

KONA³

Models: 3 and 3X

Installation and Operation Guide





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Table of Contents

Trademarks	ii
Notice	ii
FCC Emission Information	ii
Contacting Support	ii
Limited Warranty	iii
Chapter 1: Introduction	
Overview	1
Features	2
Hardware	2
Broadcast-Quality Conversion	2
KONA 3 Audio	3
Dual Link	3
2K Workflow Support	3
Hardware-based Acceleration	4
Internal HD/SD Hardware Downstream Keyer	4
Software	5
KONA 3 Supports Final Cut Multi-cam Feature	5
What's In The Box?	5
System Requirements	7
Minimum and Recommended System and Software Requirements	7
Understanding Disk Storage Methods	8
About RAIDs	8
Software For Striping	9
Storage Example: AJA KONA 3 and Xserve RAID	9
Storage Example: AJA KONA 3 for Dual Link HD and 2K resolutions	10
Storage capacity	10
Cable Connections	11
Using the Standard Cables	11
Using The Breakout Box	12
About BNC and Mini-Connectors	12
Connector Descriptions—Cables and K3-Box	13
8 Channel Digital AES/EBU Audio Inputs And Outputs	13
Analog 2 Channel Unbalanced Audio (Breakout Box only)	13
RS422 Machine Control	13
SDI Input and Outputs	13
Analog Monitor Out (Component HD or SD or SD Composite + Y/C)	14
Reference Video	14
In This Manual	15
Chapter 2: Getting Started—Workflow	
KONA 3 And Your Workflow	17
Understanding Typical Workflows	18

PhotoJPEG	19
DV (DV25)	19
DV50	19
DVCPRO HD	20
HDV	20
Uncompressed 8-bit 4:2:2 (SD or HD)	20
Uncompressed 10-bit 4:2:2	20
AJA Kona 10-bit Log RGB and RGB Codecs	20
AJA Kona 10-bit Log RGB and RGB Codecs as related to a 2K Workflow	21
Workflow General Notes	21
HD Offline Scenario #1	21
HD Offline Scenario #2	22
Mixing and Matching Formats in Final Cut	22
2K Workflows	22
 Chapter 3: Installation	
Installation Overview	25
Unpacking	26
Shipping Box Contents	26
Installing the KONA 3 Card into a MacPro or G5	28
Cabling the System	30
System Video/Audio Cable Connections	30
Typical System	31
Installing KONA 3 Software	33
Software Installation Procedure	33
Genlock and Your System	37
 Chapter 4: Final Cut Pro and Other Application Software	
Final Cut Pro	39
Using The KONA 3 Control Panel	39
Control Panel Basics	40
Input Tab Screen	43
Input Tab Screen Settings	44
Formats Tab Screen	45
Format Tab Screen Settings	46
Digital Out Tab Screen	51
Digital Out Tab Screen Settings	52
Analog Out Tab Screen	54
Analog Out Tab Screen Settings	54
Control Tab Screen	55
Control Tab Screen Settings	55
DS Keyer Tab Screen	58
Setup Tab Screen	61
Setup Tab Screen Settings	61
Codec Tab Screen	62
Codec Tab Screen Settings	62
Timecode Tab Screen	64
Timecode Tab Screen Settings	65

2K Crop Tab Screen	67
Info Tab Screen	69
Saving Your Control Panel Presets	70
Who is Controlling KONA 3?	70
QuickTime Application—1st Priority	71
Mac Desktop Video—2nd Priority	72
KONA Control Panel—3rd Priority	73
Control Recommendations	73
Easy Setups for Typical Uses	74
Easy Setups Menu	74
Easy Setups For Use With KONA 3	76
Audio/Video Settings Menu	77
To Create A New Easy Setup	78
The Sequence Presets Window	80
Checking the System with a Simple Test Project of Bars and Tone	85
Using 8-bit Versus 10-bit Video	88
 Chapter 5: Troubleshooting	
If You Run Into Problems	89
Updating Software	90
Support	90
Apple Resources	91
 Appendix A: Specifications	
Video Input	A-1
Video Formats	A-1
Video Output	A-1
Audio	A-2
Up-Conversion	A- 2
Down-Conversion	A-2
Cross-Conversion	A-2
SD to SD Aspect Ratio Conversion	A-2
Reference Input	A-2
Machine Control	A-2
 Appendix B: Glossary	
 Appendix C: 2K Workflow	
Overview of 2K and Its Uses In Digital Cinema.	C-1
2K Color: More Like Film than Video	C-2
The Source of 2K Data: Scanning, Telecine and Digital Cameras	C-2
Transporting 2K Data: HSDL Defined	C-3
The AJA KONA 3: An Ideal 2K Input/Output Device	C-3
The KONA 3 2K Process—Ingest to Output	C-4
Additional Advice	C-6
Index	

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Chapter 1: Introduction



Overview

The AJA KONA 3 brings the highest quality to SD, HD, Dual Link HD and 2K film resolutions to Apple PCI-Express and PCI-X computers. The KONA 3 offers unsurpassed 10 bit broadcast quality serial digital video input/output, 8 channel digital AES/EBU audio input/output as well as 16-channel embedded audio, hardware based upconversion from SD to HD, hardware based downconversion from HD to SD and HD to HD crossconversion between 720 and 1080 HD formats, DVCProHD and HDV hardware scaling support. KONA 3 is designed to be the ultimate capture and playback card. AJA provided software utilities and applications deliver leading features for broadcasters and filmmakers.

As a state-of-the-art PCI-Express card, KONA 3 plugs into a PCI-Express slot on Apple's latest MacPro PCI-Express slot enabled computers. A PCI-X version of the card for legacy G5 computers with a PCI-X 133Mhz slot is also offered (KONA 3X). The card comes supplied with software that allows it to work seamlessly with Final Cut Pro and other QuickTime based applications to provide a professional broadcast quality editing suite, corporate/industrial video center, or high-powered desktop video setup - or anything in between. Included with the KONA 3 is a cable set that can be connected to a variety of SD, HD, Dual Link HD and 2K capable equipment. For even easier connectivity, an optional K3-Box rack mountable breakout box can also be purchased - it ships with it's own multi-pin cable and is connected to the Kona 3 card with this capable and the multi-connector SDI cable provided with the card. This manual covers the installation and operation of the KONA 3, the optional K3-Box and how to use the card in conjunction with Final Cut Pro and other software applications.

Features

The KONA 3 card offers a large number of unique features for optimum quality, ease of use, and support for a wide variety of post production workflows.

Hardware

- SD-SDI, HD-SDI, Dual Link HD-SDI, and HSDL inputs
- 2K support that includes 2048x1556 and 2048x1080 formats
- x4 Lane PCI-Express Bus Interface (or PCI-X 133Mhz)
- DVCProHD hardware scaling acceleration
- HDV hardware scaling acceleration
- Final Cut Pro Dynamic RT Extreme hardware acceleration
- Broadcast quality hardware based 10 bit upconversion
- Broadcast quality hardware based 10 bit downconversion
- Broadcast quality hardware based 10 bit crossconversion (1080 to 720 and 720 to 1080)
- Broadcast quality hardware based 10 bit SD aspect ratio conversion (anamorphic to letterbox, etc.)
- 12 bit HD component analog video and SD analog component or composite and s-video output
- 10 bit HD/SD Video+Key Output
- HD/SD Hardware Downstream Keyer
- 8 channel 24 bit, 48kHz or 96kHz digital AES/EBU audio
- 16 channels of SDI embedded digital audio
- RS-422 control via 9 pin
- Genlock input with optional looping capability via the K3- Box (terminated on the supplied breakout cable)
- Standard 2 meter length connection cables

Broadcast-Quality Conversion

KONA 3 features hardware based full 10 bit broadcast quality motion adaptive SD to HD upconversion, HD to SD downconversion and HD to HD crossconversion. The quality of the conversion features found in the KONA 3 is virtually identical to AJA's award winning stand-alone converter products used throughout the post production market. The KONA 3 built-in upconverter uses a full 10 bit path, fully motion adaptive de-interlacing, and large multi-point digital interpolators. Downconversion uses large multi-point digital interpolators, anti-alias filtering and interpolation.

Crossconversion is high-quality hardware-based, providing capability to streamline dailies and offers true broadcast picture quality in realtime. Because these functions are in hardware on the card, they are available full time, all the time—with no CPU load. Such conversions are useful for cost effective monitoring, making standard definition dubs of an HD project, or upconverting from a standard definition FCP project to an HD deliverable.

KONA 3 Audio

KONA 3 supports 8 channels of 24-bit 48kHz or 96kHz AES digital audio via XLR (balanced 110 ohm) connectors (using the supplied breakout cable) or XLR and BNC (unbalanced 75 ohm) connectors (when the optional K3-Box breakout box is used.) KONA 3 also supports 16 channels of embedded 24-bit 48kHz digital audio over the same SDI connection as the video. If you are using a Digital Betacam VTR, HDCam VTR, DVCPro VTR, D5 VTR or HDCam SR VTR—you'll have the proper audio connections for interfacing with the VTR.

KONA 3 support for 8 AES digital audio via XLR or BNC 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 48 or 96kHz audio, perfectly locked to internal KONA 3 video. Sample rate conversion is done at very high quality (over 120db THD).

Dual Link

KONA 3 supports Dual Link HD-SDI (4:4:4). This emerging technology is found in Sony's HDCamSR product line as well as Thomson Grass Valley's Viper Filmstream camera. KONA 3 supports the ingest and output of SMPTE-372M compliant 4:4:4 RGB video at 10 bit.

2K Workflow Support

The KONA 3 2K path offers potentially significant cost and labor savings over a tape-based approach to 2K workflow. In a unique development for customers on the Apple platform, users can go straight from telecine to disk with 2K media and eliminate steps requiring the use of tape stock and then the digitizing of those tapes for the nonlinear editor. 2K telecine to KONA 3 saves time and steps in the process by directly and simultaneously creating 2K DPX files and 2K QuickTime reference movies. Material can be played out at 2K via HSDL (High Speed Data Link), offering further synergy with other 2K products, such as projectors or DDRs, currently available in the market.

Additionally, KONA 3 allows 2K files to be viewed on HD 1080PsF supported video monitors, lowering the price barrier for recording to tape and viewing 2K material. This 1080 HD payout can be down-converted to SD in real time, giving the 2K DI pipeline a powerful solution for multi-format video payout of 2K material.

By generating 2K DPX files during the digitize phase, different parts of the process, for example-delivery of full-resolution media for shots intended for visual effects-can be done much earlier. Offline editing can be done in Final Cut Pro and because of the flexibility of Final Cut Pro and QuickTime, even a 2K online is possible.

Hardware-based Acceleration

Final Cut Pro users will likely notice the DVCPROHD, HDV, and Apple RT Extreme hardware acceleration provided by KONA 3. This hardware acceleration was developed in close cooperation with Apple. How does KONA 3 accelerate DVCPROHD, HDV, and Apple RT Effects? A precision hardware scalar in KONA 3 does what the Apple computer's processor would otherwise have to do, scale less than full raster HD (DVCPROHD and HDV) to full raster size, thus speeding up the system considerably—and doing this scaling at full 10-bit broadcast quality.

KONA 3 also has hardware support when capturing from HD-SDI to the DVCPROHD codec. With KONA 3, any HD source can be captured using the DVCPROHD codec—giving you online HD quality at remarkably low data rates. This feature allows HD to be used where only SD would have been considered due to drive capacity or drive performance constraints. KONA 3 even supports the DVCPROHD codec with up or down conversion—allowing projects to be downconverted to SD, or even upconverted to the DVCPROHD codec on ingest.

When using the Final Cut Pro HDV codec, the KONA 3 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 full raster 1920 x 1080, providing instantaneous playback of HDV captured by Final Cut Pro for both monitoring and recording.

Unlike the DV25 format, which can preview in realtime natively via Final Cut Pro, the MPEG structure of HDV is much more complex. Fortunately, KONA 3 can provide real time monitoring and playback to both HD and SD monitors and decks via the realtime hardware scaler and down-converter on board.

In addition to speeding up Final Cut Pro Dynamic RT by using the KONA scalar, multiple frame size RT (1/4 size, 1/2 size, full size)—a Final Cut Pro feature—also benefits from KONA 3. The frame count and image size are dynamically changed during file playback, so you don't get the “un-rendered” message in Final Cut Pro. The KONA 3 scalar handles the dynamic multiple frame sizes seamlessly, so that the Dynamic RT you see on the Mac monitor is the same as that shown on your professional broadcast monitor.

Internal HD/SD Hardware Downstream Keyer

Available for the first time on any QuickTime capture card is a powerful hardware keyer that can place graphic files with an alpha channel over video in, a selectable matte, or the contents of the card's framebuffer from a software application (AJA Kona TV / Apple's Final Cut Pro / AJA's VTR Xchange). Key a bug or text over picture and avoid what might normally be a lengthy software render. In addition to working with these software applications, you can also key video that has an alpha channel over video input or a matte. For example, you could load a QuickTime clip that has an alpha-channel - a flying logo generated in the Animation codec - into KONA TV and then place it over live video coming into the card and then passing both on to a VTR for recording or broadcast.

