Io LA and Io LD

Installation and Operation Guide

AJA VIDEO SYSTEMS INC

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Notice

FCC Emission Information

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

Contacting Support

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

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

Technical Support Telephone: +1.530.271.3190
Fax: +1.530.274.9442

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

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

Limited Warranty

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

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

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

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Important Safety Information

There are no user-serviceable parts inside. Opening the chassis will void the warranty unless performed by an AJA service center or licensed facility.

Cautionary Notice—Possible Damage to Equipment from Phantom Power

Do not connect Io, Io LA, or Io LD, to any equipment having phantom power turned ON. Phantom power may cause damage to Io, Io LA/Io LD, or other audio equipment connected.

Table of Contents

Io^{LA} and Io^{LD}

Chapter 1: Introduction

Overview

AJA Io^{LD} and Io^{LA} offer two new ways of delivering high quality video and audio to an Apple Power Mac running Final Cut Pro 4 software. Like the award-winning Io, these products offer unsurpassed 10-bit uncompressed video and multi-channel audio, allowing a Power Mac to be configured anywhere from a professional editing suite, corporate/industrial video center, or high-powered desktop video setup. Unlike the larger Io, Io^{LD} and Io^{LA} are smaller more-affordable panels that are optimized for SDI digital or analog suites, respectively.

Both the Io^{LD} and Io^{LA} install easily using a single FireWire connection between them and the Apple Power Mac—while serving *simultaneous* realtime connection for all audio and video sources. All data—including uncompressed video—moves over the IEEE 1394a 400Mb/s FireWire port on the Power Mac. And since uncompressed is only 270Mb/s (and it has filler data included), FireWire can easily handle the bandwidth. Both panels provide the following professional features:

- A/V presets for Final Cut Pro 4.
- All outputs are active—all the time.
- RS422 machine control for professional control of VTRs
- Video Genlock for synchronizing with reference sources
- Flexible A/V monitoring
- Rack-mounting option for professional installation; two panels can be placed side by side in a standard 19" 1RU rack space. A blank plate is provided for mounting a single Io^{LD} or Io^{LA}.
- Chassis styling compliments Apple's Xserve and Xserve RAID for a stylish desktop video suite appearance.

Features

Io^{LD} and Io^{LA} each offer a large number of unique features for connectivity, control, and ease of installation in any environment. In addition to the features they share in common (mentioned previously), they offer these hardware features:

Io^{LD} Hardware

Optimized for SDI digital systems, Io^{LD} provides:

- RS-422 Control Port (Sony), 9-pin D, for machine control.
- 10-bit uncompressed SDI In/Out—with embedded audio. Two SDI outputs are provided for flexibility.
- SDI Loop-through output.
- Two channels of 24-bit digital audio out, via S/PDIF connector.
- Analog Outputs:
  - —stereo balanced analog audio out connectors on a supplied XLR breakout cable (24-bit D/A conversion).
  - —analog component (RGB/YPbPr) or composite/S-video outputs, via 3 BNCs on the supplied breakout cable (10-bit D/A conversion).
- Front Panel Status Indicators: Power On/Off, FireWire (active/inactive), Ref (Genlock), NTSC or PAL.
- Front Panel Mode Indicators: Input/Output.
- Front Panel SDI Video/Audio Source Indicators showing whether Video and Audio are present at the inputs.

Io^{LA} Hardware

Optimized for analog video systems, Io^{LA} provides:

- RS-422 Control Port (Sony), 9-pin D, for machine control.
- Analog (10-bit A/D and D/A) video inputs/outputs:
  - —S-Video In/Out
  - —Composite NTSC/PAL Video In/Out
  - —Component YPbPr/RGB Video In/Out
  - —Genlock/Reference Video (looping)
- Four channels of Analog balanced Audio In/Out are available using a supplied XLR breakout cable.
- Front Panel Status Indicators: Power On/Off, FireWire (active/inactive), Ref (Genlock), NTSC or PAL.
- Front Panel Mode Indicators: Input/Output.

- Front Panel Video Input Source Indicators:
  —Present, Component, S-video, and Composite.

Software

AJA's Io[LD] and Io[LA] were codeveloped with Apple for use with Final Cut Pro 4 for powerful video/audio capture, editing, and video production—all in a single integrated system. Many Final Cut Pro features in version 4 can be better utilized through use of Io. Each of the panels comes with special Final Cut Pro presets for ease of use.

Optional Rackmounting Kit

With a stylish appearance and protective rubber feet underneath, the Io[LD] and Io[LA] panels work great placed directly on a desktop; however, you can also rackmount them if you wish.

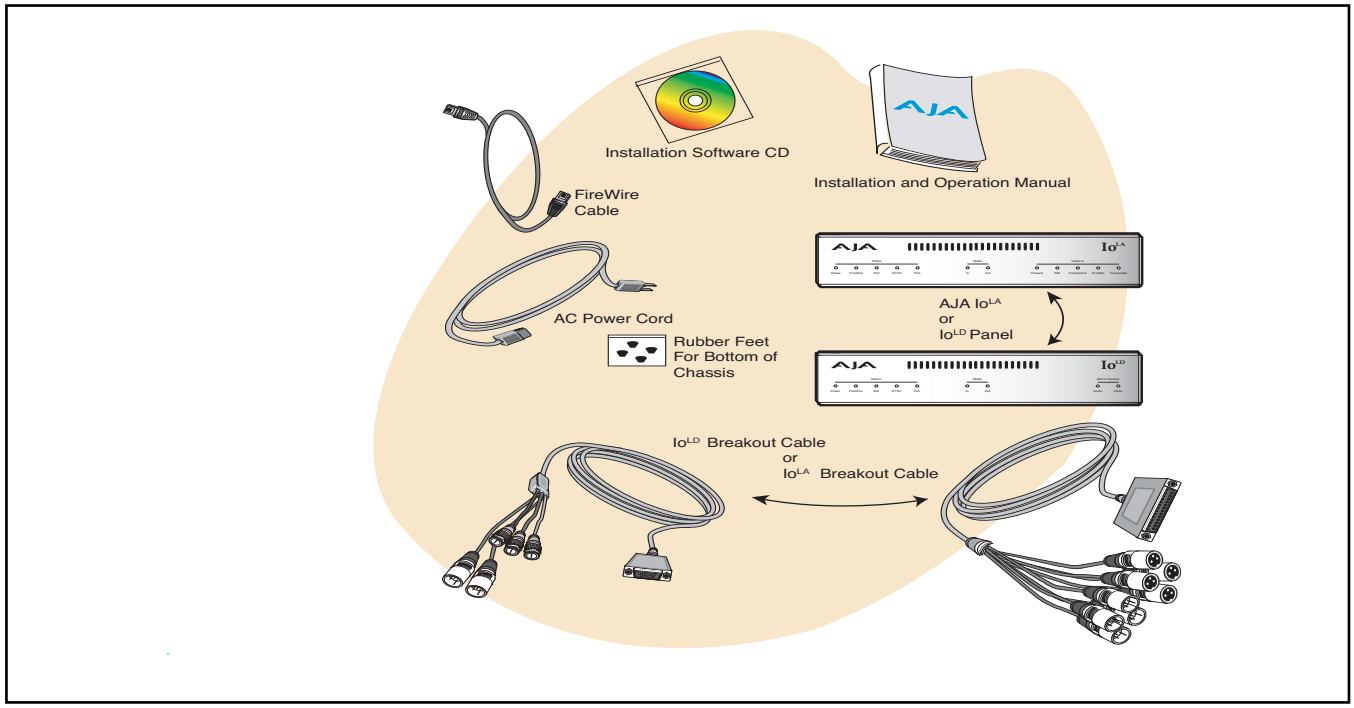
To professionally mount Io[LD] and Io[LA] panels in a standard 19" industrial equipment rack, you'll want the optional AJA rackmounting kit. The kit consists of a 1RU rack chassis, mounting screws, and a blank cover plate. You can mount either one or two Io[LD] and Io[LA] panels using this kit. Whether mounting one or two panels, the result is an attractive rack chassis matching the look of AJA's full-size Io and Apple's Xserve RAID products.

What's In The Box?

When you unpack your AJA Io[LD] and Io[LA] panel, you'll find the following components:

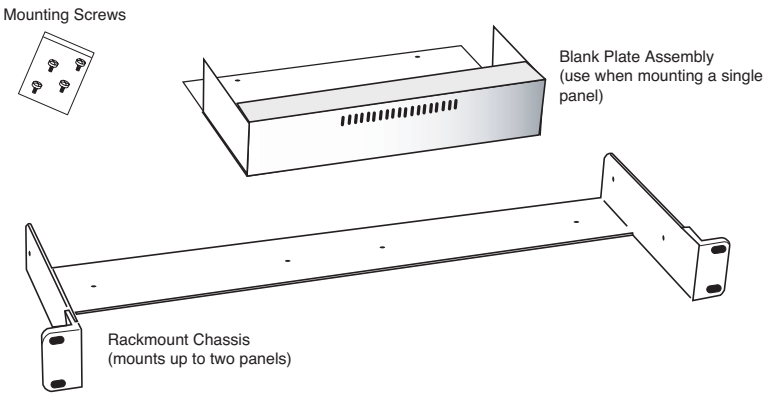
- AJA Io Installation Software CD-Rom—this CD contains the software installer to place Io drivers on an Apple Power Mac for use with Final Cut Pro. Install the software as discussed in this manual in *Chapter 4: Installation and Configuration.* The CD also contains a wide variety of useful information, including a softcopy of this manual you're reading (PDF format).
- Io[LD] or Io[LA] panel.
- Rubber Feet (4) for desk use of the Io[LD] or Io[LA] panel (see *Chapter 4—Installation and Configuration* for further details.
- AC Power cord.
- FireWire cable for connection between Io[LD] or Io[L] and a Power Mac or Xserve.
- Breakout Cable
- Io[LD] or Io[LA] Installation and Operation Manual (the manual you're reading).
- Late-breaking News and/or errata (where applicable, AJA may include additional bulletins related to your product and software).

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



Io Shipping Box Contents

Optional Rackmounting Kit Contents



Optional Rackmounting Kit Contents

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 and then discuss disk storage issues that should be understood for proper system configuration.

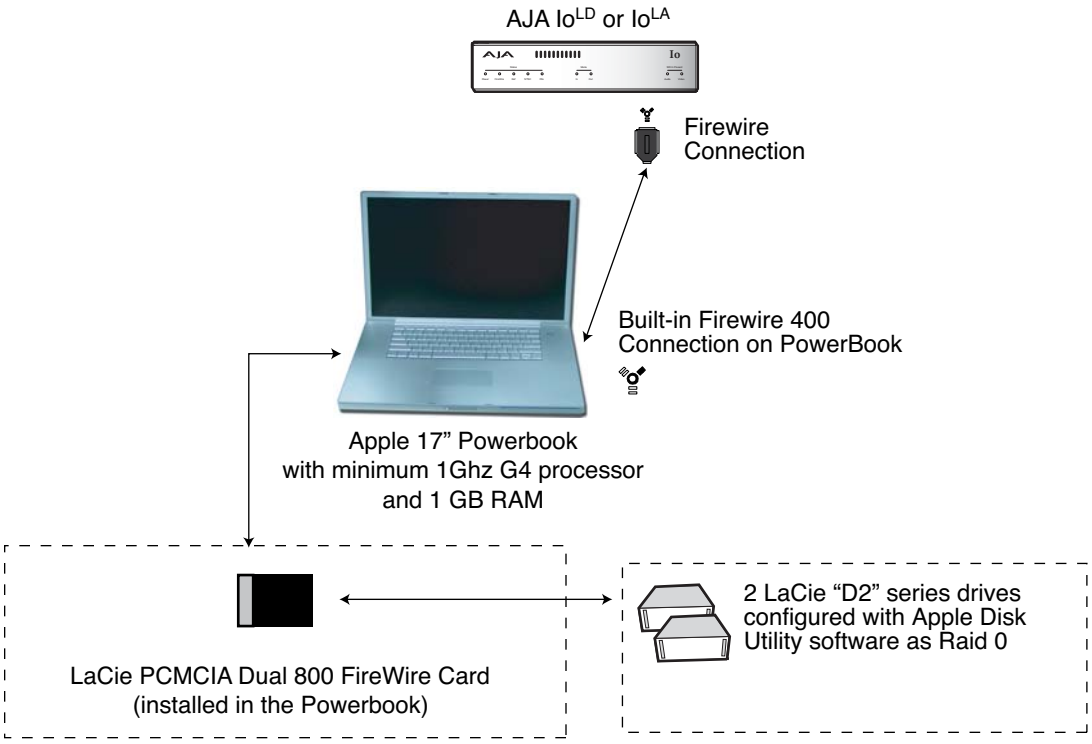
Minimum and Recommended System and Software Requirements

The following table outlines the system hardware and software needed.

Item	Minimum	Recommended
Macintosh Operating System	OS X, version 10.2.5	OS X, version 10.3 or newer
Editing/Production Software Suite	Final Cut Pro 4	Final Cut Pro 4
Macintosh	Power Mac G4, dual 800 MHz (or single 933 MHz G4). For portable operation, 17" Powerbook with Dual port FireWire 800 PCMCIA card.	Power Mac G5
RAM	as recommended by Final Cut Pro for your system configuration	as recommended by Final Cut Pro for your system configuration
Disk Storage (external RAID) ***Note:*** see Storage Methods topic that follows later in this Chapter	4 ATA/IDE or 4 SCSI Hard Drives	Apple Xserve RAID

PowerBook Configuration

A PowerBook 17" laptop may be used as the basis for a portable Final Cut system used with Io[LA/LD]. This configuration, however, is *not supported* or recommended by Apple, although it has been found to work by AJA when used in the following configuration shown in the illustration. Only these components have been tested by AJA.



PowerBook and Io$^{LA/LD}$ Configuration—Apple Unsupported

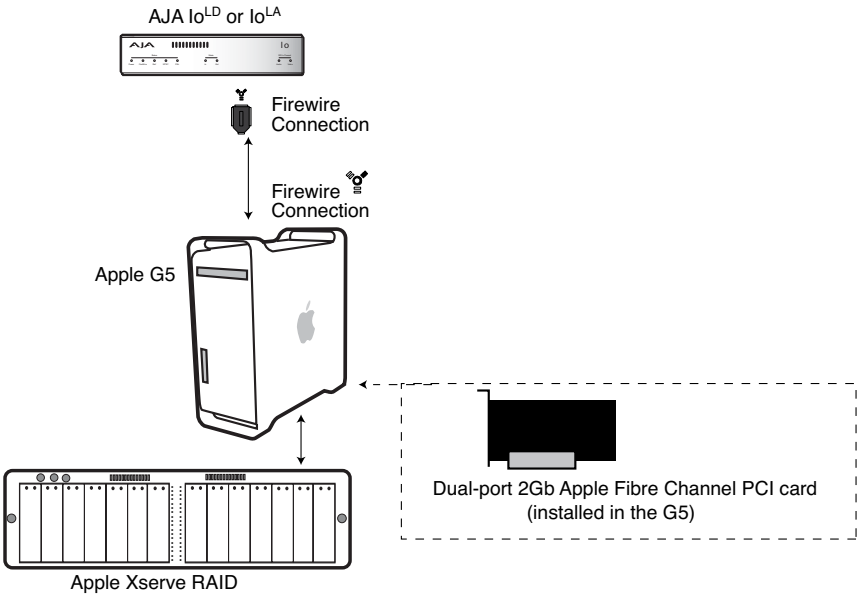
Understanding Disk Storage Methods

Io^{LD} or Io^{LA}, an Apple Power Mac, and Final Cut Pro 4, together offer the most cost-effective set of features and incredible performance for Video/Audio production applications. However, to ensure performance and quality, the disk storage system used with the Apple Power Mac must be able to meet the demands of storing realtime uncompressed media. At the very minimum, the disk storage system must be able to provide and maintain a consistent 50 MB/s transfer rate from the Power Mac to disk (read/write). There are a variety of system configurations and peripherals that can provide this level of performance. Possible system configurations are listed below:

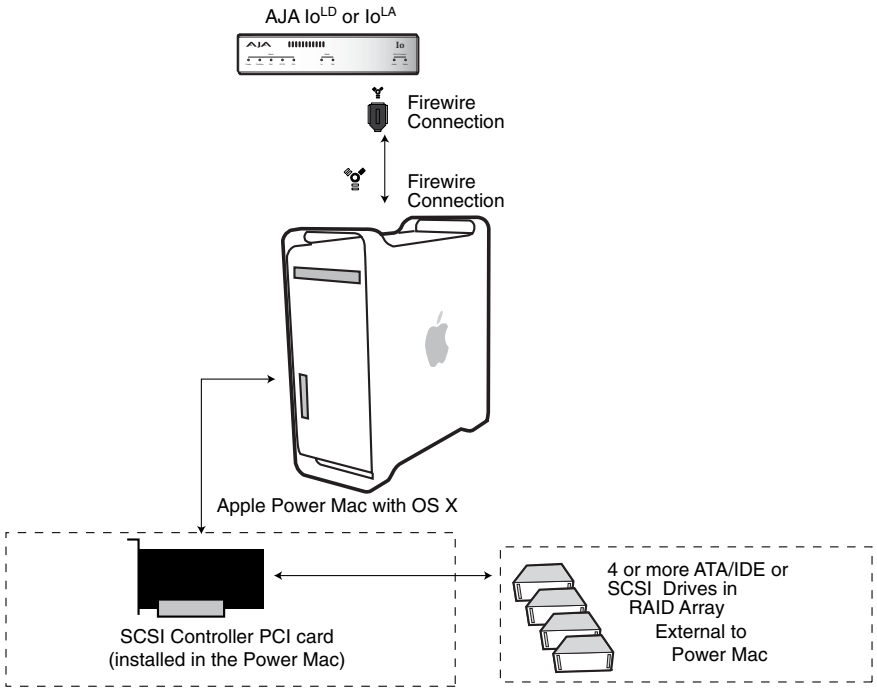
Storage Method	Features/Limitations	Cost
Xserve RAID	Features up to 14 ATA/100 drive channels, dual independent RAID controllers, and a dual 2Gb Fibre Channel host interface. Xserve provides up to 3.5TB of storage with throughput of up to 400 megabytes per second.	Expensive, although the cost per gigabyte is excellent when large storage is needed

Storage Method	Features/Limitations	Cost
External ATA/IDE or SCSI RAID	Scalable. Performance almost as good as Xserve, although it can be more complex to set up and maintain. Many vendors offer solutions (too many to list here; check with your Apple dealer for SCSI Storage solutions for details). Although the connection to the external RAID chassis is SCSI, the drives themselves may be SCSI or ATA. A pure SCSI array will offer higher performance at a higher cost.	Moderately Expensive

Note: FireWire drive solutions are not generally supported in use with AJA Io[LD] and Io[LA]. Since they connect to the host Power Mac via FireWire and use the FireWire bus bandwidth extensively, it cannot also be used for storage—at the same time. The only exception is a portable Powerbook implementation where a PCMCIA FireWire card provides an additional two ports; see the discussion on the PowerBook configuration provided in this manual. You can however attach and use FireWire drives on the Power Mac whenever Final Cut Pro is not in use. Their presence on the bus will not affect Io[LD] or Io[LA]performance as long as they aren't being actively used.



