, select the Contents folder that contains the P2 clip folders.

> **Note:** You can also select the Contents parent folder for the same result.

7 In the Import Panasonic P2 window, click to select the clips you want to import. You can use Shift-click and Command-click to refine or limit the selection.
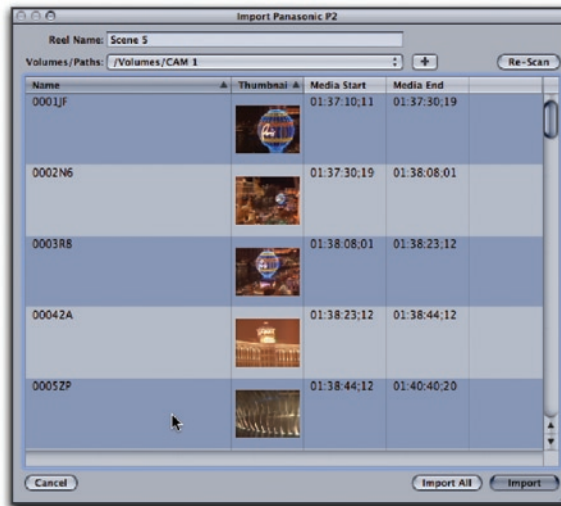
8 Click the Import button to import the selected or highlighted clips into Final Cut Pro. Click the Import All button if you want to import all the P2 clips from this volume or location at one time.

> In the Final Cut Pro Browser, during the importing process, each clip appears as it's being imported. Clips are imported in the order they appear on the card.
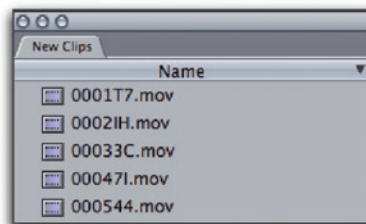
Tip: Don't forget to eject the icon of the P2 card or the camera hard drive icon first before ejecting the card or disconnecting the FireWire cable.

Once the clips are imported into Final Cut Pro, you can rename them to better reflect the actual footage.
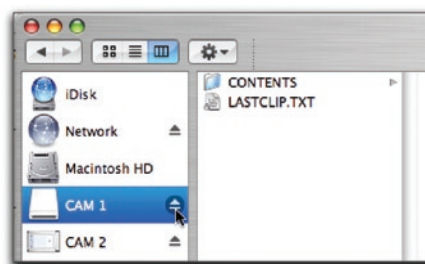
Using Log and Capture for P2 Footage

Another approach to using P2 footage is to capture it from the P2 card or from a MiniDV tape. When capturing from the P2 card, you are playing the footage back as though it were a VTR tape.

1   With the camera off, make sure the FireWire cable is attached to the camera and the computer.

2   To capture from a P2 card, make sure the media switch is set to P2 in the back of the camera. To capture from a MiniDV tape in the camera, set the switch to Tape.

3   Turn on the camera and press the Mode button to select MCR/VCR mode. In P2 card mode, you will see thumbnails of your footage clips in the camera viewer.

    Note: The camera can do either streaming mode (VCR communication MCR/VCR) or disk mode (PC/Dub), but not both at the same time.

4   Launch Final Cut Pro and choose the appropriate Easy Setup to match the footage you want to capture, then open the Log and Capture window.

5   If capturing from tape, do the following:

  • Play the tape and cue to the desired capture location.

  • Capture as you normally would using any of the Capture options.

6   If capturing from a P2 card, do the following:

  • On the camera, navigate to the thumbnail where you want to begin viewing or capturing.

  • Toggle from the thumbnail screen by pressing the Audio Dub/Thumbnail button or the Play button on the camera to engage the clip.

  • In Final Cut Pro, press the Play button in the Log and Capture preview area to begin viewing the footage. When viewing, you can use the J-K-L keys to navigate through the footage.

  • After marking an area for capture, you can use Capture Clip or Log Clip and then Batch Capture.

    Note: Capture continues across P2 clips. However, when capturing footage with timecode breaks from a P2 card, the captured clips might have incorrect durations in Final Cut Pro. To use Capture Now, don't let the footage run to the end of the P2 card. Final Cut Pro will abort the capture on dropped frames and the file will not be saved. Make sure you end the capture before the last frame is reached.

Tip: You can also use the camera VCR controls to navigate through the footage. To switch the camera out of the Thumbnail view and use the P2 card as if it were a tape source, press the Audio Dub/Thumbnail button.