Software

- KONA 3 Control Panel for audio/video source selection, conversion and control of KONA 3 within the overall MacOS environment (Macintosh Desktop, Input Pass-through, etc.)
- AJA QuickTime™ Drivers for tightly integrated hardware/software operation
- Support for Apple Final Cut Pro™ (application software not included)
- Support for After Effects, Combustion, Motion, and other application application software not included.
- AJA Utilities: KONA TV, VTR Xchange, KONA System Test, AJA Data Rate Calculator, KONA QTtoDPXtranslator, and KONA DPXtoQTtranslator (these utilities are also available for free download at www.aja.com/html/support_kona3_sw.html as well as being part of the KONA 3 installer.)

AJA's KONA 3 software and hardware were developed for use with Final Cut Pro for powerful integrated video/audio capture, editing, and video production. With a MacPro or Apple G5, FCP, and KONA 3, you have the ultimate system for standard definition—and high definition—video production and DI work. Software is supplied on CD, including the KONA 3 Control Panel, drivers for the card itself, and all files necessary for Final Cut Pro and other application support.

KONA 3 Supports Final Cut Multi-cam Feature

Final Cut Pro 5 and later provides multi-cam playout-and KONA 3 supports it. With KONA hardware and a sufficient storage solution, you can handle up to 16 sources in real time. Each stream of video is captured individually and then ganged together in Final Cut Pro for a multi-cam editing workflow. The KONA 3 hardware plays the multi-cam clips out to professional broadcast monitors or decks, via SDI, HD-SDI or via analog video. Up to 16 sources can be viewed in real time via the KONA (4-up, 6-up, 9-up, 16-up, etc.) -or each individual source can be viewed as it is selected via Final Cut Pro.

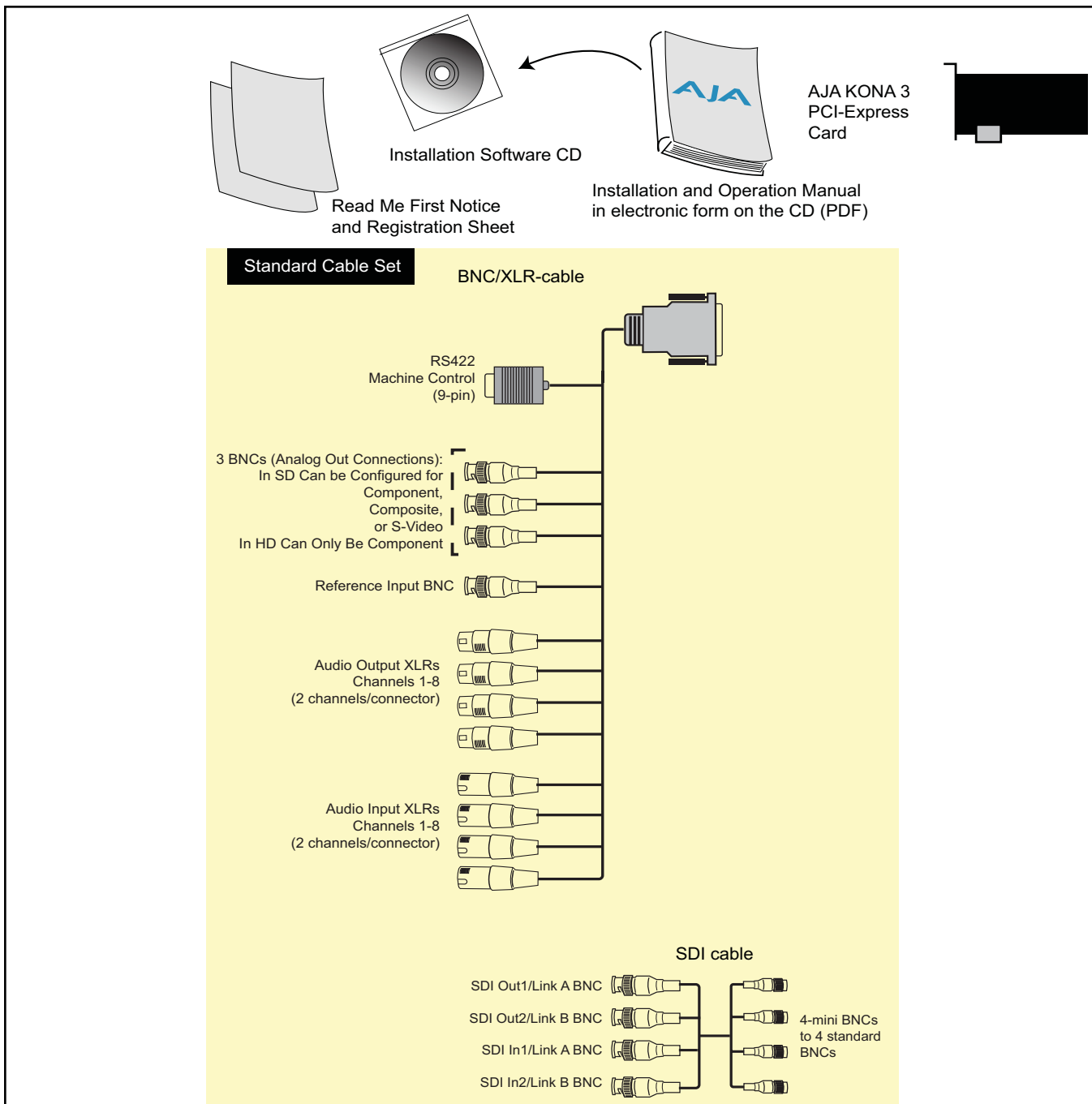
What's In The Box?

When you unpack your AJA KONA 3, you'll find the following components:

- AJA KONA 3 Software and Documentation CD-ROM—this CD contains the software installer to place KONA 3 drivers and the Control Panel on an Apple Mac. Due to the pace of innovation, it is best to install the latest driver version from the AJA website: www.aja.com/html/support_kona3_sw.html
- Install the software as discussed in this manual in *Chapter 3: Installation and Configuration*. The CD also contains a wide variety of useful information, including this manual you're reading (PDF format).
- KONA 3 4-Lane PCI-Express card (or KONA 3X if you ordered the PCI-X version).

- Cable, KONA 3 SDI In/Out—mini-connectors on the card (technically called “1.0/2.3 connectors”) connect to full-size BNCs for ease of use and compatibility with professional equipment.
- Cable, AES XLR digital audio connectors, RS422, and Reference Input.
- Read Me First Notice, Registration sheet, and any other late-breaking news and/or errata related to KONA 3.

Please save all packaging for shipping the KONA 3 should you wish to do so when moving or sending it in for service.



KONA 3 Shipping Box Contents

System Requirements

AJA Video recommends that your system meet minimum hardware and software requirements to achieve a satisfactory level of performance when operating it. Here, we provide minimum and recommended requirements and then discuss disk storage issues that should be understood for proper system configuration.

Minimum and Recommended System and Software Requirements

The following table outlines the system hardware and software needed.

Item	Recommended
Operating System	OS X version 10.4.x
QuickTime:	QuickTime 7 or latest Apple release version of QuickTime
Recommended Software Suite:	Final Cut Pro 5 / or latest release of Final Cut Studio
Recommended Kona Driver:	For FCP 5.1 and later, Kona driver version 3.1 or latest driver release
Macintosh Tower:	<p>For PCIe version of KONA 3:</p> <p>Power Mac G5 Dual 2GHz (M9590LL/A) PCI-Express 2GB or more RAM</p> <p>Power Mac G5 Dual 2.3 GHz (M9591LL/A) PCI-Express 2GB or more RAM</p> <p>Power Mac G5 Quad 2.5GHz (M9592LL/A) PCI-Express 2GB or more RAM</p> <p>MacPro 2.66GHz (MA356LL/A) or 2.0GHz or 3.0GHz build to orders PCI-Express 2GB or more RAM</p> <p>MacPro 2.66Ghz 8 core (MA356LL/A) or 2.0GHz or 3.0GHz build to orders PCI-Express 2GB or more RAM</p> <p>Or latest generation PCIe slot equipped Apple desktop computer</p> <p>For PCI-X version (KONA 3X)</p> <p>Power Mac G5 2.5Ghz (M9457LL/A) PCI-X 133Mhz 2GB or more of RAM</p> <p>PowerMac G5 2.7Ghz (M9749LL/A) PCI-X 133Mhz 2GB or more of RAM</p> <p>Intel XServe Quad 2.0Ghz (MA409LL/A) via Apple PCI-X riser for slot 1, part number: 922-7860 2GB or more of RAM</p>

Item	Recommended
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

Understanding Disk Storage Methods

The KONA 3 card, an Apple PCI-Express Power Mac, and Final Cut Pro, together offer an unprecedented level of features and performance for audio/video post production applications. However, to ensure performance and quality, the disk storage system used with the Apple computer must be able to meet the demands of the media.

For uncompressed SD, AJA recommends that at a minimum, the disk storage system must be able to provide and maintain a consistent 50 MB/sec transfer rate from the Apple computer to disk (read/write). There are a variety of system configurations and peripherals that can provide this level of performance.

For uncompressed single link HD, AJA recommends that at a minimum, the disk storage system must be able to provide and maintain a consistent 200 MB/sec transfer rate from the Apple computer to disk (read/write). There are a variety of system configurations and peripherals that can provide this level of performance.

For uncompressed dual link HD and 2K, AJA recommends that at a minimum, the disk storage system must be able to provide and maintain in excess of 300 MB/sec transfer rate from the Apple computer to disk (read/write). There are a variety of system configurations and peripherals that can provide this level of performance.

KONA 3 users wishing to configure a storage for a system should also be aware that raw benchmark numbers alone do not necessarily reflect the performance of a drive solution. Other factors, such as drive seek time and controller cache can also affect performance especially with regard to the bandwidth requirements of SD, HD, dual link HD and 2K files.

About RAIDs

Redundant Array of Independent Disks, or RAID, is a group of hard drives that appears to the host computer 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, that would otherwise not be possible from a single hard drive. Drives inside the RAID array operate simultaneously, increasing overall throughput. RAID configurations can be comprised of:

- Striping data across multiple drives for storage performance (RAID 0).
- Mirroring for redundancy (RAID 1).
- Parity for data protection (such as RAID 5).

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

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

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

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

Software For Striping

AJA recommends the Disk Utility software provided by Apple with OS X for creating and striping RAIDs, including 3rd-party, SCSI and Fibre Channel RAIDs. This easy to use utility can be found in *Macintosh HD/Applications/Utilities*, where “*Macintosh HD*” is the name of the system drive.

Storage Example: AJA KONA 3 and Xserve RAID

For an optimum disk storage configuration with Final Cut Pro and the AJA KONA 3—working with compressed media to uncompressed single link HD media—Apple's Xserve RAID is an effective storage device when properly configured. Apple's Xserve RAID holds up to 14 drive modules (resulting terabytes of storage) in a rackmount-optimized 3U enclosure. Each 7200-RPM hard drive connects to a dedicated ATA/100 drive channel, eliminating a traditional source of bottlenecks and maximizing the 2Gb/s Fibre Channel host connection(s). Populated with all 14 drive modules and using 512MB cache for each controller, the Xserve RAID can support the ingest and playback of all formats up to and including uncompressed single link HD. Dual Link HD and 2K formats are not supported on a single Xserve RAID.

Note: When creating and striping an Xserve RAID with the Apple Disk Utility provided with OS X, an ideal configuration is RAID 50: in other words, the internal Xserve RAID drives are set up as RAID 5 via the RAID Admin application; the Xserve RAID then shows up in Disk Utility as two drives (regardless of the number of internal drives) which must be configured together as RAID 0. Apple calls this configuration “RAID 50.”

When considering any high-performance disk storage system, AJA recommends working with a qualified reseller in order to configure storage appropriate for your needs.

Storage Example: AJA KONA 3 for Dual Link HD and 2K resolutions

AJA can recommend the following examples of drive configurations to support certain specified video and digital film resolutions and their associated bandwidth requirements. If a particular drive array or manufacturer is not listed, it may simply be because AJA has no experience with the company or a particular unit. This guide simply offers examples that AJA has used with success when working with the specified formats listed. With any device, actual results may vary from unit to unit and proper configuration of the drive array and any ancillary items such as host bus adapters, software drivers and cabling is assumed.

Supports 2K, Dual Link HD, Single Link HD, SD:

- G-Technology, Inc. GSPEED-XL (4Gb Fibre Channel)
Unit must be fully populated and with a minimum 512MB cache per controller.
- InforTrend EonStor A16F-G2422 (4Gb Fibre Channel)
Unit must be fully populated and with a minimum 512MB cache per controller.
- Any drive array with comparable specifications to the above examples; 16 or more SATA drives with 4Gb fibre channel connectivity to host and 512MB cache per controller.

