www.aja.com

ioEXPRESS



Published: 9/8/09

Installation and Operation Guide

Because it matters.

AJA® VIDEO SYSTEMS

Trademarks

AJA®, KONA®, and XENA® are registered trademarks of AJA Video, Inc. Ki Pro™, Io HD™, Io Express™, and Io™ are trademarks of AJA Video, Inc.

Apple, the Apple logo, AppleShare, AppleTalk, FireWire and Macintosh are registered trademarks of Apple Computer, Inc. Final Cut Pro, QuickTime and the QuickTime Logo are trademarks of Apple Computer, Inc. TASCAM is a registered trademark of TEAC Corporation.

All other trademarks are the property of their respective holders.

Notice

Copyright © 2009 AJA Video, Inc. All rights reserved. All information in this manual is subject to change without notice. No part of the document may be reproduced or transmitted in any form, or by any means, electronic or mechanical, including photocopying or recording, without the express written permission of AJA Inc.

FCC Emission Information

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications not expressly approved by AJA Video can effect emission compliance and could void the user's authority to operate this equipment.

Contacting Support

To contact AJA Video for sales or support, use any of the following methods:

443 Crown Point Circle, Grass Valley, CA. 95945 USA

Telephone: 800.251.4224 or 530.274.2048
Fax: 530.274.9442

Web: http://www.aja.com
Support Email: support@aja.com
Sales Email: sales@aja.com

When calling for support, first read the Chapter on *Troubleshooting* at the back of this manual. You can often save time and effort by looking there first for simple remedies and information on how to get support from AJA and Apple Computer Inc.

Limited Warranty

AJA Video warrants that this product will be free from defects in materials and workmanship for a period of three years from the date of purchase. If a product proves to be defective during this warranty period, AJA Video, at its option, will either repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, you the Customer, must notify AJA Video of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. The Customer shall be responsible for packaging and shipping the defective product to a designated service center nominated by AJA Video, with shipping charges prepaid. AJA Video shall pay for the return of the product to the Customer if the shipment is to a location within the country in which the AJA Video service center is located. Customer shall be responsible for paying all shipping charges, insurance, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. AJA Video shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than AJA Video representatives to install, repair or service the product, b) to repair damage resulting from improper use or connection to incompatible equipment, c) to repair any damage or malfunction caused by the use of non-AJA Video parts or supplies, or d) to service a product that has been modified or integrated with other products when the effect of such a modification or integration increases the time or difficulty of servicing the product.

THIS WARRANTY IS GIVEN BY AJA VIDEO IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. AJA VIDEO AND ITS VENDORS DISCLAIM ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. AJA VIDEO'S RESPONSIBILITY TO REPAIR OR REPLACE DEFECTIVE PRODUCTS IS THE WHOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES IRRESPECTIVE OF WHETHER AJA VIDEO OR THE VENDOR HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Trademarks ii
Notice ii
FCC Emission Information ii
Contacting Support ii
Limited Warranty iii
Overview 1
Features 1
Accepted Input Formats 2
Playback Formats 2
Io Express Audio 2
Software for Mac 2
Software for Windows 2
System Requirements 4
Minimum and Recommended System and Software Requirements 4
Cable Connections 5
Connector Descriptions—
Io Express & Cables 5
HD/SD SDI Input and Output 5
HDMI Input and Output 5
Analog 2-Channel Unbalanced Audio Output 5
RS422 Machine Control 5
Component Video Output (with Composite and Y/C functions) 6
Reference Video and LTC Input 6
In This Manual 6

Chapter 2: Installation
Installation Overview 7
Shipping Box Contents 8
Connecting to a your Computer 9
Cabling the System 10
Typical System 10
Installing Io Express Software 11
Software Installation Procedure for Mac 12
Software Installation Procedure for Windows 16
Genlock and Your System 16

Chapter 3 Using Final Cut Pro
Final Cut Pro 17
Using The AJA Io Express Control Panel 17
Control Panel Basics 17
Input Screen 20
Input Screen Settings 20
Format Screen 21
Format Screen Settings 21
Analog Out Screen 22
Analog Out Screen Settings 22
HDMI Tab Screen 23
HDMI Tab Screen Settings 23
Control Screen 24
Control Screen Settings 24
Playback Timing (greyed-out when in Input Passthrough) 26
Setup Screen 26
Setup Screen Settings 27
Codec Options 27
Codec Screen Settings 28
Timecode Screen 28
Timecode Screen Settings 29
Info Screen 30
Saving Your Control Panel Presets 31

Who is Controlling Io Express? 31
QuickTime Application Control 31
Io Express Control Panel Control 32
Control Recommendations 32
Easy Setups for Typical Uses 33
Easy Setups Menu 33
Easy Setups For Use With Io Express 35
Audio/Video Settings Menu 35
To Create A New Easy Setup 35
The Sequence Presets Window 36
The Capture Presets Window 38
Capture Presets Editing 39
The Device Control Presets Window 40
The A/V Devices Window. 41
Checking the System with a Simple Test Project of Bars and Tone 42
Using 8-bit Versus 10-bit Video 45

Using Adobe CS4 for Windows
Adobe CS4 for Windows 47

Appendix A: Troubleshooting
If You Run Into Problems 49
Updating Software 50
Support 50
Apple Resources 51

Appendix B: Specifications
Formats 53
Video Input 53
Video Output 53
Audio Input 54
Audio Output 54
Reference Input 54
Machine Control 54

Chapter 1: Introduction



Overview

Io Express is the perfect cross-platform, Mac or PC, interface for anyone who needs an inexpensive monitoring and mastering solution when working with Apple ProRes Formats, XDCAM HD, DVCPRO HD, and more. Portable and simple to use, Io Express is ideal for file-based workflows.

Features

The Io Express package includes the following features:

- HD/SD-SDI input and output
- HMDI 1.3a input and output
- Component Video output for monitoring
- 2-channel RCA audio output
- LTC I/O (selectable LTC input or Reference Video Input)
- RS-422
- 2 model options: with Expresscard adapter for laptop use; or with PCIe card for desktop (tower)
- For Mac OSX and Windows XP/Vista operating systems
- Small portable case design fits in 1RU rackmount option
- 1-meter PCIe tether cable
- 12V DC power supply

Accepted Input Formats

- HD/SD SDI
- HDMI

Note: Encoding of Apple ProRes is available only on Apple computers. Apple ProRes can be played back on a PC with the appropriate QuickTime Windows decoder.

Playback Formats

- DVCPRO HD
- DV25/DV50
- SD Uncompressed
- Apple ProRes 422 HD/SD (Mac Pro and MacBook Pro only)
- HDV
- XDCAM
- XDCAM EX, XDCAM HD

Io Express Audio

For analog audio output monitoring, Io Express provides two-channel unbalanced audio (RCA jacks).

Software for Mac

- AJA Io Express Control Panel for source selection and controlling Io Express within the overall MacOS environment, Input Pass through, and more).
- AJA QuickTime™ drivers for tightly integrated hardware/software operation.
- Supports a wide variety of popular SD and HD formats.
- Support for Apple Final Cut Pro™ (application software not included).

AJA's Io Express software and hardware were developed for use with Final Cut Pro for powerful integrated video/audio capture, editing, and video production. With an Apple Mac Pro, FCP, and Io Express, you have an ideal high-quality cost-effective system for standard definition, high definition, and analog video production workflows. Software is supplied on CD, including the AJA Io Express Control Panel, drivers for the card itself, and all files necessary for Final Cut Pro and other application support (Final Cut Pro software application not included).

Software for Windows

Windows software is in development for release soon. Check the AJA Io Express support page for the latest updates.

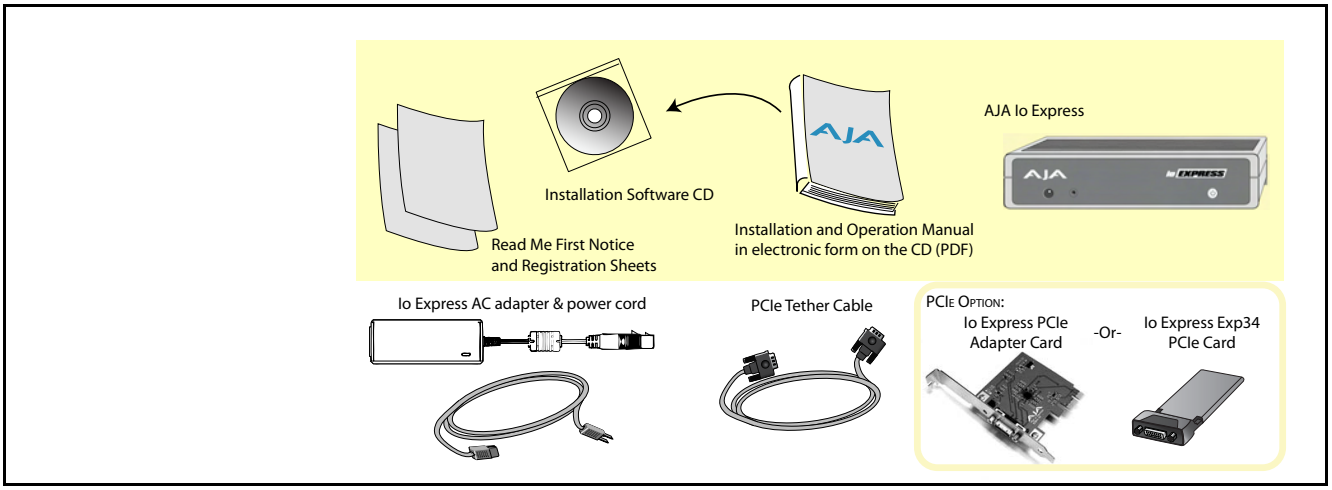
http://www.aja.com/support/io/io-express.php

What's In The Box?

When you unpack your AJA Io Express, you'll find the following components:

- AJA Io Express Software and Documentation CD-ROM—this CD contains the software installer to place Io Express drivers and the Control Panel on an Apple MacPro or Window XP/Vista workstation. Install the software as discussed in this manual in *Chapter 2: Installation and Configuration*. The CD also contains a wide variety of useful information, including this manual you're reading (PDF format).
- Io Express.
- PCIe Tether Cable.
- PCIe adapter (for desktop computer) or Expresscard34 (for laptop computer) depending on the Io Express model purchased.
- Read Me First Notice—Contains late-breaking news and/or errata related to Io Express and the documentation.
- Registration Sheet—allows you to register your card by mail or online (details provided).

Please save all packaging for shipping the Io Express should you wish to do so when moving or sending it in for service.



Io Express Shipping Box Contents

Note: Io Express comes with either an Expresscard/34 adapter or a PCIe adapter card depending on the model purchased.

System Requirements

AJA Video recommends that your system meet minimum hardware and software requirements to achieve a satisfactory level of performance when operating it. Here, we provide minimum and recommended requirements.

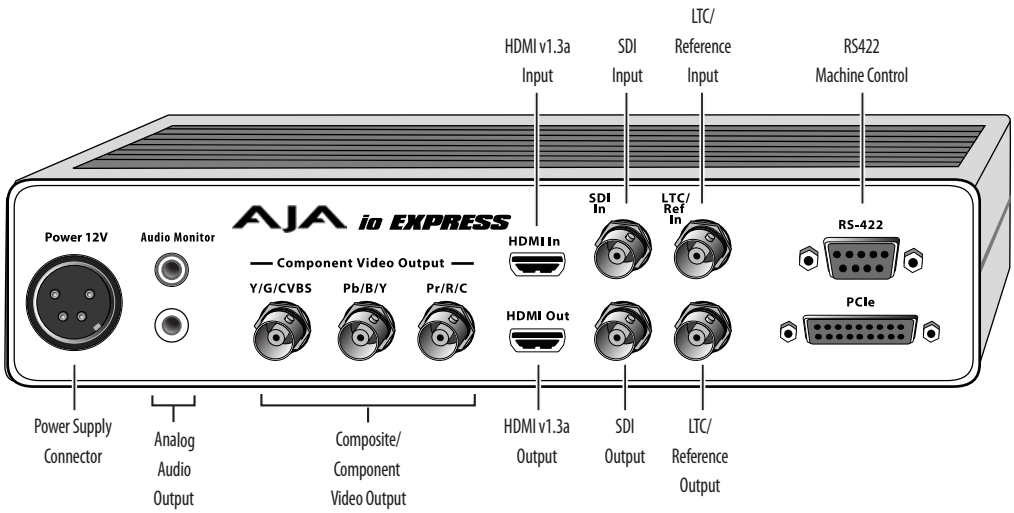
Minimum and Recommended System and Software Requirements

The following table outlines the system hardware and software needed.

Item	Recommended
Recommended Io Express Driver for Mac OSX and Final Cut Pro or Windows XP/Vista and Adobe CS4 applications: ***Note:*** always consult the release notes for the AJA software version you are running (included with installer)	FCP 7.0.x - Io Express Driver version 1.0 (Leopard and Snow Leopard OSX compatible version) For the latest appropriate match for your software and hardware, visit: *http://www.aja.com/support/io/io-express.php*
Macintosh Intel-based Pro machines:	**Recommended Io Express System:** Apple Mac Pro with Dual-Core Intel Xeon Processors (2 GHz or better) with a minimum of 2GB RAM for uncompressed SD or 4GB RAM for uncompressed HD. **Minimum Io Express System:** 2GHz with 2GB RAM minimum for uncompressed SD or 4GB RAM for uncompressed HD. **MacBook Pro PCIe:** Ensure your Macintosh has a Expresscard slot for compatibility. **Desktop Slot Placement:** One-lane PCIe interface allows placement in any available PCIe slot.
Internal Storage (SATA inside Mac):	Best suited for compressed SD/HD formats only

Cable Connections

Io Express connections are made directly to the unit's rear connector plate.



Io Express Connectors

Connector Descriptions— Io Express & Cables

HD/SD SDI Input and Output

BNC connectors are provided on Io Express for one HD/SD-SDI input and one HD/SD-SDI output. The input and output support video and embedded 24-bit digital audio. Use SDI wherever possible for the best quality 10-bit uncompressed video input, capture and output. If peripheral equipment has a variety of inputs/outputs, look to see if it has SDI I/O, and use it where possible. Most high-end professional broadcast equipment supports SDI (VTRs, cameras, media storage servers, etc.).

HDMI Input and Output

Two HDMI connectors on the Io Express provide input and output of HDMI compatible video and multi-channel embedded audio (8 channels). HDMI v1.3a capability at 30 bits per pixel allows full support of the latest 10-bit monitors.

HDCP is not supported on either input or output. Io Express HDMI output does not have HDCP, and input sources having HDCP are not supported. The HDMI input is designed to support long cable runs—up to 100 ft. when using 22 or 24AWG HDMI cable, or up to 50 ft. using 28 or 30AWG HDMI cable. The HDMI output supports standard HDMI cables only.

The AJA Io Express Control Panel allows selection and adjustment of some HDMI parameters; please see Chapter 3—Final Cut Pro and Io Express for more information on Control Panel operation.

Analog 2-Channel Unbalanced Audio Output

Io Express provides two analog output connectors, one for each channel. These connectors are RCA-style phono jacks.

RS422 Machine Control

A female DE-9 connector on Io Express provides connection for VTRs, camcorders, disk media servers, and other devices using RS422 SMPTE (Sony) protocol. (Connector pinout is listed in Appendix A: Specifications.)

Component Video Output (with Composite and Y/C functions)

Io Express features a group of 3 BNC connectors for output of component, composite and Y/C functions. The signals are labelled on the BNC connectors on the rear panel of Io Express.

A Note About YPbPr—Component Video, or YPbPr, has been given several names over time. YUV, Y/R-Y/B-Y, and YCbCr, are just some examples. Although these various formats have some differences in levels, they are all basically the same. Io Express uses the modern YPbPr terminology exclusively. Io Express supports three different types of YPbPr: SMPTE/EBU N10, Betacam (NTSC), and Betacam (NTSC Japan). These three formats differ in level only and are configured in the Mac System via the Io Express Control Panel.

Reference Video and LTC Input

Two BNC connectors on Io Express provide reference Input and Output. The Reference Video input can also be used for LTC input. The selection of Reference (sync) or LTC is set using the Io Express Control Panel.

In Video Pass-through mode, these connectors are effectively loop-through. Supplying reference signal to the Reference input allows you to synchronize Io Express outputs to your house analog reference video signal (or black burst). If you have a sync generator or central piece of video equipment to use for synchronizing other video equipment in your studio, then connect its analog composite output here. When Io Express outputs video, it uses this reference signal for locking. When connecting a reference video source, the locking signal should be the same format as the Primary format selected in the Io Express Control Panel. It is possible in some circumstances to use an alternate format video signal as long as the basic frame rate is compatible.

