www.aja.com

ioEXPRESS

Published: 11/29/10

Installation and Operation Guide

Because it matters.

AJA® VIDEO SYSTEMS

Trademarks

AJA®, KONA®,Ki Pro® and XENA® are registered trademarks of AJA Video, Inc., 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

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:

180 Litton Drive, 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.

Table of Contents

Chapter 4: Using AJA Machina with Windows

Chapter 5: Using Adobe CS5 Applications

Appendix B: Specifications

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
- HDMI 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 64-bit Windows 7 operating systems
- Small portable case design fits in 1RU rackmount option
- 1-meter PCIe tether cable
- 12V DC power supply

Accepted Inputs

- HD/SD SDI Video with embedded audio
- HDMI Video with embedded audio

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.

Using Multiple AJA Products

Starting with KONA, Io HD, and Io Express v7.5, more than one AJA product can be used with your host computer. Using the AJA/Io Express Control Panel (Mac) or Machina Control Application (Windows), you can choose which installed product an application uses for input/output. If you have more than one product and the associated drivers installed, in the upper left corner of the AJA Control Panel and the Setup Screen of Machina, you will see a board name, such as Io Express or KONA3. (If only one product is installed, the AJA/Io Express Control Panel will not show a product or pulldown menu.) To "target" a specific installed product for use, select it from the list of available products that appear in the pulldown.

When you launch an application such as Final Cut Pro, or AJA TV, that application will use the product that is currently selected in the AJA Control Panel or Machina application for its input/output. Once an application is running, you can change the "targeted" product selection in the AJA Control Panel or Machina and select a different product. The running application will retain its connection to the product. If you change the "targeted" product and launch a different application, that application will use the new product for its input/output, while the first application you launched will continue to use the previous AJA product.

Example: select an Io Express as the targeted product in the Control Panel application. Launch Final Cut Pro. Final Cut Pro is now using the Io Express for its input/output. Go back to the Control Panel application and select a KONA 3 as the "targeted" product. Launch the AJA TV application. AJA TV would now use the KONA 3 for its output.

If you switch back to Final Cut Pro, you will see that it still uses the Io Express for its input/output. Note that some applications, like AJA TV, have a provision for playing in the background, so playback on one product could even continue when switching the targeted device for use with another application. You can even feed the output from one AJA product to another AJA product on the same system in such cases.

AJA TV optionally supports playback in the background; checkbox "Continue Playback" when AJA TV is in background.

Note: Performance of multi-product use depends on a variety of factors: CPU usage, RAM, disk IOPS/bandwidth for streams of video, etc. and therefore performance may vary. Also be aware that multiple input/output streams are only supported by software that is explicitly designed for a multi-product environment. Also note that due to limitations of FireWire bandwidth, only one Io HD product may be used at a time on a host computer.

About Primary & Secondary Video Formats

In Io Express operation, the Primary Format is the media format written to disk and used in your project. The Secondary format is that which may be input for capture or output from Io Express to VTRs or other devices. Down-conversion may be applied to an input or on output.

The Primary Format menu allows you to select the video format used in your current project.

Down-conversion is performed based on the Primary or Secondary Format settings. Io Express can down-convert the input format (when designated as a Secondary Format input) to the selected Primary Format. Or you can set a Secondary Format output that will be a down-conversion of the Primary Format.

Note: When converting an Input to the Primary Format, select the Secondary Format option that has (I), for input only, appended to it. Conversely, when converting an

Output from the Primary Format, you must select an output signal with (O) for output only.

Convert Mode

Convert Mode allows selection of a conversion mode for down conversion between High-definition and Standard-definition formats. The choices offered depend on the AJA capture device present and the Primary and Secondary format chosen. Io Express supports down conversion plus SD-to-SD aspect ratio conversions. See the following tables for conversion options.

All conversions use AJA 10-bit hardware on the card.

To do a down-conversion on an HD input:

Set the Primary Format as an SD format

Select the correct HD format with an (I) input designation for the Secondary Format, then

Choose a "– Secondary" Video Input type

Down-conversion display mode choices that may be available include:

- Anamorphic: full-screen
- Letterbox: image is reduced with black top and bottom added to image area with the aspect ratio preserved
- Crop: image is cropped horizontally to fit new screen size

The following Primary Video Signal Formats are supported by Io Express.

720x576 @ 25.00i
720x576 (Wide) @ 25.00i
720x486 @ 29.97i
720x486 (Wide) @ 29.97i
720x480 @ 29.97i
720x480 (Wide) @ 29.97i
1280x720 @ 23.976p
1280x720 @24.00p
1280x720 @ 25.00p
1280x720 @ 29.97p
1280x720 @ 30.00p
1280x720 @ 50.00p
1280x720 @ 59.94p
1280x720 @ 60.00p
1920x1080 @ 23.976sF
1920x1080 @ 24.00sF
1920x1080 @ 25.00sF
1920x1080 @ 29.97sF
1920x1080 @ 30.00sF
1920x1080 @ 25.00i
1920x1080 @ 29.97i
1920x1080 @ 30.00i
1920x1080 @ 23.976p
1920x1080 @ 24.00p
1920x1080 @ 25.00p
1920x1080 @ 29.97p
1920x1080 @ 30.00p

Io Express Down-conversion Options:

The table below contains the available Io Express down-conversion options.

Primary Video Format	Secondary Format Options
1280x720 @ 23.976p	720x486 @ 29.97i
1280x720 @ 25.00p	720x576 @ 25.00i
1280x720 @ 29.97p	720x486 @ 29.97i
1280x720 @ 50.00p	720x576 @ 25.00i
1280x720 @ 59.94p	720x486 @ 29.97i
1920x1080 @ 23.976sF	720x486 @ 29.97i
1920x1080 @ 25.00sF	720x576 @ 25.00i
1920x1080 @ 29.97sF	720x486 @ 29.97i
1920x1080 @ 25.00i	720x576 @ 25.00i
1920x1080 @ 29.97i	720x486 @ 29.97i

All conversions use AJA 10-bit hardware on the card.

Playback Formats

Playback formats supported by Io Express include:

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

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).
- Support for Adobe Premiere Pro, After Effects and Photoshop (application software not included)

AJA's Io Express software and hardware were developed for use on the Macintosh platform providing powerful integrated video/audio capture, editing, and video production. With an Apple Mac Pro and Io Express, you have an ideal high-quality cost-effective system for standard definition and high definition 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 (software application not included).

Software for Windows

AJA Software for Windows brings high quality HD and SD video and audio to a Windows workstation with Io Express. With Io Express's professional features, you can run these Windows platform applications (application software not included):

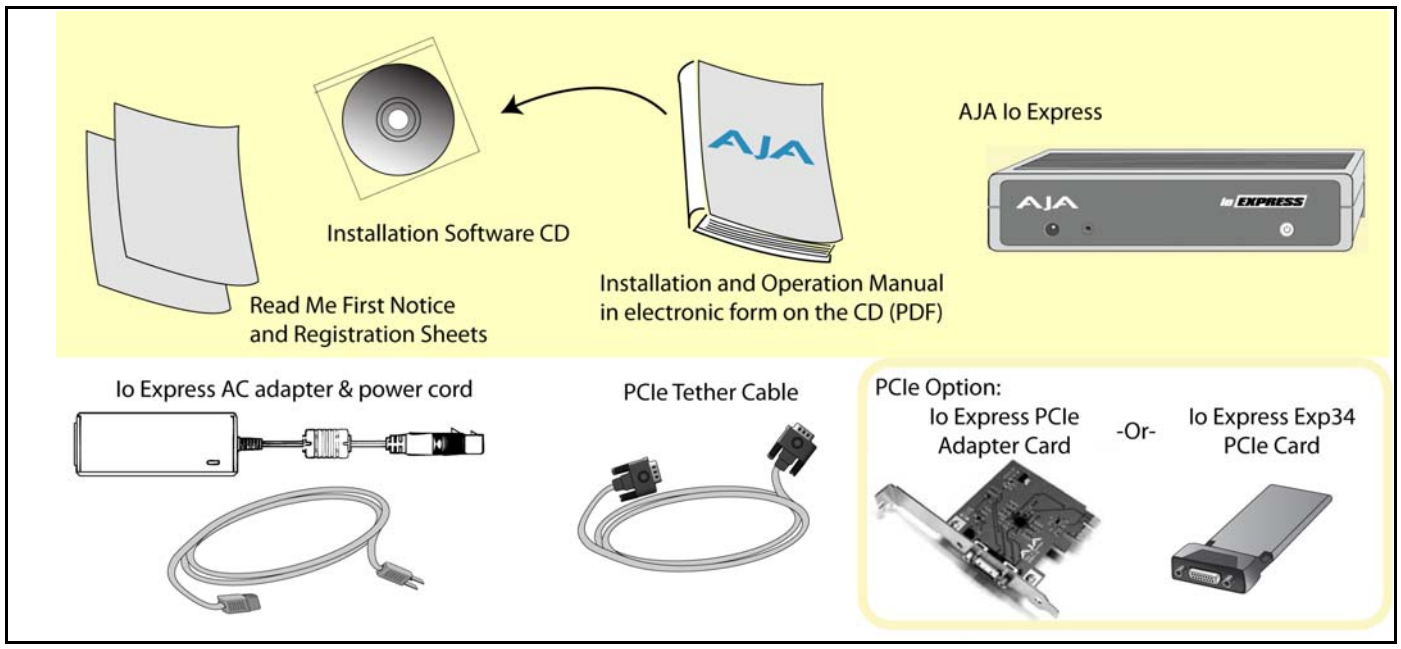
- Adobe Premiere Pro CS5
- Adobe After Effects CS5
- Adobe Photoshop CS5
- Autodesk Combustion
- Eyeon Fusion
- Sony Vegas 9.0c

Io Express software also offers AJA's own Machina application for incredible standalone file capture, preview and playout with full machine control.

What's In The 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.

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.



Io Express Shipping Box Contents

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 related software on an Apple MacPro or Windows 7 64-bit 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).

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.

Platform	System Requirements
Mac System Recommended  	Processor: Dual-core 2.8 GHz RAM: 4 GB OS: OSX 10.6 Snow Leopard Hardware Interface: 34mm Expresscard slot for laptop; PCIe slot for tower
Mac System Minimum	Processor: Dual-core 2 GHz RAM: 2 GB OS: OSX 10.5 Leopard Hardware Interface: 34mm Expresscard slot for laptop; PCIe slot for tower
Windows System Recommended 	Processor: Quad-core 2.5 GHz RAM: 8 GB OS: Windows 7, 64-bit Hardware Interface: 34mm Expresscard slot for laptop; PCIe slot for tower
Windows System Minimum	Processor: Dual-core 2.26 GHz RAM: 8 GB OS: Windows 7, 64-bit Hardware Interface: 34mm Expresscard slot for laptop; PCIe slot for tower

Recommended Io Express Driver for Mac OSX and Final Cut Pro is FCP 7.5.x - Io Express Driver version (Leopard and Snow Leopard OSX compatible version)

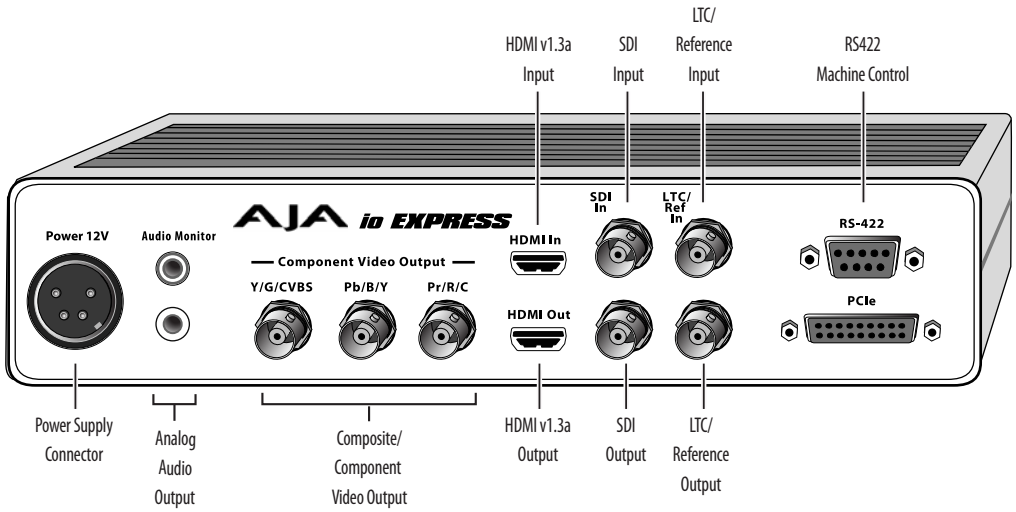
For operation under Windows OS XP 32 or Vista 32/64 use Io Express version 4.2.

Note: Always consult the release notes for the AJA software version you are running (included with installer) For the latest appropriate match for your software and hardware, visit:

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

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 using AJA Software for Windows and the Machina capture/playback application.

Chapter 5 discusses operational aspects of Io Express when used with Adobe CS5 Premiere Pro and related applications.

Chapter 6 discusses operational aspects of Io Express when used with Autodesk Combustion and Eyeon Fusion 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. The steps of installation and configuration are discussed here and summarized as follows:

1. Unpack the shipping box (see *"What's In The Box?" on page 5*.)
2. If not previously installed on your Mac Pro or Windows workstation, ensure that appropriate application software such as Final Cut Pro or Adobe Premiere Pro 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.

   Note: Starting with Io Express 7.5, you can operate multiple AJA capture products in a workstation. See *"Using Multiple AJA Products" on page 2* for details.
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.

Connecting to your Computer

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

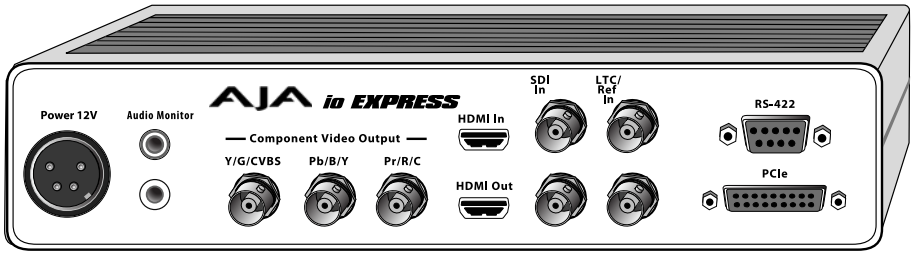
Caution: *Always have power off when connecting any device to the PCIe bus.*

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



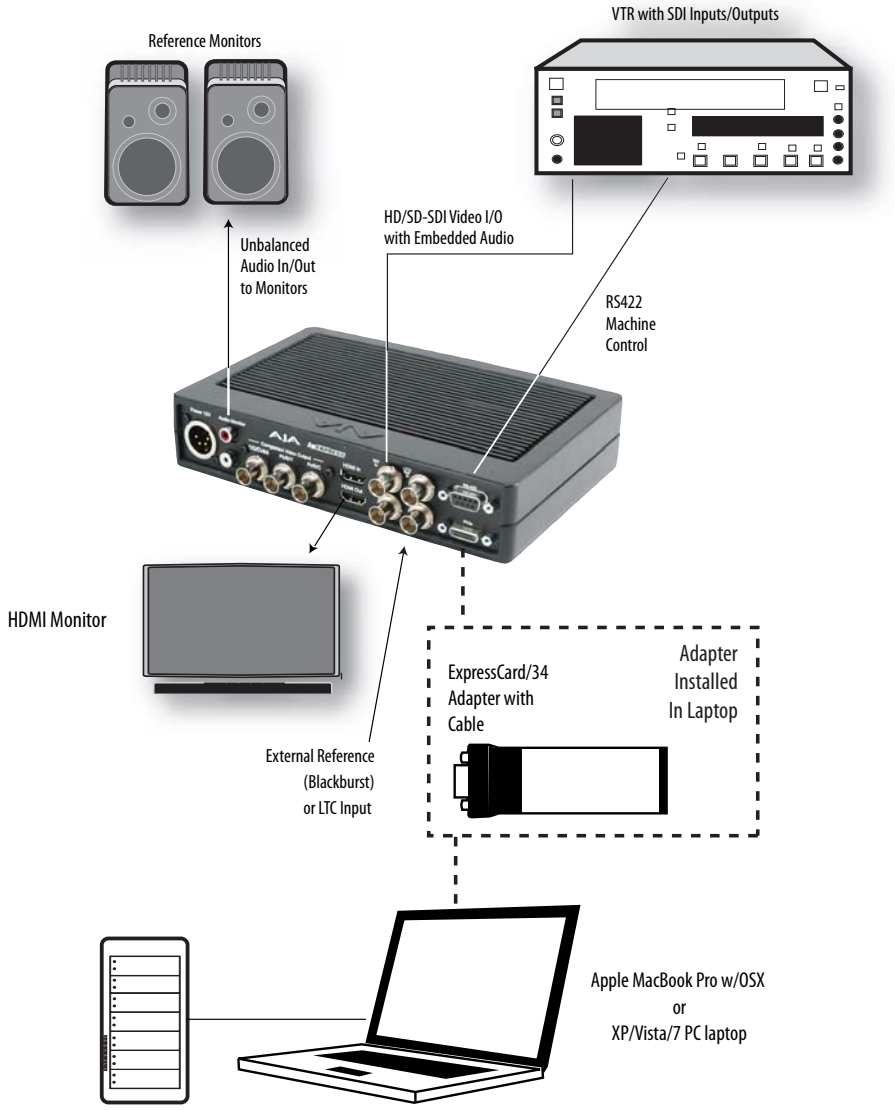
Io Express Connections

Cabling the System

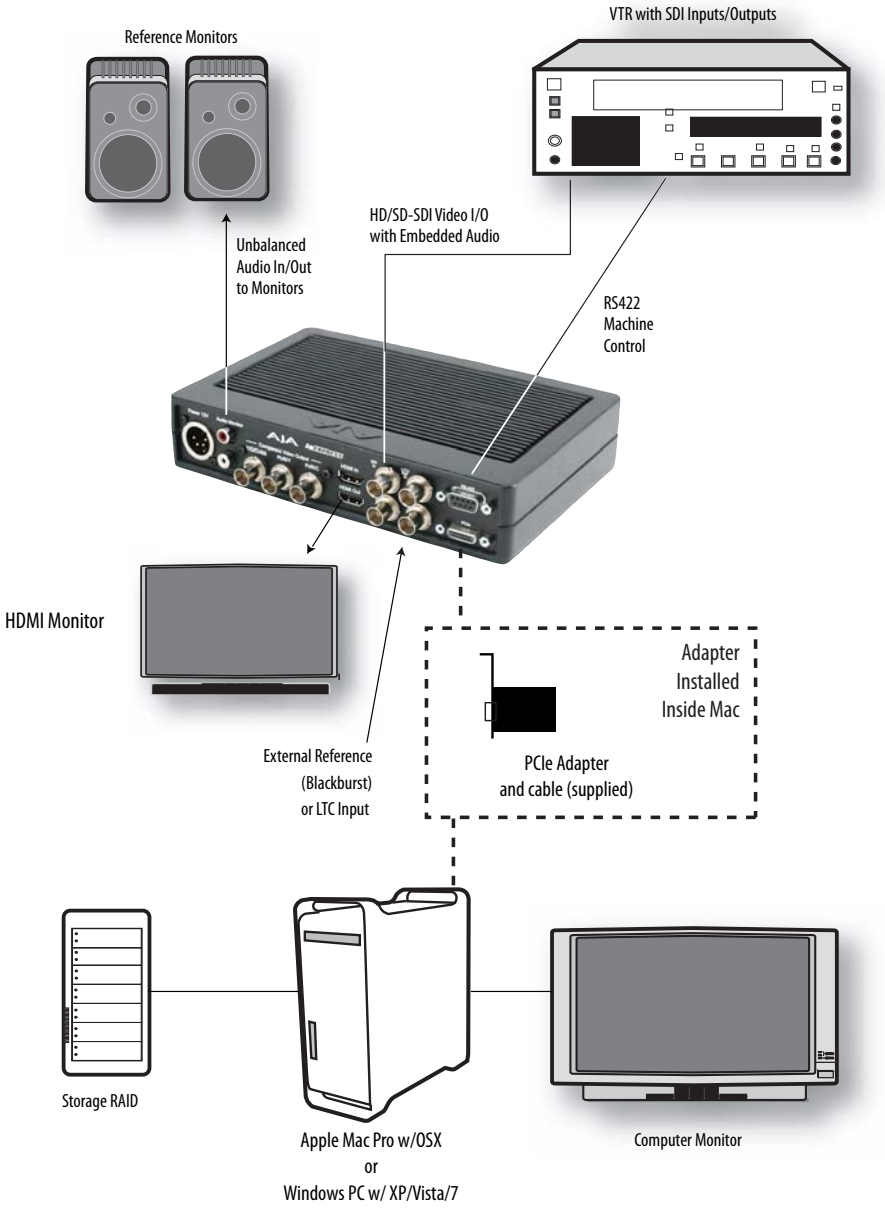
Typical System

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.



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, go to the AJA website to download the latest Io Express software. If you don't have an appropriate internet connection, use the CD-ROM supplied with the Io Express system to install necessary software drivers and control panel application (Windows-based Machina or Mac-based AJA/Io Express Control Panel. You cannot use Io Express with Final Cut Pro or Adobe CS4, or other third-party 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.

If you add Io Express supported applications at a later date and have not previously installed the appropriate plugins, you must run the install program again selecting the appropriate application support software to be installed.

Mac Pro Software Installation

Locate the AJA Io Express Software download or CD-ROM packaged with your system. Then follow the procedure below to put the required software on the host Mac 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*. If you are going to use Adobe CS4 Applications with Io Express, you will need to download and install a second Io Express package for Adobe for Mac.

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

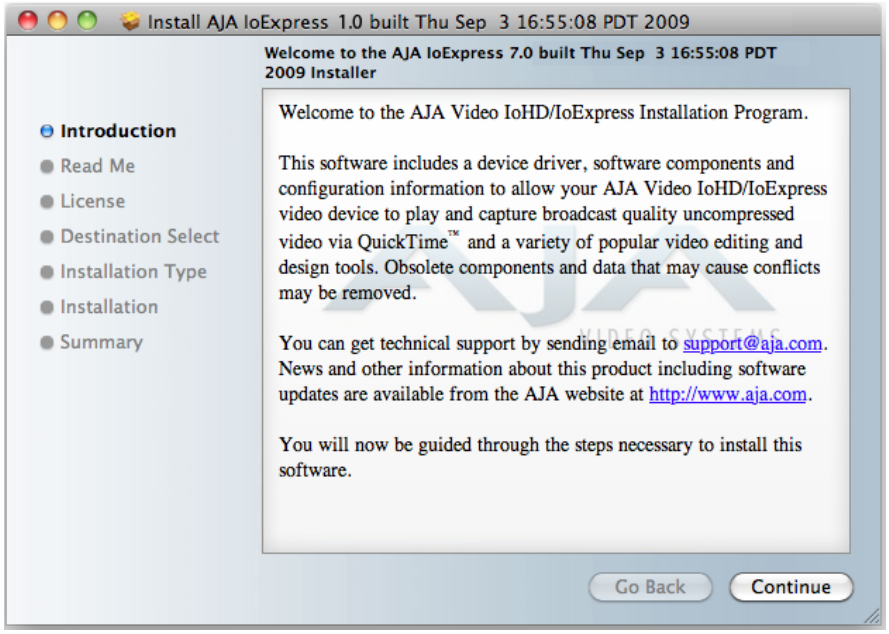
1. For CD-ROM: Insert the Io Express CD in the Mac, locate the Io Express CD icon on the OS X desktop. Double click the icon to see the CD contents, which will appear in its own window.
2. Locate the package file (download or CD); it has an icon that looks like a box and has a ".pkg" or ".mpkg" suffix.

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.

3. Double-click the package to log on and begin software installation.
4. 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.

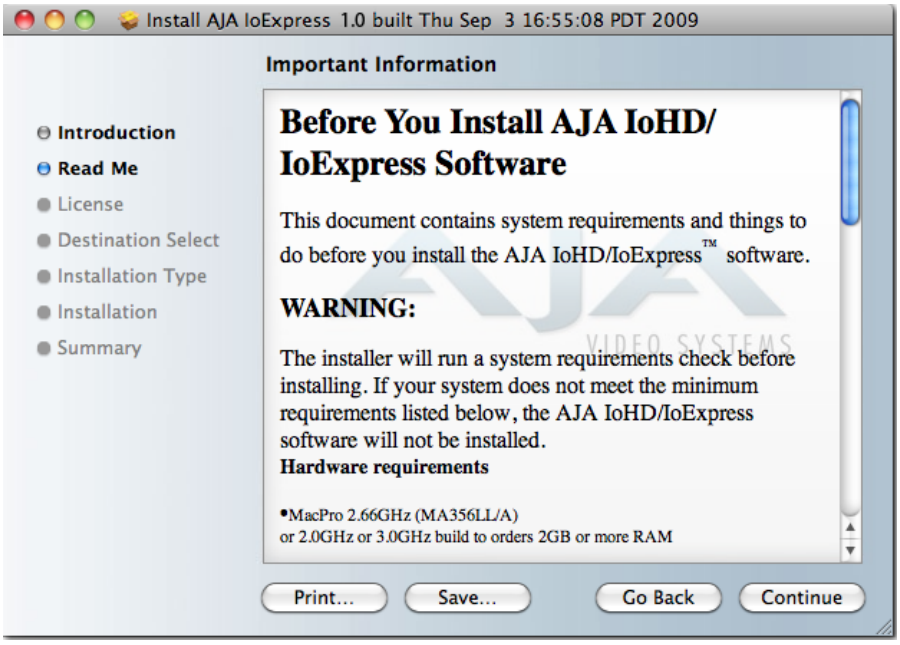
Log On Authenticate Prompt

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



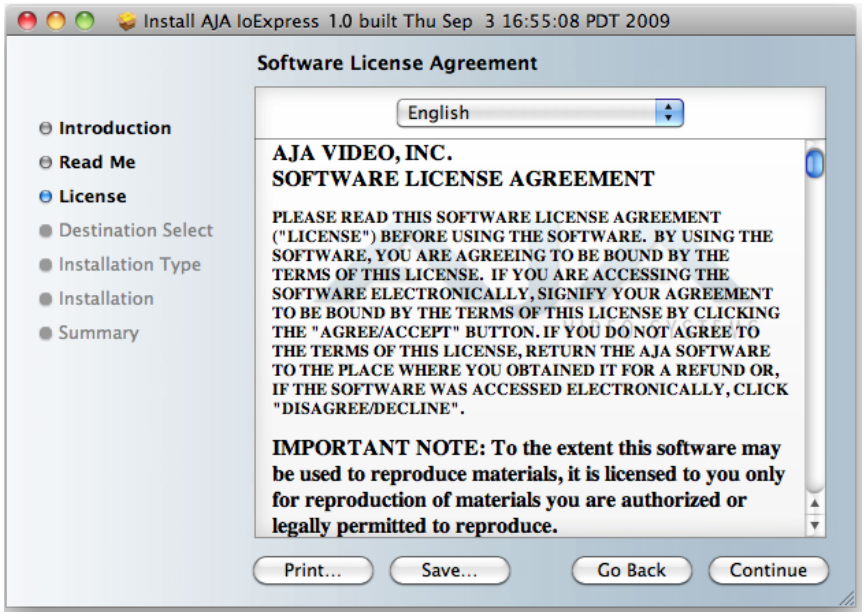
Initial Installer Screen

7. Click *Continue* to begin installation.
8. 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

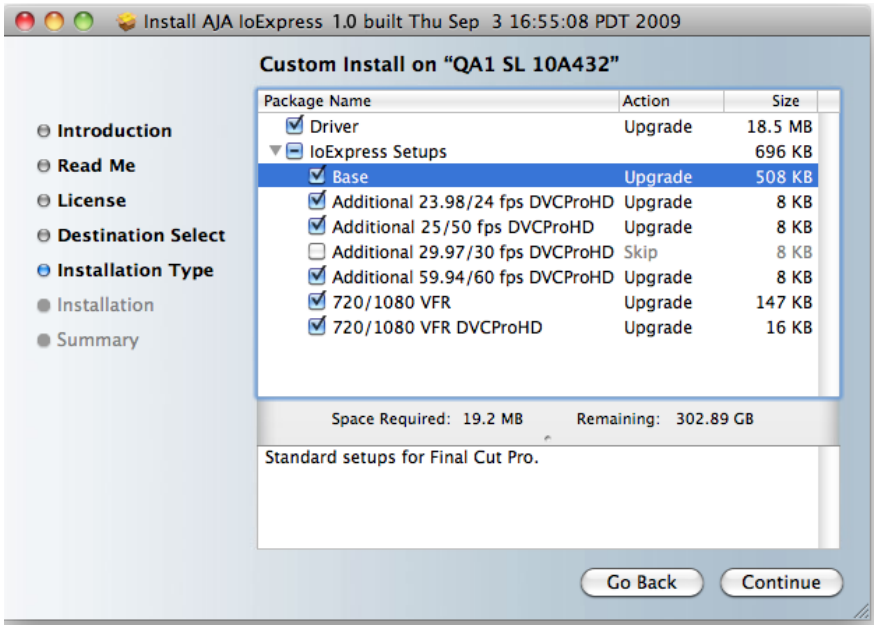
9. Read and agree to the Software License Agreement.



Io Express Software License Agreement Screen

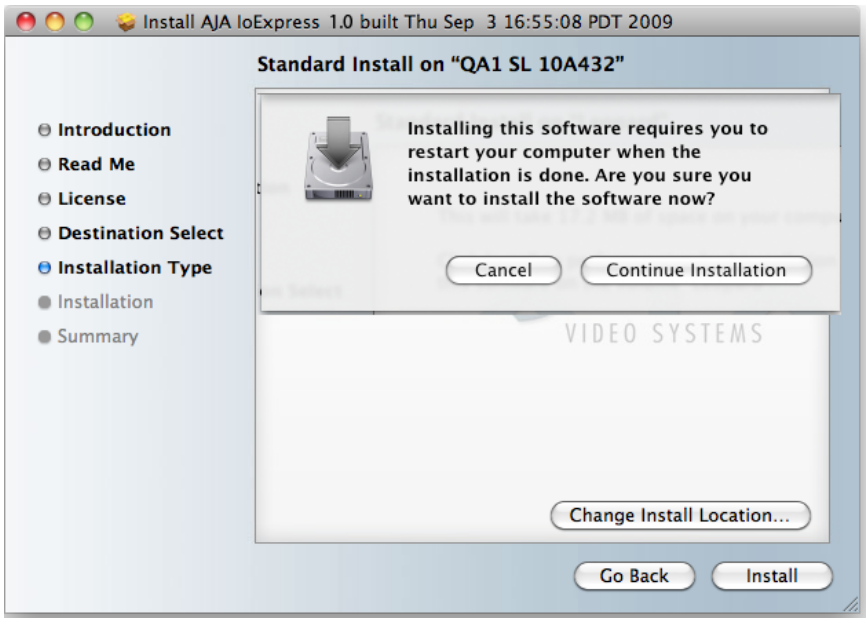
10. The next screen shows all the available drives on the Mac Pro. Click on the drive that contains your system files (Apple default is "Macintosh HD"). A green arrow will point to the drive you've selected. Click the *Continue* button to proceed with installation.

11. 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

12. 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

13. 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."

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

Windows Software Installation

Locate the AJA Windows Software download file or CD packaged with your system and follow the procedure below to install the required software on the host system. There are two versions of AJA Windows Software installation—for 32-bit workstations and 64-bit Vista workstations. The 32-bit software is designated "-x86" (for 32-bit processors) and "-x64" (for 64-bit processors).

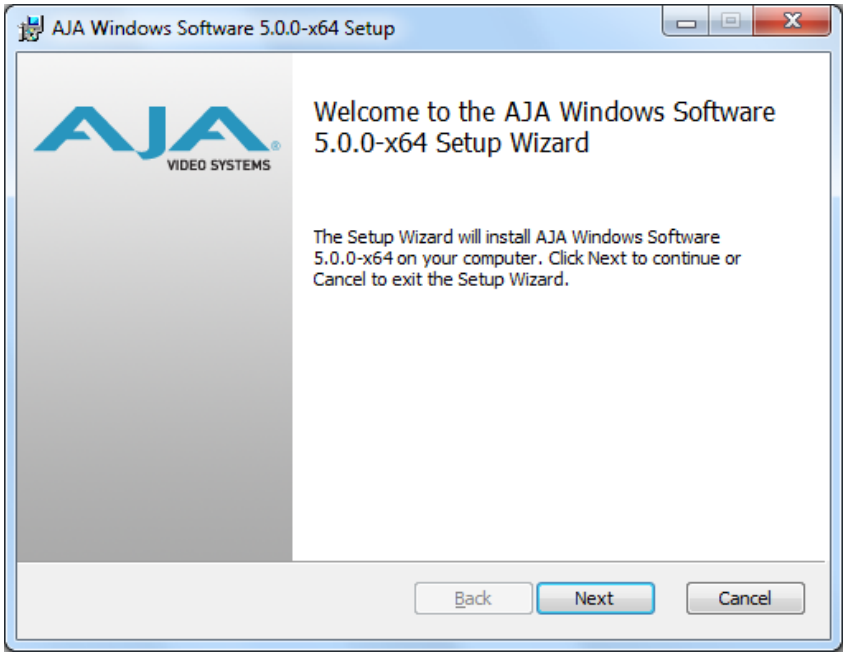
Note: Note: Before installing AJA Windows Software, turn off any virus protection and security software that you have installed on your computer.