Disk Storage Solutions—G5 and Xserve RAID



Disk Storage Solutions—External ATA/IDE or SCSI RAID

About RAIDs

Redundant Array of Independent Disks, or RAID, is a group of hard drives that appears to the host Power Mac as a single high-speed storage unit. RAID systems enable you to increase storage capacity and get the performance, reliability, and data protection needed for video production, but not possible from a single hard drive. RAID drives inside the array operate simultaneously, increasing overall throughput. RAID technology is comprised of these techniques (some or all):

- Striping data across multiple drives for storage performance (RAID 0).
- Mirroring for redundancy (RAID 1).
- Parity for data protection (RAID 5 [plus others]).

Most RAID configurations, or RAID levels, combine these to provide a balance of protection and performance.

Striping divides a logical drive into data blocks, or stripes, that are distributed across an array of physical drives. Striping a set of disks improves storage performance because each drive operates concurrently. However, striping alone, known as RAID level 0, offers no data protection.

Mirroring involves writing identical copies of all data to a pair of physical drives. This results in very high data reliability: If one drive fails, the data is still available on the remaining disk drive. However, it also results in a storage efficiency of only 50 percent, because two physical drives are required to achieve a single drive's capacity. Mirroring alone is known as RAID level 1.

Parity provides data protection without requiring complete duplication of the drive contents. In the event of a drive failure, parity information can be used with data on surviving drives to reconstruct the contents of a failed drive. Parity data can be stored on a dedicated drive, as in RAID 3, or distributed across an array of drives, as in RAID 5. Parity provides much greater storage efficiency than mirroring—up to 85 percent for a set of seven drives.

Software For Striping

AJA recommends the Disk Utility software provided by Apple with OS X for creating and striping RAIDs, including 3rd-party, SCSI, and Xserve RAIDs. It is very easy to use and has been tested to work well. The utility can be found in *Macintosh HD/Applications/Utilities,* where *"Macintosh HD"* is the name of the system drive.

Note: *Journaling* should be turned off on drives used for realtime video.

AJA Io^{LD}/Io^{LA} and Xserve RAID

For the optimum in disk storage with Final Cut Pro 4 and Io^{LD} or Io^{LA}, we recommend Apple's Xserve RAID. Xserve RAID holds up to 14 hot-swap Apple Drive Modules—3.5TB of storage—in a rack-optimized 3U enclosure. Each 7200-RPM hard drive connects to a dedicated ATA/100 drive channel, eliminating a traditional source of bottlenecks and maximizing the 2Gb/s Fibre Channel host connection(s). By adding more Xserve RAID systems, you'll have very large expansion capabilities: A standard 42U rack can hold over 49TB of Xserve RAID storage.

Xserve RAID is designed for nonstop operation. Redundant hot-swap power and cooling modules allow the system to keep functioning even if one module fails. A high-availability architecture and dual independent RAID controllers support RAID levels 0, 1, 3, 5, and 0+1. In addition, Xserve RAID supports hybrid RAID levels 10, 30, and 50 when used in conjunction with host-based software RAID. Remote Xserve RAID management capabilities are provided via Apple's Java-based RAID Admin application.

Note: When creating and striping an Xserve RAID for Io^{LA} or Io^{LD}, using the Apple Disk Utility provided with OS X, use *RAID 50*. The internal Xserve RAID drives are set up as RAID 5; the Xserve RAID then shows up in Disk Utility as two drives (regardless of the number of internal drives) which must be configured together as RAID 0. Apple calls this configuration "RAID 50."

Storage capacity

No matter which storage system you choose, pick one that can scale to meet your needs over time. Ideally, you should be able to increase storage capacity or switch to a RAID level offering increased data protection in the future. Balance current and future storage needs with your budget and choose accordingly.

FORMAT	Transfer Rate in MB/sec	Storage Requirement in GB/Hour	Capacity of Typical 4 x 73GB SCSI RAID in Hours	Capacity of Typical 4 x 120GB ATA RAID in Hours
10 bit Uncompressed	28	101	2.9	4.8
8 bit Uncompressed	21	76	3.9	6.3
DV50	6.3	23	12.9	21.2
DV25	3.1	11	26.2	43.0
Photo JPEG	2.5	9	32.4	53.3
MB = MegaBytes				
GB = GigaBytes				

Note: for uncompressed formats, PAL and NTSC transfer rates and storage requirements are the about the same because PAL has a lower frame rate, but more lines.

In This Manual

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

Chapter 2 discusses the front and rear panel connections and indicators. Illustrations point out the various connectors and indicators with text discussions of each.

Chapter 3 gets you started with using your system in a typical Video environment. Workflows for Analog component or composite, Digital SDI (Serial Digital), DV, and offline, are all discussed.

Chapter 4 provides complete instructions for installing and configuring the panel, from unpacking, installing the chassis, installing AJA software from CD, cabling the system and then getting it up and running. Important configuration information is provided on video settings and use of genlock/external reference.

Chapter 5 discusses operational aspects of Io^{LD} and Io^{LA} when used with Final Cut Pro.

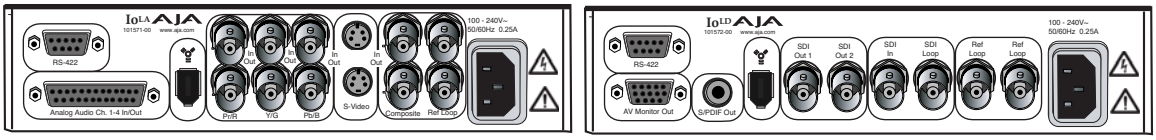
Chapter 6 discusses troubleshooting problems with your system and what to do when there's a problem you can't solve.

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

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

Io^{LA} and Io^{LD}

Chapter 2: Controls and Indicators



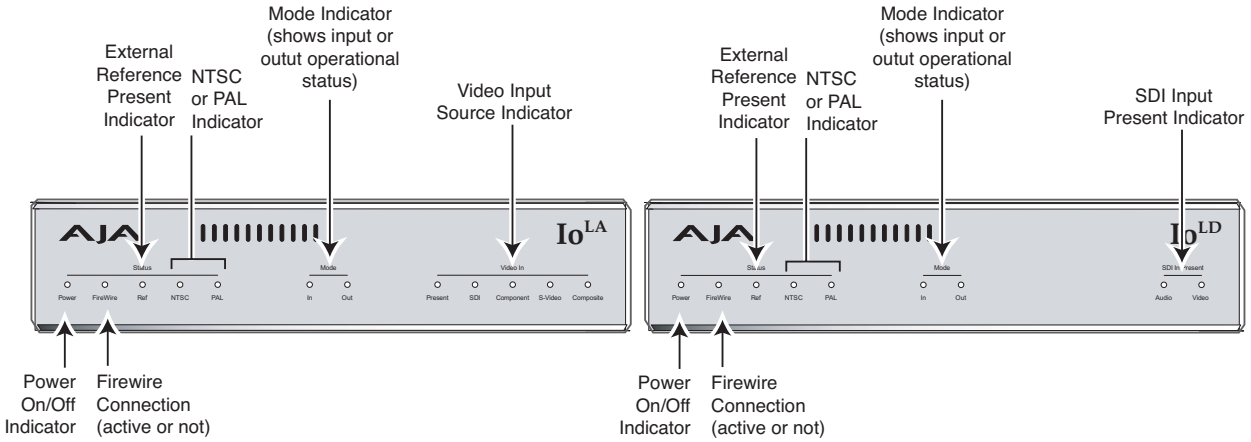
Controls and Indicators

When installing the AJA Io^{LD} or Io^{LA} system, you'll make media cable connections to a variety of equipment. After installation, the front panel indicators will be useful in monitoring what is happening on the system as well as troubleshooting problems that can occur. Becoming familiar with the front and rear panels will simplify installation, setup, and operation of the system.

On the following pages are front and rear panel illustrations with notations that summarize all of the connectors and indicators. Detailed descriptions of each of the connectors and indicators follow afterward.

Full installation instructions are provided in Chapter 4 later in this manual. Be sure to read that chapter before attempting to install the product.

Front Panel



AJA Io^{LD} and Io^{LA} Front Panel Indicators

Indicator Descriptions

Indicators on the front panel are LEDs that illuminate when a condition is present. The following indicators are conveniently arranged in groups to show specific subjects:

- Status
- Mode
- Video In or Video Present

Each of these groups of indicators are discussed on the following pages.

Status Indicators

Power—shows that Io$^{LD/LA}$ is connected to AC mains power. It may also blink or not light at all in the case of a boot error.

FireWire—shows audio/video is flowing over the FireWire connection (capture or playback are occurring).

Ref—shows that the panel has an external reference video source applied (Genlock), usually black burst. Please refer to the "*Genlock and Your System*" topic in Chapter 4 for additional information on the use of the Ref Loop connector and the effect of Genlock/External Reference sources on the system.

NTSC—shows that the system is configured for NTSC/525-line standards.

PAL—shows that the system is configured for PAL/625-line standards.

Mode Indicators

In—shows that the panel is configured to capture video/audio.

Out—shows that the panel is currently selected to playback video/audio.

If you're not running Final Cut Pro, both Mode LEDs will be off.

Video In Indicators (Io[LA] only)

Present—shows that the selected video source has been detected.

Component—shows that the component RGB/YPbPr video input is selected.

S-Video—shows that the S-Video digital video input is selected.

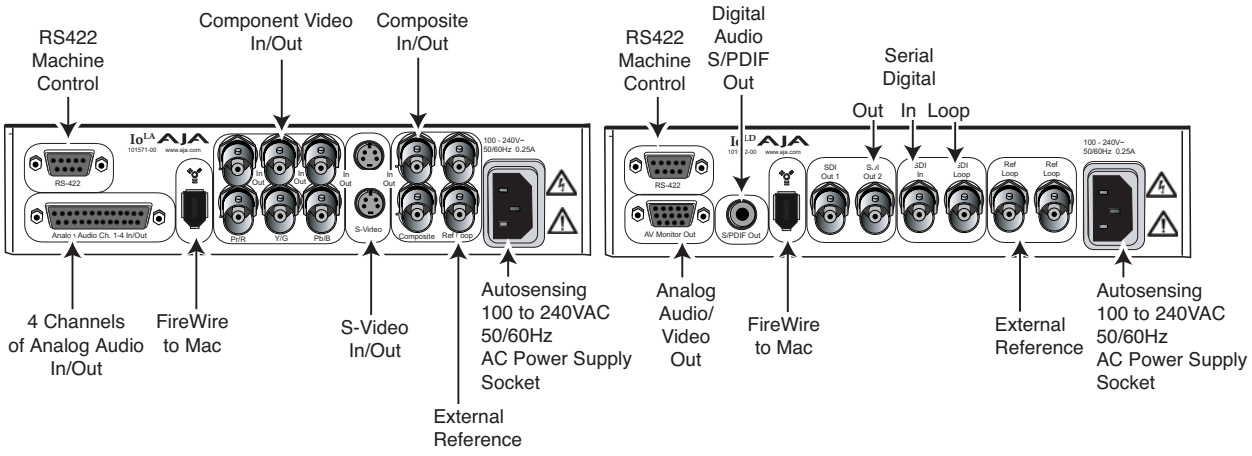
Composite—shows that the composite video input, in either NTSC or PAL, is selected.

SDI In Present Indicators (Io[LD] only)

Video—shows that serial digital video has been detected at the input.

Audio—shows that embedded serial digital audio has been detected at the input.

Rear Panel



AJA Io[LD] and Io[LA] Rear Panel Connectors

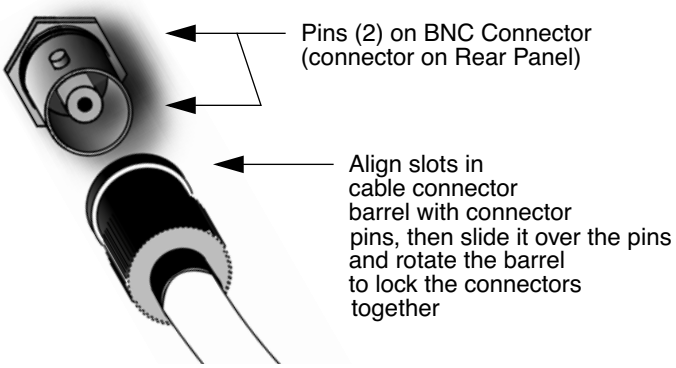
About Inputs and Outputs

The exact function of Io^{LD} or Io^{LA} inputs and outputs depend on the operational mode at a given time. In the capture mode, inputs are selected by Final Cut Pro's *Audio Video Settings* menus (or *Easy Setups*). While capturing, the selected inputs are mirrored at the Io panel's outputs. When not in the capture mode, the outputs change to reflect the output of Final Cut Pro. In all cases, all of the panel's outputs are active all the time. In other words, the same output video appears simultaneously on all the output connectors the panel has. For example, the Io^{LD} has simultaneous SDI output at its "SDI Out" connectors and Component or Composite at its "A/V Monitor Out" connector. The Io^{LA} has simultaneous Composite, S-Video, and Component at its respective output connectors. This method of operation allows simultaneous connection to VTRs and monitoring facilities.

About BNC Connectors

Although most video professionals are used to BNC connectors, you may not have seen them if you've been using primarily desktop video equipment. BNC connectors ensure a positive connection by the act of locking the connectors together via pins in one connector that fit into slots in the corresponding connector.

To make a BNC connection, slide the cable connector over the connector on the Io rear panel and then when seated, rotate the barrel of the cable connector 90° clockwise until the connectors are locked together. When properly locked, the cable cannot accidentally be pulled out.



Io^{LD} Connectors

Connectors on the rear panel are arranged in groups for easy installation and maintenance. Connectors provided are:

- *A/V Out* DB15 connects to a supplied breakout cable, providing 2 channel balanced analog audio output connectors (XLR), and analog component or composite video output via 3 BNCs.
- RS-422 Control Port (Sony), 9-pin D, for machine control.
- S/PDIF connector provides two-channel digital audio output (1 RCA).

- IEEE 1394a FireWire connector for audio/video and control data between the panel and an Apple Power Mac.
- SDI video with 8 channels of 24-bit embedded audio Input (1 BNC).
- SDI video with 8 channels of 24-bit embedded audio Output 1 and 2 (two BNCs).
- *SDI Loop* connector (1 BNC), that mirrors the input.
- Ref Loop connectors for Genlock/External Reference Video (looping), two BNCs
- AC power connector, 3 pin (with Ground)

Each of these connectors are discussed on the following pages.

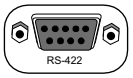
Io^{LA} Connectors

- *Analog Audio Ch. 1-4 In/Out* DB25 connects to a supplied breakout cable, providing 4 channels of balanced analog audio input and output connectors (8 XLRs).
- RS-422 Control Port (Sony), 9-pin D, for machine control.
- 400mb IEEE 1394a FireWire connector for audio/video and control data between the panel and an Apple Power Mac.
- S-Video input and output connectors (two 4-pin mini-DINs).
- Composite NTSC/PAL Video In/Out, 1 BNC for input, and 1 BNC for output.
- Component YPbPr/RGB Video, 3 BNCs for input, and 3 BNCs for output.
- Genlock/Reference Video (looping), two BNCs
- AC power connector, 3 pin (with Ground)

Common Connector Descriptions (Io^{LD} and Io^{LA})

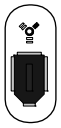
RS422 Machine Control

A female DB9 connector provides connection for VTRs, camcorders, disk media servers, and other devices using RS422 SMPTE (Sony) protocol.



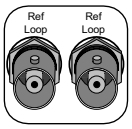
FireWire

IEEE 1394a FireWire connector for connecting to the 400 Mb/s FireWire connector on an Apple Power Mac for passing video, audio, and control data. Software installed from the Io Installer CD provides the Power Mac with drivers that allow optimum use of Io from within Final Cut Pro. This connector does not support connection to any other FireWire devices.



