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KONA LHe



Published: 5/4/11

Installation and Operation Guide

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AJA® VIDEO SYSTEMS

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180 Litton Drive, Grass Valley, CA. 95945 USA

Telephone: 800.251.4224 or 530.274.2048
Fax: 530.274.9442

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

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

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Chapter 1: Introduction



Overview

The AJA KONA LHe brings the highest quality HD, SD and analog video/audio to an Apple Mac Pro or G5 Mac running Final Cut Pro software. KONA LHe digital and analog interfaces are very high quality. KONA LHe supports 8 and 10 bit uncompressed video, DV25 and DV50 using the DVCPRO codec, and JPEG—all on an Apple Mac Pro or G5. DVCProHD, HDV, and Apple RT Extreme are all supported—and even accelerated by onboard hardware. Using superb 12 bit video A/D and D/A converters, analog formats like BetaCam SP also look excellent. In addition to high quality video, KONA LHe also supports balanced analog, AES/EBU, and embedded audio I/O, all at 24 bits and 48Khz. For simplified system integration, KONA LHe includes hardware sample-rate conversion for AES inputs (eliminating annoying synchronization hassles)—and RS-422 machine control.

Features

The KONA LHe card offers a large number of unique features for optimum quality, ease of use, and support for a wide variety of workflows and environments. KONA LHe provides flexible standard definition and high definition capture and playback, a hardware downconverter for working in mixed SD/HD environments—and it supports both analog and digital audio/video I/O.

Hardware

- 10-bit uncompressed SD/HD QuickTime capture card
- 12-bit HD Analog Component I/O
- 12-bit SD Analog Component/Composite/S-Video I/O
- 10-bit hardware HD-to-SD downconversion
- DVCProHD hardware acceleration
- HDV hardware acceleration

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- Dynamic RT Extreme hardware acceleration
- SDI or HD-SDI Input, 2 independent SDI/HD-SDI outputs
- 2-channel analog balanced XLR audio I/O
- 2-channel AES XLR audio I/O
- 8-channel SDI embedded audio I/O
- HD/SD genlock on analog video inputs
- RS-422 Machine Control
- Final Cut Pro, Motion, After Effects, Combustion, and more
- Cables standard
- Optional KL-box Breakout Box—provides rack mounting and flexible easy I/O (KL-box cabling is included with the KL-box). When ordering, specify a KL-box for the KONA LH since it uses a unique cable.
- 3-year warranty

KONA LHe Audio

KONA LHe supports 2-channel 24-bit 48kHz AES audio via XLR connections, and 8 channel embedded 24 bit 48kHz audio over the same single SDI connection as the video. If you are using a digital deck—you'll have the proper connections to the deck.

For analog audio, KONA LHe provides two-channel balanced audio input and output. If you purchase the optional KL-Box breakout box, you also get two-channel unbalanced audio output (RCA jacks).

KONA LHe also features AES input sample rate conversion; this feature eliminates the requirement for audio source synchronization. Sample rate converters auto-lock to any AES input, 32-96KHz, and then convert it to 24 bit 48KHz audio, perfectly locked to internal KONA LHe video. Sample rate conversion is done at very high quality (over 120db THD).e

Software

- KONA LHe control panel for source selection and controlling KONA LHe within the overall MacOS environment (Macintosh Desktop, Input Pass through, and more).
- AJA QuickTime™ drivers for tightly integrated hardware/software operation.
- Supports all popular standard definition formats: 8/10 bit uncompressed, JPEG, DV25/50, and 3:2 pulldown for 24Hz support.
- Support for Apple Final Cut Pro™ (application software not included).
- Support for After Effects, Combustion, Motion, and Other Applications (application software not included).

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

What's In The Box?

When you unpack your AJA KONA LHe, you'll find the following components:

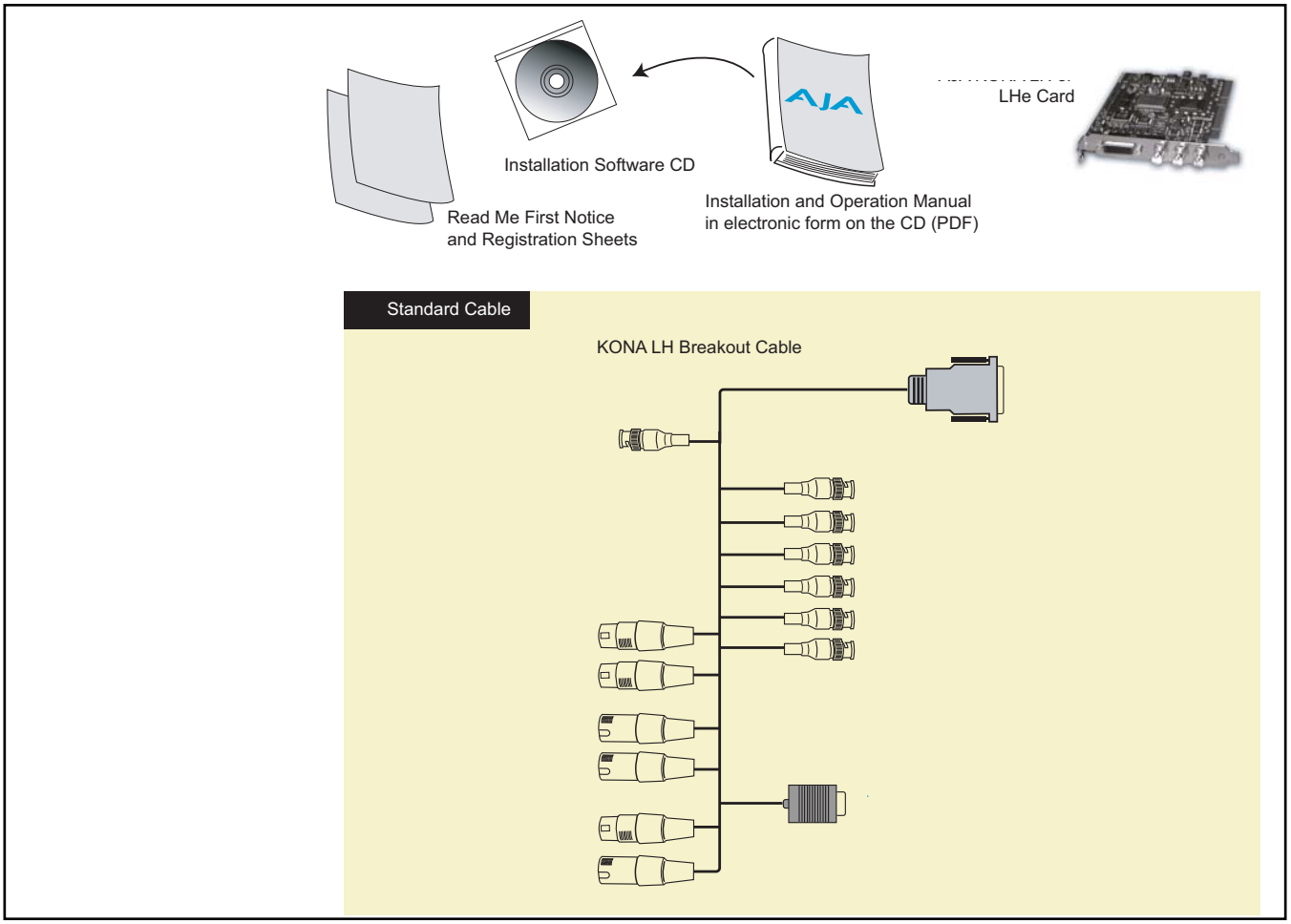
- AJA KONA LHe Software and Documentation CD-ROM—this CD contains the software installer to place KONA LHe drivers and the Control Panel on an Apple Power Mac. Install the software as discussed in this manual in *Chapter 3: Installation and*

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Configuration. The CD also contains a wide variety of useful information, including this manual you're reading (PDF format).

- KONA LHe PCI Express card.
- Cable, KONA LHe Standard Breakout, with Analog video, audio, AES, Reference Input, and RS-422 Machine Control. SD-SDI and HD-SDI In/Out connectors are on the LHe card itself.
- Read Me First Notice—Contains late-breaking news and/or errata related to KONA LHe and the documentation.
- Registration Sheet—allows you to register your card by mail or online (details provided).

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



KONA LHe Shipping Box Contents

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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	Recommended
Recommended Kona Driver for Mac OSX and Final Cut Pro: ***Note:*** always consult the release notes for the AJA software version you are running (included with installer)	FCP 7.0.x - KONA driver version 9.0.1 (Snow Leopard and Leopard OS compatible version) FCP 7.0.x - KONA driver version 7.5.1 (Snow Leopard and Leopard OS compatible version) FCP 7.0.x - KONA driver version 7.1 (Snow Leopard and Leopard OS compatible version) FCP 7.0.x - KONA driver version 7.0 (Snow Leopard and Leopard OS compatible version) FCP 7.0.x - KONA driver version 6.5 (Leopard OS compatible version) FCP 6.0.x - KONA driver version 6.0.3 (Leopard and Tiger OS compatible version) For the latest appropriate match for your software and hardware, visit: *http://www.aja.com/support/konaNEW/kona-lhe-lh.php*
Macintosh Tower:	**Recommended KONA LHe System:** Apple Mac Pro with Dual-Core Intel Xeon Processors (2 GHz or better) with a minimum of 2GB RAM for uncompressed SD or 4GB RAM for uncompressed HD. Use a Fibre Channel or SCSI external RAID for uncompressed SD/HD storage. **Minimum KONA LHe System:** Power Mac G5 (dual) PCI-Express, 2GHz with 2GB RAM minimum for uncompressed SD or 4GB RAM for uncompressed HD. Ensure your Macintosh has a PCI-Express slot for compatibility. Use a Fibre Channel or SCSI external RAID for uncompressed SD/HD storage. **Slot Placement:** Visit our website and view this regularly updated slot placement document: *http://www.aja.com/support/kona/kona-system-configuration.php*
Internal Storage (SATA inside Mac):	Best suited for compressed SD/HD formats only
External Storage: ***Note:*** see Storage Methods topic that follows later in this Chapter	Ideally a RAID configuration with Fibre Channel or SCSI connection to the Mac via qualified host bus adapter

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Understanding Disk Storage Methods

The KONA LHe card, an Apple Power Mac, and Final Cut Pro, together offer an unprecedented level of features and performance for all 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 following:

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 5.6TB of storage with throughput of up to 400 megabytes per second.	Expensive, although the cost per gigabyte is excellent when large storage is needed
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

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

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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.

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	Hours of Storage Per Terabyte of Disk
10 bit Uncompressed Standard Definition	28	101	9.9
8 bit Uncompressed Standard Definition	21	76	13.1
DV50 Standard Definition	6.3	23	43.4
DV25 Standard Definition	3.1	11	90.0
Photo JPEG Standard Definition	2.5	9	111
8-bit Uncompressed 1080i @59.94/60Hz	124	448	2.2
10-bit Uncompressed 1080i@59.94/60Hz	166	597	1.7
8-bit Uncompressed 1080i @50Hz	104	373	2.7
10-bit Uncompressed 1080i@50Hz	138	498	2.0
8-bit Uncompressed 1080psf@23.98/24Hz	100	358	2.8
10-bit Uncompressed 1080psf@23.98/24Hz	133	478	2.1
8-bit Uncompressed 720p@59.94/60Hz	100	358	2.8
10-bit Uncompressed 720p@59.94/60Hz	133	478	2.1
DVCPRO HD	12.5	45	22.2
MB = MegaBytes *GB = GigaBytes*			

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

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Cable Connections

KONA LHe offers unsurpassed cable connectivity for a video/audio capture card. Connections are made via a supplied breakout cable and three BNCs on the KONA LHe Card endplate.

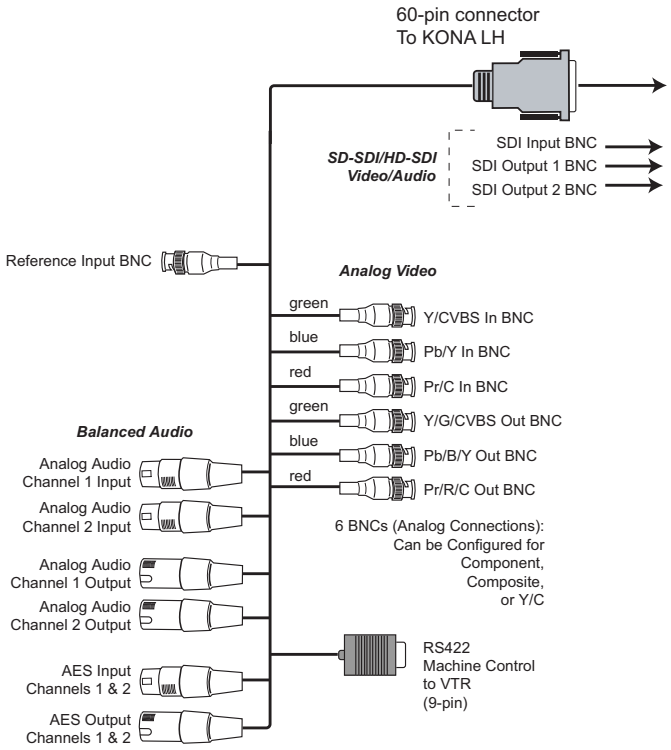
Using the Breakout Cable and 3 BNCs

The breakout cable supports:

- Reference Input (BNC)
- Component/Composite/S Video Input (3x BNC)
- Component/Composite/S Video Output (3x BNC)
- AES In (2x XLR)
- AES Out (2x XLR)
- Balanced Audio In (2x XLR)
- Balanced Audio Out (2x XLR)
- RS-422 Machine Control (9 pin D)

The three BNCs on the KONA LH Card endplate additionally provide:

- Standard and High-definition SDI input (BNC)
- 2 SDI outputs (2x BNC, independent outputs)



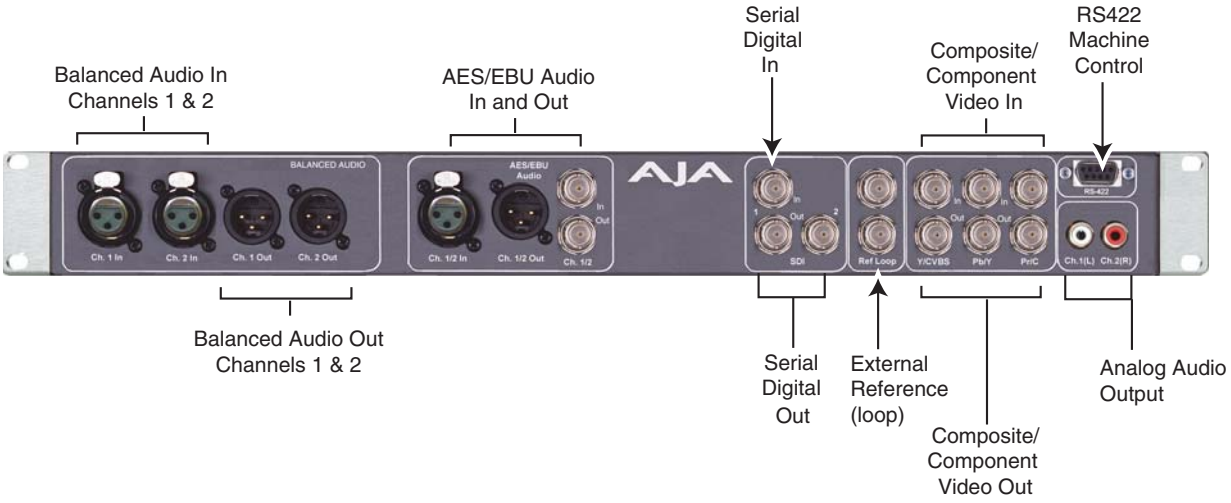
KONA LHe Breakout Cable

Using KL-box

The KL-box attaches to the KONA LHe card via cables that attach to the back of the KL-box. These cables are supplied with the KL-Box (one 60-pin to 60-pin, and one 3-BNC to 3-BNC). When you purchase the optional KL-Box, you get two-channel unbalanced audio output (2 RCA Jacks)—not available with the standard cable.

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Note: When ordering a KL-Box, ensure that you specify one configured for the KONA LHe. The KL-Box is also available for the KONA LS and LSe, but uses a different cable set when ordered for the LS card. Separate AJA part numbers exist for each configuration, so ensure your dealer supplies you with the correct one.

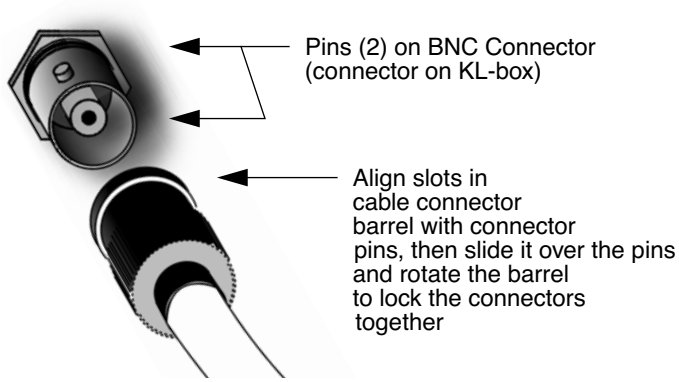


AJA KL-box Panel Connectors

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 panel connector 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.



Connector Descriptions—Cables and KL-box

Connectors on the standard cable set are labelled as to their function for easy installation and maintenance. Similarly, connectors on the optional KL-box are also labelled.

SDI Input and Outputs

BNC connectors are provided on the KONA LH card endplate for one SD-SDI or HD-SDI input and two SDI outputs (independent of the input). The SDI input and outputs support video and embedded 24-bit digital audio. Use SDI wherever possible for the best quality 10-bit uncompressed video input, capture and output. If peripheral equipment has a variety of

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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.).

2 Channel Digital AES/EBU Audio Inputs And Outputs

One female XLR connector is provided for the channel 1 and 2 inputs, while a male XLR connector carries channel 1 and 2 outputs. AES/EBU signals are handled internally as 24-bit digital.The optional KL-box also provides XLR audio connections on the front panel.

Note: AES XLR connections are digital and cannot be used with analog equipment having XLR connectors.

Analog 2 Channel Balanced Audio

Two sets of analog XLR connectors, one for each channel, support balanced audio connections. Male XLRs are provided for outputs and female XLRs are provided for inputs. Balanced audio (differential) connections provide better analog audio quality over longer cable runs. Most professional quality VTRs and audio equipment have XLR style connectors for analog audio. Analog audio signals are converted internally to 24-bit digital.

Analog 2 Channel Unbalanced Audio (KL-box only)

On the KL-box are two analog output connectors, one for each channel. These connectors are RCA-style phono jacks.

RS422 Machine Control

A female DB9 connector on the breakout cable provides connection for VTRs, camcorders, disk media servers, and other devices using RS422 SMPTE (Sony) protocol. This connector is also present on the optional KL-box. (Connector pinout is listed in Appendix A: Specifications.)

Analog Monitor Out (Component/Composite HD/SD)

Both the standard I/O cable and the optional KL-Box feature two groups of 3 BNC connectors (each) for input and output of component, composite and Y/C functions. The signals are labelled on both the cable and KL-Box connectors.

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, KONA LHe supports it. However, because the KONA LHe (and SMPTE SDI) native format is YPbPr, AJA recommends the use of YPbPr whenever possible for analog monitoring. 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 round-off error. RGB can be configured in the KONA LH Control Panel.

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. KONA LHe uses the modern YPbPr terminology exclusively. KONA LH supports three different types of YPbPr: SMPTE/EBU N10, Betacam (NTSC), and Betacam (NTSC Japan). These three formats differ in level only and are configured in the KONA LHe Control Panel.

Reference Video

A single BNC on the standard KONA LHe cable—or two BNC connectors on KL-box (it loops through)—allow you to synchronize KONA LH outputs to your house analog reference video signal (or black burst). If you have a sync generator or central piece of video equipment to use for synchronizing other video equipment in your studio, then connect its analog composite output here. When KONA LHe outputs video it uses this reference signal to lock to. When connecting a reference video source, the locking signal should be the same format as the

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Primary format selected in the KONA LHe Control Panel. It is possible in some circumstances to use an alternate format video signal as long as the basic frame rate is compatible.

