

***io* EXPRESS**



Published: 12/28/12

Installation and Operation Guide

Because it matters.

AJA[®]
VIDEO SYSTEMS

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

Mail: 180 Litton Drive, Grass Valley, CA. 95945 USA

Telephone: +1.800.251.4224 or +1.530.271.3109

Web: <http://www.aja.com/en/support/>

Email: support@aja.com

When calling for support, have all information at hand prior to calling.

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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.

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Contents

Trademarks	ii
Notice	ii
Contacting Support	ii
Limited Warranty	iii

Chapter 1: Introduction

Overview	1
Features	1
Accepted Inputs	2
Using Multiple AJA Products	2
About Primary & Secondary Video Formats	3
Playback Formats	4
Io Express Audio	4
Software for Mac	4
Software for Windows	5
What's In The Box?	5
System Requirements	6
Cable Connections	6
Connector Descriptions—Io Express & Cables	6
In This Manual	8

Chapter 2: Installation

Installation Overview	9
Connecting to your Computer	10
Cabling the System	11
Typical System	11
Installing Io Express Software	12
Mac Pro Software Installation	13
Windows Software Installation	17
Re-Installation & Repair	22
Genlock and Your System	22

Chapter 3: Operation

Using Io Express with Professional Video /Audio Software	23
Using the AJA Control Panel	23
Control Panel Basics	23
Control Screen	27
Format Screen	29
Input Select Screen	31
SDI Out Screen	33
HDMI Screen	34
Analog Out Screen	35
Video Setup Screen	36
Audio Setup Screen	37
Conversion Screen	38
Timecode Screen	40
Firmware Screen	43

Info Screen	44
Who is Controlling Io Express?	45
Using 8-bit Versus 10-bit Video	46

Chapter 4: Troubleshooting

If You Run Into Problems	47
If You Run Into Problems	47
Updating Software	48
Contacting Support	48

Appendix A: Specifications

Formats	49
Video Input	49
Video Output Digital	49
Video Output Analog	49
Audio Input Digital	50
Audio Output Digital	50
Audio Output Analog	50
Reference Input or LTC Input	50
Machine Control	50
Physical	50

Appendix B: Safety & Compliance

Index	59
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Chapter 1: Introduction

IO EXPRESS



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

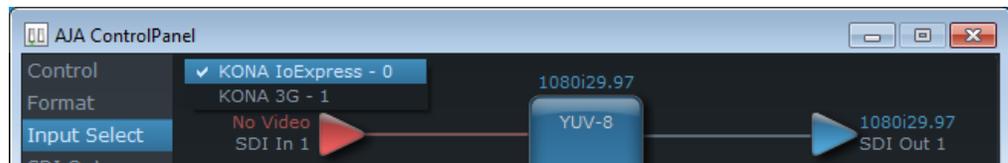
- HD/SD SDI Video with embedded audio
- HDMI Video with embedded audio

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 Control Panel, 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 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 Adobe Premiere Pro, or AJA TV, that application will use the product that is currently selected in the AJA Control Panel application for its input/output. Once an application is running, you can change the “targeted” product selection in the AJA Control Panel 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.



Multiple AJA Products Pulldown Menu

Example: select an Io Express as the targeted product in the Control Panel application. Launch your third-party editing application. This application is now using the Io Express for its input/output. Go back to the Control Panel application and select a KONA card as the “targeted” product. Launch the AJA TV application. AJA TV would now use the KONA card for its output.

If you switch back to the third-party application, 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

For a list of the Primary Video Signal Formats supported by Io Express, see [“Formats” on page 49](#).

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

Io Express Audio

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

Software for Mac

- AJA Io Express Control Panel for source selection and controlling Io Express within the overall MacOS environment, Input Pass through, and more).
- AJA QuickTime™ drivers for tightly integrated hardware/software operation.
- Supports a wide variety of popular SD and HD formats.
- Support for third-party applications:
 - Apple Final Cut Pro X
 - Avid Media Composer
 - Adobe Premiere Pro
 - Adobe Photoshop, and more.

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 Control Panel, drivers for the card itself, and all files necessary for third-party application support (software application not included).

Software for Windows

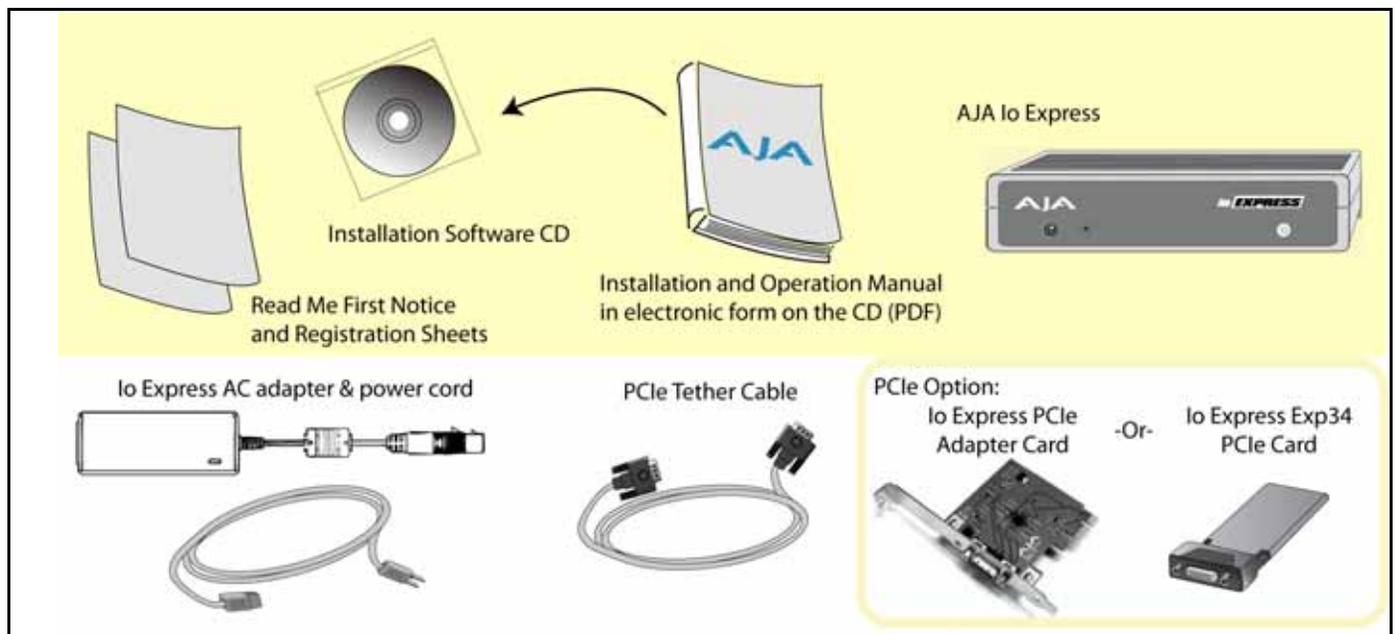
AJA Software for Windows brings high quality HD and SD video and audio to a Windows workstation with Io Express. With Io Express's professional features, you can run the AJA Control Panel and these Windows platform applications (application software not included):

- Adobe Premiere Pro CS6
- Adobe After Effects CS6
- Adobe Photoshop CS6
- Adobe Prelude CS6
- Adobe Encore CS6
- Eyeon Fusion
- Sony Vegas 9.0c

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

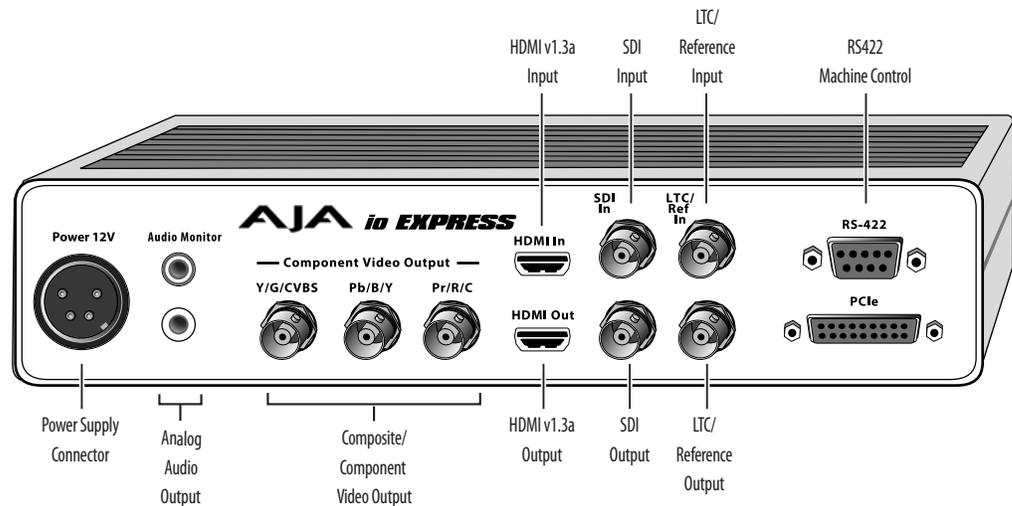
AJA Video recommends that your system meet minimum hardware and software requirements to achieve a satisfactory level of performance when operating it. Here, we provide minimum and recommended requirements.

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/en/support/io/mac/io-express/>

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 Control Panel allows selection and adjustment of some HDMI parameters.

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, 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 the AJA Control Panel and third-party applications.

Chapter 4 discusses troubleshooting problems with your system and what to do when there's a problem you can't solve.

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

Appendix B contains important safety and compliance information for Io Express operation.

The remainder of the manual consists of an index section to help you rapidly find topics in the manual.

Chapter 2: Installation



Installation Overview

The installation and set up of an 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 Apple's 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/en/support/io/mac/io-express/>
4. Install AJA Io Express software on your Mac or PC from the AJA website download or, if internet connection is not available, 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).

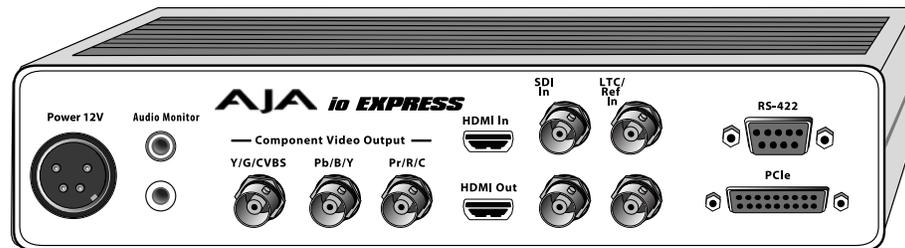
Caution: *Always have power off when connecting any device to the PCIe bus.*

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

2. Connect the PCIe tether cable between lo Express PCIe port and the PCIe adapter.
3. Assemble the Power Adapter and cable and connect to the lo 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 lo Express using the front power switch.

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

Ensure that the third-party editing software you are using has been installed before proceeding to the installation of lo 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.