In This Manual

Chapter 1 is the introduction you're reading, listing features, box contents, and system requirements.

Chapter 2 provides complete instructions for installing and configuring the AJA Io Express. The user is guided through unpacking, cabling the Io Express, installing Io Express Mac or Windows Software From CD, then getting it up and running. Important configuration information is also provided on video settings and use of genlock/external reference.

Chapter 3 discusses operational aspects of Io Express when used with Final Cut Pro.

Chapter 4 discusses operational aspects of Io Express when used with Adobe CS4 Premiere Pro and related applications.

Appendix A discusses troubleshooting problems with your system and what to do when there's a problem you can't solve.

Appendix B presents a list of technical specifications for the product.

Chapter 2: Installation & Configuration



Installation Overview

The installation and set up of a Io Express is very simple. All of the steps of installation and configuration are documented in this chapter, summarized as follows:

1. Unpack the shipping box
2. If not previously installed on your Mac Pro or Windows workstation, ensure that Final Cut Pro or the appropriate Adobe CS4 application is installed as detailed in its user documentation. Editing software *must be installed and have been run at least once prior to installing Io Express software.*
3. For latest System Compatibility and Software Version information for Io Express: Visit: http://www.aja.com/support/io/io-express.php.
4. Install AJA Io Express software on your Mac or PC from the supplied AJA CD-ROM
5. Cable the system audio and video sources, VTR, audio monitor, and video monitor. If you purchased the laptop Express34 model, install the PCIe adapter into the PCIe slot in your laptop. If instead you're using the a desktop (tower) machine, you will connect the PCIe tether to your installed PCIe interface card.

Each of these steps are explained in greater detail in the remaining pages of this chapter.

Unpacking

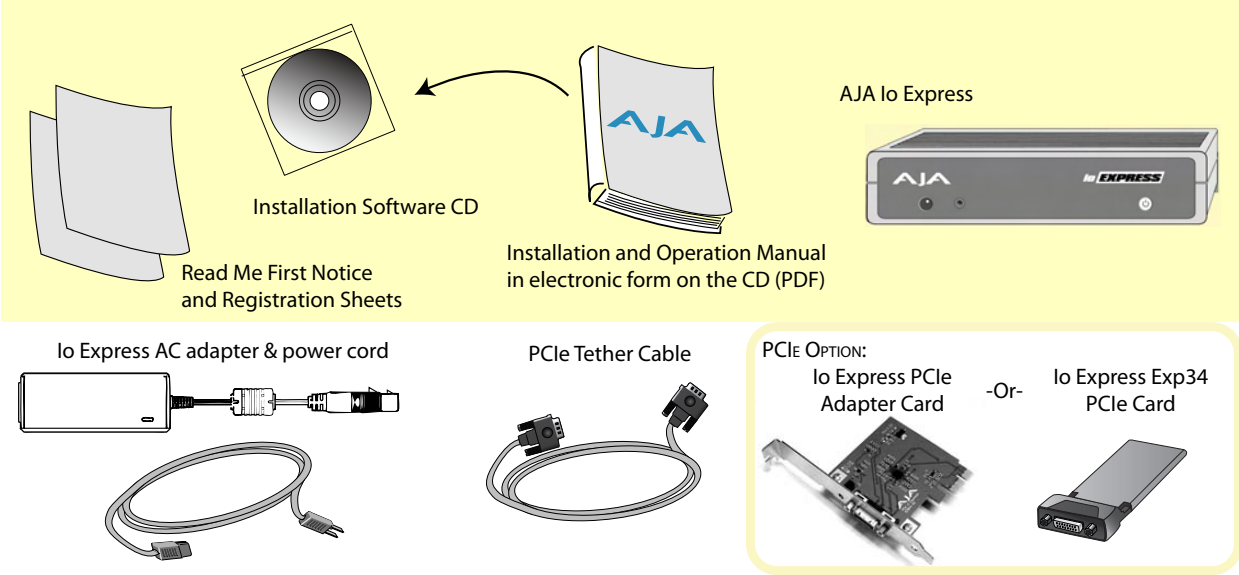
Shipping Box Contents

Io Express is available in two configurations:

Io Express - PCIe, for MacPro and Vista/XP towers with PCIe card adapter

Io Express - Exp34 for MacbookPro and Vista/XP laptops, with ExpressCard/34 adapter

Both models are shipped with a CD containing system software and an Installation and User manual (a PDF on the CD), AC power adapter, and a PCIe tether cable.



Contents, Io Express Shipping Box

As you unpack the shipping box(es), carefully examine the contents. Ensure you received everything and that nothing was damaged during shipment. If you find any damage, immediately notify the shipping service and supply them with a complete description of the damage. AJA will repair or replace damaged items. If you find shipping damage, contact your AJA dealer or distributor for details on how to have your Io Express repaired or replaced.

Note: Save packing materials and the shipping box. If you ever require service or move your system—use the packaging materials and box for safe shipment.

Connecting to your Computer

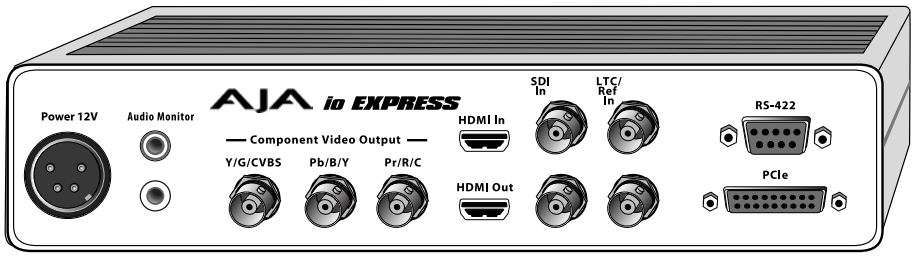
1. With your computer off, install the PCIe adapter card (desktop) or Express card (laptop).

Note: Refer to your PC manufacturer's documentation for installing a PCIe card or Express card.

2. Connect the PCIe tether cable between Io Express PCIe port and the PCIe adapter.
3. Assemble the Power Adapter and cable and connect to the Io Express 12V Power connector.
4. Connect your desired Video I/O, Audio monitoring, reference, and machine control cables. (Refer to ***Cabling the System*** following.)
5. Connect the Power Supply to AC power and turn on Io Express using the front power switch.

Important: For correct performance, always power Io Express before starting your computer and power down your computer before powering down Io Express.

Note: Ensure that the Apple, Adobe, or other software you are going to use has been installed and used at least once before proceeding to the installation of Io Express software. It is always a good idea to verify you have the most up-to-date release of your AJA software by checking the AJA support site:
http://www.aja.com/support/io/io-express.php



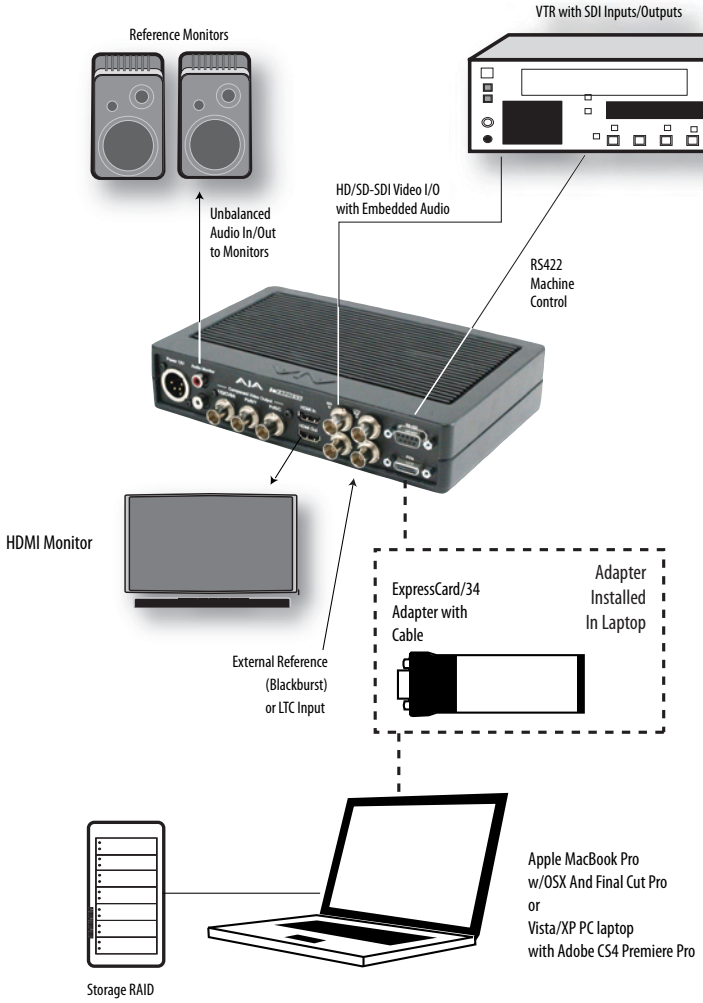
Io Express Connections

Cabling the System

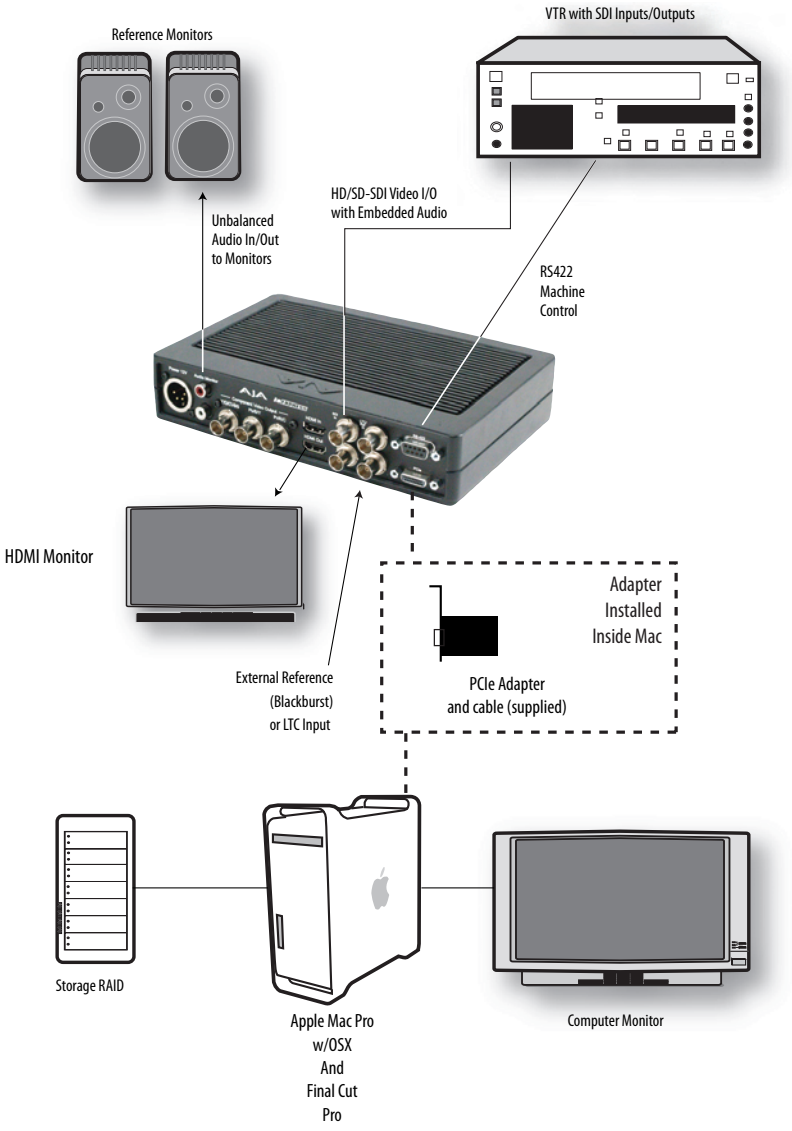
Typical System

This figure shows typical system interconnections for a system with digital A/V sources. Your system may differ depending on VTRs, audio monitoring, and video monitoring.

1. If desired, connect your house reference sync to the Io Express *Ref/LTC* connector (BNC). The second Io Express Ref Loop connector (if used in Pass through mode) can be connected to the VTR or terminated with a 75-ohm terminator. If instead using LTC timecode input, connect to the Ref/LTC input.
2. Connect an HDMI Video Monitor to the Io Express HDMI Out connector. *Or instead, use the Component Analog Video Out* BNC connectors to go to an analog monitor.
3. Connect a 9-pin DE-9 machine control cable between your VTR's RS422 control port and the Io Express *RS-422* machine control connector.
4. Connect two SDI cables between Io Express and your digital VTR (Digital Betacam etc.): one from Io Express *SDI In* to the VTR SDI Out, and one from Io Express *SDI Out* to the VTR SDI In. The Io Express SDI connections have embedded audio so the VTR must be configured accordingly.
5. Use the two RCA-style unbalanced stereo output jacks for audio monitoring output.



6. ***Typical Laptop System Connections***



Typical Desktop System Connections

Installing Io Express Software

First ensure that Final Cut Pro or Adobe CS4 applications are installed as detailed in their user documentation. These applications *must be installed and have been run at least once prior to installing AJA Io Express software*. Next, use the CD-ROM supplied with the Io Express system to install necessary software drivers and Mac-based (Io Express) control panel (if necessary). You cannot use Io Express with Final Cut Pro or Adobe CS4 Video software until the AJA Io Express software has been installed on the host workstation.

System software updates may occasionally become available to AJA Io Express owners on our website (www.aja.com). We recommend checking occasionally for both software updates and additional product information.

Note: If your workstation has previously had another video capture or multimedia card installed, ensure you remove the card and/or uninstall any related software before installing Io Express This will prevent any hardware or software conflicts. Io Express will not operate properly on a Mac or PC that also has an AJA Io, Io HD, KONA, or XENA card installed.

Software Installation Procedure for Mac

Locate the AJA Io Express Software CD packaged with your system. Then follow the procedure below to put the required software on the host system to be used with Io Express. The system must be an Apple Mac Pro or MacBook Pro as described earlier in *Chapter 1: System Requirements.*

Note: Before installing Io Express software, turn off any virus protection and security software that you may have installed on your computer.

1. Insert the Io Express CD in the Mac
2. Locate the Io Express CD icon on the OS X desktop.
3. Move the mouse cursor to the icon and double click to see the CD contents, which will appear in its own window.
4. In the window, locate the package file; it has an icon that looks like a box and has a ".pkg" or ".mpkg" suffix.

Note: Files ending in the ".pkg" and ".mpkg" suffix are OS X installer files. These launch the OS X installer and tell it where and what to install on your system.

5. Double-click the package to log on and begin software installation.
6. The system will respond by asking you to authenticate who you are as currently defined on your OS X user profile. Enter the proper name and password at the Authenticate prompt; if you have multiple users defined, ensure that you log on as a user with administrator-level authority.



Log On Authenticate Prompt

7. Click on the *OK* button after entering a valid user and password.
8. The installer will launch and you'll see a series of installer screens.



Initial Installer Screen

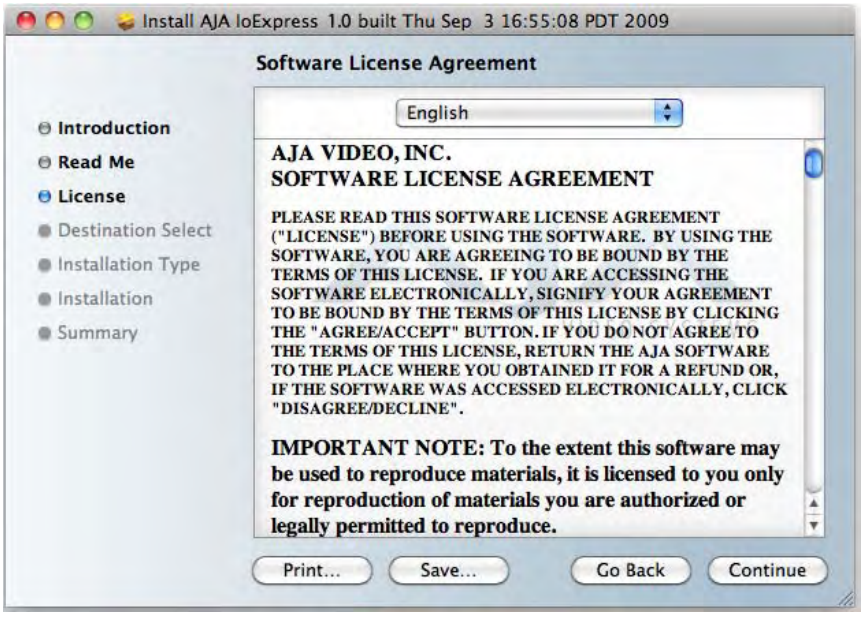
9. Click *Continue* to begin installation.