In This Manual

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

Chapter 2 gets you started with using KONA LHe in a typical Video environment. Typical workflows are discussed.

Chapter 3 provides complete instructions for installing and configuring the AJA KONA LHe card. The user is guided through unpacking, installing the card into a PowerMac, installing KONA LHe Mac Software From CD, cabling the system and then getting it up and running. Important configuration information is also provided on video settings and use of genlock/external reference.

Chapter 4 discusses operational aspects of KONA LHe when used with Final Cut Pro.

Chapter 5 discusses troubleshooting problems with your system and what to do when there's a problem you can't solve.

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

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

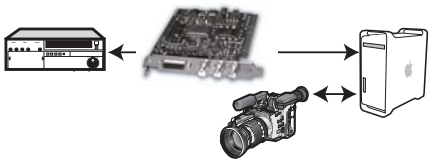
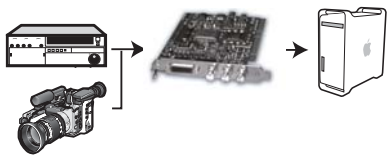
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Chapter 2: Getting Started

KONA LHe 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—many systems these days are a mixture of equipment from high-end professional to desktop video. This chapter hopes to show how Final Cut Pro and KONA LHe can help fit into whatever workflow you currently have and make it more efficient.

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

Source Deck Type(s)		Workflow Attributes	Applications
Digital SD-SDI or HD-SDI Examples: Digibeta, DV50, DVCPRO HD, HD Varicam and DVcam		KONA LHe captures and outputs SD-SDI/HD-SDI video with embedded audio. Use high-quality AES/EBU and/or embedded 8-channel audio output.	Pro Broadcast Corporate/Industrial On-site Editing
Analog Examples: Beta, VHS, and U-matic		KONA LHe captures and outputs Y/C, Component, and Composite Video, with 2-channel audio.	Corporate/Industrial Pro Broadcast On-site Editing
Digital capture via Firewire with Output via AJA KONA LHe. The LHe has Analog HD component in, which also allows you to bring in HD directly from an HDV camera head. Example: MiniDV, HDV		Using standard desktop video techniques, video/audio is captured directly from a camcorder or deck. KONA LHe is used for playing back captured media and editing/mastering to tape or DVD using Final Cut 5 HD and other tools such as After Effects, Combustion, Apple Motion, etc. HDV playback is aided by KONA LHe onboard hardware scalar.	Desktop Video Corporate/Industrial On-site Editing Pro Broadcast
Without even using a deck; use the video monitor as a second Mac monitor. The KONA LHe desktop lets you drag graphics from programs like Adobe Photoshop from the computer display to the video monitor. You paint full frame and live onto a broadcast monitor. Output virtually anything to video—ideal for animators and compositors.		Using Final Cut Pro, work with a wide range of old and new SD and analog sources, and then also using desktop graphics and video software for creative power and flexibility.	Post-production Animation Compositing

Workflow Scenarios

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Understanding Typical Workflows

KONA LHe and Final Cut Pro allow more workflow flexibility than ever before. Users can independently select different formats for capture and storage media, while also outputting to an array of analog and digital uncompressed formats—with all outputs active simultaneously. Capture can range from analog, DV, or SD and HD digital uncompressed. 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 SD and HD

As quality and codecs improve, the lines between offline and online are blurring. For example, with the Apple ProRes 422 codec, native HD editing in that codec is now possible, providing very high quality results (true HD editing) at very low data rates.

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 Mac's internal system drive—it's noted where this is supported in the following discussions.

PhotoJPEG

Data rate: approximately 1-3 MB/second standard definition or high definition—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 allows you to adjust quality using a PhotoJPEG control panel. KONA LHe allows for PhotoJPEG monitoring and/or output in both SD and HD. KONA LHe can capture from almost any HD or SD input, directly to PhotoJPEG media.

DV (DV25)

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

Quality: Good

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

DV50

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

Quality: Very Good

Like DV25, Final Cut Pro also supports the Panasonic DV50 standard definition 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 KONA LHe to convert DV50 projects to uncompressed—in real time—for monitoring and/or output. KONA LHe can capture uncompressed from any input, directly to DV50 media.

DVCPRO HD

Data rate: 12 MB/second high definition—supported by internal system drive

Quality: Excellent

Like DV50, Final Cut Pro also supports the Panasonic DVCPRO HD high definition codec. You can use KONA LHe to convert DVCPRO HD projects to uncompressed—in real time—for monitoring and/or output. KONA LHe can capture uncompressed from any input, directly to DVCPRO HD media. When playing the DVCPRO HD format back, the KONA LHe hardware handles the work of properly scaling the video for monitoring and output—which provides for more streams of RT effects, since the Mac processors are freed up to handle the RT.

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HDV

Data rate: 19 MB/second high definition720p, 25 MB/second high definition 1080i—supported by internal system drive

Quality: Excellent

KONA LHe supports and accelerates the Final Cut Pro HDV Codec. You can use KONA LHe to convert HDV projects to uncompressed—in real time—for monitoring and/or output. KONA LHe can capture uncompressed from any input, directly to HDV media. The KONA LHe advanced scaling engine takes the native frame (long GOP 1440 HD) and outputs it via hardware—in real time. Precision AJA circuitry re-sizes the video to proper 1920 x 1080, providing quick playback of HDV captured by Final Cut for monitoring and recording.

HDV captures HD images via MPEG2 compression and allows for recording the signal to a MiniDV tape. This MPEG2 compression is similar to a DVD (although DVD is a program stream vs. HDV's transport stream and HDV uses a constant bit rate whereas DVDs use variable bit rates). The issue for post production is that the HDV transport stream is based around a long-GOP structure (group of pictures) which produces images based on information over a section of time, via I, P and B frames; Intraframes, predicted frames and bi-directional frames. Formats that do not use this scheme treat frames as individual units, as in the progressive formats where a frame truly is a frame, or as interlaced frames where two fields create the image. Sometimes we refer to these formats in contrast to MPEG formats, as I-frame formats where frames can be easily defined as individual.

Since the frames of HDV have the long GOP structure to define them, herein lies the problem for post-production; how can we work with the material if we must know what lies before, after and during? Luckily, the transport stream MPEG2 can be transmitted over IEEE1394 (aka FireWire). This means that the compressed HD material can be transferred into systems with the appropriate hardware and software (for example, a Mac Pro with Final Cut Studio 2). While this seems like a simple solution for post-production, it means that the footage must be brought into the system as a rather heavily compressed format and that the computer must continue to work with the material as a MPEG2 transport stream, which is incredibly processor intensive for the computer.

How does the AJA KONA LHe card connect to HDV and digitize material to uncompressed HD files for editing—or at the very least, to a lightly compressed I-Frame HD format? The answer to this is provided in a feature common to many HDV devices: analog HD output via component video. The component connectors on JVC cameras and decks, along with Sony cameras and decks, allows for the output of the long GOP MPEG2 data as a standard HD video format such as 720P in the JVC products—or 1080i in the Sony products.

Since the KONA LHe has the ability to digitize analog HD signals, the analog component output of the HDV devices can simply be connected to the KONA inputs. Note that HD signal cannot be transported over composite or S-Video (Y/C) cables, so the HDV device must have an analog component HD output. The KONA LHe also has the ability to ingest analog audio, so the analog audio outputs of the HDV devices can be sent to the KONA card as well. (Also note that these analog audio outputs on the HDV devices are usually unbalanced RCA connections where the KONA card uses balanced XLR style connection so some sort of audio level correction device, such as a mixer or a stand alone active interface amplifier, should be used for accurately attenuated audio.)

Finally, you will want to control your device. Where all of the video, audio and timecode information moved over the FireWire cable, now you are dividing those tasks. Device control is the most difficult to configure for HDV devices because so few HDV devices have implemented any form of device control other than IEEE1394. The one notable exception is the JVC BR-HD50 HDV deck which has a remote serial port for RS422 protocol and device control. Check the KONA LHe support area on the AJA website for a whitepaper on HDV, which gives details on using KONA LHe with various HDV equipment.

Note: direct capture into HDV media on the LHe is not possible. Direct capture into the LHe can only be done using uncompressed, DVCPRO HD, or Pro Res. Regarding ProRes 422, capturing HD resolution ProRes 422 from an HD source requires a Mac Pro with an Intel Xeon processor.

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Apple ProRes 422 and Apple ProRes 422 HQ (SD or HD)

Data rate: Approximately 18 MB/second ProRes 422, Approximately 31 MB/second ProRes 422 HQ— supported by internal system drive or attached storage

Quality: Excellent, broadcast quality

Captured media is virtually indistinguishable from pristine uncompressed sources. Better yet, ProRes maintains the quality during editing, surviving multiple encoding/decoding generations without degradation. It was designed by Apple for editing, rather than as a transmission/distribution codec as are most popular codecs. Some of the advantages include:

- Full-size 1920-by-1080 and 1280-by-720 HD resolutions.
- Full-size 720-by-486 and 720-by-576 SD resolutions.
- 4:2:2 chroma sampling. Provides precise compositing and blending at sharp saturated-color boundaries.
- 10-bit sample depth. Preserves subtle gradients of 10-bit sources (perfect for green-screen compositing, graphics or color correction) with no visible banding artifacts.
- I frame-only encoding. Ensures consistent quality in every frame and no artifacts from complex motion.
- Variable bit-rate (VBR) encoding. "Smart" encoding analyzes the image and allocates more bits to complex frames.
- Low data rate requirements make for more storage options and require less drive space to store high quality video.

Uncompressed 8-bit

Data rate: 21 MB/second standard definition, or 100-124 MB/second high definition (see later "Storage Capacity" chart in Chapter 1 for the various transfer rates per format)— requires SCSI, Fibre Channel, or ATA drive array

Quality: Excellent

Uncompressed media is KONA LHe's 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 supports RT with uncompressed media using RT Extreme. KONA LHe supports capture of uncompressed through any of its inputs, and uncompressed projects are output to all of its outputs simultaneously.

Uncompressed 10-bit

Data rate: 28 MB/second standard definition, or 133-166 MB/second high definition— uncompressed 10-bit requires SCSI, Fibre Channel or SATA drive arrays.

Quality: Excellent, very high quality

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. 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."

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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). You could even capture 8-bit uncompressed and HDV, and then place them both on a PhotoJPEG timeline and end up having to render them *both*. You can capture directly, in real time to any supported format, even if it doesn't match the source formats at all (for example, DV and DV50 to 8 bit uncompressed).

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. KONA LHe is ideal for this since it has the connections necessary to bring in a variety of media for capture into Final Cut.

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Chapter 3: Installation & Configuration



Installation Overview

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

1. Unpack the shipping box
2. If not previously installed on your Mac Pro, ensure that Final Cut Pro is installed as detailed in its user documentation. Final Cut Pro *must be installed and have been run at least once prior to installing AJA KONA LHe software.*
3. For Mac Pro and LHe:
   Visit: http://www.aja.com/support/kona/kona-system-configuration.php
   Locate your Mac model and install in the recommended slot.
   For Model LHe and a G5:
   Lay the PCIe PowerMac G5 on it's on it's side (motherboard facing up). Install the KONA LHe capture card into one of the PCI Express slots in the PowerMac. The RAID controller card (SCSI or Fibre Channel) can go in any other available slot.
4. Install AJA KONA LHe software on your Mac from the supplied AJA CD-ROM
5. Cable the system audio and video sources, VTR, audio monitor, and video monitor. If you purchased the optional KL-box, then install it into an equipment rack or place it on a desk and connect its two cables to the KONA LHe card. If you're instead using the standard cable set, then use those to connect equipment.

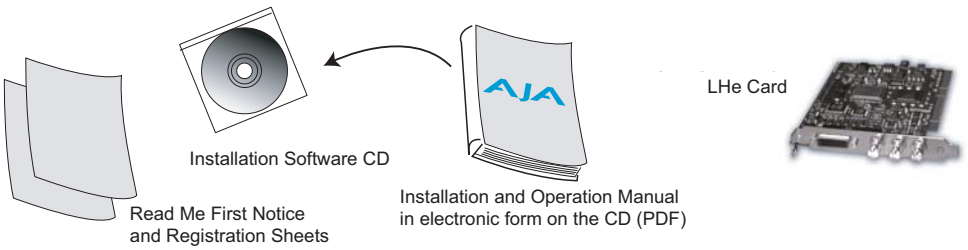
Each of these steps are explained in greater detail in the remaining pages of this chapter.

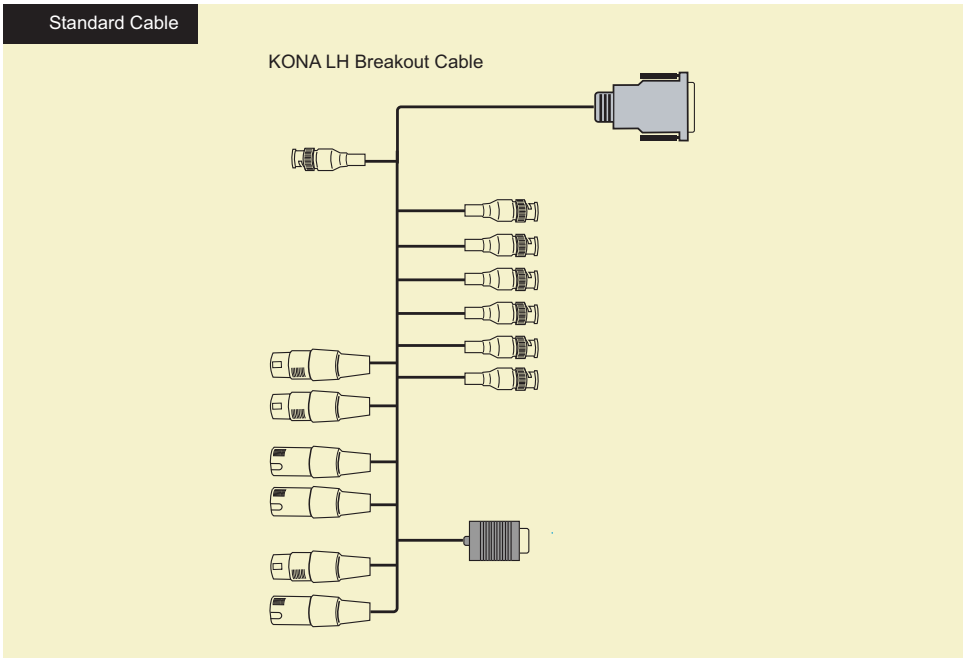
Unpacking

Shipping Box Contents

KONA LHe is shipped with a CD containing system software and an Installation and User manual (a PDF on the CD), and a cable. If you purchased the optional KL-box breakout box, it ships with its own set of cables and instructions for connection to the KONA LHe card.

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Contents, KONA LHe Shipping Box

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

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Installing the KONA LHe Card in a Mac Pro

1. Place the Mac Pro in a well-lit convenient area, where you will have easy access to the chassis access door.
2. Using your hand, touch the outside of the Mac Pro to discharge any static electricity you have. Remove the power cable from the back of the Mac.
3. Remove the access door as described in your Apple User Manual. Lay the Mac on its side, motherboard facing up.
4. Remove the KONA LHe card from its protective anti-static bag; place the card on top of the bag.
5. Visually locate the PCIe slots inside the Mac chassis. The slots are numbered along the left side. Visit:

   http://www.aja.com/support/kona/kona-system-configuration.php

   ....and determine which slot works best for your Mac Pro model. This page is updated regularly to account for Apple product line changes.
6. Remove the card edge locking plate on the right side of the card cage, using a Phillips screwdriver (it is held in place by two captive phillips screws).
7. Carefully insert the KONA LHe card by rocking it slowly into the desired PCIe slot. Ensure the card edge aligns properly with the Mac Pro's rear panel opening (where the card edge locking plate was just removed) and that it is fully seated in the slot.
8. Replace the card edge locking plate removed earlier, securing the two phillips screws.
9. Replace the Mac Pro's access door.



KONA LHe Card

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Installing the KONA LHe Card in a G5

1. Place the PCI-Express G5 in a well-lit convenient area, where you will have easy access to the chassis access door.
2. Using your hand, touch the outside of the G5 to discharge any static electricity you have. Remove the power cable from the back of the PowerMac G5.
3. Remove the access door and clear inner panel as described in your Apple G5 User Manual. Lay the G5 on its side, motherboard facing up.
4. Remove the KONA LHe card from its protective anti-static bag; place the card on top of the bag.
5. Visually locate the PCI-Express slots inside the G5 chassis. The KONA card only requires a 4-lane PCI-Express slot, so any of the available slots will work correctly.
6. Remove the card edge access cover from the desired slot where you will be inserting the KONA LHe card. The card edge cover is secured by a phillips screw; save this screw for use in installing KONA LHe.
7. Holding the KONA LHe card by the card edge plate and an outside edge, carefully insert the KONA LHe card by rocking it slowly into the slot. Ensure the card edge aligns properly with the G5's opening (where the card edge cover was just removed) and that it is fully seated in the slot.
8. Secure the card in the slot using the screw removed earlier.
9. Replace the G5's clear inner panel and outer access door.

Note: After you install the KONA LHe card, you may notice that in the MacOSX Network preferences there is a message stating "You have a new network port named KONA LHe —be sure to check the settings...". There is no need to take any action; this occurs because MacOSX detects the RS-422 serial port on the KONA LHe card that you will use for VTR machine control.

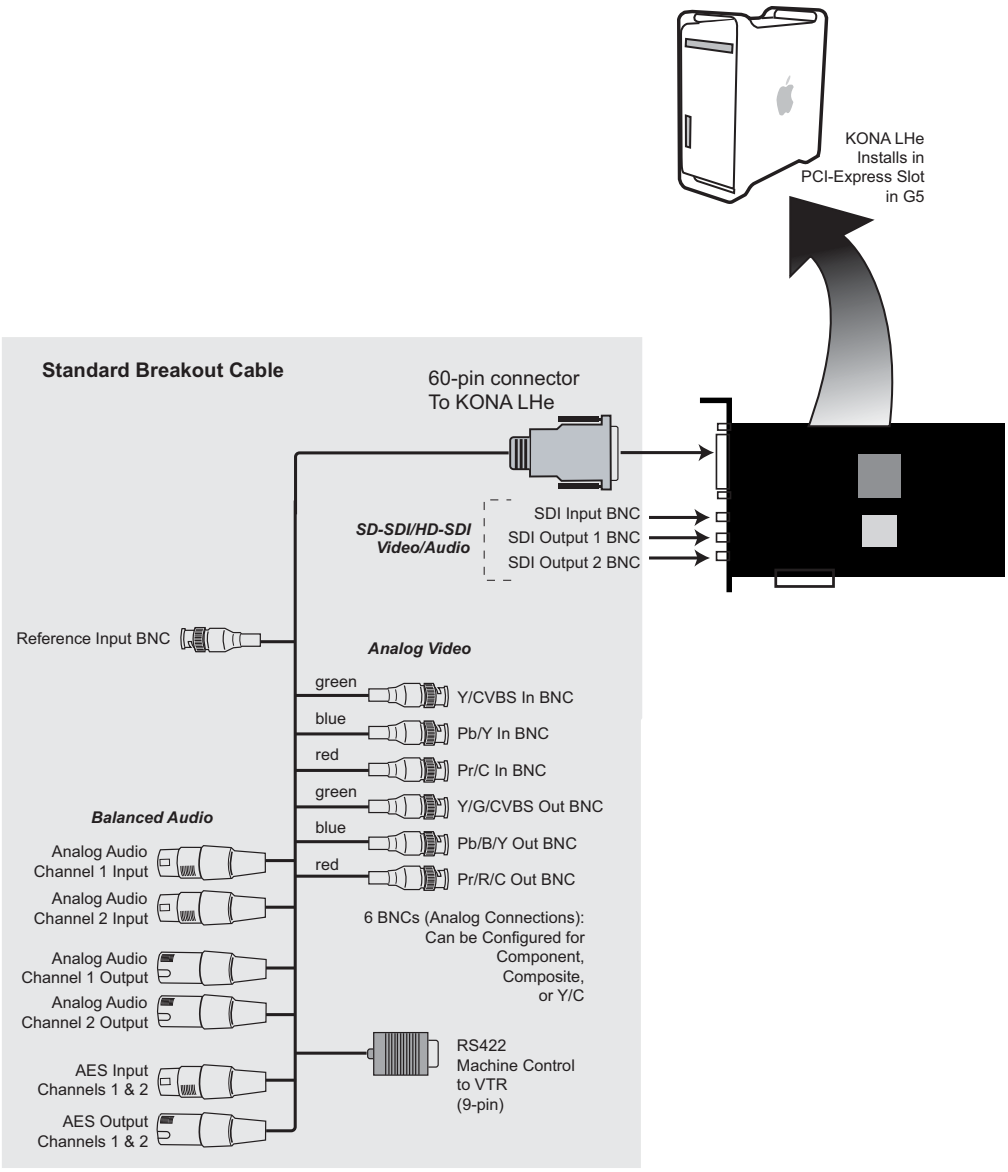
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Cabling the System

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.