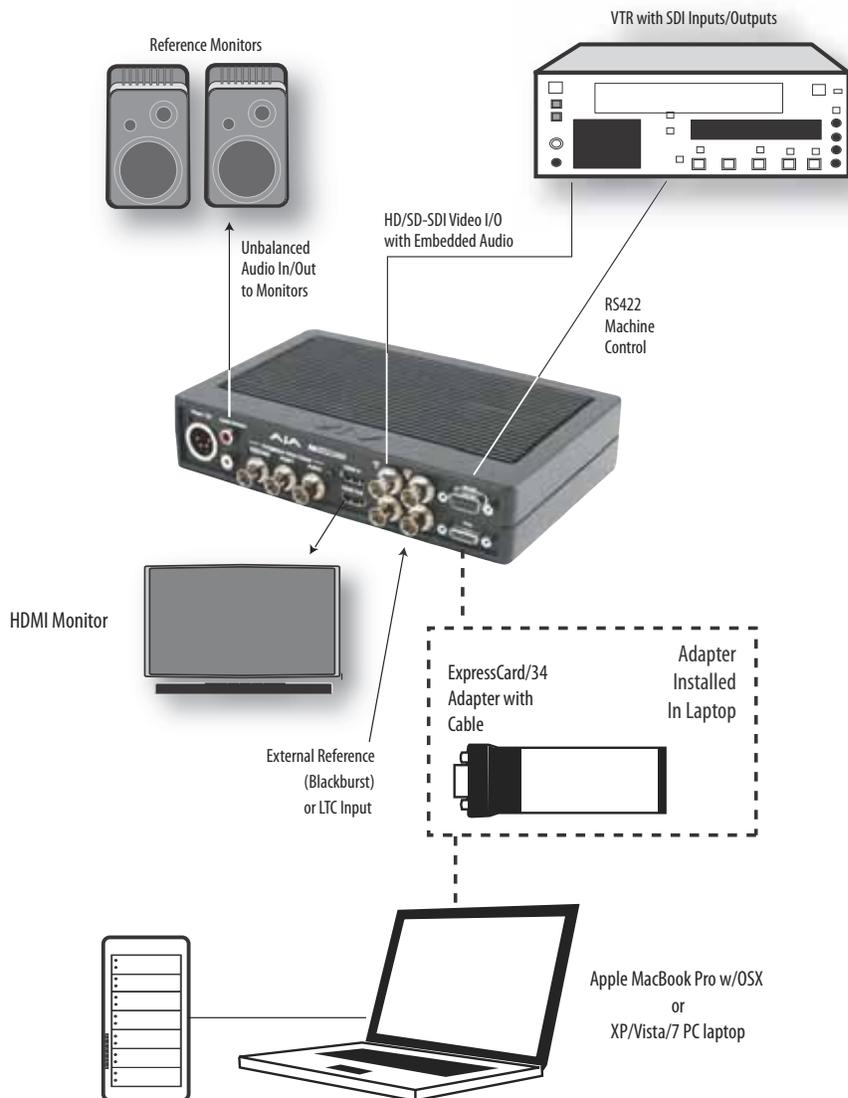
lo Express Connections

Cabling the System

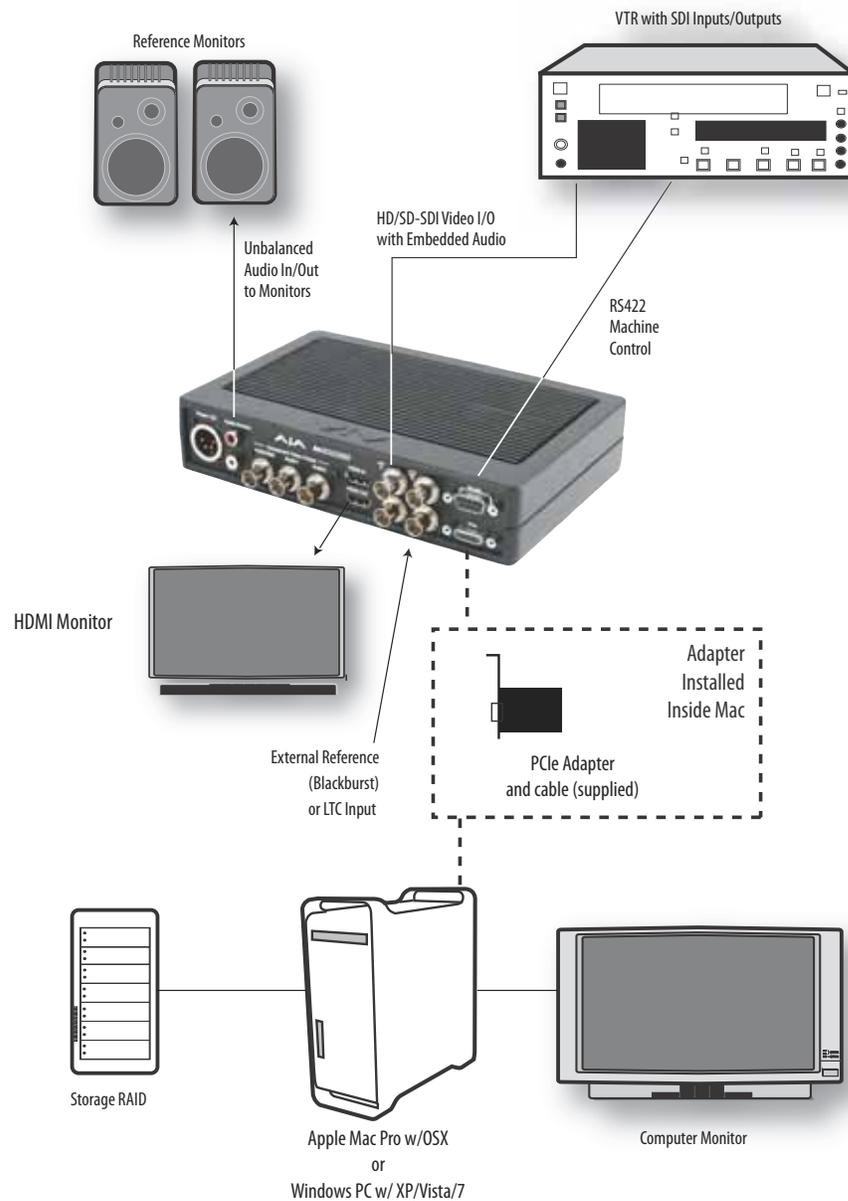
Typical System

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 your third-party editing 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 the AJA Control Panel. You cannot use Io Express with 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.

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 Applications with Io Express, you will need to download and install a second Io Express package for Adobe for Mac.

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

Mountain Lion OS and Gatekeeper

Also, with the addition of Gatekeeper functionality in Mac OS Mountain Lion, you should go to System Preferences>Security & Privacy and choose to allow “Mac App Store and identified developers.”



Mac Security & Privacy Gatekeeper Setting

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.

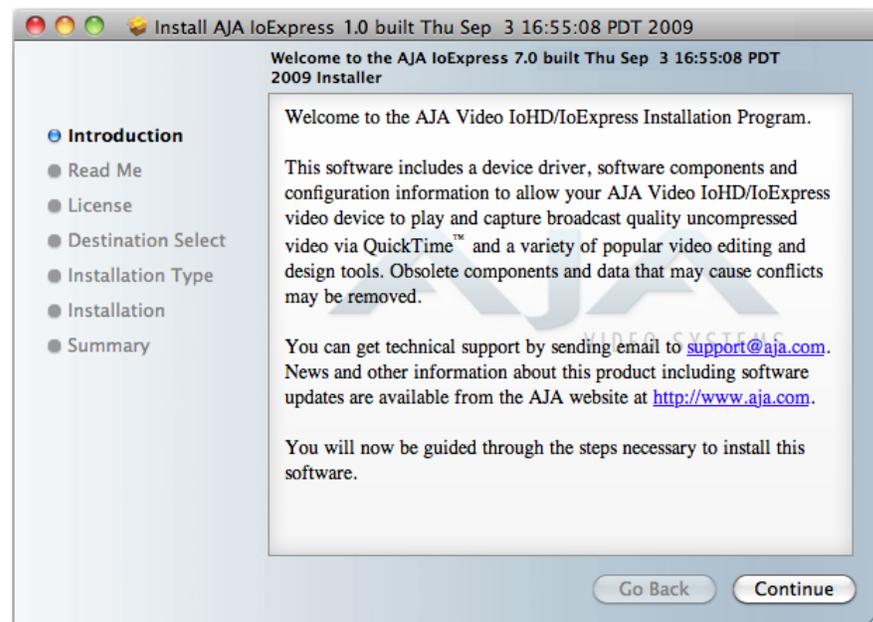
Note: Files ending in the “.pkg” and “.mpkg” suffix are OS X installer files. These launch the OS X installer and tell it where and what to install on your system.

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.



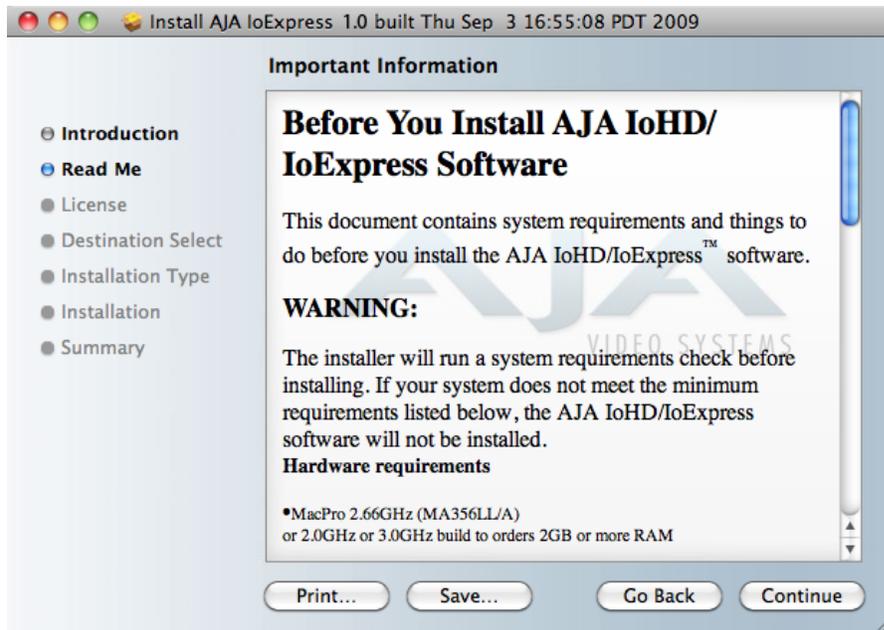
Log On Authenticate Prompt

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.



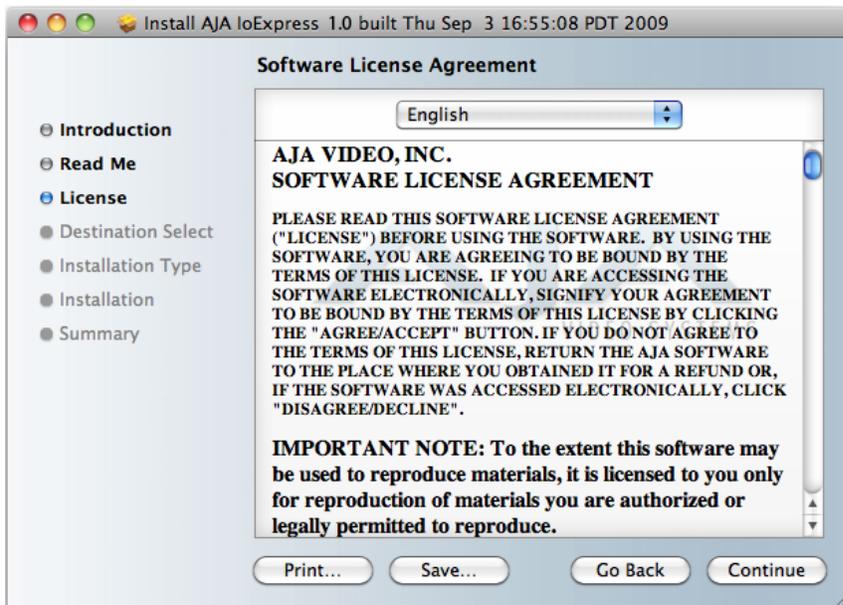
Initial Installer Screen

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

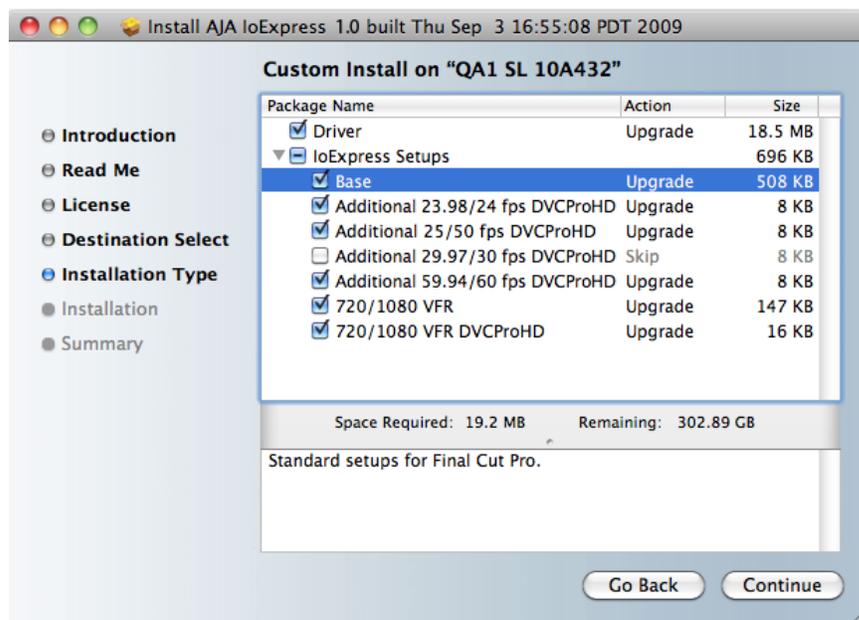
9. Read and agree to the Software License Agreement.