Open the AJA Windows Software download or insert the Software CD in the PC.

Note: If you are installing from the CD, the Auto-run installation installs the 32-bit package. If you want the 64-bit, you must stop the auto-run, browse the C D, and select the 64-bit package for installation.

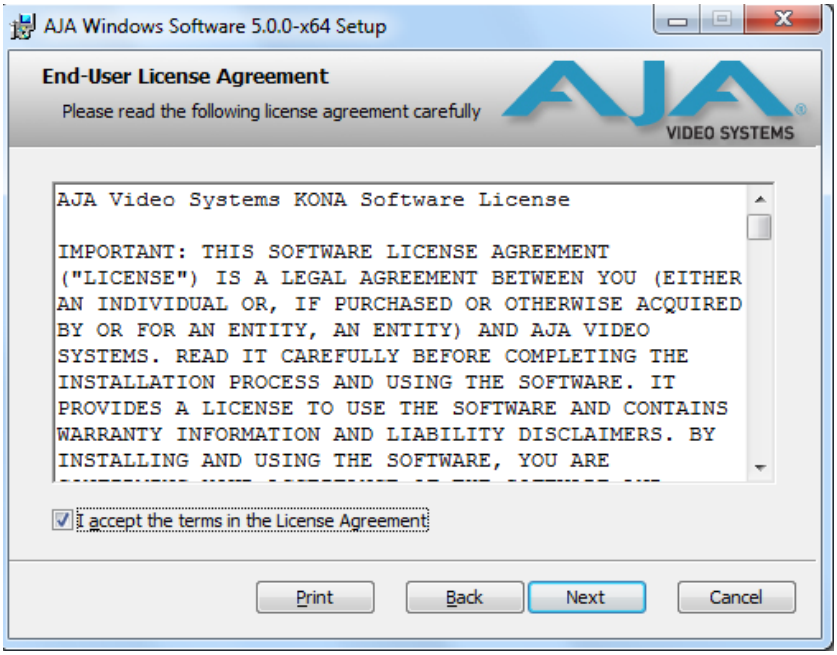
Install Wizard

The AJA Windows Software installation program will launch and extract the necessary Io Express drivers, Machina Software, and application plugins for installation on the desired hard drive.



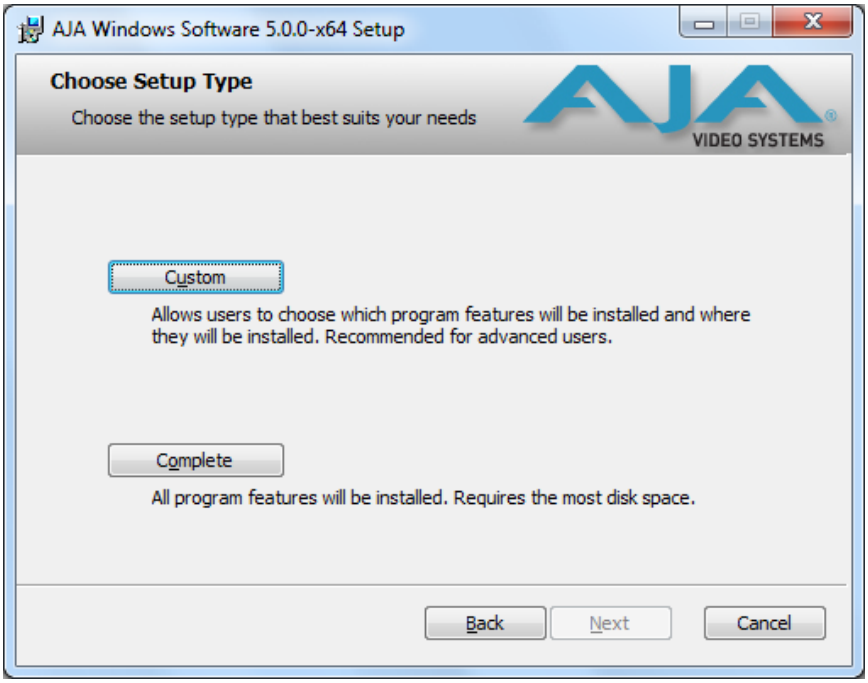
Install Wizard Welcome

When you see the Welcome page, click "Next" to view the AJA Windows Software license agreement.



License Agreement

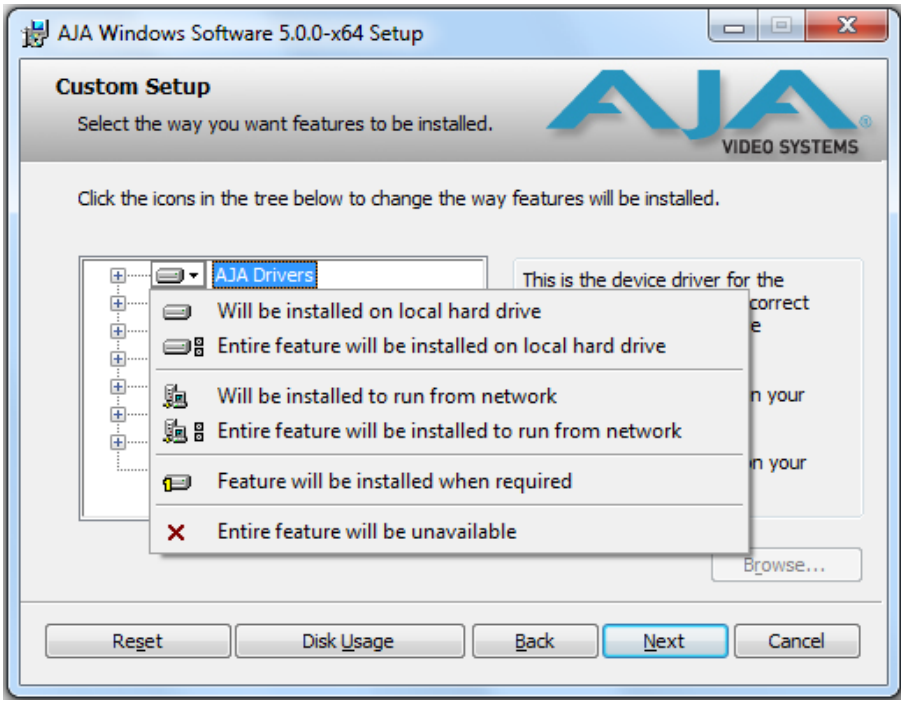
Read the Windows Software license agreement and click "Yes" to accept. You will be asked to choose the type of installation you would like to perform.



Installation Type

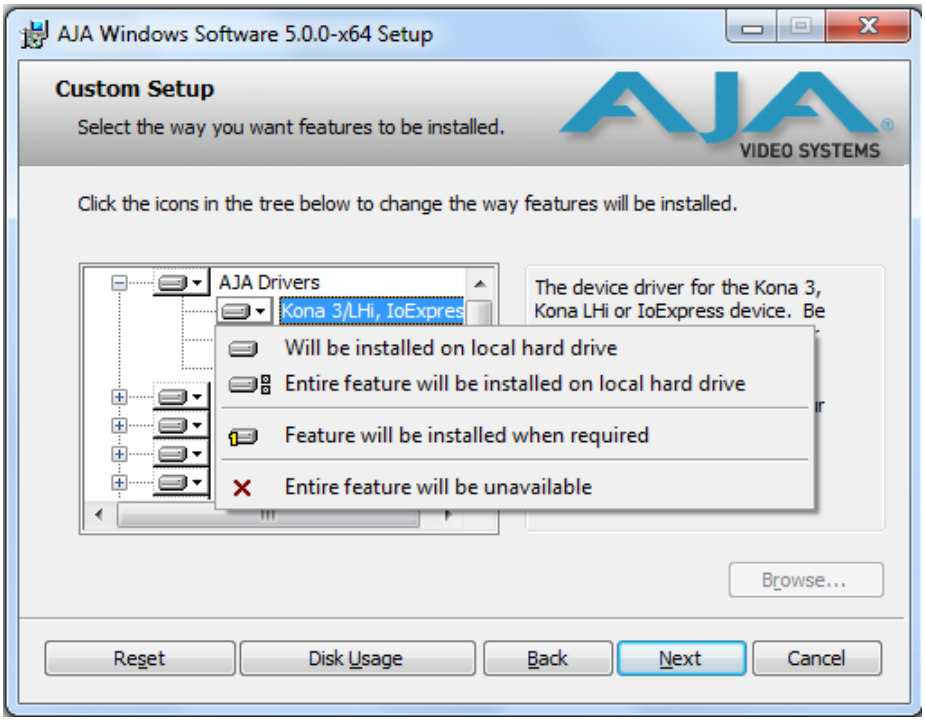
If you don't have all the AJA Windows Software supported Adobe Production Studio products installed on your workstation, you may choose to perform a Custom installation (default) and select only the software necessary for your applications. If you use the entire collection, use the "Complete" installation.

The following screens depict the more elaborate Custom installation. Shown below are the top-level directory of options. Click (+/-) to expand or contract.



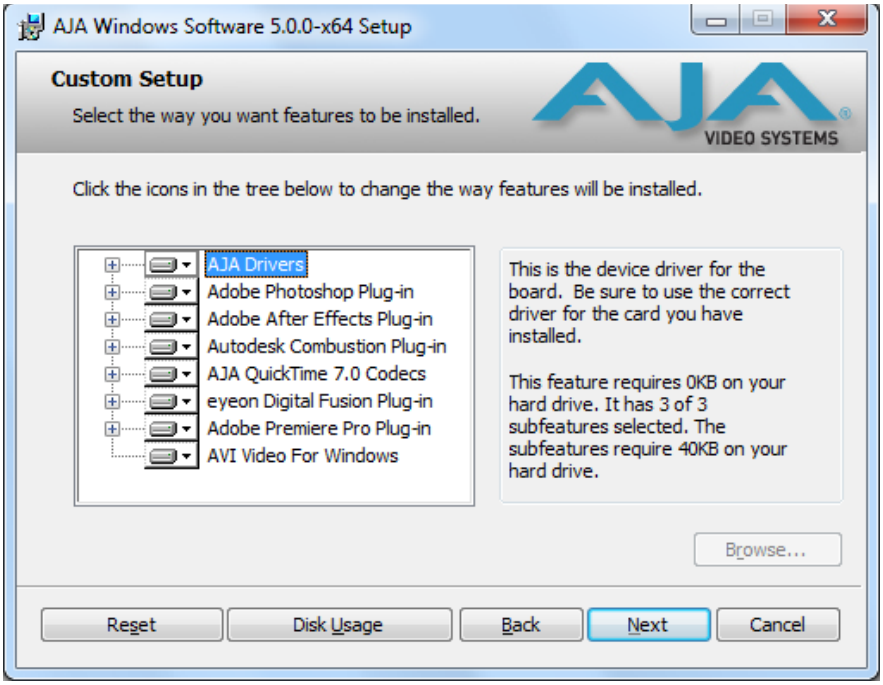
Top-level Installation Item Selection

You may deselect any Item for installation by using the pulldown to make it unavailable.



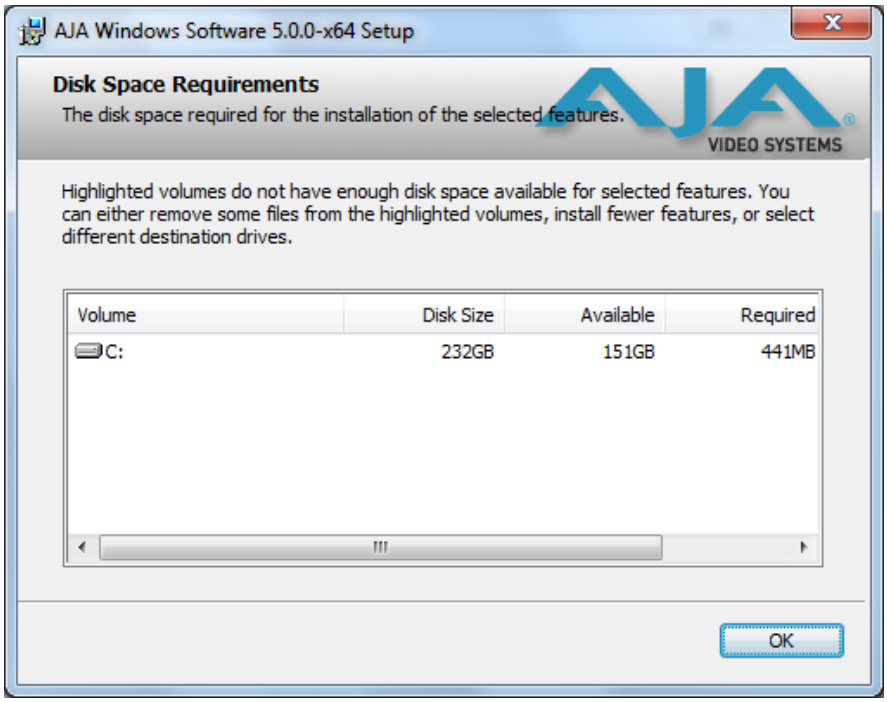
Custom Selections Pulldown Menu

Use second level options to choose the specific drivers and plugins you would like installed.



Custom Selection Second-level Options

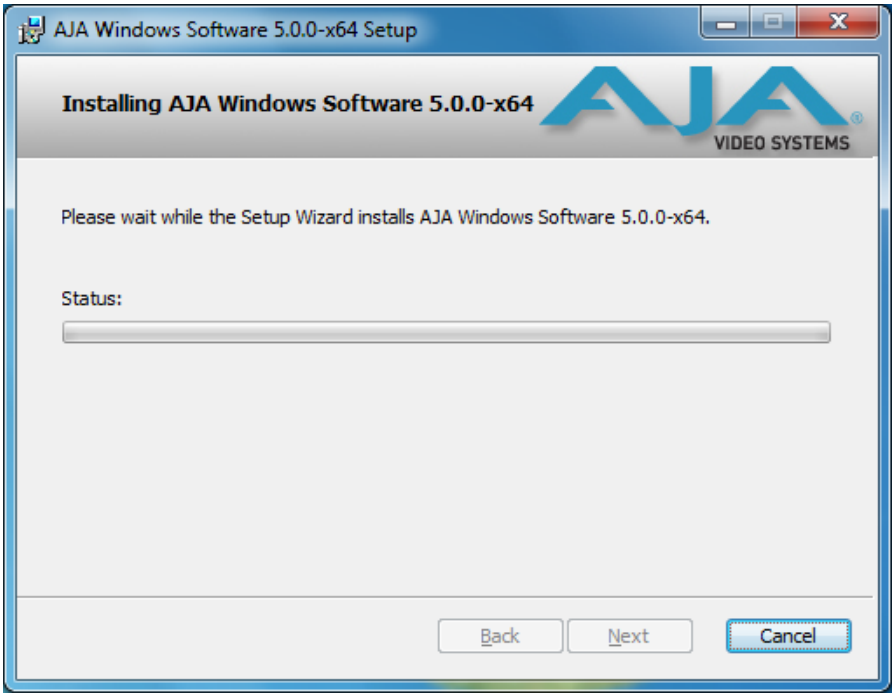
Disabled selections are marked with a red X. Before clicking Next to install, you can verify your disk space availability by clicking the Disk Usage button.



Workstation Disk Usage Display

To return to the installation click OK.

Click Next to begin the installation.



Installation Progress Screen.

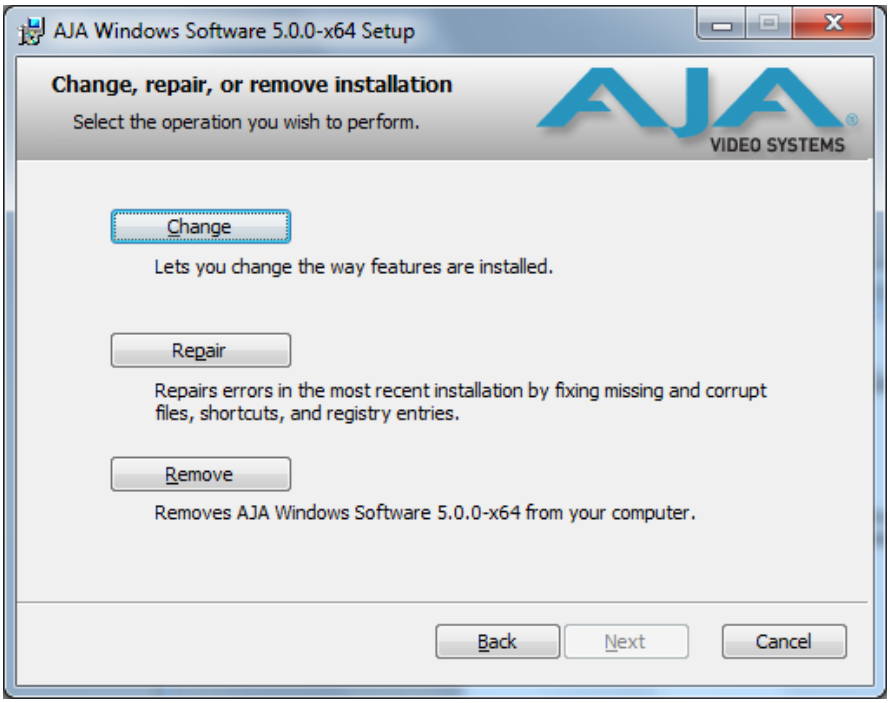
When the installer has completed copying the AJA Windows Software to disk, you will see a standard Windows Logo test warning. Click on the "Continue Anyway" button to finish the installation.

When the installation is completed, a final screen will be displayed announcing that "Setup has finished installing AJA Windows Software on your computer." Click on the Finish button after the installation is complete. Restart the computer after installation to activate the Io Express.

Re-Installation & Repair

If you have problems running your newly installed pluggins or need to re-install for added applications, you can relaunch the install package and access the following window.

Note: Always uninstall AJA Windows Software before installing a new version.



Change, Repair, or Remove Installation Menu

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 (Mac) or Machina Control Panel (Windows).

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 AJA Io Express Control Panel and how Final Cut Pro works with Io Express.

With Final Cut Pro you'll choose the proper "canned" setups from those provided by AJA. These setups, called "Easy Setups" in Final Cut Pro, 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 become familiar with the AJA Io Express Control Panel, used for source selection, configuring many Io Express features, and 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 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 IO Express Control Panel

The IO Express Control Panel is a software application that provides a simple visual way to see how the Io Express interface is currently configured and 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 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 configured. 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

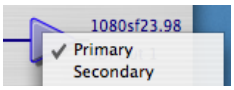
To ensure you make the most of the software, launch the AJA/Io Express Control Panel application and look at its display. Then refer to the "Basics" described here to fully understand what you're seeing and learn how to view and change the Io Express system configuration.

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.

Multiple AJA Devices

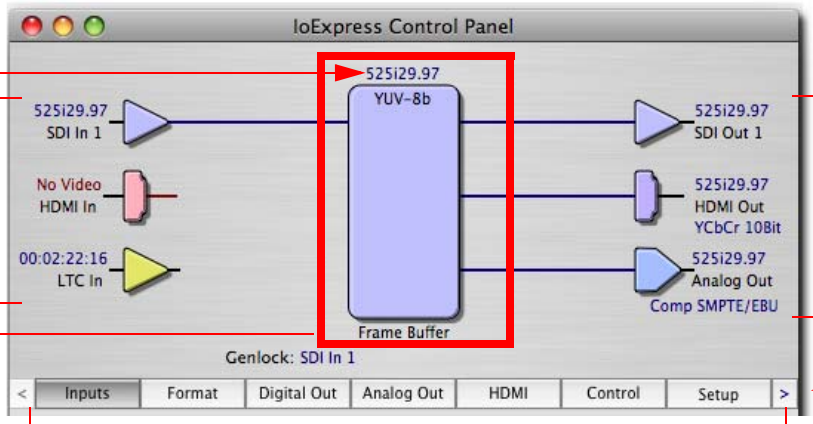
If you have more than one AJA device installed in a workstation, you will see a device pulldown menu in the top-left corner of the control panel screen. See *"Using Multiple AJA Products" on page 2* for details.

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

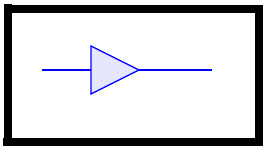
Framebuffer—The framebuffer is the "engine" in Io Express where active video operations take place using Final Cut Pro, other 3rd-party applications, or even Io Express itself. The framebuffer has a format (called the "Primary Format" and color space that it follows, as defined in the Tabbed Windows 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. So, for example, if you see that the input and output icons are blue, then you know that the same format is used throughout the video path and that no format conversion is being performed. If a different color is displayed on the input or output, say green for example, then you know that Io Express is performing a format conversion in the video path.

Secondary Format—Any format other than the currently selected Primary Format, is a secondary format. As described previously, this means that either the Inputs or Outputs are somehow different from the framebuffer's assigned format (i.e., the "Primary Format"). This can be seen at a glance because the color will be different than blue.

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

Conversion Icons—when an input or output is a different standard than the framebuffer, the Io Express may be down-converting the signal to the selected standard. This may be automatic, because it's detected an input signal that differs from the standard currently selected, or because you've explicitly told it to convert. In either case, the block diagram will show the conversion by displaying a conversion icon in between the input/output and the framebuffer.

Down-conversion icon

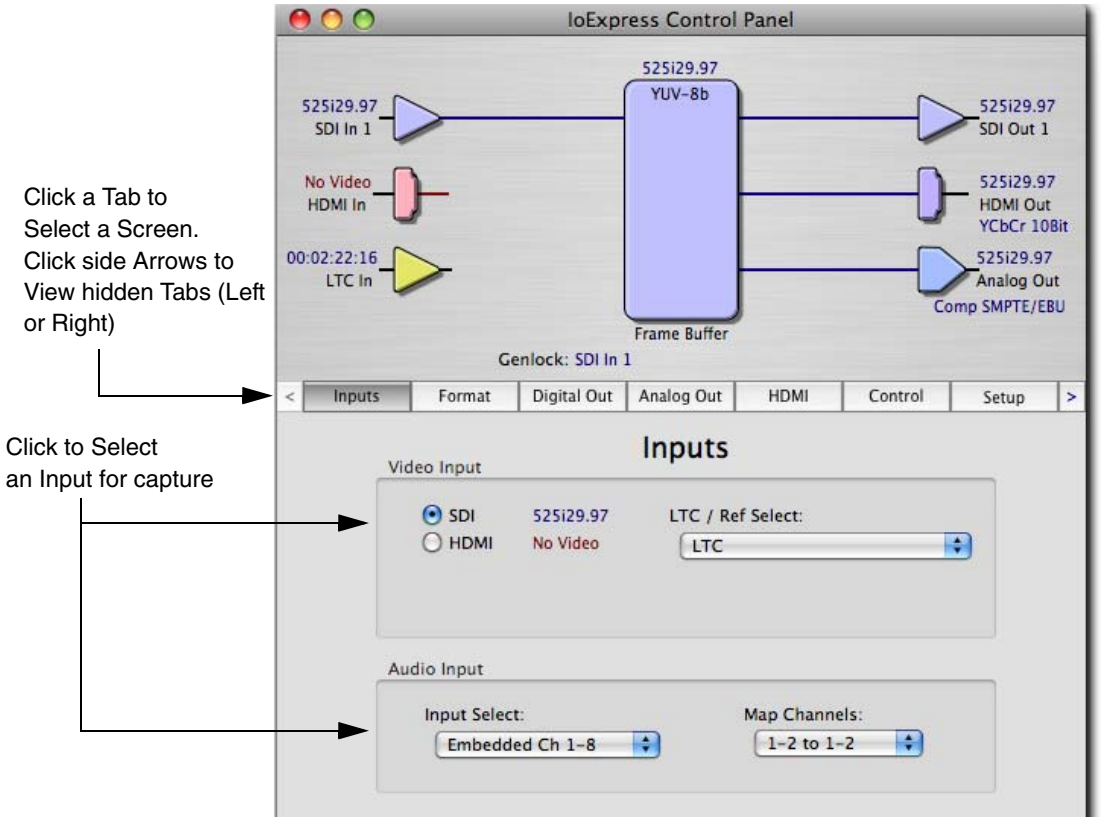
Color Meanings—All items in the IO Express Control Panel block diagram are color-coded to show what is happening in realtime. This applies to both icons and text. These colors have the following corresponding meanings:

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)
Green: indicates that Io Express is performing an active change to the video making it different from the Primary Format (e.g., down-conversion).

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
Formats: select the framebuffer primary video format and any secondary formats for down-conversion of inputs/outputs
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

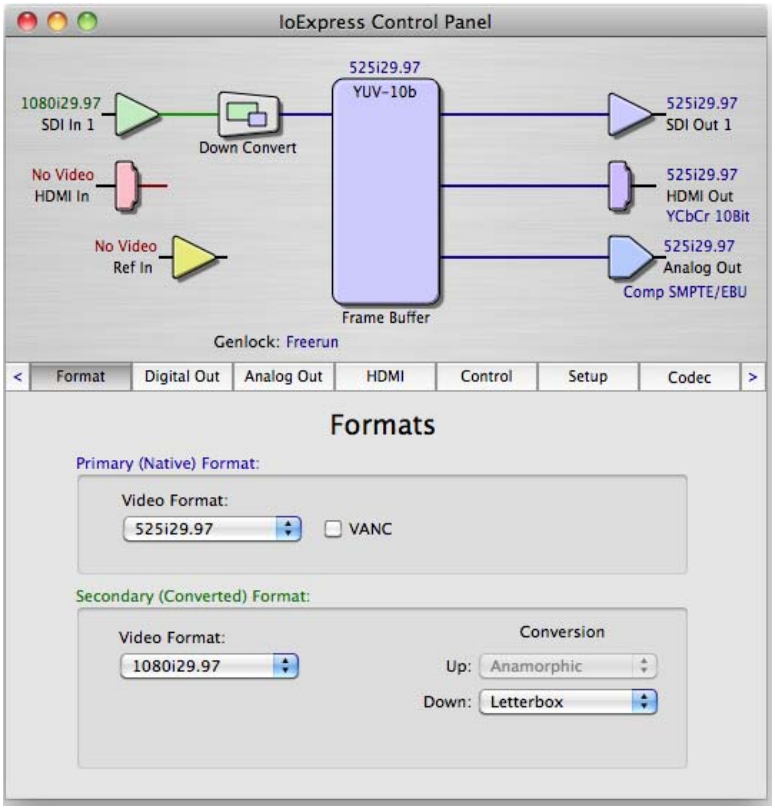
Video Input—These radio buttons allow you to see and change what's currently selected and the video format that Io Express has detected there (if any). If you wish to select a different input, click a different radio button. Choices are:

- 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. For example, on the Formats screen, if the output or inputs are a different format than the primary, you'll see an additional information pane that allows you to view and edit the secondary format—including control over whether down-conversion is employed. In the figure below, the SDI input (Secondary Format) is being down-converted to the Primary Format.



Io Express Control Panel, Format Tab and Pulldown Menu

Format Screen Settings

Video Format—This pull-down menu shows the currently selected format. This pull-down appears in both the Primary Format area of the Formats screen and the Secondary Format area (if present). If you select an alternate value in the Primary Format using the pull-down, it will change the format used by Io Express's framebuffer. Video Format can only be changed when the Control Tab menu has the setting "Input Pass through". When a change is made via the Video Format pull-down, the block diagram will change to reflect the new format.

In the case of Secondary Format, the formats available can vary based on what the Primary Format is and the input signal (frame rates of input sources limits the to/from conversion choices). The "Secondary Video Format" pull-down menu lists all formats with those that are incompatible shown in gray (these can't be selected). This allows you to see what you've chosen, and also see those formats that are incompatible with the selected Primary format.

For more details on Io Express Primary and Secondary Formats see "About Primary & Secondary Video Formats" on page 2.

Note: The IO Express 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.

Down-conversion: For down-conversion, the following format choices are available:

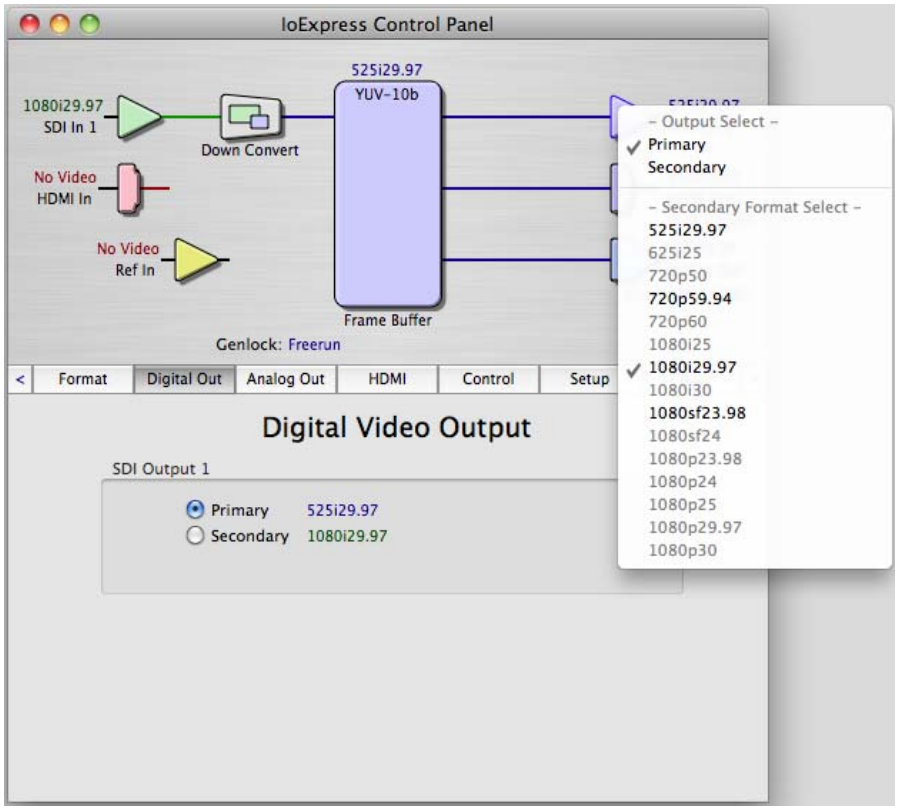
Anamorphic: full-screen "stretched" image

Letterbox: image is reduced with black top and bottom added to image area with the aspect ratio preserved

Crop: image is cropped to fit new screen size

Digital Out Screen

The Digital Out screen shows the current setting for both the SDI and HDMI outputs. If an input/output has no video, it will be indicated on the block diagram ("No Video").



Io Express Control Panel, Digital Out Tab

Digital Out Screen Settings

Information that can appear includes the following items. You can view the current setting or click on another to change to it:

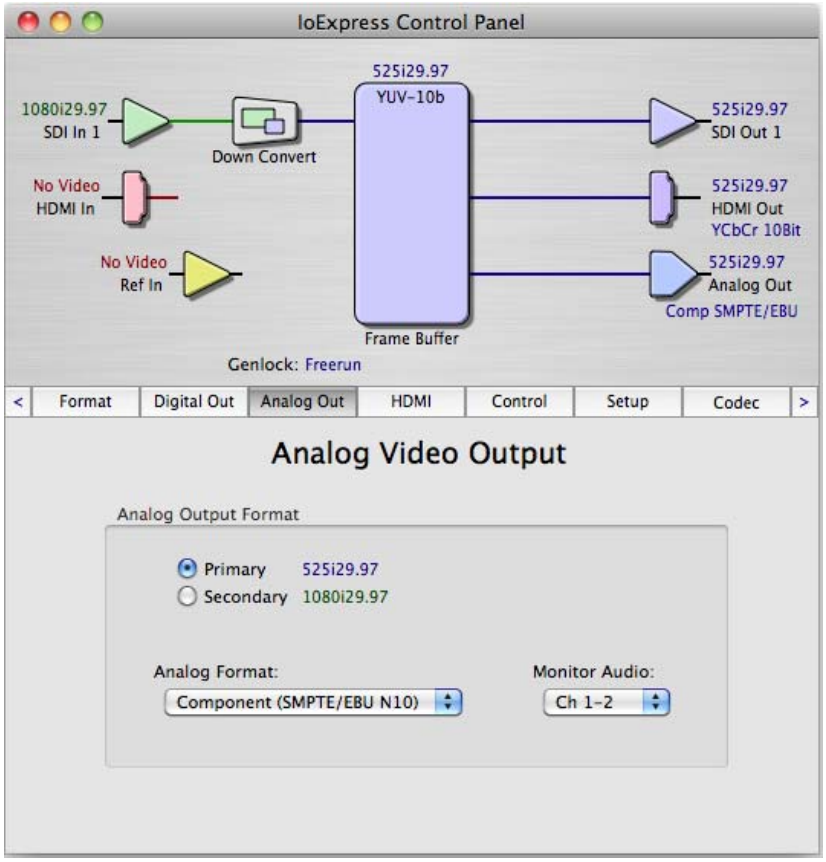
Primary—when selected, this indicates that the SDI output is set to the same format as the framebuffer. That value will be listed in blue.