10. The next screen lets you know that the installer will check your Mac to ensure it has the hardware and software resources required (see Minimum Requirements in Chapter 1).



System Check Installer Screen

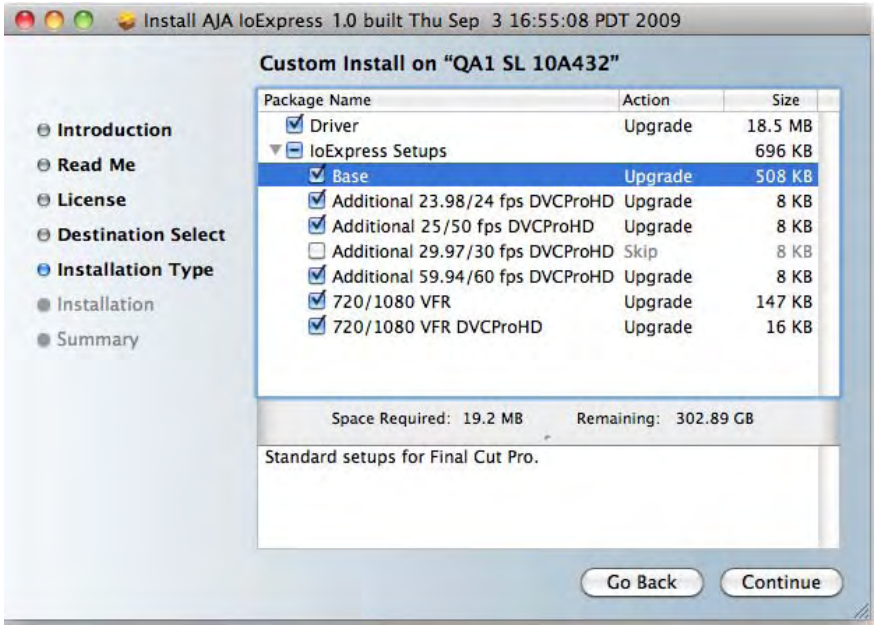
11. Read and agree to the Software License Agreement.



Io Express Software License Agreement Screen

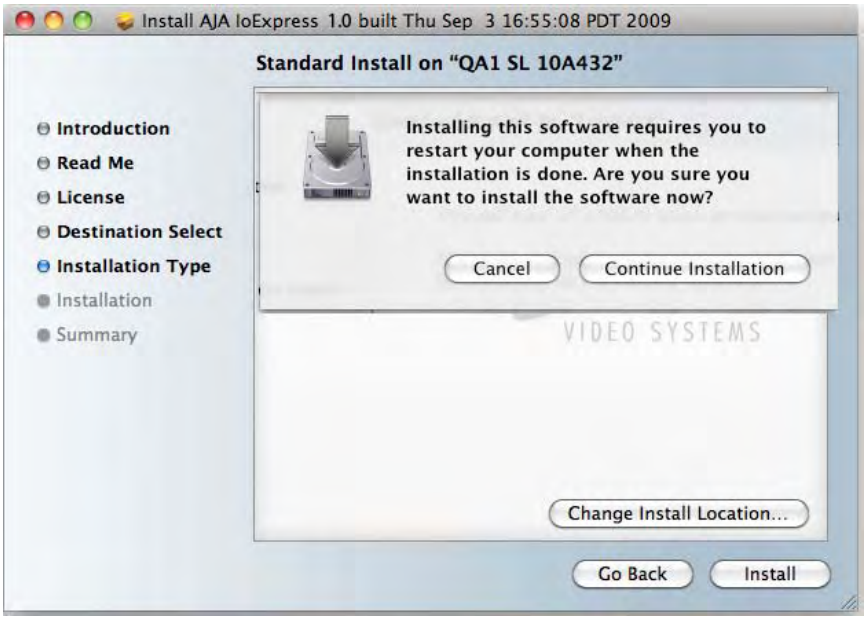
12. The next screen shows all the available drives on the Mac Pro. Click on the drive that contains your system files (Apple default is "Macintosh HD"). A green arrow will point to the drive you've selected. Click the *Continue* button to proceed with installation.

13. At the next screen, select the Easy Setups that you want to use (or all of them) and then click the *Continue* button to place the software on the drive you previously selected.



Installer Screen, Select Easy Setups to be Installed

14. A system prompt will pop up with a reminder that OS X must be restarted after installation. Click the *Continue Installation* button to proceed.



Restart OS X Reminder Prompt

15. The installer will run and put all the necessary Io Express drivers, presets and software on the desired hard drive. When it has completed installation, a final screen will be displayed announcing that "software was successfully installed."

16. Click the Restart button to complete the installation procedure. The system will perform software restart and be ready for use.

Software Installation Procedure for Windows

Note: Windows and Adobe CS4 compatible software for Io Express is in progress and will be released soon. For updates, see the AJA Io Express Support page at:

http://www.aja.com/support/io/io-express.php

Genlock and Your System

For video stability and proper system operation, you can genlock all equipment to house sync, however genlock is not required for Io Express due to excellent freerun accuracy. To connect genlock, use a black burst generator output looped through the system. On the Io Express house sync is connected to "LTC/Ref In".

Note: Be sure to set the Reference/LTC connection to Reference in the Io Express Control Panel.

Chapter 3: Using Final Cut Pro

Final Cut Pro



Final Cut Pro (not included with Io Express) ships with information already configured for most common system configurations. After you install the Io Express software on your Mac Pro, all you need to do to begin using it is to become familiar with the Io Express Control Panel and how Final Cut Pro works with Io Express.

With Final Cut Pro you'll choose the proper setups from the "canned" ones provided by AJA. These canned setups are called "Easy Setups" in Final Cut Pro and are available to use and edit under Audio/Video Settings in the "Final Cut Pro" menu (next to the apple menu).

You'll also need to gain familiarity with the Io Express Control Panel, which will be used for source selection, configuring many Io Express features, and for creating your own preset configurations for different applications.

The manual you are reading does not provide operational information about Final Cut Pro. Please read the Final Cut Pro user documentation provided with it for information on configuration and operation. The chapter you are reading addresses configuration and setup unique to the use of Io Express with Final Cut Pro and other applications.

Using The AJA Io Express Control Panel

The AJA Control Panel application is a software application that provides a simple visual way to see how Io Express interface is currently configured and then make changes as desired. Settings—both those you changed and those you didn't—can be saved as a snapshot for recall at anytime. This lets you save settings associated with all your frequent tasks; then as you switch tasks you don't have to spend extra time constantly resetting interface configurations—just load the previously saved settings for each task.

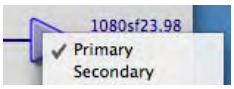
One thing you'll notice instantly about the Control Panel is that it represents a visual block diagram of how the unit is set. The current status, input and output settings, and many other details can be viewed as a color-coded block diagram in the Control Panel.

Control Panel Basics

To ensure you make the most of the software, run the Io Express application and look at its display. Then refer to the "Basics" described here to fully understand what you're seeing and learn how to view and change the Io Express system configuration.

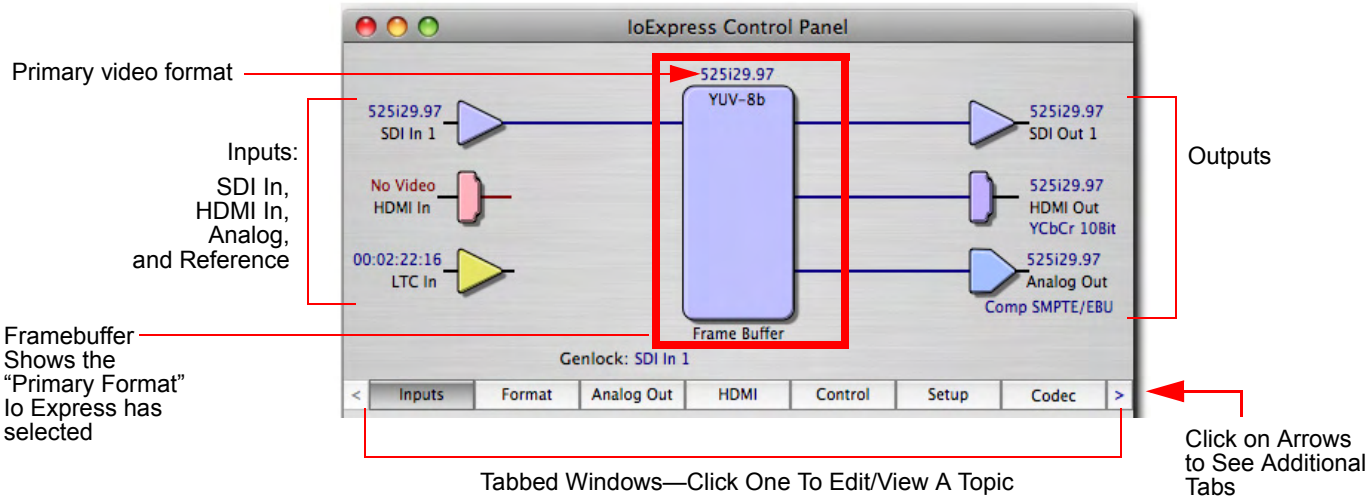
Before we go into too much detail, here are some basic definitions you should know (please refer to the figure that follows for reference). After studying the basics, read "*Who is Controlling Io Express*?" later in this chapter for more advanced information on how applications interact with Io Express.

Block Diagram Screen—The top area of the Control Panel shows a visual picture representing the processing (if any) that's currently occurring, including inputs/outputs, reference source, and system status. Lines between inputs, the framebuffer, and outputs, show a video path. Where there are no lines, it shows there is no connection; this can be because an input or output isn't selected. The lines will also show whether the outputs are video or video + key.



Control-Clicking an Icon Produces a Context-sensitive Menu

Icon objects on the block diagram screen (input/output icons, frame buffer, etc.—also called "widgets"—indicate their status by color (explained later) and can be clicked for context-sensitive information and choices. (These same choices can also be made from the tabbed Control Panel screens.)



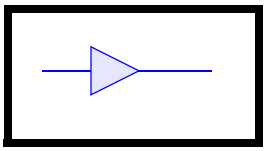
Io Express Control Panel, Block Diagram

Framebuffer—The framebuffer is the "engine" in Io Express where active video operations take place using Final Cut Pro, other 3rd-party applications, or even Io Express itself. The framebuffer has a format (called the "Primary Format" and color space that it follows, as defined in the Tabbed Windows or via external application software (such as the "Easy Setups" in Final Cut). It is important to realize that inside the Macintosh many applications can use the Io Express (as you switch from window to window) and it may not always be obvious which currently controls it.

The Control Panel displays the name of the application controlling the card. In some cases, applications may not always properly "let go" of the I/O interface as another takes over—you'll be able to tell by looking at the Control Panel.

Primary Format—The video format currently assigned to Io Express. This is the format that the framebuffer will use and is shown in the Control Panel using the color blue. All icons in blue are the same as the Primary Format used by the framebuffer. Also any text descriptions in the block diagram that appear in blue also indicate that something is in the primary format.

Input/Output Icons—The input and output icons are triangles that together with their color show all the input and outputs and their status (selected, not selected, input present or not, format, etc.). A complete video path is shown when inputs and outputs are connected with lines going to/from the framebuffer.



Input/Output Icon

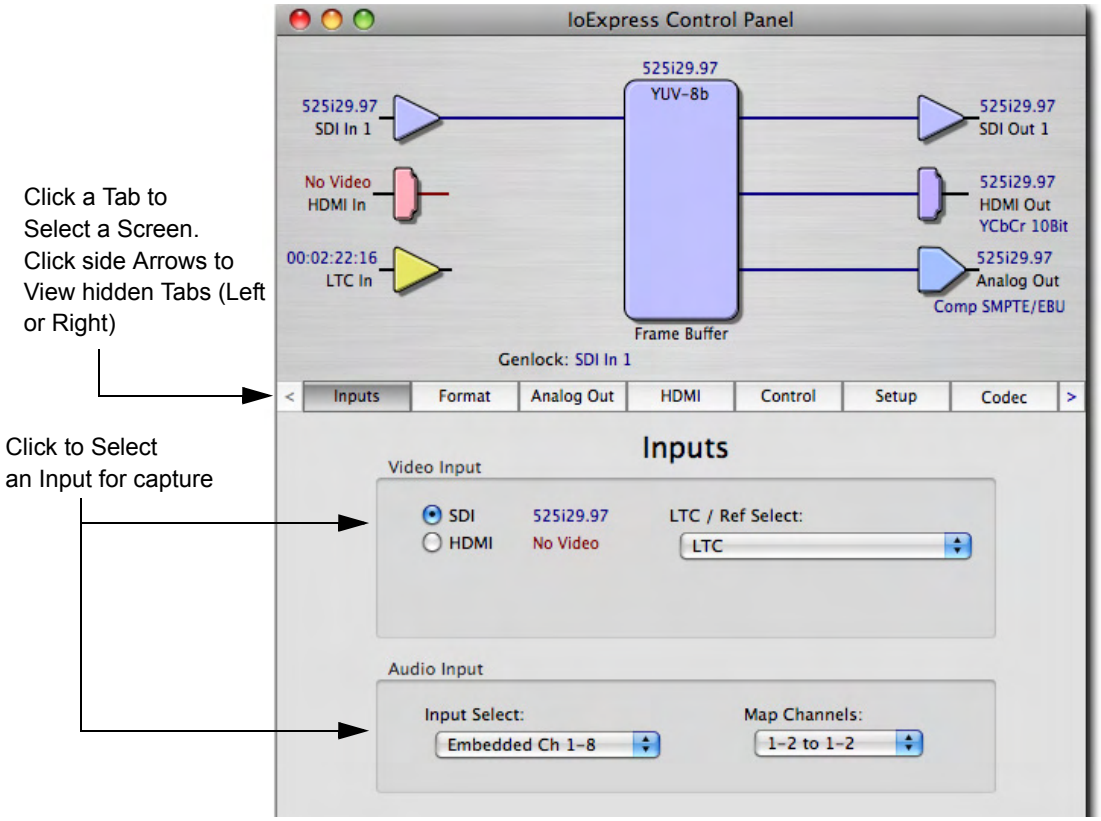
Color Meanings—All items in the Io Express Control Panel block diagram are color-coded to show what is happening in realtime. This applies to both icons and text. These colors have the following corresponding meanings:

Blue: video is same format as the Primary Format (framebuffer)
Red: the selected operation cannot be performed
Yellow: reference video (black burst or other reference source).

Tabbed Windows—The bottom area of the Io Express Control Panel provides different information categorized by topic. Clicking on a "Tab"—or a block diagram element—displays an information screen corresponding to a tabbed topic. The arrows at either side of the displayed tabs can be clicked to see any additional tabs not visible on the screen. If an arrow is "grayed out", there are no additional tabs in that direction. Each of these tabbed windows are described on the following pages. Tabs that can be selected are:

Inputs: view and edit input selections and how they are mapped
Format: select the framebuffer primary video format and any secondary
Digital Out: assign outputs
Analog Out: configure the component/composite analog output
HDMI: configure the HDMI I/O
Control: configures Io Express operation (pass through, desktop, etc.) plus setting output timing.
Setup: configures Video and Audio options such as composite black level and analog audio monitor level.
Codec: used to select codec options such as whether a pause stops on a full frame or a single field (jitter shown or not) and 24 to 30 fps padding patterns.
Timecode: monitor and configure timecode
Info: displays status information and firmware version # of the Io Express and how it is installed in the host Macintosh. This information is generally intended for troubleshooting/support.

Input Screen



Io Express Control Panel, Inputs Tab

On the Inputs screen, you can view the currently selected video and audio input sources and map audio sources to the channels supported by your capture application (more on this later). Two information panes in the screen are provided: Video Input and Audio Input.