Io Express Software License Agreement Screen

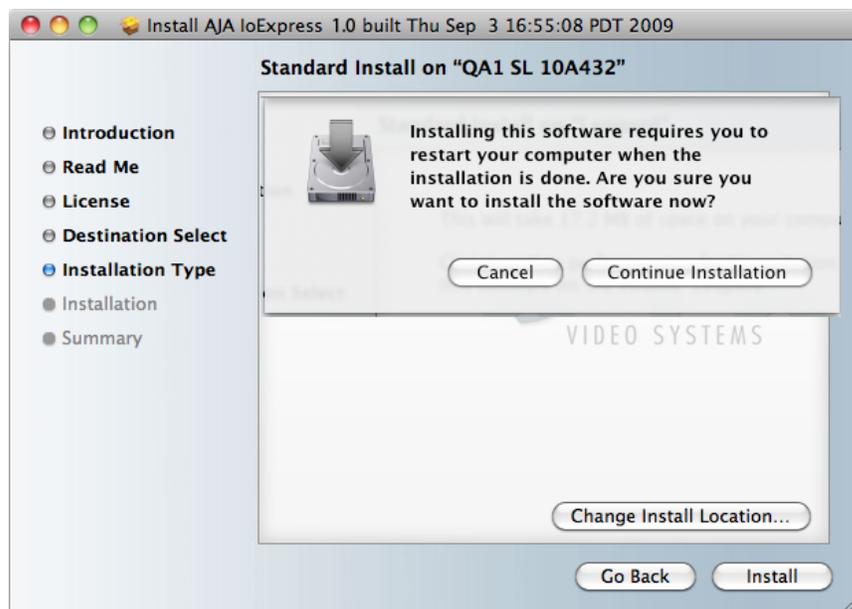
10. The next screen shows all the available drives on the Mac Pro. Click on the drive that contains your system files (Apple default is "Macintosh HD"). A green arrow will point to the drive you've selected. Click the *Continue* button to proceed with installation.

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.

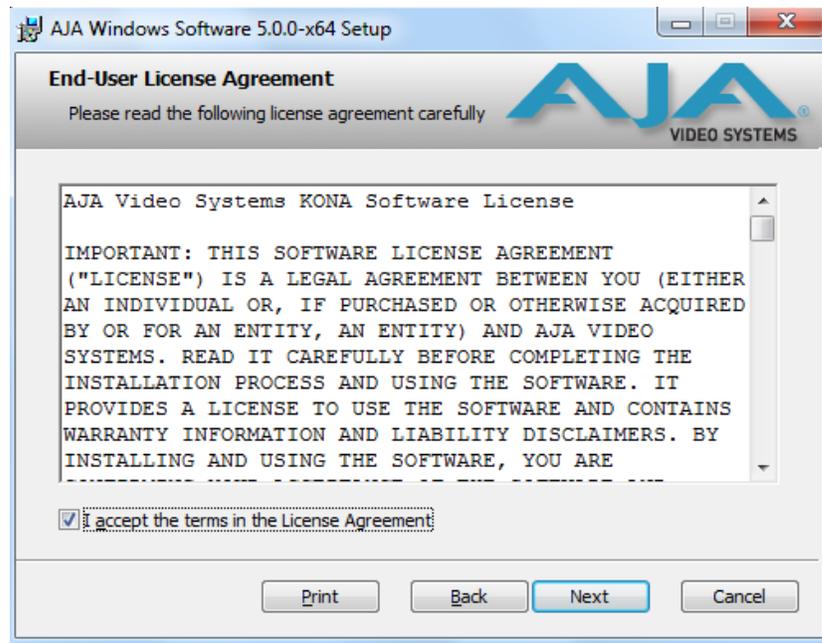
Install Wizard

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



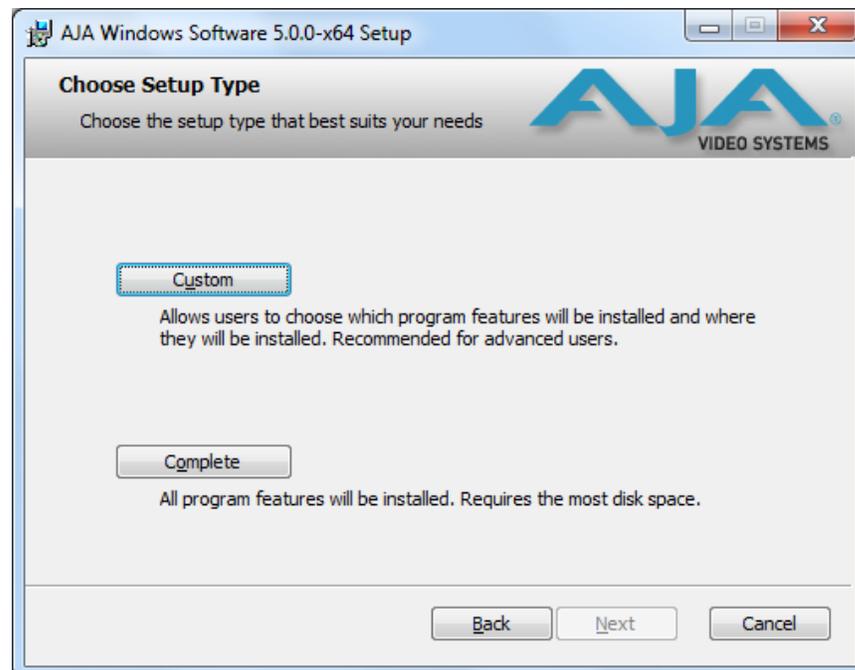
Install Wizard Welcome

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



License Agreement

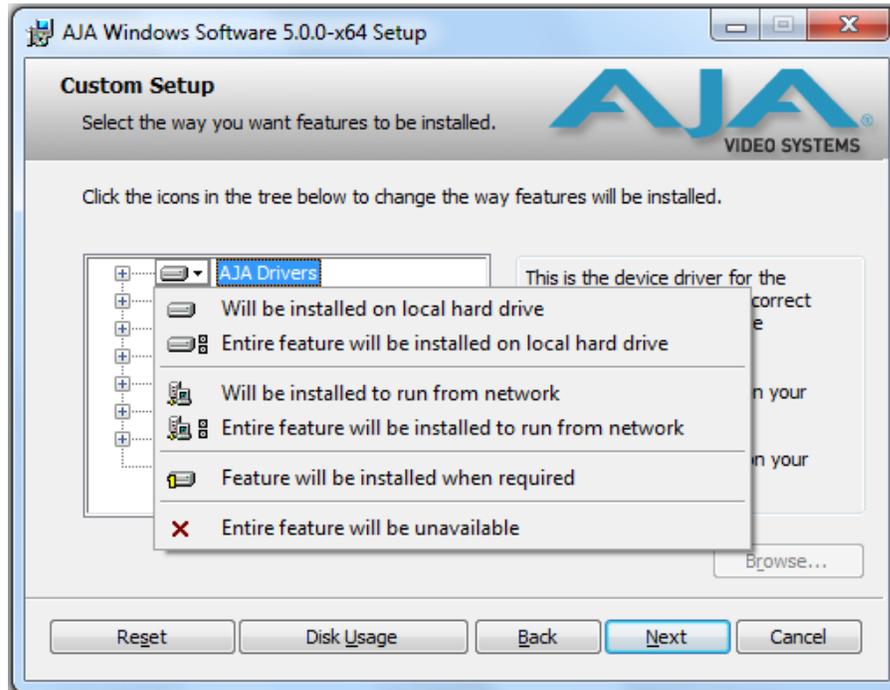
Read the Windows Software license agreement and click "Yes" to accept. You will be asked to choose the type of installation you would like to perform.



Installation Type

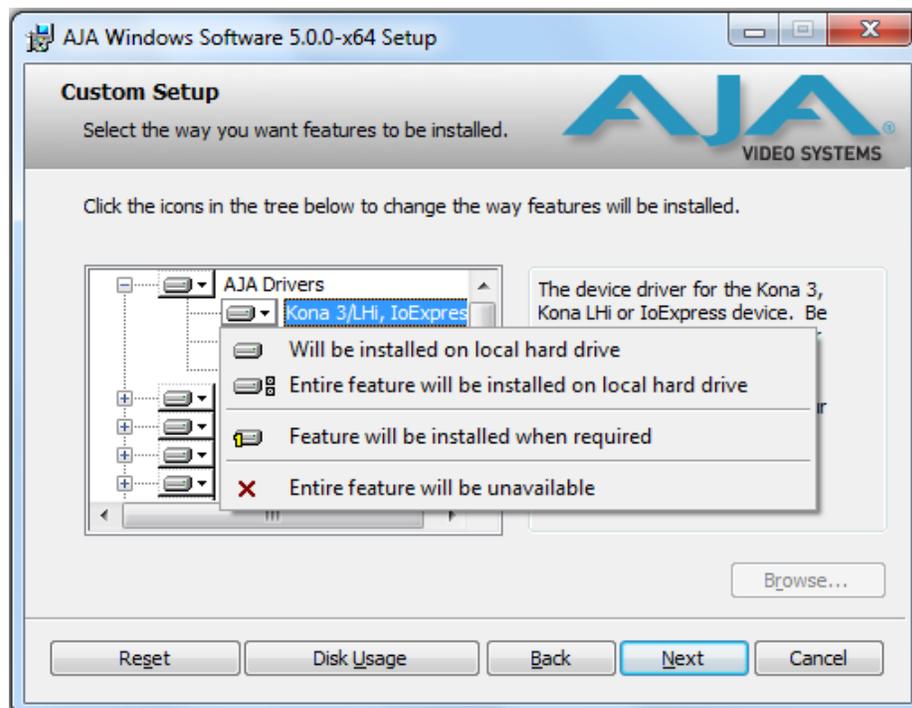
If you don't have all the AJA Windows Software supported Adobe Production Studio products installed on your workstation, you may choose to perform a Custom installation (default) and select only the software necessary for your applications. If you use the entire collection, use the "Complete" installation.

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.