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.

Note: All of the following numbers are approximations based on 2 channels of 48kHz audio. More audio channels can increase data rates. AJA also provides a freeware application called the AJA Data Rate Calculator that can be used to help determine the amount of storage space and bandwidth requirements needed for a selected format, frame rate, audio setting and compression. The AJA Data Rate Calculator is also included with version 3.3 and higher of the Kona driver and can be found in the AJA Utilities folder which installs in the Applications folder of the Mac OS. The AJA Data Rate Calculator application can also be downloaded from the AJA website and used on any OSX computer.

FORMAT	Data Rate in MB/sec	Storage Requirement in GB/Hour
SD Formats		
10 bit 4:2:2 SD (NTSC/PAL)	28	101
8 bit 4:2:2 SD (NTSC/PAL)	21	76
DV50(NTSC/PAL)	7	27
DV25(NTSC/PAL)	3.6	14
Photo JPEG SD (NTSC/PAL)	2.5	9
HD Formats		
10 bit 4:2:2 1080i 59.94Hz/29.97fps	166	597
8 bit 4:2:2 1080i 59.94Hz/29.97fps	124	448
10 bit 4:2:2 1080i 50Hz/25fps	138	498
8 bit 4:2:2 1080i 50Hz/25fps	104	373
10 bit 4:2:2 1080PsF 23.98Hz/fps	133	478
8 bit 4:2:2 1080PsF 23.98Hz/fps	100	358
10 bit 4:2:2 720P 59.94Hz or fps	133	478
8 bit 4:2:2 720P 59.94Hz or fps	100	358
10 bit 4:4:4 1080PsF 23.98Hz/fps	199	717
10 bit 4:4:4 1080PsF 25Hz/fps	207	746
8 bit 4:2:2 1080i 59.94Hz/29.97fps	124	448
8 bit 4:2:2 1080i 50Hz/25fps	104	373
8 bit 4:2:2 1080PsF 23.98Hz/fps	100	358
8 bit 4:2:2 720P 59.94Hz or fps	100	358
2K Formats		
10 bit 4:4:4 2048x1556PsF 23.98fps	306	1100
10 bit 4:4:4 2048x1080PsF 23.98fps	212	764
<i>MB = MegaBytes</i>		
<i>GB = GigaBytes</i>		

Cable Connections

When KONA 3 is installed in an Apple desktop computer, it connects to the outside world via either the standard cable set supplied with the board, or the optional K3-Box Breakout Box (using the cables and directions supplied with it). Use the cables or the optional Breakout Box to connect your VTR, input and output sources, and external reference video (genlock).

Using the Standard Cables

KONA 3 offers you complete I/O connectivity choices. One cable provides AES/EBU digital XLR connections and analog monitoring video connections. The other cable has 4 mini-connectors on one end, and 4 BNCs on the other, and provides SDI connections for both single link and dual-link SD/HD SDI/HSDL connections. Cable connections are marked on both the KONA 3 card endplate and on the cable connectors for easy identification.

Using The Breakout Box

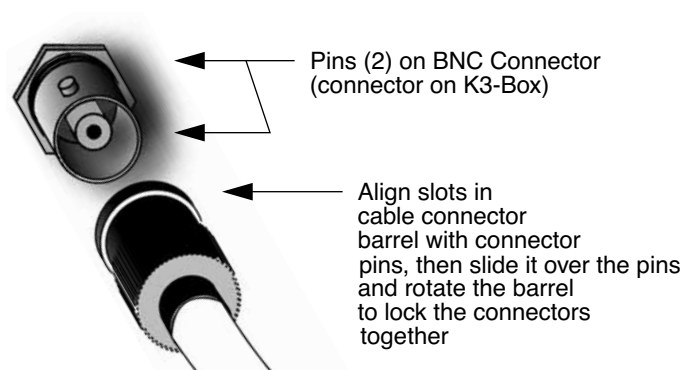
The KONA 3 Breakout Box attaches to the KONA 3 card via cables supplied with it that attach to the back of the Box.

For additional functionality, the K3-Box Breakout Box provides some features not present in the standard break-out cables: simultaneous XLR and BNC AES output, 2 channel RCA analog audio monitoring, and looping BNC Genlock reference connectors.

About BNC and Mini-Connectors

Although most video professionals are used to BNC connectors, you may not have seen them if you've been using primarily prosumer 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.

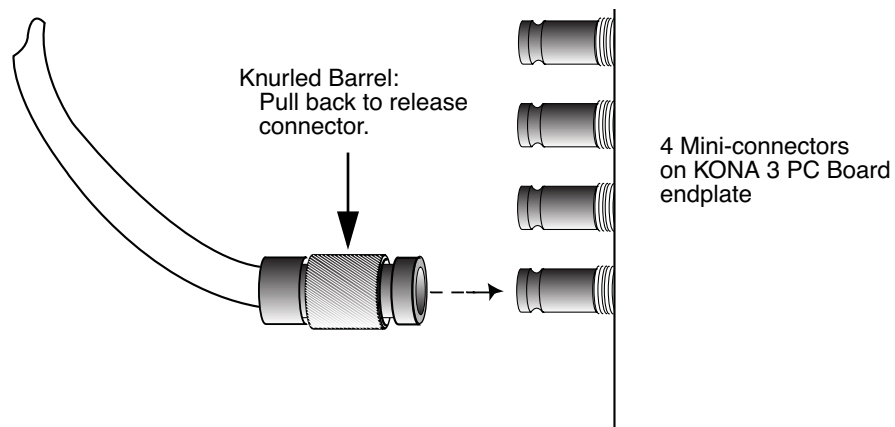


The four mini-connectors found on the KONA 3 endplate are not common to most video equipment but offer small size, ease-of-use, and high reliability. (The connectors are also called “mini-BNCs” and “1.0/2.3 Connectors”.)

To make a connection with these connectors simply push the cable mini-connector onto the endplate mini-connector. It will lock in place when fully seated.

To remove a mini-connector, just grasp the knurled barrel on the connector and pull the connector off.

Note: Do not try to remove the mini-connector by pulling on the cable itself as this action will not remove the connector—but can stress the cable.



Connector Descriptions—Cables and K3-Box

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

8 Channel Digital AES/EBU Audio Inputs And Outputs

When using the standard cables, XLR connections are provided for digital AES/EBU audio input/output. Four female XLR connectors are provided for audio input and four male for audio output. Each XLR carries two channels. XLR connectors are labelled as to input/output and channels.

The optional Breakout Box provides both BNC and XLR audio connections on the front panel.

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

Analog 2 Channel Unbalanced Audio (Breakout Box only)

On the optional K3-Box are two analog output connectors, one for each channel. These connectors are RCA-style phono jacks.

RS422 Machine Control

A DB9 connector provides connection to VTRs, digital disk recorders, and other devices using RS422 device protocol. For the breakout cable the connection is male and for the breakout box the connector is female. (Connector pinout is listed in Appendix A: Specifications.)

SDI Input and Outputs

Mini-connectors are provided for two SDI inputs and two SDI outputs for single or dual-link. A cable with four Mini-connectors on one end and four BNCs on the other end is provided for connecting equipment to the SDI inputs and outputs. This cable is also used to interconnect between the KONA 3 board to the optional K3-Breakout Box.

KONA 3 has up to 4 video outputs in SD and up to 3 outputs in HD—2 SDI outputs that are used for both high-definition and standard-definition (SD/HD-SDI), and an analog video output (configuration of this three BNC cluster is discussed later with regards to component, composite and Y/C). Each of the three outputs is independently switchable between HD and SD. For example, if you are working in HD, you can have simultaneous HD-SDI, SD-SDI, and HD-component analog output.

SDI inputs and outputs support video as well as 16-channels of embedded 24-bit digital audio. Use SDI wherever possible for the best quality 10-bit uncompressed video input, capture and output. If peripheral equipment has a variety of inputs/outputs, look to see if it has SDI I/O, and use it where possible. Most high-end professional broadcast equipment supports SDI (VTRs, cameras, media storage servers, etc.).

Note: In the past manufacturers have used separate I/O connections for standard- and high-definition SDI because the circuits were different. On KONA 3 we use the same connectors for both HD and SD-SDI (both input and output) due to our dual rate chipset which supports both HD and SD.

Analog Monitor Out (Component HD or SD or SD Composite + Y/C)

KONA 3 features 12-bit component video output for both HD and SD. The analog component output can be configured in a variety of ways; as a component, composite or Y/C signal. This flexibility allows, for example, the use of an inexpensive analog input-only monitor for both HD or SD viewing. Since the three BNC connectors share component, composite and Y/C functions, output of component is exclusive while composite and Y/C can be output simultaneously. For Y/C monitoring an adapter cable from dual BNC for Y/C to S-Video mini-DIN style connector is required. For analog monitoring, a component video signal is generally regarded as higher quality for monitoring than a composite signal.

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 3 uses the modern YPbPr terminology exclusively. KONA 3 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 3 Control Panel.

A Note About RGB—Although RGB is used less in today’s video systems, KONA 3 supports it for A/V Monitor output. However, because KONA 3’s (and SMPTE SDI’s) 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 3 Control Panel.

Reference Video

A single BNC connector is standard on the KONA 3 cable (self terminating). Two BNC connectors are standard on the breakout box (these provide loop through: if ref is not looped out, a 75 ohm terminator should be used for the loop out connector). Reference allows you to synchronize KONA 3 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 to the KONA 3 reference input. When KONA 3 outputs video it uses this reference signal to lock to. When connecting a reference video source, the locking signal should be the same format in Hz (1080i29.97, 625i25, etc.) as the Primary format selected in the KONA 3 Control Panel. It is possible in some circumstances to use an alternate format video signal as long as the basic frame rate is compatible (for example, using a 525i29.97 genlock signal to lock a system running 1080i29.97)—if the Hz coincide.

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 3 in a typical video environment. Typical workflows for SD, HD, Dual Link HD, and 2K are discussed.

Chapter 3 provides complete instructions for installing and configuring the AJA KONA 3 card. The user is guided through unpacking, installing the card into a Mac tower, installing KONA 3 Mac Software, 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 3 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.

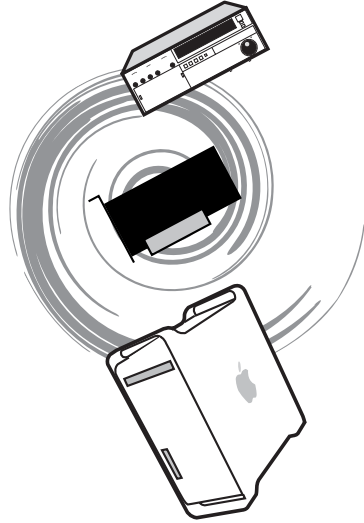
Appendix A presents a list of technical specifications for the product.

Appendix B gives a glossary of technical terms and acronyms used in the manual.

Appendix C discusses the operational aspects of using 2K workflows with KONA 3.

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

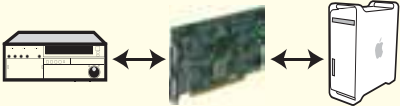
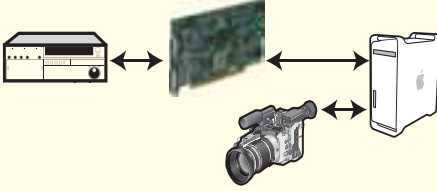
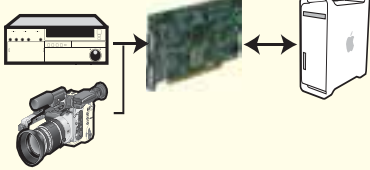
Chapter 2: Getting Started



KONA 3 And Your Workflow

There are a lot of ways to think about audio/video workflows. 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 tries to show how Final Cut Pro and KONA 3 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 type of workflow attributes KONA 3 applications support. After the diagram, we also discuss some typical applications.

Source Deck Type(s)		Workflow Attributes	Applications
Digital SD or HD Examples: Digibeta, DV50, DVCPROHD, HDCAM, and DVcam		KONA 3 captures and outputs SDI video (SD or HD) with embedded audio. Use high-quality AES/EBU and/or embedded 8-channel audio output.	Pro Broadcast Corporate/Industrial On-site Editing
Digital capture via Firewire with Output via AJA KONA 3 Example: HDV		Using standard desktop video techniques, video/audio is captured directly from a camcorder or deck. KONA 3 is used for playing back captured media and editing/mastering to tape or DVD using Final Cut 4.5HD and other tools such as After Effects, Combustion, Apple Motion, etc.	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 3 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 HD sources, including dual-rate and dual-link, and then also use desktop graphics and video software for creative power and flexibility.	Post-production Animation Compositing

Workflow Scenarios

Understanding Typical Workflows

KONA 3 and Final Cut Pro allow more workflow flexibility than ever before in post production. Users can select a variety of formats, frame rates and codecs for capture and editorial manipulation. KONA 3 hardware has a full array of connectors for interfacing with VTRs, DDRs and other devices—with all outputs active simultaneously. Capture can range from compressed DV to uncompressed dual link HD and even 2K. 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 8 or 10 bit uncompressed quality

As quality and codecs improve, the lines between offline and online are blurring. For example, with the DVCPRO HD codec introduced in FCP HD (v.4.5), native HD editing in the codec became possible, providing very high quality results (true HD editing) at very low data rates, in some cases as lower than 6 MB sec. Compare this to 100MB/sec and higher for uncompressed HD formats, and you can immediately see the benefits.