  • To capture a different clip on the card, either press Stop twice in the Final Cut Pro Log and Capture window or press the Stop button on the camera. The Thumbnail view will appear in the camera viewer and you can navigate to a different clip or area.

Choosing an Easy Setup

The HVX200 offers up to 21 different shooting modes. The following image shows a sample clip for almost every format available in the HVX200, shot on a P2 card. Each clip is named for its shooting format. Look at the information in the Browser columns that define each clip's properties, especially the Vid Rate column.

Name	Audio	Frame Size	Vid Rate	Compressor	Data Rate	Aud Rate
0002IH_1080i 60	4 Mono	1280 x 1080	29.97 fps	DVCPRO HD 1080i60	14.1 MB/sec	48.0 KHz
00033C_1080i 30p	4 Mono	1280 x 1080	29.97 fps	DVCPRO HD 1080i60	14.1 MB/sec	48.0 KHz
00047I_1080i 24p	4 Mono	1280 x 1080	29.97 fps	DVCPRO HD 1080i60	14.1 MB/sec	48.0 KHz
00054H_1080i 24pa	4 Mono	1280 x 1080	29.97 fps	DVCPRO HD 1080i60	14.1 MB/sec	48.0 KHz
0006UK_720p 60p	4 Mono	960 x 720	59.94 fps	DVCPRO HD 720p60	14.1 MB/sec	48.0 KHz
0007SP_720p 30p	4 Mono	960 x 720	59.94 fps	DVCPRO HD 720p60	14.1 MB/sec	48.0 KHz
00089B_720p 24p	4 Mono	960 x 720	59.94 fps	DVCPRO HD 720p60	14.1 MB/sec	48.0 KHz
00090I_720p 30pn	4 Mono	960 x 720	29.97 fps	DVCPRO HD 720p60	7.2 MB/sec	48.0 KHz
0010XO_720p 24pn	4 Mono	960 x 720	23.98 fps	DVCPRO HD 720p60	5.9 MB/sec	48.0 KHz
0011S9_480i 60i	4 Mono	720 x 480	29.97 fps	DVCPRO50 – NTSC	7.2 MB/sec	48.0 KHz
00122W_480i 30p	4 Mono	720 x 480	29.97 fps	DVCPRO50 – NTSC	7.2 MB/sec	48.0 KHz
00138G_480i 24p	4 Mono	720 x 480	29.97 fps	DVCPRO50 – NTSC	7.2 MB/sec	48.0 KHz
0014XH_480i 24pa	4 Mono	720 x 480	29.97 fps	DVCPRO50 – NTSC	7.2 MB/sec	48.0 KHz
00158Y_480i DVCPRO 50	4 Mono	720 x 480	29.97 fps	DVCPRO50 – NTSC	7.2 MB/sec	48.0 KHz
00168I_480i DVCPRO	2 Mono	720 x 480	29.97 fps	DV/DVCPRO – NTSC	3.6 MB/sec	48.0 KHz
0017KW_480i DV	2 Mono	720 x 480	29.97 fps	DV/DVCPRO – NTSC	3.6 MB/sec	48.0 KHz

Note: While DVCPRO HD Easy Setups can support eight channels of audio, the HVX200 records four channels. To save disk space, you can manually deselect the unused tracks in the Clip Settings tab during the Log and Capture process.

As always, the key in Final Cut Pro is to create a sequence with the same settings that match your footage. This process is done through Easy Setups. Because the HVX200 utilizes existing Panasonic codecs—DV, DVCPRO, DVCPRO 50, and DVCPRO HD—no new codecs are used with this camera. Final Cut Pro supports all of these codecs and has an Easy Setup option for each one. Let's look at which Easy Setup option would
be best for each shooting mode.

To access the Easy Setup options:

1 Choose Final Cut Pro > Easy Setup, or press Control-Q.

2 In the upper right corner, click the Show All checkbox.

3 Choose the Setup For pop-up menu and select the Easy Setup option that corresponds to your shooting format.

Recommended Easy Setups

All formats are NTSC (PAL available in spring 2006)