Input Screen Settings

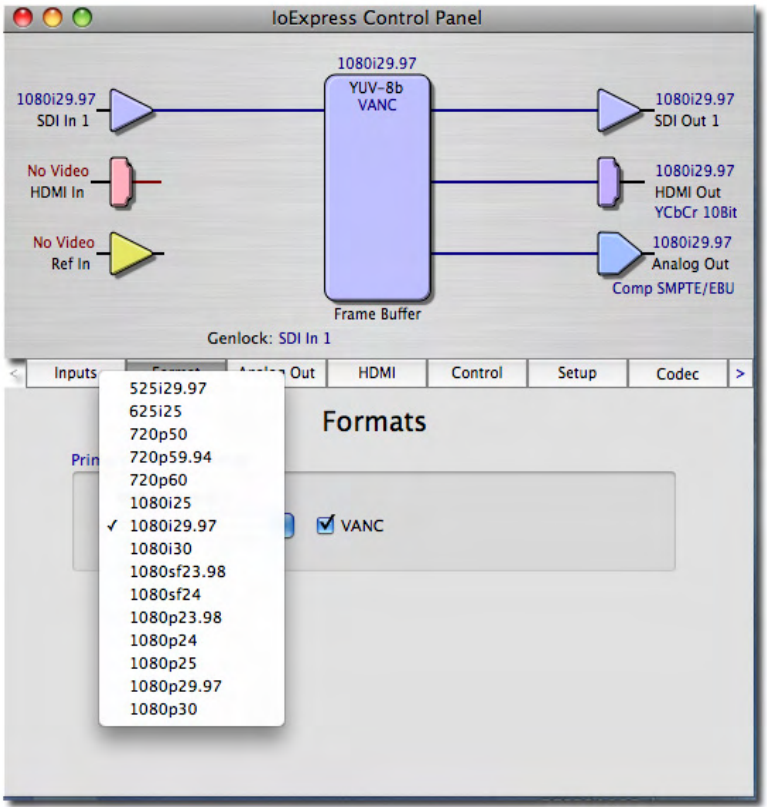
Video Input—These radio buttons allow you to see and change what's currently selected and the video format that Io Express has detected there (if any). If you wish to select a different input, click a different radio button. Choices are:

- HD/SD SDI input
- HDMI 1.3a input

Audio Input—This pulldown menu allows you to choose where the audio comes from. Io Express supports up to 8 channels of embedded digital audio, so you can choose from the 16 channels that can be embedded in SDI, and pick which to bring in (from the group 1-8 or 9-16). If your application supports only two channels of audio, you will select which two channels from the 8 selected embedded will be mapped to the two designated channels (1 & 2).

Format Screen

The Format screen shows the video format currently in use by the Io Express framebuffer (called the *Primary Format*) and allows you to change it. Throughout the Control Panel, choices are always presented based on what Io Express can do with the signals available and the inputs/outputs selected.



Io Express Control Panel, Format Tab and Pulldown Menu

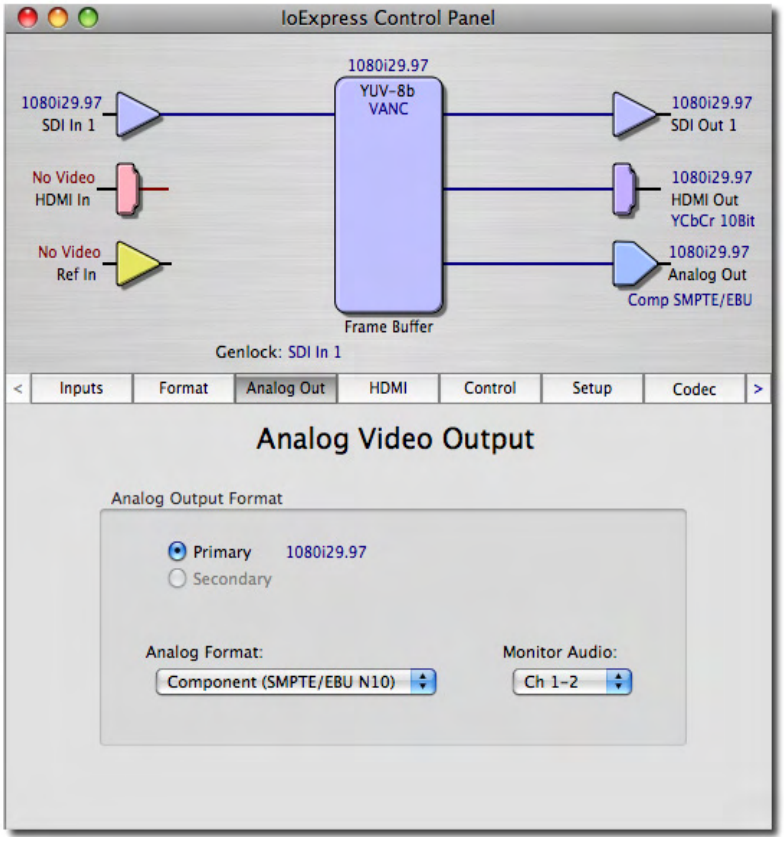
Format Screen Settings

Video Format—This pull-down menu shows the currently selected video format and available choices for primary formats.

Note: The AJA Control Panel software uses the abbreviation “sf” instead of “psf” when referring to “progressive segmented frame”. In the manual and in other literature you may see either of these acronyms used interchangeably.

Analog Out Screen

Io Express provides a high-quality analog component or composite output, generally used for monitoring. This screen shows the current settings for that analog output, and allows you to re-configure it when desired.



Io Express Control Panel, Analog Out Tab

Analog Out Screen Settings

Analog Format—choices in the Analog Format pulldown menu vary depending upon the Analog Output video standard. For example, the "Composite + Y/C" selection is only available when an SD (525i29.97 or 625i25) format is in use. Analog formats can include:

Composite +Y/C

Component (SMPTE/EBU N10)

Component (Beta)

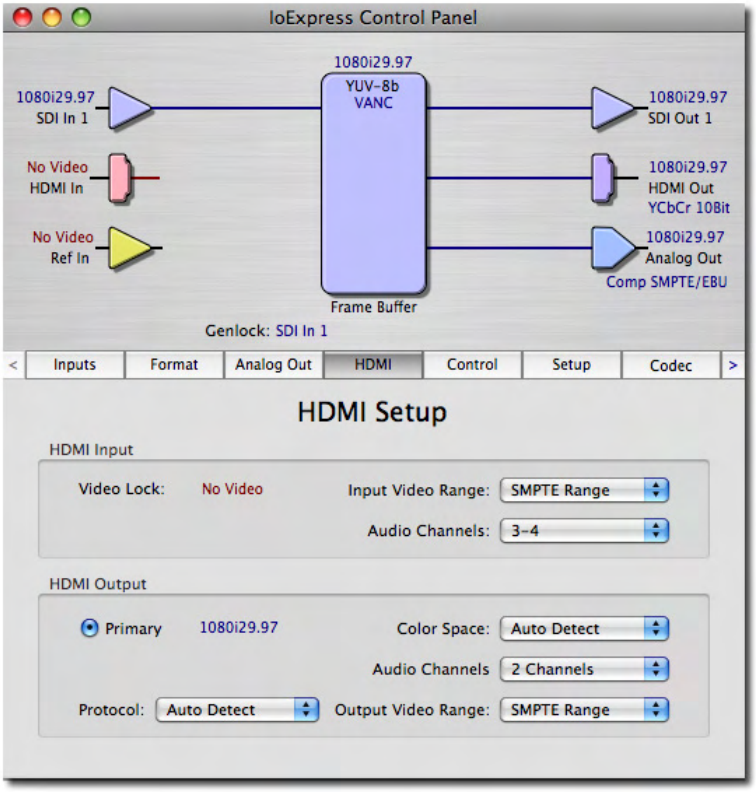
Component (RGB)

Component (RGB -HV)

Monitor Audio—selects which pair of audio channels are routed to the Audio Monitor RCA connectors.

HDMI Tab Screen

The Io Express's HDMI input and output are shown and configured at this tab screen. The HDMI input pane shows if an HDMI input source has been detected and locked on, showing the format found.



Io Express Control Panel, HDMI Tab

HDMI Tab Screen Settings

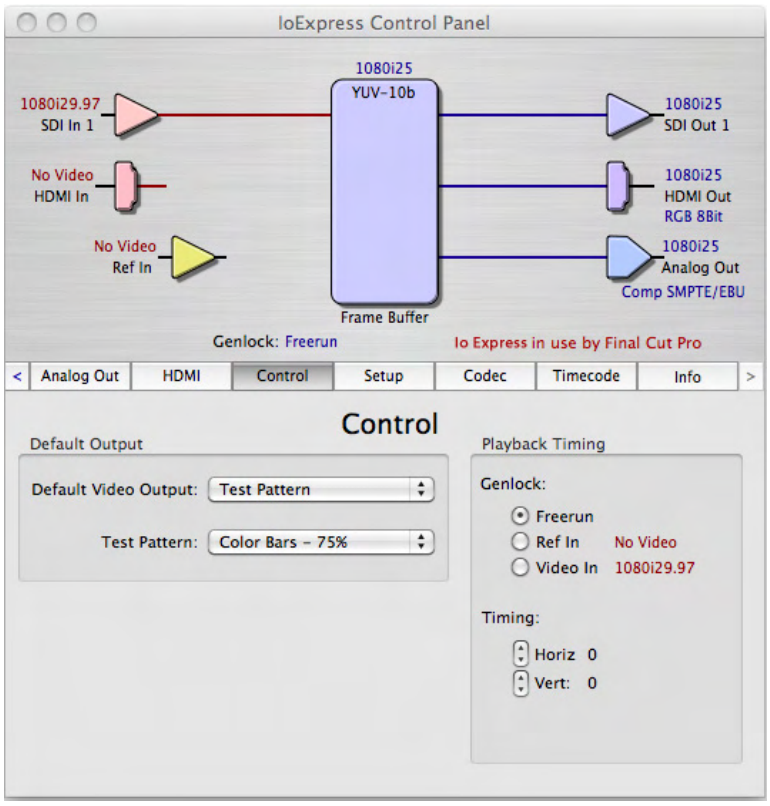
HDMI Input—while there are two different ranges of colorspace values that SDI can use (RGB and YCbCr) the HDMI input on the Io Express defaults to the SMPTE video input range. A pulldown allows you to select full range.

HDMI Output—Pulldowns are provided for configuring the video output range, color space and number of embedded audio channels (2 or the maximum 8) for the HDMI output. A Protocol pulldown allows you to choose either "HDMI" or "DVI" protocol—use DVI if you're outputting to a DVI monitor using an HDMI to DVI adapter.

Control Screen

The Io Express can be controlled by various software applications running on a host MacPro. The Control Screen is where you select how the Io Express directs video used by application software. This screen also provides control for configuring output timing for external reference video and horizontal/vertical delay.

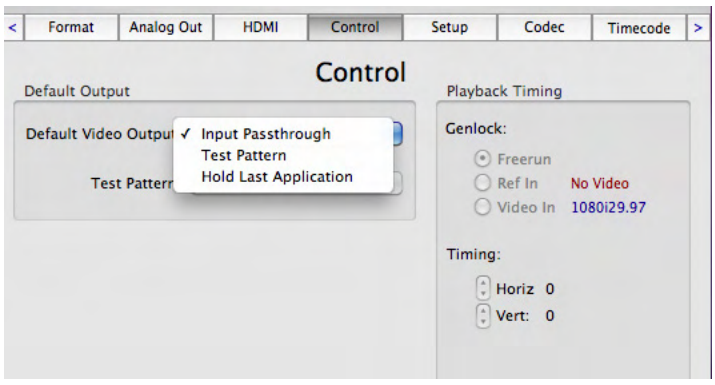
At the top of the Control screen, it will show the current Default Io Express output and the application currently controlling the Io Express card (if there is one). For example, in the screen shown here, the default output is Input Passthrough.



Io Express Control Panel, Control Tab

Control Screen Settings

Default Io Express Output—Here you select the output Io Express will use as the default *when no application has control of the board*, like when the Finder is active. Since Io Express can be controlled by either software applications or its own Control Panel, the output can change dynamically. When you change video applications, they will usually grab control of the Io Express inputs/outputs. When they don't, these default settings determine which Io Express inputs/outputs are active and set the formats.



Io Express Control Panel, Control Tab, Default Io Express Output Pulldown Menu

Choices available and their meaning are:

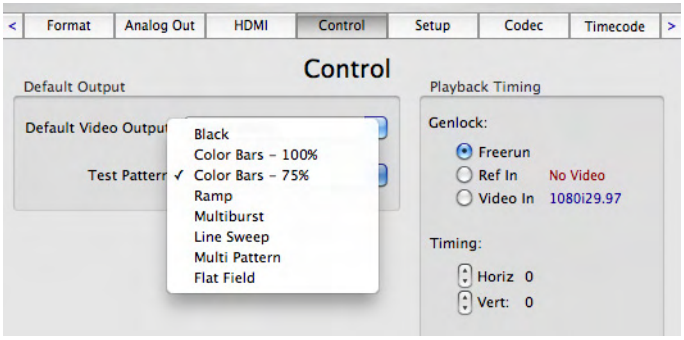
Input Passthrough: this selection directs Io Express to route video from its selected input through the card for output. When this selection is in effect, all Primary selections are available for selection in controlling the output.

Test Pattern: this selection directs Io Express to output a choice of preset patterns—when no other QuickTime application is using Io Express.

Note:

Hold Last Application: this selection directs Io Express to hold and output the last frame of video from the last application to control Io Express. This can be helpful when operating in an environment where you're switching back and forth between multiple application windows.

Tip: Pressing and holding the Apple *COMMAND* key while clicking in the Io Express Control Panel—while in any software application (Final Cut, etc.)—causes control of the Io Express to stay with that application, rather than shifting to the Control Panel. This works regardless of the setting of "Default Io Express Output."



Io Express Control Panel, Test Pattern Choices

Playback Timing *(greyed-out when in Input Passthrough)*

Genlock (*Freerun*, *Ref In*, *Input 1*, or *Input 2*)—Selects how Io Express will synchronize program video:

Freerun: in this mode, Io Express generates video without an external reference source

Ref In: directs Io Express to use the Ref Video source for sync (usually an analog black burst video signal)

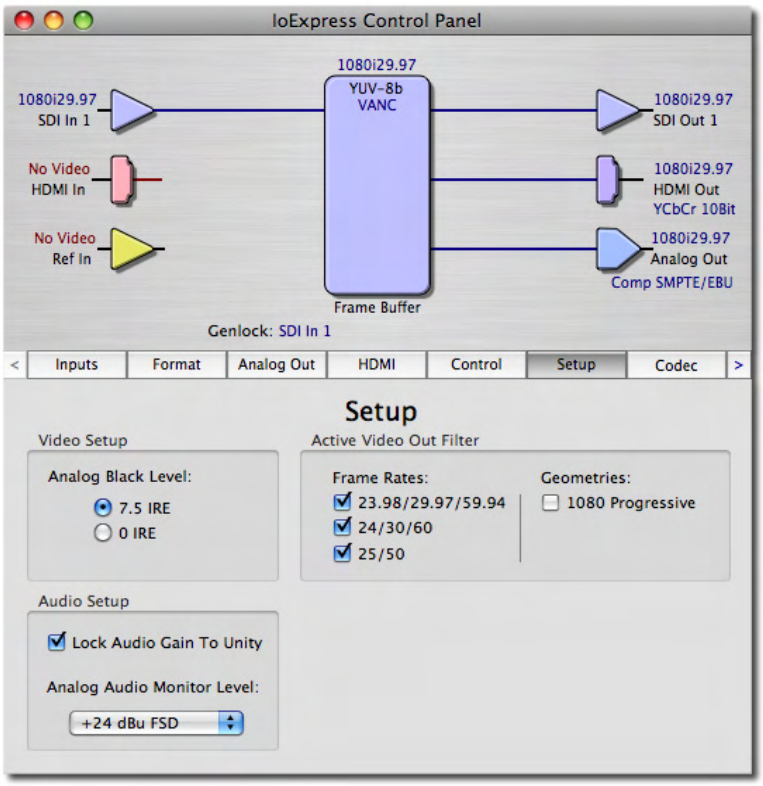
Video: directs Io Express to use whichever video input source has been selected in the *Inputs* tab window for sync

Note: When the Io Express goes into capture mode, the Genlock mode automatically switches to Video In.

Timing (*Horiz* and *Vert*)—these two pull-downs allow output timing adjustment with reference to the Ref Video source selected. The Horizontal reference can be adjusted by selecting a number of pixels (clocks) to offset. Vertical can be adjusted by specifying a number of lines to offset.

Setup Screen

Io Express provides a high-quality analog component output, generally used for monitoring. This screen shows the current settings for that analog output, and allows you to re-configure it when desired.