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 Apple computer'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 PhotoJPEG codec offers an excellent compressed media choice for near 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 the quality using a slider. To be able to effectively encode to PhotoJPEG when capturing HD, the quality slider should not be set past 35% for HD. The quality slider can be set higher for SD formats. KONA 3 allows for PhotoJPEG monitoring and/or output in both SD and HD. KONA 3 can capture from almost any HD or SD input, directly to PhotoJPEG media.

DV (DV25)

Data rate: 3+ MB/second (megabyte/second) standard definition only—supported by internal system drive

Quality: Good

DV is commonly input to an Apple computer via FireWire. KONA 3 can capture directly to DV compressed media from an uncompressed SDI source. For devices that may not have FireWire (IEEE1394 or i.Link) connections, this allows the user to capture to this low data rate, yet good quality codec. While DV does offer good quality, it has lower chroma resolution when compared to DV50, JPEG, or uncompressed. The KONA 3 can be used to convert DV projects to uncompressed—in real time—for monitoring and/or output even if you haven't captured the footage using the KONA 3.

DV50

Data rate: 6+ 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 3 to convert DV50 projects to uncompressed—in real time—for monitoring and/or output. KONA 3 can capture from its SDI input, directly to DV50 compression.

DVCPRO HD

Data rate: 6 to 14 MB/second high definition—supported by internal system drive

Quality: Excellent

KONA 3 has hardware support that allows capture from HD-SDI to the DVCPRO HD codec. KONA 3's hardware also takes a portion of the DVCPRO HD codec processing load off the CPU, allowing more computer processor time for Dynamic RT effects in Final Cut Pro.

HDV

Data rate: 2+ MB/second high definition—supported by internal system drive

Quality: Very Good to Excellent

While the structure of HDV (Long GOP MPEG2) makes it nearly impossible to ingest in realtime, you can use KONA 3 to convert HDV projects to uncompressed-in real time on playback-for monitoring and/or output.

**Uncompressed
8-bit 4:2:2 (SD or
HD)**

Data rate: 21 MB/sec for standard definition or 100 to 125 MB/sec for high definition—external storage recommended

Quality: Excellent, broadcast quality

Capturing in uncompressed results in clearly defined video, at full raster size and 4:2:2 chroma sampling. Using uncompressed maintains high quality from capture all the way through effects rendering. Final Cut Pro supports RT with uncompressed media using RT Extreme. KONA 3 supports capture of uncompressed through its SDI input. Uncompressed media can output via all of the KONA 3 outputs simultaneously.

**Uncompressed
10-bit 4:2:2**

Data rate: 28 MB/second standard definition, or 133-166 MB/second high definition

Quality: Excellent, broadcast quality

Offering all the benefits noted previously for 8-bit uncompressed, 10-bit additionally offers higher color specificity for compositing and color correction. With Uncompressed 10-bit 4:2:2 media, video quality is second to none-at any price point - for non-linear post production. 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.”

**AJA Kona 10-bit
Log RGB and RGB
Codecs**

Data rate: 200 to 300+ MB/sec - high definition and 2K

Quality: Excellent, highest quality available

Offering all the benefits noted previously for 10-bit uncompressed 4:2:2, Dual Link 4:4:4 video uses 2 HD-SDI channels to provide full color resolution as well as luminance. The term “4:4:4” refers to the ratio of sampling frequencies used to define the RGB components of a video signal. In this ratio, the red, green and blue components receive equal specificity, providing increased quality over 4:2:2 where chroma sub-sampling occurs. 4:4:4 is particularly useful for film related digital intermediate work as well as the highest level compositing and color correction.

AJA Kona 10-bit Log RGB and RGB Codecs as related to a 2K Workflow

Data rate: For 2048x1556 2K:

- When seen as a QuickTime movie at 23.98fps with a raster of 2048x1556, the data rate is 300MB/second (approximately).
- When seen as a single frame DPX file with a 2048x1556 raster, the size is roughly 12+MB/frame.
- 2K uncompressed media necessitates the use of high-performance SCSI or Fibre Channel drive arrays.

Quality: Excellent, with additional cost and labor savings over traditional 2K workflows.

Workflow General Notes

The previously discussed codecs (DVCPRO HD, PhotoJPEG, DVCPRO 50, etc.) are used in different ways based on project characteristics. Some codecs create very high quality offline files at low data rates for projects that will ultimately be delivered as uncompressed via an offline/online process; other projects may use these compressed formats to create final masters. AJA provides Final Cut Pro Easy Setups for settings that can be used in a “capture once-use in many steps” type of process. For example, you might use offline files for editing, digital dailies for review from a digital projector, location footage viewing and editorial performed on laptops - even creating screening cuts of the project for approval and audience testing-all from one QuickTime file using the DVCPRO HD codec. Some examples of these scenario workflows are given following.

HD Offline Scenario #1

A popular way to edit long form content, such as feature films shot at 24fps film (or 23.98) is to take the telecine to HD tape masters, or the HD field masters (typically at 23.98fps) and then capture using the KONA 3 to a compressed format. An interesting and very high quality option would be to use the DVCPRO HD codec to capture from whatever deck you are using for your HD masters (typically HDcam or D5). This allows for offline files that in the 1080PsF 23.98 format are under 12MB/sec. and in the 720p raster are under 6MB/sec. This size and processing efficiency for the codec allows for the use of multiple layers of RT effects and color correction in the Final Cut Pro Dynamic RT environment. A choice of viewing quality (draft or high quality modes) can be selected depending on how much RT is required and the speed of your Apple computers processors. In addition to the low data rates, another advantage is that your offline files are in the same timebase as your original master tapes, greatly simplifying the online editing and finishing process.

A more traditional way (still supported by the KONA 3 using the on-board down-conversion option, and Cinema Tools software) is to down-convert your HD masters to an SD format (DVCam for example, at 29.97fps non-drop frame). This allows for traditional lower cost SD monitoring equipment to be used, but results in the changing of the editorial time base of your media for your offline editing, which then must be dealt with via a somewhat complex series of software steps. Keeping your files in the same timebase allows for a much simpler offline/online process, particularly when dealing with 24p HD media. For 29.97 (59.94) HD projects, the complexity of the changing time base is eliminated, but the same rules apply. In this case, using the 1080i DVCPRO HD setting for your offline gives you great quality results at data rates about half the size of SD uncompressed files for offline-all the while allowing editorial to be performed in a high quality compressed HD format.

HD Offline Scenario #2

The DV codec has been a staple of Final Cut Pro since the application's inception, providing a well-suited offline editing workflow that has proven to work fine for many projects. Similar to the process described above with the newer DVCPRO HD codec, this codec can be used to capture from your HD tapes at the native frame rates of those tapes (23.98fps). While not as high quality as DVCPRO HD, the files sizes can be even smaller-less than 3 MB/sec -and are usually more than adequate for offline purposes.

Mixing and Matching Formats in Final Cut

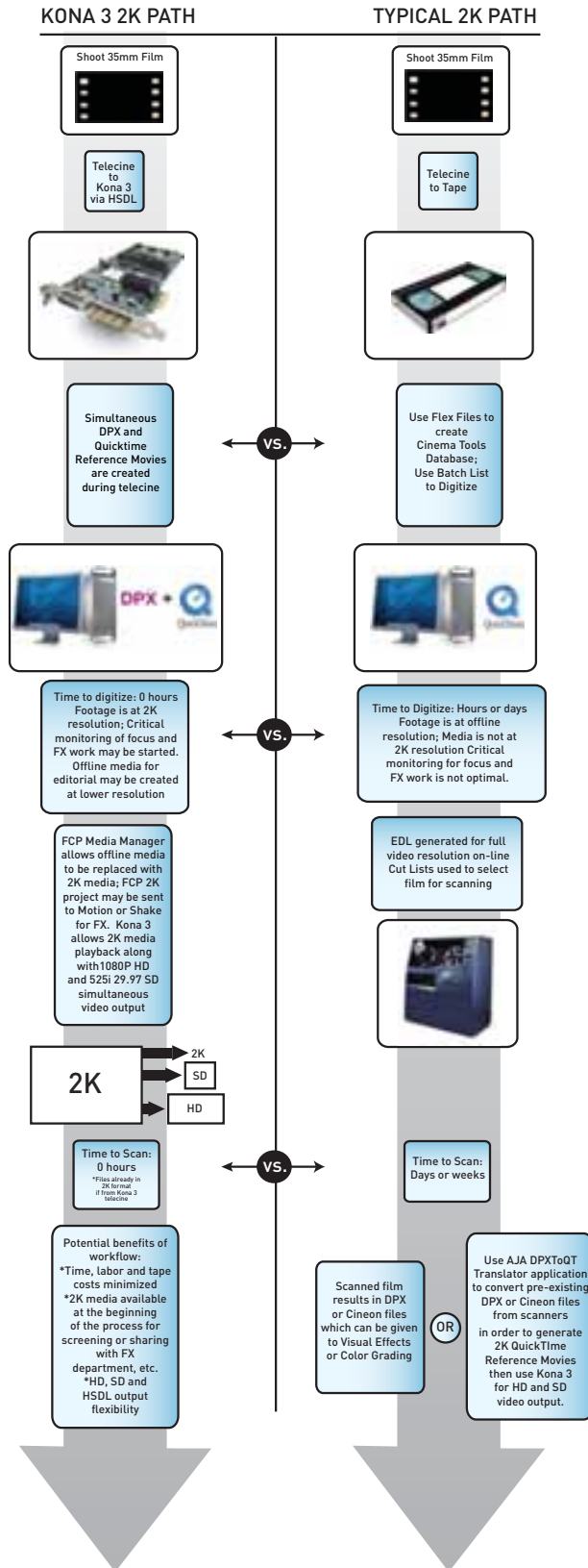
In Final Cut Pro, the best editorial results come from working with one format consistently per timeline. For example, if you capture HDV files and then capture 10-bit uncompressed files, you'll have to re-render one or the other when using the two types on the same Final Cut sequence (the timeline where media is edited into a project). You could even capture 8-bit uncompressed and DV, and then place them both on a PhotoJPEG timeline and end up having to render them both.

Therefore, it makes sense to capture media into your system at the highest quality you'll expect to use in Final Cut to eliminate re-rendering and ensure the best results for mastering. Otherwise a well thought out online/offline workflow should be mapped out before starting a project. Luckily, the KONA 3 card allows users to capture to a common codec easily with its hardware based upconversion, downconversion and crossconversion capabilities. For example, if a 720P 59.94 DVCPProHD master were desired, and the source material was standard definition Digital Betacam tapes at 29.97fps, DVCPProHD tapes at 59.94fps and HDCam tapes at 29.97fps, all of these tapes could be digitized to the common codec of DVCPProHD at 720P 59.94.

2K Workflows

For large facilities, KONA 3's 2K support allows ingest of 2K media via HSDL, high speed data link, (using SDI connections) from 2K telecine machines or DDRs into the KONA 3 as 2K sequential DPX files and 2K QuickTime reference movies simultaneously. 2K playout via HSDL further enhances the flexibility of KONA 3 to work with other 2K equipment such as DDRs and projectors that work with 2K. For cost-conscious facilities, playback of 2K to HD 24P supported monitors helps lower the price barrier for working with, and especially viewing, 2K material.

When comparing the traditional 2K path and a potential Kona3 2K path, the potential for cost and labor savings becomes apparent. By avoiding the telecine to tape and instead going straight to disk with media, the Kona3 2K path can immediately save users the cost of tape stock and the time associated with then digitizing these tapes into a non-linear editor. By generating 2K DPX files during the digitize phase, the Kona3 also moves a portion of the 2K process up to the beginning - instead of the end - of the post production process; this means that shots intended for visual effects work could be given to visual effects artists at full resolution at the beginning of the process instead of waiting until near the end of the process. The flexibility of an offline using Final Cut Pro leveraged against the power of QuickTime and Final Cut Pro's media management tools, allows easy access to 2K resolution files and even potential 2K online possibilities.

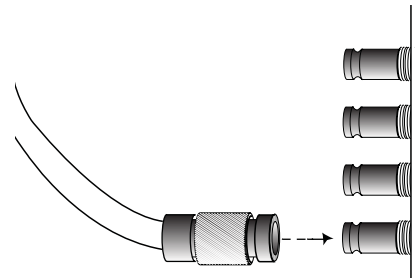


KONA 3 Workflow for 2K Compared to Traditional 2K Workflow

Important Note about 2K: Operational procedures and information for working with 2K workflows are presented in Appendix C at the back of this manual. 2K workflows are unique and require the use of KONA's VTR Exchange and Final Cut Pro, in conjunction with the 2K Crop features of the KONA Control Panel (discussed in Chapter 4-2K Crop Screen). To begin working with 2K, please read Appendix C.