Secondary—when selected, this indicates that the SDI output is set to a format different from the framebuffer (Primary Format). That secondary format value will be listed in green. This shows that active processing of the video is taking place (format change and possibly down-conversion).

Note: Control-clicking on an output icon brings up a contextual menu allowing you see the current format and make changes if desired.

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

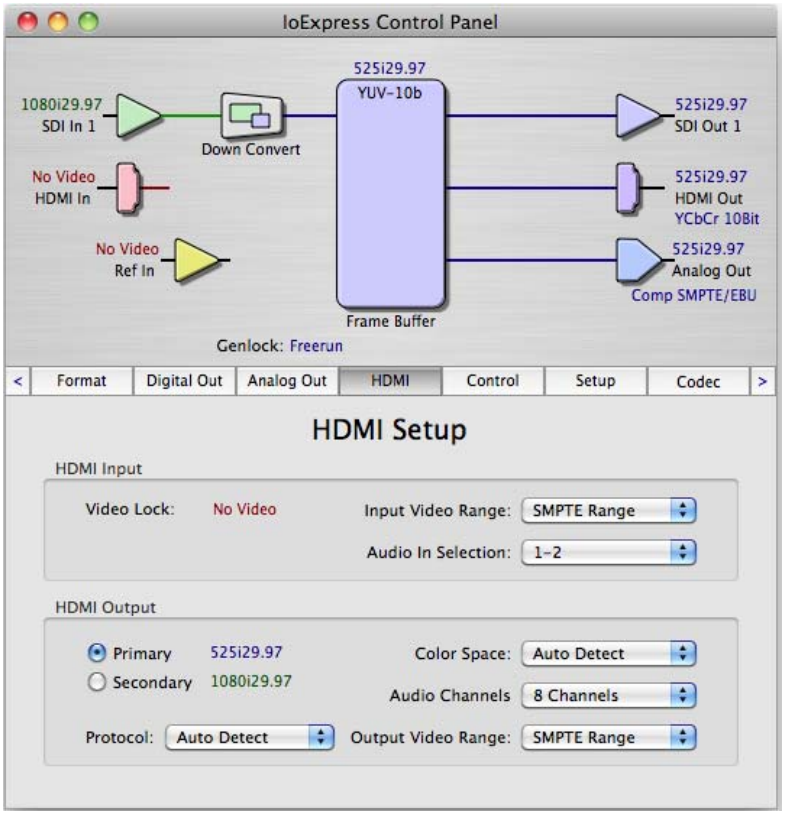
Analog Format—choices in the Analog Format pulldown menu vary depending upon the Analog Output video standard. For example, the "Composite + Y/C" selection is only available when an SD (525i29.97 or 625i25) format is in use. Analog formats can include:

- Composite +Y/C
- Component (SMPTE/EBU N10)
- Component (Beta)

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

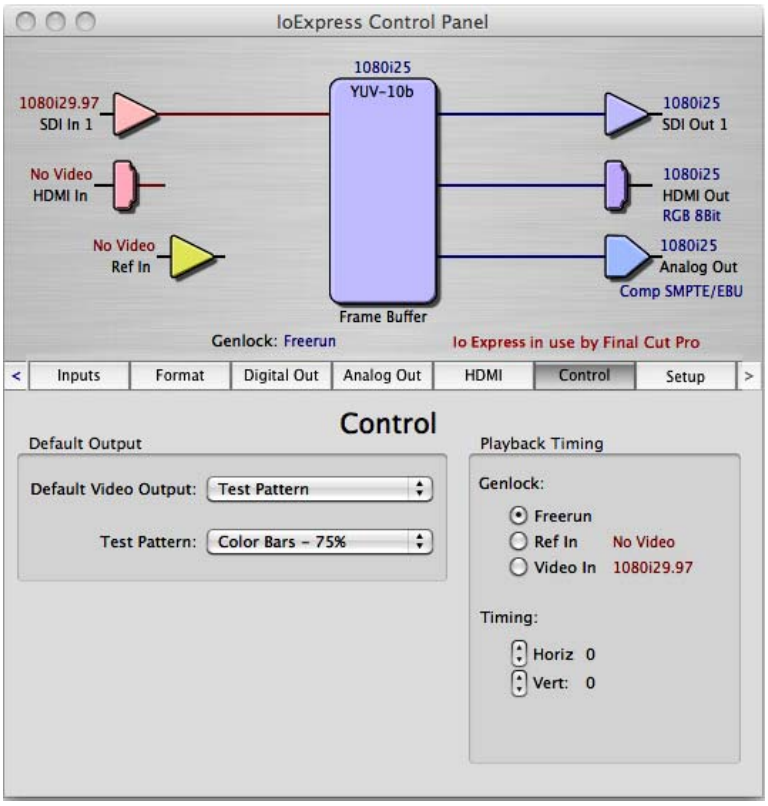
HDMI Input—while there are two different ranges of colorspace values that SDI can use (RGB and YCbCr) the HDMI input on the Io Express defaults to the SMPTE video input range. A pulldown allows you to select full range.

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.

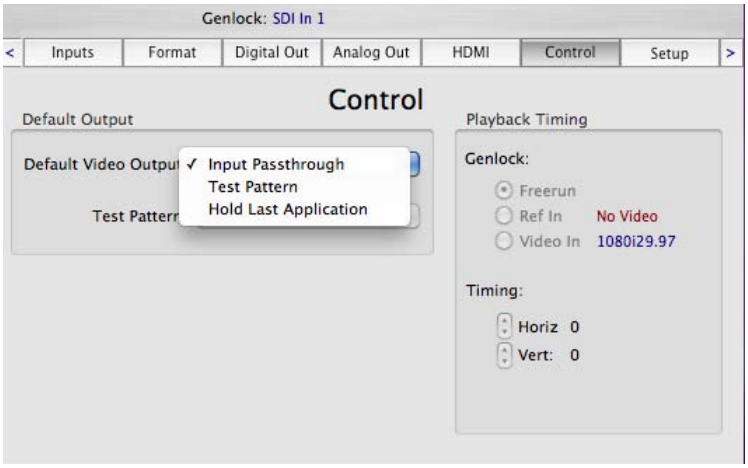
At the top of the Control screen, it will show the current Default Io Express output and the application currently controlling the Io Express card (if there is one). For example, in the screen shown here, the default output is Input Passthrough.



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:

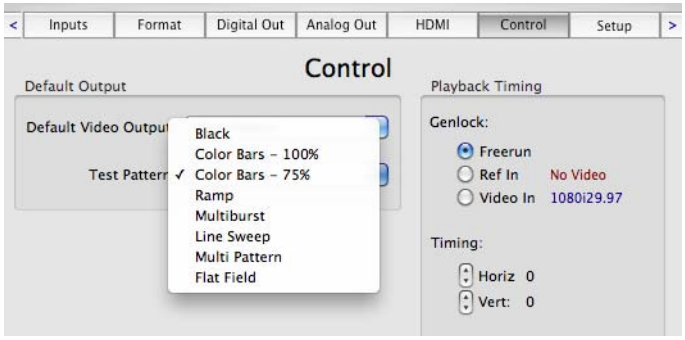
Input Passthrough: this selection directs Io Express to route video from its selected input through the card for output. When this selection is in effect, all Primary selections are available for selection in controlling the output.

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)

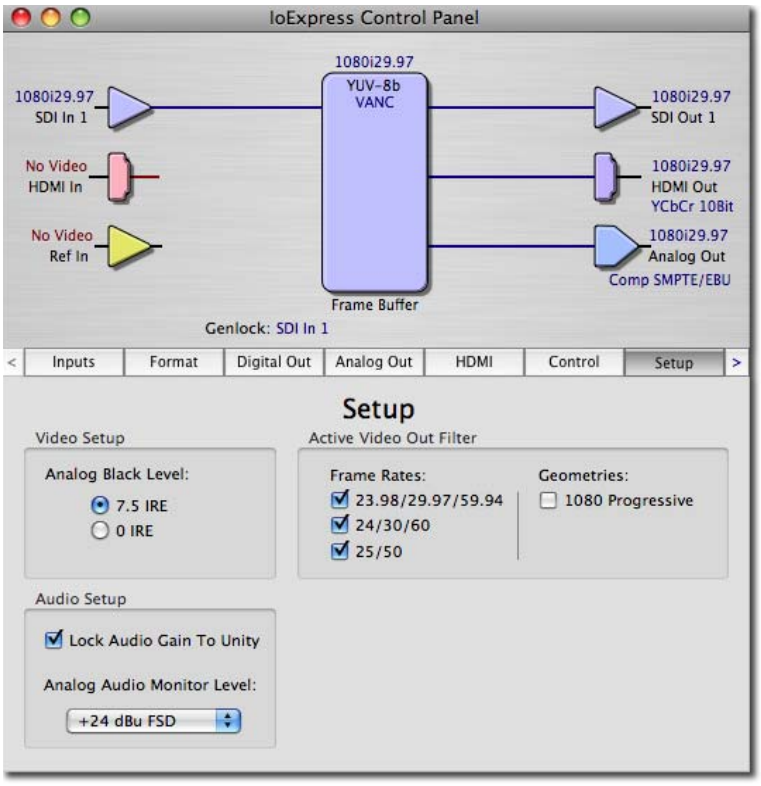
Video: directs Io Express to use whichever video input source has been selected in the *Inputs* tab window for sync

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.

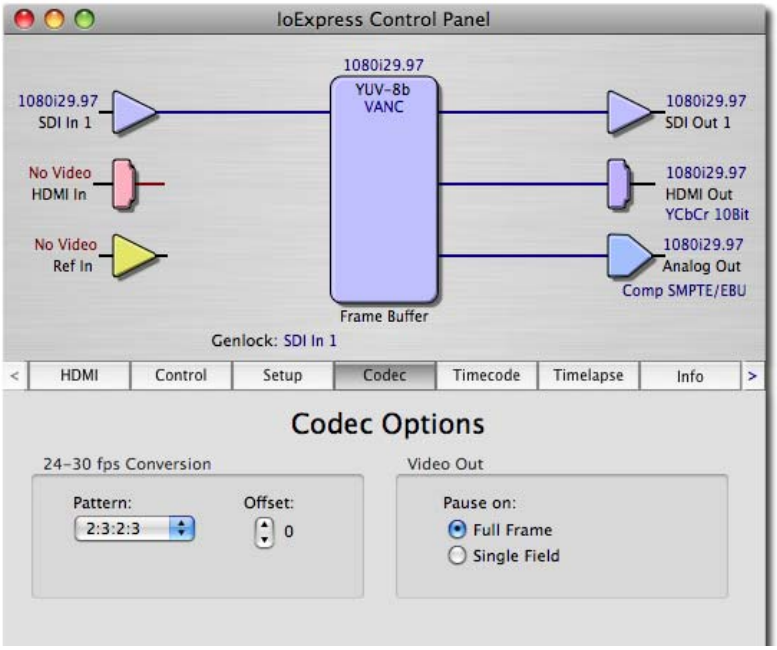
Active Video Output Filter—The Active Video Output Filter is designed to help manage the comprehensive list of video outputs that may be available to applications, particularly Final Cut Pro's *A/V Devices* tab.

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

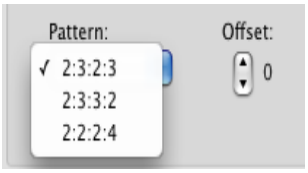
This screen offers controls that determine how Io Express behaves under Final Cut Pro.



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.



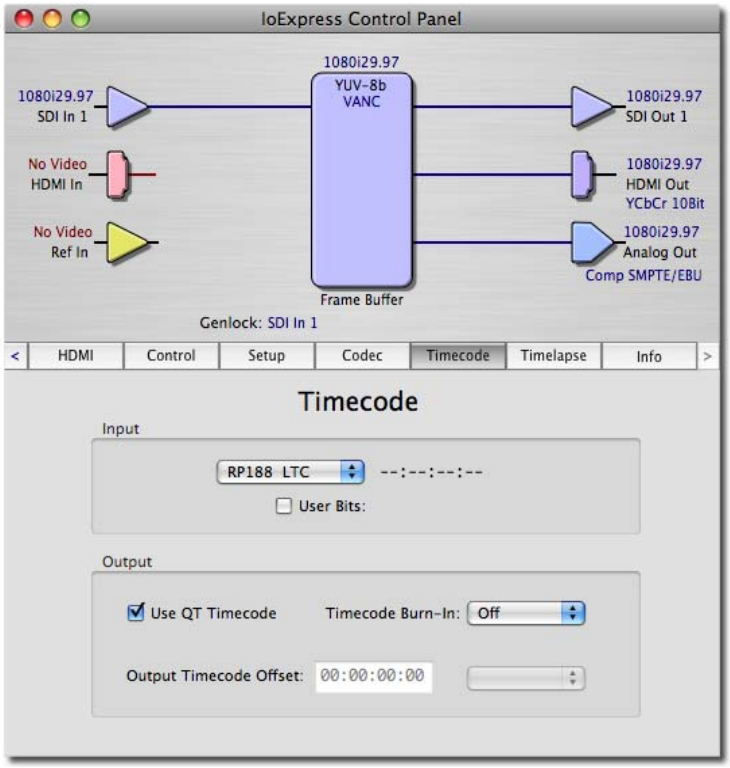
Io Express Control Panel, Codec Tab, Frame-padding Pattern Choices

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.

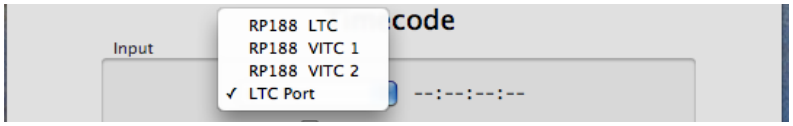


Io Express Control Panel, Timecode Tab

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.

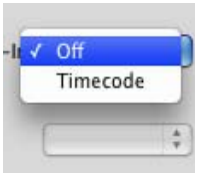


Io Express Control Panel, Timecode Tab, User Bits Checked

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.

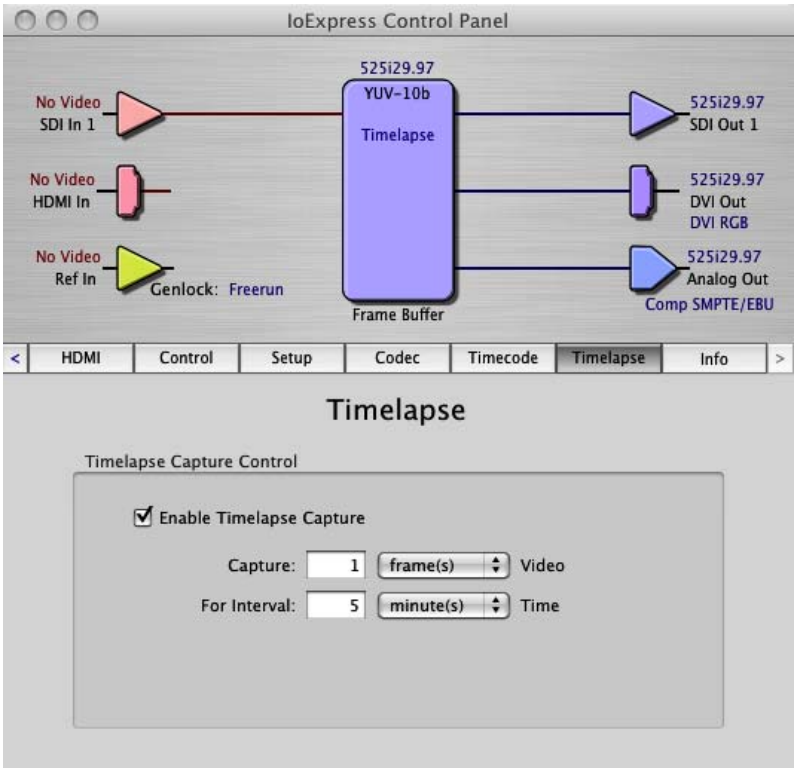
Timecode Burn-in—this pulldown selects whether the timecode value is "burned-in" on video output from Io Express. If set to "OFF", timecode will not be keyed over the video. If set to "timecode", then the timecode value will be keyed over the output video. This can be useful for synchronizing, choosing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

Timelapse Screen

Beginning with v7.5 drivers, KONA, Io HD and Io Express products now provide a timelapse feature. Within the IO Express Control Panel application, there is a new Timelapse tab.



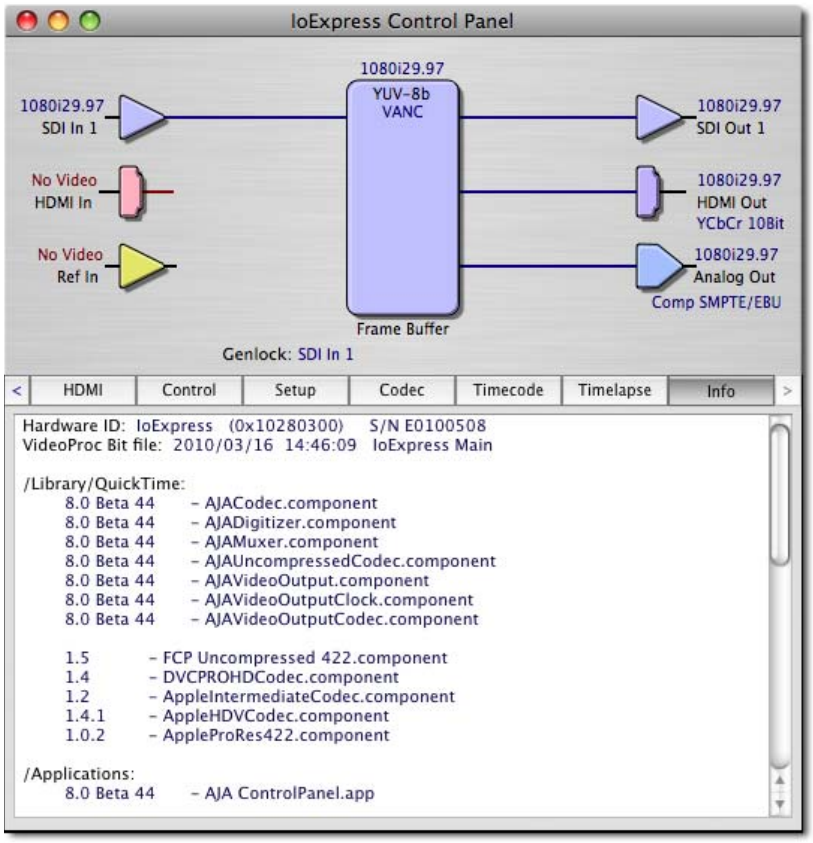
Io Express Control Panel, Timelapse Tab

To use the timelapse capability, choose the "Enable Timelapse Capture" checkbox. This functionality is enabled for all QuickTime capture applications (Final Cut Pro, VTR Xchange, etc.).

Set the "Capture" and "For Interval" parameters as desired. Launch a capture application like Final Cut Pro, select the desired Easy Setup for the video format desired. You will not need to change anything within the application; the timelapse feature will produce QuickTime files with the framerate specified by the Easy Setup used. The resulting timelapse clip can be used without additional rendering.

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

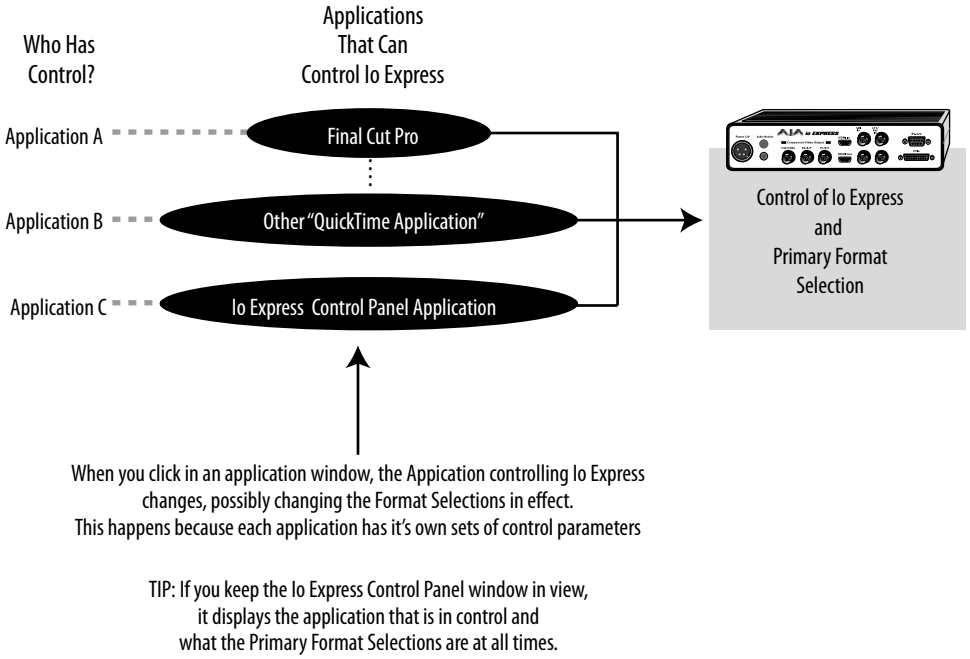
Saving Your Control Panel Presets

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.

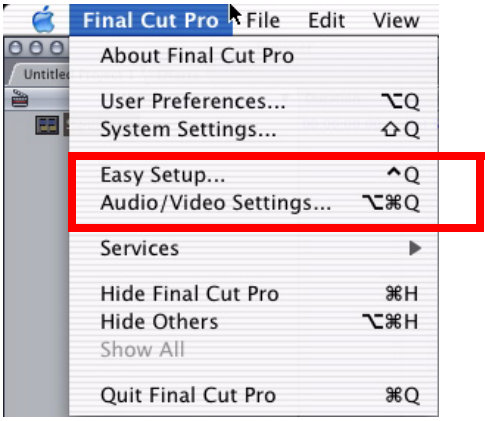
Although this manual assumes you're familiar with Final Cut Pro and have read its documentation, let's review Easy Setups and how to use them effectively with Io Express.

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.

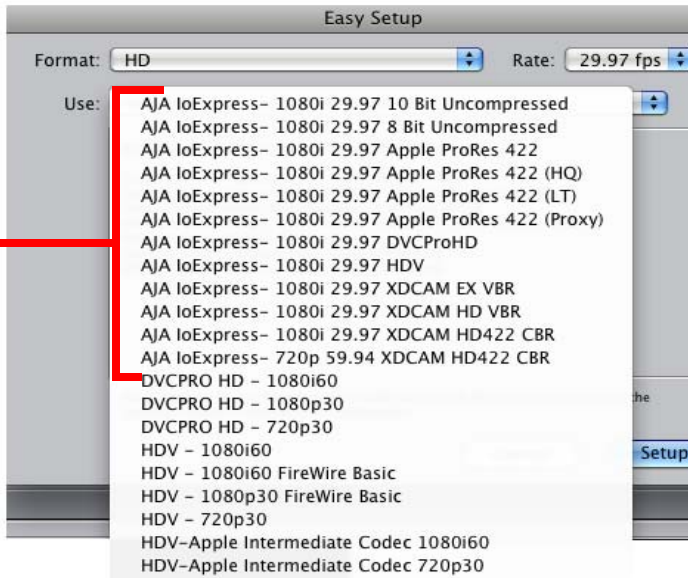


Easy Setup and Audio/Video Menu Items

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.

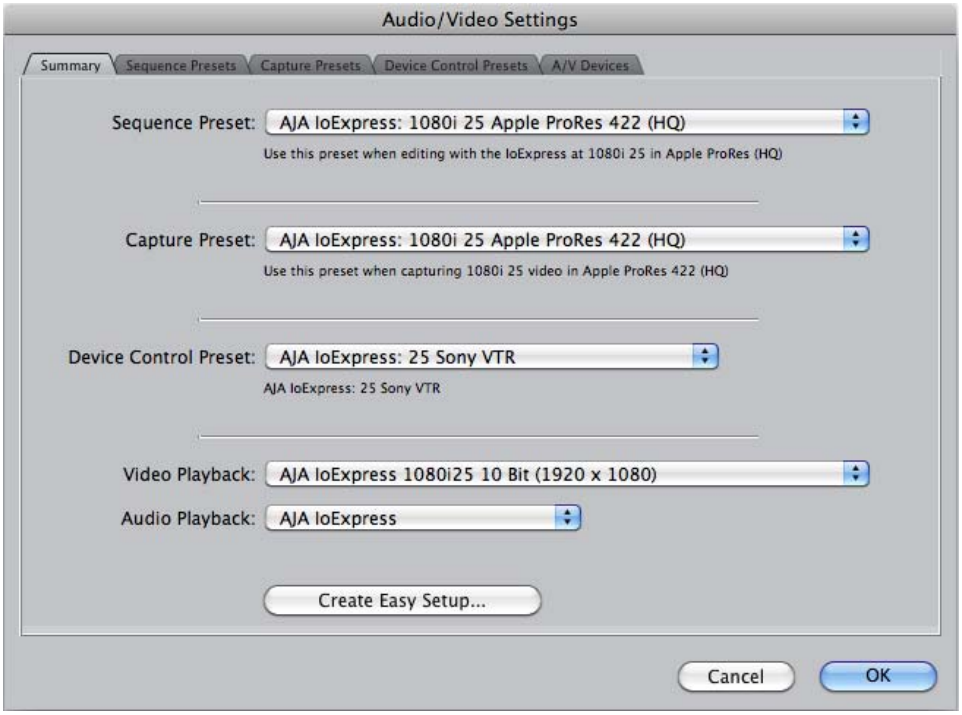
The presets you can change on the Summary window are:

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.

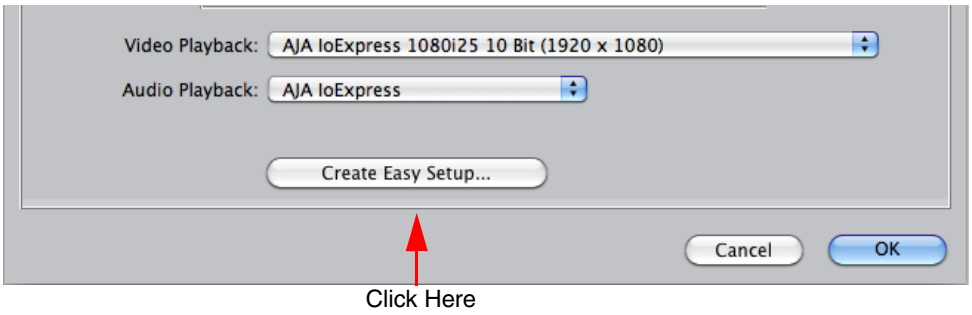


Audio/Video Settings, Summary Window

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.



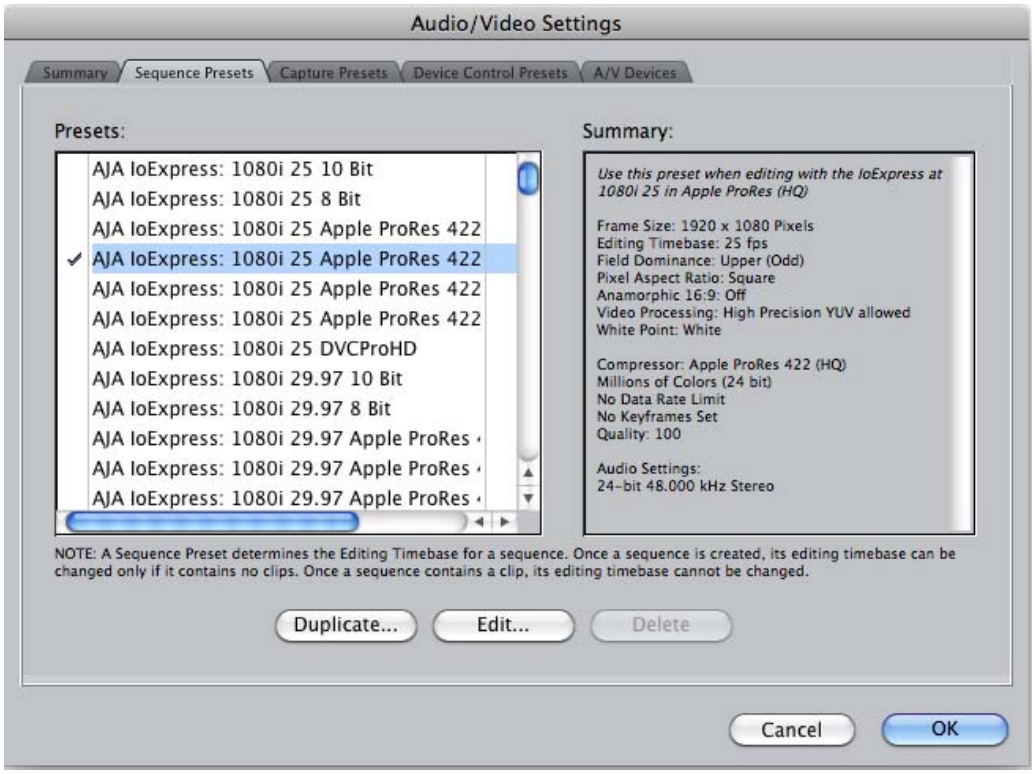
Audio/Video Settings, Creating a New Easy Setup

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



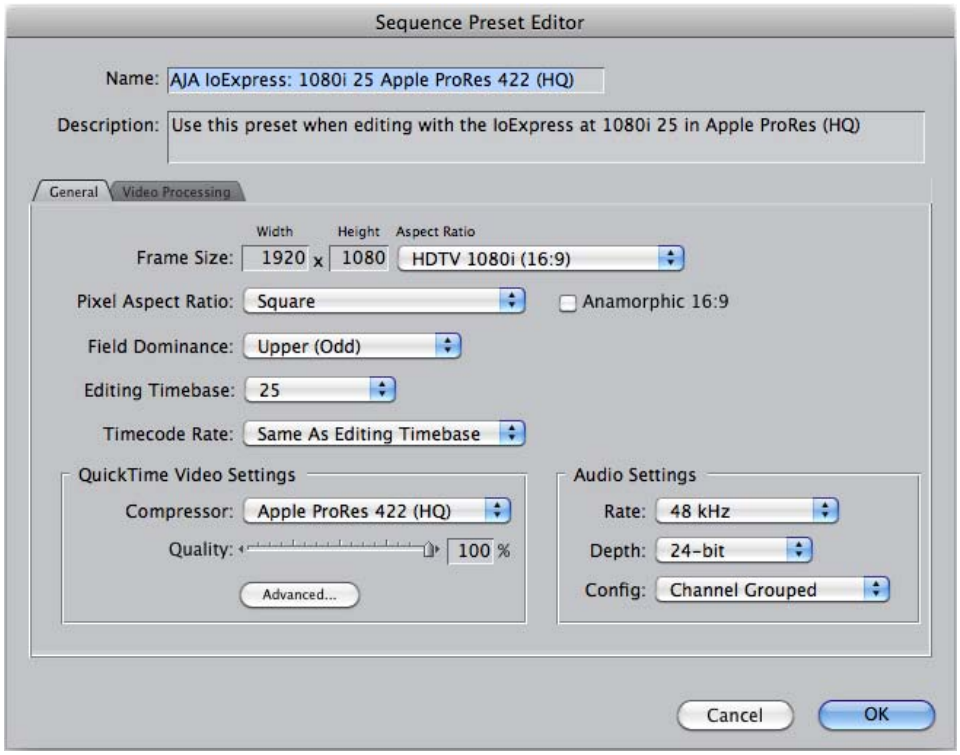
Audio/Video Settings, Sequence Presets Window

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.