Io Express Control Panel, Setup Tab

Setup Screen Settings

Analog Black Level—choices in the black Level pulldown menu are only available for the two Composite analog formats. Choices presented are for US or Japan settings:

- 7.5 IRE (NTSC US)
- 0 IRE (NTSC Japan)

Lock Audio Gain To Unity—When set, Io Express will ignore the Final Cut Pro gain setting and set the audio gain at unity. When not set, this checkbox tells Io Express to get the audio gain setting from Final Cut Pro.

Analog Audio Monitor Level—determines the audio level that will appear at the Analog Audio Output RCA connector pair ("FSD" is *full-scale-deflection* reading as measured on a VU meter). Select +18 for Europe or +24 for USA.

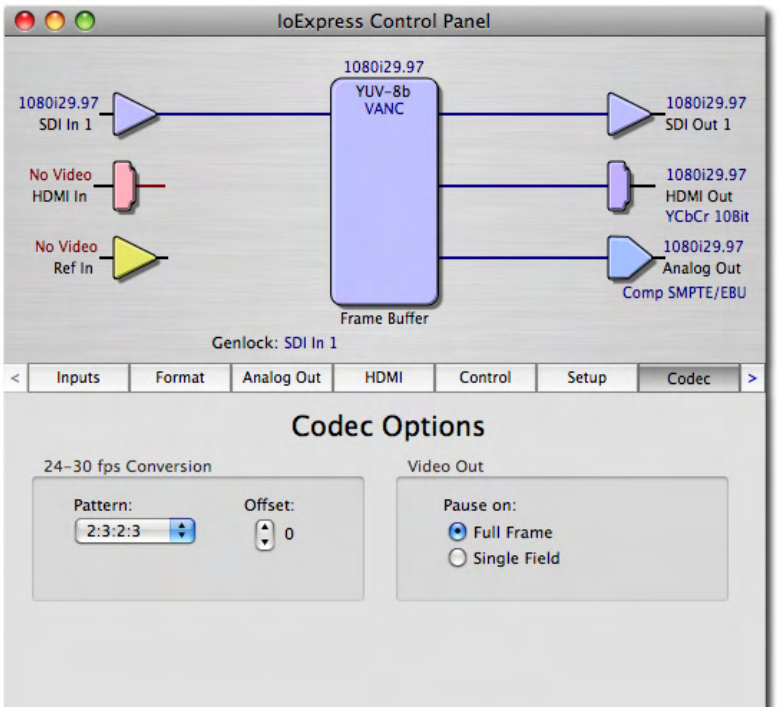
Active Video Output Filter—The Active Video Output Filter is designed to help manage the comprehensive list of video outputs that may be available to applications, particularly Final Cut Pro's *A/V Devices* tab.

By selecting the checkbox next to specified parameters, the video outputs related to these specified parameters are enabled as possible video outputs for applications. As an example, if the checkbox next to *25/50* is unchecked, 50Hz video outputs are deselected and would not be available to the user in the *A/V Devices* tab of Final Cut Pro. To avoid confusion, users might elect to leave *50Hz* unchecked if they work solely in a 60Hz editorial environment. The Quicktime application must be quit and restarted to see changes here.

Note: If a prompt occurs in Final Cut Pro stating that the AJA output device is missing, this may simply be due to the Active Video Filter for a given parameter being unchecked for the format selected in the application. If this occurs, quit Final Cut Pro, make the appropriate selection in the Control Panel application and restart Final Cut Pro where the selection should now be available.

Codec Options

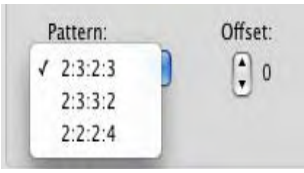
This screen offers controls that determine how Io Express behaves under Final Cut Pro.



Io Express Control Panel, Codec Tab

Codec Screen Settings

24-30 FPS Conversion—the value selected in this pulldown is used whenever, due to format selection, you've chosen to do 24 frames-per-second to 30 conversion where extra fields will be added to pad the existing ones. Depending on video content, selection of different field patterns may be useful in reducing jitter due to the content of adjacent fields. The numbers in the pattern choices specify the frequency with which inserted fields will be repeated. For example, "2:3:2:3" means duplicate a field twice, then the next field three times, then the next twice, and then back to three times.



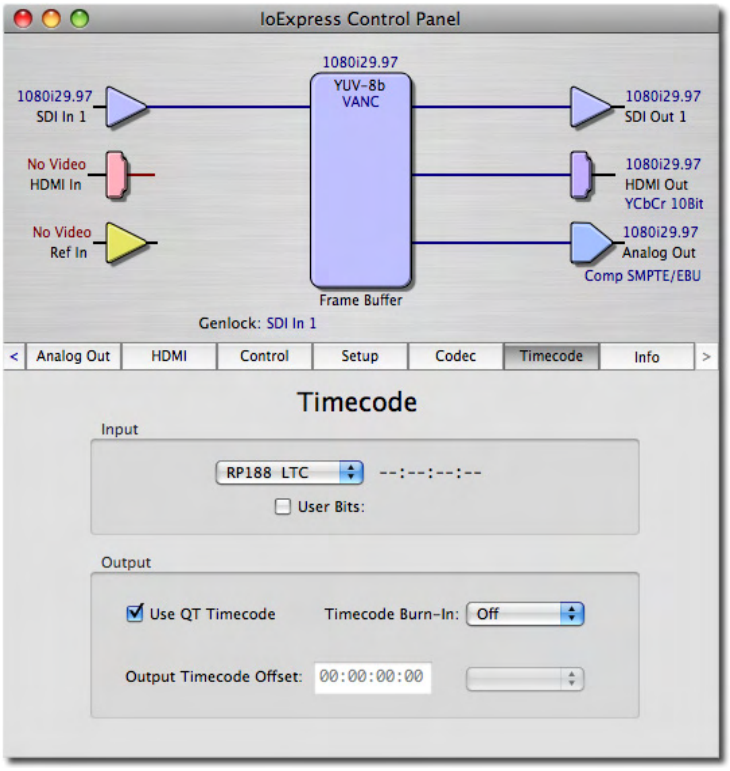
Io Express Control Panel, Codec Tab, Frame-padding Pattern Choices

Video Out, Pause On—these two choices determine what happens when Final Cut Pro is paused in stop mode:
Full Frame: both fields are displayed resulting in some jitter while paused.
Single Field: a single field is displayed, showing no flicker (useful when color correcting or whenever the flickering would be a distraction).

Timecode Screen

The timecode screen is used too look at incoming timecode from any source. In Final Cut Pro, timecode always comes from RS-422. In other applications (such as VTR Xchange), timecode can come from any source and this is where you select that source.

Note: SMPTE 12M-2 is the updated name and specification for what was RP-188.

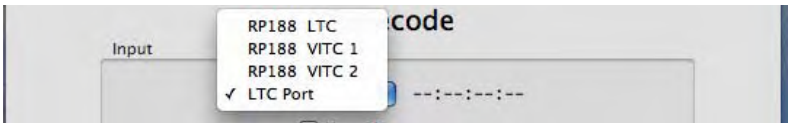


Io Express Control Panel, Timecode Tab

Timecode Screen Settings

RP-188 Timecode <n>—in RP-188 timecode (SMPTE 12M-2) there can be multiple timecode values in the data stream. Use this pull-down to select the one you wish to monitor. The selection will be displayed in the timecode value displayed to the right of the pull-down.

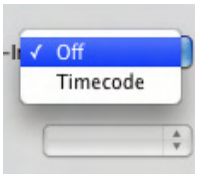
User Bits—For monitoring variable framerate (VFR) timecode (such as Varicam), you may wish to monitor the user bits embedded in the timecode. If you set this checkbox, Io Express will detect and interpret the user bits and display them next to the checkbox.



Io Express Control Panel, Timecode Tab, User Bits Checked

Use QuickTime Timecode—when checked, this directs Io Express to output timecode from the QuickTime timecode track in playback. When not checked, Io Express uses the *Output Timecode Offset* value plus the number of frames into the movie. Note: not all QuickTime applications use or support timecode tracks—so sometimes the QuickTime timecode is missing or not meaningful.

Output Timecode Offset (entry field and FPS pull-down)—this text entry field allows you to specify a timecode offset for use with Final Cut Pro (or any other application that has timecode offsets that are user-controlled). In FCP, go to "Timeline Options" and locate the "Starting Timecode" value. Use that same value here as the "Output Timecode Offset" to ensure the timecode is synchronized.

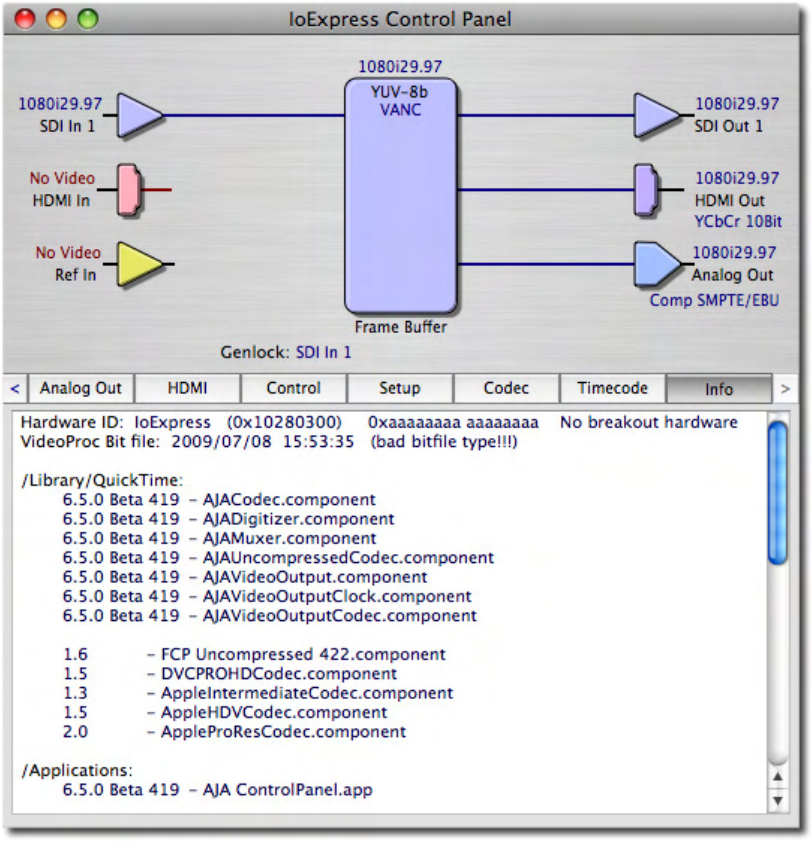


Timecode Burn-in—this pulldown selects whether the timecode value is "burned-in" on video output from Io Express. If set to "OFF", timecode will not be keyed over the video. If set to "timecode", then the timecode value will be keyed over the output video. This can be useful for synchronizing, choosing edit points, dailies, and many other purposes.

Note: SMPTE RP 188 defines a standard for the transmission of time code and control code in the ancillary data space of a digital television data stream. Time code information is transmitted in the ancillary data space as defined in ANSI/SMPTE 291M. Multiple codes can be transmitted within a single digital video data stream. Other time information, such as real time clock, DTTR tape timer information, and other user-defined information, may also be carried in the ancillary time code packet instead of time code. The actual information transmitted through the interface is identified by the coding of a distributed binary bit. Equipment manufacturers can use the meta data for different purposes.

Info Screen

This Tabbed screen shows the Io Express software files that have been installed on your system. This information may be needed if you talk to an AJA Customer Service representative to determine if files are missing or need updating.



Io Express Control Panel, Info Tab

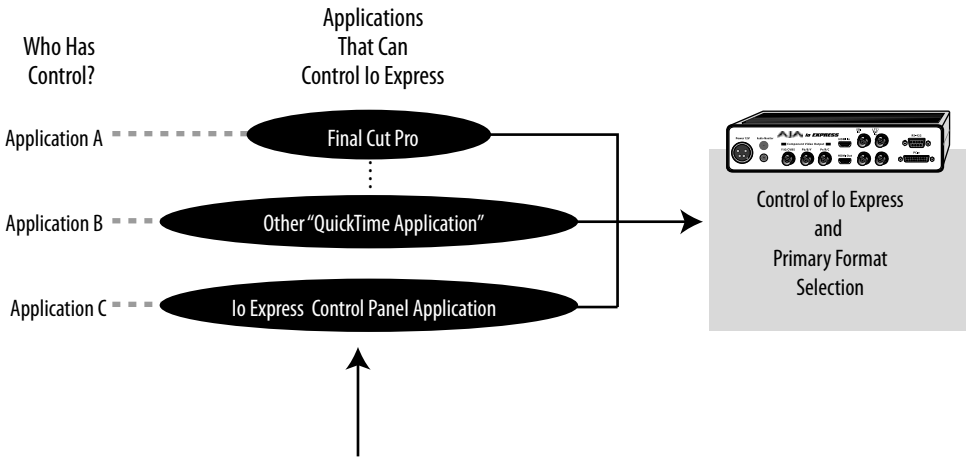
Saving Your Control Panel Presets

After configuring the Io Express Control Panel via the Tabbed screens, you can then save all your settings as a snapshot for later recall—called a preset. In this way, you can organize the presets for all your typical tasks, saving time by not having to manually reconfigure each time. To save a preset, simply go to "File -> Save Preset...". Be sure to give the preset a meaningful name. Thereafter the preset will be available under the Control Panel "Presets" menu.

Who is Controlling Io Express?

If you are consistent in the workflows and formats you use between applications, you generally won't be surprised by how your system operates. Io Express is very flexible and most applications perform the necessary housekeeping so they work correctly when they're active and when they're not. However, since several applications using Io Express can be running at once, with one active, it can create confusion when settings are different in each and you switch back and forth. To prevent confusion, we recommend you run the Io Express Control Application and have it visible somewhere on your Macintosh desktop. It will tell you, even when it's not the "active" application, who has control of Io Express (see message directly above the Control Panel tab bar) and what the format selections are.

For further understanding, read on and we'll give you some further background on Io Express control. The main issue you'll generally want to know, is what application *has control of Io Express's Primary Format at the current moment*.



Io Express Control Options

QuickTime Application Control

If a running QuickTime application uses Io Express for capture or output, it controls the Primary format via its own menus and settings. For example, when Final Cut Pro is active (it's the topmost application) and has Io Express as its "A/V Device", then the Io Express'S Primary format is determined by Final Cut's "Video Playback" submenu (under the "View" menu) or its "Audio/Video Settings..." dialog under A/V Devices.

When a QuickTime application is in control of the Io Express, it will be indicated by a label in both the Io Express Control Panel's *Format* and *Control* tabs. The Io Express Control Panel's *Primary Format* menu will also indicate that it is not active while the QuickTime application is running—it will be grayed-out.

What can be confusing is that QuickTime applications can start and stop and change modes—even while they are running! And the behavior of different QuickTime applications can vary: some applications take control of the interface as soon as they are launched and don't give it up until they quit, while other applications take control of the interface only when they are the "front-most" running application and then relinquish control when they're not. Final Cut Pro is one of the latter type QuickTime applications. This difference in behavior can surprise you when you click in and out of multiple QuickTime application windows.

To illustrate such possible confusion, consider this multiple application scenario:

1. Open Final Cut Pro (FCP), select Io Express as the A/V device. FCP takes control of the Io Express and tells it what Primary format to use. If one of the FCP windows covers up the Io Express Control Panel application (which typically happens), you won't be able to see the *"Io Express is in use by Final Cut Pro"* message displayed in the Control Panel, or be able to tell which format FCP has selected. (This is why we recommend you arrange your display so you can see the Control Panel at all times.)
2. Next, you want to see what Io Express is doing, so you find the Io Express Control Panel application by clicking around on the desktop, eventually clicking on the Control Panel to make it visible. As soon as FCP realizes it is now running in the background, it gives up control of the Io Express board. The Io Express Control Panel application takes away the *"...Final Cut Pro"* message.
3. With the Control Panel the topmost application—and in control of the interface—you now switch to a different Primary format.
4. However, when you click back on Final Cut Pro and bring it back to continue your project, it becomes the master again and resets the board's Primary format to the one determined by Final Cut's A/V Settings dialog. To further the surprise, if FCP's windows are covering the Io Express Control Panel window, the change will be hidden and you won't know why the board isn't doing what you told it earlier via the Control Panel.

The moral of the story: keep the Control Panel visible so you can learn what various QuickTime applications are doing when they control Io Express—and then you can step in and change the application's settings and Control Panel settings as desired to get the configuration you expect.

Io Express Control Panel Control

If a QuickTime application *is not running*, the Io Express Control Panel gets control of the board.