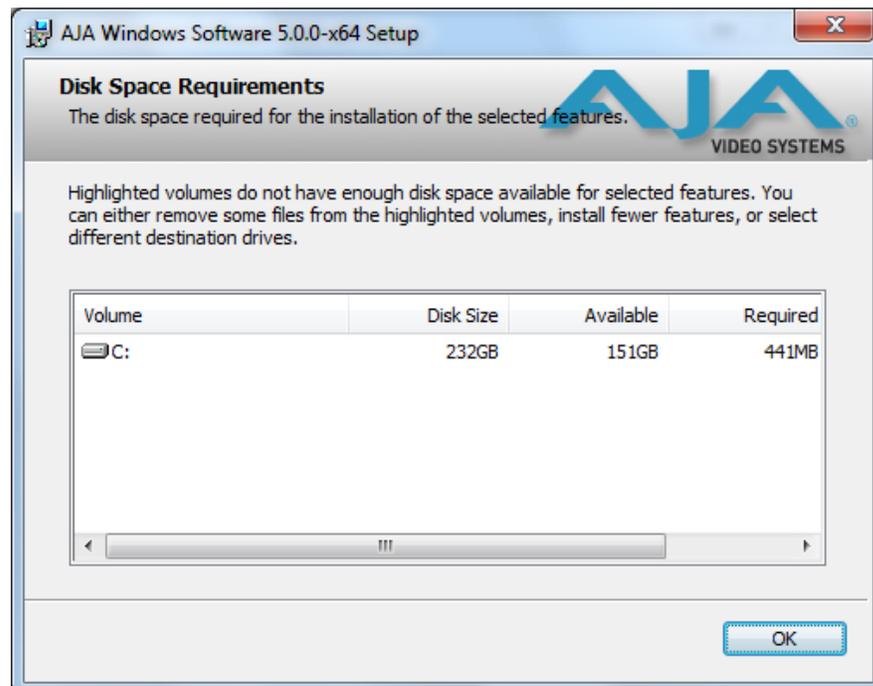
Custom Selections Pulldown Menu

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



Custom Selection Second-level Options

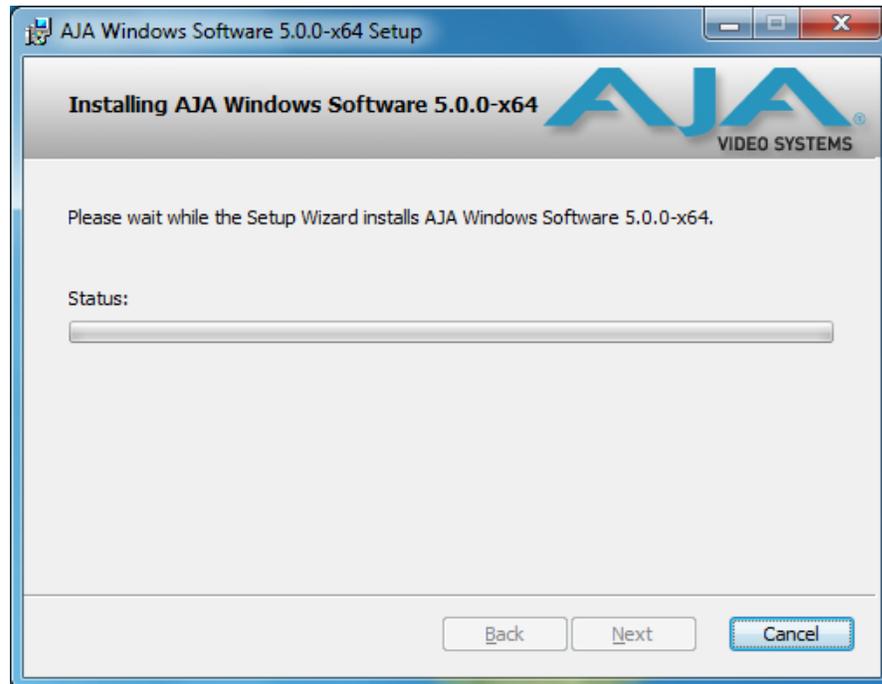
Disabled selections are marked with a red X. Before clicking Next to install, you can verify your disk space availability by clicking the Disk Usage button.



Workstation Disk Usage Display

To return to the installation click OK.

Click Next to begin the installation.



Installation Progress Screen.

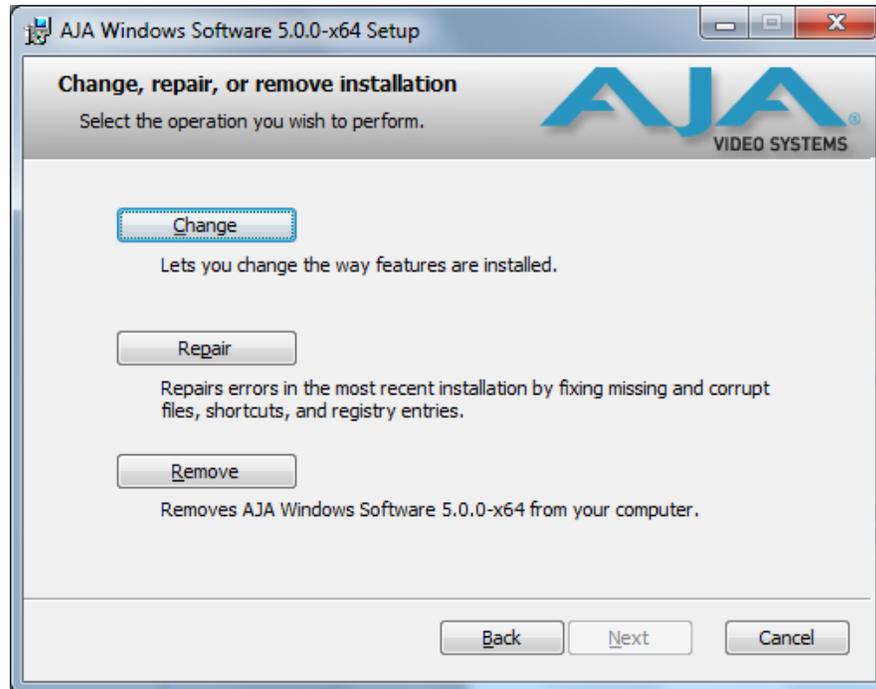
When the installer has completed copying the AJA Windows Software to disk, you will see a standard Windows Logo test warning. Click on the "Continue Anyway" button to finish the installation.

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 AJA Control Panel.

Chapter 3: Operation

Using Io Express with Professional Video /Audio Software

After you install the Io Express software and any AJA plug-ins to support your choice of 3rd-party software, you're then ready to begin capturing and playing back video and audio.

Go here to look for AJA plug-ins and documentation for your favorite 3rd-party software applications:

<http://www.aja.com/en/support/io/mac/io-express/>

Using the AJA Control Panel

The AJA 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

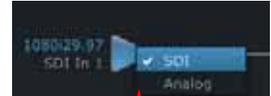
To ensure you make the most of the software, launch the AJA/Io Express Control Panel application and look at its display. Then refer to the "Basics" described here to fully understand what you're seeing and learn how to view and change the Io Express system configuration.

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 pull-down 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 AJA 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 AJA Control Panel screens.)

Currently selected Screen

Framebuffer Format (Primary Format)

Outputs: SDI, HDMI and Analog

Inputs

Screen Topic Links – Click One to Edit/View a Topic

AJA Control Panel, Block Diagram

Framebuffer—The framebuffer is the “engine” in Io Express where active video operations take place using 3rd-party editing 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 AJA Control Panel or via external application software. It is important to realize that inside the computer workstation, a number of 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 AJA Control Panel displays the name of the application controlling the Io Express. 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 “In Use” display.



Controlling Application

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).

Screen links—The bottom area of the IO Express Control Panel provides different information categorized by topic. Clicking on a left-column navigation links (or, alternatively, a block diagram element) displays an information screen corresponding to a screen topic. Each of these linked screens are described on the following pages. Screens that are available for Io Express are:

Control: configures Io Express operation (pass through, desktop, etc.) plus setting output timing.

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

Input Select: view and edit input selections and how they are mapped

SDI Out: select output format—Primary or Secondary (downconversion)

HDMI: configure the HDMI I/O

Analog Out: configure the component/composite analog output

Video Setup: configures Video such as composite black level.

Audio Setup: configures Audio options such as analog audio monitor level.

Conversion: 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

Presets: add or delete saved preset configurations (handy for setting up the Io XT for certain workflows and then saving it as a canned configuration for easy later recall)

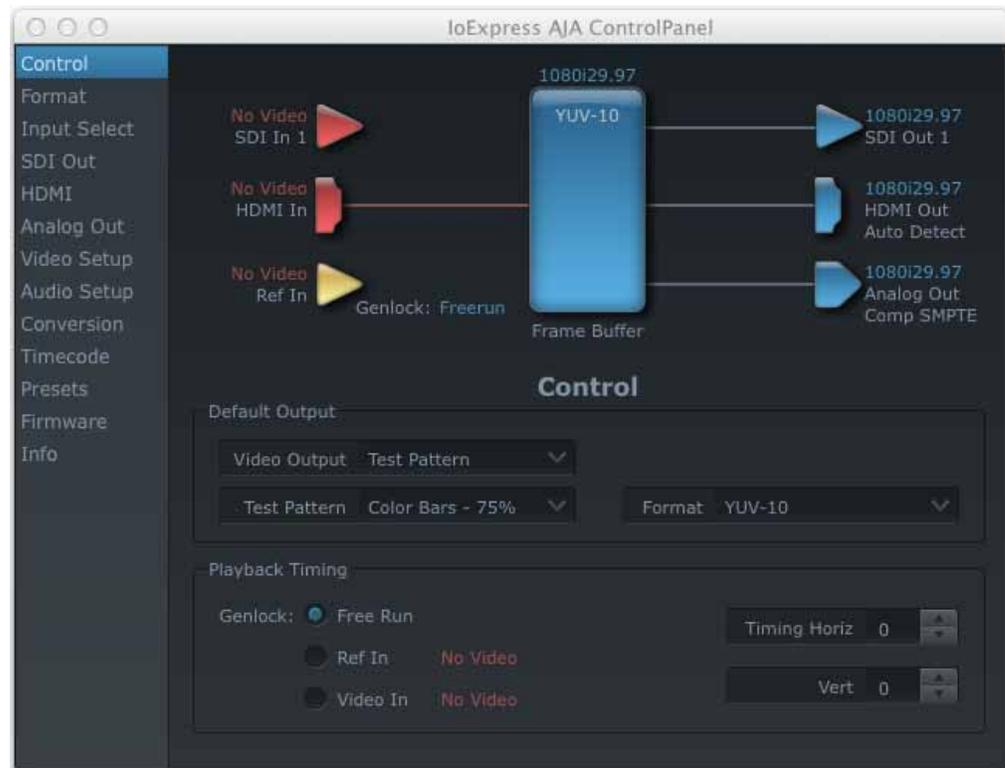
Firmware: enables installation of AJA card firmware.

Info: displays status information and firmware version # of the Io Express and how it is installed in the host computer. This information is generally intended for troubleshooting/support.

Control Screen

The Io Express can be controlled by various software applications running on a host computer. 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.

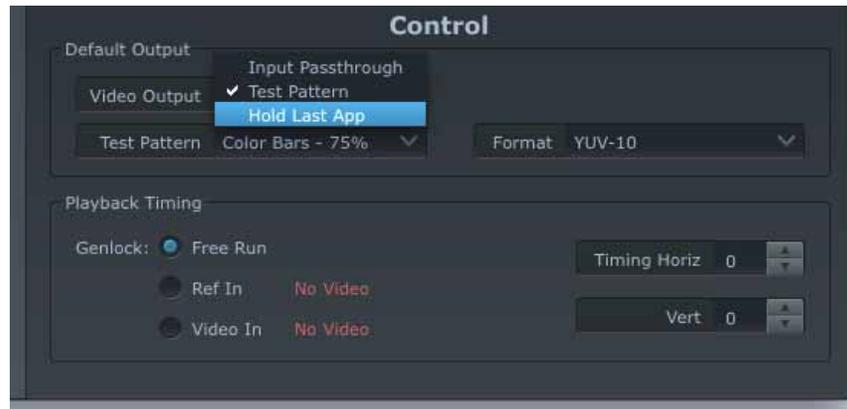
At the top of the Control screen, it will show the current Default Io Express output and the application currently controlling the Io Express card (if there is one). For example, in the screen shown here, the default output is Input Passthrough.



Io Express Control Panel, Control Screen

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.



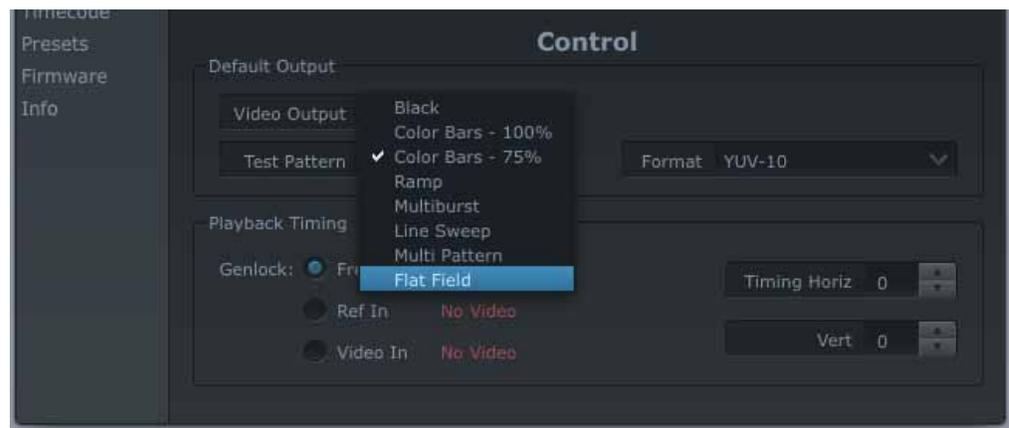
Control Screen, Default lo Express Output Pulldown Menu

Choices available and their meaning are:

Input Passthrough: this selection directs lo 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 lo Express to output a choice of preset patterns—when no other QuickTime application is using lo Express.