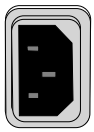
Reference Video (looping)

These two BNC connectors allow you to synchronize Io^{LD} or Io^{LA} outputs to your house 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 composite output here. When an Io^{LD} or Io^{LA} outputs video it uses this reference signal to lock to.



AC Power

A standard male AC power socket provides connection to a power cable (supplied separately) having three wires—one for ground. The internal power supply is autosensing, meaning that it adjusts automatically to either 110 or 220 VAC. The range of input AC levels is from 100 to 240VAC at either 50 or 60Hz.

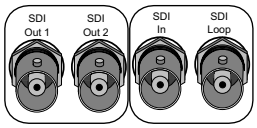


Caution: *The Io^{LA} and Io^{LD} panels have no user-serviceable parts. An internal fuse protects the circuitry; however, it can only be replaced by AJA service centers or AJA dealers.*

Io^{LD} Connector Descriptions

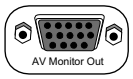
SDI Input and Outputs

BNC connectors are provided for one SDI input, two SDI outputs (independent of the input), and one looping SDI output that follows the input. SDI inputs and outputs support video and embedded 24-bit digital audio. SDI offers 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.).



Audio/Video Analog Output

A DB15 female connector provides attachment for a breakout cable that offers two XLR connectors for stereo balanced analog audio output, and three BNCs for analog component or composite video output. The connections are ideal for monitoring and/or connecting to analog video equipment.



BNC Assignments—Component and Composite Modes

Component Mode	Composite Mode
3 BNCs: YPbPr or RGB	BNC1: Composite
	BNC2: Y (s-video)
	BNC3: C (s-video

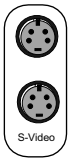
S/PDIF Audio Output

The S/PDIF connector carries 2 channels of digital audio output as configured by Final Cut Pro. S/PDIF signals are handled internally as 24-bit digital. The connector is an RCA-style jack.

Io[LA] Connector Descriptions

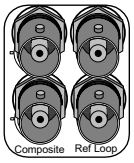
S-Video (Y/C)

S-Video input and output female 4-pin mini-DINs provide for connection of desktop video/pro-sumer level equipment, including camcorders, VCRs/VTRs, and monitors—to name a few. Use high quality shielded S-Video cables when making connections. S-video signals are converted internally to 10-bit digital.



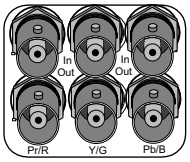
Composite NTSC/PAL

BNC connectors support composite NTSC or PAL input and output. Connect an NTSC or PAL composite video cable from a VTR, Camera, or other source to the Composite In BNC. Then connect the Composite Out BNC to a monitor, or other Composite video device. Composite video signals are A/D (input) and D/A (output) converted (10-bit).



YPbPr and RGB

Connect component YPbPr video cables from a VTR, Camera, or other source to the three YPbPr input BNCs: Y/G, Pr/R, and Pb/B. Then connect the YPbPr Out BNCs to a monitor, or other component device. Component video signals are A/D (input) and D/A (output) converted (10-bit). Component video signals are generally higher quality than composite, but not as high quality as serial digital (SDI).

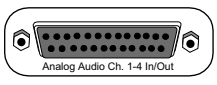


A Note About RGB—Although RGB is used less in today's video systems, Io supports it at both input and output. Because Io[LA]'s (and SMPTE SDI's) native format is YPbPr, AJA recommends the use of YPbPr whenever possible. Although component video monitors often have RGB inputs, it's better to use YPbPr when the monitor supports it. The YPbPr format provides "headroom" for "superwhite" and "superblack"—and these video levels *will be clipped* when transcoding to RGB. Also, the RGB/YPbPr transcoding involves a level translation that results in mathematical roundoff error. Within Final Cut Pro, RGB can be configured in the *Audio/Video Settings* or *Easy Setups* menus.

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[LA] uses the modern YPbPr terminology exclusively. It 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 Final Cut Pro within the *Audio/Video Settings* or *Easy Setups* menus.

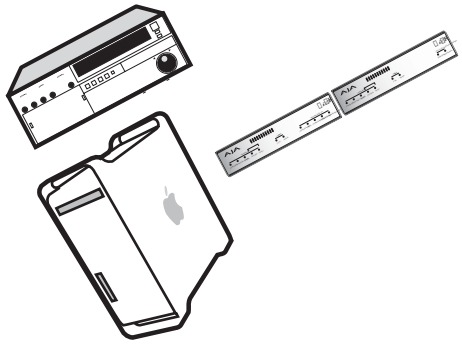
Analog Audio Output

A DB25 female connector provides attachment for a breakout cable with 8 XLR connectors, four male and four female, for four channels of balanced analog audio input and output.



Io^{LA} and Io^{LD}

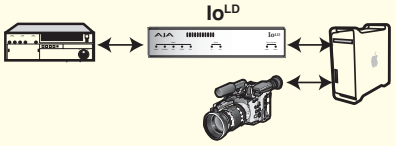
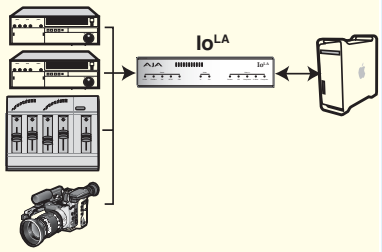
Chapter 3: Getting Started



Io$^{LD/LA}$ And Your Workflow

There are a lot of ways to think about the video/audio workflow you follow. Your setup might be categorized as corporate video, professional broadcast, or desktop video. Or the workflow might be categorized by the type of equipment used rather than the nature of work produced—often systems are a mixture of equipment from high-end professional and desktop video. This chapter hopes to show how Final Cut Pro and Io$^{LD/LA}$ can help fit into whatever workflow you currently have and make it more efficient. If you're doing anything beyond standard DV direct into a Power Mac, then Io will make work easier. Even if you have been using DV direct to a Power Mac, Io will vastly increase what you can capture and bring into Final Cut Pro.

A *Workflow Scenarios* diagram on the following page shows types of equipment, sorted by VTR source, and the types of workflow attributes and Io applications supported. After the diagram, we also discuss some typical applications.

Source Deck Type(s)		Workflow Attributes	Applications
Analog Examples: Beta, VHS, and U-matic		Io^LA captures and outputs component and composite video, with 4 channel balanced audio	Corporate/Industrial Pro Broadcast On-site Editing
Digital Examples: Digibeta, DV50, DVCPRO, and DVcam		Io^LD captures and outputs SDI video with embedded audio.	Pro Broadcast Corporate/Industrial On-site Editing
Digital capture via Firewire with Output via AJA Io^LD Example: MiniDV		Using standard desktop video techniques, video/audio is captured directly from a camcorder or deck. Io^LD is used for playing back captured media and editing/mastering to tape or DVD using Final Cut 4 and other tools	Desktop Video Corporate/Industrial On-site Editing Pro Broadcast
Monitoring one or multiple video/audio sources Examples: monitoring studio equipment while setting up chroma keys or monitoring a remote shoot, or using older legacy equipment in an edit suite		Monitoring a variety of legacy and current devices for playback or conversion can be a challenge., AJA Io^LA can use all of its I/O ports simultaneously, supporting a wide range of old and new equipment configurations.	Offline Editing, On-site Editing, Archival

Workflow Scenarios

Understanding Typical Workflows

Using Io^LD or Io^LA and Final Cut Pro 4 allow more workflow flexibility than ever before. Users can independently select different formats for capture and storage media, while also outputting to analog and/or digital uncompressed formats. Capture formats may vary, depending on the Io model you purchased. Media can be stored on disk as:

- offline quality at low bit rates
- on-line quality at moderate bit rates
- or with the highest quality as 8 or 10 bit uncompressed

Following are summaries of the most common workflows, listing data rates and relative quality levels. Some workflows require a RAID array and some will work using the host Power Mac's internal system drive—it's noted where this is supported in the following discussions.

DV (DV25)

Data rate: 3.13 MB/second (megabyte/second)—supported by internal system drive

Quality: Good

In this workflow, DV is usually input to a Power Mac running Final Cut Pro 4 through its FireWire port. DV offers good quality, but it has lower Chroma resolution when compared to DV50, JPEG, or uncompressed. You can use Io[LD] or Io[LA] to convert DV projects to uncompressed—in real time—for monitoring and/or output. Alternatively, you can capture uncompressed from any input, directly to DV media.

DV50

Data rate: 6.26 MB/second—supported by internal system drive

Quality: Very Good

Like DV25, Final Cut Pro 4 also supports the Panasonic DV50 codec. DV50 is a 4:2:2 compressed format and therefore has higher chroma resolution when compared to DV25. Also like DV25, you can use Io[LD] or Io[LA] to convert DV50 projects to uncompressed—in real time—for monitoring and/or output. Io[LD] or Io[LA] can capture uncompressed from any input, directly to DV50 media.

PhotoJPEG

Data rate: approximately 2-3 MB/second—supported by internal system drive

Quality: Very Good

The Apple PhotoJPEG codec offers an excellent compressed media choice for on-line quality at low data rates. PhotoJPEG can use the full-raster at 4:2:2 sampling. Final Cut Pro 4 allows you to adjust quality using a PhotoJPEG control panel. Io[LD] or Io[LA] will convert PhotoJPEG projects to uncompressed—in real time—for monitoring and/or output. Io[LD] or Io[LA] can capture uncompressed from any input, directly to PhotoJPEG media.

Uncompressed 8-bit

Data rate: 21 MB/second—requires SCSI or ATA drive array

Quality: Excellent

Uncompressed media is the Io family native storage format, offering the highest quality available. Capturing in uncompressed results in no compression artifacts, and video is sampled over the full raster at a 4:2:2 rate. Using uncompressed maintains a higher quality in your project from capture all the way through effects rendering. Final Cut Pro 4 supports RT with uncompressed media using RT Extreme. Io products support capture of uncompressed through any inputs, and uncompressed projects are output to all outputs simultaneously.

Uncompressed 10-bit

Data rate: 28 MB/second—requires SCSI or ATA drive array

Quality: Excellent, highest quality available

Offering all the benefits noted previously for 8-bit uncompressed, 10-bit additionally offers the very highest quality available. With 10-bit media and Final Cut Pro's 32 bit Floating Point YUV Codec, video quality is second to none—at any price. For more information on this subject, please see the topic at the end of Chapter 4: *Installation and Configuration*, titled "Using 8-bit Versus 10-bit Video."

Mixing and Matching Formats in Final Cut

In Final Cut Pro, it works best to use one format consistently. For example, if you capture DV 50 files and then capture 8-bit uncompressed files, you'll have to rerender one or the other when using the two types on the same Final Cut *sequence* (the timeline where media is edited into a project). Therefore, it makes sense to capture media into your system at the highest quality you'll expect to use to eliminate rerendering and ensure best results. Io^{LD} or Io^{LA} are ideal for this since they have most of the connections necessary to bring in any kind of media from any kind of legacy or modern source for capturing into Final Cut. For digital input devices, use Io^{LD}; for analog inputs use Io^{LA}. If you need both types of inputs in a single system, use the standard Io system which has every type of input and output you could imagine.

Io^{LA} and Io^{LD}

Chapter 4: Installation & Configuration

Installation Overview

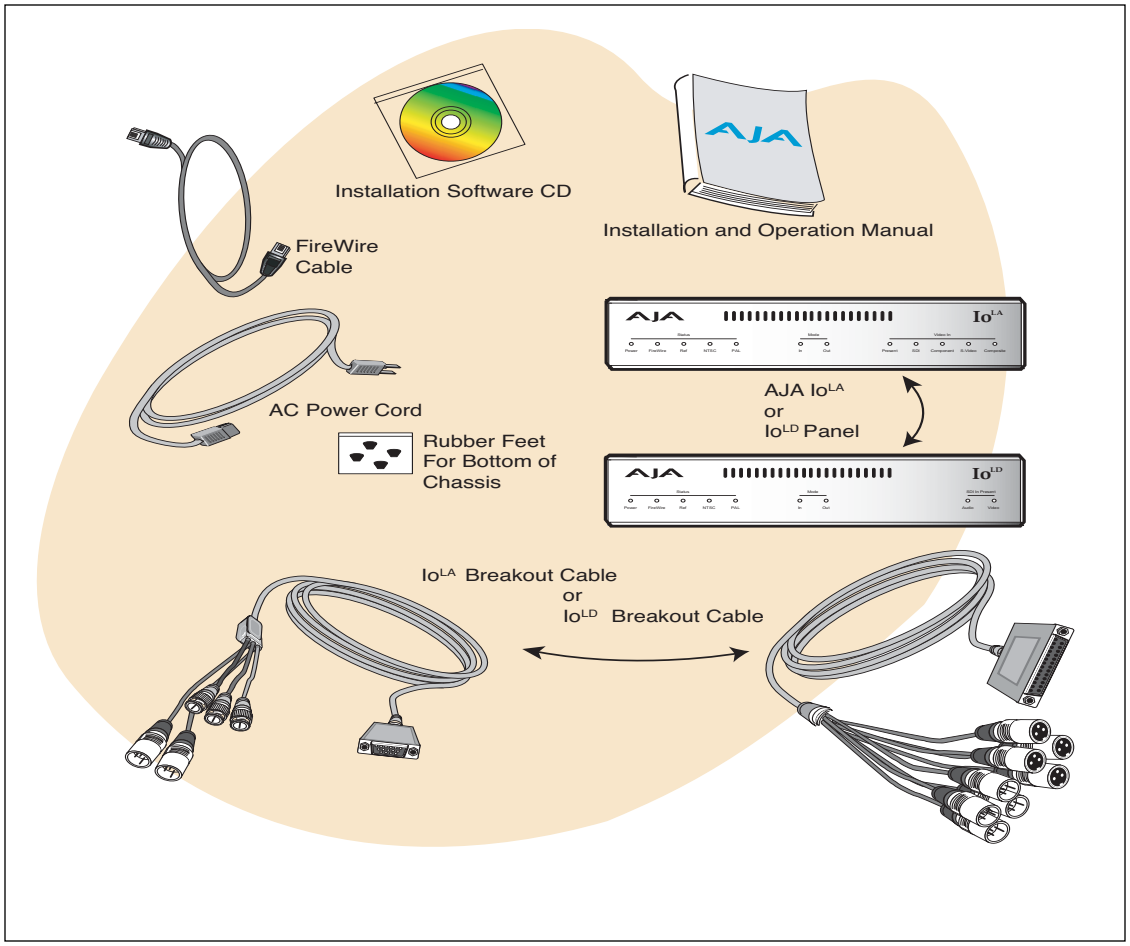
The installation and set up of an Io^{LD} or Io^{LA} is very simple. Plug it in to AC mains power and connect the FireWire cable to a suitable Power Mac or Xserve's FireWire port with the cable supplied. All of the steps of Installation and Configuration are documented in this chapter, summarized as follows:

1. Unpack the shipping box
2. If not previously installed on your Power Mac, ensure that Final Cut Pro 4 is installed as detailed in its user documentation. Final Cut Pro 4 *must be installed and have been run at least once prior to installing AJA Io^{LD} or Io^{LA} software.*
3. Install AJA software on your Power Mac or Xserve from the supplied AJA CD-ROM
4. Configure the Io^{LD} or Io^{LA} for how it will be mounted: deskmount as shipped, or using the optional rackmount kit. If deskmounting, install the supplied rubber feet by removing their adhesive-backing and placing them in the four small indentations on the underside of the panel.
5. Cable the system audio and video sources, VTR, audio monitor, and video monitor.

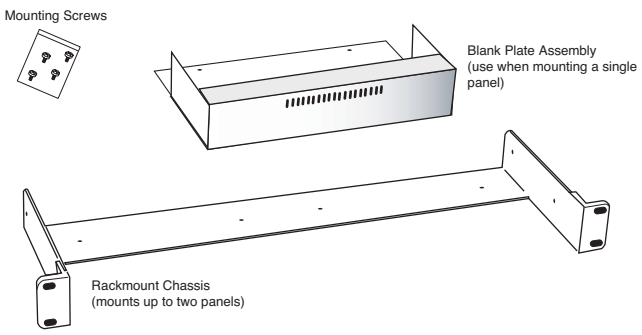
Unpacking

Shipping Box Contents

The Io LA/LD chassis is shipped with an AC power cord, FireWire cable, four rubber feet (for desktop mounting), a software installation CD, late-breaking news bulletin (if applicable), and the Installation and Operation Guide you're currently reading.



Box Contents



Optional Rackmounting Kit Contents

As you unpack the shipping box, 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 repaired or replaced.

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

Installing AJA Software

First ensure that Final Cut Pro 4 is installed as detailed in its user documentation. Final Cut Pro 4 *must be installed and have been run at least once prior to installing AJA software.* Next, use the CD-ROM supplied with the Io[LD] or Io[LA] system to install necessary software drivers. You cannot use your AJA system with Final Cut Pro until the Io[LD] or Io[LA] software has been installed on the host Power Mac or Xserve.