For more information on 2K and the use of the AJA KONA 3 card, users should download the AJA whitepapers on this specific topic on our website (www.aja.com).

Chapter 3: Installation & Configuration



Installation Overview

The installation and set up of a KONA 3 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, ensure that Final Cut Pro is installed as detailed in its user documentation. (If you do not intend to use the KONA card with Final Cut Pro but the AJA provided stand alone applications, FCP need not be installed.) Not only must Final Cut Pro be installed in order for the Kona Easy Setups to be properly installed for FCP use, FCP should have been run at least once prior to installing the AJA KONA 3 driver. If other capture cards have been installed, the software for those products should be removed before installing the Kona driver to avoid possible conflicts.
3. Lay the Mac on it's side (motherboard facing up, side door opening up toward you).
4. For the PCIe version of the KONA 3 capture card, AJA recommends that the KONA 3 be placed in Slot 3 and the Apple Expansion Slot Utility be configured so that the slot is running at x4 lane speed or higher. (The choice of x4, x4, x1 and x16 is ideal.) For the PCI-X 133Mhz version of the KONA 3 card (KONA 3X), PCI-X enabled G5s slot 4 is a 133Mhz slot. For the Intel based Apple XServe product, the PCI-X version of the KONA 3 may be used in the slot—if the PCI-X riser is in place.
5. Install AJA KONA 3 software on your Mac (while the CD supplied with your card will likely have a recent version of the driver, the fast paced nature of feature releases and updates means that visiting the AJA website for the latest driver is usually a better choice.)

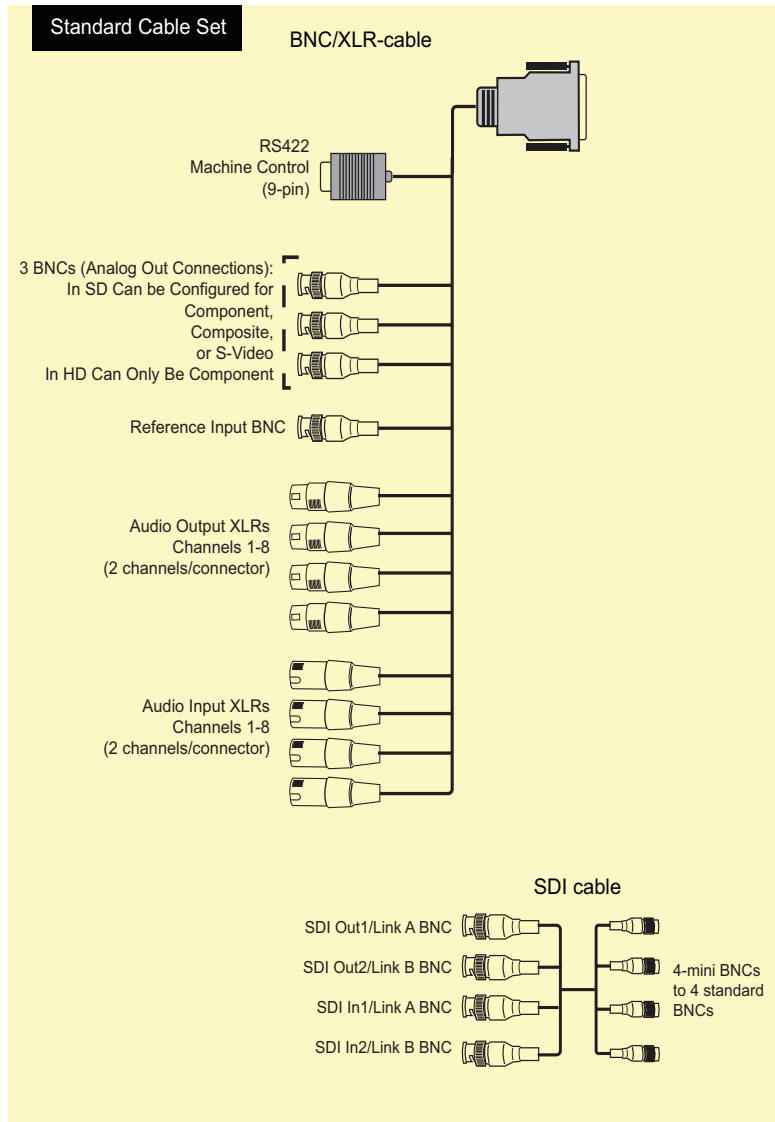
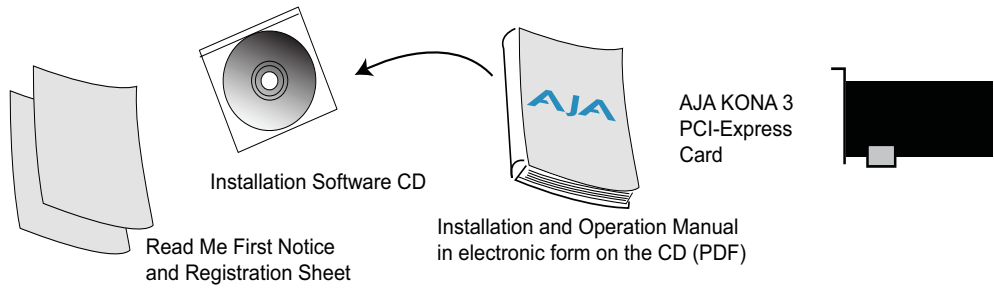
6. Cable the system audio and video sources, VTR, audio monitor, and video monitor. If you purchased the optional Breakout Box, then install it into an equipment rack or place it on a desk and connect its cables to the KONA 3 card. If you're instead using the standard cable set, then use those to connect equipment.

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

Unpacking

Shipping Box Contents

KONA 3 is shipped with a CD containing system software for installation and a user manual (a PDF on the CD), and two cables (a multi-pin to multi-connector breakout cable and a x4 BNC to 1.0/2.3 connectors cable). If you purchased the optional K3-Box breakout box, it ships with a multi-pin to multi-pin cable for connecting from the KONA 3 card to the breakout box. The x4 BNC cable to 1.0/2.3 connectors cable that shipped with the card is also needed interconnect the SDI connectors out of the card to the breakout box.



Contents, KONA 3 Shipping Box Contents

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 3 repaired or replaced.

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

Installing the KONA 3 Card into a MacPro or G5

1. Place the computer in a well-lit area, where you will have easy access when opening the MacPro or G5 chassis.
2. Using your hand, touch the outside of the Mac to discharge any static electricity you have. Remove the power cable from the back of the chassis.
3. Remove the side access door and clear inner panel as described in your Apple User Manual. The Mac Pro does not have a clear inner panel so you will have direct access to the slots. Lay the machine on its side, motherboard facing up.
4. Remove the KONA 3 card from its protective anti-static bag; place the card on top of the bag.
5. Visually locate the PCI-Express slots inside the Mac chassis (G5 photo shown on the following page). The KONA card only requires a x4 lane PCI-Express slot, so any of the available slots will work correctly—(be aware that slot 4 is the preferred slot on a PCIe G5 and slot 3 is the preferred slot on the MacPro) You should also be aware to configure the slots with the Apple Expansion Slot Utility application for the MacPro so that the KONA is at x4 or better speed. For PCI-X KONA 3 cards, the top slot of PCI-X enabled G5s is a 133Mhz slot suitable for the KONA 3 card.
6. Remove the card edge access cover from the desired slot where you will be inserting the KONA 3 card. The card edge cover is secured by a phillips screw on G5s and by a tie-down bar with two secured screws on MacPro computers; after removing either, set them aside for use in securing the KONA 3 in the slot later in the installation process.
7. Holding the KONA 3 card by the card edge plate and an outside edge, carefully insert the KONA 3 card by rocking it slowly into the slot. Ensure the card edge aligns properly with the computer's slot 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 or with the tie-down bar found on MacPro machines.
9. Replace the G5's clear inner panel for the G5 machines and then the outer access door for G5s or MacPro machines.



KONA 3 Card

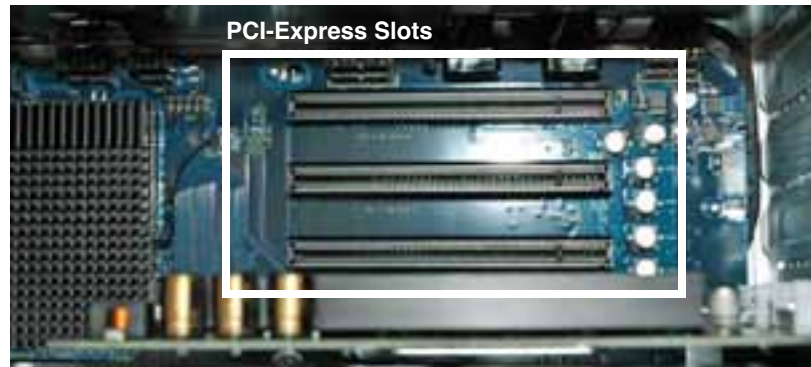


To Install:

1. Remove Screw and Cover Plate and Insert KONA Card
2. Secure KONA with Screw Removed Earlier

PCI-Express Slots

PowerMac G5 Cardcage Access (MacPro card cage differs in appearance)



Slot 4 is the preferred slot on a PCIe G5 for KONA 3 PCIe card installation
Slot 3 is the preferred slot on a MacPro for KONA 3 PCIe card installation
Top Slot is preferred in PCI-X G5s (133Mhz slot) for KONA 3X PCI-X card installation

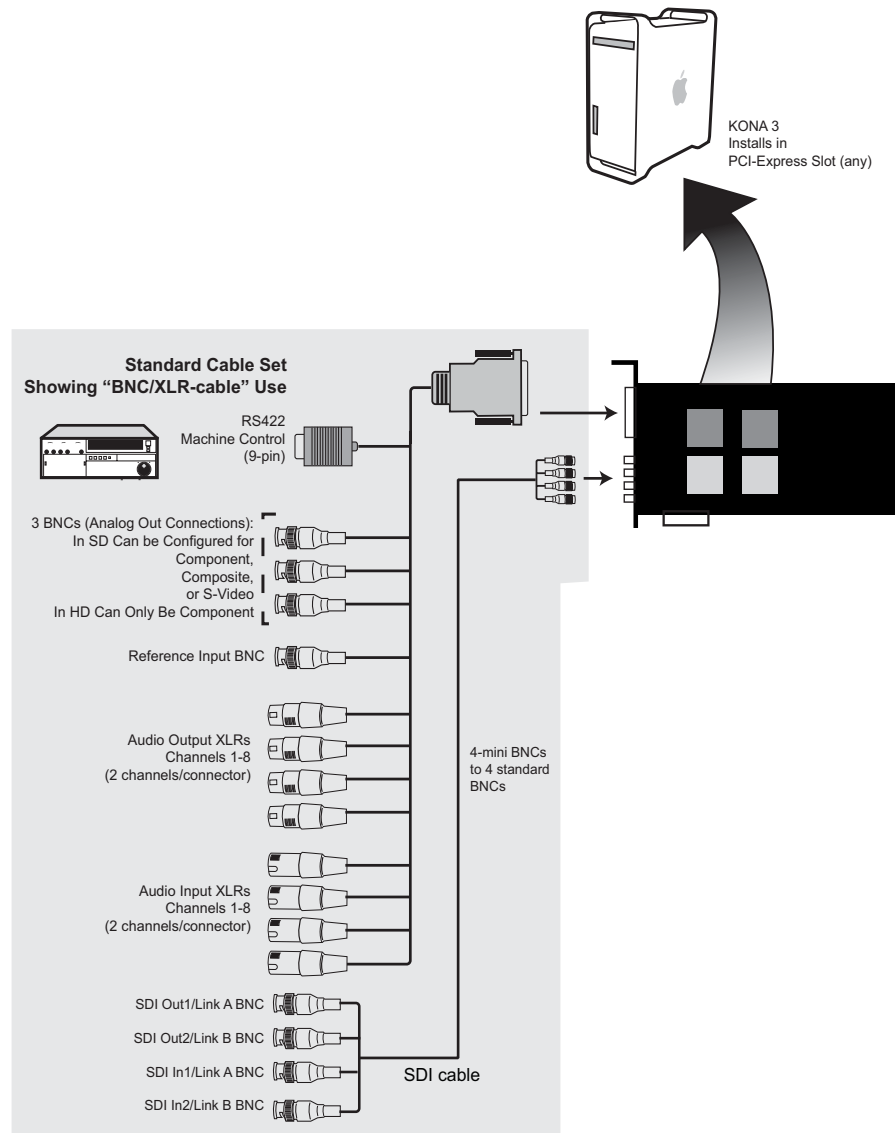
Card Slots, PCIe G5 shown here

Note: After you install the KONA 3 card, you may notice that in the MacOSX Network preferences there is a message stating “You have a new network port named KONA 3 —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 3 card that you will use for VTR machine control.