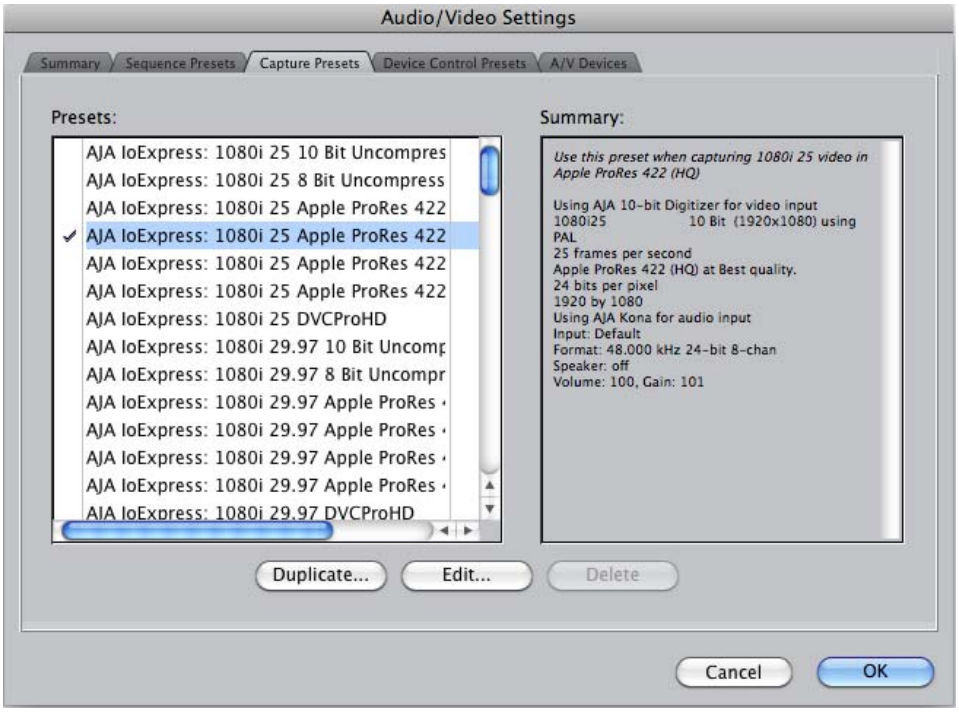
If you select an editing timebase you can then edit it (click the Edit button) or copy and rename it as another (click Duplicate). When editing a timebase you can change the following:

- 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

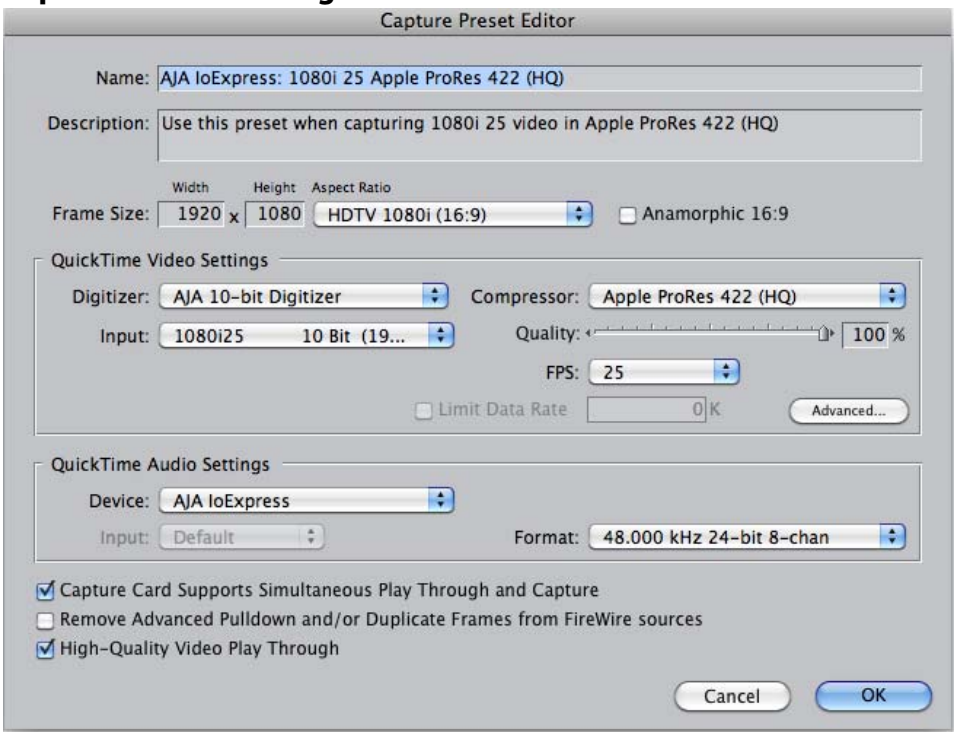
This window lets you choose a preset format for incoming source video and audio media you'll be capturing. Select the maximum quality format you'll be using for most of the material so there will be no need to re-render later. The information on the right window pane describes the preset and all it's 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.

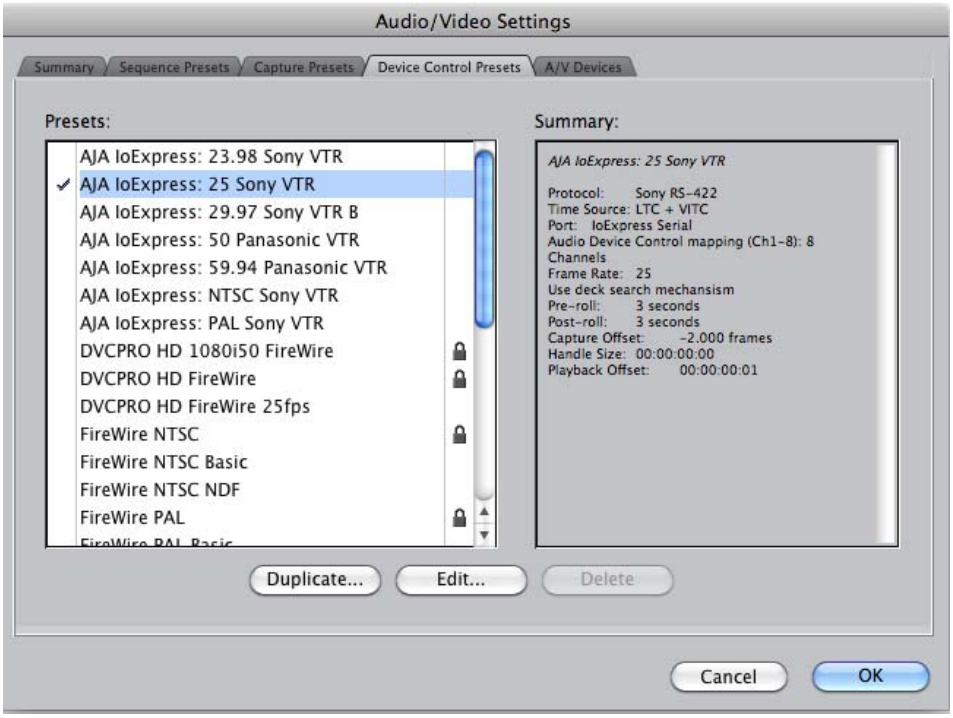
Frame Size—below the name and description are the frame size settings. These can be changed via the pulldown menu. Selecting a new *Aspect Ratio* value also changes the values in the width and height fields.

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.)

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.

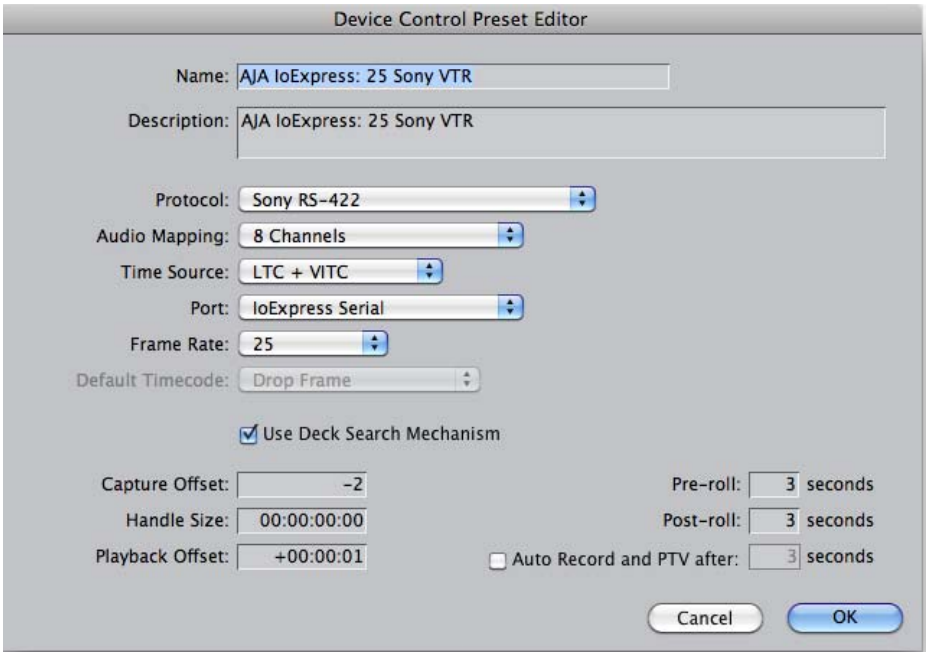
If you select a preset you can edit it (click the Edit button) or copy and rename it as another (click Duplicate). The only exceptions are those presets marked with a lock icon; those can be duplicated, but when you try to edit one the system will report they're locked and can only be copied (it will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

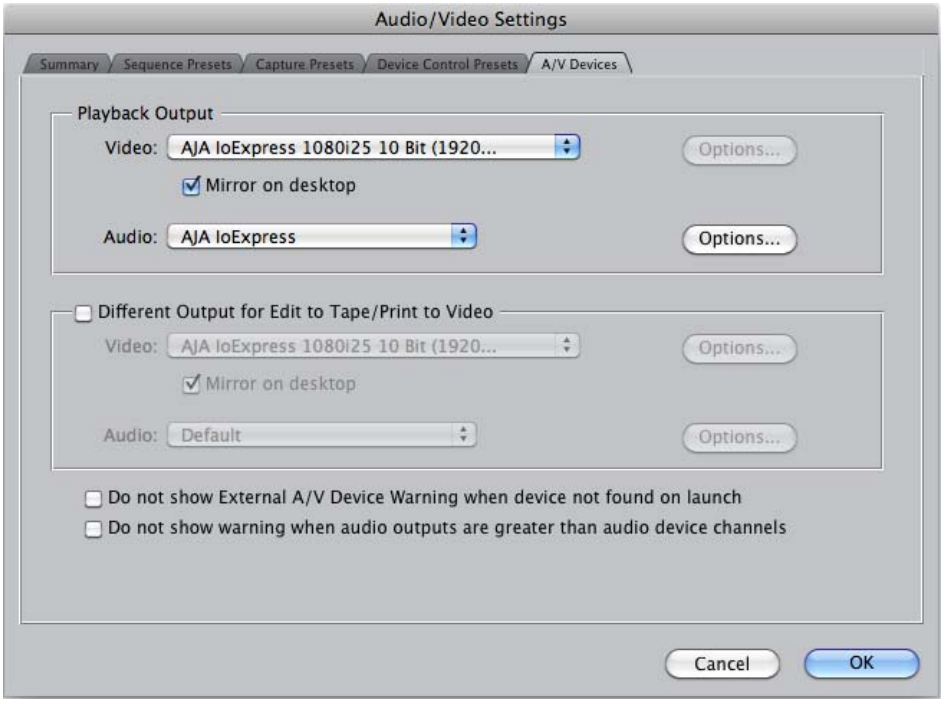
- Frame Rate
- Default Timecode (Drop Frame etc.)
- Capture/Playback Offsets (to correct for VTR versus Final Cut timing issues)
- Handles/Pre-roll/Post-roll
- Auto Record and PTV

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.

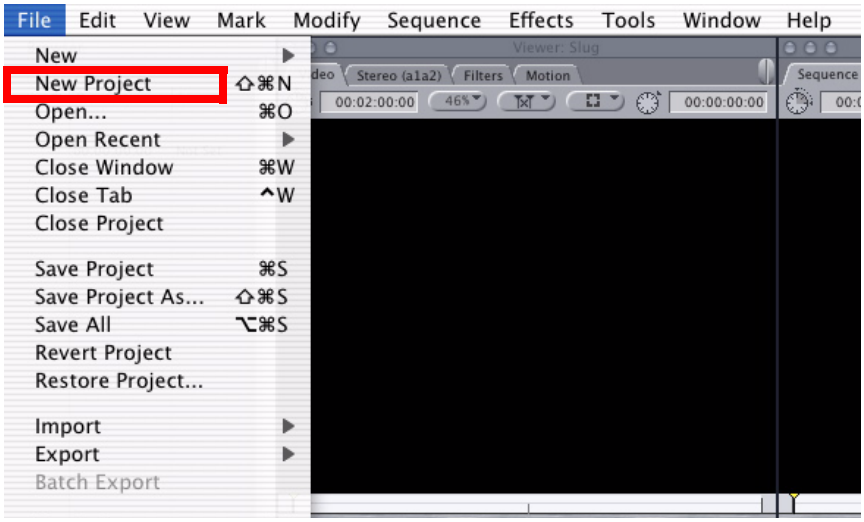
You may wish to use a different Io Express output for final Print-to-tape from Final Cut. You can select that in this window by clicking the checkbox "Different Output for Edit to Tape/Print to Video." This allows you to select via a pull-down menu any Io Express video output and audio output.

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.

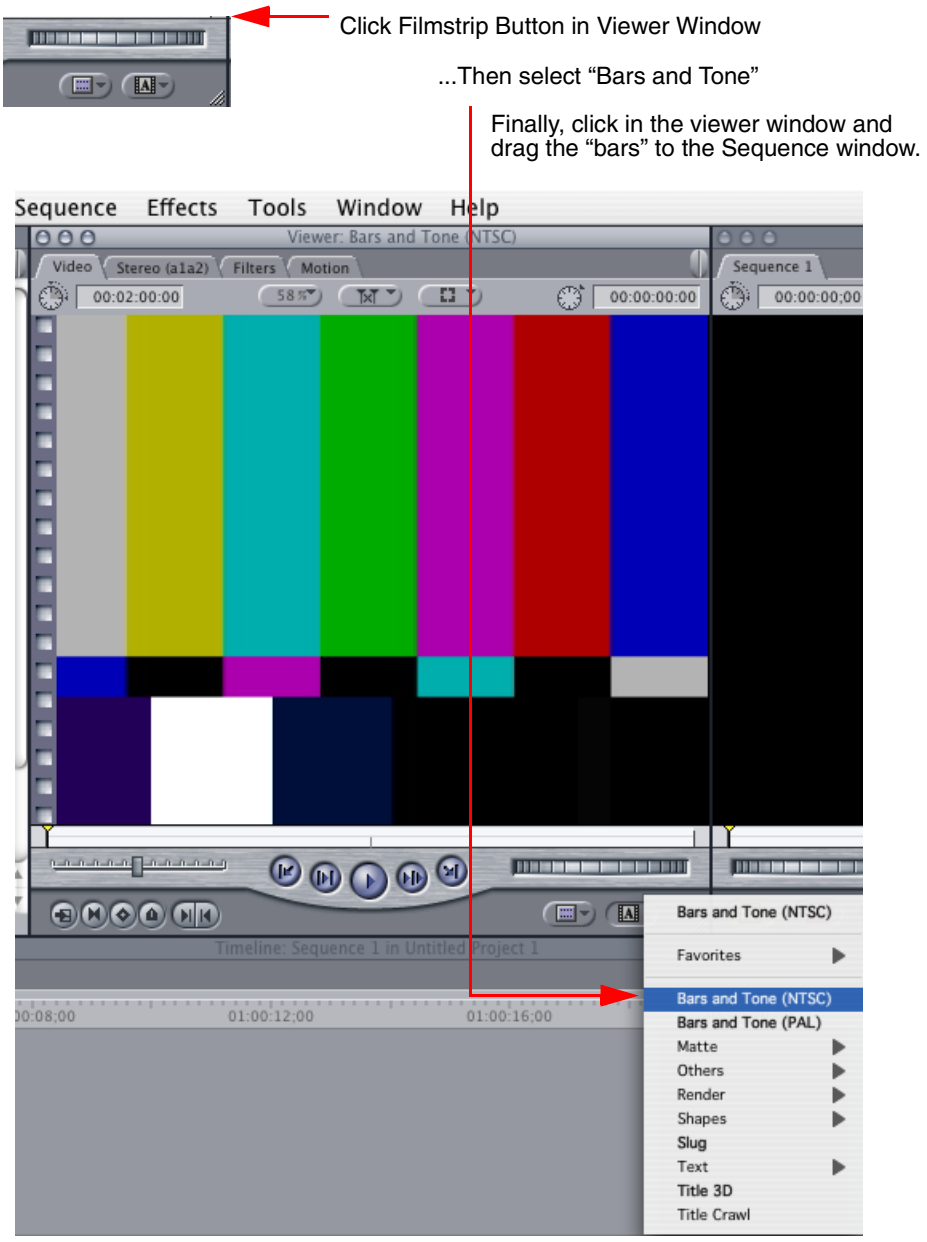
1. Select an Easy Setup as previously discussed (go to the Final Cut Pro menu and select *Easy Setup*; then select a desired preset).
2. Select *New Project* from the File menu.



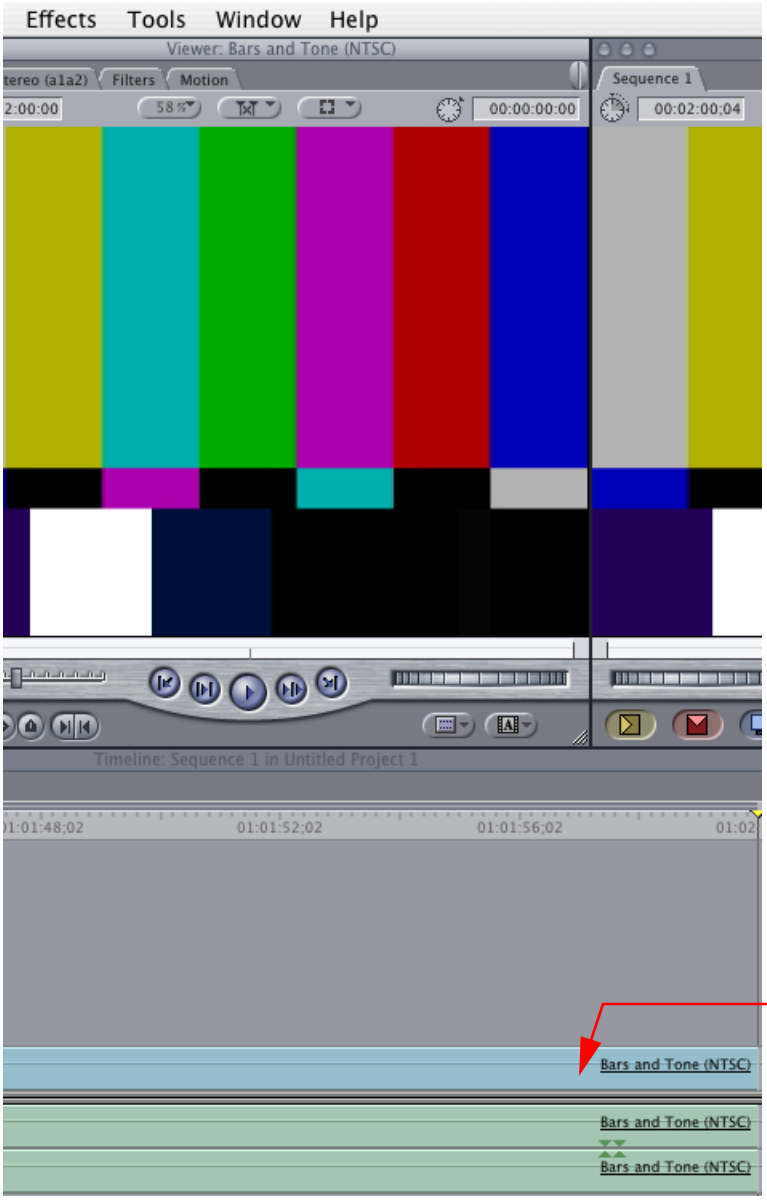
Create a New Project

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 AJA Machina with Windows

Overview

Machina (pronounced: mock´-en-uh) is AJA's powerful standalone capture/playback application that includes full VTR machine control. It is an easy-to-use interface that provides access to any and all Io Express supported file formats, and video standards. Captured files can be imported into virtually any software package that supports these file formats—such as 3D animation programs, audio editing programs, and more. With Machina, you can also accurately output files exported from these same programs to tape.

The Machina application is part of the software package that came with your Io Express. If you haven't already done so, launch the latest Io Express Download Package from AJA's website or use the Install CD that came with your system. Follow the prompts for installation and, when finished, click on the Machina short-cut placed on the desktop to launch Machina.

This chapter addresses configuration and setup unique to use of Io Express with Machina.

Io Express Realtime Performance

With Io Express running Machina, in realtime you can:

1. Capture HD/SD-SDI video or HDMI 1.3a to: Quicktime, AVI, or YUV
2. Playback to multiple displays simultaneously.

Note: AJA Software for Windows includes a codec for capture and editing compressed DVCProHD.

Machina Overview

AJA's Machina provides three tabbed windows that perform the following:

- Setup – set Activation, Capture, Playback, Device Control, and General options
- Capture – set Capture file and Clip options and Control the capture
- Play – set Playback file options and Control the playback

Machina Application Interface – Setup Menu

This section of the manual will discuss each of these windows in detail and discuss how various Pull-down menu options, hot-text entry fields, and play/record controls function and interact.

Note: The specific options available to you are determined by the currently active AJA capture device model installed in your workstation. This section will describe all possible options for Machina and note any options exclusive to Io Express.

Shortcuts and Display Features

Keyboard Shortcuts

Space Bar – Use it to start and stop playback of media. Pressing the Space Bar starts playback from the location of the Edit Line.

I key – press to set an In-point when trimming a clip.

J key – press to shuttle backward through the clip. Press repeatedly to move at a faster rate (2x, 4x, etc.).

K key – press to stop playback at the current position.

L key – press to shuttle forward through the clip. Press repeatedly to move at a faster rate (2x, 4x, etc.).

O key – press to set an Out-point when trimming a clip in Machina.

Left Arrow key (<-) – press to move one frame backward.

Right Arrow key (->) – press to move one frame forward.

Up Arrow key – press to start playback (forward).

Down Arrow key – press to start playback backward.

Full-screen Desktop Display

To use Machina for full-screen preview during capture or playback, first maximize the Machina window, then hit the Escape key. This can be especially useful for monitoring capture or playback in the absence of a full-resolution monitor. In full-screen mode you can use the mouse to control picture position and zoom for detail monitoring of graphic elements or frame-cut results (see *Display Sizes*, later in this section).

Setup Window

To configure the Machina operation, click on the Setup tab at the top of the window. In the left-most column are the Activation Options. The next column will toggle between Capture and Playback options when you click on the arrow tabs to the left and right of the header text. Next, Device Options address machine control settings. Finally, General Options establish paths to file storage directories for Video and Audio files and enable other options.

Activation Options

Board

Note: The term **Board** in this case refers to the AJA capture device being controlled by an application. In this section you will find the terms “board,” “card,” or “capture device” used interchangeably.

The Board window/menu reports the current Type of AJA capture device (Io Express or KONA card) selected.

Note: Using multiple AJA capture devices in the same workstation is possible but not always practical due to motherboard and disk system bandwidth limitations. See *“Using Multiple AJA Products” on page 2* for details.

Activation Mode

Machina and Io Express plugins in Adobe applications can be set for Automatic or Manual activation using the Activation Mode pull-down menu. Automatic is the default setting and is recommended for normal operation. Current activation status is reported below the pull-down menu.

The Io Express can be accessed by multiple application client windows but only one can have control at a time (for example, Adobe Premiere Pro and Adobe Photoshop). In automatic mode, an application or plugin can take active control when the Io Express is not being used. When the controlling application is done (and any processing initiated is complete), control is released, making the Io Express available to others.

Note: If the application window you click on does not access Io Express (reporting Io Express Status: Active), either another application window is still processing operations or it is set in Manual activation mode. (Remember: only one client window can have control of the Io

Express at a time.) If it is controlled by an application in Manual mode, you must either uncheck the enable check-box or select Auto in the Activation Mode pull-down menu to relinquish control.

In Manual mode, you must click on the enable check-box to activate board-control.

Io Express Information

At the bottom of the Machina Setup screen, in the left hand column, you'll find vital information about your specific Io Express —license type, serial number, and version. This information will be helpful if you ever need technical support.

Capture Options

To the right of "Activation Options "there is a column that can toggle to either "*Capture Options*" or "*Play Options*." The arrow buttons on either side of the Capture Options/Play Options button determine which of the two is displayed. Under Capture Options, you can select the appropriate formats and settings for your project. During Io Express operation, the *Primary Format* is the format written to disk. The *Secondary Format* is not available since Io Express does not support conversions.

The Primary Format menu allows you to select the video format for the current project.

Analog output is always available for component or composite monitor feeds.

Primary & Secondary Video Formats Supported

Note: See "About Primary & Secondary Video Formats" on page 2 for Primary/Secondary video format and Io Express down-conversion information.

Video Input

Use the Video Input pull-down menu to select the appropriate signal type of your input. (The current selection is reported in the display of the pull-down menu.)

Video Input Options supported by Io Express include:

- Single Link SDI
- HDMI

Audio Input

Use the Audio Input pull-down menu to select the appropriate signal type for your input. (The current selection is reported in the Status Display.)

Audio Input Options Supported by Io Express include:

- Embedded SDI, 8-channel
- Embedded HDMI, 2-channel, 24-bit SMPTE-259

SDI Output

Io Express has one SDI output so the SDI output will be Single Link.

Analog Output

Analog format choices in the Analog Output pull-down menu vary with selected file format. For example, "Composite + Y/C" is only available when an SD format is in use.

Analog Output Options Supported by Io Express cards include:

Composite + Y/C

Component (SMPTE/EBU N10)

Component (Beta)

Timecode Input

Select the type of timecode used by the source video machine — RS-422, Embedded SDI (RP188) or choose to input an External LTC timecode source input via the Io Express RS-422 port.

Note: SMPTE RP 188 defines a standard for the transmission of timecode and control code in the ancillary data space of a digital television data stream. Timecode 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 timecode packet instead of timecode. 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. After configuring Machina Capture Options, select the Play options by clicking on the toggle arrows on either side of the Capture Options title header.

Play Options

Primary Format, and Output Type settings are all the same for playback mode as those described previously. Refer to the Capture Options section.

Audio Sync

Because there is no conversion in Io Express, Audio synch is always to the Primary source.

Audio Sample Rate

In Io Express the audio sample rate is always 48 KHz.

Timebase

Use the Timebase pull-down menu to choose between:

- Frames
- Timecode (NDF)
- Timecode (DF)
- Reference

Using the Reference pull-down menu, select timing Reference source — Free Run, from External (genlock), or from the video Input signal.

Device Control Options

Device Control Options set options for the RS-422 machine control interface on the Io Express card. These functions support Print-to-Tape machine control.

Machina Device Control Options

Timecode Format

Use this pull-down to select the timecode base supported by your VTR.

- Base 24
- Base 25
- Base 25 (50 frames per second)
- Base 30 DF (drop-frame, 30 frames per second)
- Base 30 NDF (non-drop-frame, 30 frames per second)
- Base 30 DF (drop-frame, 60 frames per second)
- Base 30 NDF (non-drop-frame, 60 frames per second)

Timecode Source

Choose between a separate-channel Longitudinal Timecode (LTC) or Vertical Interval Timecode (VITC) transported in the video signal's vertical interval or include both (LTC + VITC).

Click on the Hot Text items to enter a value for:

- Preroll – 0 to 15; the number of frames required to start the source machine before capture
- Handles – 0 to 60; the number of frames added to the front and back of a sequence for editing flexibility
- Timecode Offset– -30 to +30; timecode adjustment (in frames) forward or back to compensate for discrepancies between the source's burned-in timecode and that of the captured sequence.

General Options

Video/Audio Directory Setup

Use these hot text fields to enter the path of the default capture/playback directories.

Enforce Memory Alignment

For almost all cases this checkbox should remain unchecked. However on certain types of RAID Controllers (usually RAID5 SATA), when reading/writing to disc to/from system memory, memory alignment must be done on a 512 byte address alignment. Enabling this option insures that reading/writing is done to a 512 byte address in system memory. But there is a performance cost. Due to re-alignment, reading/writing is not guaranteed to be in realtime.

Audio Files Setup

Three audio enable check boxes, when checked, allow you to:

- Enable Audio Scrubbing – Audio will play while you move through frames using the scrub bar (see Play Controls).
- Enable Audio Variable Speed – Audio will play at the same speed the video is played (rather than 1x only).
- Enable Audio Auto-Search – Io Express software will automatically load the Audio Track list with audio files that have been generated with the same name as the selected video file.

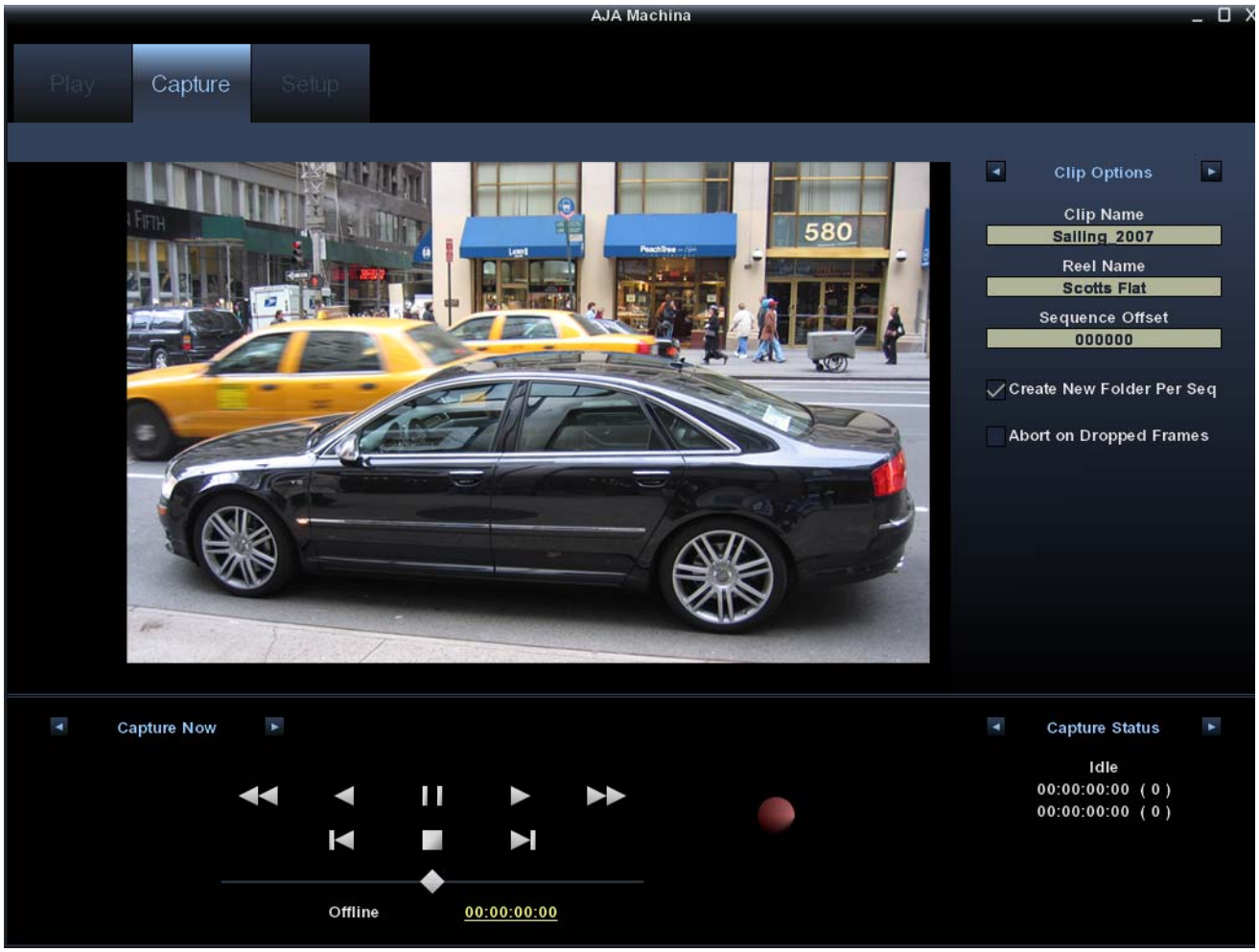
Note: When Audio Auto-Search is active, existing file names in the list will be removed or over-written when the Video File is loaded. (Does not affect the actual audio files.)

Audio Monitor Levels

Choose between +6 dB (US) monitor level and +0 dB (EBU).

Capture Window

Click on the Capture tab to bring up the Capture window. The figure below shows the Clip Options panel. Also available by clicking on the hot toggle buttons left and right of the title header are File Options and Display Options and Overlay Options.



Machina Capture Window

File Options

In the File Options menu you will configure the capture file you will be creating by setting the following.

Type

The Type pull-down menu provides a choice of video/audio file formats:

Note: Because the Io Express is a YUV only device, file types that require RGB colorspace cannot be used.