SHOOTING FORMAT	EASY SETUP
480i DV	DV-NTSC
480i DVCPRO	DV50
480i DVCPRO 50	DV50
480i 60/480p 30	DV-NTSC or DV50-NTSC
480p 24	DV-NTSC 24p (23.98) or DV50 NTSC 24p (23.98)
480pa 24	DV-NTSC 24p (23.98) Advanced Pulldown or DV50 NTSC 24p (23.98) with Advanced Pulldown
720p 60	DVCPRO HD—720p60
720p 30	DVCPRO HD—720p30
720p 24	DVCPRO HD—720p24
720pn 24	DVCPRO HD—720p24
720pn 30	DVCPRO HD—720p30
720p [x] (variable)	DVCPRO HD—Any one
720pn [x] (variable)	DVCPRO HD—720p24 or 720p30, depending on PN rate
1080i 60	DVCPRO HD—1080i60
1080i 30p	DVCPRO HD—1080i60*
1080pa 24	Not supported at this time
1080p 24	Not supported at this time

* Preset must be modified by user—edit the sequence preset and change field dominance to "none."

Editing P2 Footage

Once you've imported or captured P2 clips into a Final Cut Pro project and chosen the appropriate Easy Setup option, you're ready to create a sequence and begin editing. You open P2 clips and mark and edit them just as you would any other clips. There are a few differences to take into consideration.

· **Four-channel audio**
Clips captured with four channels of audio come in as mono or stereo tracks.

The HVX200 records only four channels of audio. Since the Final Cut Pro DVCPRO HD Easy Setup records eight channels, you must manually deselect the unused tracks to save disk space.

· **Event recorded over two cards**
While recording, when one P2 card is filled, the camera jumps to card two and continues recording. Final Cut Pro will not put these two pieces together—you will have to manually reassemble them into a single clip.

Timecode will continue from the end of the first card to the beginning of the second card. That is, the second clip will begin with the next timecode frame number that follows the last timecode number on the first card or clip.

- **Working with variable speed recordings**
  When shooting in variable speed, time lapse can be achieved with 720p 60 and 720p 30. In the Recording Setup menu, change the Rec Function to Interval. Then select an interval time from 2 frames to 10 minutes in length. This interval enables you to record single frames up to every 10 minutes to create time-lapse footage. These clips can be captured, or P2 clips can be imported, into Final Cut Pro.

Outputting a P2 Project

When editing is complete, you can output from Final Cut Pro using the Print to Video option. You can output a sequence, depending on length and originating format, to a P2 card in the camera, using the camera as the recording device. You can also use the MiniDV tape in the camera to output a DV sequence or to downconvert a 720 or 1080 clip to DV. For all other options, you will need an appropriate deck.

To output to P2 with embedded timecode from your HD sequence:

1 In Final Cut Pro, prepare your sequence for output as you normally would.

2 In the Camera Menu, choose an HD format that matches your sequence output.

3 Switch the camera to P2 MCR mode and connect it to the computer via FireWire.

4 In the MCR menu on the camera, ensure that 1394 TC REGEN is set to ON and 1394 UB REGEN is also set to ON.

5 Choose File > Print to Video and make the appropriate selections. You must start the recording on the camera manually *after* beginning the sequence playback. Therefore, it is recommended that a leader element be used in the Print to Video dialog box in Final Cut Pro. Do *not* check the Automatically Start Recording checkbox.

To output to tape:

1 In Final Cut Pro, prepare your sequence for output as you normally would.

2 Switch the camera to Tape mode and connect it to the computer via FireWire.

3 Choose File > Print to Video and make the appropriate selections. You must start the recording on the camera *after* beginning the sequence playback.

Note: If you are shooting and editing in 24p, you can also output to DVD using DVD Studio Pro to maintain the high-resolution format.

Workflow Tips

As with any new technology, you'll find that various tips, tricks, and occasional workarounds will help you get the most out of your new equipment. It might be helpful to review the following tips before starting a project.

· In the current Final Cut Pro version, if you encounter an error as you're trying to ingest, you might get just one generic error message.

· You can do real-time downconversions within the camera from the P2 card to DV tape. This process preserves timecode.

· You can shoot 720p at variable frame rates on a P2 card and downconvert that to DV tape.

Frequently Asked Questions

What protocol does Final Cut Pro use to handle the material?
Final Cut Pro uses MXF (material exchange format), which is the SMTPE standard.

Does Final Cut Pro recode the P2 files?
No, Final Cut Pro unwraps and rewraps the clip in QuickTime. It doesn't recode.

Does Final Cut Pro support the use of image proxies?
Not at this time.

Can I use other external FireWire drives to transfer or ingest material from P2 cards?
You can use an external FireWire drive.

Can Final Cut Pro read the voice annotations written to a P2 clip?
Not at this time. You do, however, get a .wav file and can connect that to the clip.