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

Software Installation Procedure

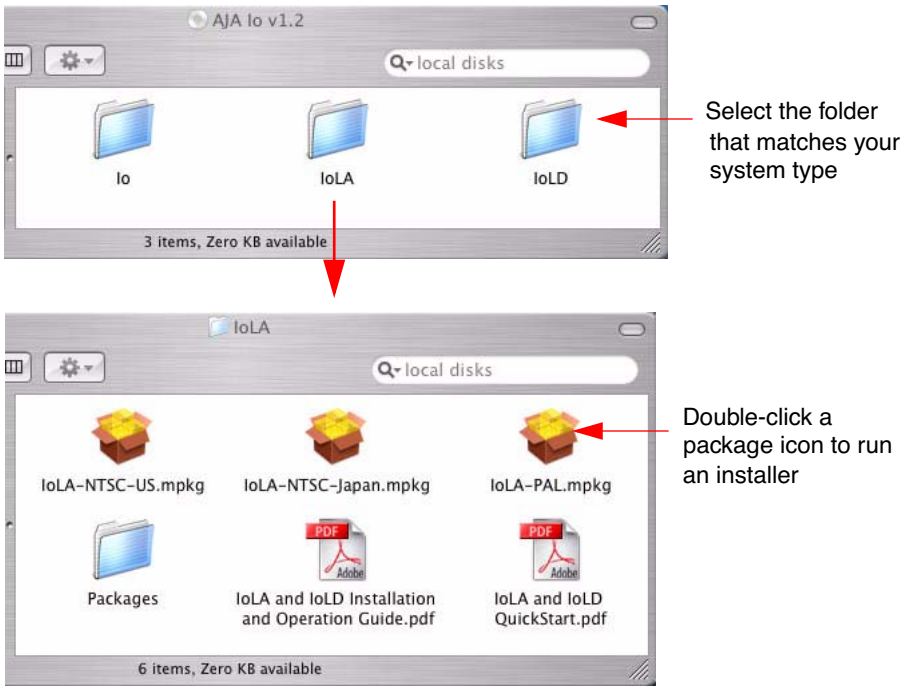
Locate the AJA Software CD packaged with your system. Then follow the procedure below to put the required software on a host system to be used with Io[LD] or Io[LA]. The system can be either an Apple Power Mac or Apple Xserve. Minimum system requirements for the host were described in *Chapter 1: System Requirements.*

1. Insert the CD in the Power Mac or Xserve
2. Locate the CD icon on the OS X desktop (see figure below).

CD Icon

3. Move the mouse cursor to the icon and double click to see the CD contents, which will appear in its own window.
4. In the window, locate the folder for your system (Io, IoLA, or IoLD). Open the folder and you'll find OS X package files; they have an icon that looks like a box and have a ".mpkg" suffix. There are a variety of different packages.
5. Out of the packages, choose the one that best matches your operating environment. For example, if the system will be used primarily for working with US NTSC digital video, then select the "IoDigitalNTSC-US.mpkg" file. The file you choose affects the Final Cut Easy Setup presets that will be installed.

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



Example of The Io Software Installer Packages

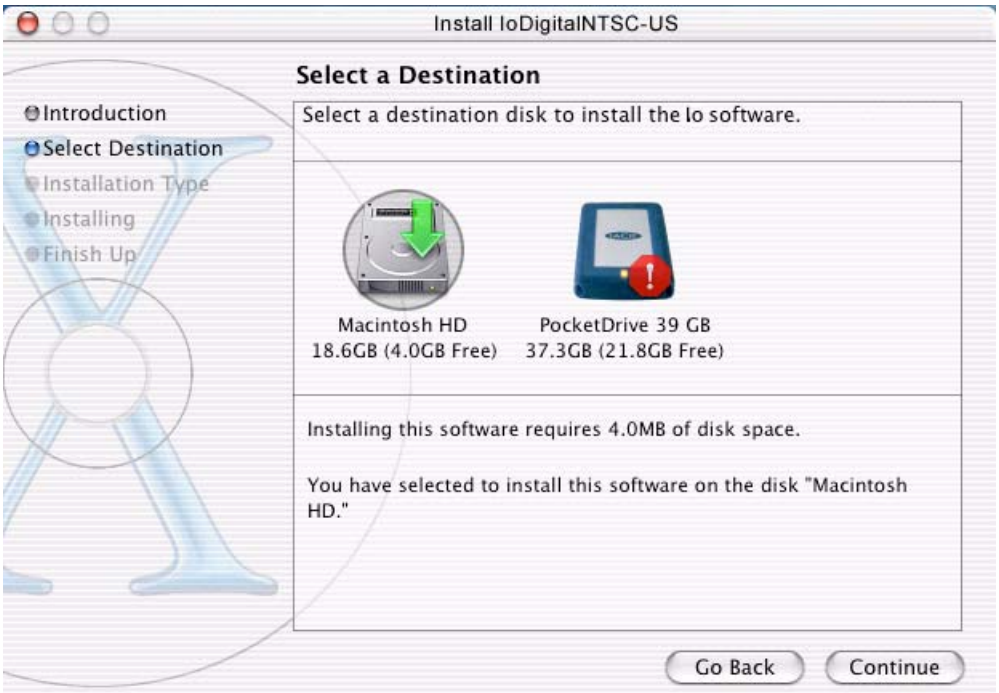
7. Double-click the desired package to log on and begin software installation.
8. The system will respond by asking you to authenticate who you are as currently defined on your OS X user profile. Enter the proper name and password at the Authenticate prompt; if you have multiple users defined, ensure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

Log On Authenticate Prompt

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

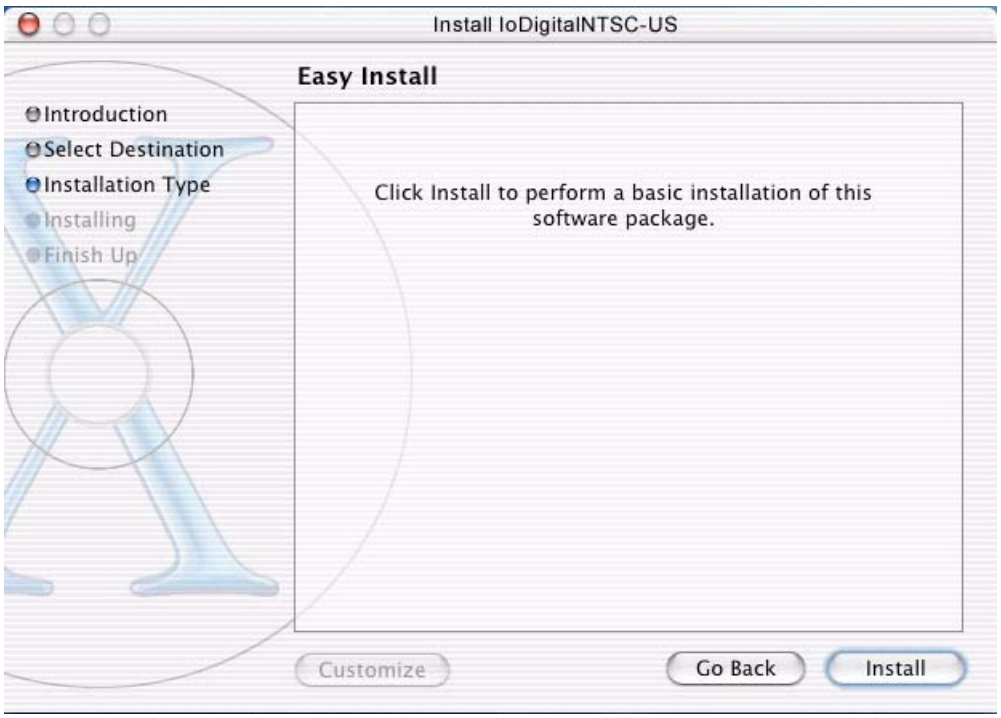
Initial Installer Screen

11. Click *Continue* to begin installation.
12. The next screen shows all the available drives on the Power Mac or Xserve. 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.



Select a Destination Drive For the Io Software

13. At the next screen, click the *Install* button to place the software on the drive you previously selected.



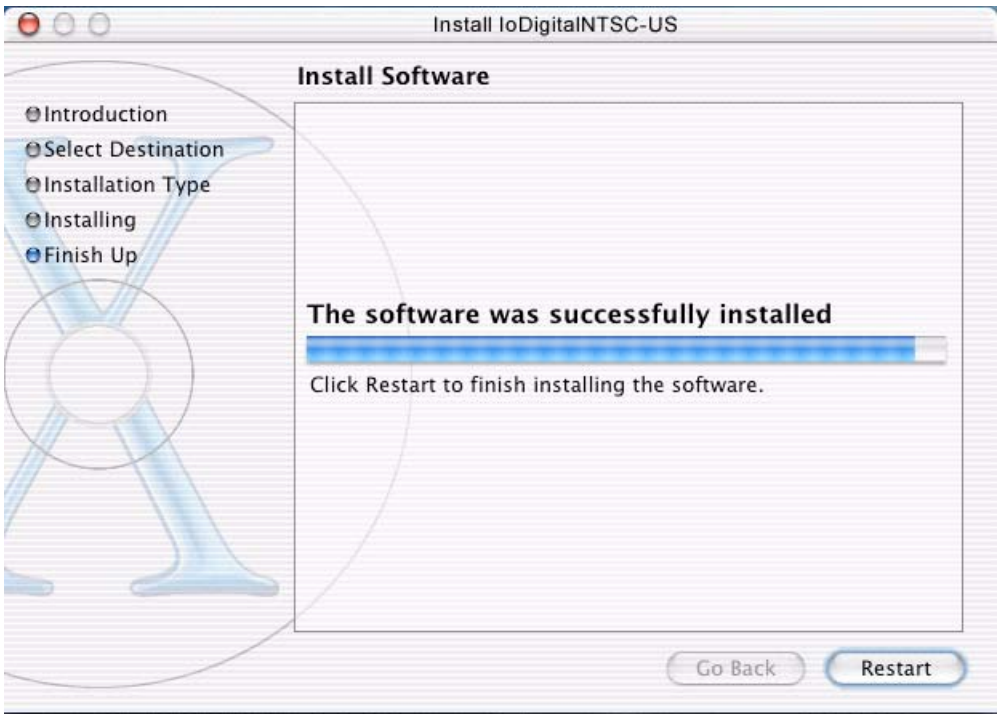
Easy Install, Installer Screen

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

Restart OS X Reminder Prompt

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

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



Final Installation Screen

Configuring the Panel for Desk or Rackmount

Physical Requirements

You can locate your Io^{LD} or Io^{LA} panel in two ways:

- Desktop—lay it horizontally flat, with the rubber chassis feet resting on a stable surface (feet installation is discussed below).
- Rackmounting—use the optional Io$^{LD/LA}$ rackmounting kit to place one or two panels in a standard 1-RU 19” equipment rack.

When planning equipment locations and mounting methods, take into account the weight and size of the Io^{LD} and Io^{LA} panels:

- Panel Dimensions (both panels have the same dimensions):
  Height—1.75” (4.445 cm)
  Depth—10.75” (27.30 cm)
  Width—8.50” (21.59 cm)
- Panel Weight (one panel): approximately 4 pounds (1.814 kg)
- Two panels mounted in Rackmount kit: approximately 9 pounds (4.08 kg)

Desk Mounting

To desk mount an Io^{LD} or Io^{LA}, follow this procedure. Refer to the illustration *Optional Rackmounting Kit* for visual reference.

1. Locate the plastic bag containing four rubber feet that was shipped with the system. Each of the feet have an adhesive-backed flat side.
2. Turn the panel upside down. Locate the four circular depressions at each of the four corners—these are where the feet will be placed.
3. For each of the four rubber feet: peel off the plastic strip over the adhesive backed side of the rubber foot and then press it, adhesive side down onto the mounting location.
4. Press each foot firmly to ensure the adhesive has positive contact and will adhere.

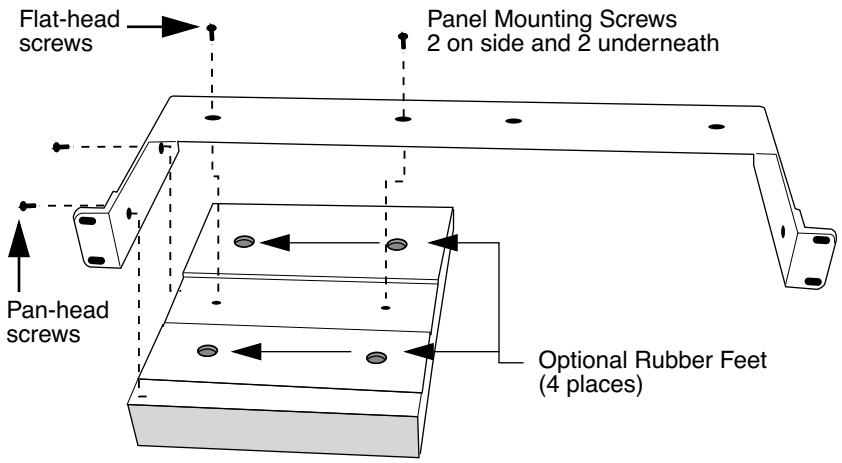
Rackmounting

The optional rackmounting kit is shipped with a mounting screw bag, the rackmount chassis, and one blank panel assembly—this is used when rackmounting only one panel with the kit.

To mount a panel:

1. Turn the Io^{LD} or Io^{LA} panel upside down.
2. Locate the two threaded mounting screw holes in the depression on the bottom of the panel.
3. Place the rackmount chassis upside down so that it lays neatly into the depression with the threaded screw holes in the panel lining up with the holes in the chassis.

4. Insert two screws from the supplied bag through the chassis into the panel below. Tighten the screws until they are snug. Do not over-tighten the screws.
5. Locate the two holes on the side of the rackmount chassis, next to where the panel was mounted.
6. Insert two more screws in these holes and tighten them snugly as before.
7. If you have an additional panel to mount, repeat steps 2 through 5 and you're done. If mounting only one panel, procede to the next step.
8. Slide the blank panel assembly under the rackmount chassis so that the screw holes in the blank panel align with those in the chassis. Insert four screws through the chassis into the blank panel assembly and tighten them snugly.



Optional Rackmounting Kit

Cabling the System

Where to Place Io

- Plan adequate space for cable routing from the back of the panel. Ensure that cable connectors are not stressed and that cables are not bent or crimped.
- When rackmounting, allow adequate airflow to the panel(s) and equipment above and below it. Note the location of cooling vents on all equipment and ensure none are obstructed.
- Place the panel where temperature and humidity are moderate. Temperature specifications are as follows:

Operating Temperature	10˚C to 35˚C (50˚F to 95˚F)
Storage Temperature	-40˚C to 60˚C (-40˚F to 140˚F)

Panel Temperature Specifications

Power Requirements

- Input Voltage—autosensing 100VAC to 240VAC, 50/60Hz
- Power Consumption—
  Io^{LA} 10 Watts
  Io^{LD} 8 Watts

Warning: *Io^{LD} and Io^{LA} panels contain no user serviceable parts. Although internally fused, the fuse should only be replaced by AJA factory trained service centers.*

System Video/ Audio Cable Connections

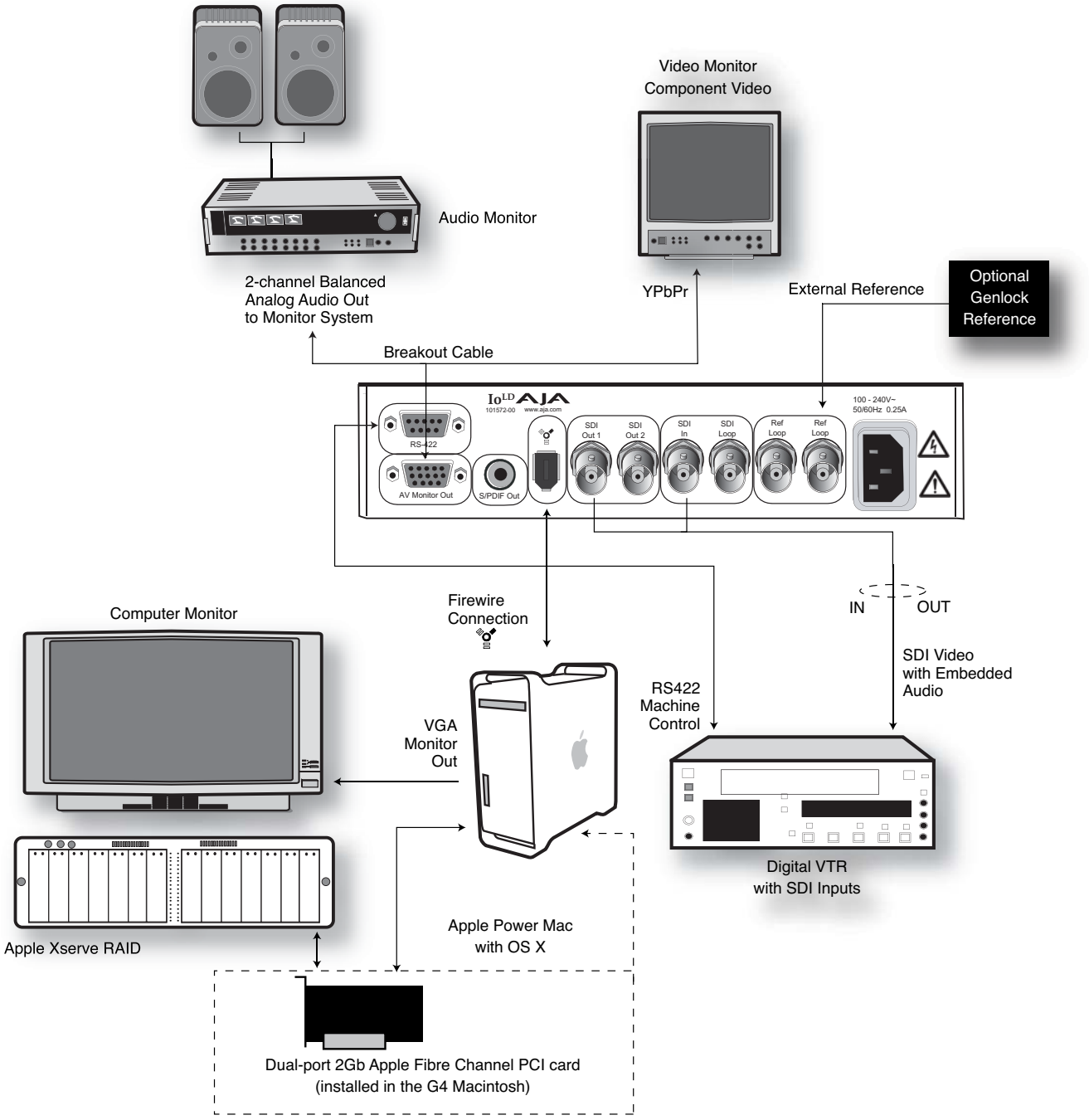
When installing your system, you'll make video and audio input/output connections. These connectors are explained individually in chapter 2. Here, system interconnection is shown and described.