- QuickTime Movie
- AVI Movie
- YUV Sequence

Video/Audio

Use this pull-down menu to select the video/audio input combination you will capture:

- Video Only
- Audio Only
- Video – (minus) Audio – video and audio are recorded in separate files
- Video + (plus) Audio (QuickTime only) – video and audio are recorded in the same file

The options shown are determined by the selected file format. QuickTime captured audio is either embedded with the video file or captured to separate .mov files. All other formats capture audio to Wave Files.

Video Subtype

Video Capture Formats supported by Io Express cards (varying according to file type) include:

- 8-bit YUV 4:2:2 – '2vuy'
- 8-bit YUV 4:2:2 – '2Vuy'
- 10-bit YUV 4:2:2 – 'v210'

Audio Subtype

Audio Capture Formats supported by Io Express cards include:.

- 48 kHz 16-bit PCM Mono
- 48 kHz 24-bit PCM Mono
- 48 kHz 32-bit PCM Mono
- 48 kHz 16-bit PCM Stereo
- 48 kHz 24-bit PCM Stereo
- 48 kHz 32-bit PCM Stereo

Io Express 2K also supports 96 kHz 16 through 32-bit PCM Mono and Stereo selections

Audio Track

Select the number of audio tracks for this project. Io Express models support up to 8 tracks.

Clip Options

Clip Name

In the Clip Options menu, click on the Clip Name to name the file you will be creating. Subsequent file numbers will increment from this one.

Reel Name

Click on the hot text field to enter a source tape name—the name of the tape on the VTR. Only QuickTime and DPX files store this information.

Sequence Offset

When capturing file-per-frame sequences, after naming a file, you can set a Sequence Offset number that will determine the beginning number of the file sequence.

Create New Folder Per Sequence

A check-box is provided to enable this automatic function. When you check this selection, Machina will gather each frame capture sequence in a new folder, based on clip names, on your disk. (Not applicable to QuickTime or AVI movie files.)

Abort on Dropped Frames

Checking this box causes a capture to automatically stop any time that Io Express detects frames are being dropped for some reason. This ensures you don't waste storage space and time capturing when there may be a problem with the capture.

Display Options

Display Options configure how the desktop display operates for capture.

Display Type

The Display Type pull-down menu provides a choice of display rendering formats: OpenGL Texture or OpenGL DrawPixels. This setting changes the way the PC's GPU handles video overlay on your desktop monitor. OpenGL Texture should always be used whenever possible. Note, however that this setting is not guaranteed to work on all boards. It has been tested primarily with high-end nVidia workstation graphics cards. Using OpenGL Texture mode will allow any applied LUTs to be displayed on the desktop display as well as on the video output.

Open GL DrawPixels should only be used when you are experiencing display problems. Typically, this will be for graphics cards that are not AJA approved, and that have less OpenGL support. This mode does not allow applied LUTs to be displayed on the desktop. This mode also has many limitations when working with YUV files. When using this setting, files may appear pixelated on the desktop display. This does not affect the quality or resolution of the video being captured or output from the Io Express card.

Display To Desktop

This setting determines when the desktop monitor overlay is present. Choice include:

- OFF – always off (no display)
- While Idle Only – displays whatever is present at the selected input while idle; when capturing, there is no display (saving system resources)
- While Capture Only – only display while capturing
- Always – display during capture and when idle

Display Sizes

The desktop monitor display will be sized according to this setting. You can choose from select sizes (25% to 800%), enter a custom size (Custom), or have Io Express fit the display size according to your Machina screen (Fit). If you use Custom, use the hot text fields underneath Display Sizes to enter a specific percentage and X and Y origin points.

You can also zoom picture size by clicking on the Size hot text field and dragging to the left or right. Zoom can also be done using the scroll-wheel of your mouse (especially helpful when viewing the display in Full-screen mode, see *Shortcuts and Display Features*). To move the picture within the display, just click in the display area and drag the picture.

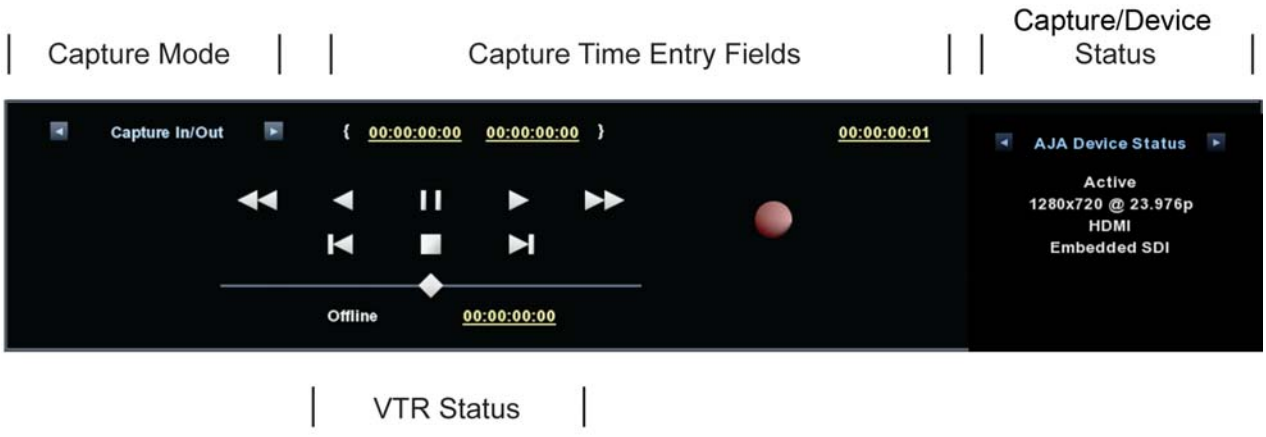
Capture Controls

Standard tape deck icons provide hot buttons for the Capture process. They are:

Rewind (8x)	Fast Forward (8x)
Reverse Play	Reverse 1 frame
Still	Stop
Play (1x)	Forward 1 frame

The slider on the bottom is a variable speed forward/reverse control. Positions from left to right are: (Reverse) 16x, 8x, 4x, 2x, 1/2, 1/4, Still, (Forward) 1/4, 1/2, 2x, 4x, 8x, and 16x.

The red button is for Record.



Machina Capture Controls

The toggle buttons on the top-left step through one of three capture modes:

- Capture Now – manual record/stop (“crash”) capture
- Capture Duration – capture a specified number of frames after manual start, based on the timebase of the selected Primary Format
- Capture In/Out – initiate and end capture using timecode-based in and out settings

The selected mode will activate the appropriate hot text for that mode (to the right of the Capture Mode selection). Click the hot text to enter a timecode value (hours:minutes:seconds:frames). The bottom display indicates the current machine status and timecode from the VTR.

Capture In/Out Mode

The capture in-point is entered by clicking on the left field of eight digits. The out-point can be set by clicking on the right field of eight digits. Alternatively, you can specify a duration in the Duration field and the in- or out-point (whichever you have not entered) will be entered automatically according to duration.

Note: The in-point/out-point field values are inclusive. If both are set to the same value, the capture duration will be 1 frame.

To load the current VTR timecode setting in either field (in-point or out-point) click on the hot text field and enter from your keyboard.

Note: When a hot text field has a dotted underline, you can left-click and hold on the field and drag your curser to increment or decrement the value.

VTR TC

The current VTR timecode is displayed on the bottom of the control pane and you can click on it and enter a timecode to perform a seek to that timecode on the VTR. The VTR must be online and in remote rather than local control mode (as reported to the left of the current timecode).

Capture/Io Express Status

Click on the hot toggle buttons of the Status header to switch between Capture Status and Io Express Status. Capture Status reports current state of activity, capture duration and number of frames captured in ( ), and the number of frames that may have been dropped.

Io Express Status reports Active/Inactive status, Primary Format setting, Video Input type, and Audio Input type.

Play Window

Machina Play Screen

File Options

On the right side of the desktop display you can use the hot buttons at the top to toggle between File Options, Display Options, and Leader/Trailer Options. In File Options, the current file name and path is loaded into the Video field. Alternatively, you can click on the path hot text to select a file, delete it using the trash icon at the left, or turn it on/off using the check-box at the right.

Format, Colorspace, and total number of frames in the file is reported below the path text.

You can preview the effects of a color Look Up Table by clicking on the LUT hot text or delete the selected LUT file by clicking on the trash icon.

You can edit the Audio Track list that is automatically loaded with audio files that have been generated with the same name as the selected video file. QuickTime embedded audio files are automatically appended with a number and will be loaded numerically into the track list. Click on the trash icon to delete a track. Click on the check-box on the right to enable/disable a track. To manually enter audio files, simply double-click on a track in the list.

Display Options

In the Display Options menu you will configure how the desktop display operates during playback operations.

Display Type

The Display Type pull-down menu provides a choice of display rendering formats: *OpenGL Texture* or *OpenGL DrawPixels*. This setting changes the way the PC's GPU handles video overlay on your desktop monitor. OpenGL Texture should be used whenever possible. These options were described in detail earlier under the Capture screen options.

Display To Desktop

This setting determines when the desktop monitor overlay is present. Choice include:

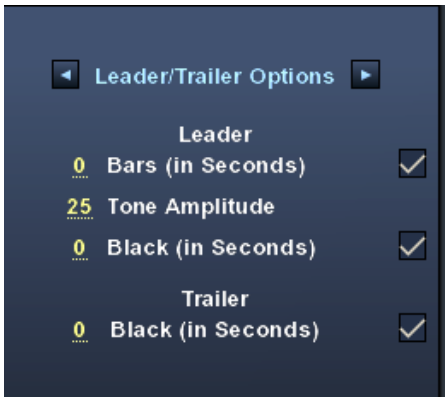
- OFF – always off (no display during scrubbing or playback)
- While Scrubbing Only – displays media as you scrub through it via the playhead; during playback there is no display (saving system resources)
- While Playing Only – displays media only during playback
- Always – display during playback *and* when idle

Display Sizes

The desktop monitor display will be sized according to this setting. You can choose from select sizes (25% to 800%), enter a custom size ("Custom"), or have Io Express fit the display size according to your Machina screen ("Fit"). If "Custom" is chosen, use the hot text fields underneath Display Sizes to enter a specific percentage and/or X and Y origin.

Leader/Trailer Options

Leader/Trailer Options allow you to add colorbars, test tone, and black field in a leader to your clip and black field as trailer. Note that the dotted underline indicates that you can left-click down and scroll the mouse to increment/decrement these values.



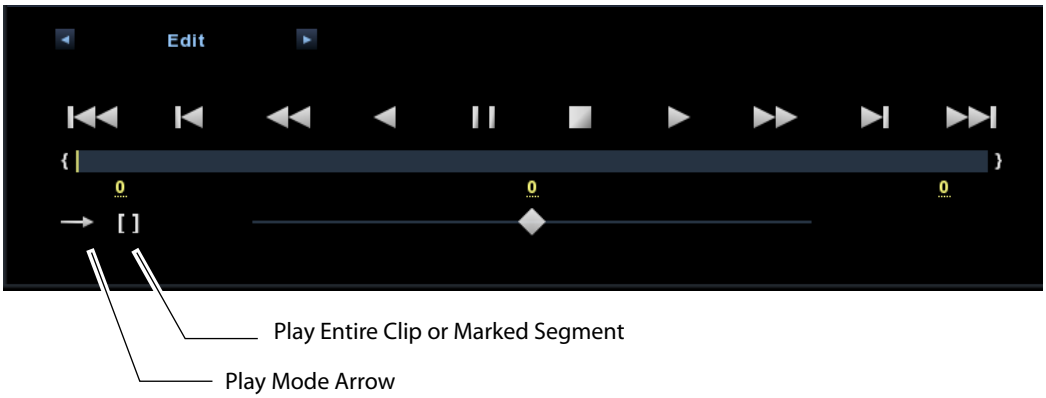
Leader/Trailer Options

Play Controls

There are two modes of play control—one for Edit and one for Output. Click the hot buttons at the top-left of the pane to toggle between the two modes.

Edit Mode – In Edit mode, immediately under the mode toggle buttons are standard tape deck icons providing hot buttons for the Play process. They are:

Go-to-Previous "Most Significant" frame	Reverse 1 frame
Rewind (8x)	Reverse Play
Still	Stop
Play (1x)	Fast Forward (8x)
Forward 1 frame	Go-to-next "Most Significant" frame



Edit Mode Play Controls and Scrub Bar

Below the Play buttons is a Scrub Bar that allows you to click and drag along the loaded sequence to view individual frames and mark In/Out- points for playback of frame subsets. To set an in-point, click on the left bracket. To set an out-point, click on the right bracket.

To set an in-point, click on the left-most hot text numeral below the bar and enter the desired frame number. Similarly, enter the out-point by clicking on the right side hot text numeral.

Note: The "first" or "last" frame may be for the entire sequence or for frames in an in/out-marked subset. In this case, first, last, in, and out frames become "Most Significant Frames." For example, clicking on the Go-to-1st button will move you to the first Most Significant Frame to the left. Clicking on the Go-to-Next button will move you to the first Most Significant Frame to the right.

The slider on the bottom is a variable speed forward/reverse control. Positions from left to right are: (Reverse) 16x, 8x, 4x, 2x, 1/2, 1/4, Still, (Forward) 1/4, 1/2, 2x, 4x, 8x, and 16x.

Play Modes

Select a Play type by clicking the Play hot toggle buttons above the controls. Choose between: Play All or Play Range.

You can select one of three Play Modes by clicking on the Play Mode arrow to the left of the slider control. You will step through the following modes:

- Once (single arrow) – play once through in forward or reverse
- Bounce (double-ended arrow) – play continuously, alternating between forward and reverse play
- Loop (double right-pointing arrow) – play repeatedly, looping in one direction

If you have designated an In/Out sub-segment you can use the hot text brackets (to the right of the Play Mode arrow) to play either the entire clip [ ] or the marked segment only { }.

Output Modes

Toggle the Play Mode to Output and standard VTR controls and machine control timecode hot text will appear. Beneath the Output mode header are hot-buttons that allow you to choose between two modes of output—Insert Edit or Print-To-Video. Print-To-Video and Insert Edit will output the loaded clip from its in/out- points (if any exist) or from the first to last frame (if no in/out-points have been set).

Play Controls for Insert Edit

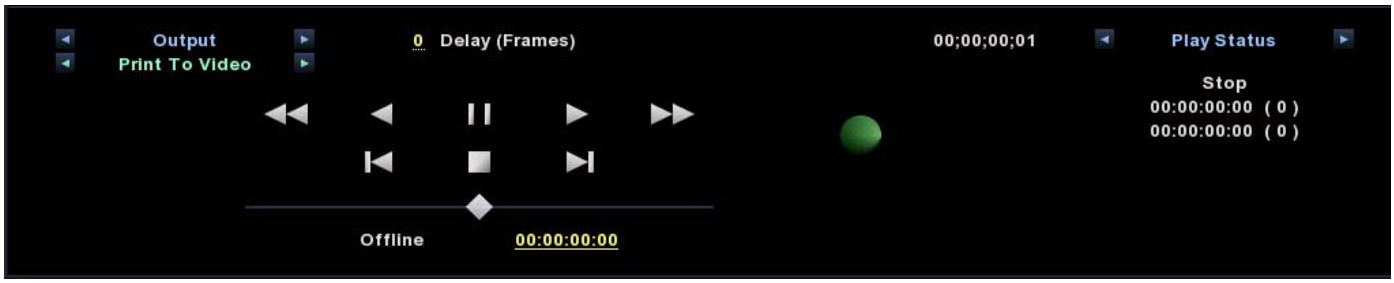
Insert Edit

In this mode, you can select the Video/Audio content that you want to insert by checking the desired content boxes at the left. Then set an in-point that the recording VTR will use to initiate recording of your segment. Duration is determined by the length of the clip you are outputting.

Note: The **Preview Edit** check-box controls whether the insert edit is in "Preview" mode or not. In preview mode, the deck never goes into record but just simulates the edit without putting anything to tape. You must un-check this box to perform the actual Insert Edit.

Print-to-Video Mode

This mode allows you to manually put a clip to tape using the VTR's current position. You have the option of adding *Delay frames*. Io Express will wait this many frames after the tape machine's start command, before it outputs the clip. The Duration Field displays the total length of the clip that will go to tape. Click on the green hot button to launch the output sequence.



Play Controls for Print-to-Video

Assemble Edit Procedure

Assemble Edit features exist in both Machina and the AJA capture Plug-in for Premiere Pro. These features create a two step process for Assemble Editing. The procedure require the tape to have at least a few seconds of timecode already on it. If it does not have any timecode, a small segment near the front of the tape must be blackened to provide this initial timecode. This procedure assumes you are using a blank tape:

1. Blacken the Tape – This must be done in Machina

a Insert the tape and be sure it is cued to the right location

b Verify that the video cables and RS422 are connected correctly

c In the lower left hand corner of the "Play" tab in Machina, set the "Edit/Output" toggle to "Output".

Blacken Tape Mode

d Next set the toggle button below, to "Blacken Tape"

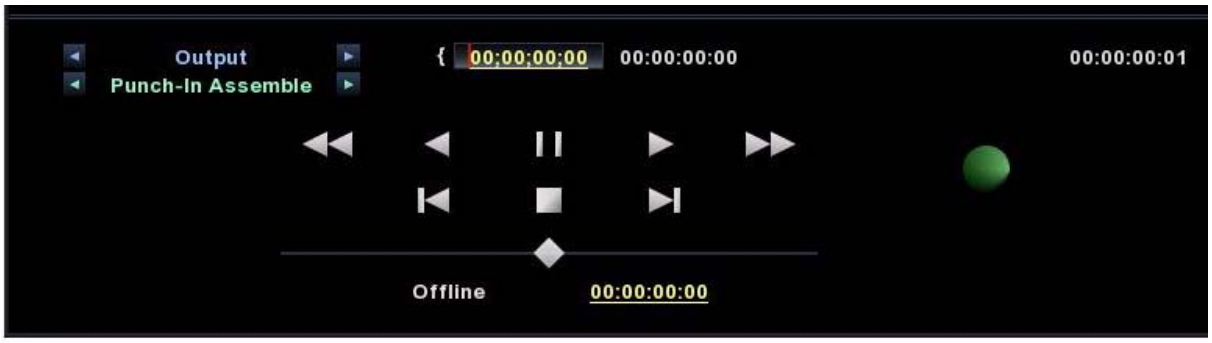
e In the timecode clock to the immediate right of the toggle buttons, enter your desired beginning timecode

f Click the green "Record" button and allow the deck to blacken about 30 seconds of the tape

2. Punch-In Assemble (This can be performed either in Machina or Premiere Pro)

a Cue the tape to a location where there is timecode

b Set the edit toggle to "Punch-In Assemble"



Punch-in Assemble Mode

c Specify the timecode where you would like the "Punch-In" to begin

d Set the timecode generation setting on your deck to "regen"

e Click the record button to begin the assemble edit.

Play/Io Express Status

Click on the hot toggle buttons of the Status header to switch between Play Status and Io Express Board Status. Play Status reports current state of activity, play duration selected for the current playback, total number of frames in ( ), and lastly, the number of frames that may have been dropped. Io Express Status reports Active/Inactive status, Primary Format setting, Video Input type, and Audio Input type.

Chapter 5: Using Adobe CS5 Applications

Overview

There are Io Express plugins for both Mac and Windows versions of the Adobe Applications and functions are virtually the same. This chapter will describe the Windows menus and note exceptions.

AJA Software for Io Express is tightly integrated with Adobe Premiere Pro CS5, Photoshop, and After Effects (not included with Io Express). Io Express allows a user to bring in supported Premiere Pro CS5 compressed formats and provides plug-ins and drivers that add functionality to the Premiere Pro application.

Note: You should have Adobe CS5 applications installed on your workstation before installing Io Express software. The Io Express installation adds required files to your Adobe application directories. Also, CS5 pluggins for Mac come in a separate installer that must be run along with the standard Io Express for Mac installer. See Io Express downloads at:

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

After you install the Io Express software on your workstation, all you need to do to begin using it is to become familiar with the AJA plugins and how Adobe CS5 applications access Io Express options.

The manual you are reading does not provide operational information for Adobe CS5 except as related to Io Express operations. Please read the Adobe Premiere Pro, Photoshop, and After Effects CS5 user documentation for information on configuration and operation.

Note: AJA Windows Software operates on both AJA KONA cards and Io Express at different functional levels. Some setup screens may use either KONA or Io Express interchangeably when referring to your AJA capture hardware.

The chapter you are reading addresses configuration and setups supported by Io Express. Topics covered include:

- Adobe Premiere Pro Realtime Performance
- Beginning a Project with Io Express Presets
- Io Express Capture Options
- Io Express Playback Options
- Using Adobe Photoshop CS5

Adobe Premiere Pro Realtime Performance

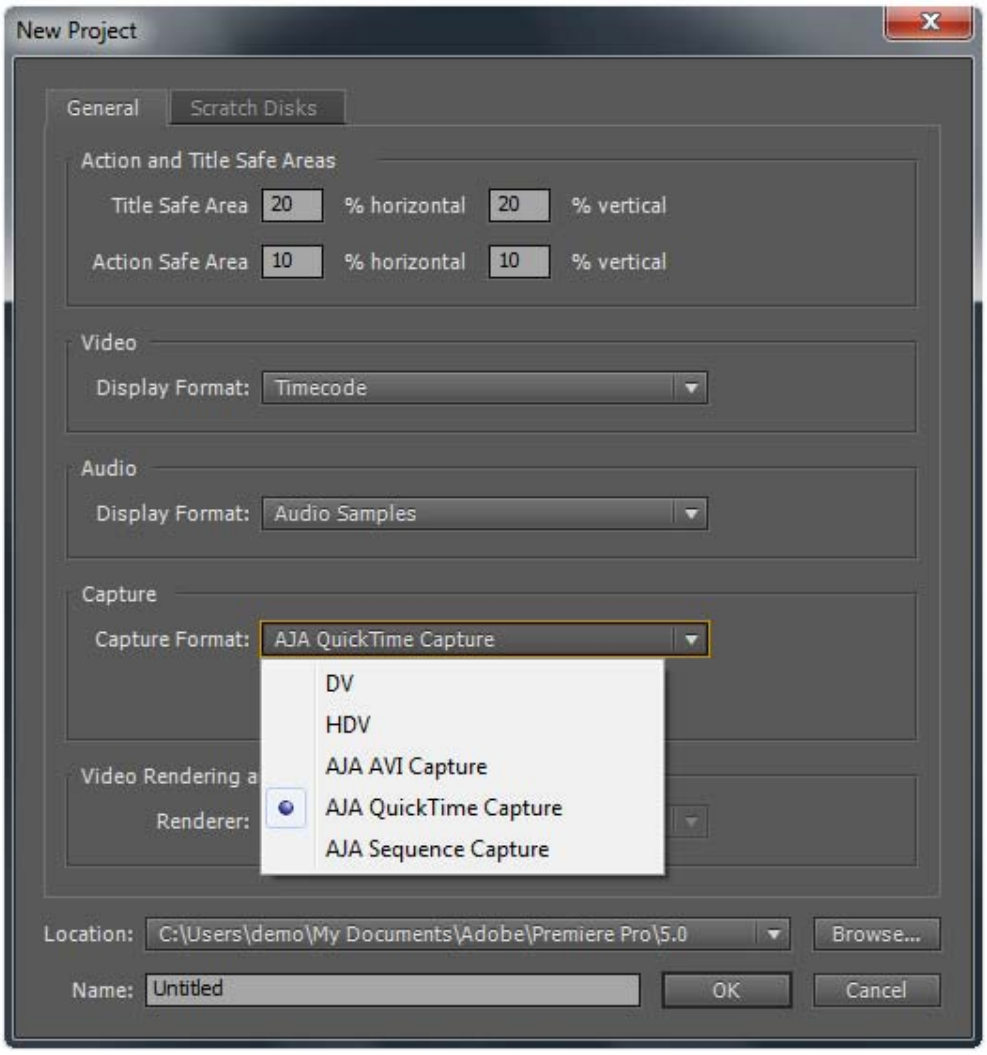
With Io Express, Adobe Premiere Pro CS5 can perform the following functions in Realtime:

- Io Express can capture uncompressed analog or digital SD/HD-SDI or HDMI 1.3a to the supported file formats that are YUV.
- Playback of Quicktime, AVI, YUV, HDV MPEG, XDCamHD, XDCamEX, DVCProHD, and AVCHD.

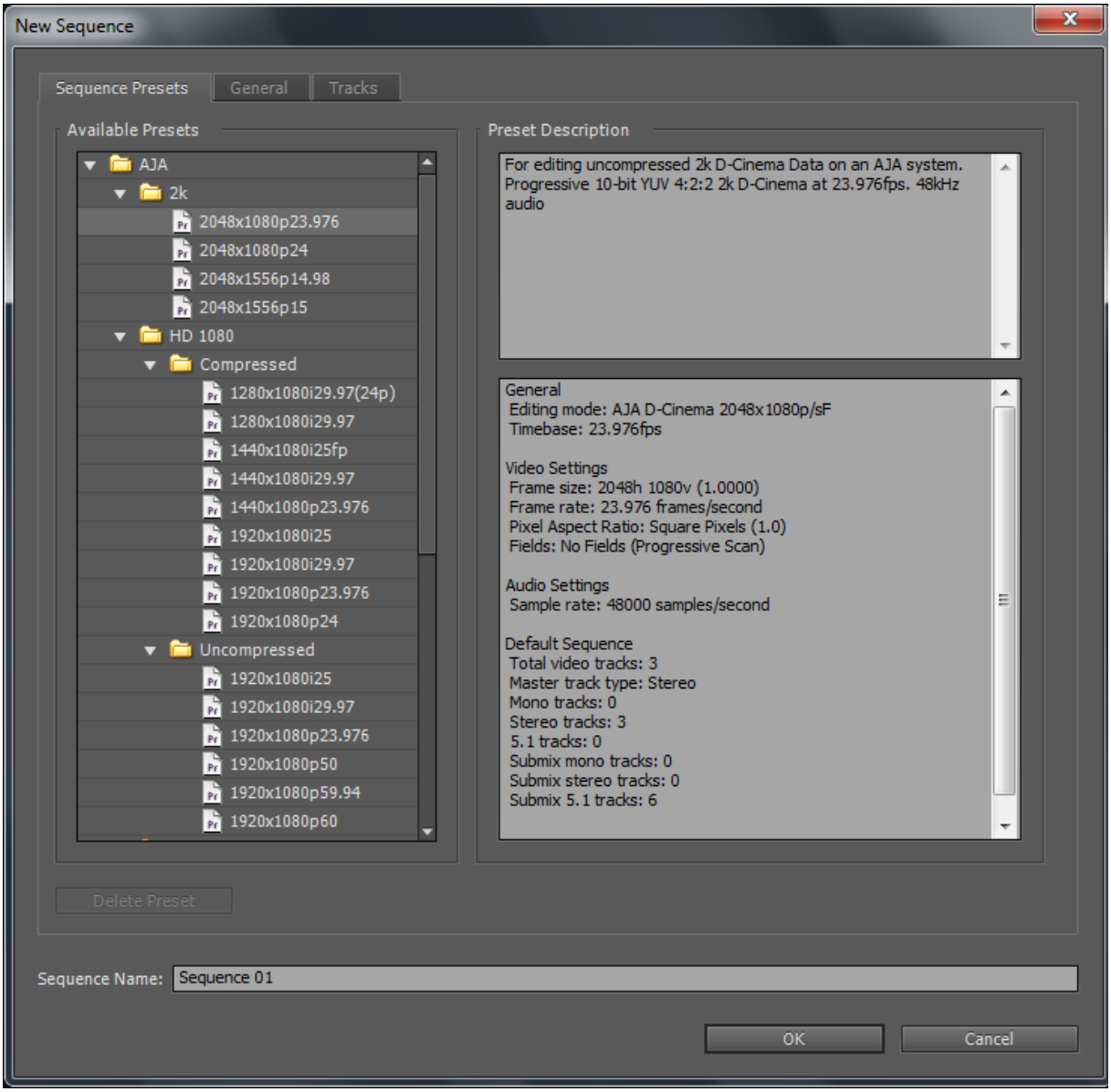
  This happens automatically. Files of these types that match the resolution and frame rates of the projects will play in realtime as long as they are in one of the supported colorspaces. For HDV to playback in realtime, it must be in a 1080 project and the frame rate or the file must match that of the project.

Beginning a Project with Io Express Presets

Opening Adobe Premiere Pro CS5, you will select New Project from the Quick Start Screen and choose an AJA Capture Format from the pulldown menu, name the project, and click OK to access the New Sequence setup panel with presets or click the AJA Setup button for custom capture settings.



Io Express Adobe Premiere Pro CS5 New Project panel



New Sequence Setup Panel

Here you can select from AJA Presets. The Io Express Presets offer typical project settings.

The Description field summarizes the parameters for each preset including:

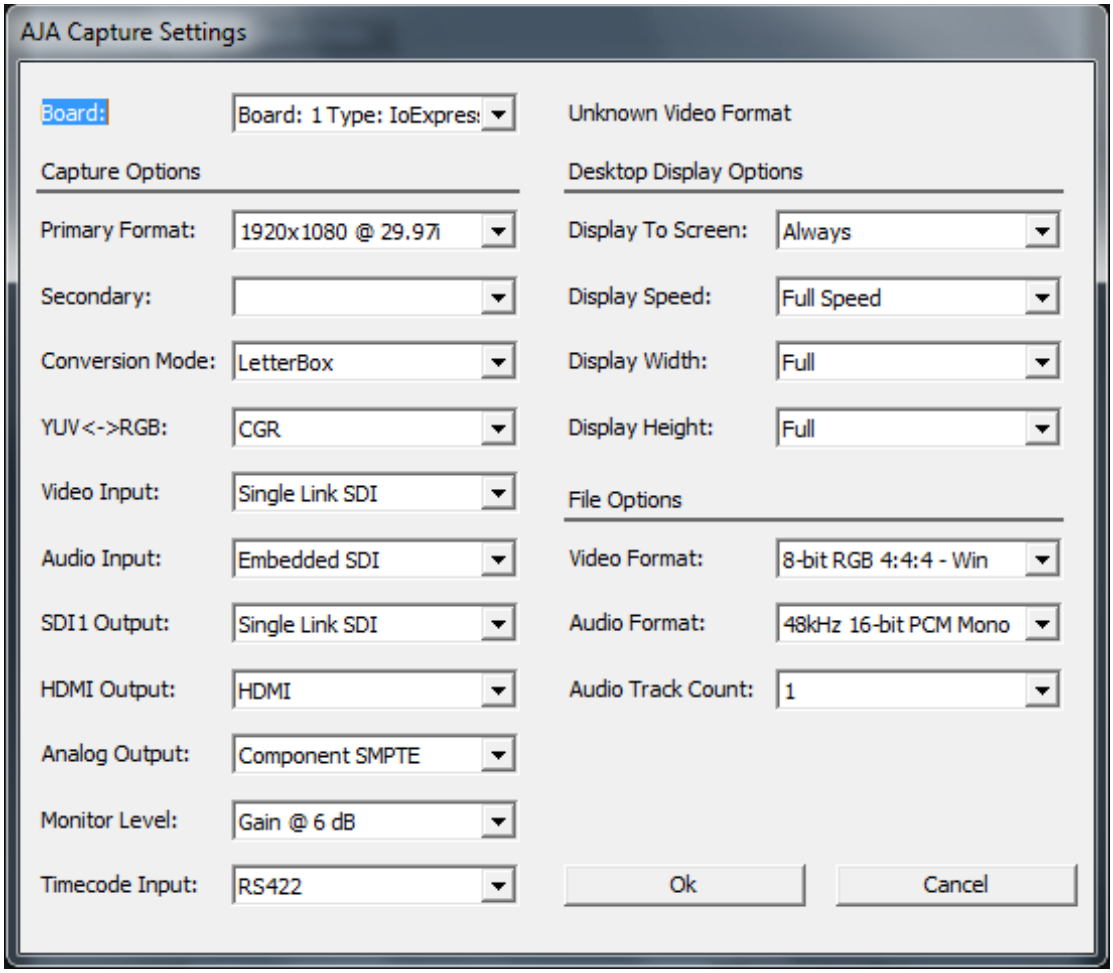
- Frame raster size
- Frame rate
- Field order
- Capture file format
- Sequence settings
- Timebase
- Pixel Aspect Ratio
- Audio sample rate
- Video Rendering format

You can adjust the preset Capture setting by going to Project>Project Settings>General to access the Custom Setting Panel.

AJA Capture Options Panel

Using the Capture Options panel you can change or adjust details for the selected Preset. The following settings can be accessed:

General – change Editing Mode and Timebase for the Adobe Premiere Pro CS5 project and access Playback settings for Io Express output. Adobe Premiere Pro CS5 Desktop Display, Preview Rendering, and Timeline options are also available.