Control Recommendations

To avoid surprises, run the Io Express Control Panel, keep it visible on the desktop—and stay consistent in your settings within all QuickTime applications when working on a project. For example, if you're working in a particular format (e.g. 525i29.97), it would make sense to set Final Cut Pro for 525i29.97 and the Io Express Control Panel for 525i29.97. Then, when you switch between applications, the output will stay in the same format.

Having the Control Panel running and visible helps because you can always check and see what the interface is doing and who has control of it—even when the Control Panel is running in the background.

Easy Setups for Typical Uses

Final Cut and Io Express together make working with multiple formats an easy proposition. Inside of Final Cut, equipment and setting presets are available in groups called Easy Setups, from which you can choose typical system configurations. A large set of Easy Setups are supplied with Io Express and installed along with the Io Express software. At installation, you can choose exactly which sets of Easy Setups you want. These "canned" choices can be used directly or as the basis for making your own customized Easy Setups. By duplicating an Easy Setup and then making changes to it, you simplify the process of configuring and re-configuring when working with new formats.

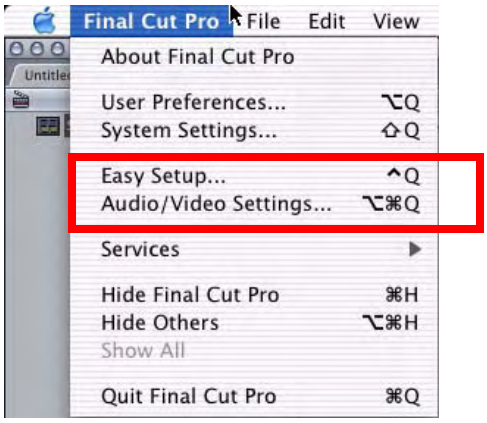
Although this manual assumes you're familiar with Final Cut Pro and have read its documentation, let's review Easy Setups and how to use them effectively with Io Express.

At the simplest level, Final Cut lets you choose and edit presets for capturing media, device control, and for project sequences. These presets are defined in the *Audio/Video Settings* menu. Just like Easy Setups, here also there are factory defined choices, plus you can create and make your own. When you have a set of presets you want to use again, you can store them as an "Easy Setup."

On the following pages we'll further review the *Easy Setups* menu and *Audio/Video Settings* Menu.

Easy Setups Menu

Both the Easy Setups menu item and the Audio/Video Settings menu item are located under the main *Final Cut Pro* menu.



Easy Setup and Audio/Video Menu Items

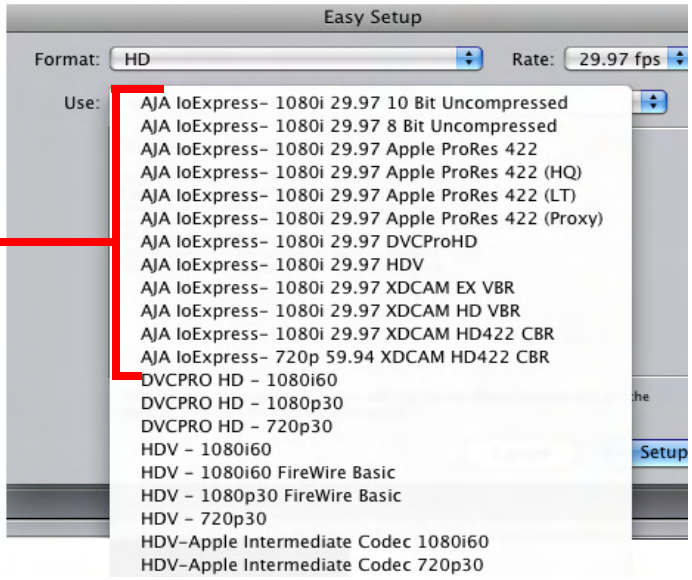
Click on the Easy Setups menu item and Final Cut Pro will present the Easy Setup dialog window:



Easy Setup dialog

At the top of the Easy Setup dialog is the currently selected Easy Setup. It can be changed by clicking on the pulldown arrow at the right. Doing so results in a long list of the factory Easy Setups stored on the system.

A large set of Easy Setups are Provided as Io Express defaults



Factory Easy Setups

To choose a new Easy Setup from the list, click on the pulldown menu and select a desired choice. The choice won't take effect until you click the *Setup* button, but you will be able to see the description for the choice just by selecting it (without clicking the *Setup* button).

Descriptions provide a paragraph summarizing what the Easy Setup is intended for and then each of the presets is explained (Sequence, Capture, Device, Playback Output, and Edit to Tape Video/Audio Outputs).

Easy Setups For Use With Io Express

The factory default Easy Setups currently shipped with Io Express are updated regularly by AJA and posted on the relevant support web page for your Io Express. Also, there are additional easy setups available on your Io Express Software CD

Audio/Video Settings Menu

The Audio/Video Settings menu in Final Cut Pro contains a series of tabbed windows where you define the presets in specific categories such as A/V devices (playback) or format of media being captured. When you open the Audio/Video Settings window, it shows a summary of the currently selected Easy Setup. Other tabbed windows are available with greater details about each category. On the initial summary window you can see the selected presets for the Easy Setup as well as change specific presets.

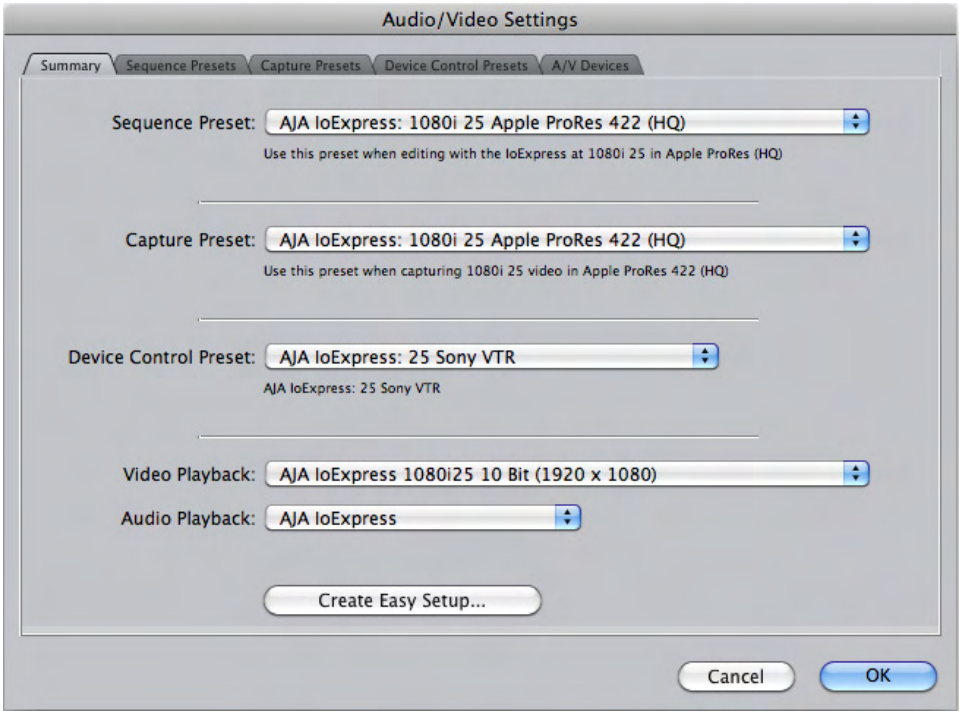
The presets you can change on the Summary window are:

Sequence Preset—select one of these as the editing timebase for new sequences. If you make a change to Sequence Presets, the change will only take effect on any new sequences you create—currently active sequences will not see the change.

Capture Preset—select one of these to set the incoming source format you'll be capturing. Ideally, select the maximum quality format you'll be using for most of the material so there will be no need to re-render later as clips are added from the bin to the sequence.

Device Control Preset—select the AJA Video Io Express device (NTSC or PAL as desired). This tells Final Cut that the Io Express will control the VTR attached to Io Express.

A/V Devices (Audio and Video Playback)—select the Io Express as video and audio playback devices for Final Cut and the format to be output.



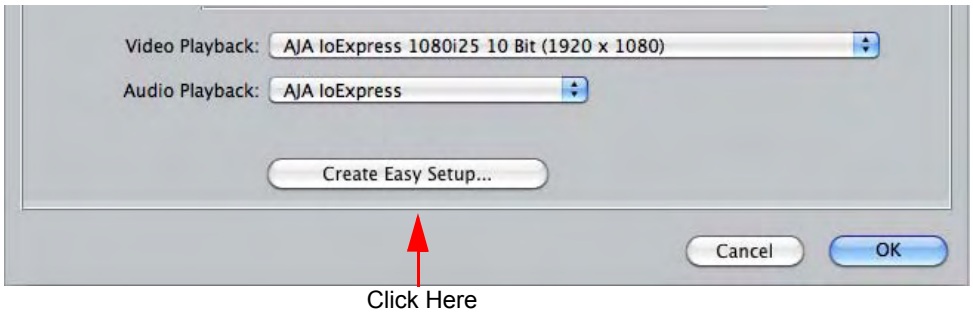
Audio/Video Settings, Summary Window

To Create A New Easy Setup

If you have a group of presets that you'd like to use continually, then you can create a new Easy Setup by modifying the settings of the Easy Setup currently selected. Simply pick one most like the one you want to create and then save it under a new name:

1. Change the currently selected Easy Setup by making changes at the Summary tabbed window via the pulldown menus.

2. When everything is set as desired, click on the *Create Easy Setup* button at the bottom of the Summary window.
3. A new dialog will pop up. Enter a descriptive name for the new Easy Setup (e.g., 10-bit SDI from Video Server) in the *Name* field.
4. Enter a sentence or two describing what is unique about the Easy Setup in the *Description* field.
5. Click the *Create* button to store the new Easy Setup.

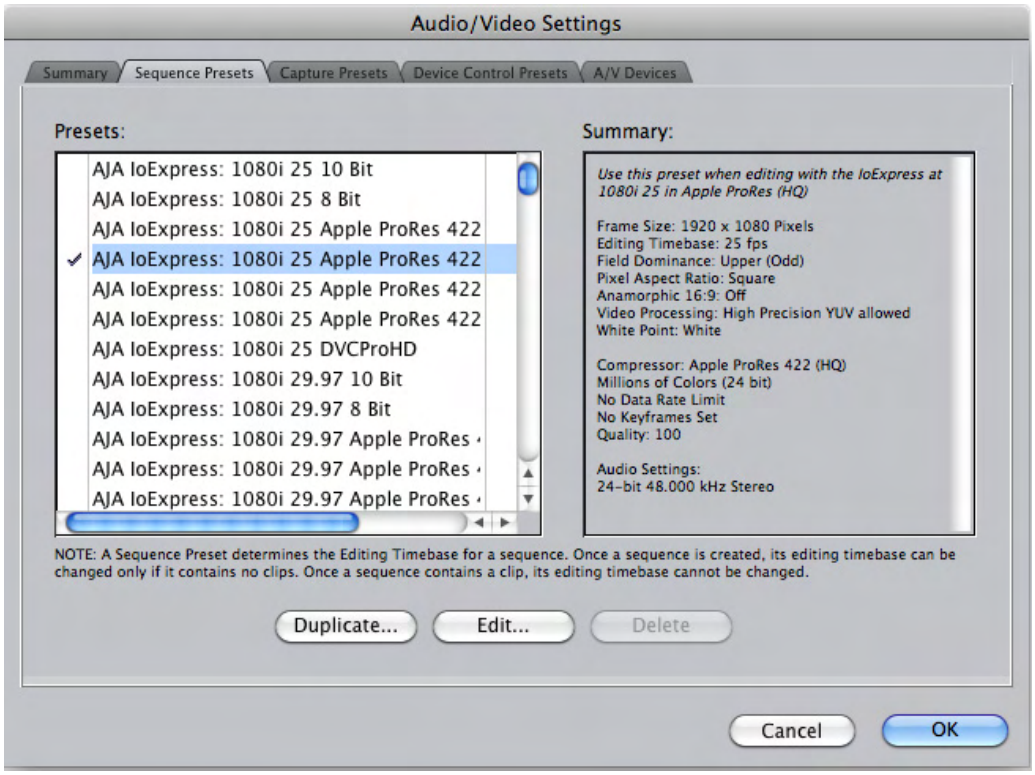


Audio/Video Settings, Creating a New Easy Setup

At any point in the above procedure you can go to the other tabbed windows and make additional changes. For example, in the Sequence Presets, Capture Presets, and Device Control Presets windows you can select a preset and click on an *Edit* button to change specific aspects of the preset. As an example, under *Device Control Preset* you might wish to change the Time Source on your VTR from LTC to VITC, or change the pre-roll and post-roll values. When you save a Setup, it defaults to saving in the Final Cut Pro *Custom Setups* folder.

Each of the tabbed preset screens are described on the following pages for your convenience. For more information, please read the Final Cut Pro user documentation.

The Sequence Presets Window



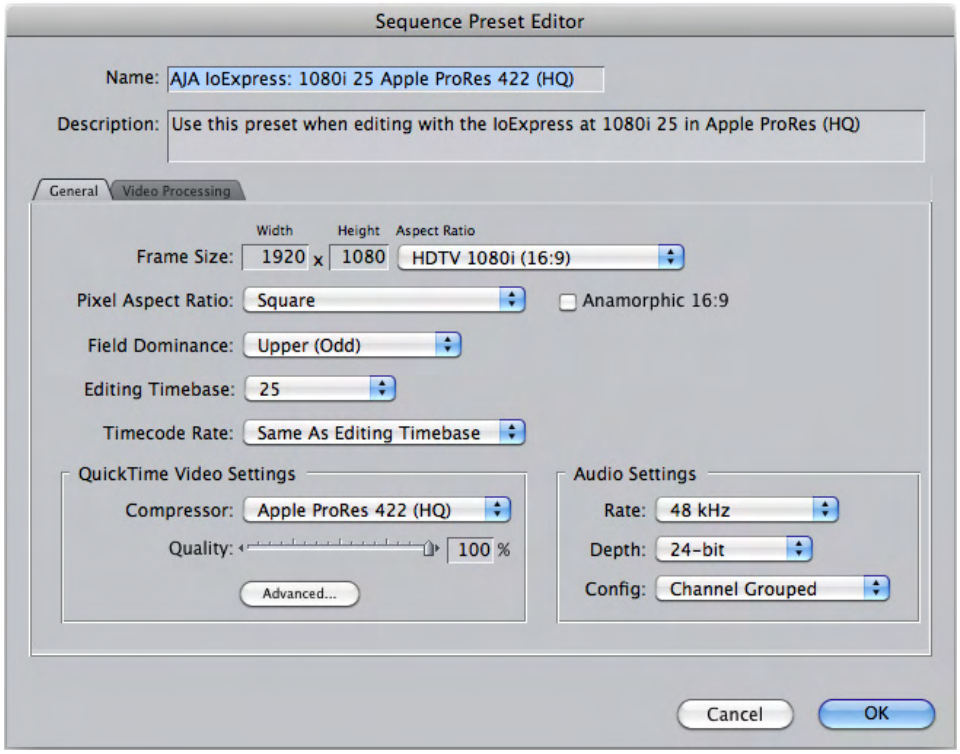
Audio/Video Settings, Sequence Presets Window

This window allows you to select an editing timebase for the current sequence. Once you add a clip to the sequence this cannot be changed.

For example, once you've selected uncompressed 10-bit NTSC 48 kHz, you then have to stay in that timebase and can't switch to another. By clicking in the leftmost column (see the checkmark in the sample screen above), you select a new Sequence Preset for use. The checkmark tells which Preset is in use—highlighting a choice alone does not select it.