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



Control Screen, 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)

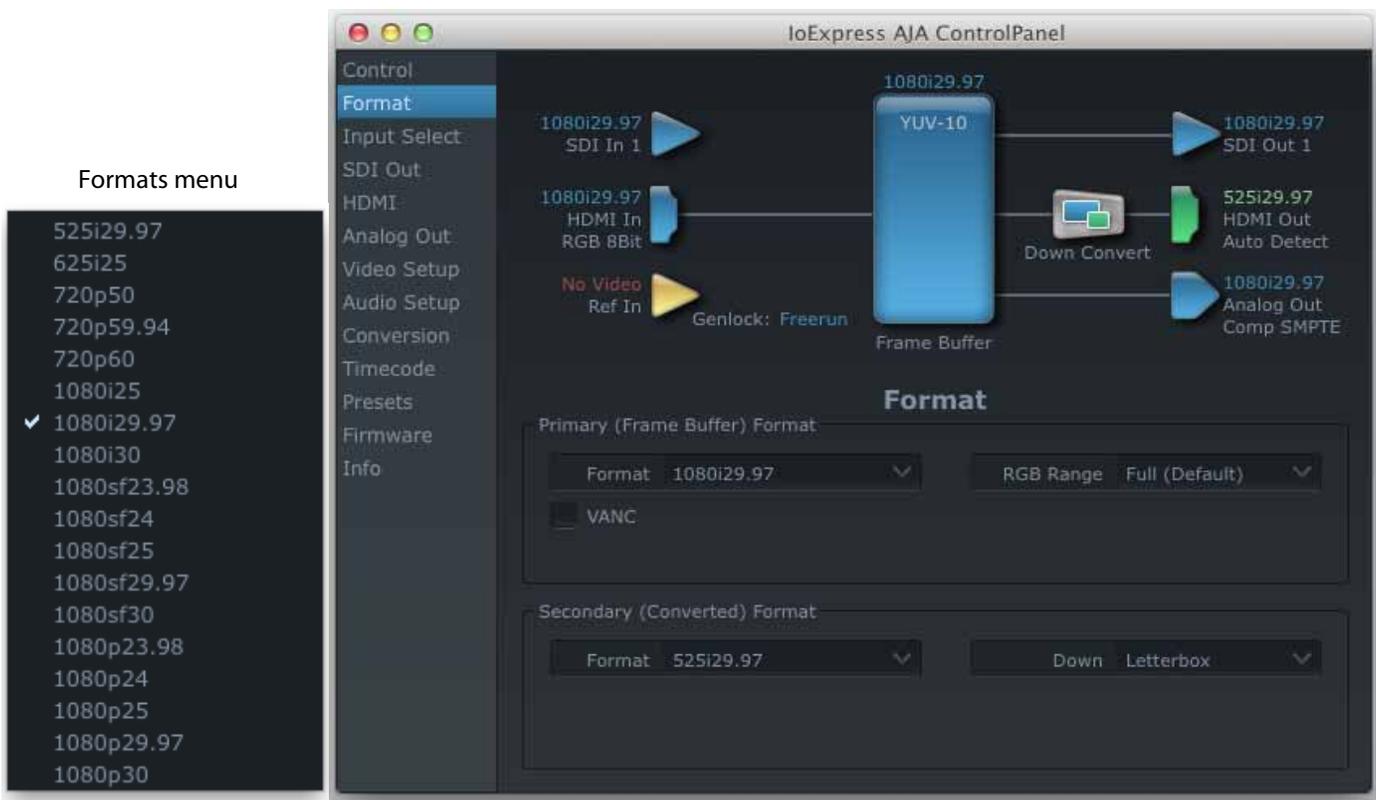
Video: directs Io Express to use whichever video input source has been selected in the *Inputs* screen for sync

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.

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.



Format Screen 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 Screen 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 3.

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.

VANC—Below the Primary Format pulldown menu, you can check the VANC box to include Vertical Ancillary Data in the video stream. VANC enables Closed Caption Ancillary data to be played or captured. If you have a file with a Closed Caption track, this checkbox must be enabled for the data to be inserted in the SDI output stream.

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

Input Select Screen

On the Input Select 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.



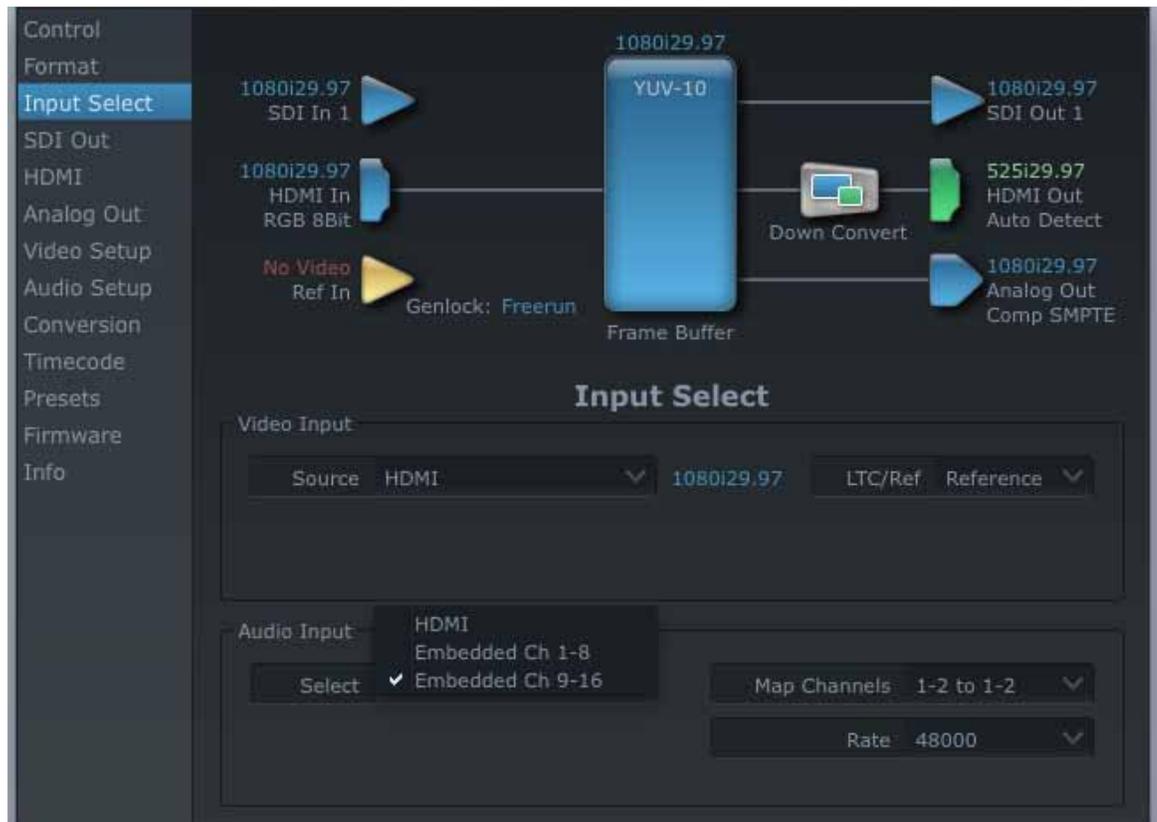
Input Select Screen

Input Screen Settings

Video Input—these pulldown menus allow you to see and change what's currently selected and the video format that Io HD has detected (if any). In the example shown previously, it shows that video is selected at the SDI 1 input and the format is 1080i with a frame rate of 29.97. Since this text is shown in blue, you can tell that it does match the framebuffer's primary format you've set in the "Formats" screen. By looking at the input source, you can determine how the primary format should likely be set (unless you want to perform a conversion on input.) If you wish to select a different input, select one from the pulldown menu. Choices are:

- SDI
- HDMI

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).



The screenshot displays the AJA Io Express control interface. On the left is a vertical menu with options: Control, Format, **Input Select** (highlighted), SDI Out, HDMI, Analog Out, Video Setup, Audio Setup, Conversion, Timecode, Presets, Firmware, and Info.

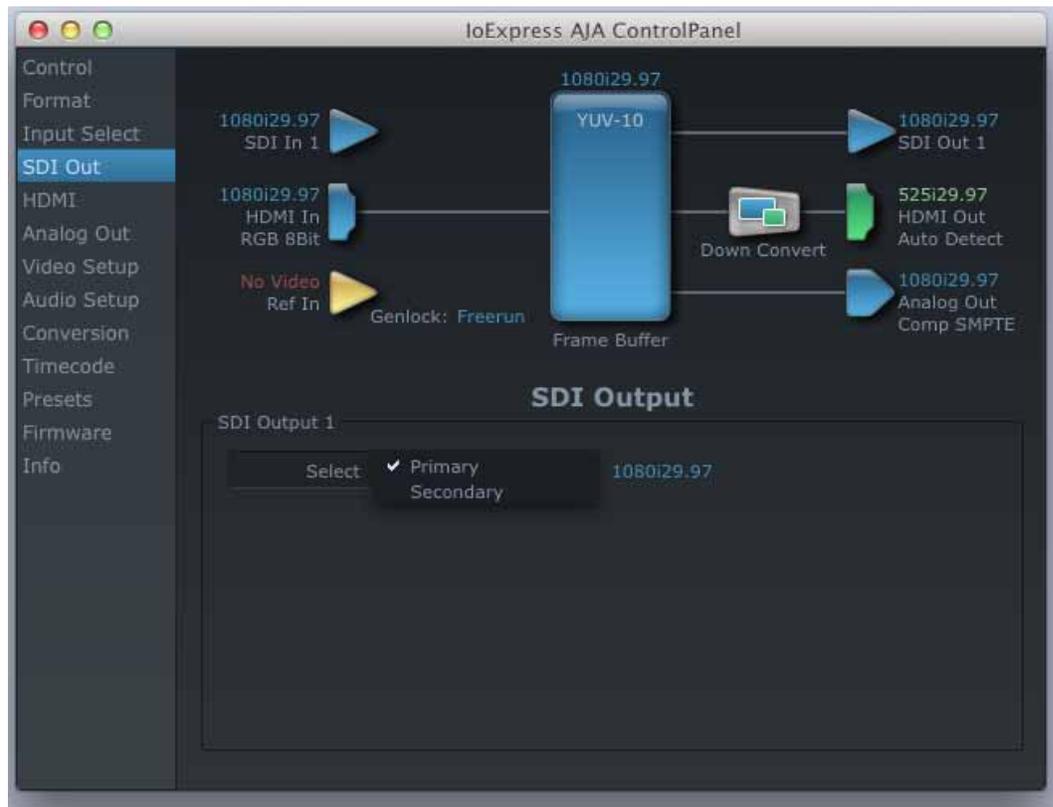
The main interface shows a signal flow diagram. On the left, three input ports are shown: "1080i29.97 SDI In 1" (blue), "1080i29.97 HDMI In RGB 8Bit" (blue), and "No Video Ref In" (yellow). A "Genlock: Freerun" label is positioned below these inputs. The signal flows into a central "Frame Buffer" block labeled "1080i29.97 YUV-10". From the right side of the Frame Buffer, three output paths are shown: "1080i29.97 SDI Out 1" (blue), "525i29.97 HDMI Out Auto Detect" (green), and "1080i29.97 Analog Out Comp SMPTE" (blue). A "Down Convert." icon is located between the Frame Buffer and the HDMI Out output.

Below the signal flow diagram is the "Input Select" configuration panel. It contains two main sections:

- Video Input:** A dropdown menu is set to "HDMI", and the source is "1080i29.97". To the right, "LTC/Ref" is set to "Reference".
- Audio Input:** A dropdown menu is set to "HDMI". Below it, a "Select" dropdown is set to "Embedded Ch 9-16". To the right, "Map Channels" is set to "1-2 to 1-2" and "Rate" is set to "48000".

SDI Out Screen

The SDI 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 Screen

SDI 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.