AJA Capture Options panel

Capture Options

Under Capture Options, select the appropriate formats and settings for your project. In Io Express operation, the Primary Format is the captured media format written to disk. Secondary format is for other AJA devices that perform format conversion.

The Primary Format menu allows you to select the video format used in your current project. The Secondary Video Format allows you to perform down-conversion of input or output video.

Analog output is always available.

Primary and Secondary Video Options Supported by Io Express

See “About Primary & Secondary Video Formats” on page 2 for Primary/Secondary video format and down-conversion information.

YUV<->RGB Range

This control mode is not used in Io Express since it does not support colorspace conversion.

Video Input

Use the Video Input pull-down menu to select the appropriate signal type of your input. (The current selection is reported in the display of the pull-down menu.) Video Input shows all the available input options based on your AJA capture device.

Video Input Options Supported by Io Express are:

- Single Link SDI
- HDMI

Io Express P2, XDCamHD, XDCamEX, and AVCHD Support

P2 MXF files are also supported, with no capture, rendering, or re-wrapping required. These files may be simply imported into the desired projects either directly from a P2 card, or after being transferred from a P2 card to the local system. They can be used in Io Express DVCProHD projects, or in full-raster uncompressed projects.

For more information on using DVCProHD for:

- Compressed Online Editing,
- Compressed Offline Editing,
- Import, Editing, and Playing Multiple Media Types,
- Cross-Platform Workflow with KONA, and DVCProHD

See the whitepaper ***DVCProHD Editing with KONA and XENA*** at

http://www.aja.com/pdf/AJA_whitepaper_DVCProHD_editing.pdf

Audio Input

Use the Audio Input pull-down menu to select the appropriate signal type for your input. (The current selection is reported in the Status Display.)

Audio Input Options Supported by Io Express include:

- Embedded SDI
- Embedded HDMI

SDI Output 1

There is no active selection here. Since there is only one SDI Output in Io Express, it will be Single Link.

HDMI Output

There is no active selection here for Io Express.

Analog Output

Analog format choices in the Analog Output pull-down menu vary with selected file format. For example, "Composite + Y/C" is only available when an SD format is in use.

Analog Output Options Supported by Io Express include:

- Composite + Y/C
- Component (SMPTE/EBU N10)
- Component (Beta)

Audio Level

Choose between +6 dB (US) monitor level and +0 dB (EBU).

Timecode Input

Select the type of timecode used by the source video machine—RS-422, Embedded SDI (RP188) or choose to input an External LTC timecode source input via the Io Express RS-422 port.

Note: SMPTE RP 188 defines a standard for the transmission of timecode and control code in the ancillary data space of a digital television data stream. Timecode 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 timecode packet instead of timecode. 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.

Desktop Display Options

Display To Desktop

Select one of four modes of desktop display:

- Off
- Display while idle only (this mode is suggested)
- Display during capture only
- Display Always

Display to Desktop uses system resources and could affect performance. Choose Capture Speed, Width, and Height as appropriate for your system's capabilities.

Display Capture Speed

- Full Speed – Every frame is displayed to desktop during playback
- Half Speed – Every other frame is displayed to desktop during playback
- Quarter Speed – One out of every four frames is displayed to the desktop

Half Speed and Quarter Speed will reduce the system load that the Display-To-Desktop is using to draw video to your computer.

Desktop Capture Width and Height

These selections allow you to reduce the resolution of the desktop capture display. The captured file will be full-resolution. Only the displayed image is reduced to save processing resources during capture. The choices available are:

- Full Resolution
- Half Resolution
- Quarter Resolution
- Eighth Resolution
- Sixteenth Resolution

File Options

The Premiere Pro *Project Setting>Capture* menu allows you to select one of the following AJA file formats from the *Capture Format* pulldown menu:

- AJA AVI Capture
- AJA QuickTime Capture
- AJA Sequence Capture

Within the AVI and QuickTime formats, you can select one of the following subtypes by clicking on the Setup button to the right to bring up the *AJA Capture Options* menu.

Note: Capture file format options vary by AJA capture device. The following selections are available in Io Express.

Under the *File Options*, select a video format subtype supported by Io Express:

AVI files in the following Subtypes	QuickTime files in the following Subtypes
8-Bit YUV 4:2:2 – '2vuy' 8-Bit YUV 4:2:2 – '2Vuy' 8-Bit YUV 4:2:2 – 'uyvy' 10-Bit YUV 4:2:2 – 'v210'	8-Bit YUV 4:2:2 – '2vuy' 8-Bit YUV 4:2:2 – '2Vuy' 10-Bit YUV 4:2:2 – 'v210' 10-Bit YUV 4:2:2 – 'V210'

When you select AJA Sequence Capture, the *File Options* panel allows you to choose a Sequence Type:

- TGA Sequence
- TIF Sequence
- BMP Sequence
- YUV

Audio Formats

- 48 kHz 16-bit PCM Mono
- 48 kHz 24-bit PCM Mono
- 48 kHz 32-bit PCM Mono
- 48 kHz 16-bit PCM Stereo
- 48 kHz 24-bit PCM Stereo
- 48 kHz 32-bit PCM Stereo

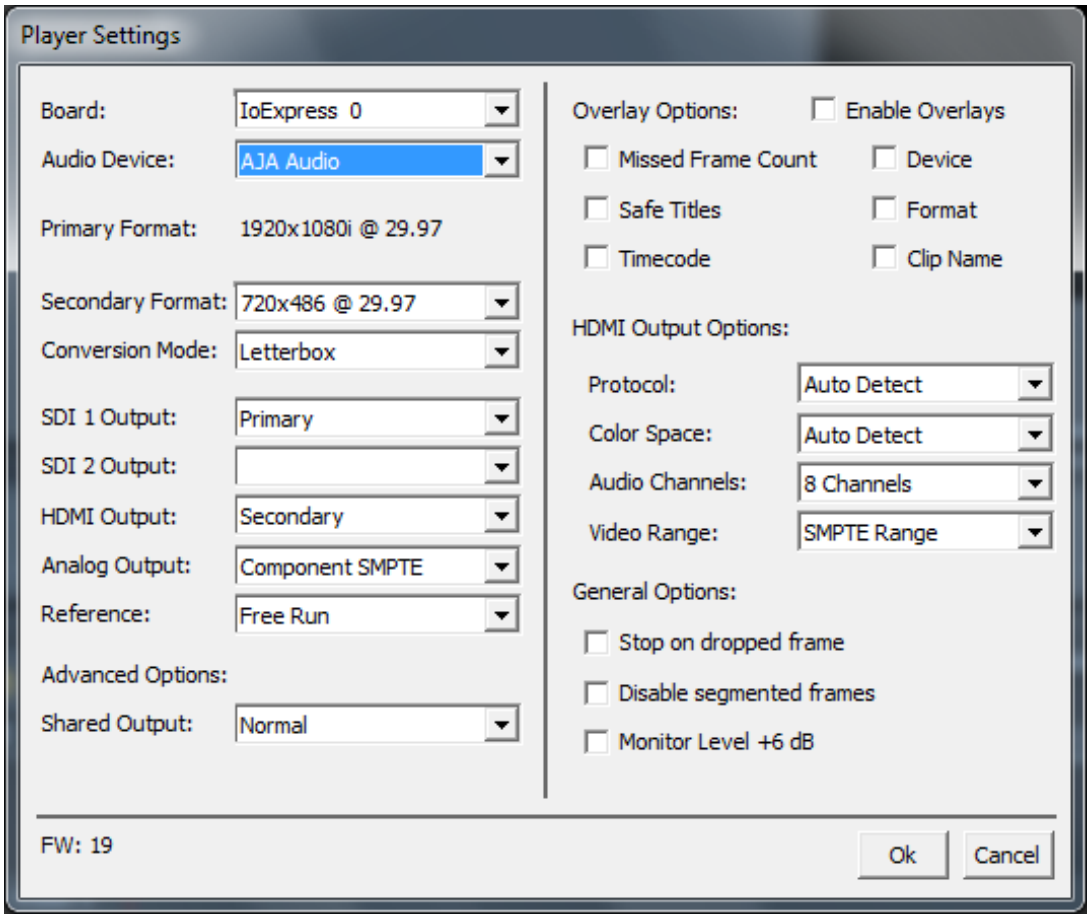
Audio Tracks

Select the number of audio tracks for this project, Io Express supports up to eight embedded audio tracks (four stereo pairs). Adobe Premiere Pro CS5 supports six channels.

Io Express Playback Options

Playback settings are accessed on the Player Settings panel and in Premiere Pro Preferences.

To access the Player Settings panel go to: Sequence>Sequence Settings and click Playback Settings or access them from the flyout menu at the top-right corner of your project window.



Player Settings Panel

Note: Primary Format, SDI and HDMI Outputs are always the same as set in the Sequence Capture Options panel. Refer to the Capture Options section.

Audio Device

Select "AJA Audio" to output your project audio through the Io Express. To complete audio setup refer to **Options Set in Premiere Pro Preferences** following.

Analog Output

Analog Output Options Supported by Io Express include:

- Composite + Y/C
- Component (SMPTE/EBU N10)
- Component (Beta)

Reference:

Select a source for the video reference signal:

- Free Run (none)
- SDI Input
- Reference Input (LTC/Ref connector)
- HDMI Input

Overlay Options

Enable and select overlay information to be included in the playback by checking the appropriate boxes. These overlay controls allow you to insert a graphic file supporting alpha channel transparency to apply an effect or insert a bug (logo) over the video content.

HDMI Output Options

HDMI video output offers these options:

- Protocol – choose Auto Detect, HDMI, or DVI
- Color Space – select Auto Detect or YCbCr 10bit (Io Express does not support RGB)
- Audio Channels – choose 8 or 2 to be embedded
- Video Range – select SMPTE or Full Range

Options Set in Premiere Pro Preferences

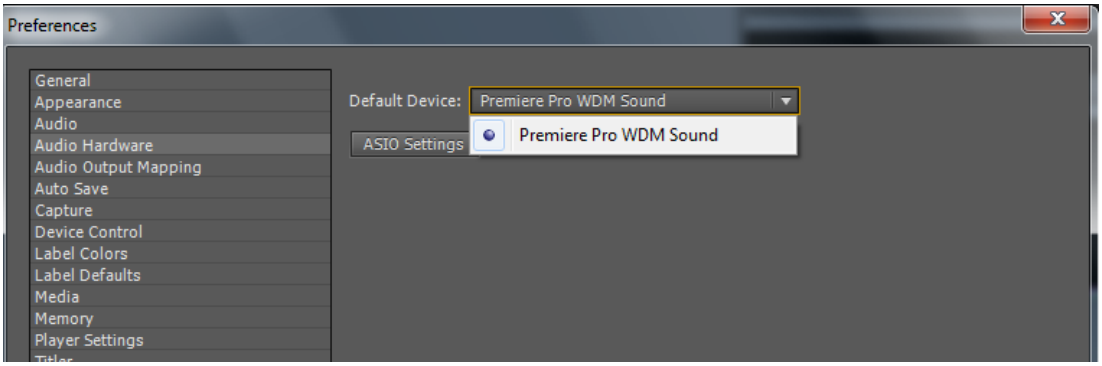
Some settings that determine both capture and playback characteristics for Io Express are accessed through Premiere Pro Preferences.

In Adobe Premiere Pro CS5 Preferences (under Edit>Preferences) you can set up global (default) settings for:

- Audio Hardware
- Device Control

Audio Hardware

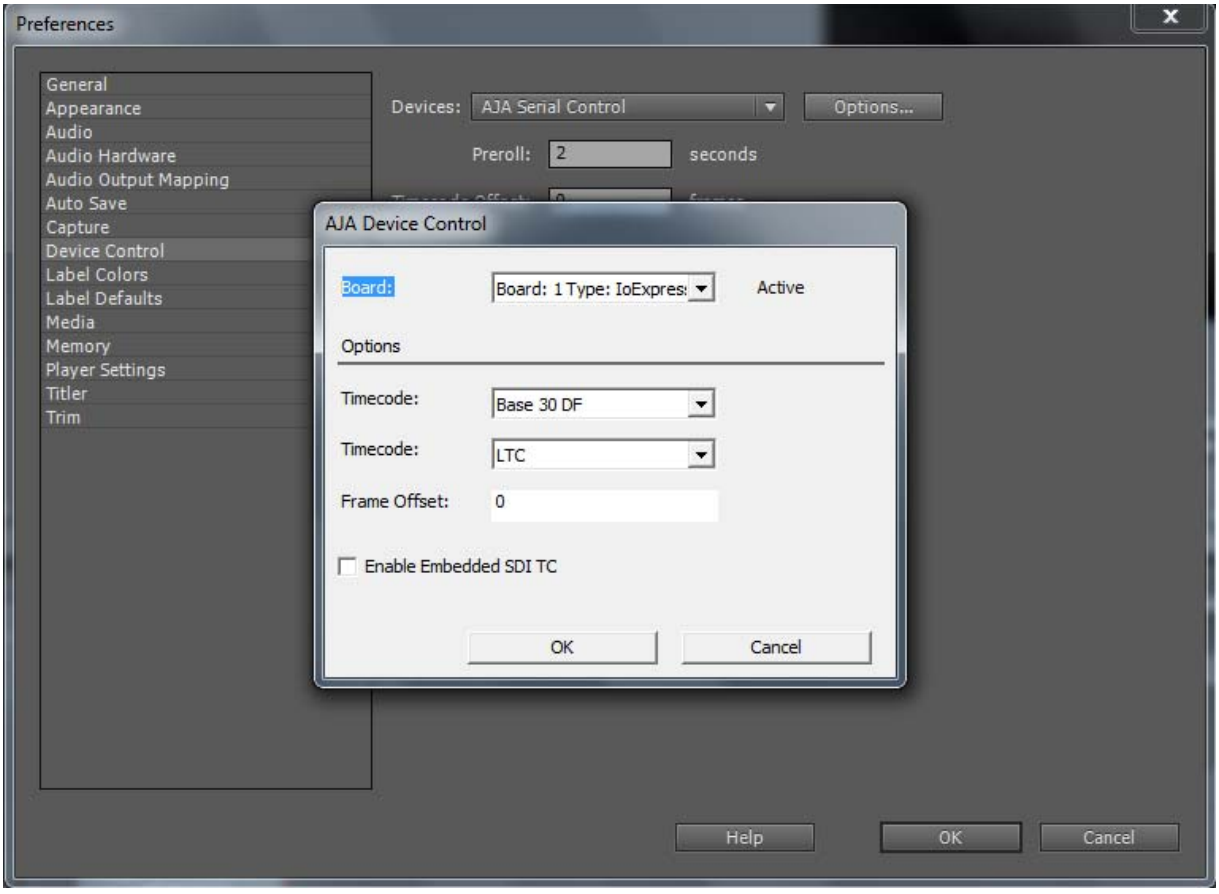
Select “Premiere Pro WDM Sound” from the pull-down menu for your audio hardware.



Audio Hardware Preferences

Device Control

Device Control Options are settings for the RS-422 machine control interface on Io Express. Always us the AJA Serial Control and the Io Express RS-422 port for Io Express capture



Edit>Preferences>Device Control>Options

Enter the desired value for:

Preroll – 0 to 15; the number of frames required to start the source machine before capture.

Timecode Offset – -30 to +30; timecode adjustment (in frames) forward or back to compensate for discrepancies between the source's burned-in timecode and that of the captured sequence.

Click on the Options button to pull up the AJA Device Control window.

Timecode Format – Use this pull-down to select the timecode base supported by your VTR.

- Base 24
- Base 25
- Base 25 NDF (50 frames per second)
- Base 30 DF (30 frames per second)
- Base 30 NDF (30 frames per second)
- Base 30 DF (60 frames per second)
- Base 30 NDF (60 frames per second)

The timecode format is used for both monitoring the RP-188 timecode embedded in the digital data stream and for selecting a timecode offset (if required) for the attached VTR (connected to Io Express's RS-422 port).

Timecode Source

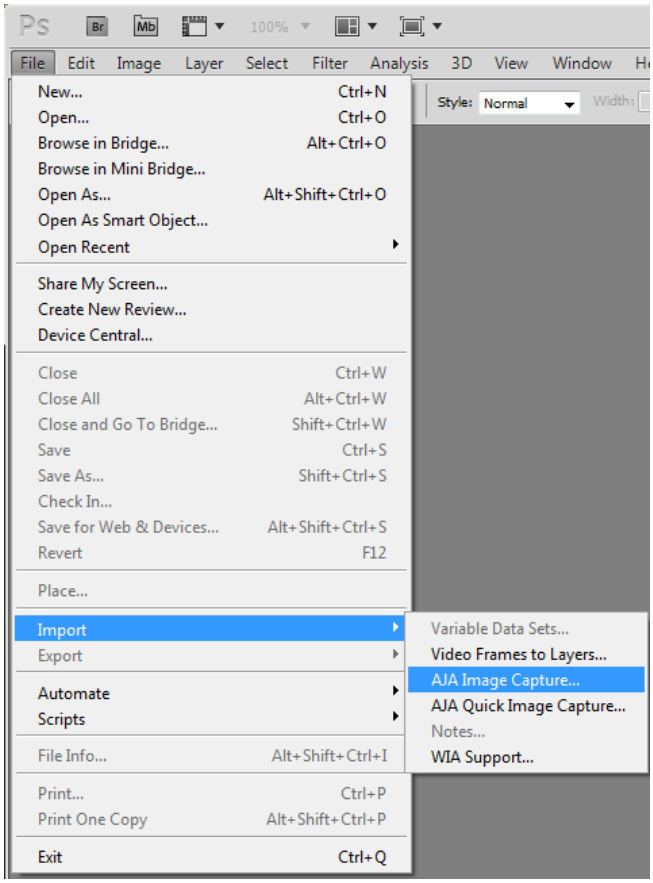
Choose between a separate-channel Longitudinal Timecode (LTC) or Vertical Interval Timecode (VITC) transported in the video signal's vertical interval or include both (LTC + VITC).

Using Photoshop CS5

Adobe Photoshop CS5 (not included with Io Express) accepts Io Express plugins and drivers to closely integrate Io Express functions into the application. After you install the Io Express software on your workstation, all you need to do to begin using it is to become familiar with the Plugins and how Photoshop works with Io Express.

With Photoshop open, you'll go to the File pull-down menu and select Import>AJA Capture to set up your workflow, source device control, and other Io Express options. Then access Export>AJA Preview Setup to configure the preview output to your monitor. Quick capture and simple send-to-preview functions are also available in these menus.

The manual you are reading does not provide operational information for Adobe Photoshop CS5. Please read the Photoshop user documentation provided with the application for information on configuration and operation. The chapter you are reading addresses configuration and setup unique to use of Io Express with Adobe Photoshop CS5.



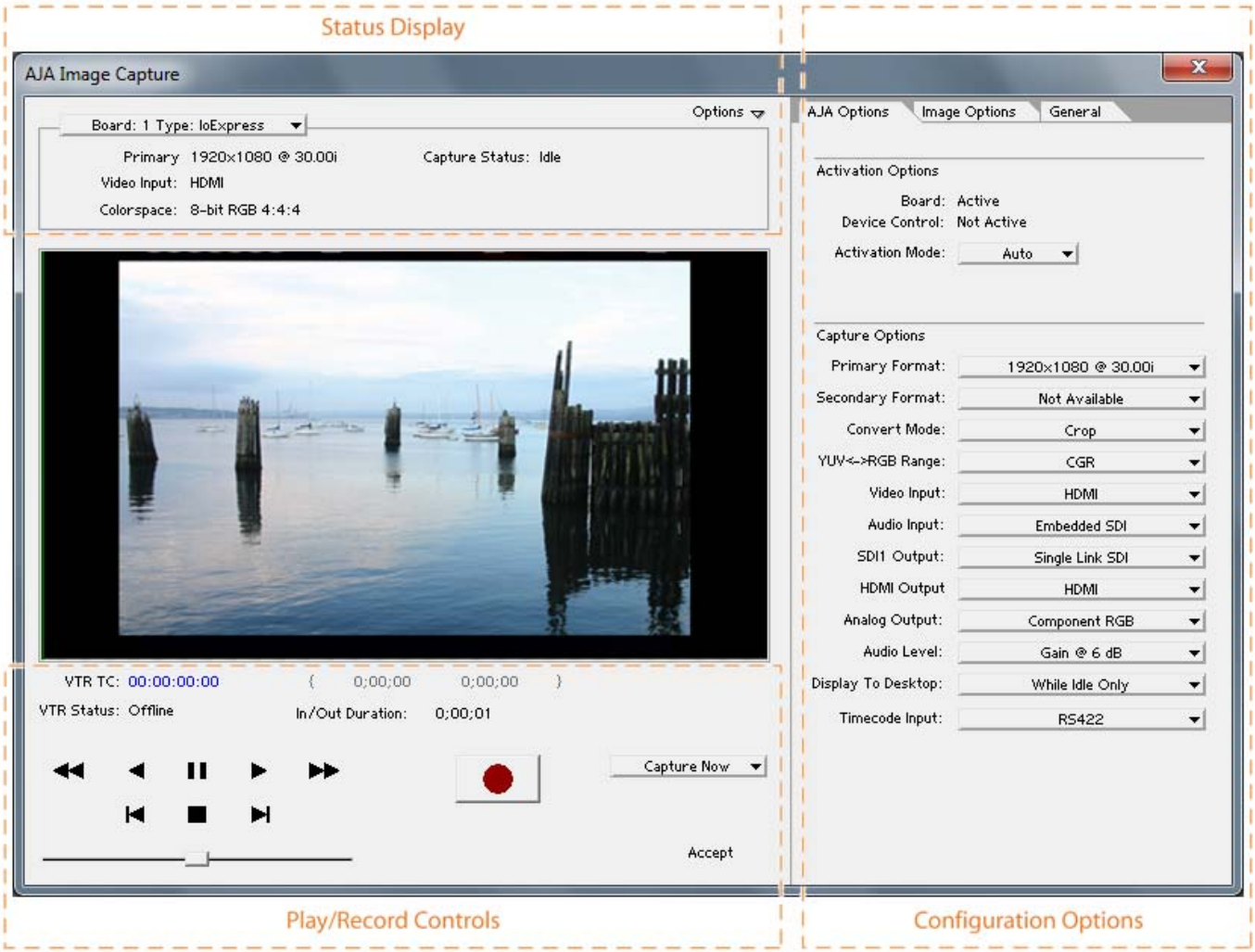
AJA Image Capture in Photoshop File>Import Menus

The Io Express Photoshop plugin is a software application that is integrated into the Photoshop CS5 application and is accessed under the File menu. The Capture plugin provides you with standard tapedeck style play/record functions, status display, and configuration options. The Preview plugin allows you to adjust output formats and view your current project frame on a monitor connected to a Io Express output before rendering to file.

In this section, you will read about the various pull-down options, hot-text entry fields, and play/record controls and how they interact.

Note: The specific options available to you are determined by the AJA capture device that is installed in your workstation and you are currently controlling. This section will describe all options for the Photoshop plugin when used with Io Express.

There are three functional areas in the Capture screen as indicated in the following illustration—Status Display, Play/Record Controls, and Configuration Options.



Io Express Photoshop Capture Plugin Layout

The **Status Display** area is read-only information about configuration, current status, and performance.

The **Play/Record Controls** offer standard tapedeck controls and more. The hot-text fields beneath the video display are for writing and reading timing data. Capture mode will determine which fields are operational.

Note: Capture Play controls are RS422 machine controls for running a VTR tape deck with timecode data.

The Configuration Options section contains tabbed menu selections that provide:

KONA Options – Io Express workflow configuration options

Image Options – Image formatting colorspace, frame, and crop information

If you don't see the Configuration Options section, click on the Options triangle switch above the Status Display. In normal operation, you may decide to hide this section when it is not needed.

File>Import>AJA Image Capture

Basic Plugin Operations and Configuration

This sections discusses settings that are common across plugin windows and how they interact.

Activation Mode

A Io Express plugin can be set for Automatic or Manual activation using the Activation Mode pull-down menu. Automatic is the default setting and is recommended for normal operation. In this mode, you merely click between the open plugins to make one active.

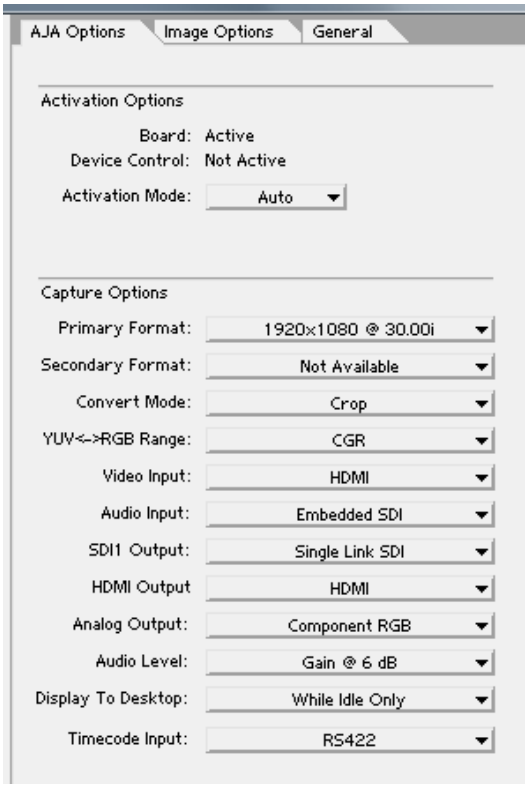
Note: Only one plugin window can have control of the AJA capture device at a time. If the window you click on does not access the Io Express (reporting Board: Active), either another window is still processing operations or it is set in Manual activation mode and must be disabled (check-box empty).

In Manual mode, you must check the Enable XENA box to activate the board control and un-check it to release control. Upon startup of the Photoshop CS5 application, if the launched plugin window is in Manual mode, the window will NOT activate until the enable box is clicked again.

The Preview plugin does not need activation since it grabs only one frame (the current working frame) at a time for output to the monitor. It grabs the data on a priority basis when it can or it is off.

Using the AJA Capture Plugin

First, activate the Io Express from the Capture window and set up your workflow by defining Input and Output formats and timing options. To do this, click on the XENA Options tab. (Io Express stores the workflow settings you make until they are next changed.) Next, access the Image Options tab to set colorspace and framing options and make Alpha Channel (for RGBA scanned-in images) and image crop settings if required. Finally, use the General Options menu to set timecode and other machine control options.



AJA Options Menu

Activation Options

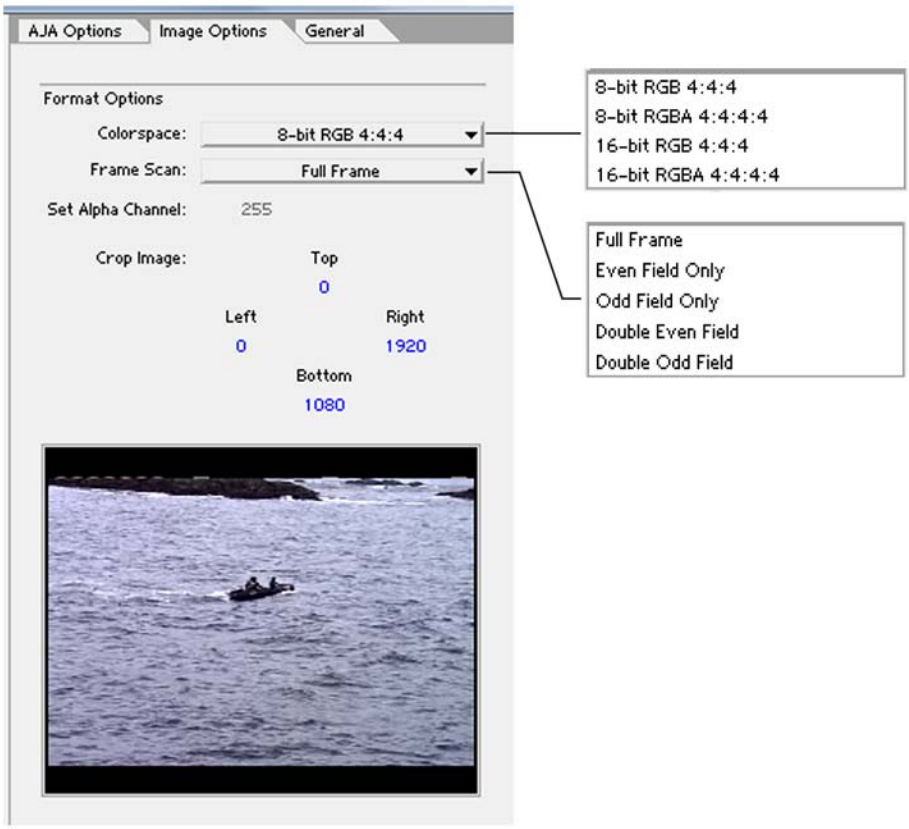
For Activation Options details, see Basic Plugin Operations and Configuration.

Capture Options

Capture Options are the same as described previously for Premiere Pro.

Image Options Menu

After configuring XENA Options, select the Image Options tab. In the Image Options menu there are four configuration settings—Colorspace, Frame Scan, Set Alpha Channel, and Crop Image.



Photoshop Plugin Image Options Tab

Note: You can enlarge the thumbnail capture image to full-screen by double-clicking on the image. To return, double-click again.

Colorspace – Io Express does not support colorspace conversion.

Frame Scan – Work with a Full Frame or capture Even or Odd fields only in single or double modes.

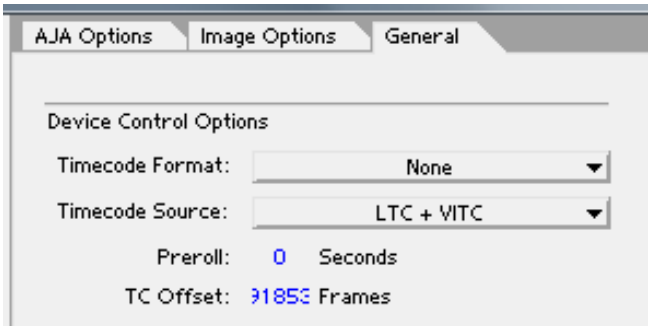
Set Alpha Channel – The Alpha channel image applies only to RGBA scanned-in images and then you can set it to 255 (default) which is zero transparency or 0 which is 100 percent transparency when the image is imported into Photoshop.

Crop Image – Use the hot text fields to enter value for pixels cropped from Top, Left, Right, and Bottom of the captured image. When you import (Accept) the image into Photoshop, it will be cropped to these specifications.

General Options Menu

Under the General tab, you will find Device Control Options. These functions are for the RS-422 machine control interface on Io Express. They support Print-to-Tape machine control.

See Device Control options in the Premiere Pro section.



General Options Tab

Status Display

If you have more than one AJA capture device installed in your workstation, you can select another device to work with by using the Board pull-down menu at the top. If they are set for Auto Activation and are idle (not processing), you will immediately take control of the new Board (see Basic Plugin Operations and Configuration).

Photoshop Capture Window Status Display

The Status Display section of the Photoshop Capture plugin, in the left column, reports the settings that you have selected for the Io Express to use when you have control of it:

- Primary Format
- Video Input type
- Selected Colorspace

In the right column Capture Status reports the detected signal status of the Io Express input:

Off Line – the capture plugin does not control the Io Express
Idle – Ready, the plugin has control and the proper input signal is present
Video Input Not Detected – no input present

Play/Record Controls

Standard tape deck icons provide hot buttons for the Play/Record RS-422 machine control of a source VTR. They are:

Rewind (8x)	Fast Forward (8x)
Reverse Play	Reverse 1 frame
Still	Stop
Play (1x)	Forward 1 frame

The slider on the bottom is a variable speed forward/reverse control. Positions from left to right are: (Reverse) 16x, 8x, 4x, 2x, 1/2, 1/4, Still, (Forward) 1/4, 1/2, 2x, 4x, 8x, and 16x. The red Record button is used to initiate a capture.

Photoshop Capture Window Play/Record Controls

The pull-down menu on the right enables one of two capture modes:

- Capture Now – manual record/stop ("crash") capture
- Capture In/Out – initiate a capture using timecode-based in or out settings

The selected mode will activate the appropriate hot text for that mode. Clicking the hot text brings up and entry field (hours:minutes:seconds:frames). The upper left display indicates the current timecode from the VTR.

Capture In/Out – Enter a timecode Capture point by clicking on either the left field or right field of eight digits in the bracketed fields above the In/Out Duration field. Since Photoshop capture is a single-frame function, the In and Out settings will always be the same and the frame duration will always be one frame.

Note: The in-point/out-point field values are inclusive. When both are set to the same value, the capture duration will be 1 frame.