System Cabling When Using The Breakout Cable



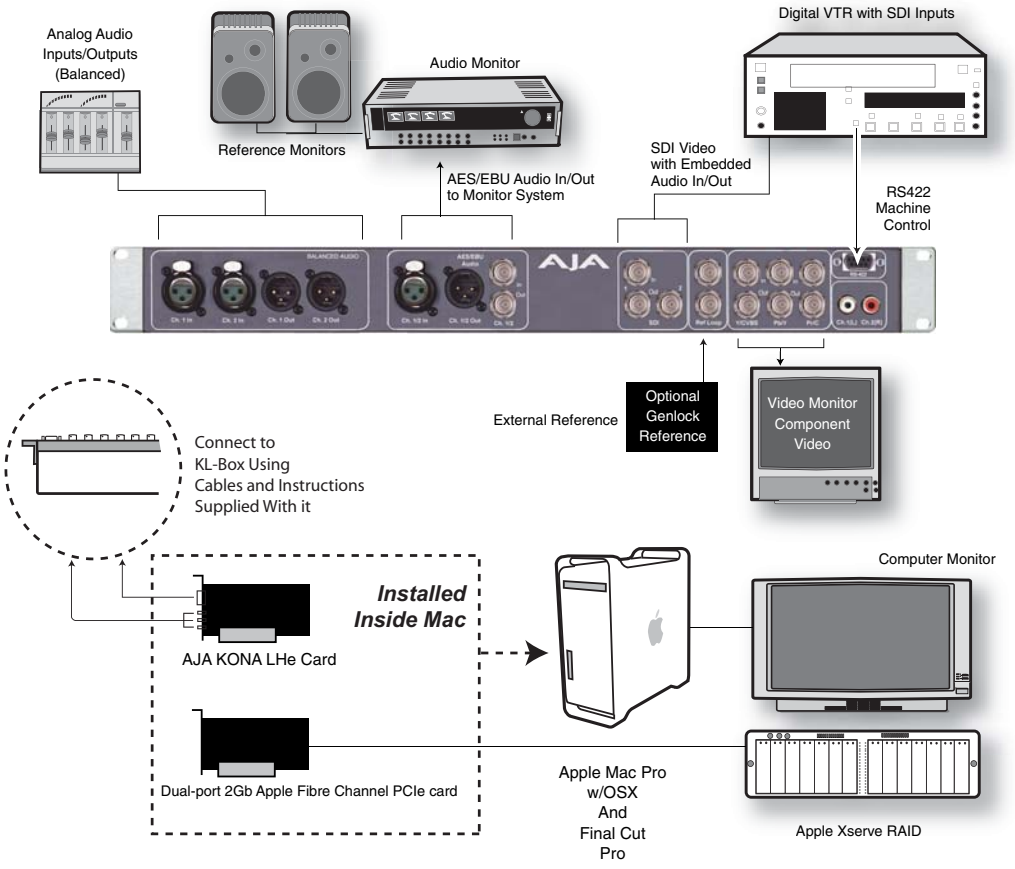
KONA LHe System Using The Breakout Cable

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Typical System

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 KONA LHe *Ref Loop* connector (BNC). The second KONA LH Ref Loop connector on the KL-box (if used) can be connected to the VTR or terminated with a 75-ohm terminator.
2. Connect a Video Monitor to the KONA LHe *Component Analog Video Out* BNC connectors (preferred), or instead connect to a composite monitor.
3. Connect a 9-pin DB9 machine control cable between your VTR's RS422 control port and the breakout cable's *RS-422* machine control connector.
4. Connect two SDI cables between KONA LHe (BNCs are on the card endplate) and your digital VTR (Digital Betacam etc.): one from KONA LH *SDI In* to the VTR SDI Out, and one from KONA LHe *SDI Out* (1 or 2) to the VTR SDI In. The KONA LHe SDI connections have embedded audio so the VTR must be configured accordingly.
5. If you have an AES/EBU-ready audio monitoring system, then connect the two channels of AES/EBU output from KONA LHe's XLR connectors (channels 1 and 2) to the monitoring system AES/EBU inputs. If you instead have an analog audio monitoring system, you can use either the XLR balanced audio connectors or the two RCA-style unbalanced stereo output jacks on the Optional KL-box for output.



Typical System Connections—Shown with Optional KL-Box

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Installing KONA LHe Software

First ensure that Final Cut Pro is installed as detailed in its user documentation. Final Cut Pro *must be installed and have been run at least once prior to installing AJA KONA LHe software.* Next, use the CD-ROM supplied with the KONA LHe system to install necessary software drivers and KONA LHe control panel. You cannot use KONA LHe with Final Cut Pro until the AJA KONA LHe software has been installed on the host Power Mac.

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

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

Software Installation Procedure

Locate the AJA KONA LHe Software CD packaged with your system. Then follow the procedure below to put the required software on the host system to be used with KONA LH/LHe. The system must be an Apple Mac Pro or Power Mac G5 as described earlier in *Chapter 1: System Requirements*.

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

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

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

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

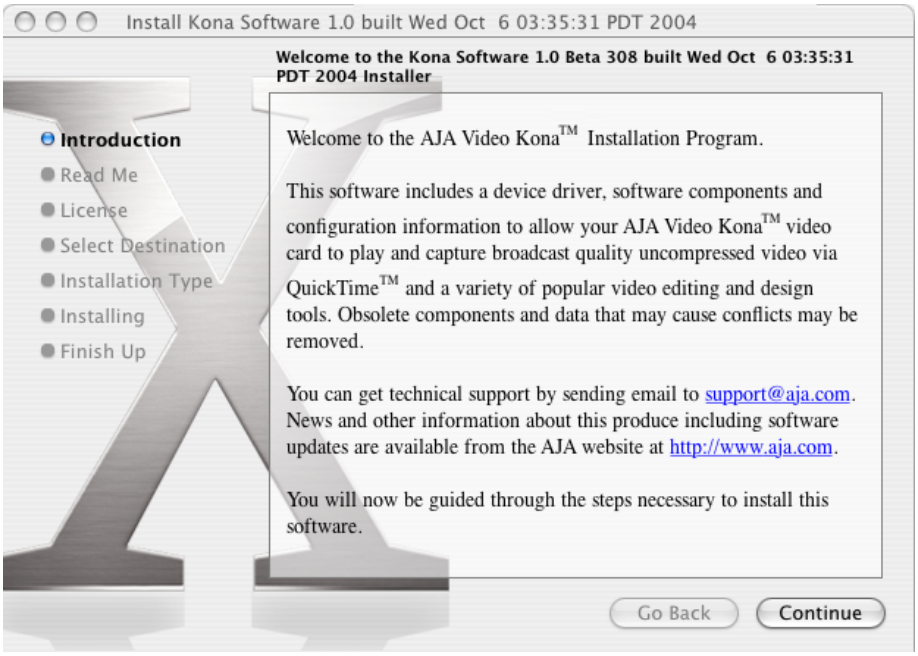


Log On Authenticate Prompt

7. Click on the *OK* button after entering a valid user and password.

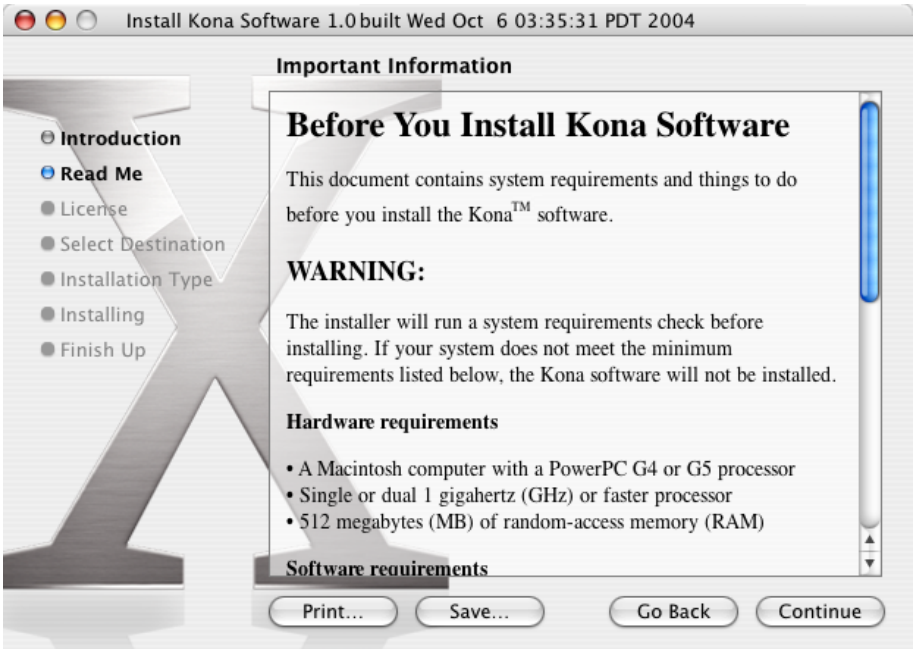
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8. The installer will launch and you'll see a series of installer screens.



Initial Installer Screen

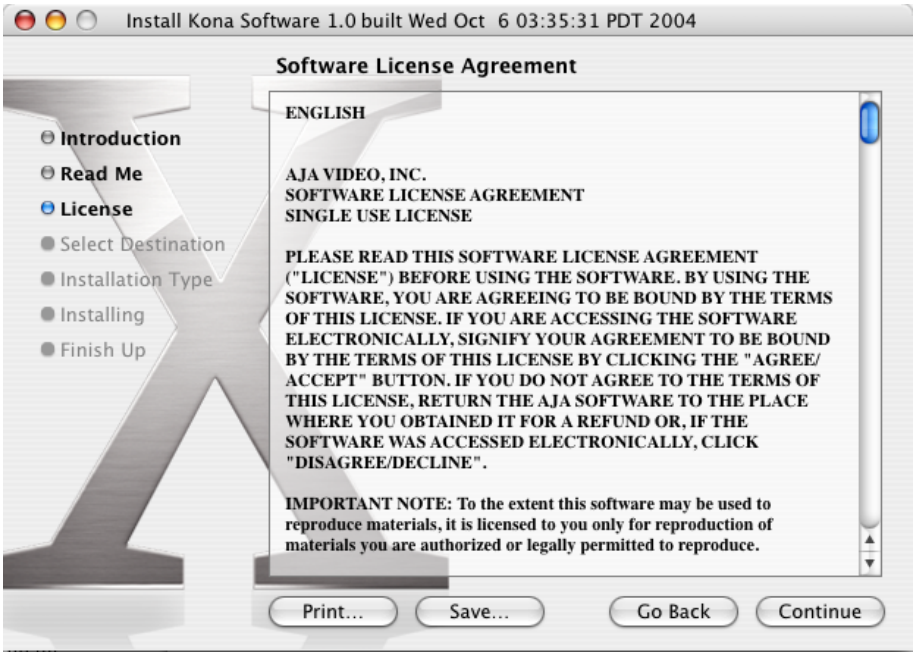
9. Click *Continue* to begin installation.
10. The next screen lets you know that the installer will check your PowerMac to ensure it has the hardware and software resources required (see Minimum Requirements in Chapter 1).



System Check Installer Screen

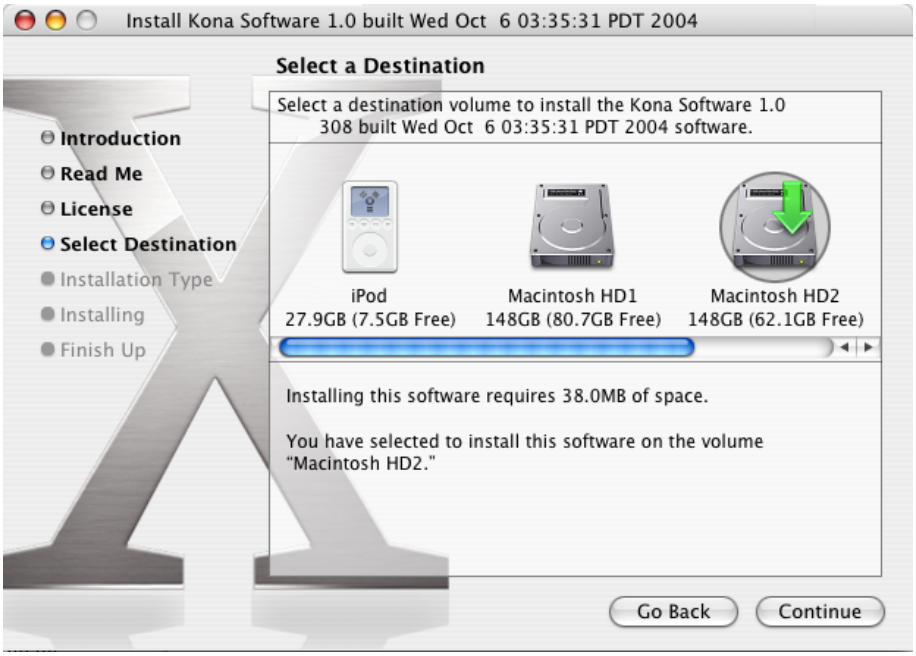
11. Read and agree to the Software License Agreement.

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KONA LH Software License Agreement Screen

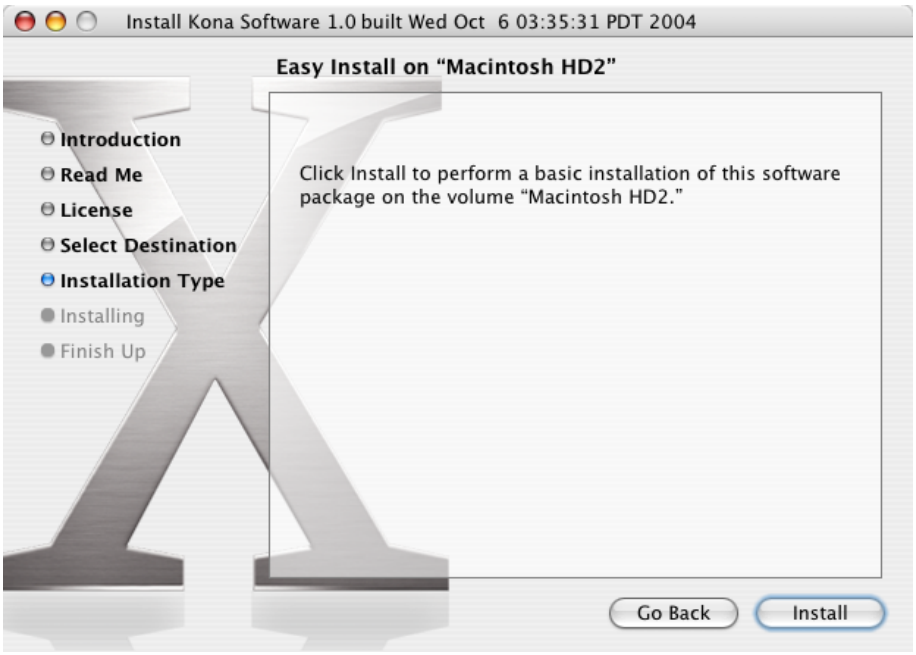
12. The next screen shows all the available drives on the Power Mac. Click on the drive that contains your system files (Apple default is "Macintosh HD"). A green arrow will point to the drive you've selected. Click the *Continue* button to proceed with installation.



Select a Destination Drive For the KONA LH Software

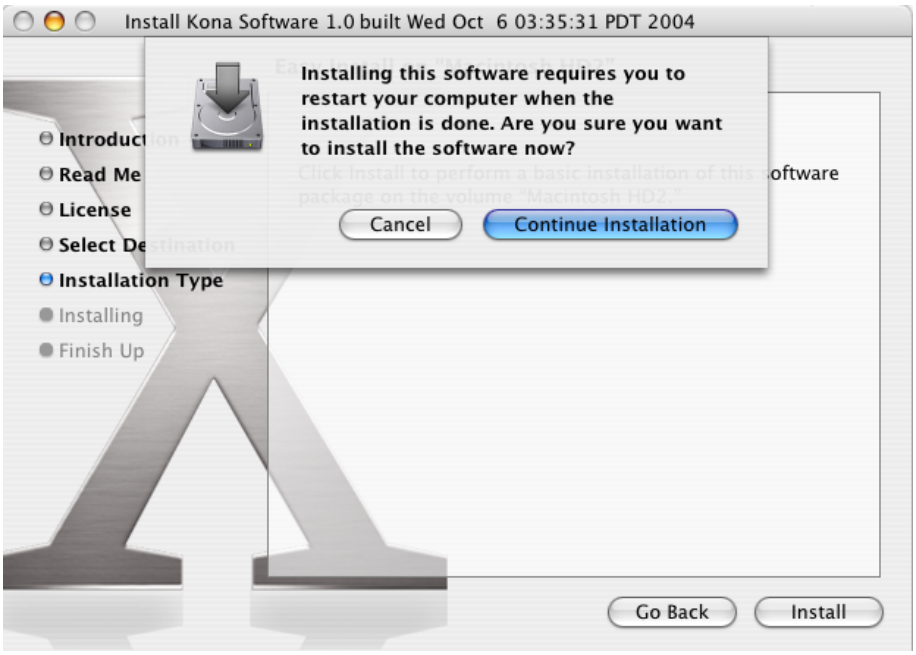
13. At the next screen, click the *Install* button to place the software on the drive you previously selected.

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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.

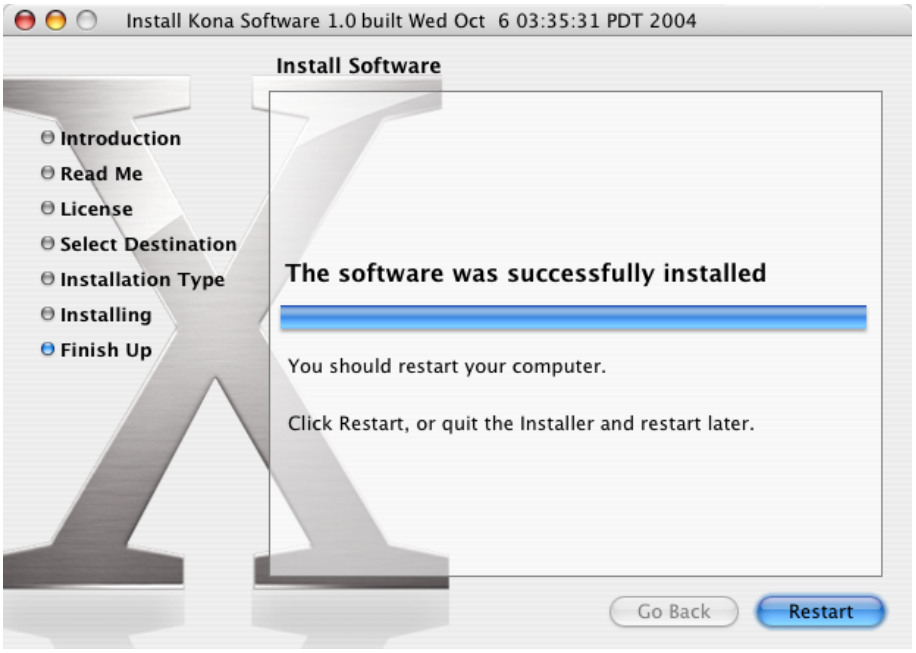


Restart OS X Reminder Prompt

15. The installer will run and put all the necessary KONA LHe drivers, KONA LHe Control Panel, 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."