Typical Digital System with Io^{LD}

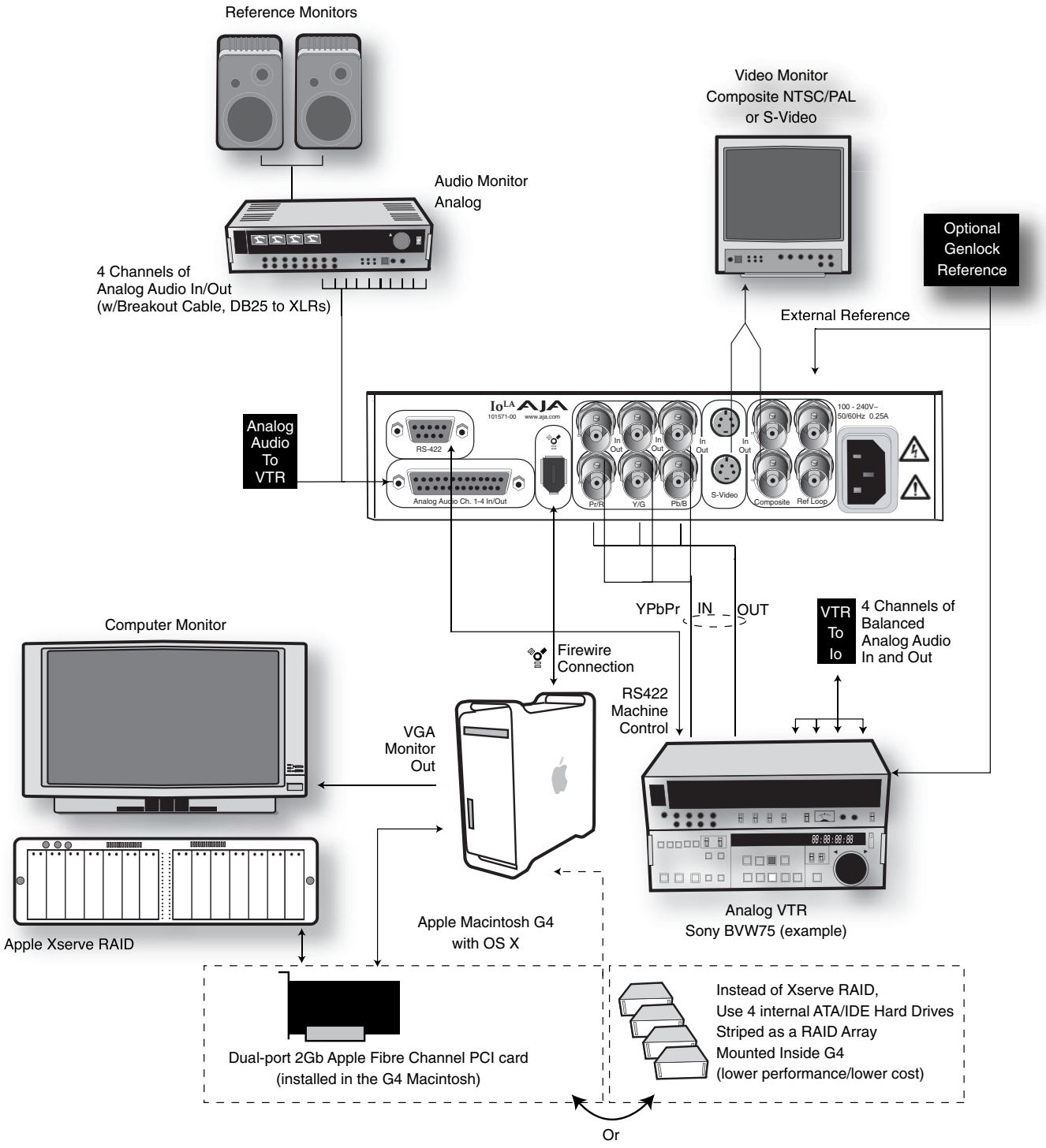
A figure on the following page shows typical system interconnections for a system with digital A/V sources. Your system may differ depending on VTRs, audio monitoring, and video monitoring.

1. If desired, connect your house reference sync to the Io *Ref Loop* connector (BNC). The second Io Ref Loop connector can be connected to your VTR or terminated with a 75 ohm terminator (also optional).
2. Connect a Video Monitor to the *Component Analog Video Out* BNC connectors on your supplied breakout cable. Attach the DB15 connector on the breakout cable to the Io^{LD} rear panel A/V Monitor Out connector.
3. Connect a 9-pin DB9 machine control cable between your VTR's RS422 control port and the Io *RS-422* connector (for machine control).
4. Connect two SDI cables between Io^{LD} and your digital VTR (Digital Betacam etc.): one from Io^{LD} *SDI In* to the VTR SDI Out, and one from Io^{LD} *SDI Out* (1 or 2) to the VTR SDI In. The Io^{LD} SDI connections have embedded audio so the VTR must be configured accordingly.
5. If you have an analog audio monitoring system, then connect to it via the two channels of Io^{LD} balanced audio out (single male XLRs for each) on the *A/V Monitor Out* breakout cable. Digital embedded audio (8 channels) is available on the SDI Out connectors.
6. Connect the Io^{LD} *FireWire* connector to your host Power Mac FireWire port using a standard IEEE 1394a cable.

Note: ensure that you do not use FireWire drives on your Power Mac for read/ write at the same time you're using Io for realtime capture/playback. They can be connected but cannot be used at the same time. Also, if you experience problems with playback or capture, ensure Appletalk is turned Off; in some rare circumstances it can affect system operation.



Typical Digital System Connections



Typical Analog System Connections

Typical Analog System with Io[LA]

System interconnections for a system with analog A/V sources are shown on the previous page. Your system may differ depending on VTRs, audio monitoring, and video monitoring.

1. If desired, connect your house reference sync to the Io *Ref Loop* connector (BNC). The second Io[LA] Ref Loop connector can be connected to your VTR or terminated with a 75 ohm terminator (also optional).
2. Connect a Video Monitor to the Io[LA] *Composite* Analog Video Out BNC connector, or instead connect a monitor via the *S-Video Out* connector (4-pin mini-DIN).
3. Connect a 9-pin DB9 machine control cable between your VTR's RS-422 control port and the Io[LA] *RS-422* (machine control) connector.
4. Connect Component Video cables between Io[LA] and your analog VTR (BVW-75 etc.): one from Io[LA] *Component Video In* BNCs (3) to the VTR *Component Video Out* BNCs (3), and one from Io[LA] *Component Video Out* BNCs (3) to the VTR *Component Video In* BNCs (3).
5. Using the supplied Io[LA] breakout cable, connect audio cables between Io[LA] and your analog VTR (BVW-75 etc.). Connect the four channels of Io[LA] *Balanced Audio Out* to the VTR's four Audio Inputs (A1/A2/A3/A4). Next, connect the four channels of Io[LA] *Balanced Audio In* to the VTR's four Audio Outputs (A1/A2/A3/A4). Use balanced audio cables for all connections; these will have XLR connectors on both ends (male on the output side/female on the inputs).
6. Connect the Io[LA] *FireWire* connector to your host Power Mac or Xserve FireWire port using a standard IEEE 1394a cable.

Video and FireWire

FireWire is a cross-platform implementation of the high-speed serial data bus defined by IEEE Standard 1394-1995. It can be used to move large amounts of data between computers and peripheral devices—any type of data. It features simplified cabling, hot swapping, and transfer speeds of up to 400 megabits per second (FireWire 400). A new 800 megabit per second implementation (FireWire 800) is also available on many current Apple computers. AJA has codeveloped the Io family of products with Apple to use FireWire for transferring 10-bit uncompressed video and 24-bit audio to and from an Apple Power Mac or Xserve.

Major manufacturers of multimedia devices have been adopting the FireWire technology and it can be found in a variety of professional and consumer digital products—including digital camcorders, digital video tape recorders, digital video disks, set-top boxes, and music systems.

Apple's FireWire technology was honored by the Academy of Television Arts & Sciences, receiving a 2001 Primetime Emmy Engineering Award for FireWire's impact on the television industry.

Many people associate FireWire with DV (Digital Video); unfortunately this has led some to believe that it only works with compressed video. The AJA Io family of products do not compress video or audio—they simply uses the impressive bandwidth of FireWire as a conduit to send A/V data to and from the Power Mac.

Important Features of FireWire and Video as Implemented in Io Products

- Io products use an uncompressed audio/video protocol.
- SDI is 270 Mb/s; there is filler data in the stream; actual transfer is more like 230 Mb/s. Since FireWire 1394a is 400 Mb/s, there is adequate bandwidth for uncompressed video data transfer.

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 when compared to 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.

Genlock and Your System

For video stability and proper system operation, it’s always best to genlock all equipment to house sync. Although genlock is not absolutely required for Io or your system, better quality and repeatable operation will be experienced by doing so. Usually, this means using a black burst generator output looped through the system. On the Io panels, house sync is connected to the “Ref Loop” input on the rear panel. You can then loop the house sync to other equipment (VTR etc.) via the Ref Loop connector provided below.

Chapter 5: Final Cut Pro and Other Software

Final Cut Pro

Final Cut Pro 4 ships with information already configured for most common system configurations. After you install the AJA software on your Power Mac or Xserve, all you need to do to begin using Final Cut is to run it and choose the proper setups from the canned ones provided. These canned setups are called "Easy Setups" in Final Cut Pro and are available to use and edit under Audio/Video Settings in the "Final Cut Pro" menu (next to the apple menu).

The manual you are reading does not provide operational information about Final Cut Pro 4. Please read the Final Cut Pro user documentation provided with it for information on learning to use it and how to configure it. The chapter you are reading addresses the configuration and setup unique to use of Io with Final Cut Pro.

A Note About Io Audio Levels and Final Cut

There are many different conventions for representing audio levels in professional audio/video equipment. In the analog world, the "VU" meter has been the standard for representing audio levels within the available dynamic range. A zero ("0") VU is considered the nominal "peak." The "red" area above zero VU represents "headroom" for occasional instantaneous "hot" peak levels. It is important to support headroom, otherwise the instantaneous peaks are hard-clipped resulting in distortion. In the digital world, the digital numeric range is fixed. To support "headroom", the equivalent zero VU point is most often defined as 20db below full scale digital.

Io supports the most common industry standards for analog levels: nominal or "0 VU" is 20db below full scale digital, and full scale digital represents an analog level of +24dbu. This means a nominal tone outputs at +4dbu.

In order to meet the above professional digital levels in Final Cut Pro, audio levels should peak at –20db. In other words, you should adjust the audio levels in Final Cut so that peaks hitting 0 VU on an analog meter, hit –20db on Final Cut Pro's meter. For a nominal tone level, set the tone to –20 db.

For example, if Io's Balanced Audio Outputs are connected to a Sony Betacam SP deck, an audio level of –20db on Final Cut Pro's level meter will indicate 0 VU on the deck.

Note: the level meters on the Audio Mixer in Final Cut Pro 4 are a little different than Final Cut Pro's level master. These meters represent 12db headroom above nominal or "0." To conform to professional levels as described above, peaks should hit –8db.

First Time You Run Final Cut

The first time you run Final Cut Pro after installing it, it will present the "Choose Setup" prompt. Here is where you should select a default input format for Io$^{LD/LA}$ in the "Setup For" pulldown and select a system scratch disk (your RAID). Final Cut User documentation explains this in the installation procedures.

Easy Setups for Typical Uses

Final Cut and Io systems together make working with multiple formats an easy proposition. Inside of Final Cut, equipment and setting presets are available in groups called Easy Setups, from which you can choose typical system configurations. A large set of Easy Setups comes with Final Cut Pro, including many unique to Io$^{LD/LA}$ and some for handling direct connection of FireWire camcorders and devices. These factory canned choices can be used directly or as the basis for making your own customized Easy Setups unique to your system. By duplicating a factory Easy Setup and then making changes to it, you simplify the process of configuring and re-configuring when working with new formats.

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

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

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

Adding and Deleting Default Easy Setups

The actual Easy Setups that appear in Final Cut are dependent on the choices you made when installing the AJA software. When installing, you chose the formats to be used. If you change your mind about what was installed, you can re-run the AJA Io$^{LD/LA}$ installer and choose different formats. However, the installers are cumulative: when you run a different installer it adds new items to those already there—the installer doesn't let you delete items. You can however, delete Easy Setups from the set installed; just go to "*Macintosh HD/Library/Application Support/Final Cut Pro System Support/Custom Settings*" and remove the desired items ("Macintosh HD" is your hard drive and the name may be different if you've renamed it). If you do so, you'll need to discard the Final Cut Preferences file so that it updates its list of Easy Setups. To locate Final Cut's preference file and discard it, follow this procedure:

1. At the finder enter Command F (to search) and enter "Final Cut Pro".
2. In the resulting list of files, locate the file named "Final Cut Pro 4.0 Preferences".

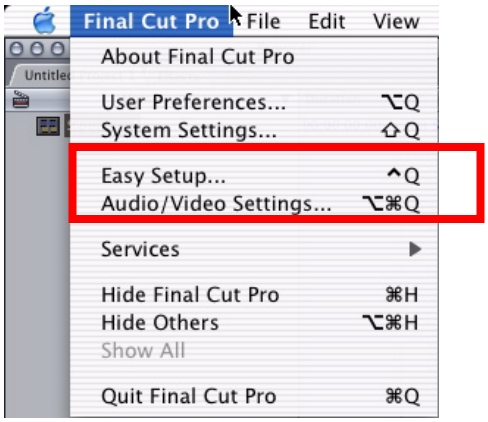
Note: the path is "Macintosh HD/users/username/library/preferences/final cut user data."

3. Click and drag that file to the Trash Can icon and drop it there.

When you next start up Final Cut Pro, it will present the "Choose Setup" prompt (as in initial installation) where you can again choose a desired Io input format in the "Setup For" pulldown and re-enter a desired system scratch disk (your RAID).

Easy Setups Menu

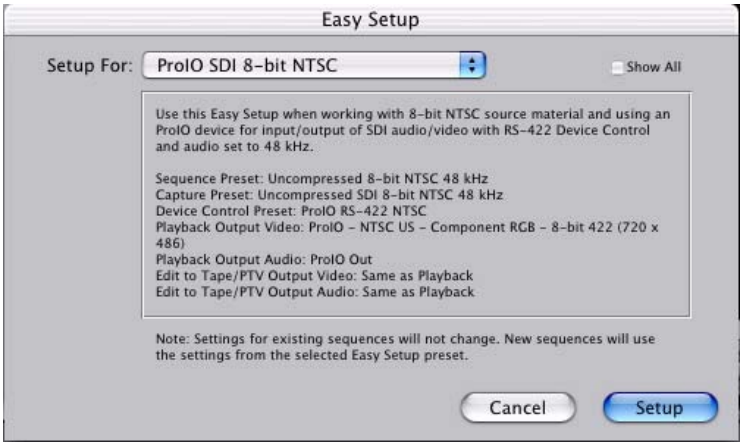
Both the Easy Setups menu item and the Audio/Video Settings menu item are located under the main *Final Cut Pro* menu.