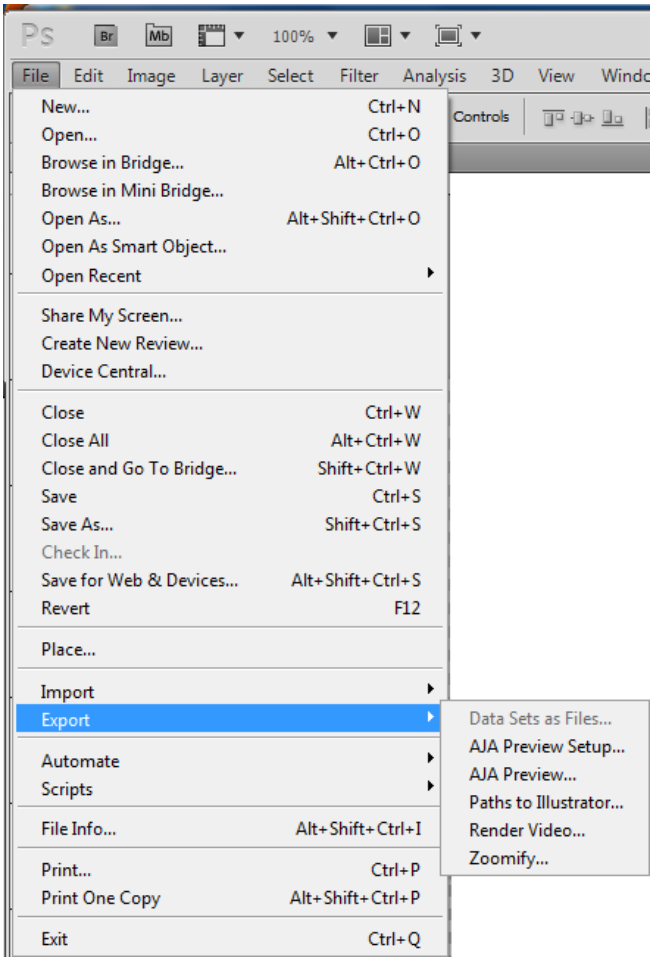
To load the current VTR timecode setting in either field (in-point or out-point) click on the bracket ({ or }) next to the field.

VTR TC – The VTR timecode field displays the current machine timecode and you can click on it to roll the VTR to another frame setting. The VTR must be online and in remote rather than local control mode (as reported in the **VTR Status** field.)

Accept – When you have successfully captured the frame you wish to use in Photoshop, Click on Accept in the bottom right corner of the Play/Record pane. The Io Express capture plugin will close and your frame will be opened in Photoshop for editing.

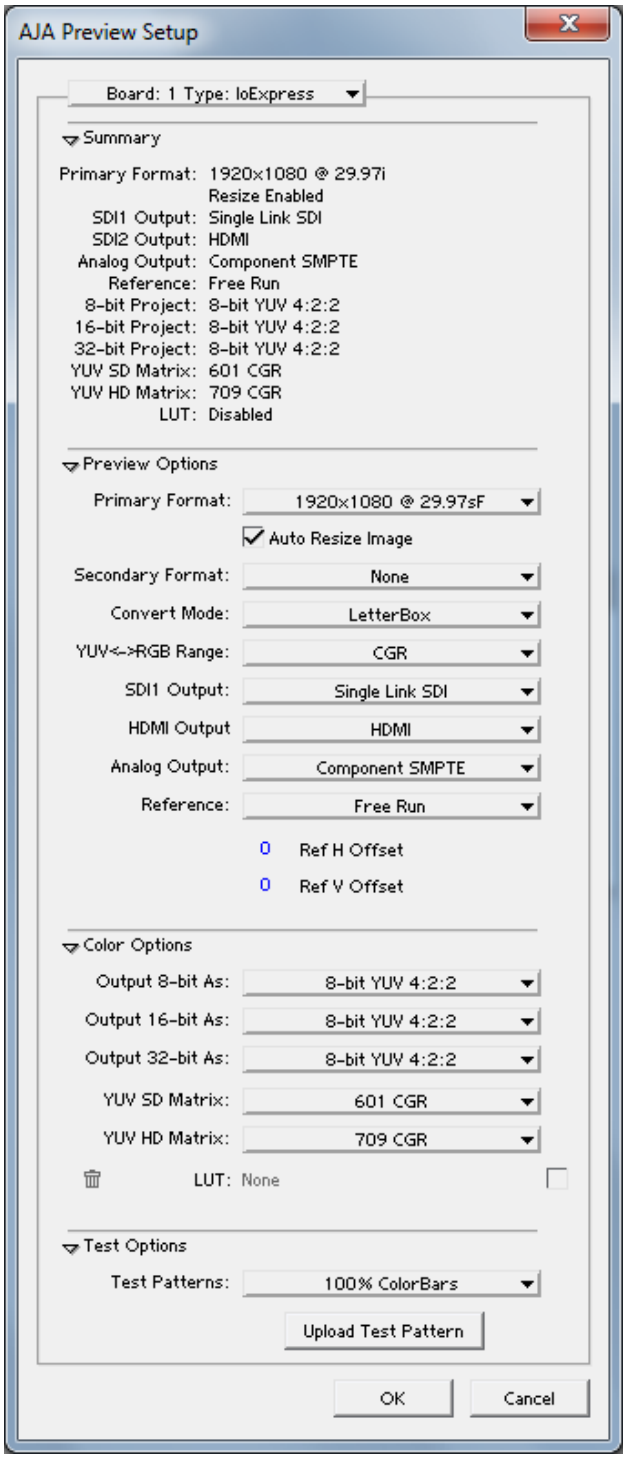
Using the AJA Preview Plugin

The Preview Plugin allows you to view on a monitor the current frame you are working on in Photoshop CS5. Go to File>Export>AJA Preview Setup to configure previews. When you have Preview Setup the way you want it, subsequent Previews are output by selecting AJA Preview (below AJA Preview Setup).



AJA Export Plugins for Photoshop

The pull-down menu at the top allows you to select any AJA capture device you have installed in your workstation (subject to Activation rules). A check box is provided to enable/disable the Preview function.



AJA Preview Setup Menu for Photoshop

The **Summary** section reports current configuration settings.

In **Preview Options**, Primary format is the current format you are using for your project.Io Express does not support conversion so the Secondary signal format and Convert mode are inactive. One SDI output is available and it is always Single Link. Select Analog output type (as applicable), and select timing Reference mode—Free Run, External (genlock), or from the video Input signal (SDI or HDMI).

In **Color Options**, Io Express does not support colorspace conversion so this function is inactive.

Finally, for picture quality adjustment, you can output a Test Pattern selection using the pull-down menu under **Test Options**. Click OK to output your Preview

Using After Effects

Io Express After Effects CS5 Plugin Overview

Io Express After Effects CS5 plugins add Io Express functions to the After Effects CS5 application. Three Io Express plugin screens are accessed under the ***Window*** pulldown menu:

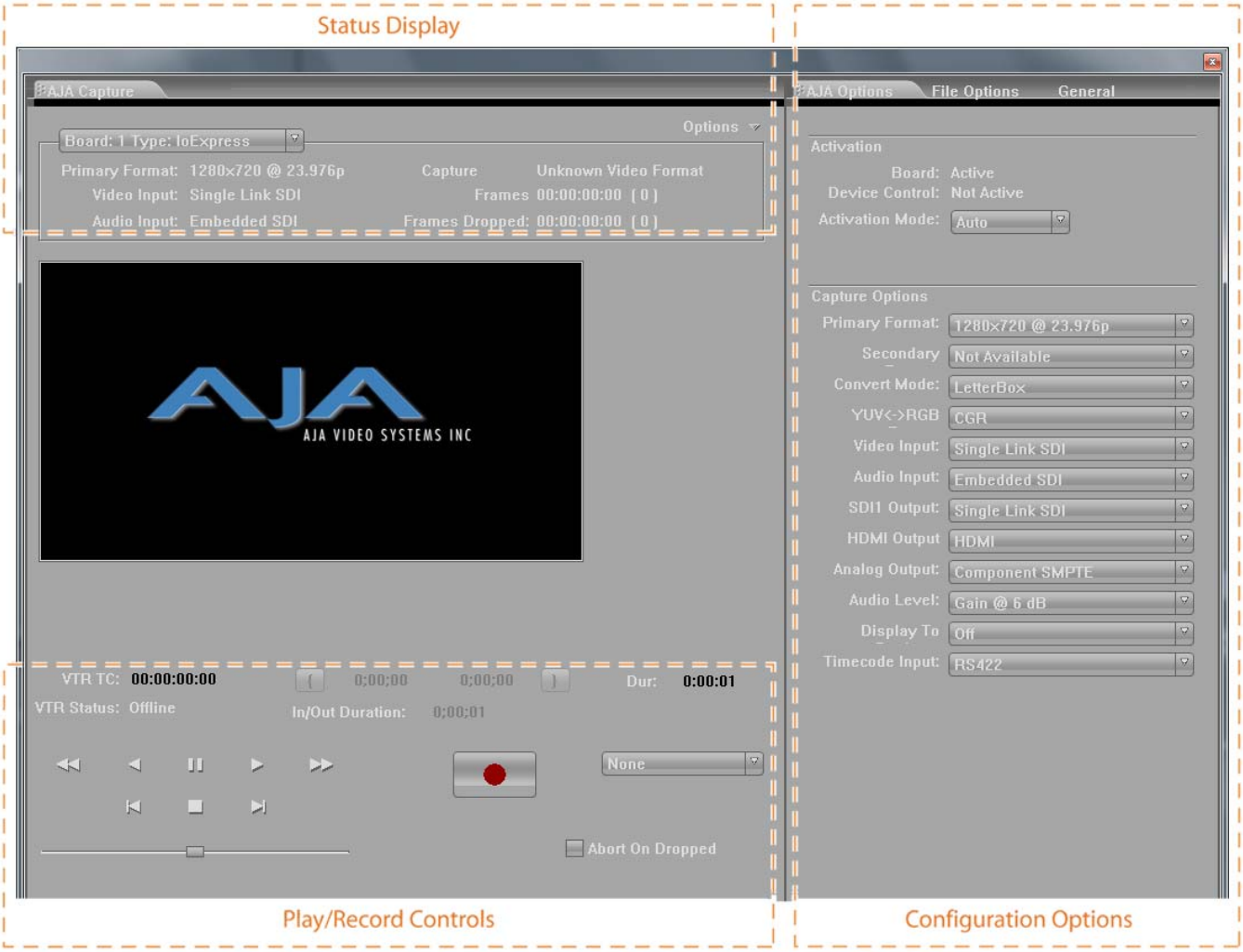
- AJA Capture
- AJA Playback
- AJA Preview

The Capture and Playback plugin screens allow you to see and edit how the Io Express workflow is currently configured for recording, storage, and playback of your video and audio data. They provide you with standard tapedeck style play/record functions, status display, and configuration options. The Preview plugin allows you to view the current frame of your working timeline in various formats on a monitor connected to a Io Express output.

In this section, you will read about the various pull-down options, hot-text entry fields, and play/record controls and how they interact.

Note: The specific options available to you are determined by the currently active AJA capture device installed in your workstation. This section will describe all possible options for Io Express.

There are three functional areas in both the Capture and the Playback screen as indicated in the following illustration (AJA Capture plugin screen is shown): Status Display, Play/Record Controls, and Configuration Options.



Io Express After Effects CS5 Plugin Layout

The **Status Display** area is read-only information about configuration, current status, and performance.

The **Play/Record Controls** offer standard tapedeck controls and more. Hot-text fields are at the top for writing and reading timing data (Capture plugin only). Capture mode will determine which fields are operational.

Note: Capture Play controls are RS422 machine controls for running a VTR tape deck. Playback controls are for Io Express playout functions.

The **Configurations Options** section contains tabbed menu selections that provide:

- XENA Options – Io Express workflow configuration options
- File Options – File path and formatting information, and
- General – General options (for machine control interface).

If you don't see the Configuration Options section, click on the Options triangle switch above the Status Display. In normal operation, you may decide to hide this section when it is not needed.

Basic Plugin Operations and Configuration

This section discusses settings common across plugin windows and how they interact.

Activation Mode

A Io Express plugin can be set for Automatic or Manual activation using the Activation Mode pull-down menu. Automatic is the default setting and is recommended for normal operation. In this mode, you merely click between the open plugins to make one active.

Note: Only one plugin window can have control of the Io Express at a time. If the window you click on does not access the card (reporting Board: Active), either another window is still processing operations or it is set in Manual activation mode and must be disabled (check box blanked).

In Manual mode, you must check the Enable XENA box to activate Io Express control and un-check it to release control. Upon startup of the After Effects CS5 application, if the launched plugin window is in Manual mode, the window will NOT activate until the enable box is clicked again.

The Preview plugin does not need activation since it grabs only one frame (the current working frame) at a time for output to the monitor. It grabs the data on a priority basis when it can or else it is turned off.

After Effects CS5 and Preview Note

Double clicking on a captured Project File in the project bin will sometimes open the file in an After Effects CS5 player which can be previewed. Some formats will result in the file opening in a third-party viewer (QuickTime for example)—but the file cannot be previewed in that viewer.

Shortcuts and Display Features

Keyboard Shortcuts

Space Bar – Use it to start and stop playback of media. Pressing the Space Bar starts playback from the location of the Edit Line.

I key – press to set an In-point when trimming a clip.

J key – press to shuttle backward through the clip. Press repeatedly to move at a faster rate (2x, 4x, etc.).

K key – press to stop playback at the current position.

L key – press to shuttle forward through the clip. Press repeatedly to move at a faster rate (2x, 4x, etc.).

O key – press to set an Out-point when trimming a clip in After Effects.

Left Arrow key (<-) – press to move one frame backward.

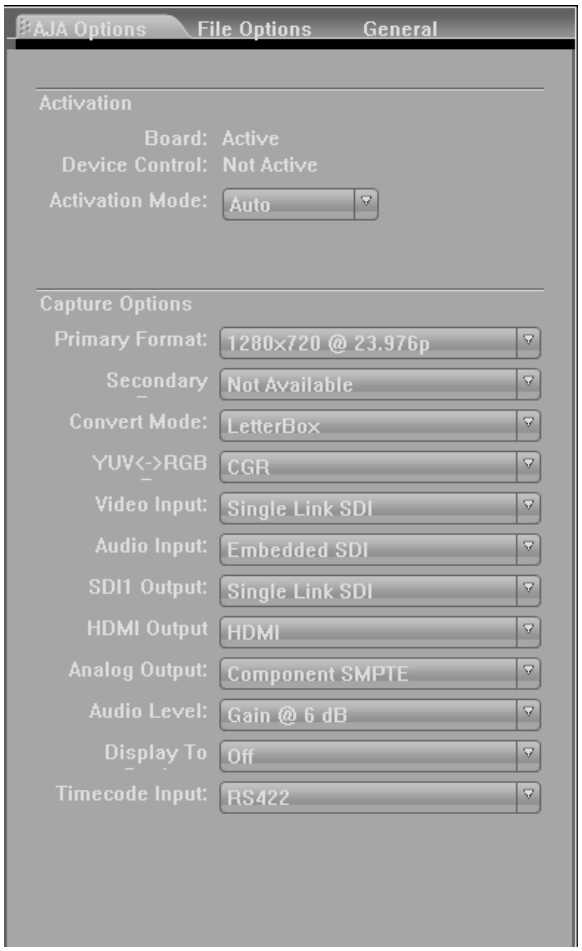
Right Arrow key (->) – press to move one frame forward.

Up Arrow key – press to start playback (forward).

Down Arrow key – press to start playback backward.

Using the AJA Capture Plugin

To begin using Io Express in After Effects CS5, go to the Capture window (*Window->AJA Capture*), ensure that Io Express is activated (look under the *Xena Options* tab), and then set up your workflow by defining Input and Output formats and timing options. Io Express remembers the workflow settings you make. Next, access the *File Options* tab to name the capture file, set file options, and set up the path to your file storage directory. Under the *General* options tab you can set Device Control timecode options.



Io Express Capture Options Menu

Activation Options

For Activation Options details, see Basic Plugin Operations and Configuration.

Capture Options

Under Capture Options you select the appropriate formats and settings for your After Effects CS5 workflow.

For details on the following, refer to Capture Options described for Premiere Pro previously:

- Primary and Secondary Format Options
- YUV<->RGB Range
- Video Input
- Audio Input
- SDI Output 1
- Analog Output
- Audio Level
- Display to Desktop
- Timecode Input

File Options Menu

After configuring XENA Options, select the File Options tab. In the File Options tabbed menu there are three operation panes below: *File Options*, *Clip Options* and *Location Options*.

File Options Menu

In the File Options pane you will select the capture file type, capture content (video/audio), video format, audio format and the number of audio tracks included.

Type The Type pull-down menu provides a choice of video/audio file formats:

QuickTime Movie•	TGA Sequence
AVI Movie (not supported in Mac)	BMP Sequence
TIF Sequence	YUV Sequence (8-bit only)

Capture Use the Capture pull-down menu to select the video/audio input combination you will capture:

Video Only
Audio Only
Video - (minus) Audio – video and audio are recorded in separate files
Video + (plus) Audio (QuickTime only) – video and audio are recorded in the same file

Note: The options shown are determined by the file format selected. QuickTime captured audio is either embedded with the video file or captured to separate .mov files. All other formats capture audio to Wave Files.

Video Format Video Capture Formats supported by Io Express include:

8-bit YUV 4:2:2 – '2vuy'
8-bit YUV 4:2:2 – '2Vuy'
10-bit YUV 4:2:2 – 'v210'

Audio Format Audio Capture Formats supported by Io Express include:.

- 48 kHz 16-bit PCM Mono
- 48 kHz 16-bit PCM Stereo
- 48 kHz 24-bit PCM Mono
- 48 kHz 24-bit PCM Stereo
- 48 kHz 32-bit PCM Mono
- 48 kHz 32-bit PCM Stereo

Audio Tracks Select the number of audio tracks for this project.

Clip Options

Clip Name In the Clip Options menu, click on the Clip Name hot-text to name the file you will be creating. Subsequent capture file numbers will increment from this one.

Reel Name Click on the hot-text field to enter a source tape name (the name of the tape on the VTR). Only QuickTime and DPX files store this information.

Sequence Offset When capturing file-per-frame sequences, after naming a file, you can set a Sequence Offset number that will determine the beginning number of the file sequence.

Create New Folder Per Sequence A check-box is provided to enable this automatic function. When you check this selection, After Effects CS5 will gather each frame capture sequence in a new folder, based on clip names, on your disk. (Not applicable to QuickTime or AVI movie files.)

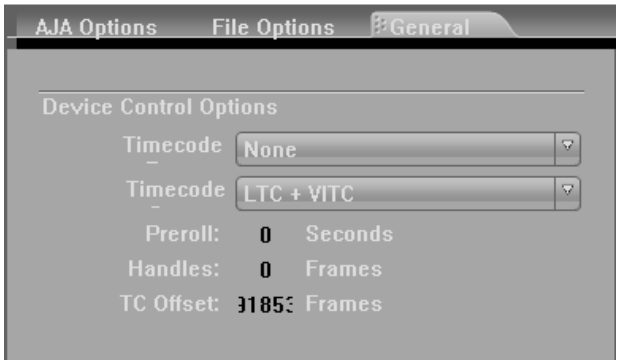
Import Clip After Capture This function imports the completed capture file into After Effects CS5 Project window.

Location Options In the Location Options pane, enter the path to the RAID location you have dedicated for Video and Audio captures.

After XENA and File Options are configured, you are ready to perform your video/motion graphics capture.

General Menu – Device Control Options

Under the General menu you will find settings for Device Control Options.



Device Control (RS-422) Settings

Device Control Options are settings for the RS-422 machine control interface on the Io Express. The timecode format is used for both monitoring the RP-188 timecode embedded in the digital data stream and for selecting a timecode offset (if required) for the attached VTR (connected to the Io Express RS-422 port).

Timecode Format Use this pull-down to select the timecode base supported by your VTR.

- Base 24
- Base 25
- Base 25 (50 frames per second)
- Base 30 DF (drop-frame, 30 frames per second)
- Base 30 NDF (non-drop-frame, 30 frames per second)
- Base 30 DF (drop-frame, 60 frames per second)
- Base 30 NDF (non-drop-frame, 60 frames per second)

Timecode Source Choose between a separate-channel Longitudinal Timecode (LTC) or Vertical Interval Timecode (VITC) transported in the video signal's vertical interval or include both (LTC + VITC).

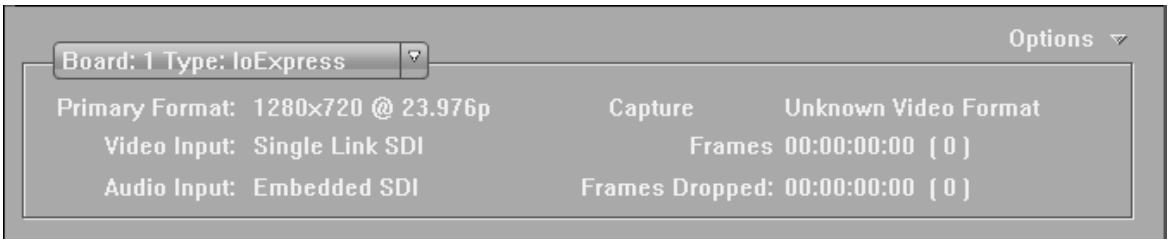
Click on the Hot-text items to enter a value for:

- Preroll – 0 to 15; the number of frames required to start the source machine before capture
- Handles – 0 to 60; the number of frames added to the front and back of a sequence for editing flexibility
- Timecode Offset – -30 to +30; timecode adjustment (in frames) forward or back to compensate for discrepancies between the source's burned-in timecode and the captured sequence.

Status Display

The Status Display section of the AJA Capture plugin, in the left column, reports the settings that you have selected for the Io Express to use when you have control of it:

- Primary Format
- Video Input type
- Audio Input type



Capture Plugin Status Display

- In the right column you will see current information for:
- Capture Status
- Number of frames successfully captured
- Number of frames dropped from the capture sequence

Capture Status reports the detected signal status of the Io Express input:

- Off Line – the capture plugin does not control the Io Express
- Idle – Ready, the plugin has control and the proper input signal is present
- Video Input Not Detected – no input present
- [format of input detected] – if the input is not a match with the chosen input format, the mismatched signal format will be displayed here

Play/Record Controls

Standard tape deck icons provide hot buttons for the Play/Record process. They are:

Rewind (8x)	**Fast Forward (8x)**
Reverse Play	**Reverse 1 frame**
Still	**Stop**
Play (1x)	**Forward 1 frame**

The slider on the bottom is a variable speed forward/reverse control. Positions from left to right are: (Reverse) 16x, 8x, 4x, 2x, 1/2, 1/4, Still, (Forward) 1/4, 1/2, 2x, 4x, 8x, and 16x. The red button is for Record.

Capture Play/Record Controls

The pull-down menu on the right enables one of three capture modes:

- Capture Now – manual record/stop (crash) capture
- Capture Duration – capture a specified number of frames after manual start, based on the timebase of the selected Primary Format
- Capture In/Out – initiate and end capture using timecode-based in and out settings

The selected mode will activate the appropriate hot-text for that mode. Clicking the hot-text brings up and entry field (hours:minutes:seconds:frames). The upper left display indicates the current timecode from the VTR.

Capture In/Out The capture in-point is entered by clicking on the left field of eight digits in the bracketed fields above the In/Out Duration field. The out-point can be set by clicking on the right field of eight digits. Or you can specify a duration in the In/Out Duration field and the in- or out-point (whichever you have not entered) will be entered automatically according to duration.

Note: The in-point/out-point field values are inclusive. If both are set to the same value, the capture duration will be 1 frame.

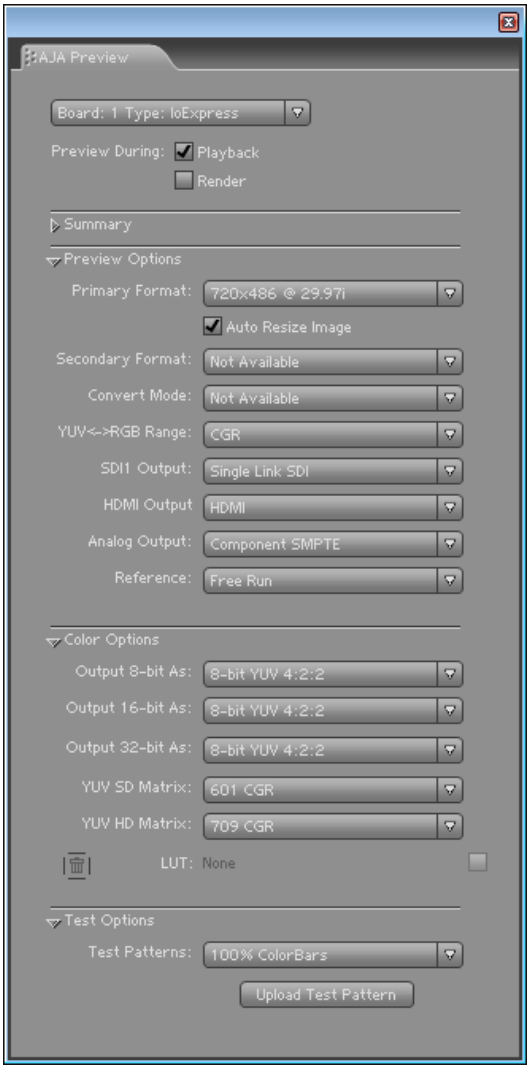
To load the current VTR timecode setting in either field (in-point or out-point) click on the bracket ({ or }) next to the field.

VTR TC The VTR timecode field displays the current machine timecode. You can click on it and enter a timecode to perform a seek to that timecode on the VTR. The VTR must be online and in remote rather than local control mode (as reported in the **VTR Status** field).

Abort on Dropped Frame Found in both Machina and the After Effects CS5 Capture window, this checkbox causes Io Express to watch for dropped frames during a capture—if one is found it automatically halts the capture and discards any media captured to that point.

Using the AJA Preview Plugin

The Preview Plugin allows you to view on a monitor the current frame you are working on in the timeline as it will appear at the Io Express output. A summary area at the top of the Preview window shows how the Io Express is currently configured. If you wish to change it, you can use the *Preview Options* below.



AJA Preview Plugin

In **Preview Options**, you can vary the Primary and Secondary signal formats, Convert mode, YUV to RGB range (see earlier discussion under the AJA Capture Plugin), SDI and Analog output type (as applicable), and select timing Reference mode—Free Run, External (genlock), or from the video Input signal.

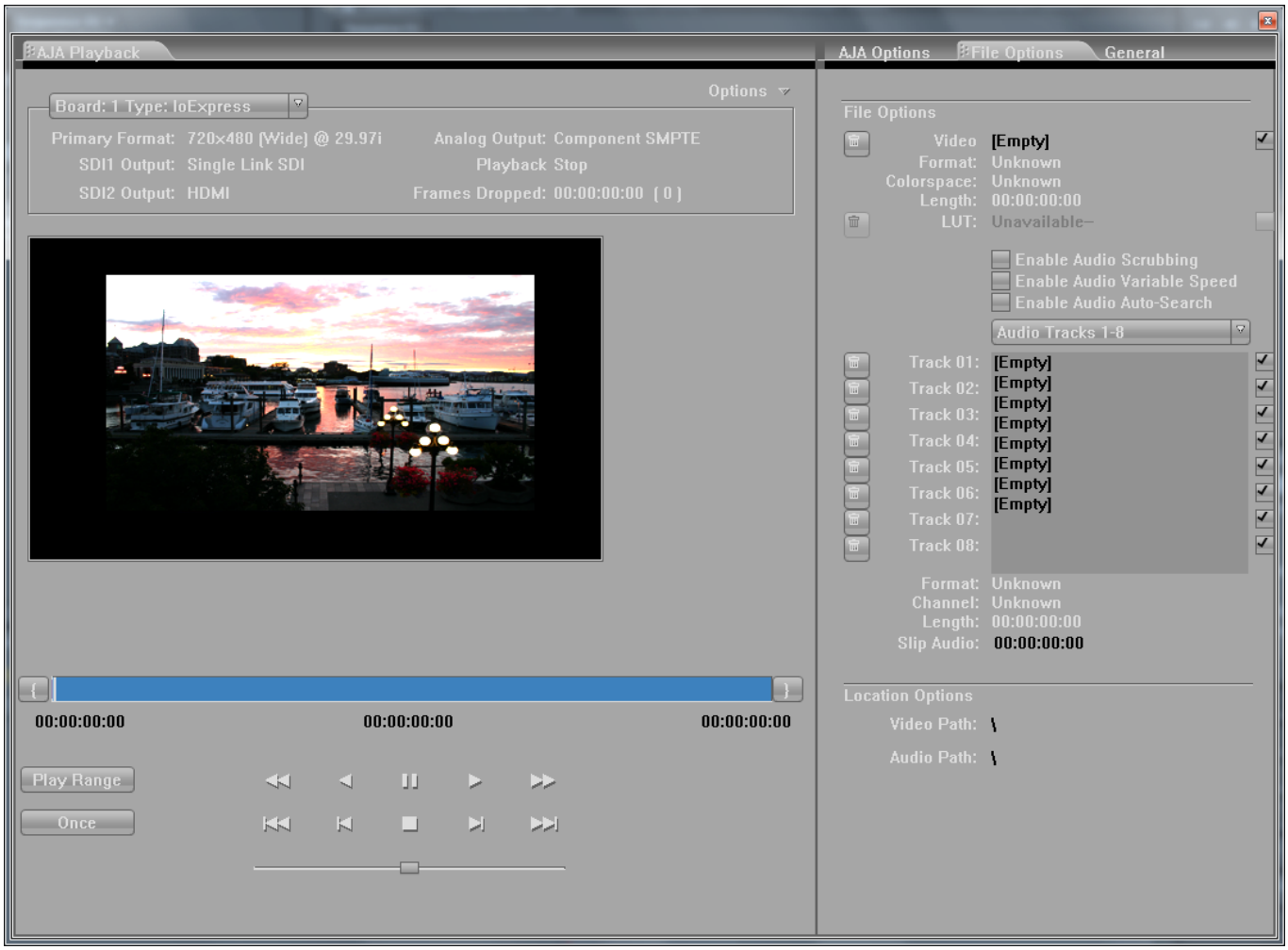
Color Options, Io Express does not currently support colorspace conversion.

You can output a Test Pattern selection using the pull-down menu under **Test Options.**

Using the AJA Playback Plugin

Use the Playback Plugin to view rendered files that are produced from the After Effects CS5 effects timeline. You've previewed your composition, made final adjustments, and rendered it to a movie or sequence. Now you want to view it in real-time.

The Playback Plugin offers the same functional layout as the Capture Plugin—Status Display, Configuration Options, Play Controls but with variations suitable for playback.



Playback File Options

You can load a file (one file only) into your Playback window by simply dragging it from disk or the After Effects CS5 bin to the active Playback window.

File Options

Select the File Options tab to see the file name and path currently pointing to the Video File used for playback. Alternatively, you can click on the path hot-text to select a file, delete it using the trash icon at the left, or turn it on/off using the check-box at the right.

You can select a color Look Up Table by clicking on the LUT hot-text, delete the existing LUT file by clicking on the trash icon, or turn the file on/off in the check-box.

Audio Files Setup – three audio enable check boxes, when checked, allow you to:

- Enable Audio Scrubbing – Audio will play while you move through frames using the scrub bar (see Playback Controls).
- Enable Audio Variable Speed – Audio will play at the same speed the video is played (rather than 1x only).
- Enable Audio Auto-Search – Io Express software will automatically load the Audio Track list with audio files generated with the same name as the selected video file.

Note: When Audio Auto-Search is active, existing file names in the list will be removed or over-written when the Video File is loaded. (Does not affect the audio files.)

You can edit the Audio Track list that is automatically loaded with audio files that have been generated with the same name as the selected video file.

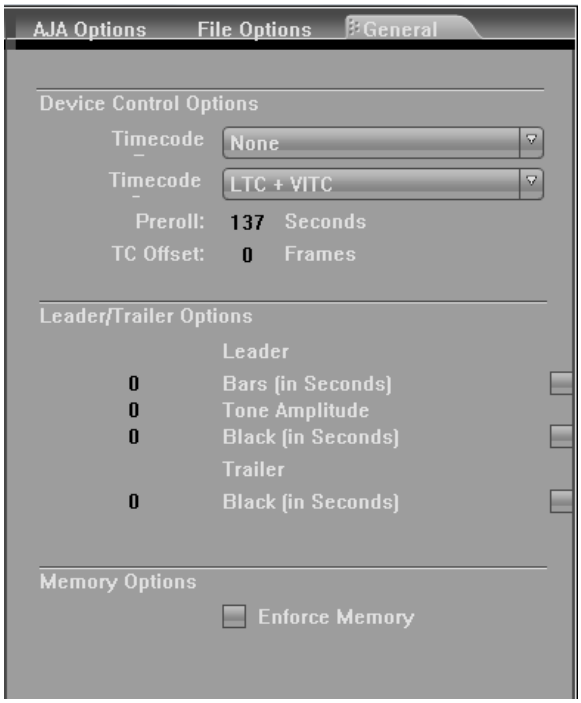
QuickTime embedded audio files are automatically appended with a number and will be loaded numerically into the track list. Click on the trash icon to delete a track. Click on the speaker icon check-box on the right to enable/disable a track. To manually enter audio files, simply double-click on a track in the list.