HDMI Screen

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



HDMI Screen

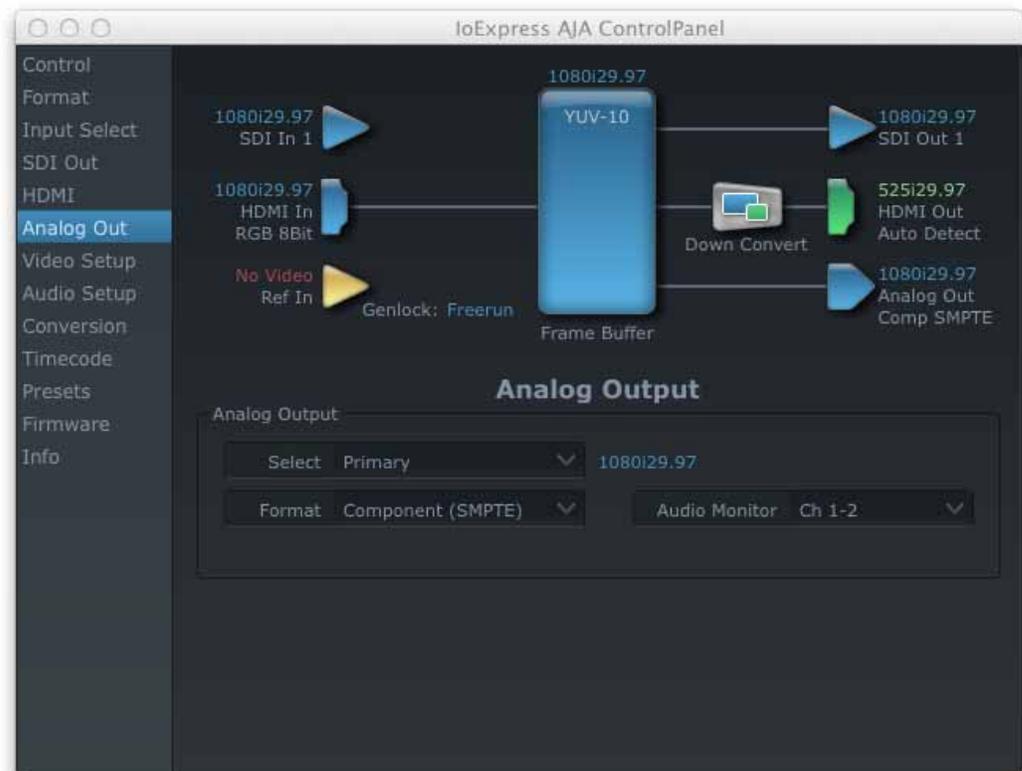
HDMI Screen Settings

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.

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.

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.



Analog Out Screen

Analog Out Screen Settings

Select menu—you can select either the Primary or Secondary format (downconvert) for the Analog output.

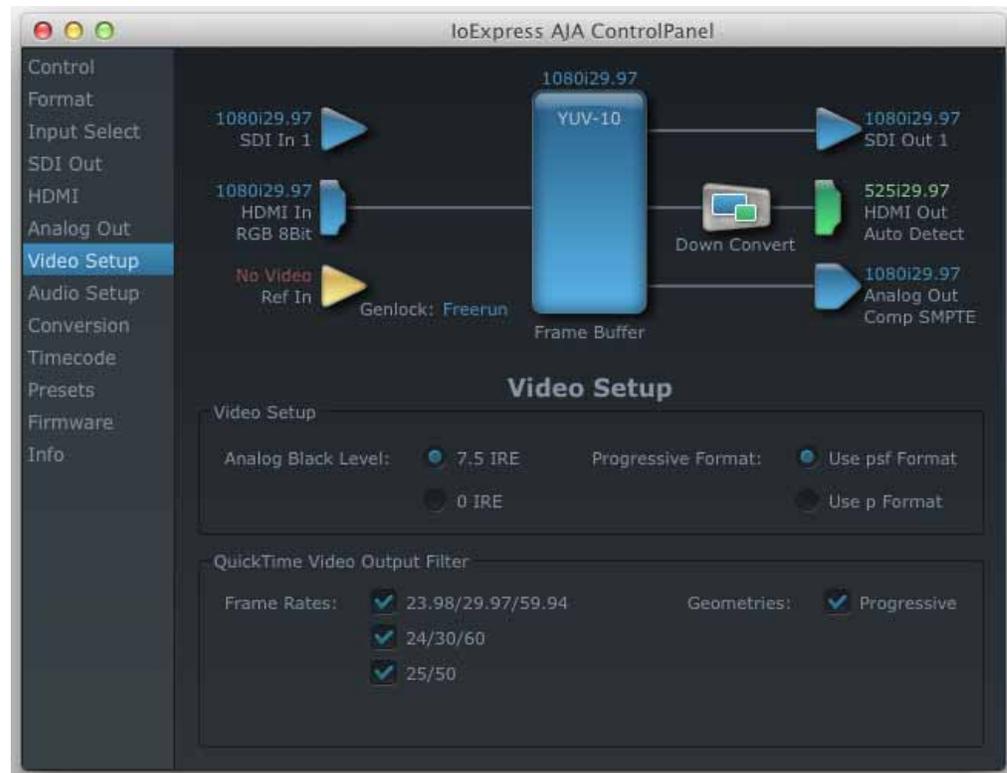
Analog Format—choices in the Analog Format pulldown menu vary depending upon the Analog Output video standard. For example, the “Composite + Y/C” selection is only available when an SD (525i29.97 or 625i25) format is in use. Analog formats can include:

- 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.

Video Setup Screen

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



Video Setup Screen

QuickTime Video Output Filter—The QuickTime Video Output Display Filter is designed to help manage the comprehensive list of video outputs that may be available to applications.

By selecting the checkbox next to specified parameters, the video outputs related to these specified parameters are enabled as possible video outputs for applications. For example, if the checkbox next to 25/50 is unchecked, 50Hz video outputs are deselected and would not be available to the user's editing application. To avoid confusion when working in a particular editorial environment, you might choose to leave 50Hz unchecked if working solely in a 60Hz editorial environment. The same might be true if you do not intend to work with true progressive 1080 material.

Audio Setup Screen

The Audio Setup This screen shows the current settings for that analog audio output, and allows you to re-configure it when desired.



Audio Setup Screen

Audio Setup Screen Settings

Lock Audio Gain To Unity—When set, the Io Express will ignore the third-party application’s gain setting and set the audio gain at unity. When not set, this checkbox tells the Io Express to get the audio gain setting from the editing application (if supported).

Analog Audio Monitor Level—This selection determines the audio level that will appear at the analog audio outputs (“FSD” is full-scale-deflection reading as measured on a VU meter). Select +18 for Europe or +24 for USA.

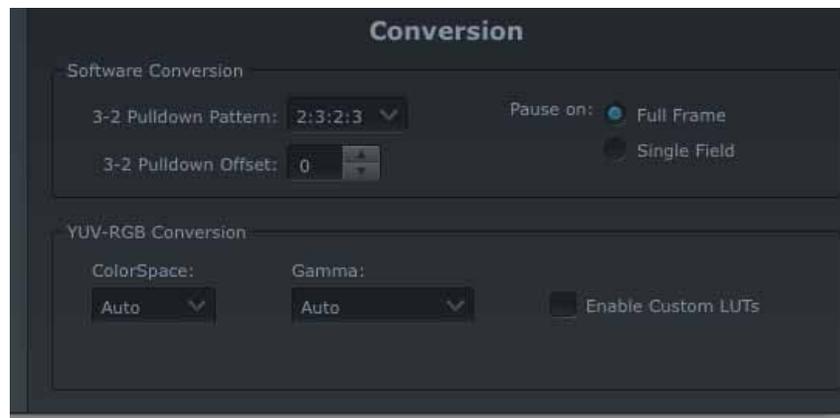
Conversion Screen

This screen allows you to select codec options such as whether a pause stops on a full frame or a single field (jitter compensation) and 24 to 30 fps padding patterns.



AJA Control Panel Conversion Screen

3-2 Pulldown—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.



Conversion Screen Frame-padding Pattern Choices

Video Out, Pause On—these two choices determine what happens when your editing application 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).

YUV-RGB Conversion: These pulldowns select industry standard color space and gamma transfer functions for the YUV-RGB conversion, or allow you to direct Io XT to automatically determine it for you.

Colorspace—choose from:

Rec 601

Rec 709

Auto

Gamma—choose from the following:

Linear (1.8)

Rec 601 (2.20)

Rec 709 (2.22)

Auto

RGB Range—The RGB Range pulldown menu allows you to select either Full range (0-1023) or SMPTE range (typically 64-940) for RGB color output.

Enable Custom LUTs—this checkbox enables a custom color lookup table (LUT).

Timecode Screen

The timecode 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 RS-422 port)—and sent during assemble-edit mode.

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

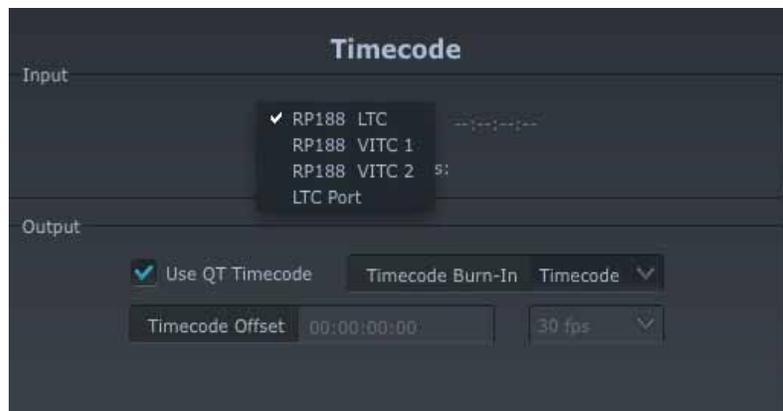


Timecode Screen

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 Pulldown Menu

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 any other application that has timecode offsets that are user-controlled. 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.

After configuring the AJA Control Panel screens, you can then save all your settings as a snapshot for later recall—called a *preset*. In this way, you can organize presets for all your typical tasks, eliminating time-robbing manual re-configuration each time. To save a preset, simply go to the Presets screen and click “Save Preset”. A dialog will be presented asking you for a name; enter a meaningful name and click “OK”. Thereafter the preset will be available under the Control Panel “Presets” list.



Presets Screen

From the Presets screen you can manage your collection of presets easily. To Load or Delete a stored preset, just select it with your mouse and then click the “Load Preset” or “Delete” button respectively.

Firmware Screen

Use the Firmware screen to access the firmware install screen. Click install to erase current firmware and load the firmware version contained in your current driver installation. Note the Installation message shown below.



Firmware Update

You will be required to power-cycle your computer and Io XT to finish the update.



Update Completed

Info Screen

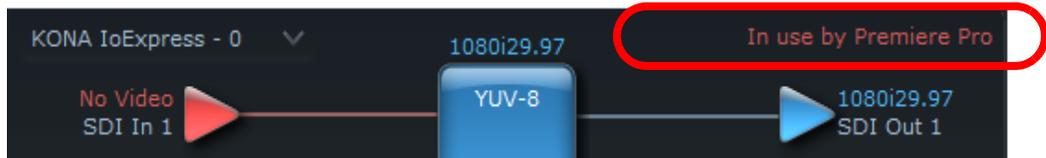
This screen shows the Io Express software files that have been installed on your system. This information may be needed if you talk to an AJA Customer Service representative to determine if files are missing or need updating.



Io Express Control Panel, Info Screen

Who is Controlling Io Express?

There are times when you might have several QuickTime applications open at one time, and each of these might want to output their video thru the Io Express video output. 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. This means that the application that is "active" (in front) will be granted control of the Io Express video output. Generally, when you switch to a different application, the previous application lets go of the video output and the new application gets control.



Io Express/AJA Control Panel "In Use" Message

The AJA Control Panel in-use message will tell you the "active" application that has control of Io Express (see in-use message above) and what the format selections are. If you click on another supported application that is running such as Adobe Premiere Pro or AJA TV, the AJA Control Panel in-use message will report the change by displaying the new application in control. If no in-use message is displayed, the AJA Control Panel is in control of Io Express. If no QuickTime applications are running, the board's state is determined by the AJA Control Panel's settings.

QuickTime Application Format Selection

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 the Third-party editing application is active (it's the front-most application) and has Io Express as its "A/V Device", Io Express's Primary format is determined by the application's "Video Playback" settings. These format selections are reported in the AJA Control Panel block diagram.

Note: 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. Even these QuickTime applications may not relinquish control until capture or output operations are completed.

Control Recommendations

We recommend you have the Control Panel running and visible at all times. When the Control Panel is running in the background (not front-most) you can see what the interface is doing and who has control of it.

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: 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.

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. Virus checking software running in the background (disable it). 2. 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 <i>Input</i> tab of the Io XT 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.
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 for software updates:

<http://www.aja.com/en/support/io/mac/io-express/>

If any are available, download the file and read any associated instructions prior to installing the software.

Contacting Support

When calling for support, first check over your system configuration and ensure everything is connected properly. Even if you cannot find the cause of the problem, having this information at hand will help when you call 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 3rd-party software operational issue, Mac system issue, then call Apple Customer Support or the 3rd-party software manufacturer for help.