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.



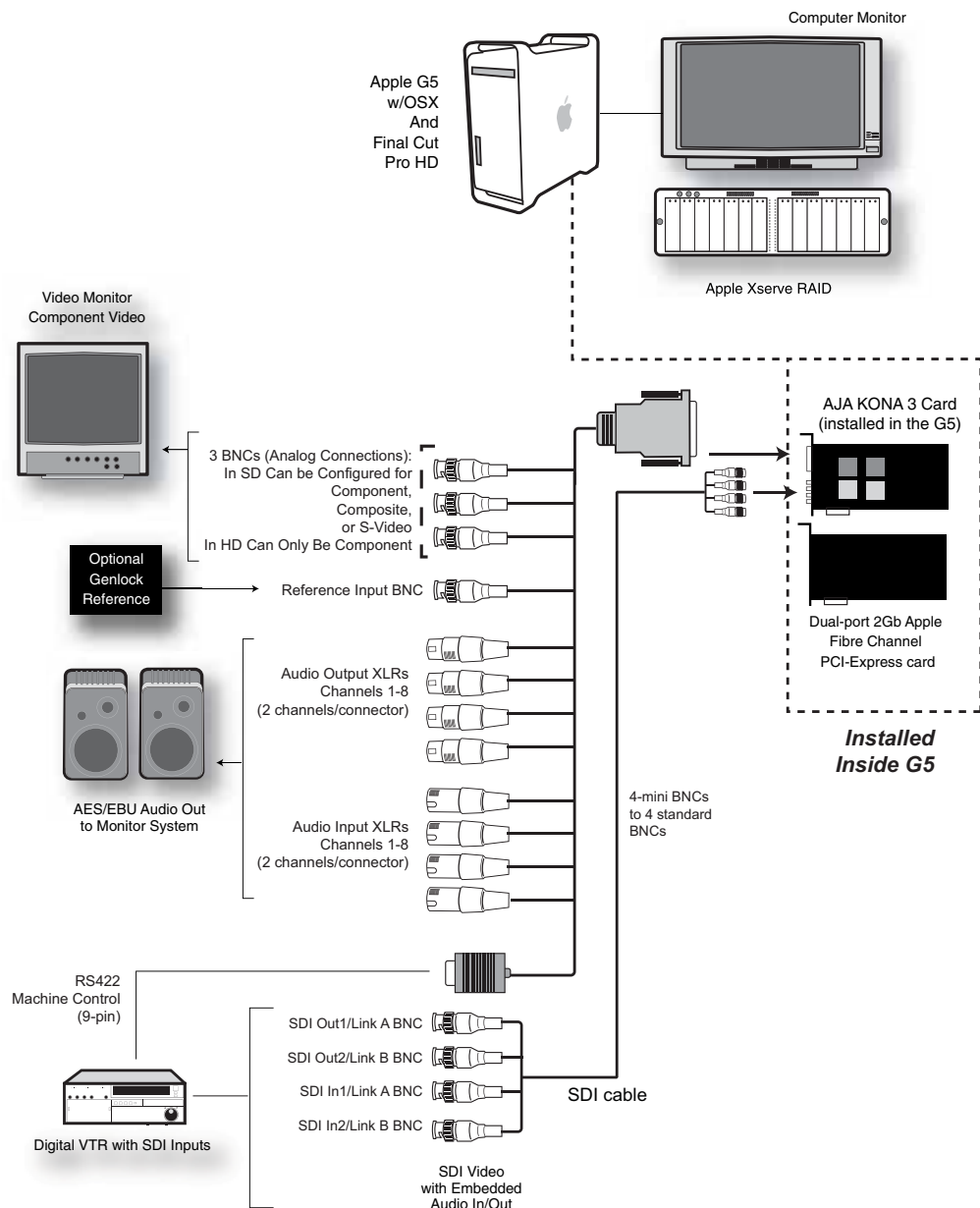
KONA 3 System Using Breakout Cable

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 3 Ref Loop connector (BNC). On the breakout cable this is a terminated reference input. The second KONA 3 Ref Loop connector on the optional Breakout Box can be connected to your VTR. If you do not loop through the reference, the second connector should be terminated with a 75 ohm terminator.
2. Connect a Video Monitor to the KONA 3 Component Analog Video Out BNC connectors (preferred), or instead connect to a composite monitor. (If you have an SDI or HD-SDI enabled monitor, you may also connect one of the Kona SDI outputs to a monitor as well.)
3. Connect the 9-pin DB9 machine control cable on the supplied breakout cable to your VTR's RS422 control port or connect a 9 pin DB9 cable between the breakout box and the VTR's RS422 serial port.

4. Connect two SDI cables between KONA 3 and your digital VTR (Digital Betacam etc.): one from KONA 3 SDI In to the VTR SDI Out, and one from KONA 3 SDI Out (1 or 2) to the VTR SDI In. The KONA 3 SDI connections have embedded audio (16-channels) so the VTR must be configured accordingly. These connections will be made via the mini-connectors-to-BNC cable or via the optional K3-Box.
5. If you have an AES/EBU-ready audio monitoring system, then connect the eight channels of AES/EBU output from KONA 3's XLR (or BNC connectors-if using an optional K3-Box): 1/2, 3/4, 5/6, and 7/8, to the monitoring system AES/EBU inputs. If you instead have an analog audio monitoring system, you can use the two RCA-style unbalanced stereo output jacks on the optional K3-Box for output.



Typical System Connections

Installing KONA 3 Software

First ensure that Final Cut Pro is installed as detailed in its user documentation. Next, install the KONA 3 driver. You cannot use KONA 3 with Final Cut Pro until the Final Cut Pro software has been installed and run at least once on the Mac. You also cannot use KONA 3 with Final Cut Pro until you run the KONA 3 driver and software installer.

System software updates may occasionally become available to AJA KONA 3 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 3. This will prevent any hardware or software conflicts. KONA 3 will operate properly on a Mac that also has an AJA Io product and its associated drivers installed.

Software Installation Procedure

For the most recent version of the KONA 3 driver, it is best to visit the AJA website at www.aja.com, download the driver and read the details and requirements on the current driver in order to ensure compatibility with your system configuration. Your system should be an Apple PowerPC Mac G5 or Apple Intel MacPro. Minimum system requirements for the host were described in *Chapter 1: System Requirements*.

Note: Before installing KONA 3 software, turn off any virus protection and security software that you may have installed on your computer.

1. Visit the AJA website for the latest driver version appropriate to your configuration. Alternately, if you have no internet connection, insert the KONA 3 CD in the Mac; as noted, this driver version may not be the most current.
2. Locate the downloaded driver on the desktop or the KONA 3 CD icon on the desktop.
3. Locate the package file in the folder from the download or by double clicking on the CD; the package has an icon that looks like a box and has a “.pkg” suffix.

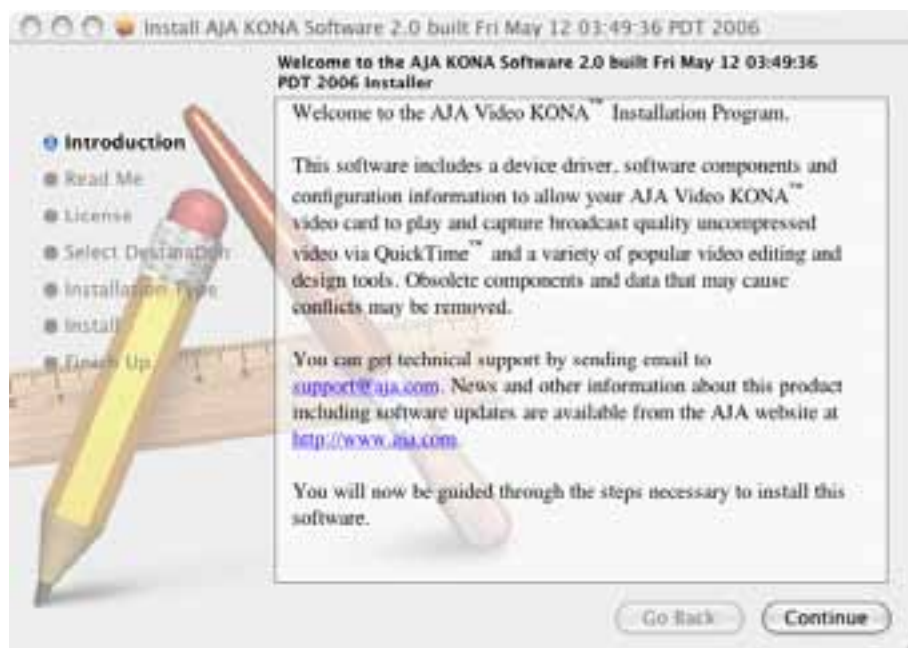
Note: Files ending in the “.pkg” suffix are OS X installer files. These launch the OS X installer and tell it where and what to install on your system.

4. Double-click the package to log on and begin software installation.
5. 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

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



Initial Installer Screen

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



System Check Installer Screen

10. Read and agree to the Software License Agreement.



KONA 3 Software License Agreement Screen

11. 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 3 Software

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



Easy Install, Installer Screen

13. A system prompt will pop up with a reminder that OS X must be restarted after installation. Click the *Continue Installation* button to proceed.
14. The installer will run and put all the necessary KONA 3 drivers, KONA 3 Control Panel, presets and additional software on the desired hard drive. When it has completed installation, a final screen will be displayed announcing that “software was successfully installed.”
15. 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 3 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 3 cables and optional K3-Box breakout box, house sync is connected to “Ref Loop”.

Chapter 4:

Final Cut Pro and Other Software



Final Cut Pro

After you install the KONA 3 software on your Mac, all you need to do to begin using it is to become familiar with the KONA 3 Control Panel and how Final Cut Pro works with KONA 3.

With Final Cut Pro you'll choose the proper setups from those provided by AJA to utilize the card for input and output. These provided setups are called "Easy Setups" in Final Cut Pro and are available to use under Audio/Video Settings in the "Final Cut Pro" menu (next to the apple menu). For unique workflows or situations, the AJA provided Easy Setups may be copied and modified.

You'll also need to gain familiarity with the KONA 3 Control Panel, which will be used for source input selection, configuring many KONA 3 features, and for creating your own preset configurations for different applications.

The manual you are reading does not provide operational information about Final Cut Pro. Please read the Final Cut Pro user documentation provided with it for information on configuration and operation. The chapter you are reading addresses configuration and setup unique to the use of KONA 3 with Final Cut Pro and other applications.

Using The KONA 3 Control Panel

The KONA 3 control panel is a software application that provides a simple visual way to see how the KONA 3 card is currently configured and then make changes as desired. Settings-both what you changed and didn't-can be saved as a preset 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 of the up-converters/downconverters, the input and output settings, and many other details can be viewed as a color-coded block diagram in the control panel. You can even access the Kona Control Panel application without exiting the application by first holding down the command key (Apple key) before mouse clicking on the Kona Control Panel application on the desktop.

For this reason, it is useful to leave the Kona Control Panel application on the desktop while you work in applications and simply command click into it to access it if you are unsure of a setting or wish to make a change.

Control Panel Basics

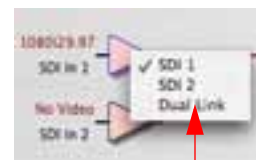
Although the KONA 3 card auto-detects the input format depending on the input that it is presented, and the Control Panel intuitively shows at a glance much about what the card is doing—there is even more information presented that may not be obvious. To ensure you make the most of the software, run the KONA 3 Control Panel application and look at its display. Then refer to the “Basics” described here to better understand what you’re seeing and learn how to view and change the KONA 3 system configuration.

Note: The KONA Control Panel also works with KONA LS/LSe, KONA LH/LHe, and KONA 2. However, the actual features and screens displayed differ slightly since the board feature sets differ. Currently, only one KONA card can be installed in a Mac at a time.