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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

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 KONA LHe 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 KONA LHe cables and optional KL-box breakout box, house sync is connected to "Ref Loop".

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Chapter 4: Final Cut Pro and Other Software

Final Cut Pro



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

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

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

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

Using The KONA LHe Control Panel

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

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

Control Panel Basics

Although the KONA LHe card auto-configures depending on the inputs present, and the Control Panel intuitively shows at a glance much about what the card is doing, there is even more information presented that may not be obvious. To ensure you make the most of the software, run the KONA LHe application and look at its display. Then refer to the "Basics" described here to fully understand what you're seeing and learn how to view and change the KONA LHe system configuration.

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Note: The KONA Control Panel also works with other KONA cards, Io HD and Io Express. However, the actual features and screens displayed differ slightly since the board feature sets differ.

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

Tabbed Screens—the bottom area of the AJA Control Panel provides different information categorized by topic. Clicking on one of the "Tab" items from the left navigation column will result in an information screen corresponding to that tab's topic. Each of these tabbed windows are described on the following pages.

Tabs screens available are:

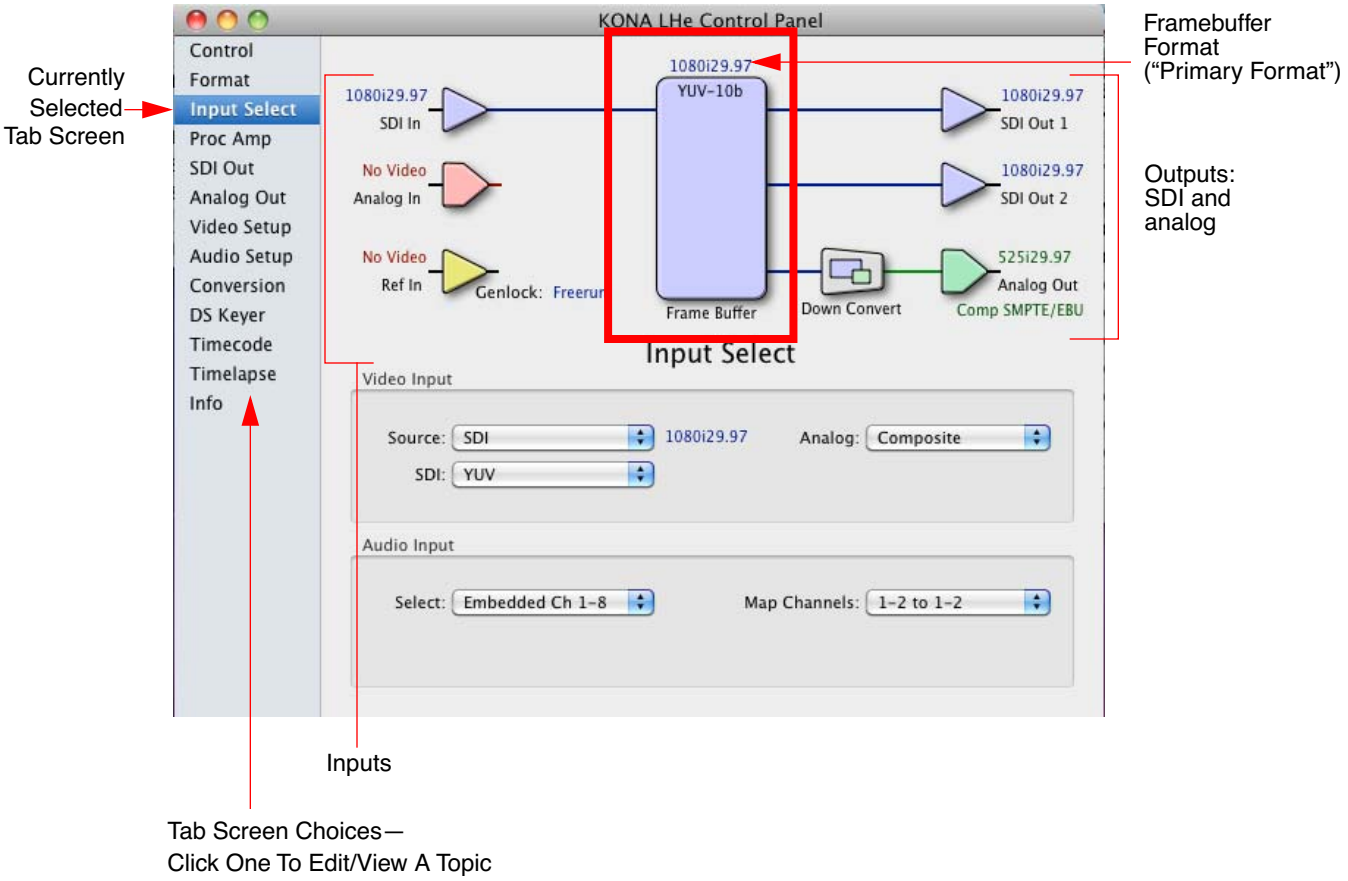
Control: configures the default output (test pattern, pass through, desktop, etc.) plus setting genlock and output timing.
Format: select the framebuffer primary video format, any secondary. formats, and parameters of conversion for input/output.
Input Select: view and edit input selections and how they are mapped.
Proc Amp: enable/disable Proc Amp, and edit settings or set to unity
SDI Output: assign outputs to either Primary or Secondary formats.
Analog Output: configure the component/composite +Y/C analog output.
Video Setup: configures Video options such as composite black level.
Audio Setup: configures analog audio monitor level and delay.
Conversion: used to select codec options such as whether paused video appears as a full frame or a single field (jitter shown or not shown) and 24 to 30 fps padding patterns.
DS Keyer: select downstream keyer mode, specify a graphic file or matte.
Timecode: monitor RP-188 timecode and configure timecode window burn output (***Note:*** SMPTE 12M-2 is the updated name and specification for what was RP-188)
Timelapse: enables the capture of select frames over a specified time interval.
Info: displays status information about the KONA. This information is generally intended for troubleshooting and support.

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

Icon objects on the block diagram screen (input/output icons, frame buffer, etc.-also called "widgets"-indicate their status by color (explained later) and when clicked will bring up the proper tabbed screen used to configure that item. For example, clicking on an SDI output icon will cause the "SDI Output" tab screen to be displayed below the block diagram. With the mouse on a block diagram element, you can also control click to reveal contextual drop down menus for certain functions.

Text Color—Colored text in the block diagram provides an indication of signal type and what the KONA LHe is doing. Text in blue shows the values automatically selected, while text in black shows values that have been manually selected. Text in red shows that the KONA is not detecting a signal or cannot negotiate with the attached device (even if it can't detect an output device, it still shows the signal it is outputting).

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AJA Control Panel, Block Diagram

Framebuffer—the framebuffer is the "engine" in the KONA LHe where active video operations take place using Final Cut Pro, other 3rd-party applications, or even the KONA itself. The framebuffer has a format (called the "Primary Format" and color space that it follows, as defined in the Tabbed Windows or via external application software such as the "Easy Setups" in Final Cut).

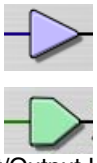
It is important to realize that inside the Macintosh many applications can use the KONA LHe (as you switch from window to window) and it may not always be obvious which is currently controlling it. The AJA Control Panel displays the name of the application controlling the card in red text on the Format and Control tabs of the interface. If an application does not properly "let go" of the KONA as another takes over-you'll be able to tell by looking at the Control Panel.

Primary (Framebuffer) Format—the video format currently assigned to KONA LHe. This is the format that the framebuffer will use and is shown in the Control Panel using the color blue. All icons in blue are the same as the Primary Format used by the framebuffer. Also any text descriptions in the block diagram that appear in blue also indicate that something is in the primary format. So, for example, if you see that the input and output icons are blue, then you know that the same format is used throughout the video path and that no format conversion is being performed. If a different color is displayed on the input or output, green for example, then you know that the KONA LHe is performing a format conversion in the video path.

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

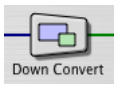
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Input/Output Icons—the input and output icons are triangles that together with their color show all the input and outputs and their status (selected, not selected, input present or not, format, etc.). A complete video path is shown when inputs and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



Input/Output Icons

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



Down Conversion Icon

If you click on a conversion icon, the Tab Screen will change to the Format scneen, allowing you to view/edit settings.

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

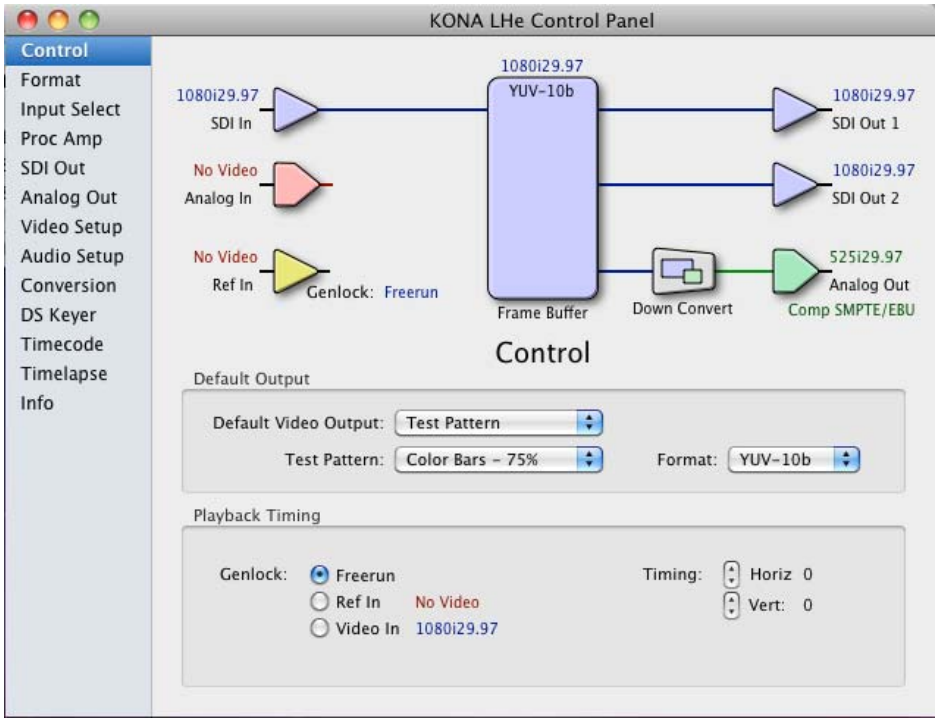
Blue: video is same format as the Primary Format (framebuffer)
Red: there is no video, the selected operation cannot be performed, or an invalid selection has been made
Yellow: reference video (black burst or other reference source)
Green: indicates that LHe is performing some kind of active change to the video, to make it different from the Primary Format (e.g., down convert).

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Control Tab Screen

The KONA LHe can be controlled by various software applications running on a host Mac as well as be used as a Macintosh Desktop extension. The Control Tab is where you select how the card directs video and is used by application software. This screen also provides control for configuring output timing with regard to external reference video and horizontal/vertical delay.

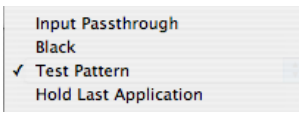
At the top of the Control screen it will show the current Default Output and the application currently controlling it (if there is one). For example, in the screen shown here, the default output is a Test Pattern.



AJA Control Panel, Control Tab

Control Tab Screen Settings

Default Video Output—this is where you select what the KONA LHe will output as a default when no application has control of it, such as when the Finder is active. Since it can be controlled by software applications as well as its own control panel, the output can change dynamically. Some video applications will grab control of the KONA LHe inputs/outputs. These settings determine what happens when an application is active that *does not* grab the KONA LHe inputs/outputs.



AJA Control Panel, Control Tab, Default Output Pulldown Menu

Default Output Choices and their meanings:

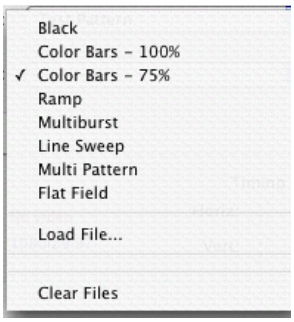
Input Pass through: this selection directs KONA LHe to route video from its selected input through the card for processing and output. When this selection is in effect, all Primary/Secondary Format selections are available for selection in controlling the output. This in effect makes the LHe a converter when used in conjunction with the AJA Control Panel application and a Mac.

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No applications other than the AJA Control Panel need to be open to convert audio and video from one format to another. For example, if an SD source tape needs to be dubbed to an HD tape, the signal might be routed from the SD VTR to the LHe, configured for upconversion in the Control Panel and then passed through to the HD VTR for recording.

Test Pattern: this selection directs KONA LHe to output a choice of preset pattern when no other application is using the card. In addition to the provided test pattern choices, a "Load File..." selection at the bottom of the menu allows you to load any standard Mac RGB graphics file (.tif, .psd, etc.) into the frame buffer for display.

Note: The graphic file will not be scaled to fit. If it's smaller than the current frame buffer format, KONA LHe will center it in the frame. If it's larger than the current frame buffer format, it will be cropped on the right and bottom. Also some graphics formats and bit depths may not be supported. Once a graphic file is loaded into the frame buffer it will be retained until it is overwritten by another graphic or test pattern, or when power is turned off. Graphic file names are only "remembered" in the menu as long as the AJA Control Panel application is running.



AJA Control Panel, Test Pattern Choices

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

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

Genlock (*Freerun*, *Ref In*, *Video In*)—selects how KONA LHe will synchronize program video:

Freerun: In this mode, KONA LHe generates sync without an external reference source

Ref In: Directs KONA LHe to use the Ref Video source for sync (usually an analog black burst video signal)

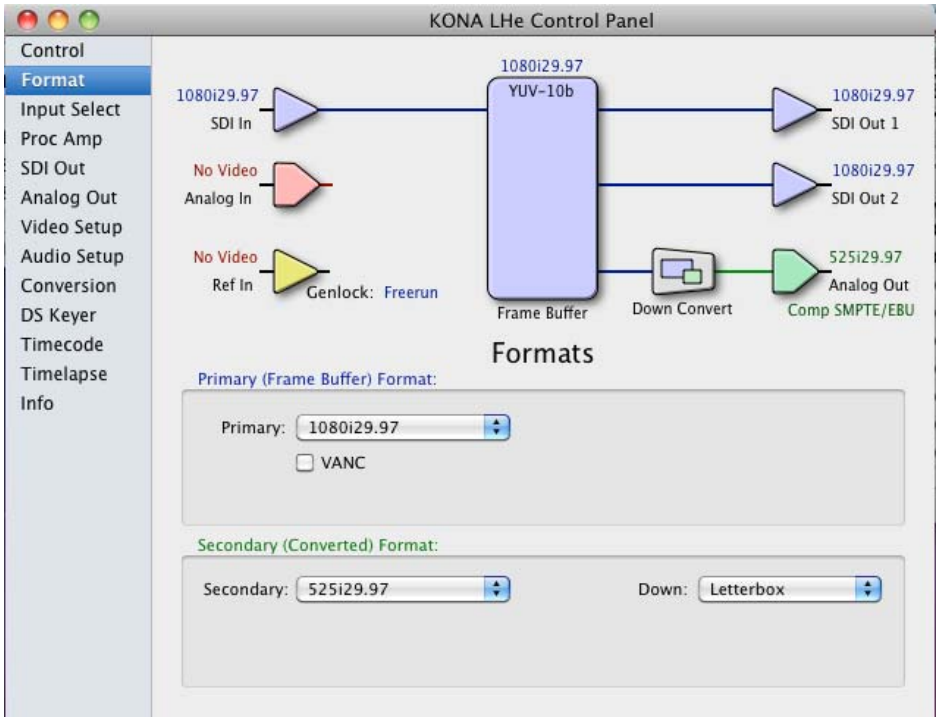
Video In: Directs KONA LHe to use whichever video input source has been selected in the Inputs tab window for sync.

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

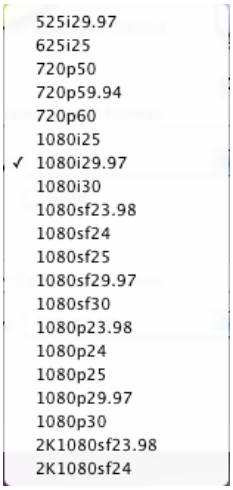
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Formats Tab Screen

The Formats screen shows the video format currently in use by the KONA LHe framebuffer (called the *Primary Format*) and allows you to change it. All throughout the Control Panel, choices are always presented based on what KONA LHe can do with the signals available and the inputs/outputs selected. For example, on the Formats screen, if the output or inputs are a different format than the primary, then you'll see an additional information pane that allows you to view and edit the secondary format—including control over whether down conversion is employed.



KONA LHe Control Panel, Formats Tab



KONA LHe Control Panel, Formats Tab, Showing Primary Formats Pulldown Menu

Format Screen Settings

Primary (Framebuffer) Format—this pull-down menu shows the currently selected format. This pull-down appears in both the Primary Format area of the Formats screen as well as the Secondary Format area (if present). If you select an alternate value in the Primary Format using the pull-down, it will change the format used by the KONA LHe framebuffer. When a change is made via the Video Format pull-down or by clicking an icon (widget) and selecting a new format via a contextual menu, the block diagram will change to reflect the new format.

VANC—enables or disables VANC data capture and playback.

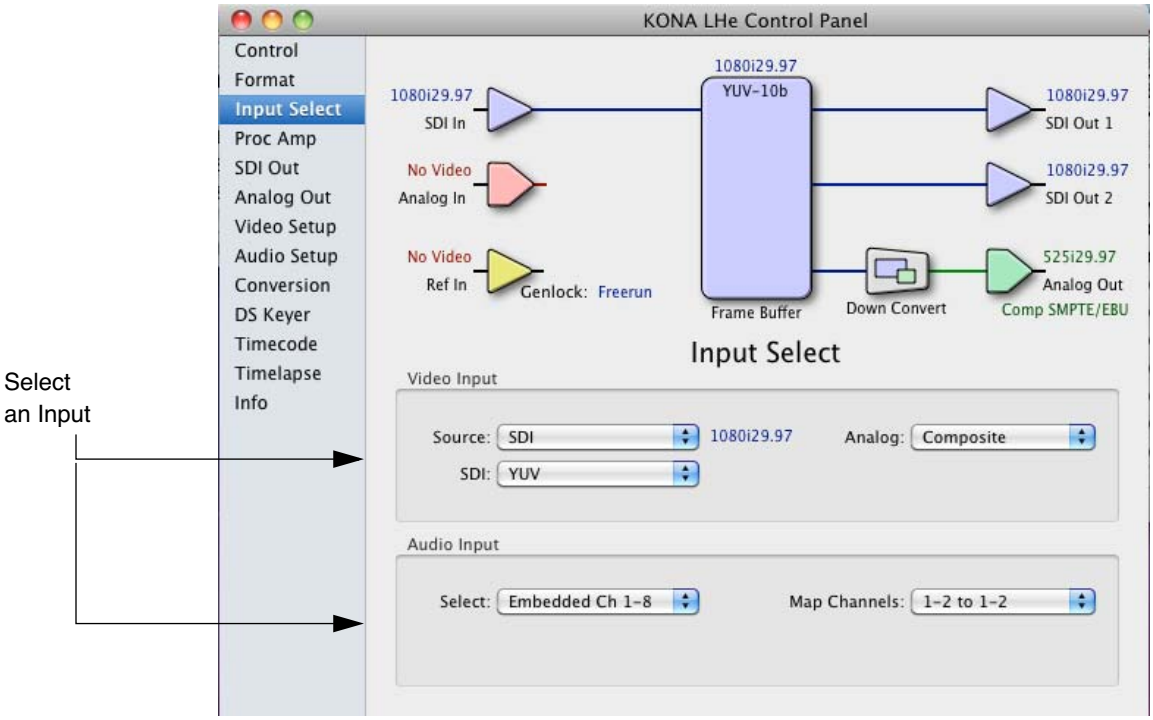
Secondary (Converted) Format—the formats available can vary based on what the Primary Format is and the input signal (frame rates of input sources limits the to/from conversion choices). The "Secondary Video Format" pull-down menu lists all compatible formats in black (incompatible formats are shown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

Note: The AJA Control Panel software uses the abbreviation "sf" instead of "Psf" when referring to "progressive segmented frame" formats. In the manual and in other literature you may see either of these acronyms used interchangeably. Visually it is easier to discern at a glance if you are working with progressively segmented frame formats (sf in the AJA Control Panel) as compared to progressive frame formats which will show only "p."