If the problem is an AJA Video Io Express issue, then contact AJA Video Customer Support. See *"Contacting Support" on page ii.*

Appendix A: Specifications

Formats

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

Video Input

- SD/HD SDI, SMPTE-259/292/296/424, 8- or 10-bit
- Single Link 4:2:2 (1 x BNC)
- HDMI v1.3 30 bits/pixel, RGB or YUV, 2.25 Gbps, SD, HD, 1080p-50/60

Video Output Digital

- SD/HD SDI, SMPTE-259/292/296/424, 8- or 10-bit
- Single Link 4:2:2 (1 x BNC)
- HDMI v1.3 30 bits/pixel, RGB or YUV, 2.25 Gbps, SD, HD, 1080p-50/60

Video Output Analog

- Composite/S-Video (Y/C) (1 x BNC)
- NTSC, NTSCJ, PAL
- 12-bit D/A, 8x oversampling
- +/- .2 dB to 5.0 MHz Y Frequency Response
- +/- .2 dB to 1 MHz C Frequency Response
- .5% 2T pulse response
- <1% Diff Phase
- <1% Diff Gain
- Component (3 x BNC)
- HD: YPbPr, RGB
- SD: YPbPr, RGB (component mode)
- 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 inequity

Audio Input Digital

- 8-channel, 24-bit SMPTE-259 SDI embedded audio, 48kHz sample rate, Synchronous
- 8-channel, 24-bit HDMI embedded audio, 48kHz sample rate, Synchronous

Audio Output Digital

- 8-channel, 24-bit SMPTE-259 SDI embedded audio, 48kHz sample rate, Synchronous
- 8-channel, 24-bit HDMI embedded audio, 48kHz sample rate, Synchronous

Audio Output Analog

- 2-channel 24-bit unbalanced audio (via RCA jack)

Reference Input or LTC Input

- 1 BNC assignable to Reference video or LTC input
- Reference:
 - Analog Color Black (1V) or Composite Sync (2 or 4V)
 - Non terminating

Machine Control

- RS-422, Sony 9-pin protocol (via breakout cable or optional K3G-Box)
- 9-pin D-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

Physical

- Power: 12-18V, 11-13W
- Interface: PCI Express x1

Appendix B: Safety & Compliance

Federal Communications Commission (FCC) Compliance Notices

Class A Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15, Subpart B of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. 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. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canadian ICES Statement

Canadian Department of Communications Radio Interference Regulations

This digital apparatus does not exceed the Class A limits for radio-noise emissions from a digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications. This Class A digital apparatus complies with Canadian ICES-003.

Règlement sur le brouillage radioélectrique du ministère des Communications

Cet appareil numérique respecte les limites de bruits radioélectriques visant les appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique du ministère des Communications du Canada. Cet appareil numérique de la Classe A est conforme à la norme NMB-003 du Canada.

European Union and European Free Trade Association (EFTA) Regulatory Compliance

This equipment may be operated in the countries that comprise the member countries of the European Union and the European Free Trade Association. These countries, listed in the following paragraph, are referred to as The European Community throughout this document:

AUSTRIA, BELGIUM, BULGARIA, CYPRUS, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS, POLAND, PORTUGAL, ROMANIA, SLOVAKIA, SLOVENIA, SPAIN, SWEDEN, UNITED KINGDOM, ICELAND, LICHTENSTEIN, NORWAY, SWITZERLAND

Declaration of Conformity

Marking by this symbol indicates compliance with the Essential Requirements of the EMC Directive of the European Union 2004/108/EC.



This equipment meets the following conformance standards:

Safety:

CB- IEC 60065:2001 + A1:2005

NRTL - UL 60065:2003 R11.06, CSA C22.2 NO. 60065:2003 + A1:06

GS - EN 60065:2002 + A1

Additional licenses issued for specific countries available on request.

Emissions:

EN 55103-1: 1996

EN61000-3-2:2006, EN61000-3-3:1995 +A1:2001 +A2:2005

CISPR 22: 2006

Immunity:

EN 55103-2: 1996

EN61000-4-2:1995 + A1:1999 + A2:2001, EN61000-4-3:2006, EN61000-4-4:2004,

EN 61000-4-5: 2005, EN 610004-6:2007, EN61000-4-11:2004

The product is also licensed for additional country specific standards as required for the International Marketplace.



Warning!

This is a Class B product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.

Achtung! Dieses ist ein Gerät der Funkstörgrenzwertklasse B. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Attention! Ceci est un produit de Classe B. Dans un environnement domestique, ce produit risque de créer des interférences radioélectriques, il appartiendra alors à l'utilisateur de prendre les mesures spécifiques appropriées.

Korean Compliance Statement

1) Class A ITE

A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
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1) Class A device

Class A (Broadcasting Communication Equipment for Office Use)	As an electromagnetic wave equipment for office use (Class A), this equipment is intended to use in other than home area. Sellers or users need to take note of this.
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Taiwan Compliance Statement

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

This is a Class A product based on the standard of the Bureau of Standards, Metrology and Inspection (BSMI) CNS 13438, Class A.

Japanese Compliance Statement

1. Class A ITE

この装置は、クラスA 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。VCCI-A

This is a Class A product based on the standard of the VCCI Council (VCCI V-3/2008.04). If this equipment is used in a domestic environment, radio interference may occur, in which case, the user may be required to take corrective actions.

Translated caution statements, warning conventions and warning messages

The following caution statements, warning conventions, and warning messages apply to this product and manual.



Warning Symbol



Hazard Warning



Caution Symbol

Before operating your AJA unit, read the instructions in this document

**Warning!**

Read and follow all warning notices and instructions marked on the product or included in the documentation.

Avertissement ! Lisez et conformez-vous à tous les avis et instructions d'avertissement indiqués sur le produit ou dans la documentation.

Warnung! Lesen und befolgen Sie die Warnhinweise und Anweisungen, die auf dem Produkt angebracht oder in der Dokumentation enthalten sind.

¡Advertencia! Lea y siga todas las instrucciones y advertencias marcadas en el producto o incluidas en la documentación.

Aviso! Leia e siga todos os avisos e instruções assinalados no produto ou incluídos na documentação.

Avviso! Leggere e seguire tutti gli avvisi e le istruzioni presenti sul prodotto o inclusi nella documentazione.

**Warning!**

Do not use this device near water and clean only with a dry cloth.

Avertissement! N'utilisez pas cet appareil près de l'eau et nettoyez-le seulement avec un tissu sec..

Warnung! Das Gerät nicht in der Nähe von Wasser verwenden und nur mit einem trockenen Tuch säubern.

¡Advertencia! No utilice este dispositivo cerca del agua y límpielo solamente con un paño seco.

Aviso! Não utilize este dispositivo perto da água e limpe-o somente com um pano seco.

Avviso! Non utilizzare questo dispositivo vicino all'acqua e pulirlo soltanto con un panno asciutto.

**Warning!**

Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.

Avertissement ! Ne bloquez aucune ouverture de ventilation. Suivez les instructions du fabricant lors de l'installation.

Warnung! Die Lüftungsöffnungen dürfen nicht blockiert werden. Nur gemäß den Anweisungen des Herstellers installieren.

¡Advertencia! No bloquee ninguna de las aberturas de la ventilación. Instale de acuerdo con las instrucciones del fabricante.

Aviso! Não obstrua nenhuma das aberturas de ventilação. Instale de acordo com as instruções do fabricante.

Avviso! Non ostruire le aperture di ventilazione. Installare in conformità con le istruzioni del fornitore.

**Warning!**

Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

Avertissement ! N'installez pas l'appareil près d'une source de chaleur telle que des radiateurs, des bouches d'air de chauffage, des fourneaux ou d'autres appareils (amplificateurs compris) qui produisent de la chaleur.

Warnung! Nicht in der Nähe von Wärmequellen wie Heizkörpern, Heizregistern, Öfen oder anderen Wärme erzeugenden Geräten (einschließlich Verstärkern) aufstellen.

¡Advertencia! No instale cerca de fuentes de calor tales como radiadores, registros de calor, estufas u otros aparatos (incluidos amplificadores) que generan calor.

Aviso! Não instale perto de nenhuma fonte de calor tal como radiadores, saídas de calor, fogões ou outros aparelhos (incluindo amplificadores) que produzam calor.

Avviso! Non installare vicino a fonti di calore come termosifoni, diffusori di aria calda, stufe o altri apparecchi (amplificatori compresi) che emettono calore.

**Warning!**

Refer all servicing to qualified service personnel. Servicing is required when the device has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the device, the device has been exposed to rain or moisture, does not operate normally, or has been

dropped.

Avertissement ! Référéz-vous au personnel de service qualifié pour tout entretien. L'entretien est exigé quand l'appareil a été endommagé de quelque manière que ce soit, par exemple lorsque le cordon d'alimentation ou la prise sont endommagés, que du liquide a été versé ou des objets sont tombés dans l'appareil, que l'appareil a été exposé à la pluie ou à l'humidité, ne fonctionne pas normalement ou est tombé.

Warnung! Das Gerät sollte nur von qualifizierten Fachkräften gewartet werden. Eine Wartung ist fällig, wenn das Gerät in irgendeiner Weise beschädigt wurde, wie bei beschädigtem Netzkabel oder Netzstecker, falls Flüssigkeiten oder Objekte in das Gerät gelangen, das Gerät Regen oder Feuchtigkeit ausgesetzt wurde, nicht ordnungsgemäß funktioniert oder fallen gelassen wurde.

¡Advertencia! Consulte al personal calificado por cuestiones de reparación. El servicio de reparación se requiere cuando el dispositivo ha recibido cualquier tipo de daño, por ejemplo cable o espigas dañadas, se ha derramado líquido o se han caído objetos dentro del dispositivo, el dispositivo ha sido expuesto a la lluvia o humedad, o no funciona de modo normal, o se ha caído.

Aviso! Remeta todos os serviços de manutenção para o pessoal de assistência qualificado. A prestação de serviços de manutenção é exigida quando o dispositivo foi danificado mediante qualquer forma, como um cabo de alimentação ou ficha que se encontra danificado/a, quando foi derramado líquido ou caíram objectos sobre o dispositivo, quando o dispositivo foi exposto à chuva ou à humidade, quando não funciona normalmente ou quando foi deixado cair.

Avviso! Fare riferimento al personale qualificato per tutti gli interventi di assistenza. L'assistenza è necessaria quando il dispositivo è stato danneggiato in qualche modo, ad esempio se il cavo di alimentazione o la spina sono danneggiati, è stato rovesciato del liquido è stato rovesciato o qualche oggetto è caduto nel dispositivo, il dispositivo è stato esposto a pioggia o umidità, non funziona correttamente o è caduto.

**Caution!**

This device is a Class A product. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to take whatever measures may be necessary to correct the interference at their own expense.

Attention! Le périphérique est un produit de Classe A. Le fonctionnement de cet équipement dans une zone résidentielle risque de causer des interférences nuisibles, auquel cas l'utilisateur devra y remédier à ses propres frais.

Achtung! Dies ist ein Gerät der Klasse A. Bei Einsatz des Geräts in Wohngebieten kann es Störungen des Radio- und Fernsehempfangs verursachen. In diesem Fall muss der Benutzer alle notwendigen Maßnahmen ergreifen, die möglicherweise nötig sind, um die Störungen auf eigene Rechnung zu beheben.

¡Precaución! Este es un producto clase A. El uso de este equipo en áreas residenciales puede causar interferencias nocivas, en cuyo caso, se requerirá que los usuarios tomen cualquier medida necesaria para corregir la interferencia por cuenta propia.

Cuidado! Este dispositivo é um produto Classe A. Operar este equipamento em uma área residencial provavelmente causará interferência prejudicial; neste caso, espera-se que os usuários tomem as medidas necessárias para corrigir a interferência por sua própria conta.

Attenzione! Questo dispositivo è un prodotto di Classe A. Il funzionamento di questo apparecchio in aree residenziali potrebbe causare interferenze dannose, nel cui caso agli utenti verrà richiesto di adottare tutte le misure necessarie per porre rimedio alle interferenze a proprie spese.



Warning!

Disconnect the external AC power supply line cord(s) from the mains power before moving the unit.

Avertissement! Retirez le ou les cordons d'alimentation en CA de la source d'alimentation principale lorsque vous déplacez l'appareil.