Most configuration for your system is done using these menu items

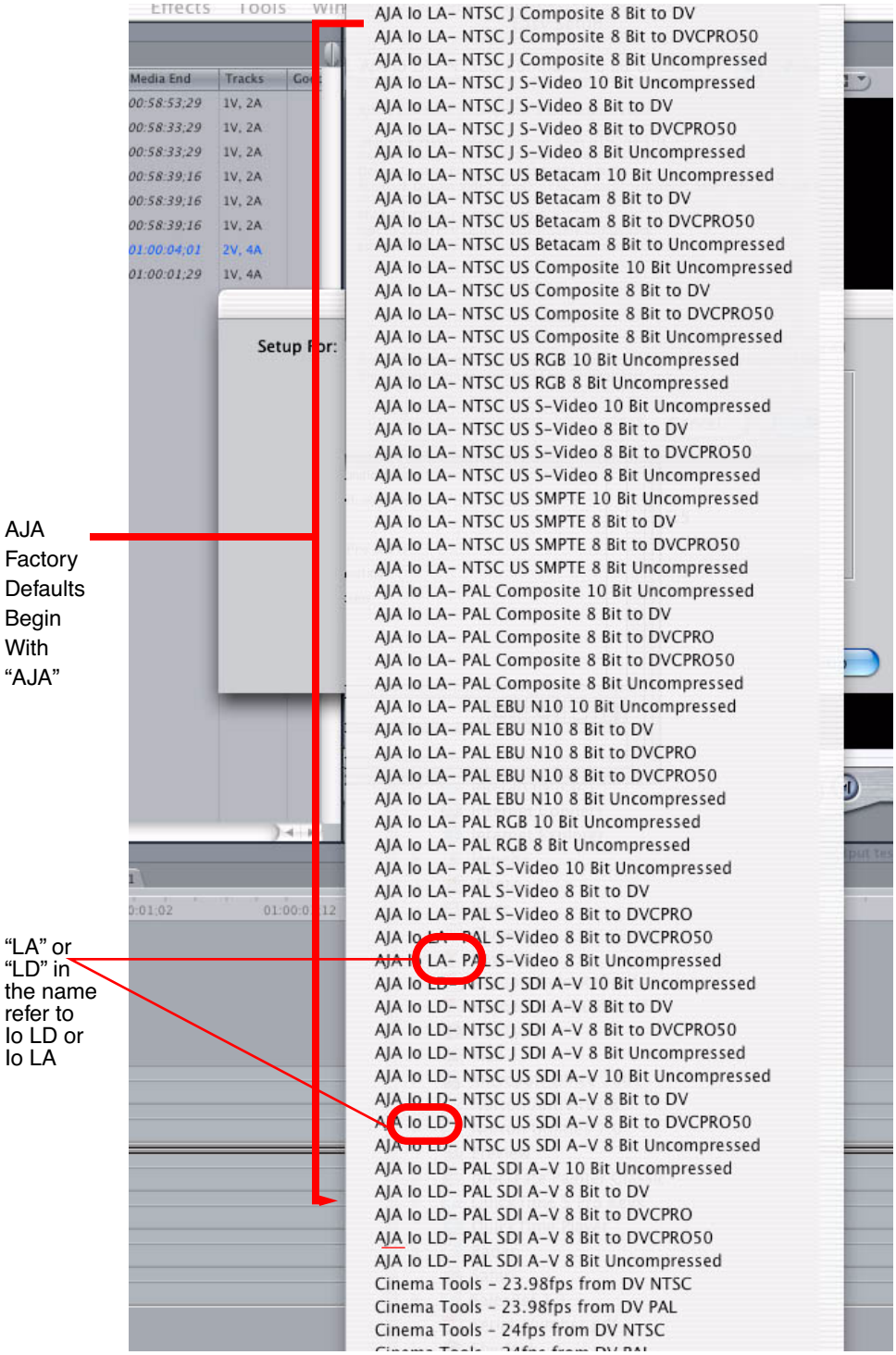
Easy Setup and Audio/Video Menu Items

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



Easy Setup dialog

At the top of the Easy Setup dialog is the currently selected Easy Setup. It can be changed by clicking on the pulldown arrow at the left. Doing so results in a long list of the factory Easy Setups stored on the system. If you wish to see all of the Easy Setups, factory, AJA, and user-defined, then click on the "Show All" checkbox at the right side of the dialog.



Factory Easy Setups

To choose a new Easy Setup from the list, click on the pulldown menu and select a desired choice. The choice won't take effect until you click the *Setup* button, but you will be able to see the description for the choice just by selecting it (without clicking the *Setup* button). Descriptions provide a paragraph summarizing what the Easy Setup is intended for and then each of the presets are explained (Sequence, Capture, Device, Playback Output, and Edit to Tape Video/Audio Outputs).

Easy Setups For Use With Io LD/LA

Here are all the factory default Easy Setups currently shipped with Io[LD/LA]. The Easy Setups you'll see in Final Cut Pro reflect what was chosen when AJA software was installed. This may include all or part of those listed here.

Table 1. Io[LD] Easy Setups

Easy Setup (as listed in FCP Pulldown)	Description/Usage
NTSC US	
AJA Io LD- NTSC US SDI A-V 8 Bit Uncompressed	Use this preset when capturing NTSC material for Uncompressed 8-bit input using SDI
AJA Io LD- NTSC US SDI A-V 8 Bit to DV	Use this preset when capturing 8-bit NTSC material for DV using SDI
AJA Io LD- NTSC US SDI A-V 8 Bit to DVCPRO50	Use this preset when capturing 8-bit NTSC material for DVCPRO50 using SDI
AJA Io LD- NTSC US SDI A-V 10 Bit Uncompressed	Use this preset when capturing NTSC material for Uncompressed 10-bit input using SDI
PAL	
AJA Io LD- PAL SDI A-V 8 Bit to DVCPRO50	Use this preset when capturing 8-bit PAL material for DVCPRO50 using SDI
AJA Io LD- PAL SDI A-V 10 Bit Uncompressed	Use this preset when capturing PAL material for Uncompressed 10-bit input using SDI
AJA Io LD- PAL SDI A-V 8 Bit to DVCPRO	Use this preset when capturing 8-bit PAL material for DVCPRO using SDI
AJA Io LD- PAL SDI A-V 8 Bit Uncompressed	Use this preset when capturing PAL material for Uncompressed 8-bit input using SDI
AJA Io LD- PAL SDI A-V 8 Bit to DV	Use this preset when capturing 8-bit PAL material for DV using SDI
NTSC Japan	
AJA Io LD- NTSC J SDI A-V 8 Bit to DV	Use this preset when capturing 8-bit NTSC material for DV using SDI
AJA Io LD- NTSC J SDI A-V 10 Bit Uncompressed	Use this preset when capturing NTSC material for Uncompressed 10-bit input using SDI
AJA Io LD- NTSC J SDI A-V 8 Bit Uncompressed	Use this preset when capturing NTSC material for Uncompressed 8-bit input using SDI
AJA Io LD- NTSC J SDI A-V 8 Bit to DVCPRO50	Use this preset when capturing 8-bit NTSC material for DVCPRO50 using SDI

Table 2. Io^{LA} Easy Setups

Easy Setup (as listed in FCP Pulldown)	Description/Usage
NTSC US	
AJA Io LA- NTSC US Composite 10 Bit Uncompressed	Use this preset when capturing NTSC US material for Uncompressed 10-bit input using Composite
AJA Io LA- NTSC US Betacam 8 Bit to Uncompressed	Use this preset when capturing NTSC US material for Uncompressed 8-bit input using YPbPr Betacam
AJA Io LA- NTSC US Composite 8 Bit to DVCPRO50	Use this preset when capturing NTSC US material for DVCPRO50 using Composite
AJA Io LA- NTSC US Composite 8 Bit to DV	Use this preset when capturing NTSC US material for Uncompressed 8-bit input using Composite
AJA Io LA- NTSC US SMPTE 8 Bit Uncompressed	Use this preset when capturing NTSC material for Uncompressed 8-bit input using YPbPr SMPTE
AJA Io LA- NTSC US SMPTE 8 Bit to DVCPRO50	Use this preset when capturing 8-bit NTSC material for DVCPRO50 using YPbPr SMPTE
AJA Io LA- NTSC US SMPTE 8 Bit to DV	Use this preset when capturing 8-bit NTSC material for DV using YPbPr SMPTE
AJA Io LA- NTSC US SMPTE 10 Bit Uncompressed	Use this preset when capturing NTSC material for Uncompressed 10-bit input using YPbPr SMPTE/N10
AJA Io LA- NTSC US S-Video 8 Bit Uncompressed	Use this preset when capturing NTSC US material for Uncompressed 10-bit input using S-Video
AJA Io LA- NTSC US S-Video 8 Bit to DVCPRO50	Use this preset when capturing 8-bit NTSC US material for DVCPRO50 using S-Video
AJA Io LA- NTSC US S-Video 8 Bit to DV	Use this preset when capturing 8-bit NTSC US material for DV using S-Video
AJA Io LA- NTSC US S-Video 10 Bit Uncompressed	Use this preset when capturing NTSC material for Uncompressed 10-bit input using S-Video
AJA Io LA- NTSC US RGB 8 Bit Uncompressed	Use this preset when capturing NTSC material for Uncompressed 8-bit input using RGB
AJA Io LA- NTSC US RGB 10 Bit Uncompressed	Use this preset when capturing NTSC material for Uncompressed 10-bit input using RGB
AJA Io LA- NTSC US Composite 8 Bit Uncompressed	Use this preset when capturing NTSC US material for Uncompressed 8-bit input using Composite
AJA Io LA- NTSC US Betacam 10 Bit Uncompressed	Use this preset when capturing NTSC US material for Uncompressed 10-bit input using YPbPr Betacam
AJA Io LA- NTSC US Betacam 8 Bit to DV	Use this preset when capturing 8-bit NTSC US material for DV using YPbPr Betacam
AJA Io LA- NTSC US Betacam 8 Bit to DVCPRO50	Use this preset when capturing 8-bit NTSC US material for DVCPRO50 using YPbPr Betacam
PAL	
AJA Io LA- PAL S-Video 8 Bit Uncompressed	Use this preset when capturing PAL material for Uncompressed 8-bit input using S-Video
AJA Io LA- PAL S-Video 8 Bit to DVCPRO50	Use this preset when capturing 8-bit PAL material for DVCPRO50 using S-Video
AJA Io LA- PAL S-Video 8 Bit to DVCPRO	Use this preset when capturing 8-bit PAL material for DVCPRO using S-Video
AJA Io LA- PAL S-Video 8 Bit to DV	Use this preset when capturing 8-bit PAL material for DV using S-Video
AJA Io LA- PAL S-Video 10 Bit Uncompressed	Use this preset when capturing PAL material for Uncompressed 10-bit input using S-Video

Easy Setup (as listed in FCP Pulldown)	Description/Usage
AJA Io LA- PAL RGB 10 Bit Uncompressed	Use this preset when capturing PAL material for Uncompressed 10-bit input using RGB
AJA Io LA- PAL RGB 8 Bit Uncompressed	Use this preset when capturing PAL material for Uncompressed 8-bit input using RGB
AJA Io LA- PAL EBU N10 8 Bit Uncompressed	Use this preset when capturing PAL material for Uncompressed 8-bit input using YPbPr EBU N10
AJA Io LA- PAL EBU N10 8 Bit to DVCPRO50	Use this preset when capturing 8-bit PAL material for DVCPRO50 using YPbPr EBU N10
AJA Io LA- PAL EBU N10 8 Bit to DVCPRO	Use this preset when capturing 8-bit PAL material for DVCPRO using YPbPr EBU N10
AJA Io LA- PAL EBU N10 8 Bit to DV	Use this preset when capturing 8-bit PAL material for DV using YPbPr EBU N10
AJA Io LA- PAL EBU N10 10 Bit Uncompressed	Use this preset when capturing PAL material for Uncompressed 10-bit input using YPbPr EBU N10
AJA Io LA- PAL Composite 8 Bit Uncompressed	Use this preset when capturing PAL material for Uncompressed 8-bit input using Composite
AJA Io LA- PAL Composite 8 Bit to DVCPRO50	Use this preset when capturing 8 bit PAL material for DVCPRO50 using Composite
AJA Io LA- PAL Composite 8 Bit to DVCPRO	Use this preset when capturing 8 bit PAL material for DVCPRO using Composite
AJA Io LA- PAL Composite 8 Bit to DV	Use this preset when capturing 8 bit PAL material for DV using Composite
AJA Io LA- PAL Composite 10 Bit Uncompressed	Use this preset when capturing PAL material for Uncompressed 10-bit input using Composite
NTSC Japan	
AJA Io LA- NTSC J Betacam 8 Bit to DVCPRO50	Use this preset when capturing 8-bit NTSC Japan material for DVCPRO50 using YPbPr Betacam
AJA Io LA- NTSC J Composite 8 Bit Uncompressed	Use this preset when capturing NTSC Japan material for Uncompressed 8-bit input using Composite
AJA Io LA- NTSC J Betacam 8 Bit to DV	Use this preset when capturing 8-bit NTSC Japan material for DV using YPbPr Betacam
AJA Io LA- NTSC J Betacam 10 Bit Uncompressed	Use this preset when capturing NTSC Japan material for Uncompressed 10-bit input using YPbPr Betacam
AJA Io LA- NTSC J S-Video 8 Bit Uncompressed	Use this preset when capturing NTSC Japan material for Uncompressed 8-bit input using S-Video
AJA Io LA- NTSC J S-Video 8 Bit to DVCPRO50	Use this preset when capturing 8-bit NTSC Japan material for DVCPRO50 input using S-Video
AJA Io LA- NTSC J S-Video 8 Bit to DV	Use this preset when capturing 8-bit NTSC Japan material for DV input using S-Video
AJA Io LA- NTSC J Composite 8 Bit to DVCPRO50	Use this preset when capturing NTSC J material for DVCPRO50 using Composite
AJA Io LA- NTSC J Betacam 8 Bit Uncompressed	Use this preset when capturing NTSC Japan material for Uncompressed 8-bit input using YPbPr Betacam
AJA Io LA- NTSC J Composite 10 Bit Uncompressed	Use this preset when capturing NTSC Japan material for Uncompressed 10-bit input using Composite
AJA Io LA- NTSC J S-Video 10 Bit Uncompressed	Use this preset when capturing NTSC Japan material for Uncompressed 10-bit input using S-Video
AJA Io LA- NTSC J Composite 8 Bit to DV	Use this preset when capturing NTSC J material for DV using Composite

Audio/Video Settings Menu

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

The presets you can change on the Summary window are:

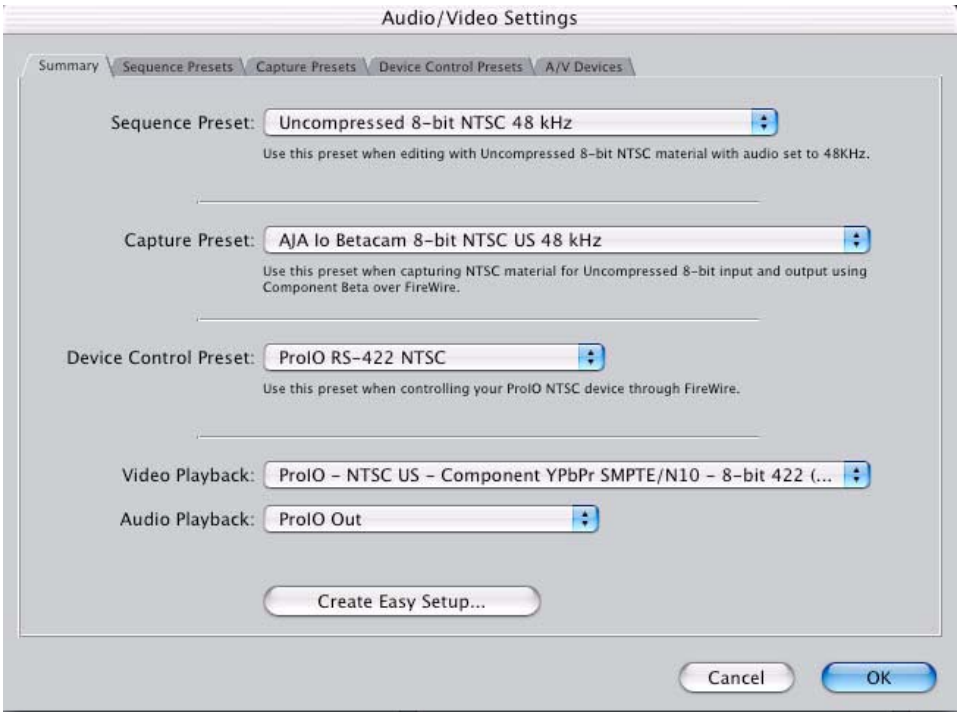
Sequence Preset—select one of these as the editing timebase for the current sequence. Once you add a clip to the sequence this cannot be changed. For example, once you've selected uncompressed 10-bit NTSC 48 kHz, you then have to stay in that timebase and can't switch to another. If you make a change to Sequence Presets, the change will only take effect on any new sequences you create—currently active sequences will not see the change.

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

Device Control Preset—select the AJA Video Io device (NTSC or PAL as desired). This tells Final Cut that the Io$^{LD/LA}$ will be controlled via FireWire and sets all the machine control parameters for the VTR attached to Io.

A/V Devices (Audio and Video Playback)—select the Io$^{LD/LA}$ as video and audio playback devices for Final Cut and the format to be output. If Io$^{LD/LA}$ isn't connected or is turned off, these will be shown as "[Missing]...".

Note: actual Audio/Video Setting choices differ slightly between Io, Io^{LD}, and Io^{LA}, so your screens may vary from those shown here (taken on an Io system).