Down (Conversion)—for downconversion the following choices are available:
Anamorphic: full-screen "stretched" image
Letterbox: image is reduced with black top and bottom added to image area with the aspect ratio preserved
Crop: image is cropped to fit new screen size

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Input Select Tab Screen



KONA LHe Control Panel, Input Select Tab

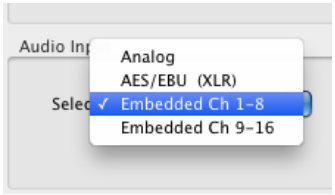
On the Inputs screen you can view the currently selected video and audio input sources and map audio sources to the channels supported by Final Cut Pro (more on this later). Two information panes in the screen are provided: Video Input and Audio Input.

Input Screen Settings

Video Input—These pulldown menus allow you to see and change what's currently selected for the video (SDI or Analog) and the audio input. If Analog is selected, then you also need to select the type of Analog input via a pulldown menu. Choices are:

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

Audio Input—This pulldown menu allows you to pick where the audio comes from. KONA LHe supports up to 8 channels of embedded digital audio, so you can choose out of the 16 channels that can be embedded in SDI, and pick which to bring in (from the group 1-8 or 9-16). Since Final Cut Pro currently only supports two channels of audio, here you can also select which two channels from the 8 embedded will be mapped to Final Cut's two channels using the Map Channels pulldown menu.



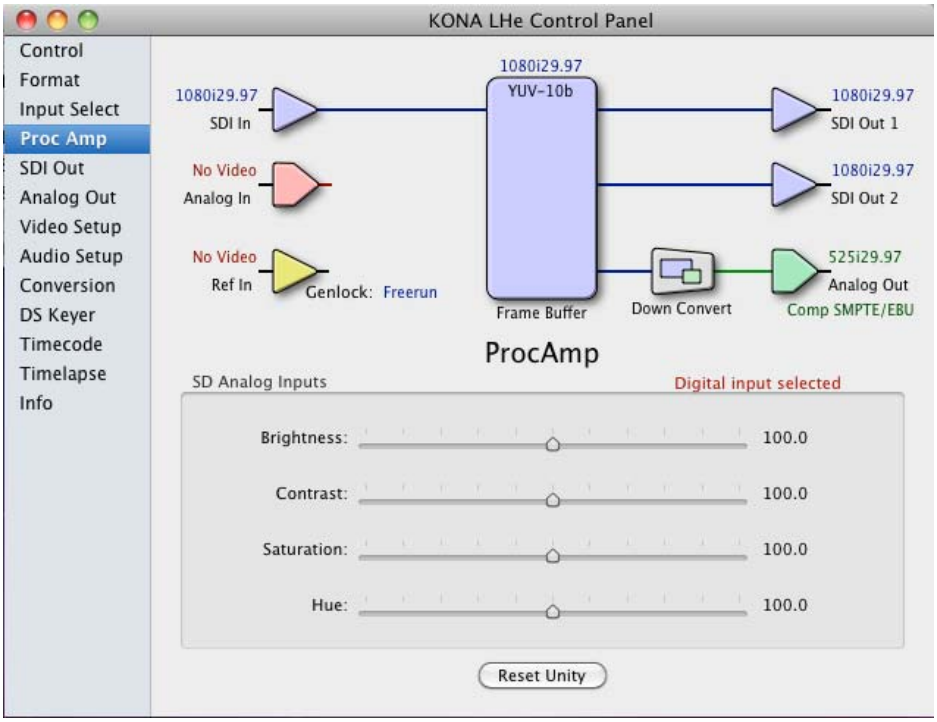
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Proc Amp Screen

The Proc Amp screen settings affect the analog proc amplifier built into the KONA LHe. Each of the four sliders controls a video parameter, with the middle being close to unity. If the value has been changed from the factory Unity setting, that value will by displayed in red at the right side of the slider. Clicking the Reset Unity button sets all four sliders back to unity.

Sliders:

- Brightness
- Contrast
- Hue
- Saturation

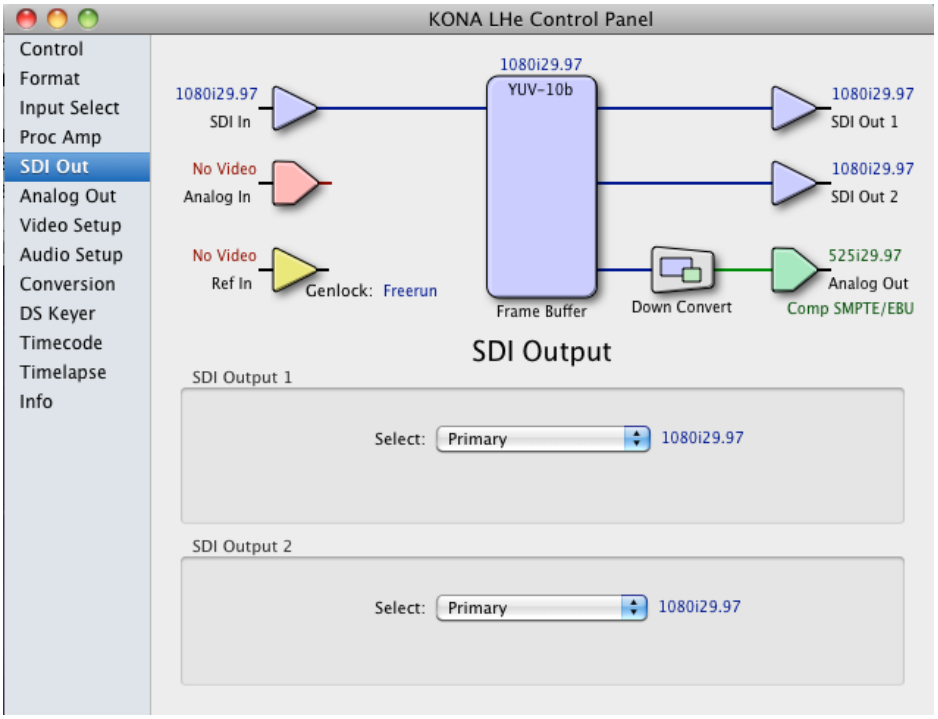


KONA LHe Control Panel, Proc Amp Tab

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SDI Output Screen

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



KONA LHe Control Panel, Digital Out Tab

SDI Output Screen Settings

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

Primary—when selected, this indicates that an SDI output (SDI Output 1 or SDI Output 2) is set to the same format as the framebuffer. That value will be listed in blue.

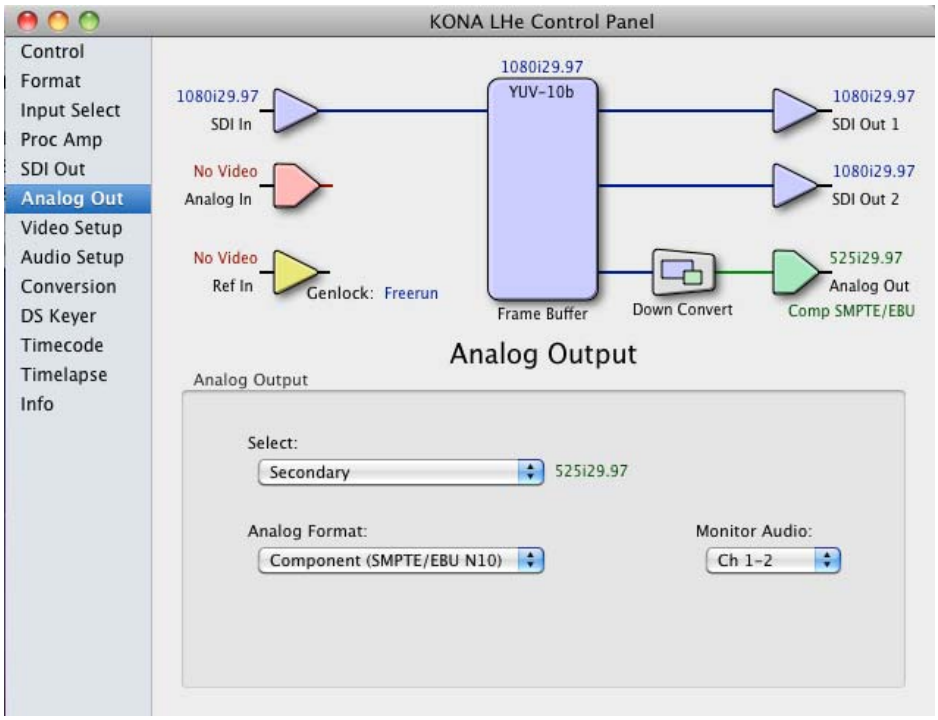
Secondary—when selected, this indicates that the SDI output is set to a format different from the framebuffer (Primary Format). That secondary format value will be listed in green. This shows that active processing of the video is taking place (format change and possibly down-conversion).

Video+Key—when selected, this selects that both SDI outputs will be used for a Video plus an associated video Key (hole cut). This will be reflected in the block diagram by showing the two lines grouped together going from the framebuffer to the SDI 1 and SDI 2 outputs. Selecting Video+Key on one pulldown also causes the other pulldown to change to Video+Key since the outputs are used as a pair.

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Analog Out Screen

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



KONA LHe Control Panel, Analog Out Tab

Analog Out Screen Settings

Select—Primary or Secondary (conversion)

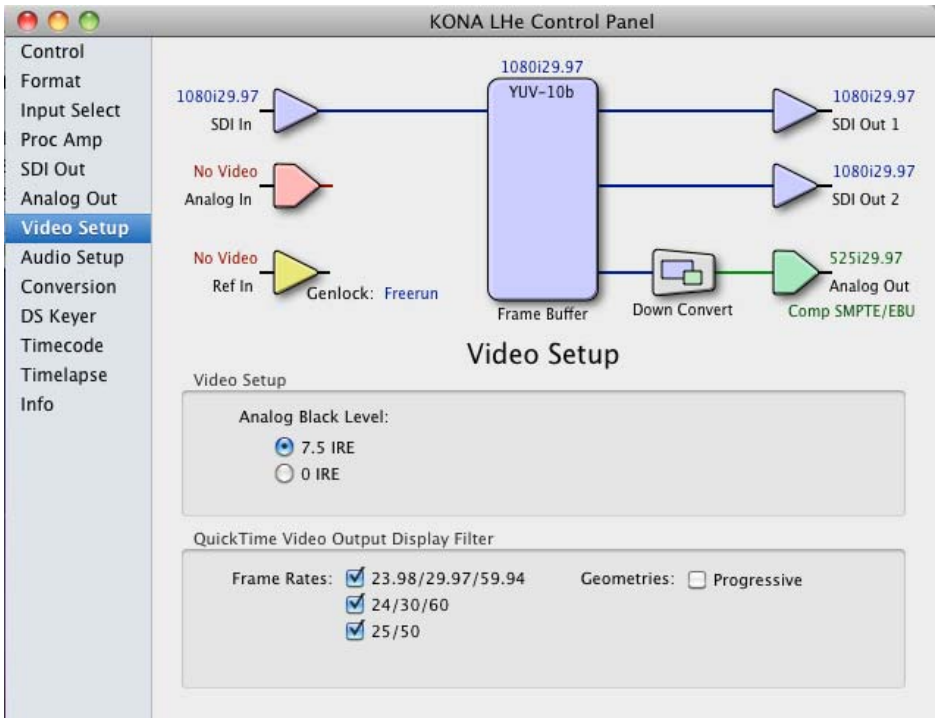
Analog Format—choices in the Analog Format pulldown menu vary depending upon the Analog Output video standard. For example, the "Composite + Y/C" selection is only available when an SD (525i29.97 or 625i25) format is in use. Analog formats can include:
Composite +Y/C
Component (SMPTE/EBU N10)
Component (Beta)
Component (RGB)
Component (RGB -HV)

Monitor Audio—select which two channels will be routed to the stereo pair of unbalanced consumer audio outputs on the KL-Box (option).

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Video Setup Screen

The KONA LHe's Analog Black level and QuickTime Video Output Display Filter are configured here.



KONA LHe Control Panel, Video Setup Tab

Setup Screen Settings

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

QuickTime Video Output Display Filter—these controls help manage the comprehensive list of video outputs and geometries that may be available to applications, particularly Final Cut Pro's *A/V Devices* tab.

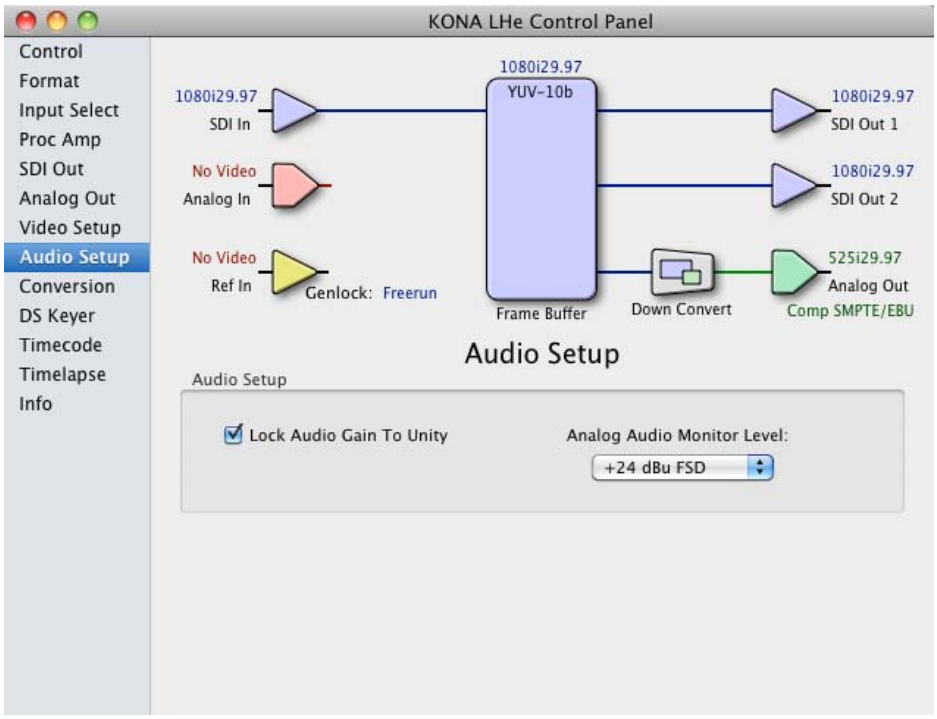
By selecting the checkbox next to specified parameters, the video outputs related to these specified parameters are enabled as possible video outputs for applications. As an example, if the checkbox next to *25/50* is unchecked, 50Hz video outputs are deselected and would not be available to the user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

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

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Audio Setup Screen

The KONA LHe's audio settings are configured here.



KONA LHe Control Panel, Audio Setup Tab

Audio Setup Screen Settings

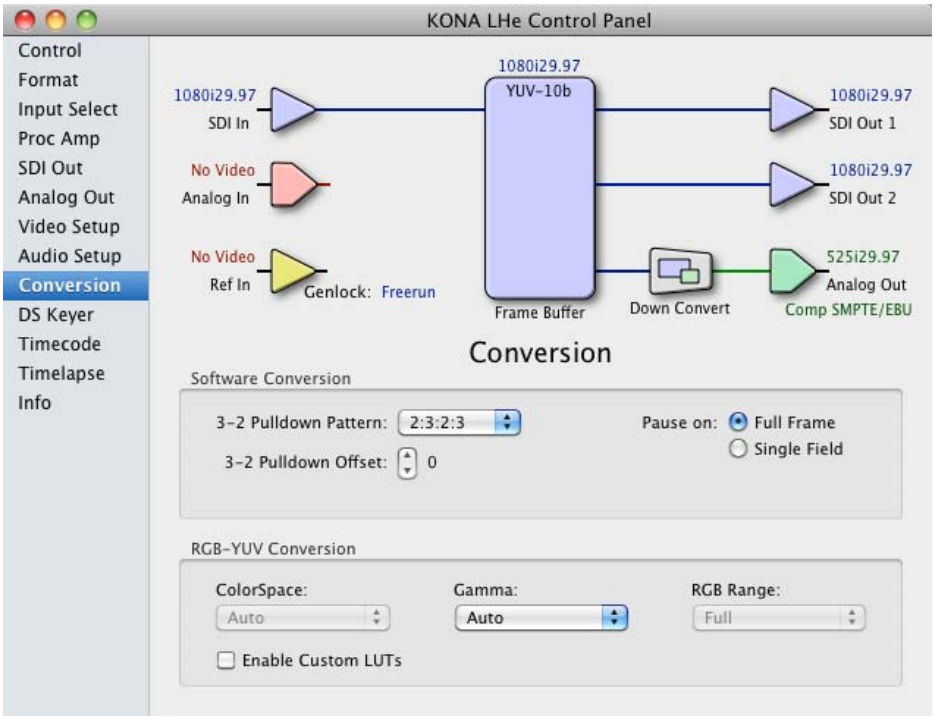
Lock Audio Gain To Unity—When set, the KONA card will ignore the Final Cut Pro gain setting and set the audio gain at unity. When not set, this checkbox tells the KONA card to get the audio gain setting from Final Cut Pro.

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

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Conversion Tab Screen

This Tabbed screen is used to set conversion options.



KONA LHe Control Panel, ConversionTab

Conversion Tab Screen Settings

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

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

3-2 Pulldown Offset—select a frame offset value from 0 to 4.

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

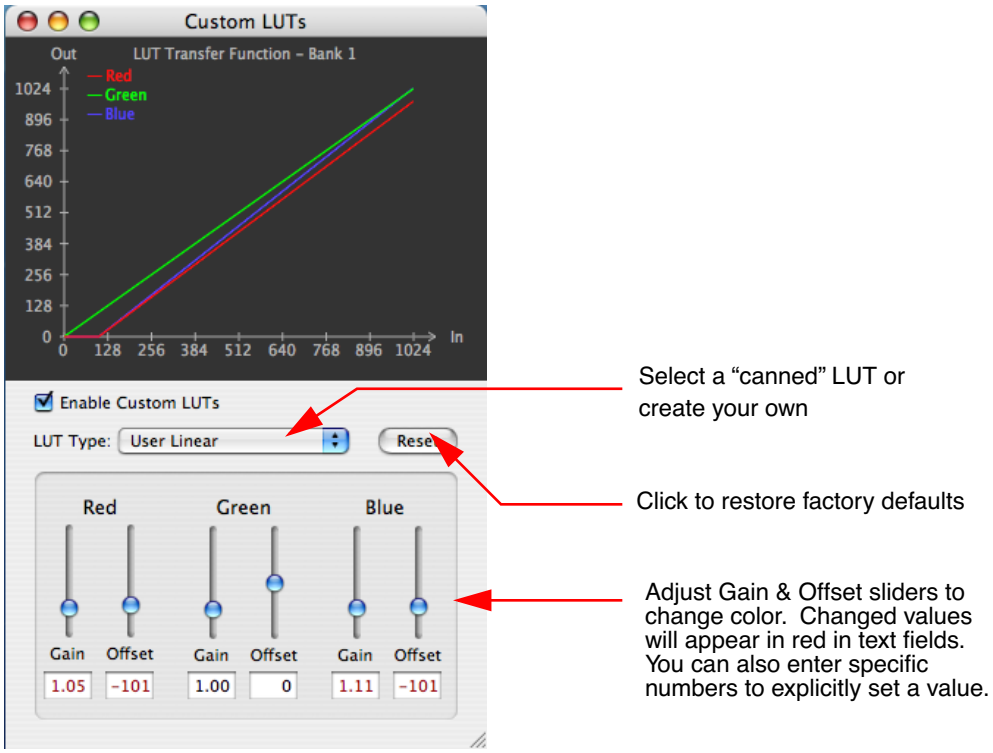
Colorspace—choose from:
Rec 601
Rec 709
Auto

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Gamma—choose from the following:
Linear (1.8)
Rec 601 (2.20)
Rec 709 (2.22)
Auto

Enable Custom LUTs—this checkbox enables a custom color lookup table (LUT) for use in Final Cut Pro. When checked, there will be a new "Custom LUT" menu item under the *Windows* menu in Final Cut. Selecting that item brings up the KONA LHe Control Panel "Custom LUTs" dialog shown below. Defining a LUT applies it to the KONA LHe output. The custom LUT will be saved with the Final Cut Pro presets.