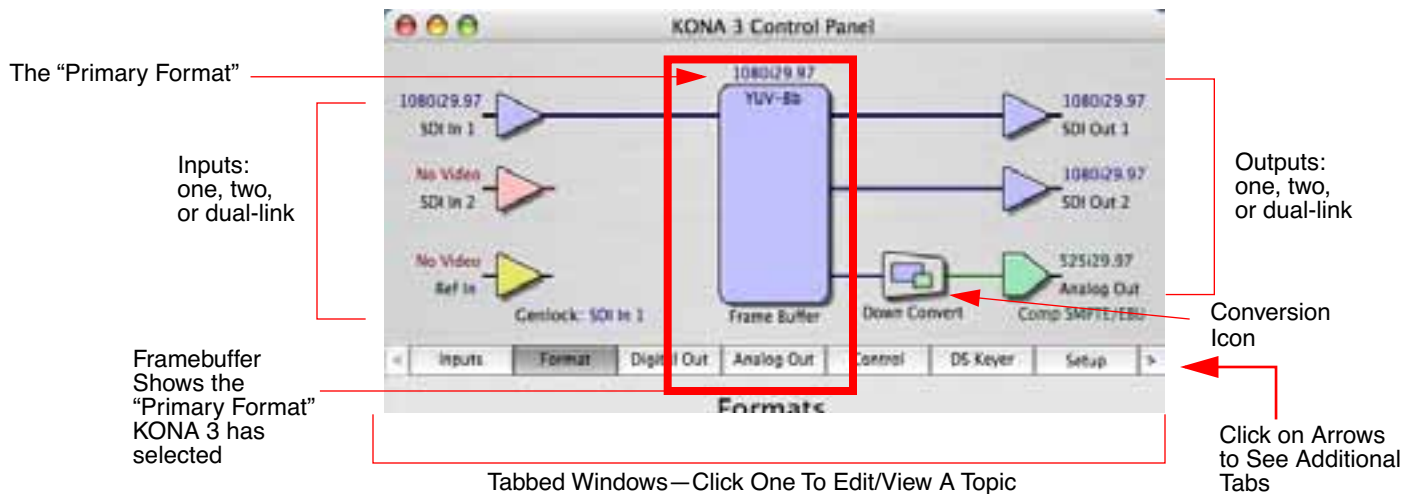
Before we go into too much detail, here are some basic definitions you should know (please refer to the figure that follows for reference). After studying the basics, read “*Who is Controlling KONA 3?*” later in this chapter for more advanced information on how applications interact with the KONA 3 board.

Block Diagram Screen—the top area of the KONA 3 Control Panel shows a visual picture representing the processing (if any) that’s currently occurring, including inputs/outputs, any up/down/cross conversion, 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. The lines will also show whether the input or outputs are single inputs/outputs or dual-link (where two channels are used to carry the bandwidth of HD-SDI 4:4:4 video), and whether output is video or video + key.

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

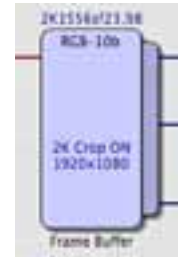


Control-Clicking
an Icon Produces
a Context-sensitive
Menu



KONA 3 Control Panel, Block Diagram

Framebuffer—the framebuffer is the “engine” in the KONA 3 card where active video operations take place using Final Cut Pro, other 3rd-party applications, or even KONA 3 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). If the framebuffer is processing 2K frame video—and video cropping is turned ON, it will indicate the cropping by showing a “shadow” underneath the icon (more later on how it's cropped).

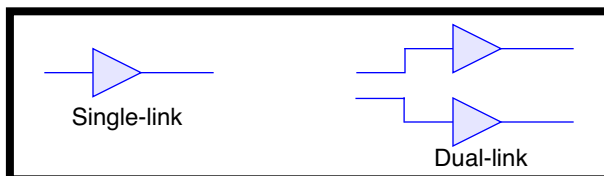


It is important to realize that inside the Macintosh many applications can use the KONA 3 card (as you switch from window to window) and it may not always be obvious which is currently controlling it. The KONA 3 Control Panel displays the name of the application controlling the card in red text on the Format and Control tabs of the interface. If an application does not properly “let go” of the card as another takes over—you'll be able to tell by looking at the Control Panel.

Primary Format—the video format currently assigned to KONA 3. 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 KONA 3 is performing a format conversion in the video path.

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

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



Input/Output Icons

Conversion Icons—when an input or output is a different standard than the framebuffer then the KONA 3 may be upconverting, downconverting or crossconverting 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. In the case of cross-conversion, the type of crossconvert will be shown under the icon (in the example that follows, it's "1080 to 720").



Down, Up, and Cross Conversion Icons

Color Meanings—all items in the KONA 3 Control Panel block diagram are color-coded to show what is happening in realtime. This applies to both icons and text. These colors have the following corresponding meanings:

Blue: video is same format as the Primary Format (framebuffer)

Red: the selected operation cannot be performed or an invalid selection has been made

Yellow: reference video (black burst or other reference source)

Green: indicates that KONA 3 is performing some kind of active change to the video, to make it different from the Primary Format (e.g., up/down convert, format change, etc.).

Tabbed Windows—the bottom area of the KONA 3 Control Panel provides different information categorized by topic. Clicking on a “Tab”-or a block diagram element-will result in an information screen corresponding to a tabbed topic. With the mouse on a block diagram element, you can also control click to reveal drop down menus for certain functions. The arrows at either side of the displayed tabs can be clicked to see any additional tabs not visible on the screen. If an arrow is “grayed out”, then it means there are no additional tabs in that direction. Each of these tabbed windows are described on the following pages.

Tabs available are:

Inputs: view and edit input selections and how they are mapped.

Formats: select the framebuffer primary video format, any secondary.

formats, and parameters of up/down/crossconversion for input/output.

Digital Out: assign outputs either Primary or Secondary formats.

Analog Out: configure the component/composite +Y/C analog output.

Control: configures KONA 3 default output (test pattern, pass through, desktop, etc.) plus setting genlock and output timing.

DS Keyer: configure the hardware-based downstream keyer for putting image files with alpha channels, like logos, or other video material with an alpha channel on top of video being passed through the card or played out of the card.

Setup: configures Video and Audio options such as composite black level and analog audio monitor level.

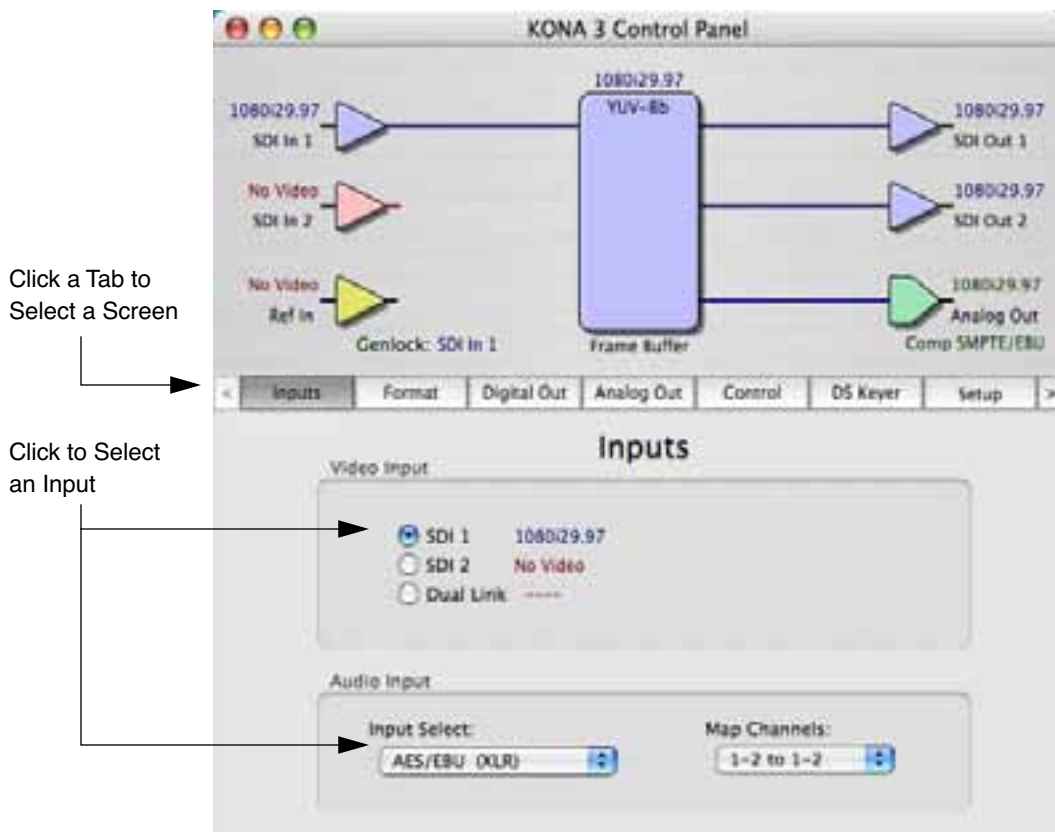
Codec: used to select codec options such as whether paused video appears as a full frame or a single field (jitter shown or not shown) and 24 to 30 fps padding patterns.

Timecode: monitor RP-188 timecode and configure timecode window burn output

2K Crop: select a 2K crop mode and the portion displayed from the overall frame.

Info: displays status information about the KONA 3 card and how it is installed in the host Macintosh. This information is generally intended for troubleshooting and support.

Input Tab Screen



KONA 3 Control Panel, Inputs Tab

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

Input Tab Screen Settings

Video Input—these radio buttons allow you to see and change what's currently selected and the video format that KONA 3 has detected (if any). In the example shown previously, it shows that video is selected at the SDI 1 input and the format is 1080i with a frame rate of 29.97. Since this text is shown in blue, you can tell that it does match the framebuffer's primary format you've set in the "Formats" screen. By looking at the input source, you can determine how the primary format should likely be set (unless you want to perform a conversion on input.) If you wish to select a different input you can do so by clicking a different radio button or you may want to select Dual Link if your source is 4:4:4 RGB.

Audio Input—this pulldown menu allows you to pick where the audio comes from. KONA 3 supports up to 8 channels of AES via XLR (or BNC on the K3-box) or 16 channels of SDI embedded audio. You can choose out of the 16 channels embedded in the SDI, and pick which 8 to bring in (1-8 or 9-16). Here you can also select which two channels from the 8 embedded would be mapped to Final Cut's if only two channels were selected in the application. FCP 5 and higher supports multi-channel input and output so you may elect to select up to all 16 embedded audio channels.

When a KONA 3 has a Breakout Box attached, there are two ways to connect AES/EBU inputs: XLR or BNC connectors. The Audio Input pulldown allows you to select which of the two connector groups will be used. If you digitize footage and find that there is no audio present on the captured footage, it may simply be because the audio selection in the Kona Control Panel is set to AES/EBU (BNC) when in fact you are connected via AES/EBU (XLR).



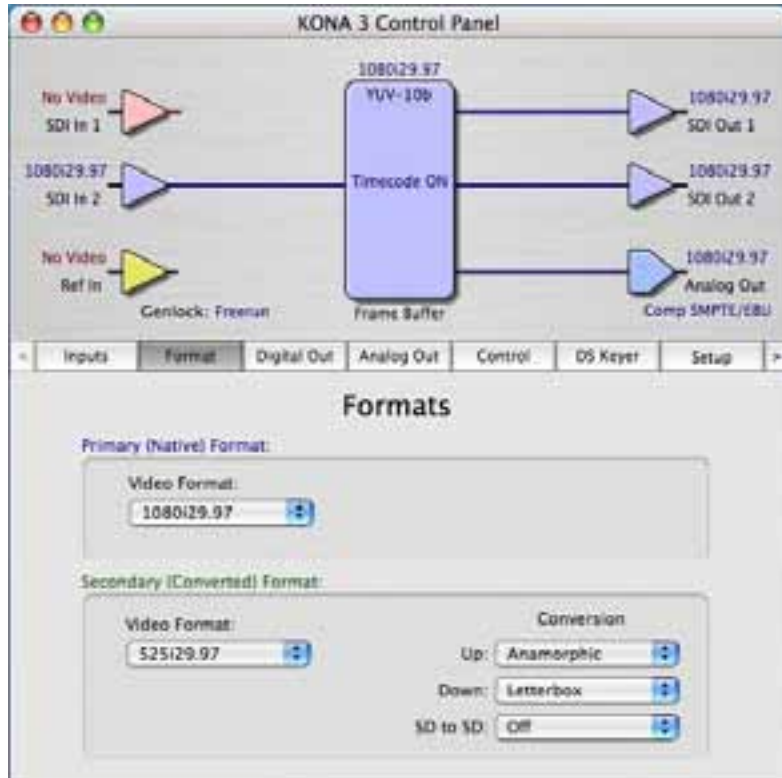
Audio Input Select Choices



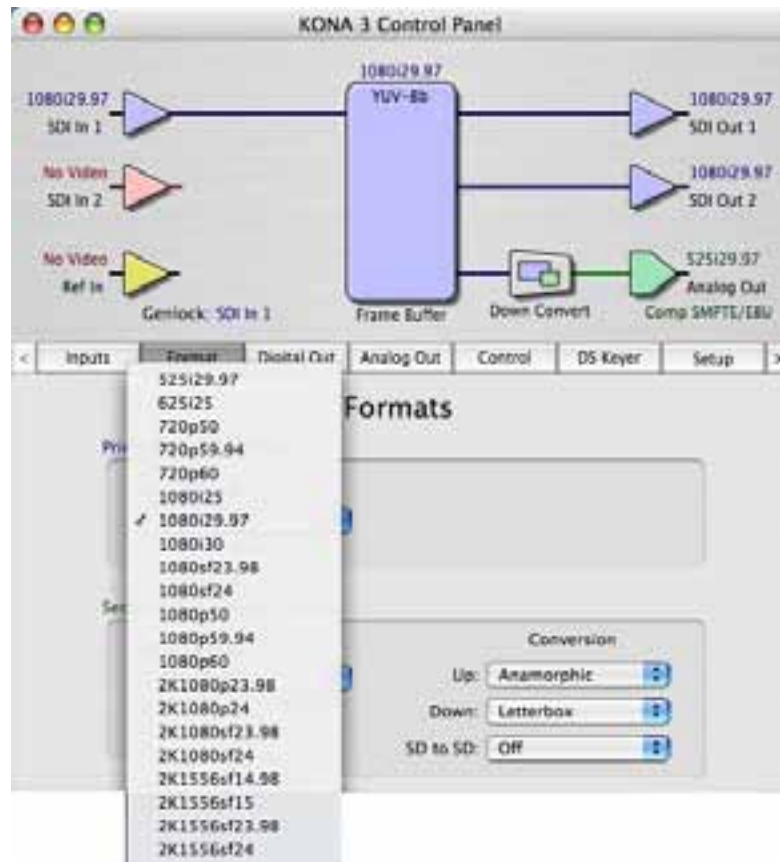
Audio Map Channel Choices

Formats Tab Screen

The Formats screen shows the video format currently in use by the KONA 3 framebuffer (called the *Primary Format*) and allows you to change it. All throughout the Control Panel, choices are always presented based on what KONA 3 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 up/down/cross conversion is employed.