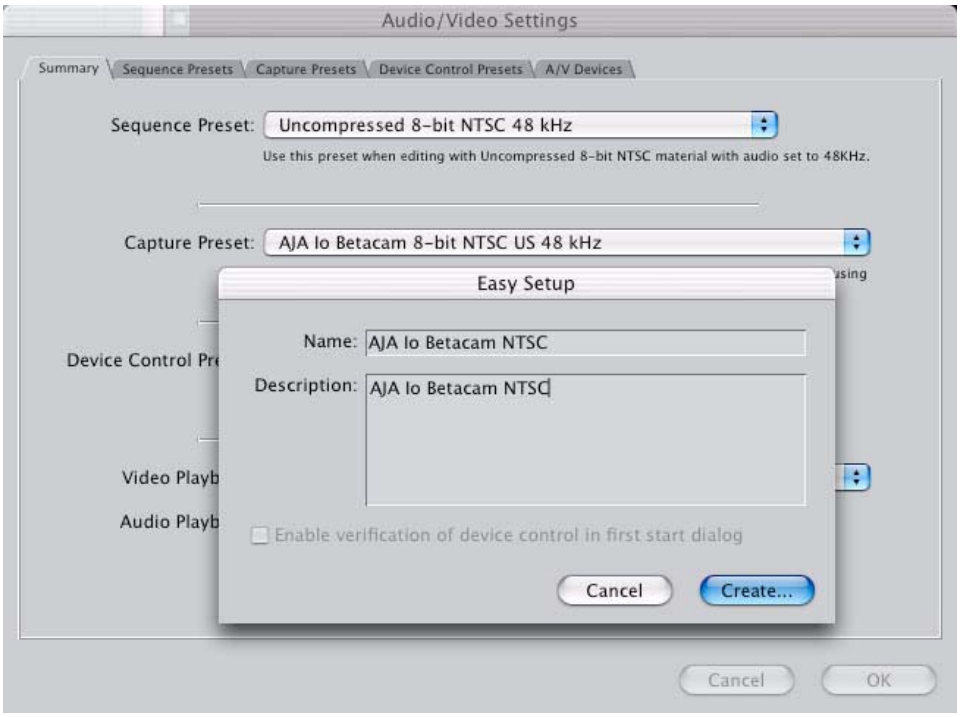


Audio/Video Settings, Summary Window

To Create A New Easy Setup

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

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

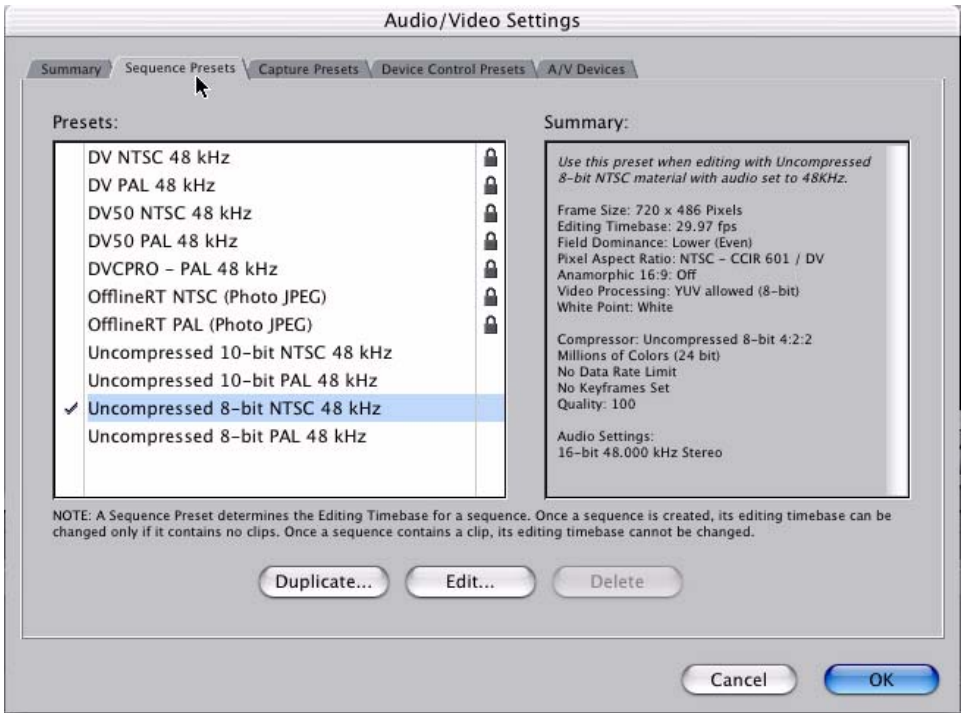


Audio/Video Settings, Creating a New Easy Setup

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

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

The Sequence Presets Window



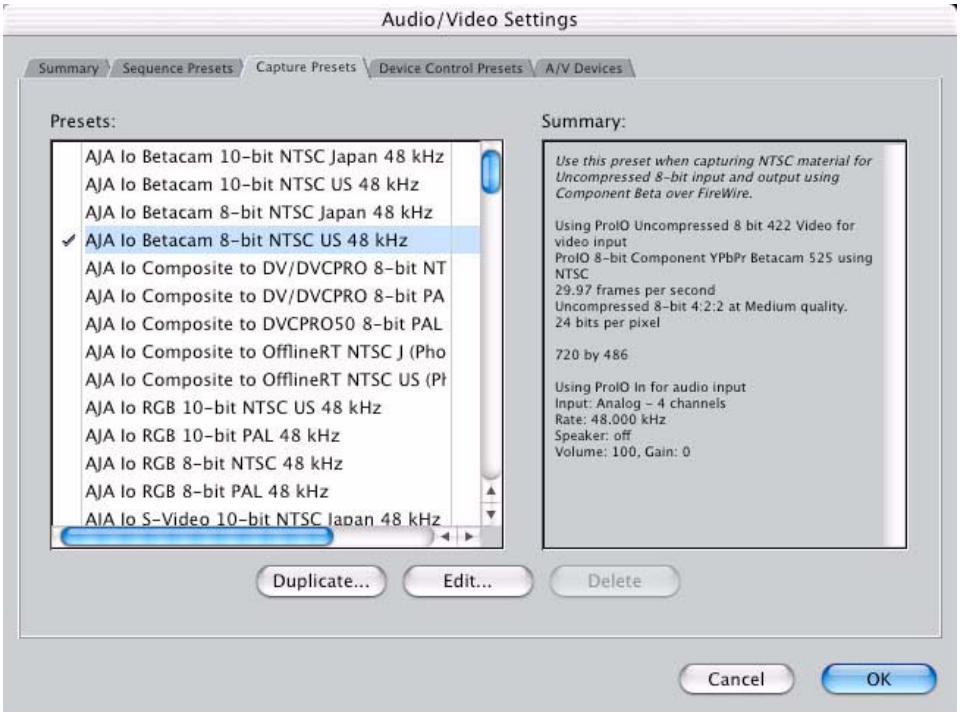
Audio/Video Settings, Sequence Presets Window

This window allows you to select an editing timebase for the current sequence. Once you add a clip to the sequence this cannot be changed. By clicking in the leftmost column (see the checkmark in the sample screen above), you select a new Sequence Preset for use. The checkmark tells which Preset is in use—highlighting a choice alone does not select it.

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

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

The Capture Presets Window



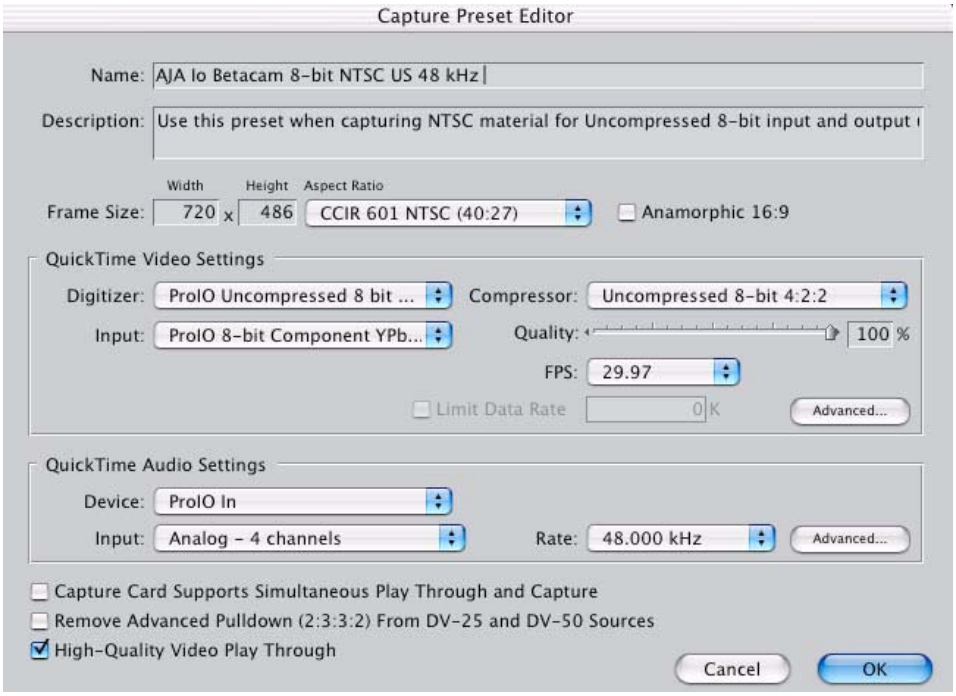
Audio/Video Settings, Capture Presets Window

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

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

Since Capture Presets will be used frequently as you bring media into Io[LD/LA], we'll discuss the edit screen next.

Capture Presets Editing



Audio/Video Settings, Capture Presets Editing Window

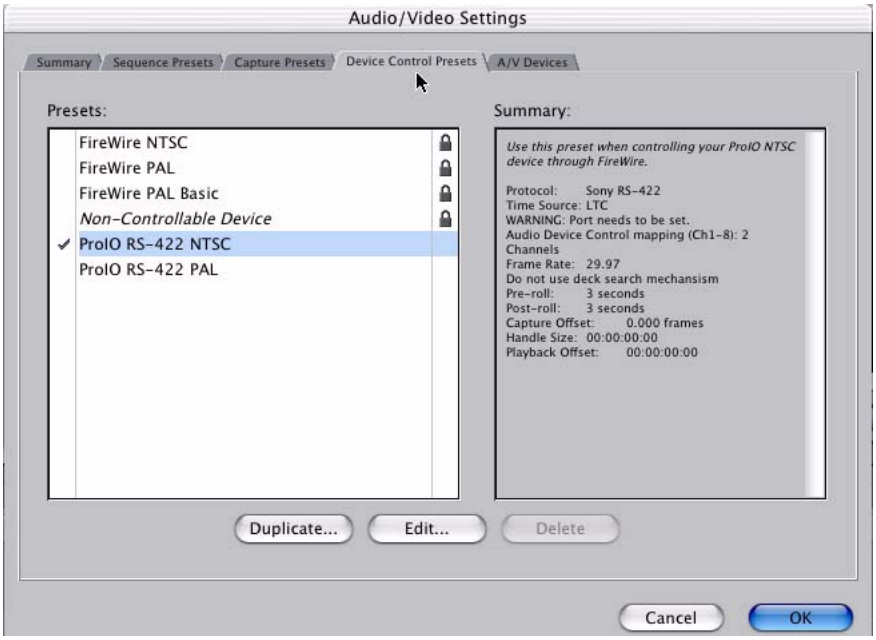
Note: Whenever a Preset is being copied as the basis of a new preset, always change the name and description to fit the new preset so users aren't confused between it and the original.

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

QuickTime Video Settings—these settings select a video input source and affect how it's processed by Final Cut Pro. The *Digitizer* pulldown menu selects whether you want the selected input source to be digitized as 8-bit or 10-bit uncompressed video as it comes into Io$^{LD/LA}$. The *Input* pulldown selects the exact input connector(s) where the panel captures and digitizes video when this preset is being used. The *Compressor* pulldown selects a codec that tells Final Cut how to process the video; the codec selected should be chosen for compatibility with the Digitizer setting selected. For example, if your Digitizer setting is 10-bit Uncompressed, then the Compressor setting should be one of the 10-bit choices available. The *Quality* slider should be set to 100 percent and the *FPS* (Frames Per Second) setting should always be set to 29.97. The *Advanced* settings button opens a new screen that is redundant and isn't needed for Io$^{LD/LA}$ usage.

QuickTime Audio Settings—these settings select an audio input source and affect how it's processed by Final Cut Pro. The *Device* pulldown should be set to Io. The *Input* pulldown selects the exact input connector(s) where Io$^{LD/LA}$ captures and digitizes audio. The *Rate* pulldown selects a sample rate; it should always be set to 48 kHz for Io systems. By clicking on the *Advanced* button, a new screen will be displayed where you can select between 8- and 16-bit sampling—typically you'll want to use 16-bit for CD quality sound.

The Device Control Presets Window



Audio/Video Settings, Device Control Presets Window

This window selects machine control parameters for an attached VTR. Your choice here tells Final Cut that Io[LD/LA] will be controlled via FireWire and sets all the machine control parameters for the VTR attached to it. Alternatively, you could also select a different device for input/output instead of Io[LD/LA]; for example, if you have a IEEE 1394 camcorder attached to the Power Mac's FireWire port you might choose "FireWire NTSC." The information on the right window pane describes the current machine control settings and parameters for the VTR attached. For Io[LD/LA] presets this means the VTR attached at the RS422 port. For non-Io presets, this means camcorder/VTRs attached directly at the FireWire port or via some other interface.

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

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

The A/V Devices Window

Audio/Video Settings, A/V Devices Window

The A/V Devices window selects the current playback device for both audio and video. Typically, you'll select Io$^{LD/LA}$ for both playback devices. The format chosen indicates the video resolution and source (8-bit/10-bit/analog/digital/etc.). Clicking on an *Options* button allows you to view specific parameters.

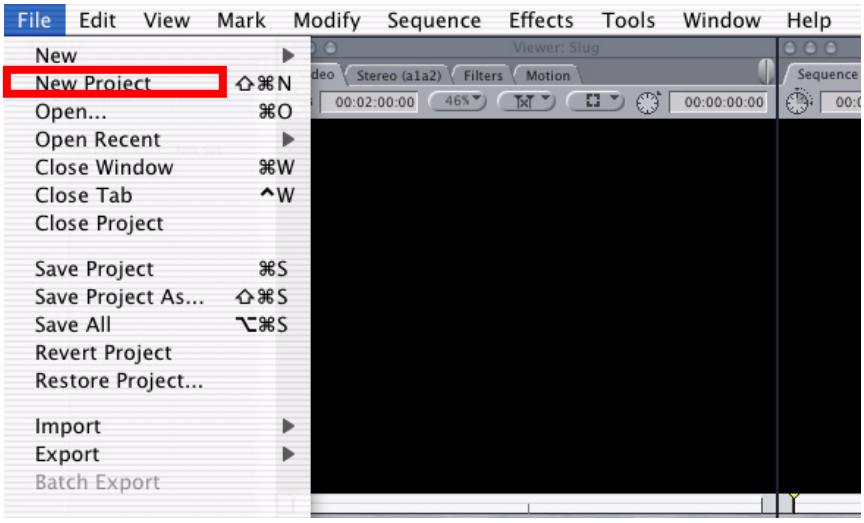
You may wish to use a different Io$^{LD/LA}$ output for final Print-to-tape from Final Cut. You can select that in this window by clicking the checkbox "Different Output for Edit to Tape/Print to Video." This allows you to select via a pulldown menu any Io$^{LD/LA}$ video output and audio output.

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

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

To test that you've installed the Io$^{LD/LA}$ drivers and have audio and video monitoring correctly configured, try creating a simple Final Cut Pro project with bars and tone.

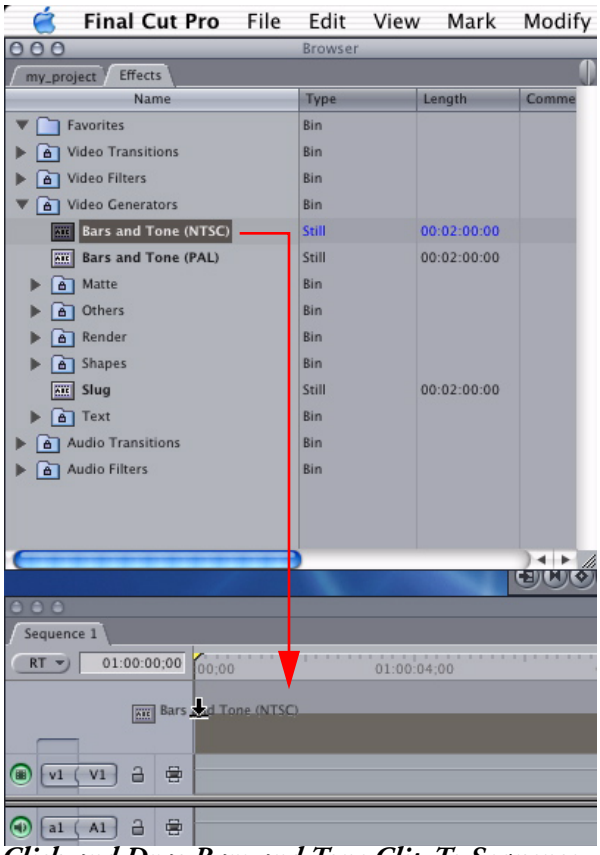
1. Select an Easy Setup as previously discussed (go to the Final Cut Pro menu and select *Easy Setup*; then select a desired preset).
2. Select *New Project* from the File menu.