Note: Custom LUTs only work with RGB material.

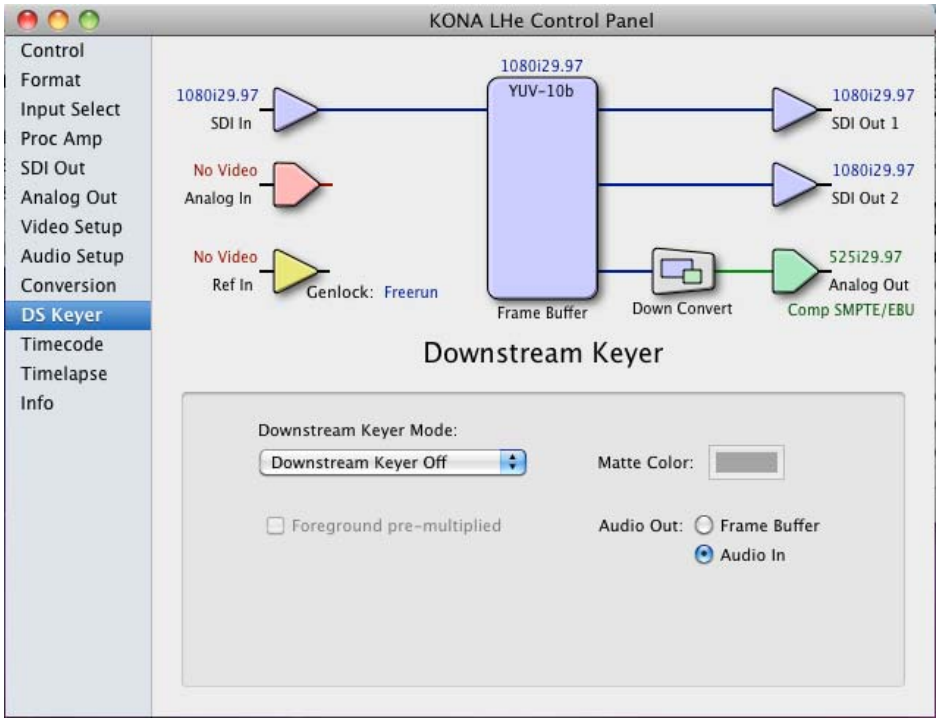


KONA Custom LUTs Dialog

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DS Keyer Screen

The KONA LHe has a hardware-based downstream keyer that is ideal for putting logos,"bugs" or other video material with an alpha channel on top of video being played out or printed to tape. A typical application would be putting a television station's call letters or channel over program video content. Keyed video can be from the KONA's internal Frame Buffer (from storage, video In, KONA TV, etc.) or from a graphics file that has an alpha channel (PhotoShop etc.).



KONA LHe Control Panel, DS Keyer Tab

DS Keyer Screen Settings

Downstream Keyer Mode:

Downstream Keyer Off — when this pulldown menu item is selected the downstream keyer will be turned off

Frame Buffer over Matte— places the keyed video with alpha channel currently in the Frame Buffer over a fixed color matte determined by the "Matte Color" setting set separately.

Frame Buffer over Video In—places the keyed video currently in the Frame Buffer over the video input for playout or print-to-tape.

Matte Color: only available when the pulldown "Frame Buffer over Matte" or "Graphic over Matte" are selected-pressing this button brings up a color selection dialog. The dialog provides a variety of ways to select a matte color including a color wheel, color picker (choose from a location anywhere on the computer screen), numeric sliders, swatches, "crayons", and spectrums. The matte chosen will be used as a video background under the keyed video.

Foreground pre-multiplied (checkbox): use to avoid "matte lines" and improve the appearance of the foreground (key) being composited over the background.

Audio Out:

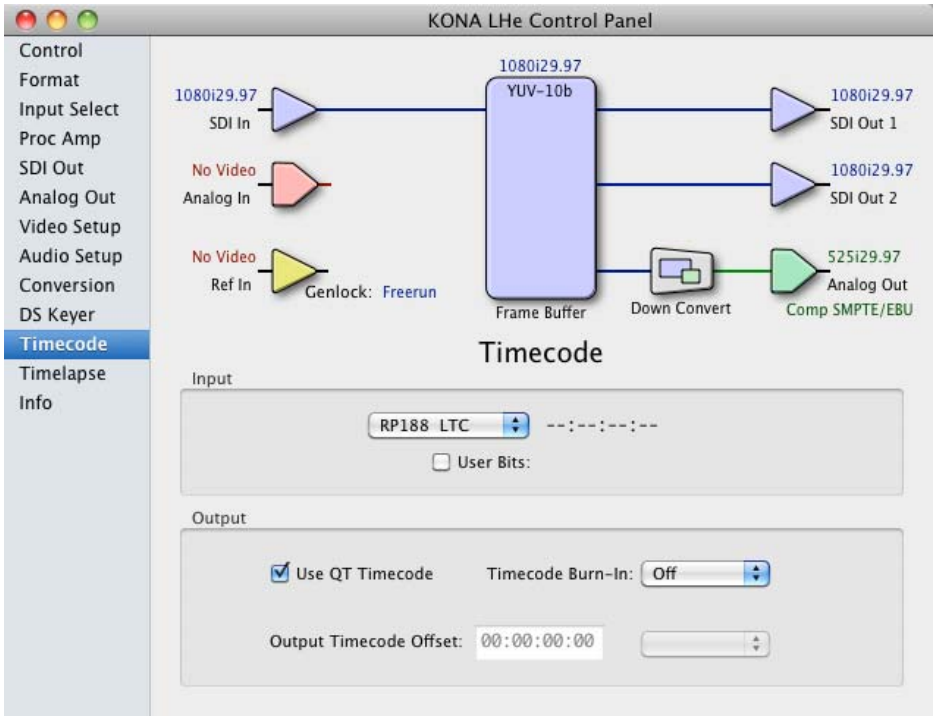
Frame Buffer—select audio out to be routed from the contents of the Frame Buffer.
Audio In—select audio out to be routed from KONA's currently selected input(s).

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Timecode Screen

The timecode is used for both monitoring the RP-188 timecode embedded in the digital data stream and for selecting a timecode offset (if required) for the attached VTR (connected to KONA LHe's RS-422 port)—and sent during assemble-edit mode.

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

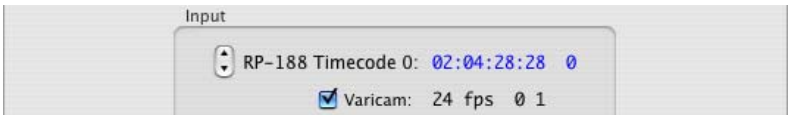


KONA LHe Control Panel, Timecode Tab

Timecode Screen Settings

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

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



KONA LHe Control Panel, Timecode Tab, User Bits Checked

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

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

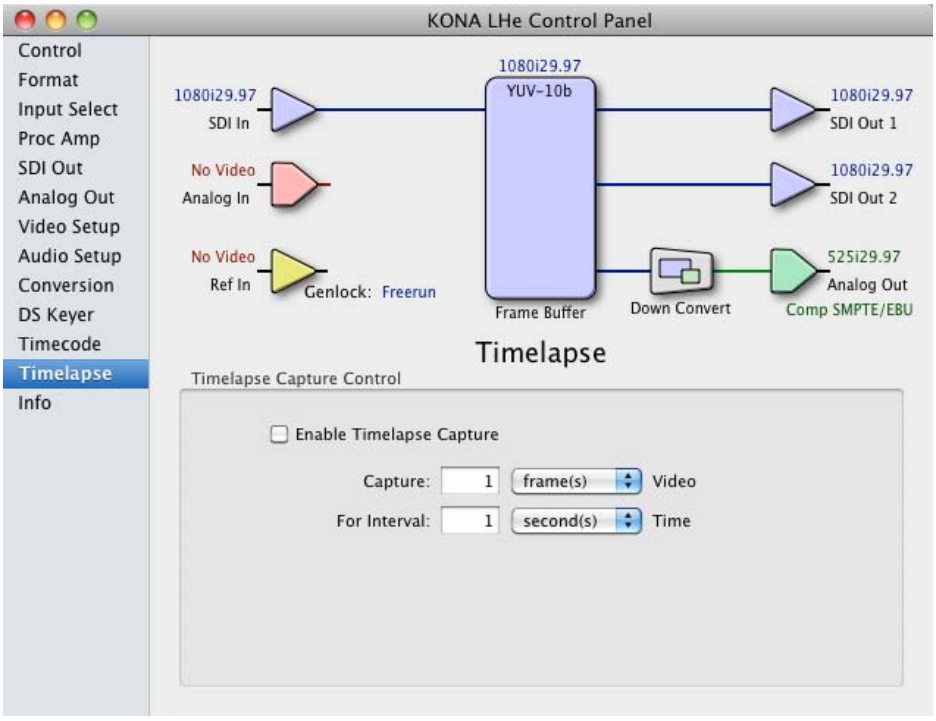


Timecode Burn-in—this pulldown selects whether the timecode value is "burned-in" on video output from KONA LHe. If set to "OFF", timecode will not be keyed over the video. If set to "timecode", then the timecode value will be keyed over the output video. This can be useful for synchronizing, choosing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

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

Timelapse Tab Screen

This Tabbed screen is used for the KONA LHe timelapse feature. To use the timelapse capability, choose the "Enable Timelapse Capture" checkbox. This functionality is enabled for all QuickTime capture applications (Final Cut Pro, VTR Xchange, etc.) Set the "Capture" and "For Interval" parameters as desired. Launch a capture application like Final Cut Pro, select the desired Easy Setup for the video format desired. You will not need to change anything within the application; the timelapse feature will produce QuickTime files with the framerate specified by the Easy Setup used. The resulting timelapse clip can be used without additional rendering.

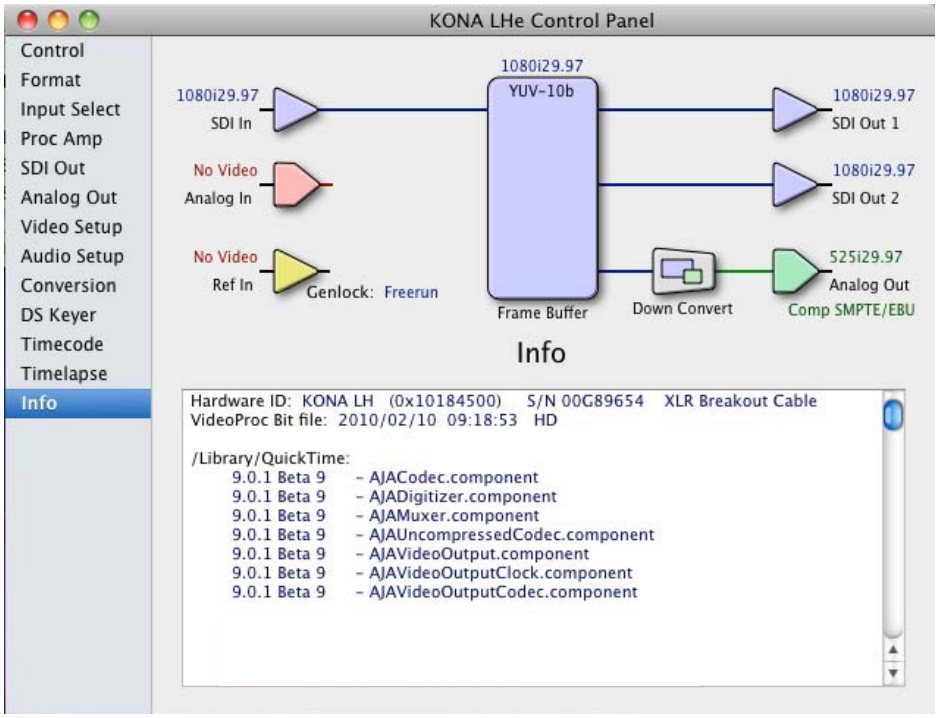


KONA LHe Control Panel, Timelapse Tab

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Info Screen

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



KONA LHe Control Panel, Info Tab

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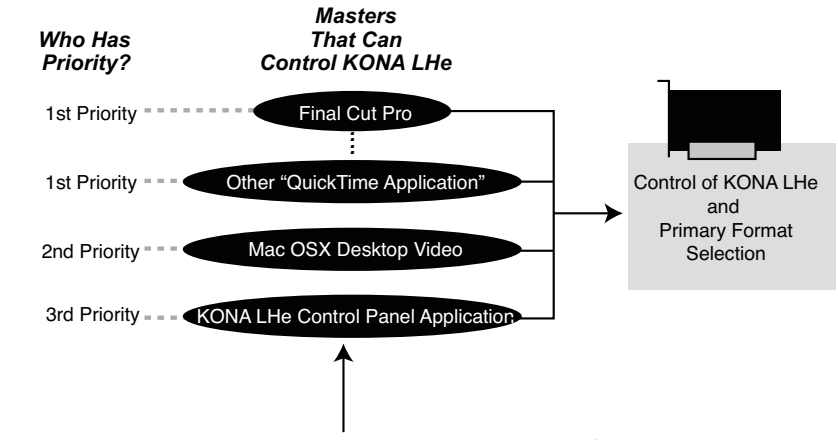
Saving Your Control Panel Presets

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

Who is Controlling KONA LHe?

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

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



When you click in an application window, the "Master" controlling KONA LHe changes, possibly changing the Format Selections in effect. This happens because each application has it's own sets of control parameters

TIP: If you keep the KONA LHe Control Panel window in view, it displays the application that is in control and what the Primary and Secondary Format Selections are at all times.

KONA LHe Control Priorities

The KONA Control Panel is one of three masters contending for control—and it's the lowest priority of the three. The other two masters are: any currently running QuickTime application (e.g. Final Cut Pro, Apple Motion, After Effects, etc.) using the board and the Mac "Desktop" display. The priority of these three "masters" is:

1. QuickTime Application
2. Macintosh Desktop
3. KONA LHe Control Panel

By "*Master*", we mean a process that can control and change what the KONA LHe is doing and the Primary and Secondary formats that it uses (as set in the Control Panel "Formats" tab screen).

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QuickTime Application—1st Priority

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

When a QuickTime application is in control of the KONA LHe board—versus one of the other masters—it will be indicated by a label in both the KONA Control Panel's *Formats* and *Control* tabs. The KONA LHe Control Panel's *Primary Format* menu will also indicate that it is not active while the QuickTime application is running—it will be grayed-out.

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

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

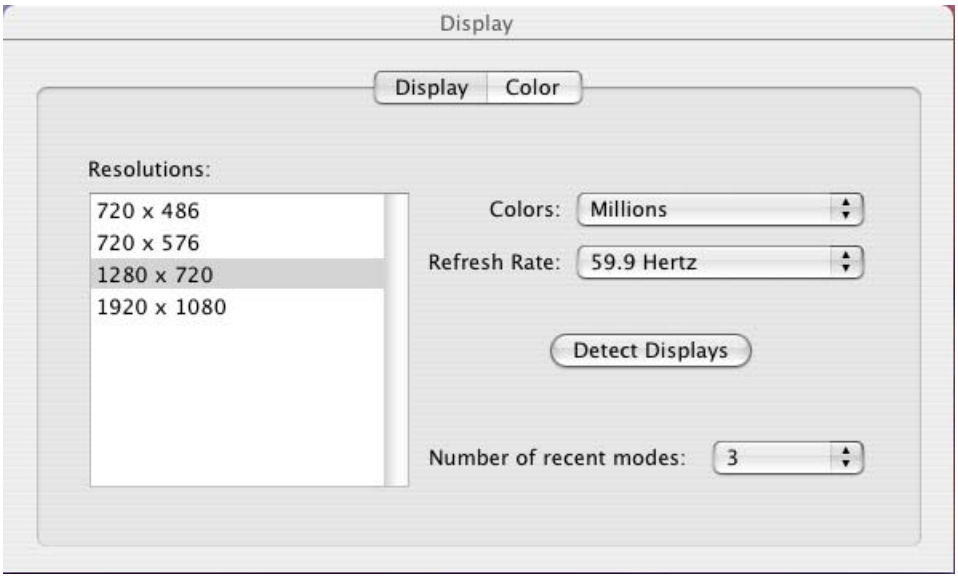
1. Open Final Cut Pro, select KONA LHe as the A/V device. FCP takes control of the board and tells it what Primary format to use. If one of the FCP windows covers up the KONA Control Panel application (which typically happens), you won't be able to see the *"Kona card is in use by Final Cut Pro"* message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

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

Mac Desktop Video—2nd Priority

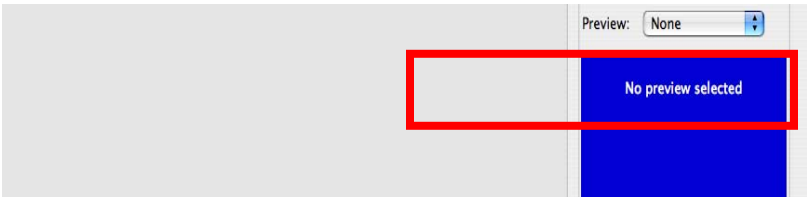
If you choose "Macintosh Desktop" as your KONA Default Video Output (Control Tab), then the Mac Finder uses the KONA LHe board as a second (or third, or fourth...) graphics "desktop" output—*as long as there isn't a QuickTime application running.* When the Finder is in control, the Primary Format is dictated by the System Preferences "Displays" panel or by you selecting "Show Displays in the menu bar", from the Displays menu near the right side of the main menu bar).

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When the Finder is in control of the KONA board, the KONA Control Panel disables the Primary Format popup and puts a message in the KONA Control Panel "Formats" tab as follows:



KONA Control Panel—3rd Priority

If a QuickTime application *is not running* and the *Default Video Output* is not set to *Mac Desktop,* then the KONA LHe Control Panel gets control of the board.

Control Recommendations

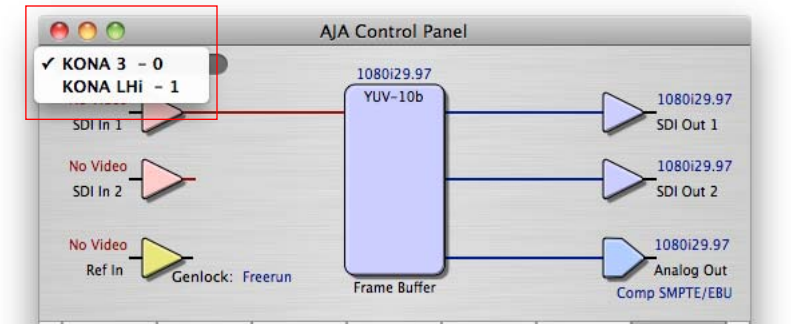
To avoid surprises, run the KONA LHe Control Panel, keep it visible on the desktop—and stay consistent in your settings within all QuickTime applications when working on a project. For example, if you're working in a particular format (e.g. 525i29.97), it would make sense to set Final Cut Pro for 525i29.97, the Mac Desktop size to 720x486, and the KONA Control Panel for 525i29.97. Then, when you switch between applications, the output will stay in the same format.