Format, Channel, and number of frames in the sequence are reported below the list.

Location Options – You can use the Video and Audio path hot-text fields to create a new Playback directory (separate from your capture directory).

Playback General Options

Under the General Options tab, you will find Device Control Options, Leader/Trailer Options, and Memory Options.



Device Control Options

Device Control Options define the RS422 machine control interface on the Io Express. These functions support Print-to-Tape machine control.

Timecode Format – Use this pull-down to select the timecode base supported by your VTR.

- Base 24
- Base 25
- Base 25 (50 frames per second)
- Base 30 DF (drop-frame, 30 frames per second)
- Base 30 NDF (non-drop-frame, 30 frames per second)
- Base 30 DF (drop-frame, 60 frames per second)
- Base 30 NDF (non-drop-frame, 60 frames per second)

Timecode Source – Choose between a separate-channel Longitudinal Timecode (LTC) or Vertical Interval Timecode (VITC) transported in the video signal's vertical interval or include both (LTC + VITC).

Click on the Hot-text items to enter a value for:

- Preroll – 0 to 15; the number of frames required to start the source machine before capture
- Timecode Offset – -30 to +30; timecode adjustment (in frames) forward or back to compensate for discrepancies between the source's burned-in timecode and that of the captured sequence.

Leader/Trailer Options

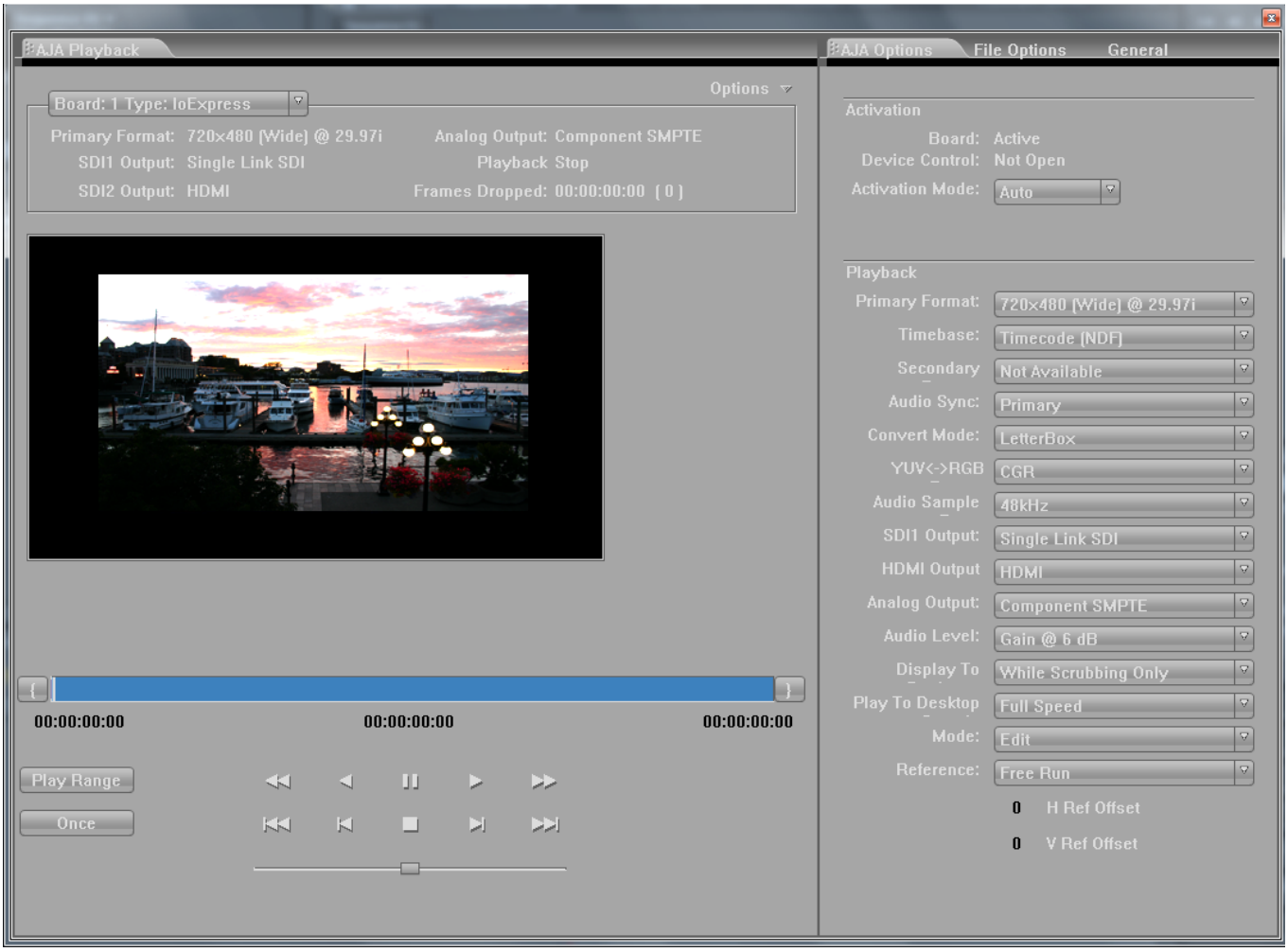
These options allow you to add colorbars, test tone, and black field in a leader to your clip and black field as trailer.

Memory Options

Under Memory Options, always leave Enforce Memory Alignment unchecked. It is for SATA controller use only.

Playback AJA Options

The AJA Options for Playback are much the same as those for Capture. Playback options, however, are for output.



Playback Screen with AJA Options menu

Activation Options

Same as Capture Plugin

Playback Options

Primary Format, YUV-RGB Range, and Output type setting are all the same as those described for the Capture window for Premiere Pro previously.

Use the Timebase pull-down menu to choose between:

- Frames
- Timecode (NDF), non-drop-frame
- Timecode (DF), drop-frame

Audio Level – Choose between +6 dB (US) monitor level and +0 dB (EBU).

Display to Desktop – Select one of four modes of desktop display:

- Off
- While Scrubbing Only (this mode is suggested)
- While Playing Only
- Always

Note: Display to Desktop uses system resources and could affect performance during capture.

Play To Desktop Speed – Use this pull-down menu to set a desktop play speed:

- Full Speed – Every frame is displayed to desktop during playback
- Half Speed – Every other frame is displayed to desktop during playback
- Quarter Speed – one out of every four frames is displayed to the desktop

Half Speed and Quarter Speed will reduce the system load that the Display-To-Desktop is using to draw video to your computer.

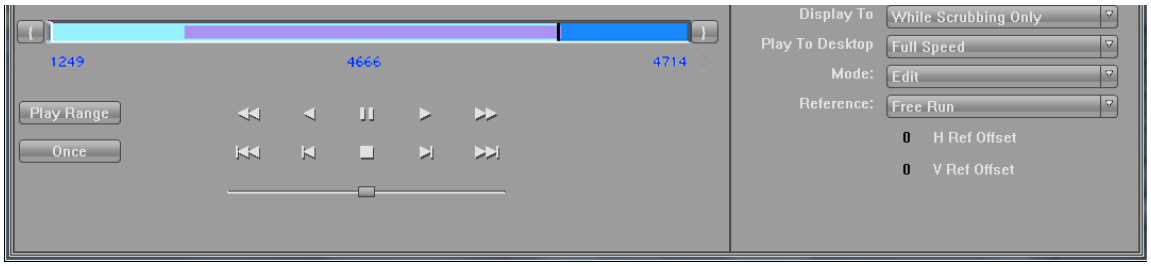
Using the **Reference** pull-down menu, select timing Reference source—Free Run, from External (genlock), or from the video Input signal.

The **Mode** option menu offers types of Playback—Edit or Output. This selection changes the functionality of the Play Controls as described in the next section.

Play Controls

The Mode selection made in XENA Options provides either editing or output functionality in the Play Controls pane and in Output mode you can choose between Print-to-Video or Insert Edit functionality.

Edit Mode The Edit mode display is shown below:



Edit Mode Play Controls and Scrub Bar

Below the video display is a Scrub Bar that allows you to click and drag along the loaded sequence to view individual frames and mark In and Out frames for playback of frame subsets. To set an in-point, click on the left bracket. To set an out-point, click on the right bracket.

Alternatively, you can set an in-point by clicking on the left most hot-text numeral below the bar and enter the desired frame number for an in-point. Similarly, enter the out-point frame by clicking on the right side hot-text numeral.

Note: The "first" or "last" frame may be for the entire sequence or for frames in a in/out-marked subset. In this case, first, last, in, and out frames become "Most Significant Frames." For example, clicking on the Go-to-1st button will move you to the first Most Significant Frame to the left. Clicking on the Go-to-Next button will move you to the first Most Significant Frame to the right.

Immediately under the scrub bar are standard tape deck icons providing hot buttons for the Play process. They are:

Go-to-Previous "Most Significant" frame	**Reverse 1 frame**
Rewind (8x)	**Reverse Play**
Still	**Stop**
Play (1x)	**Fast Forward (8x)**
Forward 1 frame	**Go-to-next "Most Significant" frame**

The slider on the bottom is a variable speed forward/reverse control. Positions from left to right are: (Reverse) 16x, 8x, 4x, 2x, 1/2, 1/4, Still, (Forward) 1/4, 1/2, 2x, 4x, 8x, and 16x.

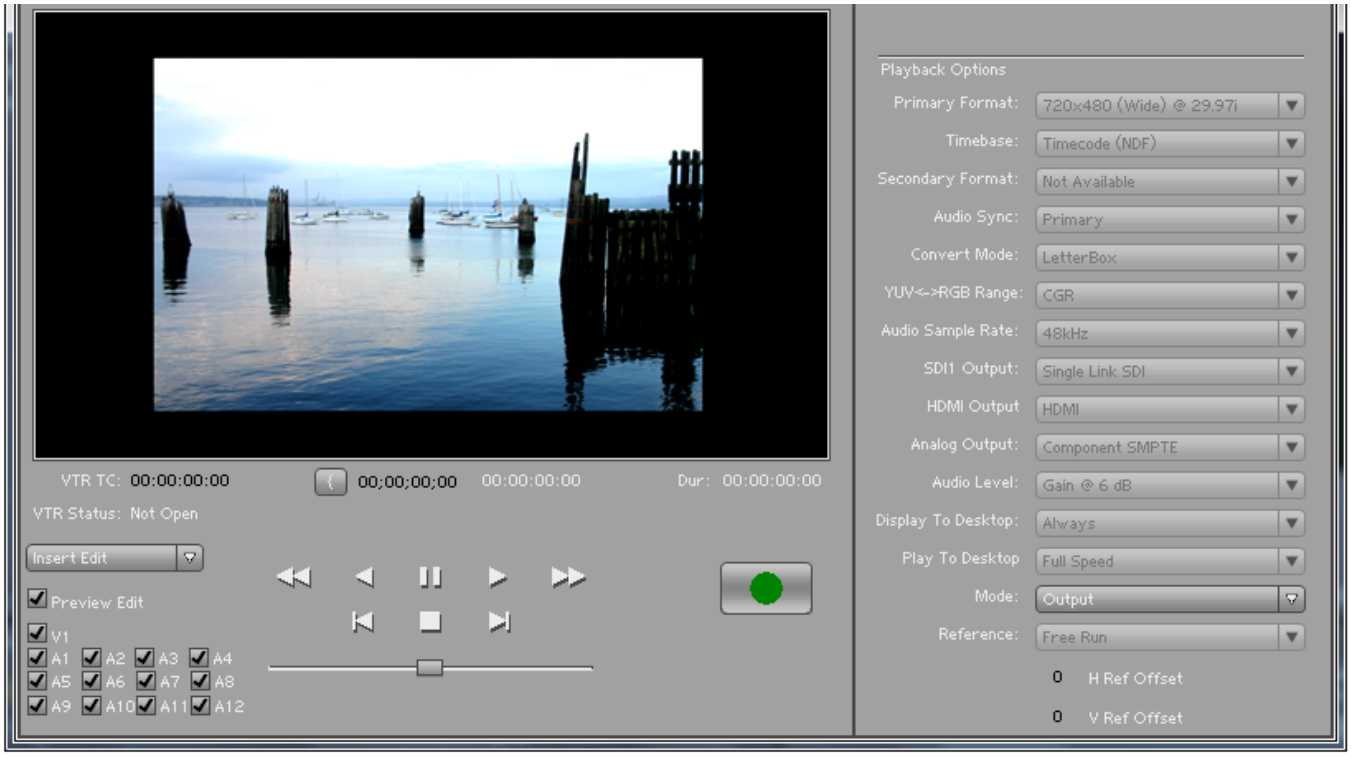
Output Mode Use the Mode pull-down at the bottom of the *Xena Options* tabbed menu to select Output mode.

Note: The Playback Options pane is disabled in this mode to prevent format changes during output.

Standard VTR controls and machine control timecode hot-text are provided for outputing your segment. A pull-down menu beneath VTR Status allows you to choose between two modes of output— Insert Edit or Print-To-Video. Print-To-Video and Insert Edit will output the loaded clip from its in/out- points (if any exist) or from the first to last frame (if no in/out-points are set).

Insert Edit Mode

In this mode, you can select the Video/Audio content that you want to insert by checking the desired content boxes at the left. Then set an in-point that the recording VTR will use to initiate recording of your segment. Duration is determined by the length of the clip you are outputting.

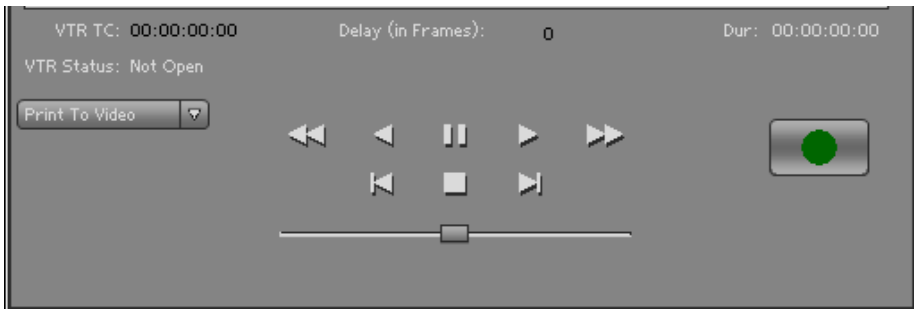


Insert Edit Mode

Note: The Preview Edit check-box controls whether the insert edit is in "Preview" mode or not. In preview mode, the deck never goes into record but just simulates the edit without putting anything to tape. You must uncheck this box to perform the actual Insert Edit.

Print-to-Video Mode

This mode allows you to manually put a clip to tape using the VTR's current position. You have the option of adding Delay frames. Io Express will wait this many frames after the tape machine start command before outputting the clip. The Duration Field displays the total length of the clip that will go to tape. Click on the green hot button to launch the output sequence.



Play Controls for Print-To-Video

Status Display The Status Display section of the AJA Playback plugin reports the settings that you have selected for the Io Express you are controlling:

- Primary Format
- Analog Output type

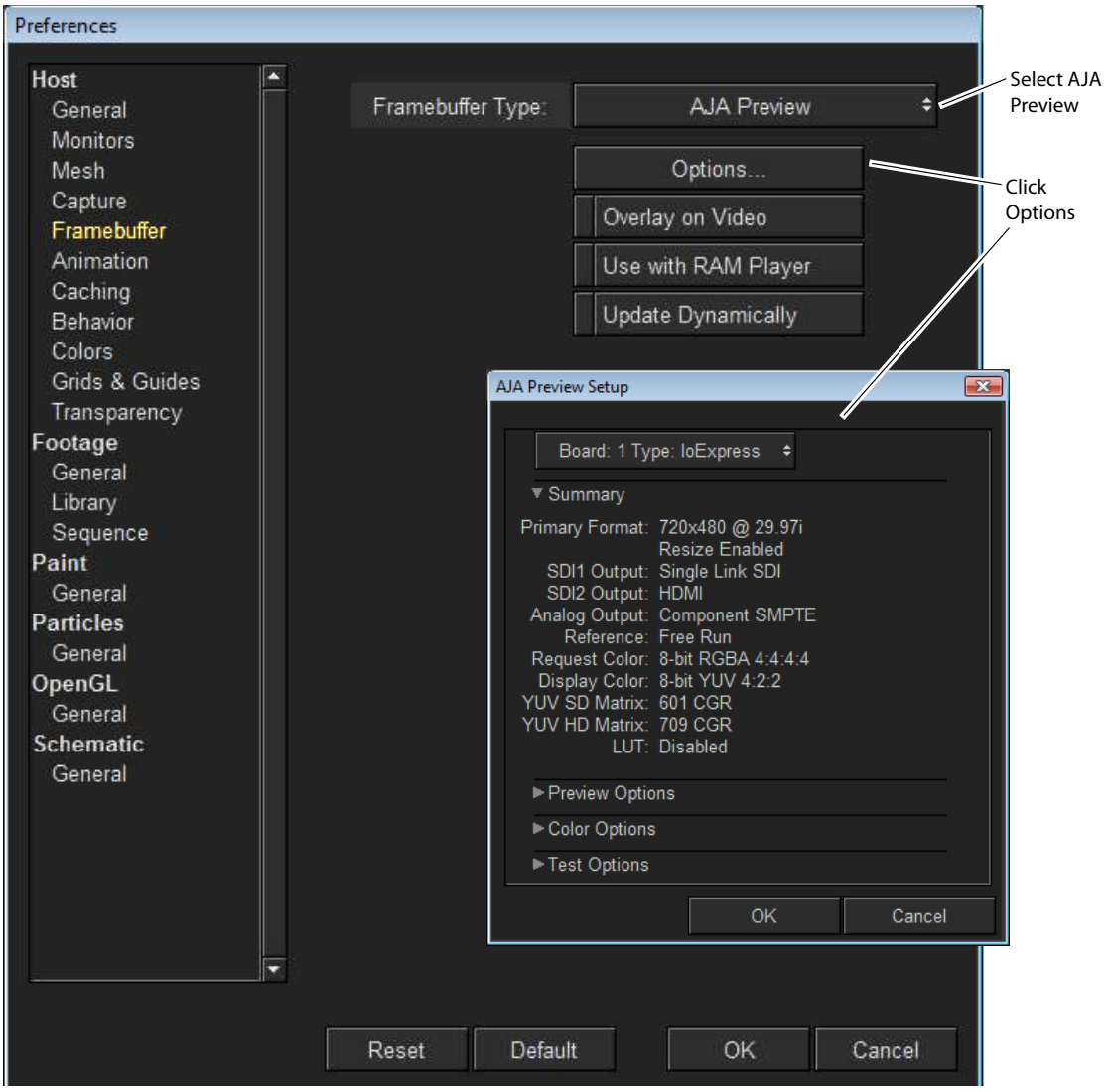
In the right column you will also see current information for:

- Playback Status: Stop, Still, Playing
- Frames Dropped: a live frame count display followed by a total count of any frames dropped from the sequence in parens ( )

Chapter 6: Using Combustion & Fusion with Windows

Using Autodesk Combustion 2008

AJA's Io Express Plugins for Autodesk Combustion 2008 are used for Preview functions only.



Combustion Preferences>Framebuffer Menu

The Preview Plugin allows you to view on a monitor the current project you are working on in Combustion, at the Io Express output. With a Combustion project open, go to *File>Preferences* and select *Host>Framebuffer*. In the pull-down window, select *AJA Preview* and click on *Options* to configure previews.

If you use Io Express Machina for capture and your Video Input format is 8-bit YUV 4:2:2, then select the 2Vuy mode (uppercase V). Select Update Dynamically to output every frame as you play a segment. Alternatively, you can output only the frame you have stopped on and are currently viewing by deselecting Update Dynamically. This mode can speed up processing by minimizing use of system resources.

Preview Options

If you have more than one AJA capture device, the Board pull-down menu at the top allows you to select the Io Express to control (subject to Activation).

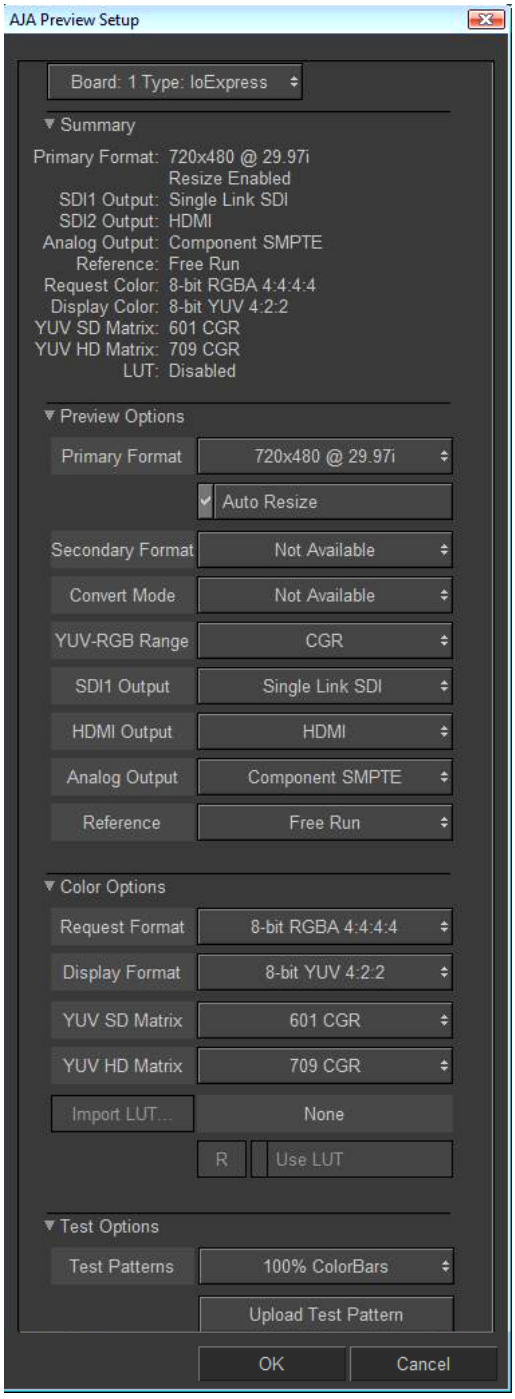
Note: Using multiple AJA capture devices in the same workstation is possible but not always practical due to motherboard and disk system bandwidth limitations.

The **Summary** section reports current configuration settings.

In **Preview Options**, you can change the Primary and Secondary signal formats, Convert mode, YUV to RGB range, SDI and Analog output type (as applicable), and select timing Reference mode—Free Run, External (genlock), or from the video Input signal.

In **Color Options**, you can change color standards and view the resulting output on your monitor. You can select a 10-bit Look Up Table (LUT) file and turn it on and off using the check-box at the right.

Finally, for picture quality adjustment, you can output a Test Pattern selection using the pull-down menu under **Test Options**. Click OK to output your Preview.



AJA Preview Setup Menu

Activation

Note: Only one plugin window can have control of Io Express at a time. If the application window you click on does not access the card (panel fields are inactive), either another window is still processing operations or it may be in Manual activation mode and requires manual disabling (check box blanked) to release control of Io Express. Activation mode is available in these applications: Machina, Adobe After Effects CS4, and Adobe Photoshop CS4.

Primary & Secondary Formats

The Primary Format menu allows you to select the video format to be used in the current project in the Io Express framebuffer. (The current selection is reported in the display of the pull-down menu.)

Choices are always presented based on which AJA capture device you are using and what signal formats it supports. Io Express supports video format down-conversions..

Primary Video Formats Supported

See "About Primary & Secondary Video Formats" on page 2 for Primary/Secondary video format and down-conversion information.

SDI Output

Io Express has one SDI output so the SDI output will be Single Link.

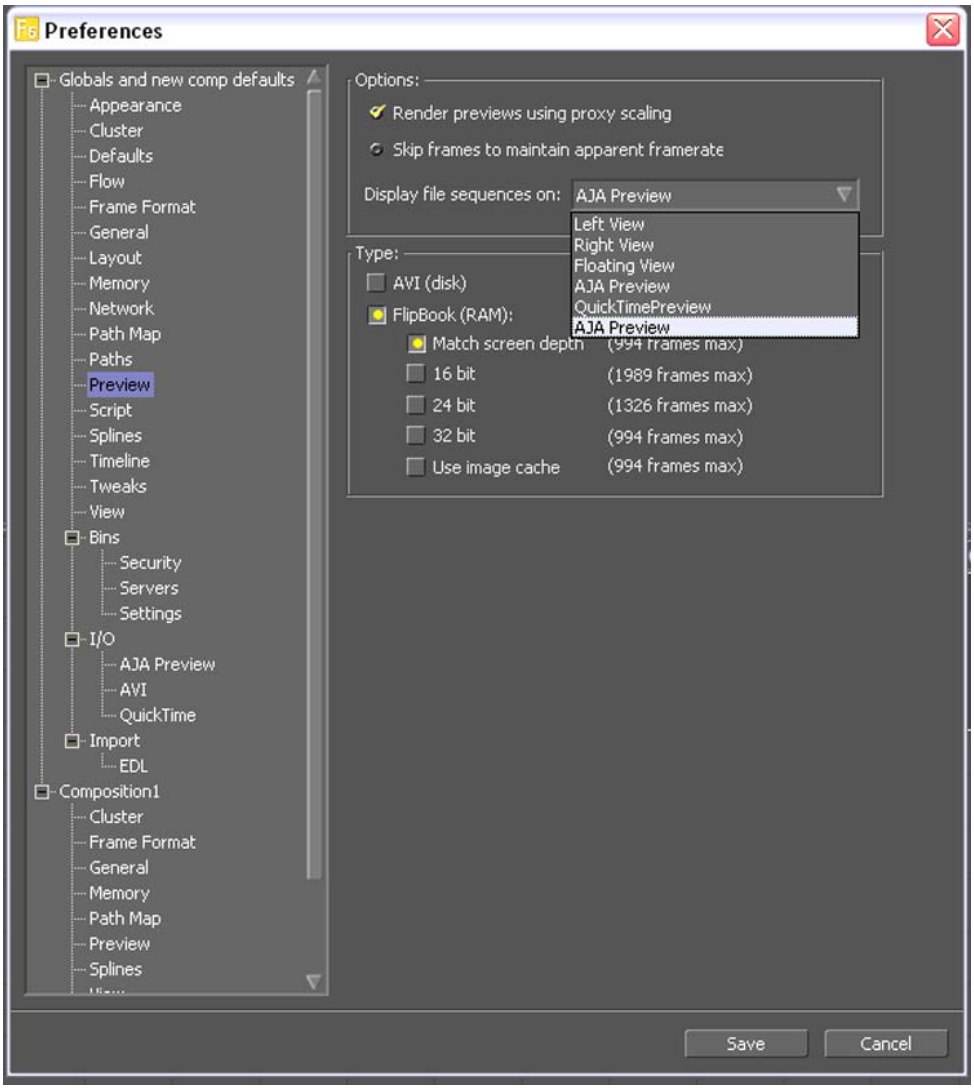
Analog Output

Analog format choices in the Analog Output pull-down menu vary depending upon file format. Choices that may be available include:

- Composite PAL
- Component Betacam PAL
- Component SMPTE PAL
- Component XVGA
- Component Betacam NTSC
- Component Betacam NTSC-J
- Component SMPTE (High Definition only)

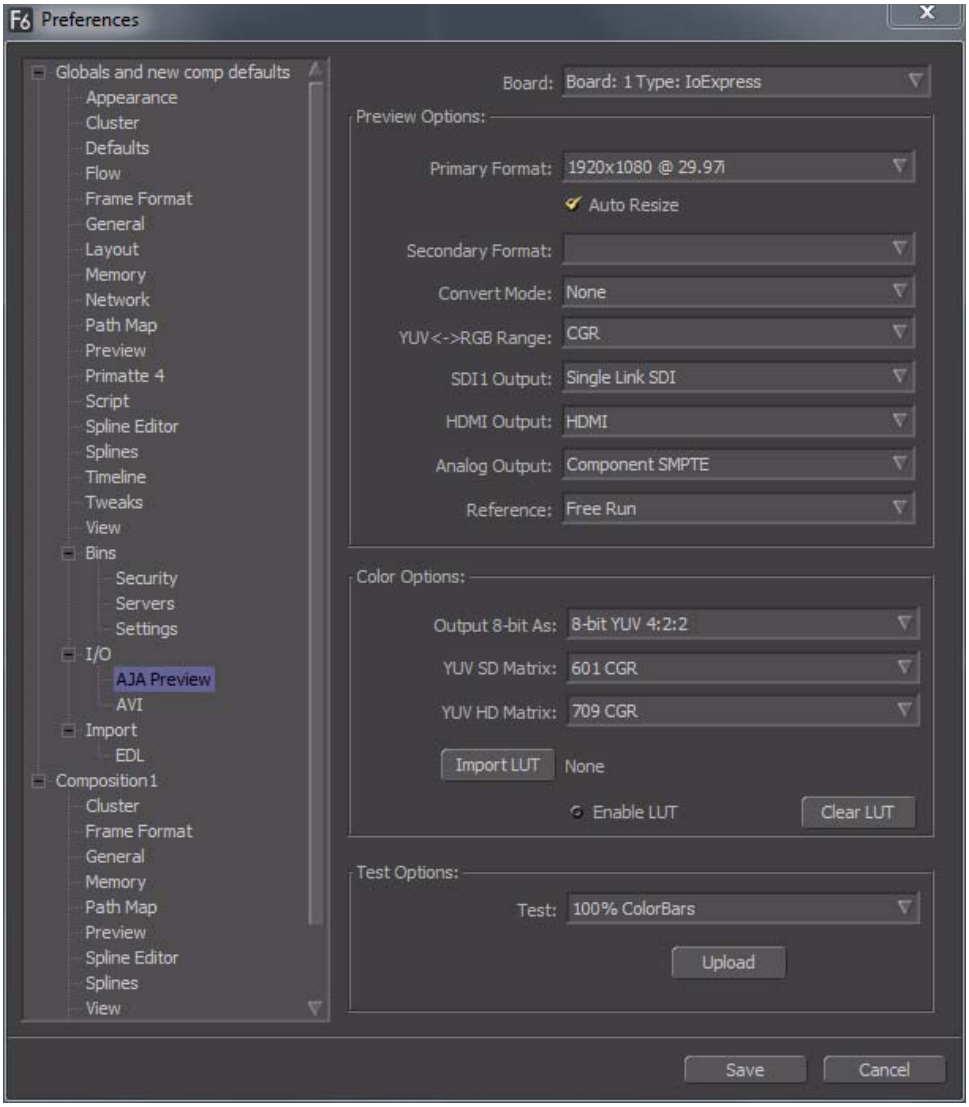
Using Eyeon Fusion

The Io Express Fusion 5 plugin is a software application integrated into Fusion that allows you to preview your current Fusion project from the Io Express output. Go to *File>Preferences* to setup AJA Preview.



Selecting AJA Preview for Fusion

Under *Globals and new comp defaults->Preview* select *AJA Preview* from the "*Display file sequences on:*" pull-down menu. To set up AJA Preview formatting, continue down to the *I/O* selections under *Globals and new comp defaults* and then choose *AJA Preview*.



AJA Preview Setup Menu for Fusion

Preview Options

If there is more than one AJA capture device installed in your system, a pull-down menu at the top allows you to select which device to control (subject to Activation rules).

In **Preview Options**, you can change the Primary and Secondary video signal formats and Analog output type (as applicable), and select timing Reference mode—Free Run, External (genlock), or from the video Input signal.

Finally, for picture quality adjustment, you can output a Test Pattern selection using the pull-down menu under **Test Options**. Click OK to output your Preview.

Note: Fusion AJA Preview, in most cases, will not be in realtime for any RAM Preview.

Activation

Note: Only one plugin window can have control of the Io Express at a time. If the application window you click on does not access the card (panel fields are inactive), either another application is still processing operations or it may have a Manual activation mode and must be disabled (check box blanked) to release control of the Io Express. Activation Mode is available in Machina, Adobe After Effects CS4, and Adobe Photoshop CS4.

Primary & Secondary Formats

The Primary Format menu allows you to select the video format to be used in the current project in the Io Express framebuffer. (The current selection is reported in the display of the pull-down menu.) Secondary Format allows you to perform down-conversions.

Choices are always presented based on which AJA capture device you are using and what signal formats it supports.

Primary Video Formats Supported

Refer to“About Primary & Secondary Video Formats” on page 2 for detailed information on Io Express down-conversion.

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:

180 Litton Drive, 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

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

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

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: 24-bit SMPTE-259 SDI embedded audio, 8-ch, 48 KHz synchronous

Audio Output

Digital: 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