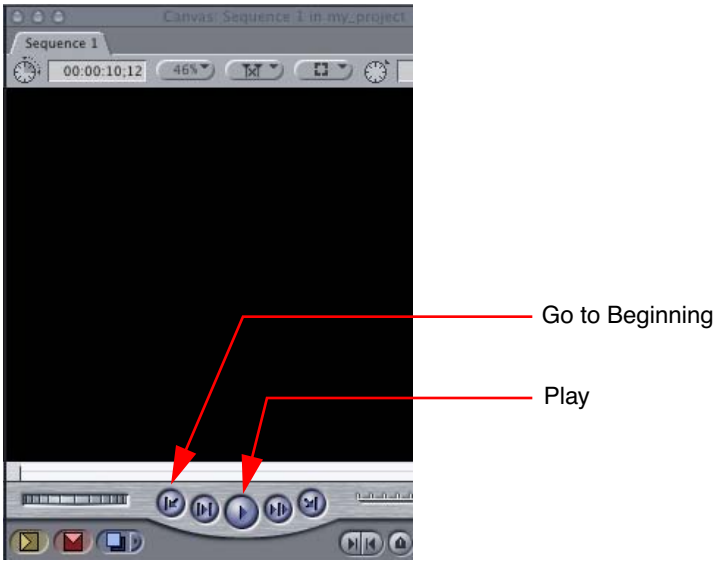
Create a New Project

3. The Sequence window will be at the bottom of the screen and a Browser window will be at the top left. Look at the Browser window and locate the "Effects" tab at the top right. Click on it.
4. Locate the Video Generators folder and open it. Do this by clicking on the triangle or double-clicking it. Inside the Video Generators folder, find the "Bars and Tone NTSC" (or PAL) icon. Click and drag it to the Sequence window onto the "v1" track at the top. When you let go of the mouse button you'll see a video track and two audio tracks.
5. Click the mouse cursor on the Bars and Tone clip while holding the Control key. A contextual menu will pop up; find the Duration menu item and select it. Set the duration to a short value (00:00:00:60).
6. Locate the Canvas window at the top right side of the Final Cut display. Find the transport buttons at the bottom of the Canvas window (Play, Go to beginning, etc.).
7. Go to the beginning of the sequence by clicking on the left-most icon and then click the "Play" icon. You should see and hear the bars and tone on your video monitor and audio monitoring system.

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



Click and Drag Bars and Tone Clip To Sequence



Canvas Window

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

A Note About Synchronizing Final Cut's Canvas with Io's Outputs

Final Cut Pro 4.1 and the Io 1.1 driver allow for perfect synchronization of the Canvas image with Io audio/video outputs. However, the Final Cut Pro default setting is not optimum for use with Io. To change the Final Cut Pro setting to work best with Io, follow these steps:

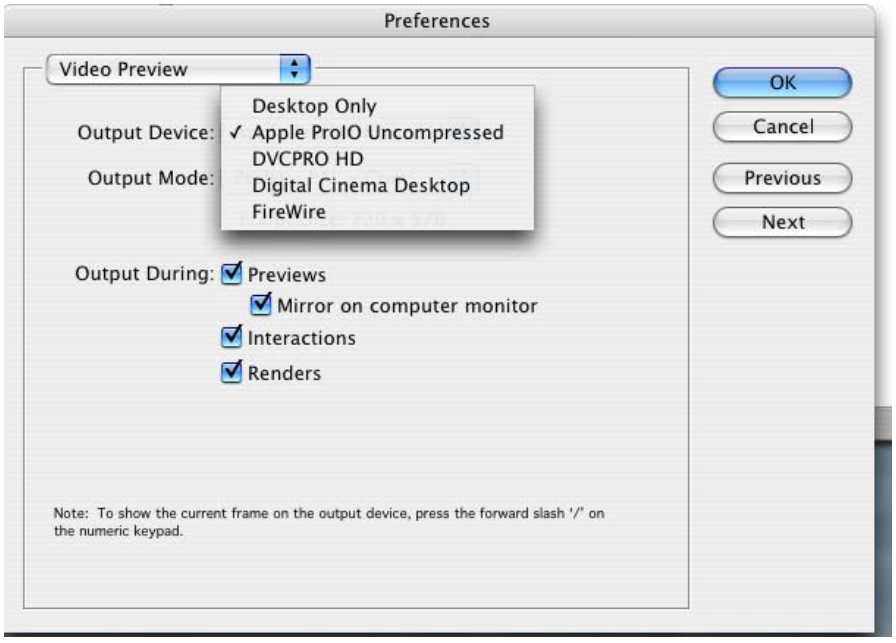
1. Open Final Cut Pro
2. From the Final Cut Pro pulldown menus, select *System Settings*
3. Click the *Playback Control* tab
4. Set the *Frame Offset* value to *7*
5. Click *OK*

This synchronizes Final Cut's Canvas image to the Io outputs.

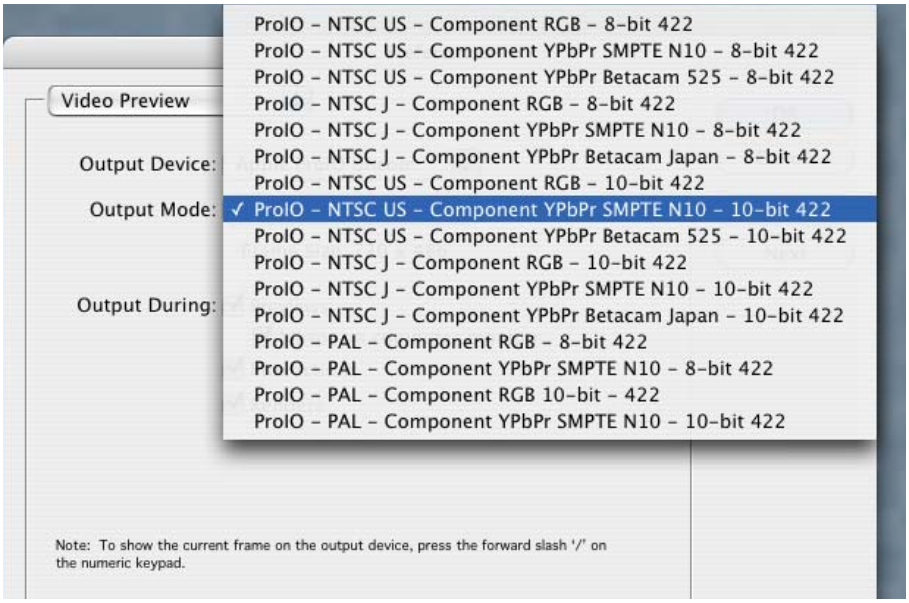
How to Use the RGB Output Feature With Adobe After Effects

You can see After Effects preview video on Io LA/LD's outputs, when properly configured. To configure Adobe After Effects for routing video to Io, follow these steps:

1. Run Adobe After Effects.
2. In Adobe After Effects, locate the menu > ***Preferences*** > ***Video Preview***



3. From the *Video Preview* window, select ***Apple ProIO Uncompressed*** as the Output Device.
4. Select a desired Io Output Mode:

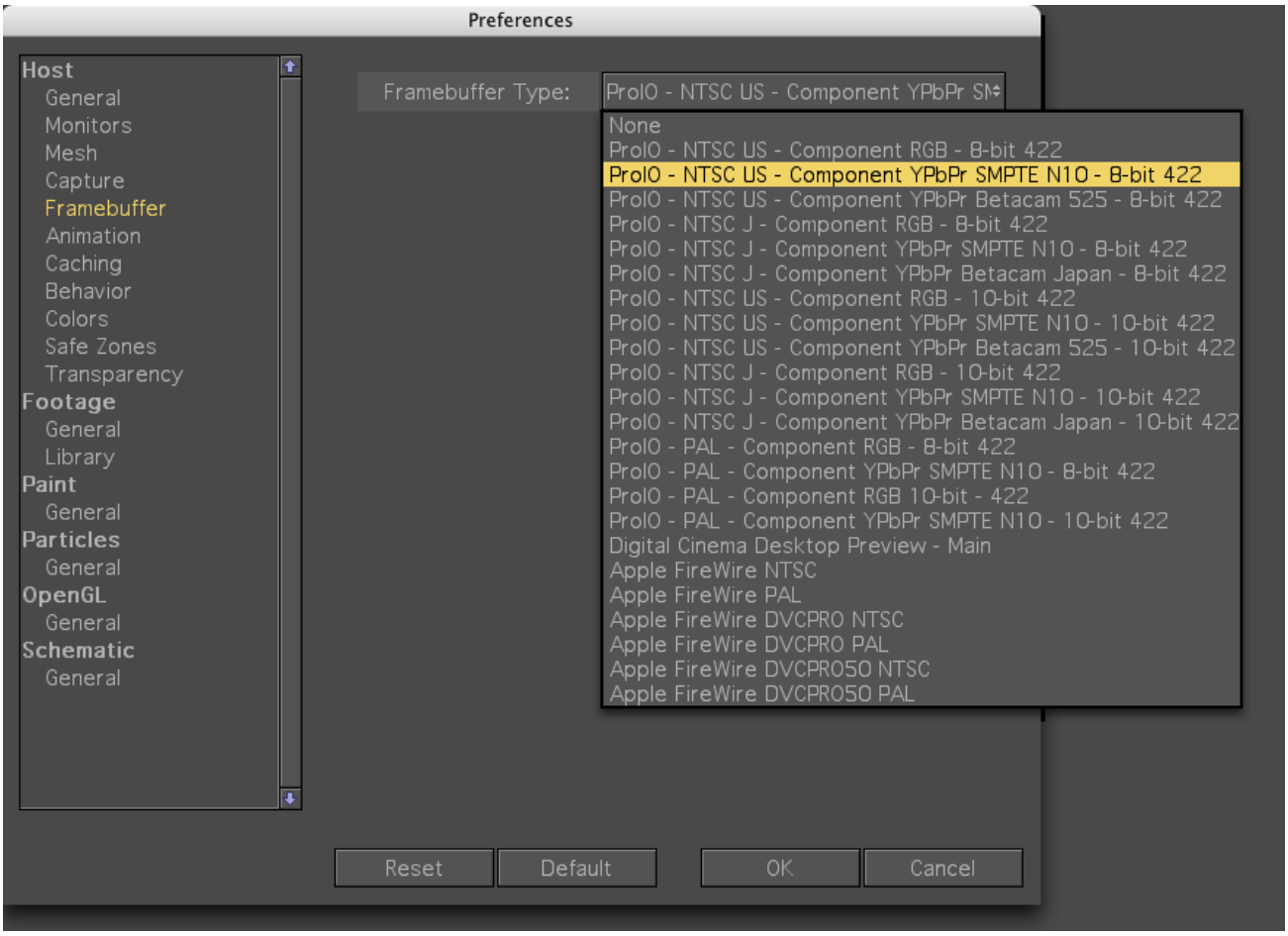


At this point, whatever is on the After Effects preview should be displayed on Io's output.

Note: when switching between After Effects and Final Cut (with both running on your Mac), always click on the desktop after leaving one application—before entering the other; if you don't you'll get a "General Error" warning message. This happens because only one device can have control of the FireWire driver at a time. If you ever get this error simply click on the desktop and then go back into FCP.

How to Use the RGB Output Feature With Discreet Combustion

1. Run Discreet Combustion
2. Locate the menu: ***Combustion > Preferences***
3. In the Preferences window, select "***Framebuffer***" under the "Host" listing on the left.



4. Select the Framebuffer Type on the right side of the window. Choose one of the "ProIo" selections as desired.

Note: Combustion does not release the FireWire driver when it isn't the active application. So when switching back and forth between Combustion and Final Cut Pro, you'll have to quit Combustion in order for Final Cut Pro's output to be seen on the external program monitor. (You can still edit in Final Cut Pro—you just won't be able to see video on the external monitor until Combustion is quit.)

Io LA and Io LD

Chapter 6: 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 make 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.

Table 6-1. ***Problem Solving by Matching Symptoms to Remedies***

Symptom	Check
Disk RAID cannot keep up (dropped frames etc.).	Ensure the disk system is providing at least 50 MB/second sustained transfer rate
Dropped frames during playback.	1. Canvas/Viewer zoom setting exceeds the fit-to-window setting. Change to "Fit-to-Window." 2. RAID cannot sustain the data rate of the clip/sequence. 3. The sequence setting does not match the "playback output setting" found at FCP Audio/Video Settings -> AV Output. 4. Virus checking software running in the background (disable it). 5. Scratch drive not set to the RAID.
Dropped frames during record.	1. RAID cannot sustain the data rate of the capture preset codec. 2. Virus checking software running in the background (disable it). 3. Scratch drive not set to the RAID.

Table 6-1. ***Problem Solving by Matching Symptoms to Remedies***

Symptom	Check
Final Cut doesn't "see" Io$^{LD/LA}$.	Check that the panel is powered up. Check that the Power LED is illuminated (shows power and successful internal processor boot up) and that the FireWire LED is illuminated (shows Io$^{LD/LA}$ is communicating with Power Mac or Xserve FireWire port.
Media is not being captured from desired external device.	Check equipment cables; outputs from external device must be properly plugged into Io$^{LD/LA}$'s inputs (ensure proper format and type) and check Io$^{LD/LA}$ front panel LEDs. The correct input LED on the right side of the panel should light to show which input you've selected in Final Cut. Also check Mode LED. When a capture has been begun in Final Cut, the *Mode In* LED should light.
Changes made to Final Cut's configuration aren't remembered or you need to force a change to them.	Under some circumstances, Final Cut Pro may need to be initialized back to the factory default state as it was when you installed it. The easiest way to do this is to locate Final Cut's preference file and discard it. To do so, follow this procedure: 1. At the finder enter Command F (to search) and enter "Final Cut Pro". 2. In the resulting list of files, locate the file named "Final Cut Pro 4.0 Preferences". *Note: path to file is "Macintosh HD/users/username/library/preferences/final cut user data."* 3. Click and drag that file to the Trash Can icon and drop it there. When you next start up Final Cut Pro, it will present the "Choose Setup" prompt (as in initial installation) where you can again choose a desired Io input format in the "Setup For" pulldown and re-enter a desired system scratch disk (your RAID).
Video in the canvas stays frozen during playback.	1. The sequence setting does not match the "playback output setting" found at FCP Audio Video Settings -> AV Output. 2. Canvas/Viewer zoom setting exceeds the fit-to-window setting. Change to "Fit-to-Window."
Video output is black.	1. External video is set to "No Frames" (View -> External Video). 2. The "Playback output setting" found at FCP Audio Video Settings -> AV Output is set to "none" or to a non-Io device.
Video stutter during playback.	RAID cannot sustain data rate.
Red render bar occurs when placing a clip on a sequence.	The sequence setting does not match the clip setting.

Updating Software

Check on the AJA Video website for software updates. If any are available, download the file and read any associated instructions prior to installing the software.

Support

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

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

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

If the problem is an AJA Video Io[LD/LA] issue, then contact AJA Video Customer Support using one of the methods listed below:

Contacting by Mail Address:

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

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

Apple Resources

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

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

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

Power Mac Support Area: http://www.info.apple.com/usen/g4/

Xserve Support Area: http://www.info.apple.com/usen/xserve/

Xserve Discussion Area:
http://discussions.info.apple.com/
WebX?f50@176.UAD8aKWnmbr.0@.3bb84b79

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

Final Cut Discussion Area:
http:/discussions.info.apple.com/WebX?14@176.UAD8aKWnmbr.0@.3bbdbd22

Io^{LA} and Io^{LD}

Appendix A: Specifications

Video Input

Io^{LD}: 8 or 10 bit SDI, SMPTE-259

Io^{LA} Analog:

Composite/S-Video:	NTSC, NTSCJ, PAL 10 bit A/D, 2x oversampling 3 line adaptive comb filter decoding +/- .25 db to 5.0 MHz Y Frequency Response +/- .25 db to 1 MHz C Frequency Response .5% 2T pulse response < 1.5% Diff Phase < 1.5% Diff Gain
Component:	SMPTE/EBU N10, Betacam 525 line, Betacam 525J, RGB 10 bit A/D, 2x oversampling +/- .25 db to 5.5 MHz Y Frequency Response +/- .25 db to 2.5 MHz C Frequency Response .5% 2T pulse response <2 ns Y/C delay inequity

Video Output

Io^{LD}: 8 or 10 bit SDI, SMPTE-259

Io^{LA}:

Composite/S Video:	NTSC, NTSCJ, PAL 12 bit D/A, 8x oversampling +/- .2 db to 5 MHz Y Frequency Response +/- .2 db to 1 MHz C Frequency Response .5% 2T pulse response < 1% Diff Phase < 1% Diff Gain
Component:	SMPTE/EBU N10, Betacam 525 line, Betacam 525J, RGB 12 bit D/A, 8x oversampling +/- .2 db to 5.5 MHz Y Frequency Response +/- .2 db to 2.5 MHz C Frequency Response .5% 2T pulse response <1 ns Y/C delay inequity

Audio Input

Io^{LD}: 24 bit SMPTE-259 SDI embedded audio, 8 chi, 48kHz synchronous

Io^{LA}: Balanced/Unbalanced input
+24dbu Full Scale Digital
24 bit A/D, 48 KHz sample rate
+/- 0.2db 20 to 20 KHz Frequency Response
108db dynamic range
-94db THD

Audio Output

Io^{LD}: 24 bit SMPTE-259 SDI embedded audio, 8 ch, 48 KHz synchronous

SPDIF, 2-channel, RCA connector, 24-bit 48 KHz

Io^{LA}: Balanced output (XLR and 25 pin D)
+24dbu Full Scale Digital
24 bit D/A, 48 KHz sample rate
+/- 0.2db 20 to 20 KHz Frequency Response
100db dynamic range
-88db THD

Reference Input

Analog Color Black (1V) or Composite Sync (2 or 4V)
Non terminating, Looping, 75 ohm

Machine Control

RS-422, Sony 9 pin protocol

FireWire

IEEE-1394a, 400Mb/s, 6 pin

Physical (applies to Io^{LA} or Io^{LD})

Width: 8.5” (21.59 cm)
Depth: 10.75” (27.30 cm)
Height: 1RU, 1.75” (4.445 cm”)
Weight: 4 Lbs (1.814 kg)

Power

Voltage: 100-240VAC,

- Power Consumption: Io^{LA} 10 Watts
  Io^{LD} 8 Watts

Regulatory

UL, FCC Class A, CE

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