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

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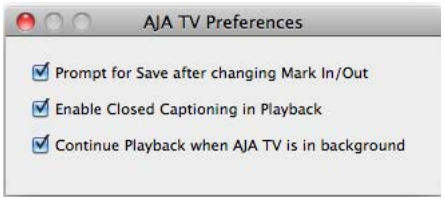
Using Multiple AJA Products

Starting with the v7.5 drivers, more than one AJA product can be used with your host computer. Using the AJA Control Panel application, you can choose which installed product an application uses for input/output. In the upper left corner of the AJA Control Panel application, you will see a board name, such as Kona3-0, if you have more than one product and the associated drivers installed (if only one product is installed, you'll see no product or pulldown). To "target" a specific installed product for use, click on the text in the upper left hand side of the UI and select from the list of available products that appear in the pulldown.



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

Example: select a KONA 3G as the targeted product in the AJA Control Panel application. Launch Final Cut Pro. Final Cut Pro is now using the KONA 3 for its input/output. Go back to the AJA Control Panel application and select a KONA LHe as the "targeted" product. Launch the AJA TV application. AJA TV would now use the LHe for its output. If you switch back to Final Cut Pro, you would note that it is still uses the KONA 3G for its input/ output. Note that some applications, like AJA TV, have a provision for playing in the background, so playback on one product could even continue when switching the targeted device for use with another application. You can even feed the output from one AJA product to another AJA product on the same system in such cases.



AJA TV Preferences, Continue Playback when AJA TV is in background

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

Notes on using multiple AJA Products:

Performance of multi-product use depends on a variety of factors: CPU usage, RAM, disk IOPS/ bandwidth for streams of video, etc. and therefore performance may vary. Also be aware that multiple input/output streams are only supported by software that is explicitly designed for a multi-product environment.

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Easy Setups for Typical Uses

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

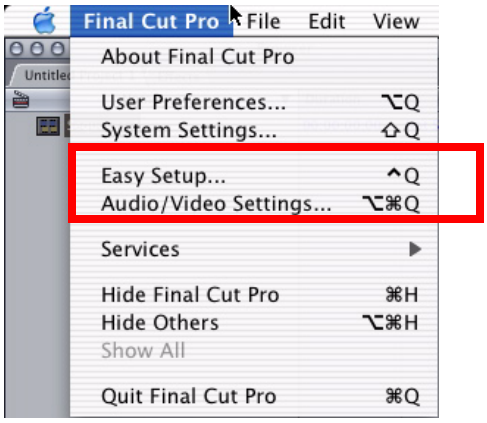
Although this manual assumes you're familiar with Final Cut Pro and have read its documentation, let's review Easy Setups and how to use them effectively with KONA LHe.

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

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

Easy Setups Menu

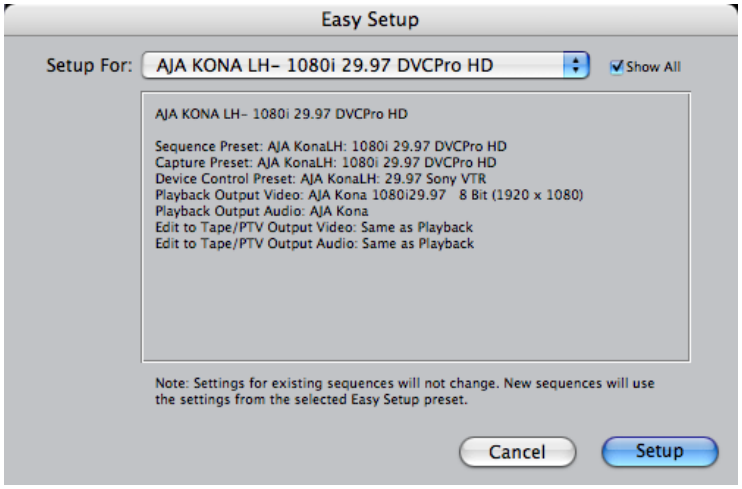
Both the Easy Setups menu item and the Audio/Video Settings menu item are located under the main *Final Cut Pro* menu.



Easy Setup and Audio/Video Menu Items

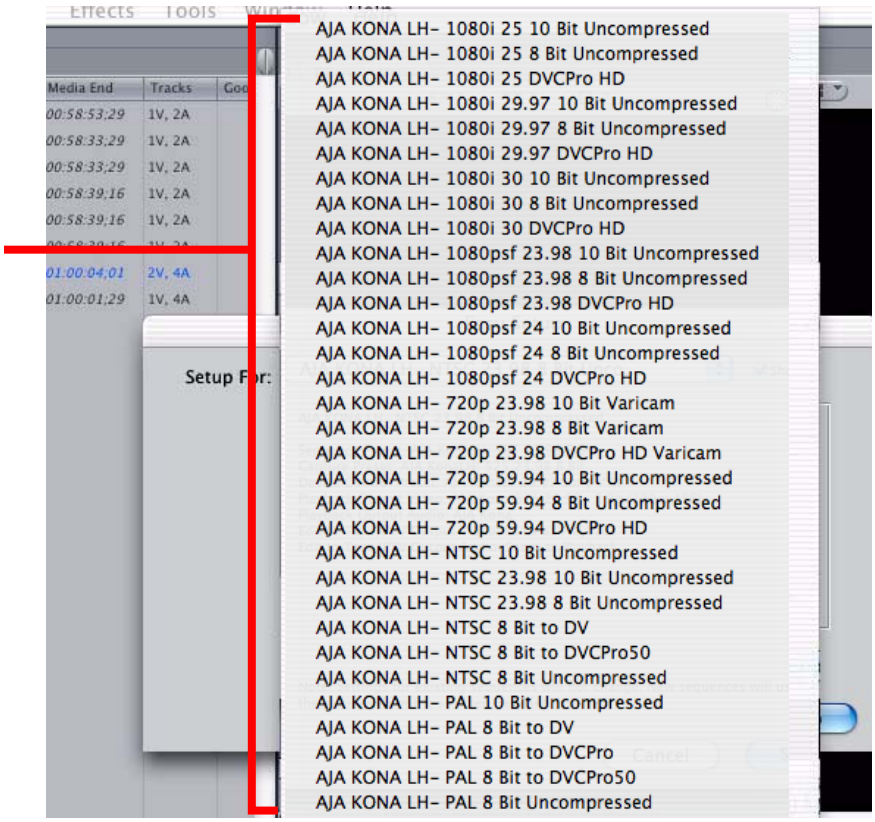
Click on the Easy Setups menu item and Final Cut Pro will present the Easy Setup dialog window:

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Easy Setup dialog

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



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

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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 KONA LHe

The factory default Easy Setups currently shipped with KONA LHe are updated regularly by AJA and posted on the relevant support web page for your model of KONA. In addition to this, there are additional easy setups available on your KONA Software CD

Audio/Video Settings Menu

The Audio/Video Settings menu in Final Cut Pro contains a series of tabbed windows where you define the presets in specific categories such as A/V devices 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.

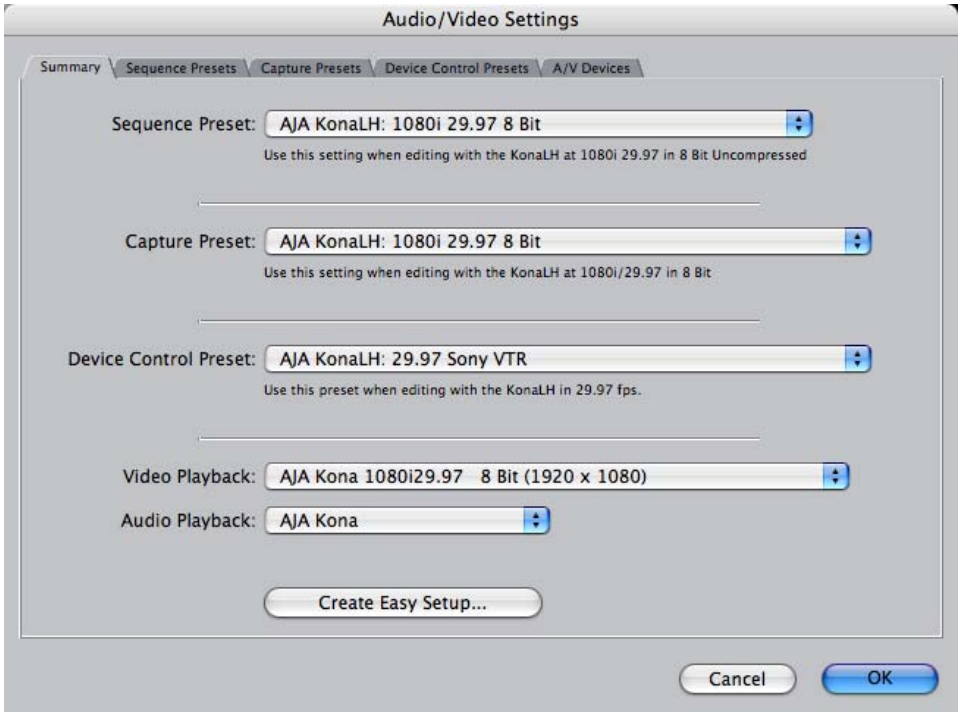
The presets you can change on the Summary window are:

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

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

Device Control Preset—select the AJA Video KONA LHe device (NTSC or PAL as desired). This tells Final Cut that the KONA LHe will control the VTR attached to KONA LHe or KL-Box.

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



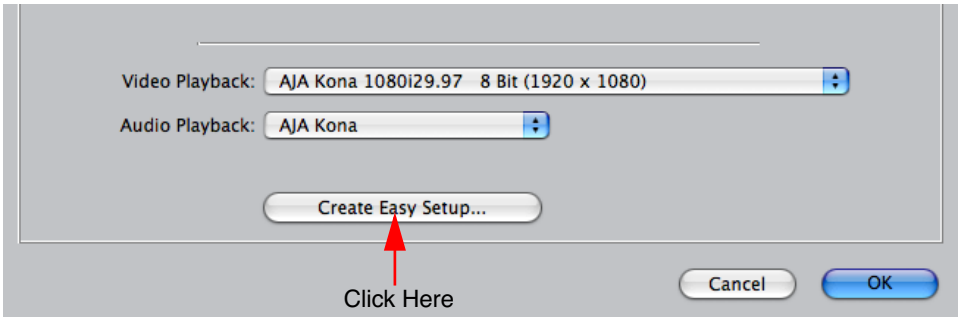
Audio/Video Settings, Summary Window

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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.



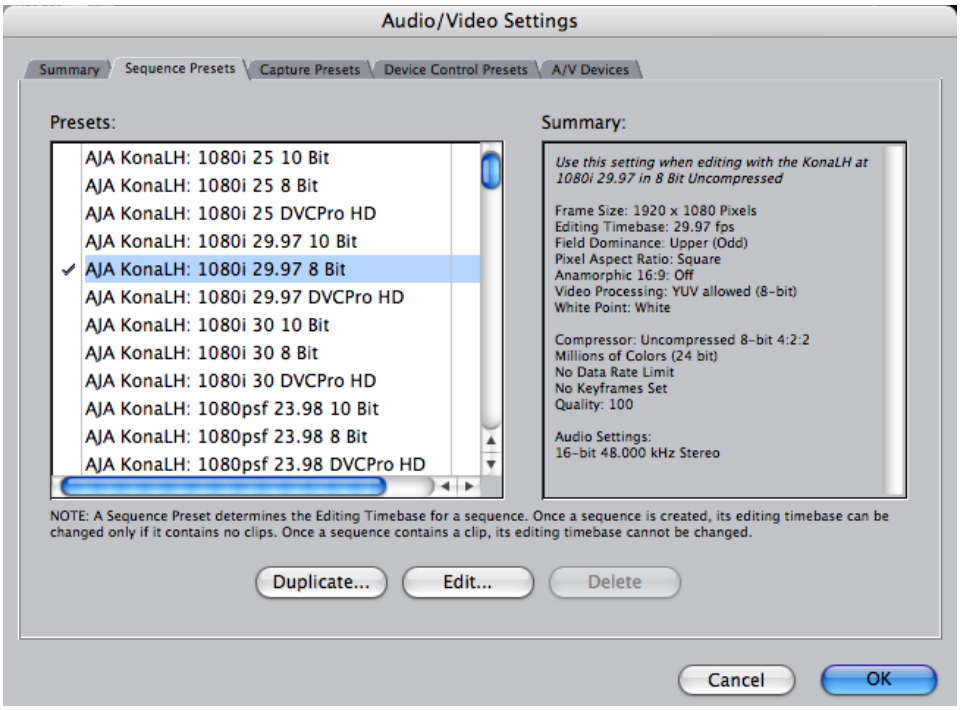
Audio/Video Settings, Creating a New Easy Setup

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.

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The Sequence Presets Window



Audio/Video Settings, Sequence Presets Window

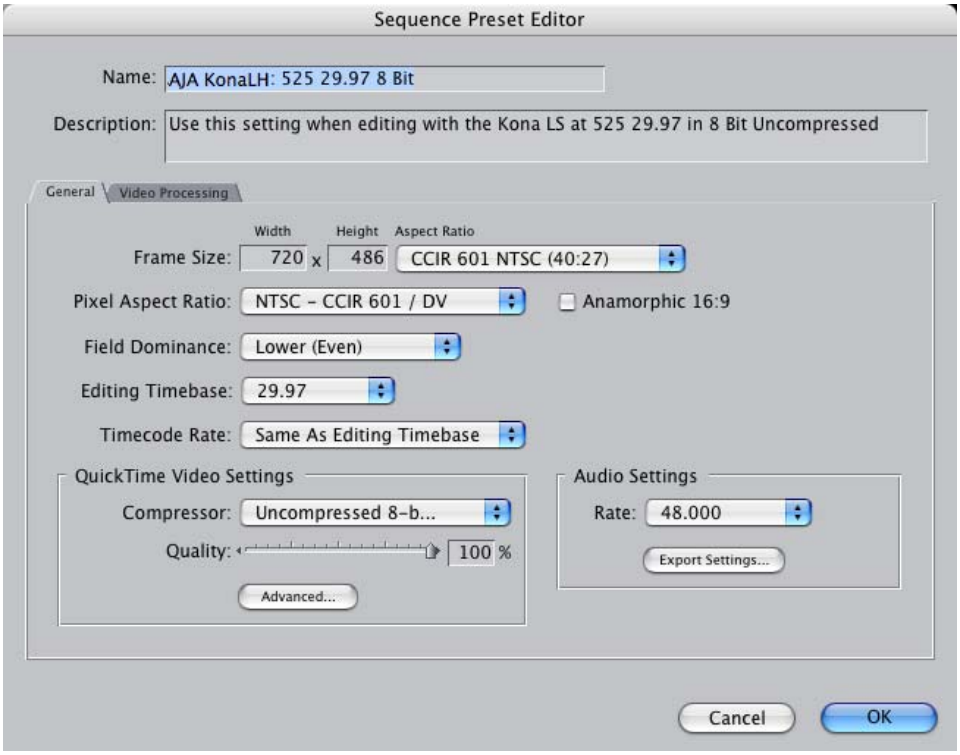
This window allows you to select an editing timebase for the current sequence. Once you add a clip to the sequence this cannot be changed.

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

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

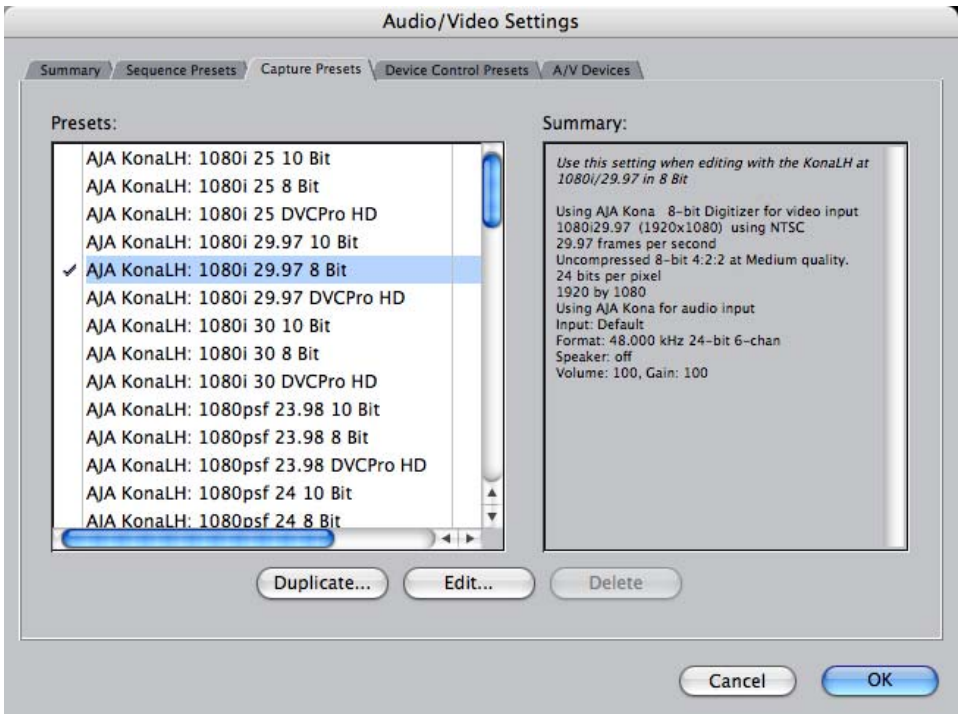
- Select video processing properties (how to render)
- Frame size and aspect ratio
- Pixel aspect ratio
- Field dominance (none, upper, or lower)
- Editing timebase
- Set QuickTime video codec settings (quality and type)
- Select audio sample rate

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Audio/Video Settings, Sequence Presets Editor Window

The Capture Presets Window



Audio/Video Settings, Capture Presets Window

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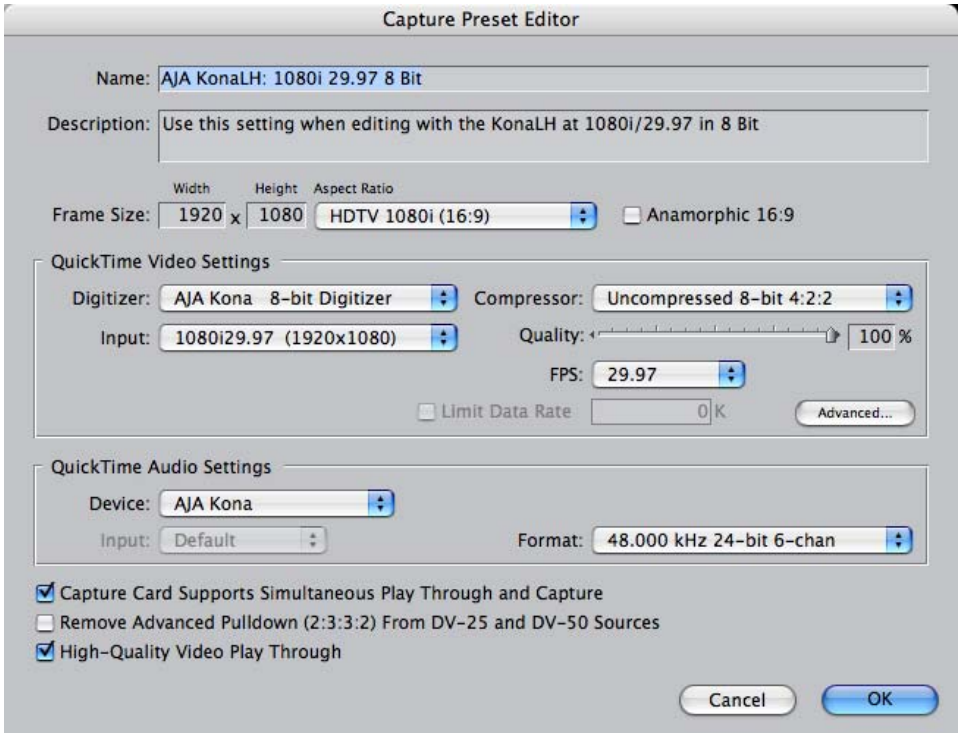
This window lets you choose a preset format for incoming source video and audio media you'll be capturing.

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 KONA LHe, we'll discuss the edit screen next.