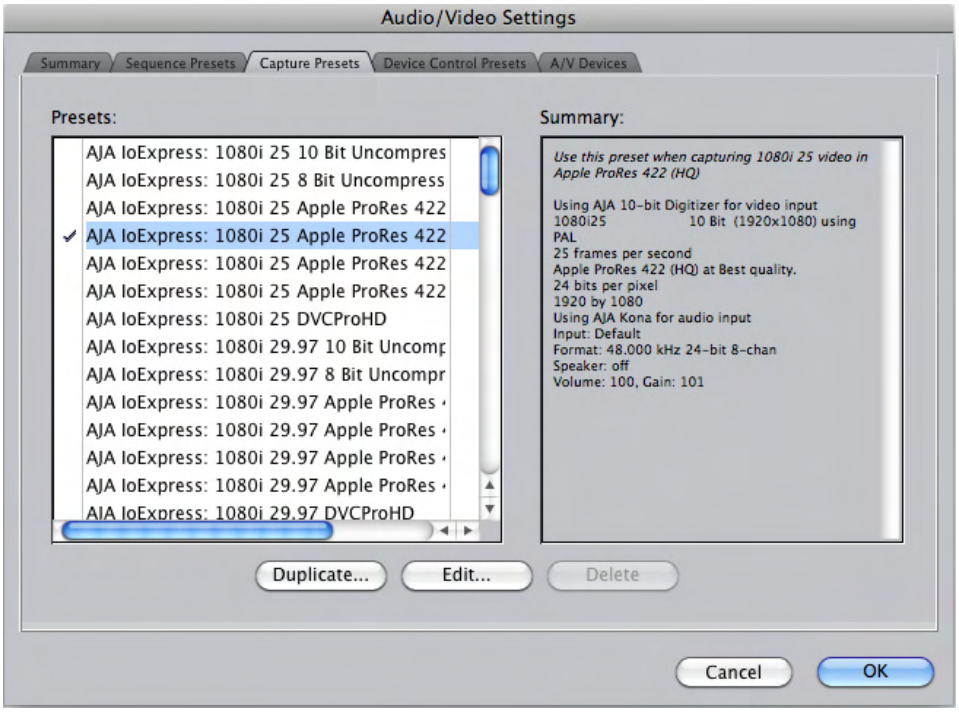
If you select an editing timebase you can then edit it (click the Edit button) or copy and rename it as another (click Duplicate). When editing a timebase you can change the following:

- Select video processing properties (how to render)
- Frame size and aspect ratio
- Pixel aspect ratio
- Field dominance (none, upper, or lower)
- Editing timebase
- Set QuickTime video codec settings (quality and type)
- Select audio sample rate



Audio/Video Settings, Sequence Presets Editor Window

The Capture Presets Window



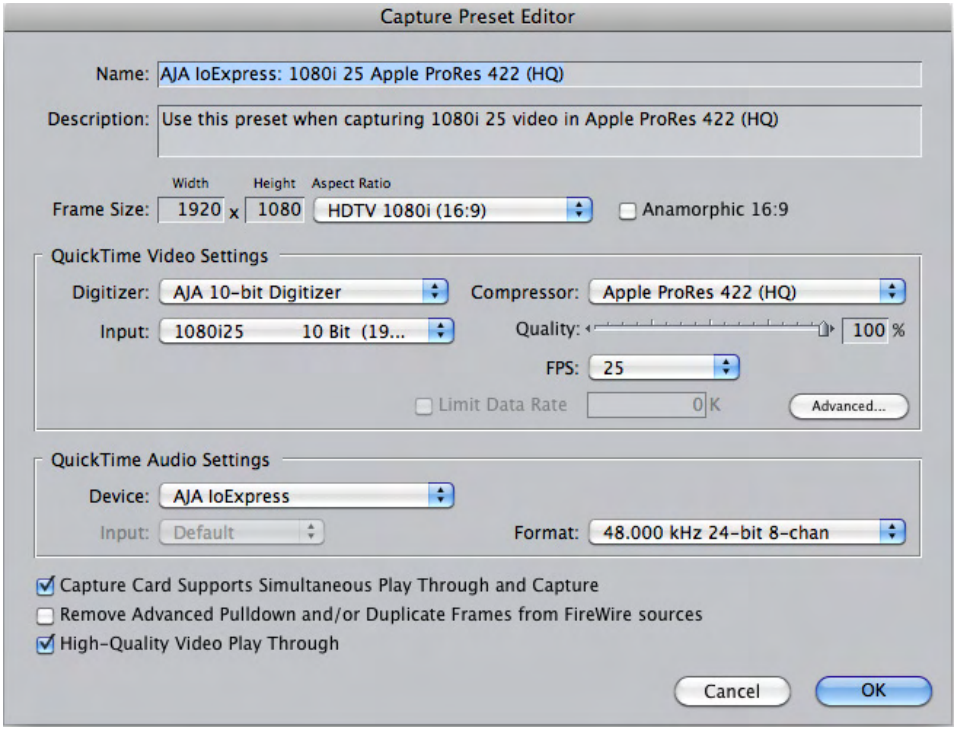
Audio/Video Settings, Capture Presets Window

This window lets you choose a preset format for incoming source video and audio media you'll be capturing. Select the maximum quality format you'll be using for most of the material so there will be no need to re-render later. The information on the right window pane describes the preset and all it's parameters. If you select a format by making a checkmark in the left column, you can edit it (click the Edit button) or copy and rename it as another (click Duplicate). The only exceptions to this are those presets marked with a lock icon; those can be duplicated, but when you try to edit one the system reports they're locked and can only be copied (it will create the copy for you when you try to edit).

Factory AJA presets are easily identified by "AJA" at the beginning of their name.

Since Capture Presets will be used frequently as you bring media into Io Express, we'll discuss the edit screen next.

Capture Presets Editing



Audio/Video Settings, Capture Presets Editing Window

Note: Whenever a Preset is being copied as the basis of a new preset, always change the name and description to fit the new preset so users aren't confused between it and the original.

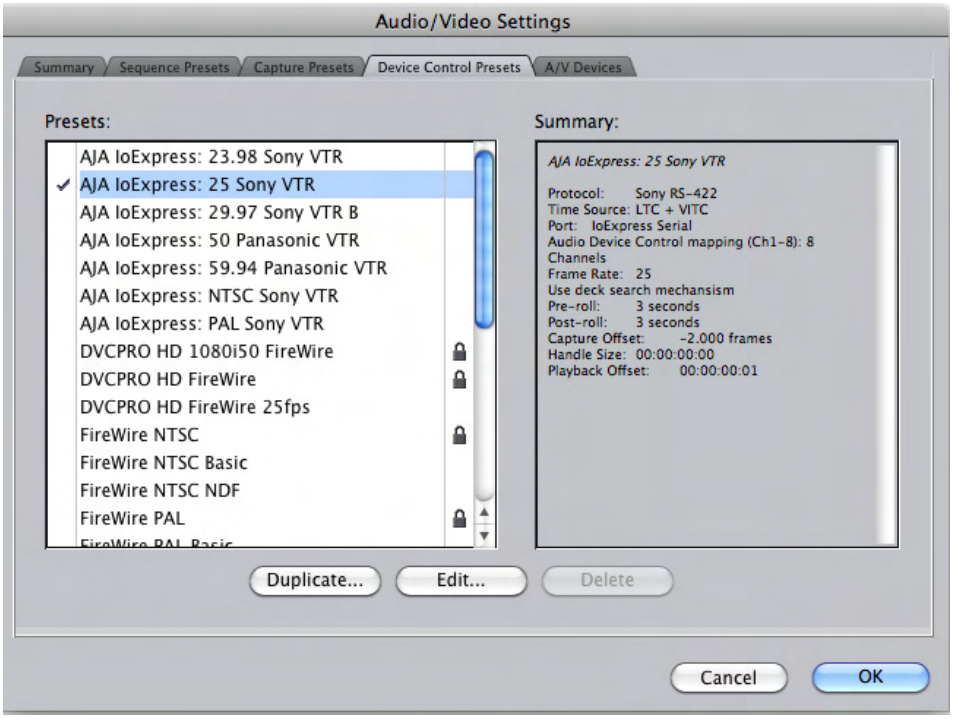
Frame Size—below the name and description are the frame size settings. These can be changed via the pulldown menu. Selecting a new *Aspect Ratio* value also changes the values in the width and height fields.

QuickTime Video Settings—these settings select a video input source and affect how it's processed by Final Cut Pro. The *Digitizer* pull-down menu selects whether you want the selected input source to be digitized as 8-bit or 10-bit uncompressed video as it comes into Io Express. The *Input* pull-down selects the primary format Io Express will use to capture input video. The *Compressor* pull-down selects a codec that tells Final Cut how to process the video; the codec selected should be chosen for compatibility with the Digitizer setting selected.

For example, if your Digitizer setting is 10-bit Uncompressed, then the Compressor setting should be one of the 10-bit choices available. The *Quality* slider should be set to 100 percent when capturing uncompressed; for other formats use an appropriate quality level. Set the *FPS* (Frames Per Second) setting to the correct frame rate. The *Advanced* settings button opens a new screen providing choices of codec-specific options. For uncompressed codecs these probably are not unneeded; for other codecs choose the options desired.

QuickTime Audio Settings—these settings select an audio input source and affect how it's processed by Final Cut Pro. The *Device* pull-down should be set to AJA Io Express. The *Input* pull-down selects that Io Express (AJA Io Express) will be used for capturing audio—it does not select the specific inputs. For specific audio input selection use the Io Express Control Panel. The *Rate* pull-down selects a sample rate; it should always be set to 48 kHz for Io Express. By clicking on the *Advanced* button, a new screen will be displayed where you can select between 8- and 16-bit sampling—AJA recommends 16-bit for optimum sound quality. (This has nothing to do with input format, as Io Express supports 20-bit SD embedded audio, and 24-bit AES audio.)

The Device Control Presets Window



Audio/Video Settings, Device Control Presets Window

This window selects machine control parameters for an attached VTR. Your choice here tells Final Cut that Io Express is handling the machine control parameters for the VTR attached to Io Express. Alternatively, you could also select a different device for input/output instead of Io Express.

For example, if you have a IEEE 1394 camcorder attached to the Mac's FireWire port you might choose "FireWire NTSC." The information on the right window pane describes the current machine control settings and parameters for the VTR attached. For Io Express presets this means the VTR attached at the RS422 port on Io Express. For non-Io Express presets, this means camcorder/VTRs attached directly at the FireWire port or via some other interface.

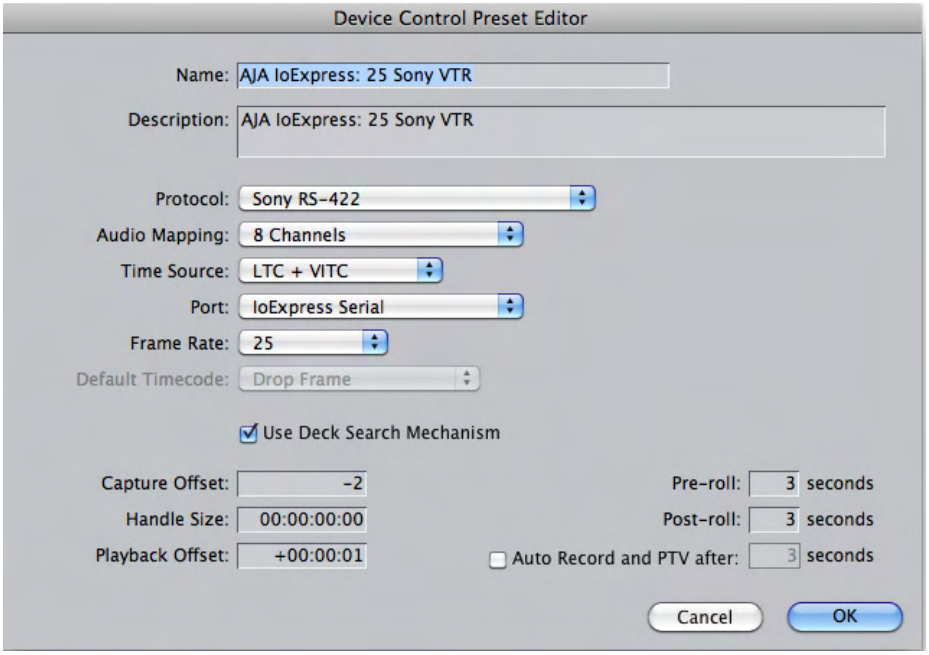
If you select a preset you can edit it (click the Edit button) or copy and rename it as another (click Duplicate). The only exceptions are those presets marked with a lock icon; those can be duplicated, but when you try to edit one the system will report they're locked and can only be copied (it will create the copy when you try to edit).

When editing a Device Control preset you can change the following:

- Name and description of Device Control preset
- Protocol for capture/playback VTR (for Io Express this will be RS422)
- Audio Mapping
- Time Source (LTC/VITC/both/etc.)
- Port
- Frame Rate
- Default Timecode (Drop Frame etc.)
- Capture/Playback Offsets (to correct for VTR versus Final Cut timing issues)
- Handles/Pre-roll/Post-roll
- Auto Record and PTV

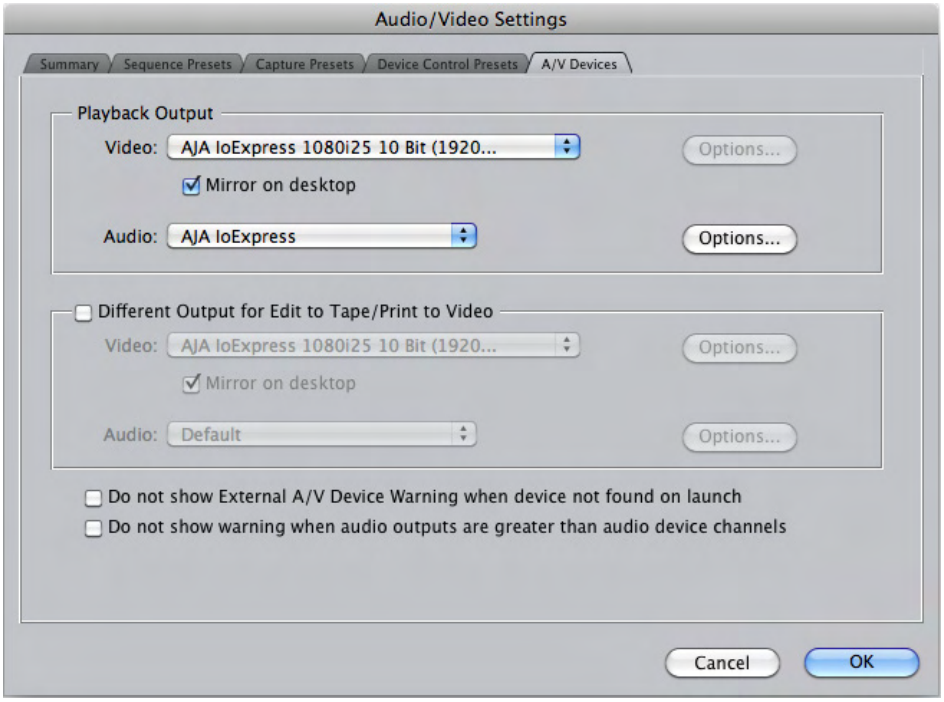
Io Express ships with VTR Device Control Presets for Sony and Panasonic VTRs. Select a Device

Control Preset for the desired frame rate. Presets for both Sony and Panasonic VTRs are provided with these frame rates: 23.98, 24, 25, 29.97, and 59.94.



Audio/Video Settings, Device Control Presets Editor Window

The A/V Devices Window



Audio/Video Settings, A/V Devices Window

The A/V Devices window selects the current playback device for both audio and video. Typically, you'll select Io Express for both playback devices. The format chosen determines the Primary format for the Io Express board during playback. The Video *Options* button is greyed out for Io

Express (use the Io Express Control Panel for video configuration; the Audio *Options* button opens a second dialog where Final Cut gives options for changing bit depth, number of channels, and the sample rate. Since Final Cut currently only supports 2 channels of audio, AJA recommends you leave all of these settings as set in the factory defaults.

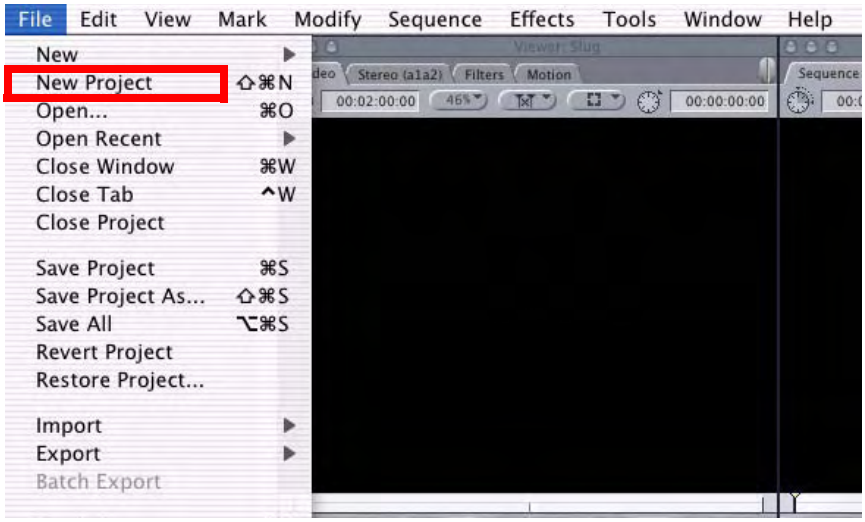
You may wish to use a different Io Express output for final Print-to-tape from Final Cut. You can select that in this window by clicking the checkbox "Different Output for Edit to Tape/Print to Video." This allows you to select via a pull-down menu any Io Express video output and audio output.