Warnung! Trennen Sie die Wechselstrom-Versorgungskabel vom Netzstrom, bevor Sie das Gerät verschieben.

¡Advertencia! Cuando mueva la unidad desenchufe de la red eléctrica el/los cable(s) de la fuente de alimentación CA tipo brick.

Advertência! Remova os cabos CA de alimentação brick da rede elétrica ao mover a unidade.

Avvertenza! Scollegare il cavo dell'alimentatore quando si sposta l'unità.



Hazard Warning!

High Voltage. This situation or condition can cause injury due to electric shock.

Avertissement ! Tension élevée. Cette situation ou condition peut causer des blessures dues à un choc électrique.

Warnung! Hochspannung. Diese Situation oder Bedingung kann zu Verletzungen durch Stromschlag führen.

¡Advertencia! Alto voltaje . Esta situación o condición puede causar lesiones debidas a una descarga eléctrica.

Aviso! Alta Tensão . Esta situação ou condição pode causar danos devido a choques elétricos.

Avviso! Alta tensione. Questa situazione o condizione può causare lesioni a causa di scosse elettriche.



Warning!

Only use attachments and accessories specified and/or sold by the manufacturer.

Avertissement ! Utilisez seulement les attaches et accessoires spécifiés et/ou vendus par le fabricant.

Warnung! Verwenden Sie nur Zusatzgeräte und Zubehör angegeben und / oder verkauft wurde durch den Hersteller.

¡Advertencia! Utilice solamente los accesorios y conexiones especificados y/o vendidos por el fabricante.

Aviso! Utilize apenas equipamentos/acessórios especificados e/ou vendidos pelo fabricante.

Avviso! Utilizzare soltanto i collegamenti e gli accessori specificati e/o venduti dal produttore.

**Warning!**

Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

Avertissement ! La sécurité de la prise polarisée ou de la prise de type mise à la terre ne doit en aucun cas être empêchée de fonctionner. Une prise polarisée a deux broches, l'une étant plus large que l'autre. Une prise de type mise à la terre a deux broches et une troisième broche pour la mise à la terre. La broche large ou la troisième broche sont fournies pour votre sécurité. Si la prise fournie ne s'insère pas dans votre prise femelle, consultez un électricien pour le remplacement de la prise femelle obsolète.

Warnung! Der Sicherheitszweck des gepolten bzw. Schukosteckers ist zu berücksichtigen. Ein gepolter Stecker verfügt über zwei Pole, von denen einer breiter als der andere ist. Ein Schukostecker verfügt neben den zwei Polen noch über einen dritten Pol zur Erdung. Der breite Pol bzw. der Erdungspol dienen der Sicherheit. Wenn der zur Verfügung gestellte Stecker nicht in Ihren Anschluss passt, konsultieren Sie einen Elektriker, um den veralteten Anschluss zu ersetzen.

¡Advertencia! No eche por tierra la finalidad del tipo de enchufe polarizado con conexión a tierra. Un enchufe polarizado tiene dos espigas, una más ancha que la otra. Un enchufe con conexión a tierra tiene dos espigas iguales y una tercera espiga que sirve para la conexión a tierra. La espiga ancha, o la tercera espiga, sirven para su seguridad. Si el enchufe suministrado no encaja en el tomacorriente, consulte con un electricista para reemplazar el tomacorriente obsoleto.

Aviso! Não anule a finalidade da segurança da ficha polarizada ou do tipo ligação terra. Uma ficha polarizada tem duas lâminas sendo uma mais larga do que a outra. Uma ficha do tipo de ligação à terra tem duas lâminas e um terceiro terminal de ligação à terra. A lâmina larga ou o terceiro terminal são fornecidos para sua segurança. Se a ficha fornecida não couber na sua tomada, consulte um electricista para a substituição da tomada obsoleta.

Avviso! Non compromettere la sicurezza della spina polarizzata o con messa a terra. Una spina polarizzata ha due spinotti, di cui uno più largo. Una spina con messa a terra ha due spinotti e un terzo polo per la messa a terra. Lo spinotto largo o il terzo polo sono forniti per motivi di sicurezza. Se la spina fornita non si inserisce nella presa di corrente, contattare un elettricista per la sostituzione della presa obsoleta.

**Warning!**

Since the Mains plug is used as the disconnection for the device, it must remain readily accessible and operable.

Avertissement ! Puisque la prise principale est utilisée pour débrancher l'appareil, elle doit rester aisément accessible et fonctionnelle.

Warnung! Da der Netzstecker als Trennvorrichtung dient, muss er stets zugänglich und funktionsfähig sein.

¡Advertencia! Puesto que el enchufe de la red eléctrica se utiliza como dispositivo de desconexión, debe seguir siendo fácilmente accesible y operable.

Aviso! Dado que a ficha principal é utilizada como a desconexão para o dispositivo, esta deve manter-se prontamente acessível e funcional.

Avviso! Poiché il cavo di alimentazione viene usato come dispositivo di sconnessione, deve rimanere prontamente accessibile e operabile.

**Warning!**

Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the device.

Avertissement ! Protégez le cordon d'alimentation pour que l'on ne marche pas dessus ou qu'on le pince, en particulier au niveau des prises mâles, des réceptacles de convenance, et à l'endroit où il sort de l'appareil.

Warnung! Es muss verhindert werden, auf das Netzanschlusskabel zu treten oder dieses zu knicken, besonders an den Steckern, den Steckerbuchsen und an dem Punkt, an dem das Kabel aus dem Gerät heraustritt.

¡Advertencia! Puesto que el enchufe de la red eléctrica se utiliza como dispositivo de desconexión, debe seguir siendo fácilmente accesible y operable.

Aviso! Proteja o cabo de alimentação de ser pisado ou de ser comprimido particularmente nas fichas, em tomadas de parede de conveniência e no ponto de onde sai do dispositivo.

Avviso! Proteggere il cavo di alimentazione in modo che nessuno ci cammini sopra e che non venga schiacciato soprattutto in corrispondenza delle spine e del punto in cui esce dal dispositivo.



Warning!

Unplug this device during lightning storms or when unused for long periods of time.

Avertissement ! Débranchez cet appareil pendant les orages avec éclairs ou s'il est inutilisé pendant de longues périodes.

Warnung! Das Gerät ist bei Gewitterstürmen oder wenn es über lange Zeiträume ungenutzt bleibt vom Netz zu trennen.

¡Advertencia! Desenchufe este dispositivo durante tormentas eléctricas o cuando no se lo utilice por largos periodos del tiempo.

Aviso! Desconecte este dispositivo da tomada durante trovoadas ou quando não é utilizado durante longos periodos de tempo.

Avviso! Utilizzare soltanto i collegamenti e gli accessori specificati e/o venduti dal produttore, quali il treppiedi e l'esoscheletro.



Warning!

Do not open the chassis. There are no user-serviceable parts inside. Opening the chassis will void the warranty unless performed by an AJA service center or licensed facility.

Avertissement! Ne pas ouvrir le châssis. Aucun élément à l'intérieur du châssis ne peut être réparé par l'utilisateur. La garantie sera annulée si le châssis est ouvert par toute autre personne qu'un technicien d'un centre de service ou d'un établissement agréé AJA.

Warnung! Öffnen Sie das Gehäuse nicht. Keine der Geräteteile können vom Benutzer gewartet werden. Durch das Öffnen des Gehäuses wird die Garantie hinfällig, es sei denn, solche Wartungsarbeiten werden in einem AJA-Service-Center oder einem lizenzierten Betrieb vorgenommen.

¡Advertencia! No abra el chasis. El interior no contiene piezas reparables por el usuario. El abrir el chasis anulará la garantía a menos que se lo haga en un centro de servicio AJA o en un local autorizado.

Advertência! Não abra o chassi. Não há internamente nenhuma peça que permita manutenção pelo usuário. Abrir o chassi anula a garantia, a menos que a abertura seja realizada por uma central de serviços da AJA ou por um local autorizado.

Avvertenza! Non aprire lo chassis. All'interno non ci sono parti riparabili dall'utente. L'apertura dello chassis invaliderà la garanzia se non viene effettuata da un centro ufficiale o autorizzato AJA.

Index

Symbols

.pkg 14

Numerics

10-bit video 46

8-bit Versus 10-bit Video 46

A

Analog 4 Channel Balanced/Unbalanced Audio 7

analog audio 37

analog component 35, 36

analog composite 35, 36

Analog Format 37, 39

Analog Out Screen 35

Analog Out Screen Settings 37

Audio 4

Audio Input 32

B

Balanced 7

Betacam 7

black burst 7

Black Level 37, 39

Block Diagram Screen 23

Blue 26

Box 5

C

Cable Connections 6

Cable connector descriptions 6

Cabling the System 11

camcorders 7

CD 5

CD, KONA 2 Software 5

CD-ROM 12

Chassis Connections 11, 12

Color Meanings, Control Panel 26

Colorspace choices 39

Component Analog Video Out 11

Component/Composite 7

composite output 35, 36

Configuration 13

configuring output timing 27

Connector Descriptions 6

Connectors 6

Control Panel Basics 23

Control Panel, AJA Software 4

Control Panel, KONA 2 23

Control Panel, Tabbed Screens 26

Control Screen 36, 37

Control Screen Settings 27

Conversion Icons, Control Panel 25

Conversion Options

2K 4

conversion, YUV-RGB 39

Custom LUTs 39

customer service 47

D

DB9 7, 11

Default Io HD Output 34

Default Kona Output 27

Digital System 11

drivers 12

E

EBU N10 7

F

Features, KONA 2 software 4

Final Cut Pro and KONA 2 23

format, primary 7

format, secondary 24

Framebuffer 25

Freerun 29

G

Gamma 39

Gatekeeper 13

Genlock 29

Genlock and Your System 22

Getting Help 48

H

hardware and software requirements 6

HDMI Screen 34

Hold Last Application 29

house reference 7

house reference sync 11

house sync 22

I

Icons 25

Icons, Control Panel 25

Info Screen 44

Input Pass through 28

Input Screen 31

Input Screen Settings 31

Input/Output 25

Installation Overview 9

Installation Software CD-Rom 5

- Installer Screen 14
- Installing Io Software 12
- K**
- KONA 2 Software 12
- KONA 2 will synchronize program video 29
- L**
- Linear 39
- Log On Authenticate Prompt 14
- M**
- Machine Control 7
- Machine Control, pinout 50
- Manual 8
- minimum hardware and software requirements 6
- Monitor Audio 38
- Mountain Lion 13
- Multiple AJA Products 2
- O**
- OS X installer files 14
- P**
- Presets 42
- Primary Format 25
- Primary format 7
- Primary/Secondary conversion
 - XENA 2K 4
- problem symptoms 47
- Problems, what to do 47
- problems, what to do if you encounter 47
- Q**
- QuickTime™ Drivers, AJA KONA 2 4
- R**
- Rec 601 39
- Rec 709 39
- Red 26
- Ref In 29
- Ref Loop 11
- Reference Video 7
- Requirements, System 6
- RP 188 definition 41
- RP-188 40
- RP-188 Timecode 40
- RS422 7
- S**
- SDI cables 11
- set up 9
- shipping 5
- Shipping Box Contents 5
- signal conversion
 - 2K 4
- SMPTE protocol 7
- SMPTE RP 188 41
- snapshot, Control Panel settings 42
- Software 4
- Software CD 13
- software files that have been installed 44
- Software License Agreement Screen 15
- Software on a PowerMac G4 or Xserve Server 12
- software requirements 6
- software updates 48
- software, 3rd-party 23
- Sony 7
- Support 48
- support 48
- Support, 3rd-party software 4
- Symptoms, problem 47
- sync generator 7
- synchronize program video 29
- synchronizing other video equipment 7
- system configuration, Control Panel 23
- System Connections 11, 12
- system interconnections 11
- System software 13
- T**
- Tabbed Windows 26
- Timecode Offset 41
- Timecode Screen 40
- Timecode Screen Settings 40
- Timing adjustment, Control Panel 29
- Troubleshooting 47
- troubleshooting 47
- typical system interconnections 11
- U**
- unpack 5
- Updating Software 48
- Use 43
- user and password 14
- User Bits, RP-188 40
- V**
- Video Input 49
- Video Monitor 11
- video path 25
- VTR 11
- VTR RS-422 Control Port 7
- VTRs, 7

Y

Y/R-Y/B-Y 7

Yellow 26

YPbPr 7

YUV 7

YUV-RGB Conversion 39