Capture Presets Editing



Audio/Video Settings, Capture Presets Editing Window

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

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

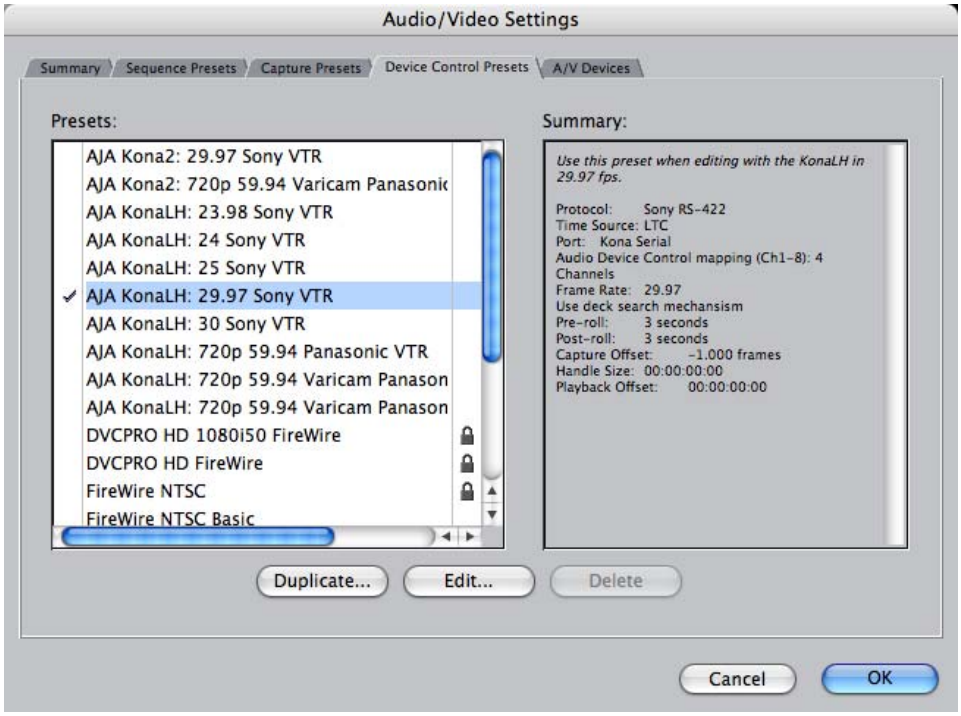
QuickTime Video Settings—these settings select a video input source and affect how it's processed by Final Cut Pro. The *Digitizer* pull-down menu selects whether you want the selected input source to be digitized as 8-bit or 10-bit uncompressed video as it comes into KONA LHe. The *Input* pull-down selects the primary format KONA LHe will use to capture input video. The *Compressor* pull-down selects a codec that tells Final Cut how to process the video; the codec selected should be chosen for compatibility with the Digitizer setting selected. For example, if your Digitizer setting is 10-bit Uncompressed, then the Compressor setting should be one of the 10-bit choices available. The *Quality* slider should be set to 100 percent when capturing uncompressed; for other formats use an appropriate quality level.

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Set the *FPS* (Frames Per Second) setting to the correct frame rate. The *Advanced* settings button opens a new screen providing choices of codec-specific options. For uncompressed codecs these probably are not unneeded; for other codecs choose the options desired.

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

The Device Control Presets Window



Audio/Video Settings, Device Control Presets Window

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

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

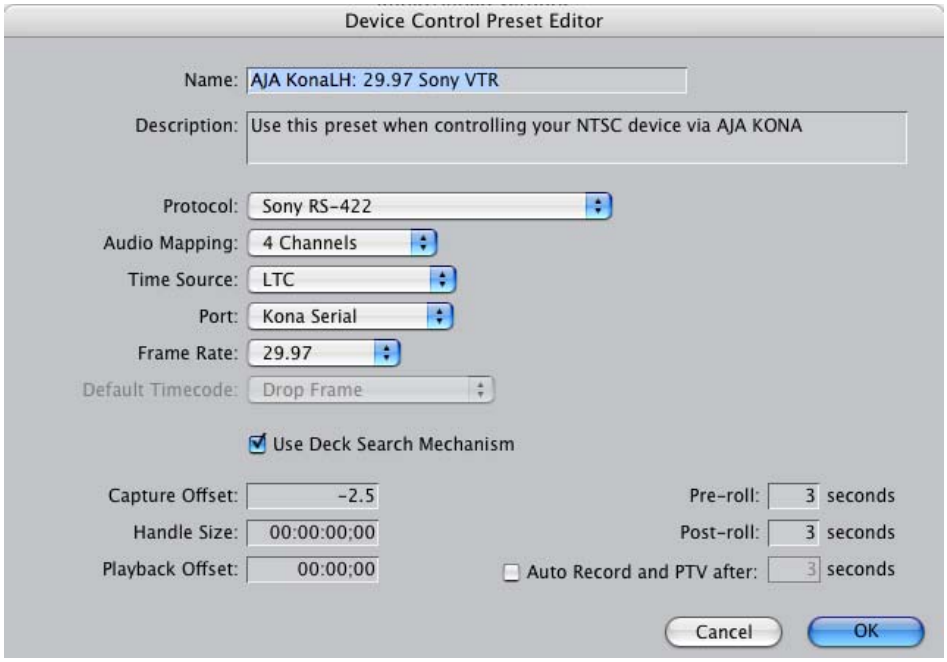
If you select a preset you can edit it (click the Edit button) or copy and rename it as another (click Duplicate). The only exceptions are those presets marked with a lock icon; those can be duplicated, but when you try to edit one the system will report they're locked and can only be copied (it will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

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

- Name and description of Device Control preset
- Protocol for capture/playback VTR (for KONA LHe 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

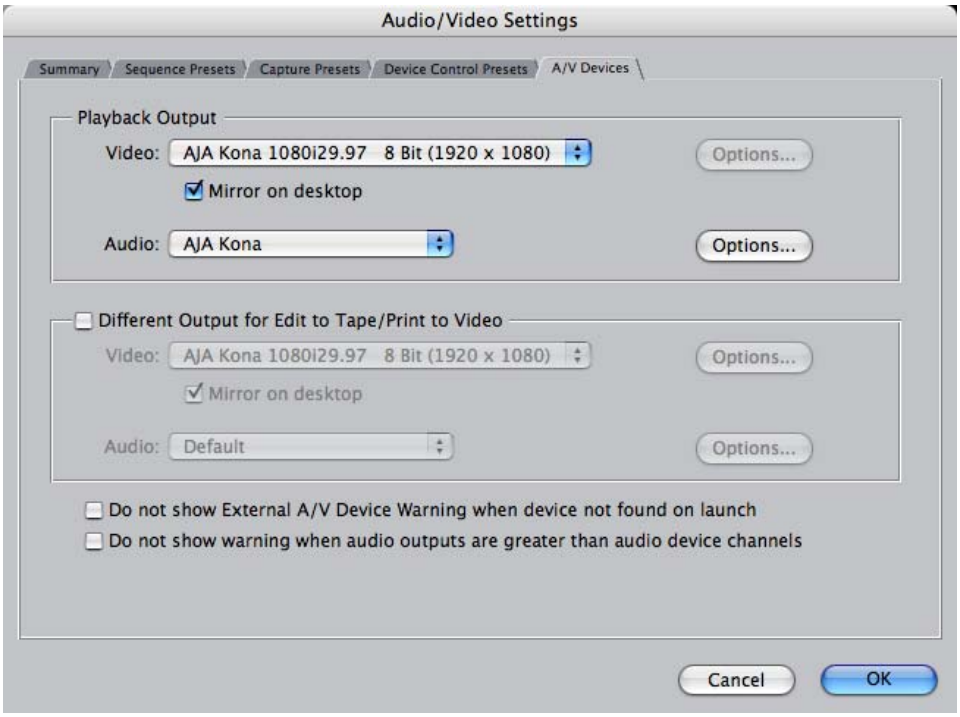
KONA LHe ships with VTR Device Control Presets for Sony and Panasonic VTRs. Select a Device Control Preset for the desired frame rate. Presets for both Sony and Panasonic VTRs are provided with these frame rates: 23.98, 24, 25, 29.97, and 59.94.



Audio/Video Settings, Device Control Presets Editor Window

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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 KONA LHe for both playback devices. The format chosen determines the Primary format for the KONA LHe board during playback. The Video *Options* button is greyed out for KONA LHe (use the KONA LHe Control Panel for video configuration; the Audio *Options* button opens a second dialog where Final Cut gives options for changing bit depth, number of channels, and the sample rate. Since Final Cut currently only supports 2 channels of audio, AJA recommends you leave all of these settings as set in the factory defaults.

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

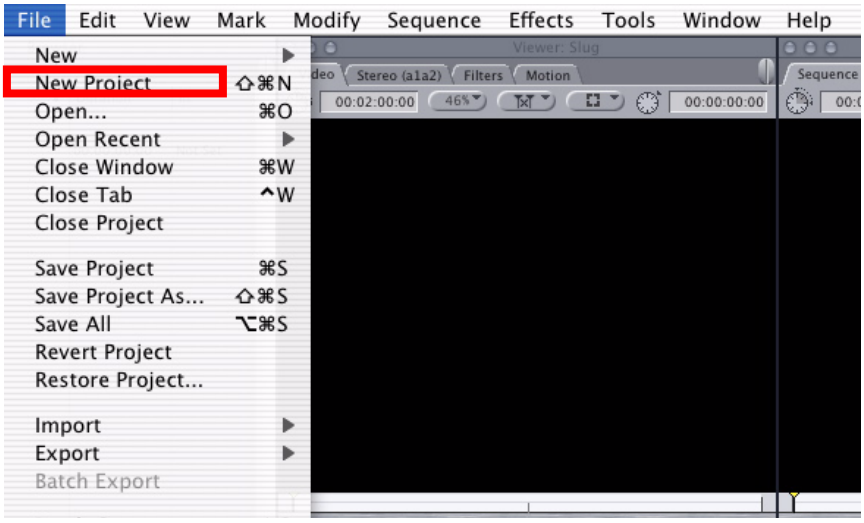
The window also allows you to turn on and off device and audio output warnings.

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

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

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

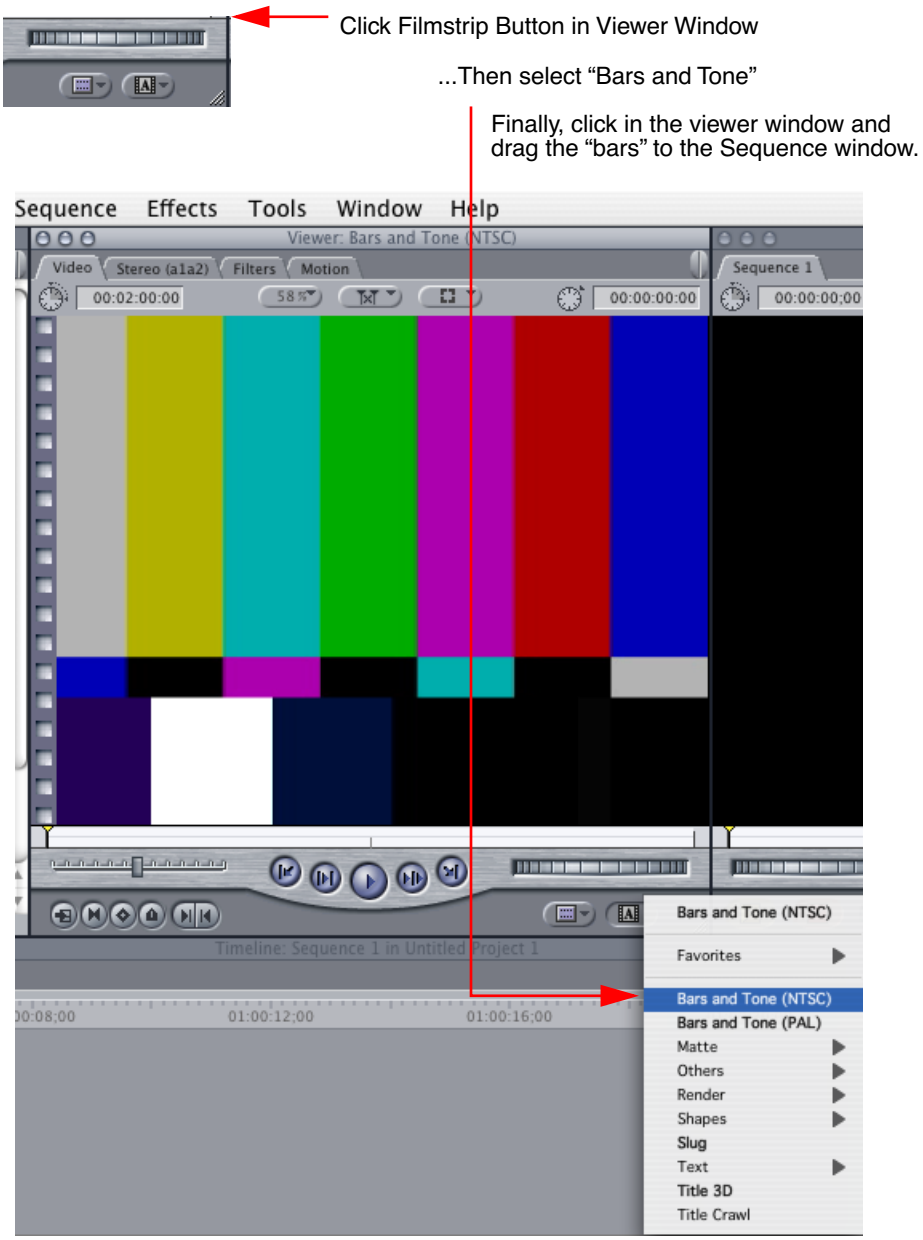


Create a New Project

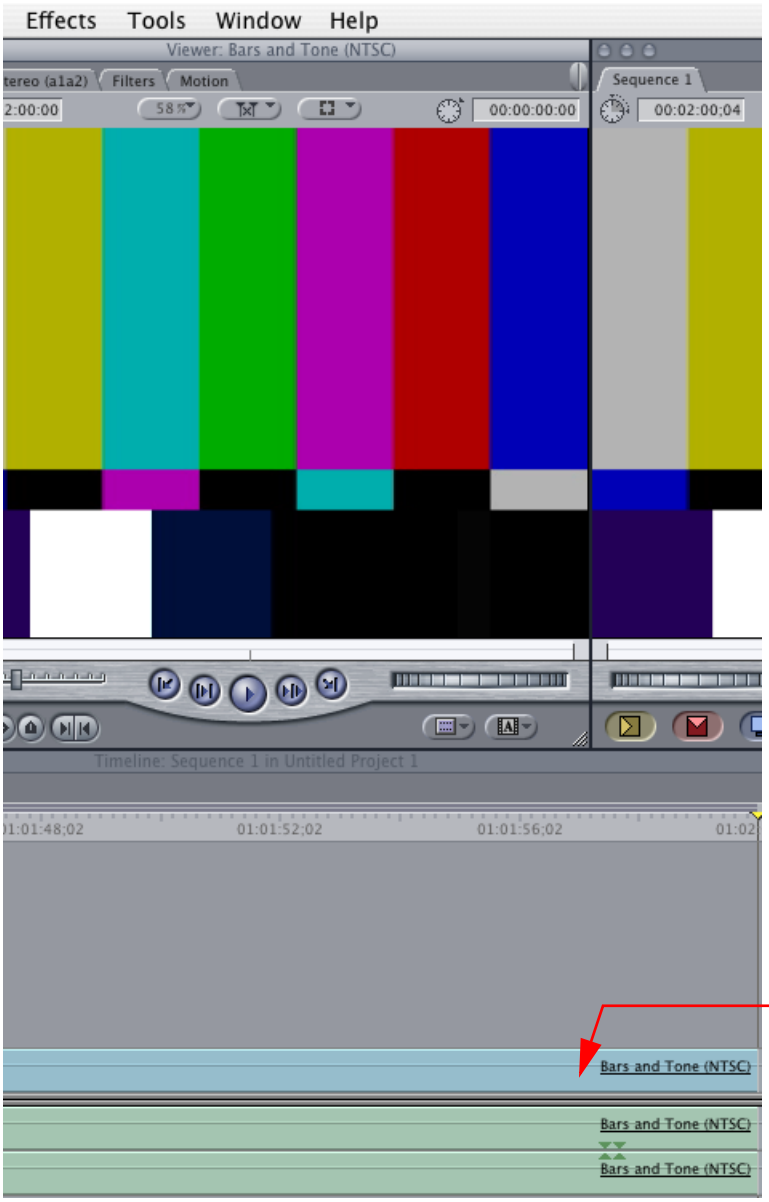
3. The Sequence window will be at the bottom of the screen and a Browser window will be at the top left. Look at the Browser window and locate the "Effects" tab at the top right. Click on it.
4. Locate the Viewer window in Final Cut and click on the Filmstrip pulldown menu button (it's a "filmstrip"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

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

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Click and Drag Bars and Tone From Viewer Window To Sequence



Sequence Window Showing Bars and Tone Clip Dragged from Viewer

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

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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.

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Chapter 5: Troubleshooting

If You Run Into Problems

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

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

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

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Symptom	Check
Changes made to Final Cut's configuration aren't remembered or you need to force a change to them.	Under some circumstances, Final Cut Pro may need to be initialized back to the factory default state as it was when you installed it. The easiest way to do this is to locate Final Cut's preference file and discard it. To do so, follow this procedure: 1. Locate the file named "Final Cut Pro x.x Preferences". Note: path to file is "Macintosh HD/users/username/library/preferences/final cut user data." 3. Click and drag that file to the Trash Can icon and drop it there. When you next start up Final Cut Pro, it will present the "Choose Setup" prompt (as in initial installation) where you can again choose a desired KONA LHe 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-KONA LHe 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 (www.aja.com/support_kona.html) for software updates. If any are available, download the file and read any associated instructions prior to installing the software.

Support

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

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

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

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

Contacting by Mail Address:

180 Litton Drive, Grass Valley, CA. 95945 USA
Telephone: 1.800.251.4224 or 1.530.274.2048
Fax: 1.530.274.9442

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

Apple Resources

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

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

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

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

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

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

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Appendix A: Specifications

Formats

525i 29.97
625i 25
720p 59.94
720p 60
1080i 25
1080i 29.97
1080i 50
1080psf 23.98
1080psf 24

Video Input

Digital: 8 or 10 bit HD-SDI/SDI, SMPTE-259/292/296, Dual-rate

Analog:

Composite/S-Video (Y/C): NTSC, NTSCJ, PAL
12 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
12 bit A/D, 2x oversampling
+/- .25 db to 5.5 MHz Y Frequency Response
+/- .25 db to 2.5 MHz C Frequency Response
.5% 2T pulse response
<2 ns Y/C delay inequity

Video Output

Digital: SD-SDI, SMPTE, 259M, 10-bits, BNC
HD-SDI SMPTE, 292/296, 10-bits, BNC

Analog:

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

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

A

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Analog SD and HD Output, 12-bits, BNC:
HD: YPbPr, RGB
SD: YPbPr, RGB (component mode)
Composite/YC (composite mode)

Audio Input

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

Analog: 2-channel balanced input
+24dbu Full Scale Digital
24 bit A/D, 48 KHz sample rate
+/- 0.2db 20 to 20 KHz Frequency Response

Audio Output

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

Analog: 2-channel Balanced output (XLR)
+24dbu Full Scale Digital (0dbFS)
24 bit D/A, 48 KHz sample rate
+/- 0.2db 20 to 20 KHz Frequency Response
2-channel unbalanced output (RCA-jack): requires KL-Box option

Down-Conversion

Hardware: 10-bit output, 24-bit internal processing
Anamorphic: full-screen
Letterbox: image is reduced with black top and bottom added to image area with the aspect ratio preserved
Crop: image is cropped horizontally

Reference Input

Analog Color Black or HD Tri-level
1 BNC on standard breakout cable (75 ohm terminating)
KL-Box (optional): 2 BNCs, passive loop-through

Hardware Acceleration Provided

DVCProHD hardware acceleration
HDV hardware acceleration
Dynamic RT Extreme hardware acceleration

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Machine Control

RS-422, Sony 9-pin protocol Connector provided on KONA LHe breakout cable and on optional KL-Box. 9-pin D-connector pinout is as follows:

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

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