The window also allows you to turn on and off device and audio output warnings.

Checking the System with a Simple Test Project of Bars and Tone

To test that you've installed the Io Express drivers and have audio and video monitoring correctly configured, try creating a simple Final Cut Pro project with bars and tone.

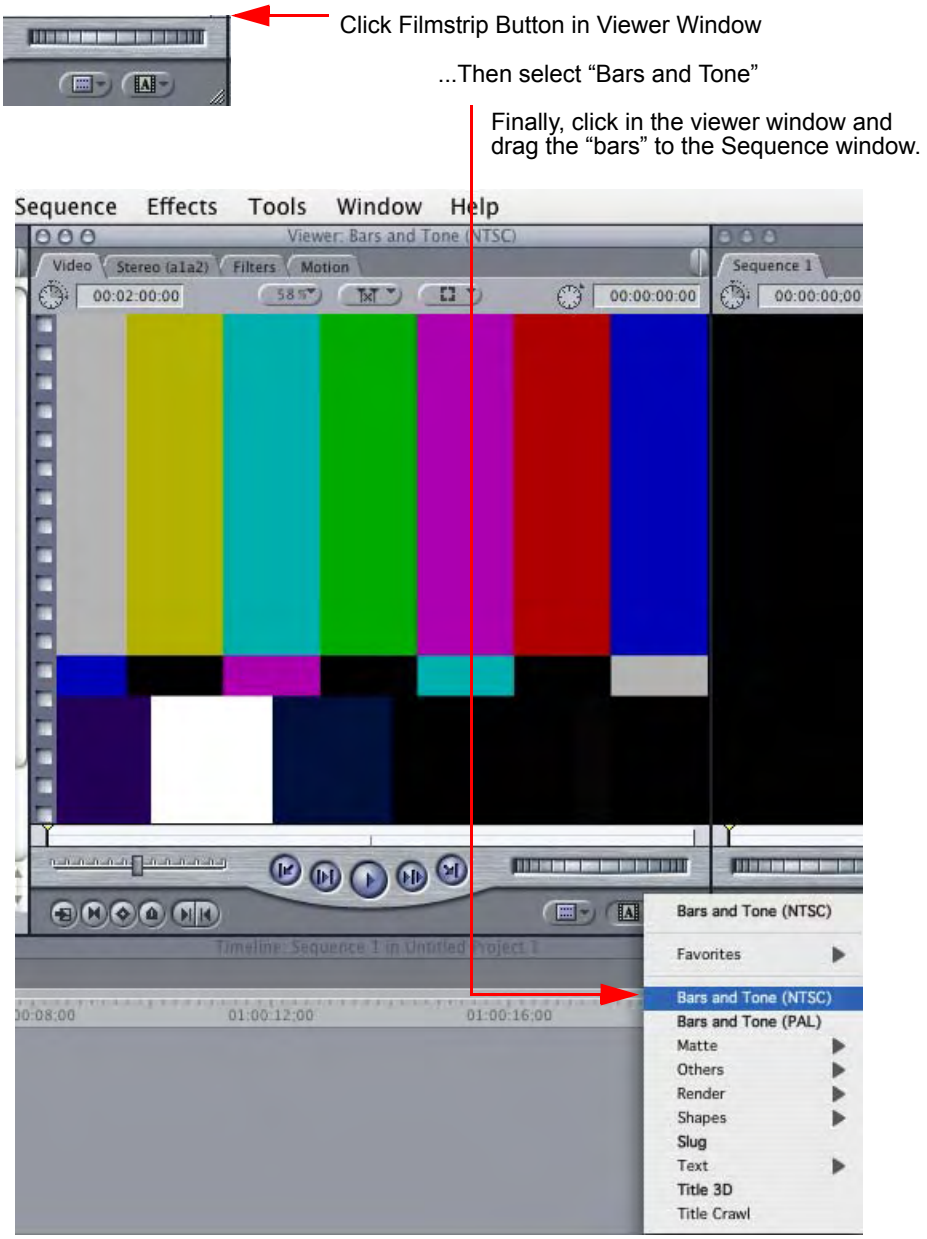
1. Select an Easy Setup as previously discussed (go to the Final Cut Pro menu and select *Easy Setup*; then select a desired preset).
2. Select *New Project* from the File menu.



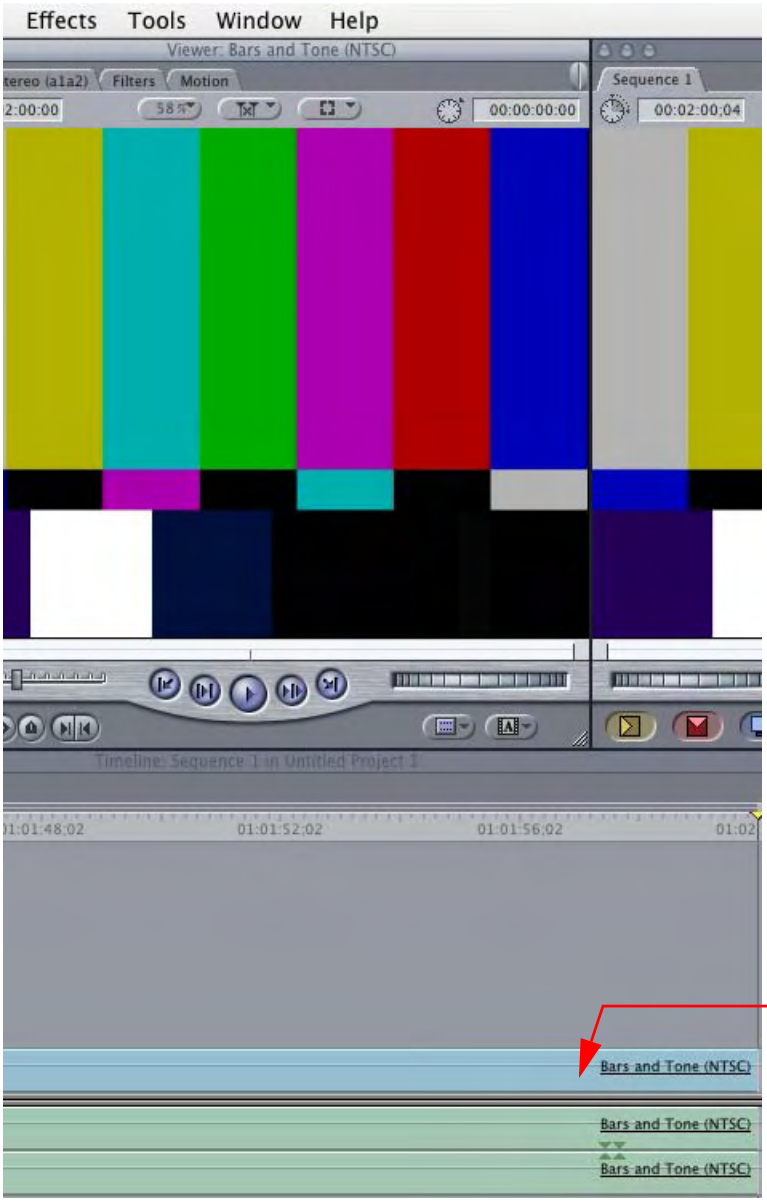
Create a New Project

3. The Sequence window will be at the bottom of the screen and a Browser window will be at the top left. Look at the Browser window and locate the "Effects" tab at the top right. Click on it.
4. Locate the Viewer window in Final Cut and click on the Filmstrip pulldown menu button (it's a "filmstrip" icon with an "A" on it). Select "Bars and Tone NTSC" or "Bars and Tone PAL". The viewer window will display bars after you do this.
5. Click the mouse cursor on the Bars and Tone in the Viewer window and drag it to the beginning of the sequence window. You'll see the bars and tone show up on the sequence where it can be played.
6. Go to the beginning of the sequence by clicking on the left-most icon and then click the "Play" icon. You should see and hear the bars and tone on your video monitor and audio monitoring system.

If you don't see bars on the external video monitor and hear tone, check your connections and ensure Io Express is selected in the Easy Setups and Audio/Video Settings as necessary.



Click and Drag Bars and Tone From Viewer Window To Sequence



Sequence Window Showing Bars and Tone Clip Dragged from Viewer

If everything works properly, go ahead and try capturing audio and video media from your VTR.

Using 8-bit Versus 10-bit Video

While both 8- and 10-bit uncompressed video are capable of providing excellent quality broadcast video, 10-bit represents a significantly higher quality and is preferable in many situations.

Because 10-bit video has four times the numerical precision of 8-bit, it has a signal-to-noise ratio 12 dB higher than 8-bit video.

Visually, in 8-bit video compared to 10-bit video, you will notice a substantial difference. In 8-bit video there will be “contour lines” or “striations” visible, particularly noticeable in scenes having soft gradients like a ramp or sunset. For example, if a sky region is mostly the same color but varies by only a few digital numbers from one side of the picture to another, you may see contour lines where the signal passes from one digital value to the next higher value.

Since each numerical value in a 10-bit system is only one fourth as large as an 8-bit system's, these contours become invisible and the sky varies smoothly.

10-bit video is often used when the source and output video (or “master”) is also 10-bit. Even if the input and/or output video is 8-bit, a 10-bit “project” will still maintain a higher quality when there is a significant amount of effects rendering involved.

Industry standard professional mastering formats—Sony Digital Betacam for Standard Definition and Panasonic D5 for High Definition—are both true 10-bit formats.

Chapter 4: Using Adobe CS4 for Windows

Adobe CS4 for Windows

Note: Windows and Adobe CS4 compatible software for Io Express is in progress and will be released soon. For updates, see the AJA Io Express Support page at:

http://www.aja.com/support/io/io-express.php

Appendix A: Troubleshooting

If You Run Into Problems

One useful way to find the source of problems is to isolate your system to the smallest size where the problem still occurs and then note all the symptoms. This serves to eliminate areas not involved in the problem and makes finding the problem easier.

Once you've noted problem symptoms, look through the following table and see if any of the symptoms are listed. If so, check the items listed. If you later need to call for customer service, let them know all of the things you've tried and when and how the symptoms appeared.

Symptom	Check
Disk RAID cannot keep up (dropped frames etc.).	Ensure the disk system is providing at least 50 MB/second sustained transfer rate
Dropped frames during playback.	1. Canvas/Viewer zoom setting exceeds the fit-to-window setting. Change to "Fit-to-Window." 2. RAID cannot sustain the data rate of the clip/sequence. 3. The sequence setting does not match the "playback output setting" found at FCP Audio/Video Settings -> AV Output. 4. Virus checking software running in the background (disable it). 5. Scratch drive not set to the RAID.
Dropped frames during record.	1. RAID cannot sustain the data rate of the capture preset codec. 2. Virus checking software running in the background (disable it). 3. Scratch drive not set to the RAID.
Media is not being captured from desired external device.	Check the settings in the *Input* tab of the Io Express Control Panel application. Also check equipment cables.
Dropped frames during playback	Look for scroll bars in the viewer or canvas as a warning sign that the zoom setting exceeds the fit-t-window.

Symptom	Check
Changes made to Final Cut's configuration aren't remembered or you need to force a change to them.	Under some circumstances, Final Cut Pro may need to be initialized back to the factory default state as it was when you installed it. The easiest way to do this is to locate Final Cut's preference file and discard it. To do so, follow this procedure: 1. Locate the file named "Final Cut Pro x.x Preferences". Note: path to file is "Macintosh HD/users/username/library/preferences/final cut user data." 3. Click and drag that file to the Trash Can icon and drop it there. When you next start up Final Cut Pro, it will present the "Choose Setup" prompt (as in initial installation) where you can again choose a desired Io Express input format in the "Setup For" pulldown and re-enter a desired system scratch disk (your RAID).
Video in the canvas stays frozen during playback.	1. The sequence setting does not match the "playback output setting" found at FCP Audio Video Settings -> AV Output. 2. Canvas/Viewer zoom setting exceeds the fit-to-window setting. Change to "Fit-to-Window."
Video output is black.	1. External video is set to "No Frames" (View -> External Video). 2. The "Playback output setting" found at FCP Audio Video Settings -> AV Output is set to "none" or to a non-Io Express device.
Video stutter during playback.	RAID cannot sustain data rate.
Red render bar occurs when placing a clip on a sequence.	The sequence setting does not match the clip setting.

Updating Software

Check on the AJA Video website (http://www.aja.com/support/io/io-express.php) for software updates. If any are available, download the file and read any associated instructions prior to installing the software.

Support

When calling for support, first check over your system configuration and ensure everything is connected properly and that current Final Cut presets and Easy Setups match what you are trying to do. Even if you cannot find the cause of the problem, having this information at hand will help when you call Apple or AJA Customer Support for help.

If the problem is unknown or you need general help, first contact the dealer where you purchased the product. AJA dealers offer product support for many service requirements.

If the problem is a Final Cut Pro operational issue, Mac Pro system issue, or Xserve RAID issue, then call Apple Customer Support for help.

If the problem is an AJA Video Io Express issue, then contact AJA Video Customer Support using one of the methods listed below:

Contacting by Mail Address:

443 Crown Point Circle, Grass Valley, CA. 95945 USA
Telephone: 1.800.251.4224 or 1.530.274.2048
Fax: 1.530.274.9442

Web: http://www.aja.com
Support Email: support@aja.com

Apple Resources

Apple provides a large amount of support information online at their support website. Information provided includes answers to top questions, discussions on specific topics, and software downloads for updates and utilities.

You may also enroll in AppleCare for extended support of hardware and software products. Information is provided on the Apple Support website on how to enroll in AppleCare.

General Apple Support Website for information on all products:
http://www.info.apple.com/

Mac Pro Support Area: http://www.apple.com/support/macpro/

Final Cut Pro Web Support: http://www.info.apple.com/usen/finalcutpro/

Final Cut Discussion Area:
http://www.apple.com/support/finalcutpro/

Appendix B: Specifications

Formats

525i 29.97
625i 25
720p 50
720p 59.94
720p 60
1080i 25
1080i 29.97
1080i 30
1080PsF 23.98
1080PsF 24
1080P 23.98
1080P 24
1080P 25
1080P 29.97
1080P 30
1080P 50
1080P 59.94
1080P 60

Video Input

Digital: 8- or 10-bit HD/SD SDI, SMPTE-259/292/296/424, 1 BNC
HDMI v1.3, 30 bits/pixel, RGB or YUV, 2.25 Gbps, SD, HD, 1080p50/60

Analog

Component:

SMPTE/EBU N10, Betacam 525 line, Betacam 525J
12 bit A/D, 2x oversampling
+/- .25 db to 5.5 MHz Y Frequency Response
+/- .25 db to 2.5 MHz C Frequency Response
.5% 2T pulse response
<2 ns Y/C delay inequality

Video Output

Digital: HD/SD SDI, SMPTE-259/292/296/424, 1 BNC
HDMI v1.3, 30 bits/pixel, RGB or YUV, 2.25 Gbps, SD, HD, 1080p50/60

Analog:

SD Component:

SMPTE/EBU N10, Betacam 525 line,
Betacam 525J, RGB
12-bit D/A, 8x oversampling
+/- .2 db to 5.5 MHz Y Frequency Response
+/- .2 db to 2.5 MHz C Frequency Response
.5% 2T pulse response
<1 ns Y/C delay inequality

Analog SD and HD Output, 12 bits, BNC:

HD: YPbPr, RGB
SD: YPbPr, RGB (component mode)
Composite/YC (composite mode)

Audio Input

Digital: 2-channel 24-bit AES/EBU, 48 KHz sample rate
Synchronous or Non-synchronous
(Internal sample rate conversion)
24-bit SMPTE-259 SDI embedded audio, 8-ch, 48 KHz synchronous

Audio Output

Digital: 2-ch 24-bit AES/EBU, 48 KHz sample rate
24-bit SMPTE-259 SDI embedded audio, 8-ch, 48 KHz synchronous

Analog: 2-channel unbalanced output (RCA-jack)

Reference Input

Color Black or Tri-level sync
LTC Input (on Reference input)

Machine Control

RS-422, Sony-style DE-9 connector. The 9-pin DE-9 connector pinout is as follows:

1 GND
2 RX-
3 TX+
4 GND
5 No Connection
6 GND
7 RX+
8 TX-
9 GND
Shell GND