KONA 3 Control Panel, Formats Tab



KONA 3 Control Panel, Formats Tab, Showing Primary Formats Pull-down Menu

Format Tab Screen Settings

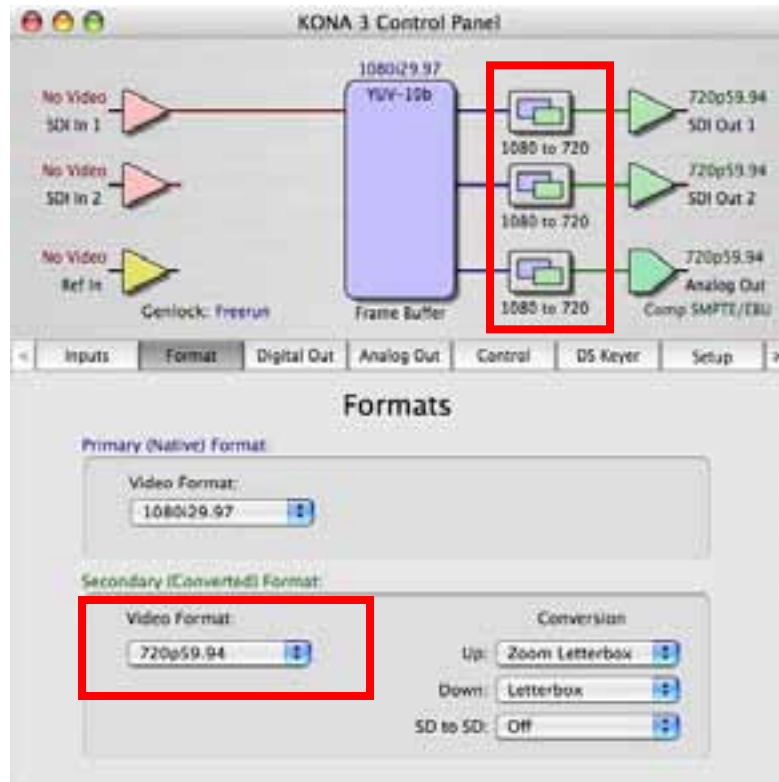
Video Format—this pull-down menu shows the currently selected format. This pull-down appears in both the Primary Format area of the Formats screen as well as the Secondary Format area (if present). If you select an alternate value in the Primary Format using the pull-down, it will change the format used by KONA 3's 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. In the case of a Secondary Format, the formats available can vary based on what the Primary Format is and the input signal (frame rates of input sources limits the to/from conversion choices). The "Secondary Video Format" pull-down menu lists all 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.

KONA 3 Formats include:

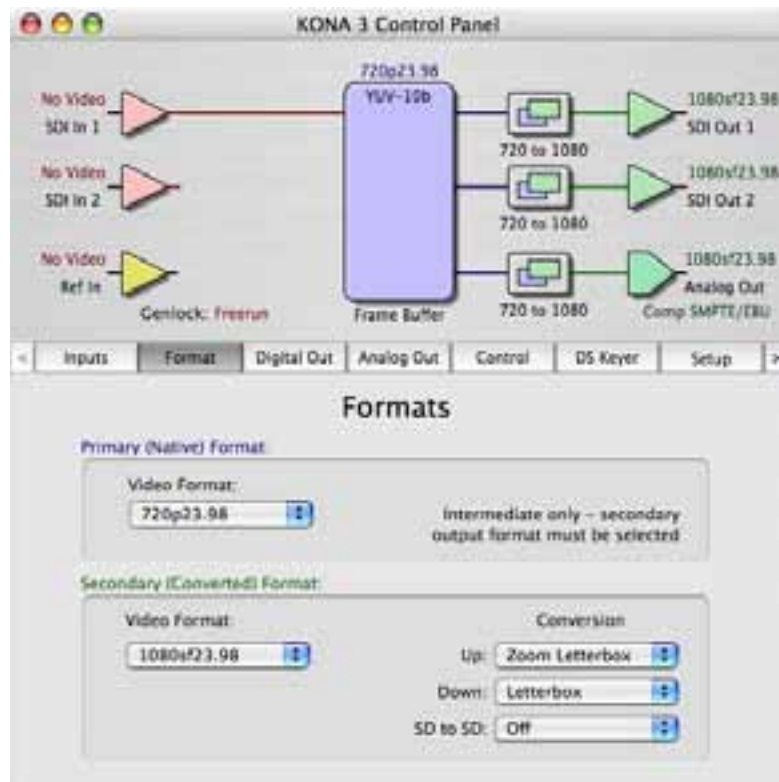
525i 23.98
525i 29.97
625i 25
720p 23.98
720p50
720p 59.94
720p 60
1080i 25
1080i 29.97
1080i 30
1080sf 23.98
1080sf 24
1080p23.98
1080p24
1080p25
1080p29.97
1080p30
1080p50
1080p59.94
1080p60
2K1080p23.98
2K1080p24
2K1080sf23.98
2K1080sf24
2K1556sf14.98
2K1556sf15
2K1556sf23.98
2K1556sf24

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 Kona Control Panel) as compared to progressive frame formats which will show only "p."

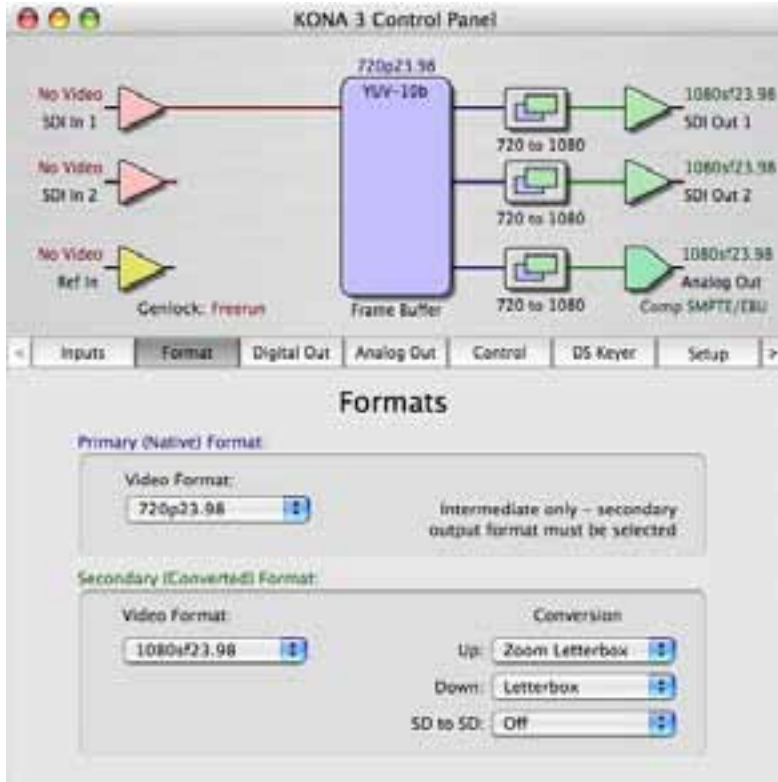
Crossconversion: if you have an HD format as your primary and then select a secondary HD format with a different frame size, the KONA 3 card will perform a crossconversion where necessary (input or output) for "*like Hz*" formats. By *like Hz* this means that 720P 59.94 may be converted to 1080i 29.97 (59.94Hz). Converting from disparate Hz is not supported on the KONA 3 card for crossconversions. The example below shows 1080i to 720p.



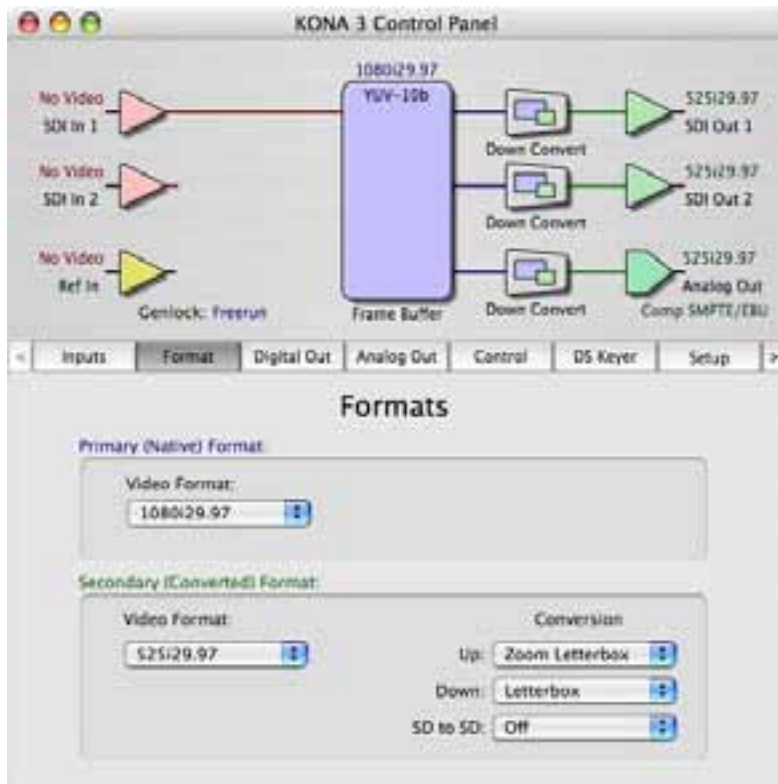
KONA 3 Control Panel, Formats Tab Showing Crossconversion, 1080i to 720p



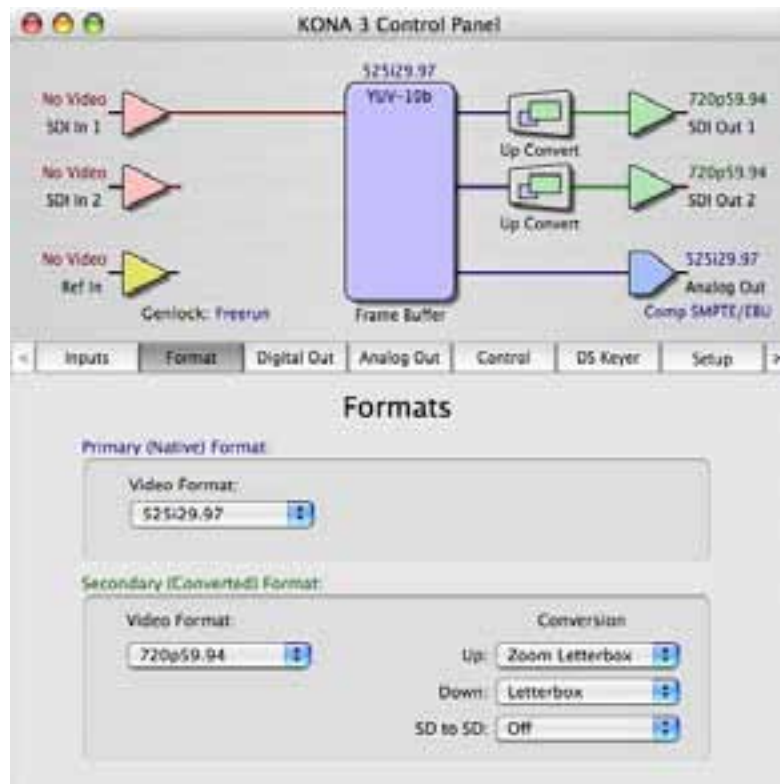
KONA 3 Control Panel, Formats Tab Showing Crossconversion, 720p to 1080i



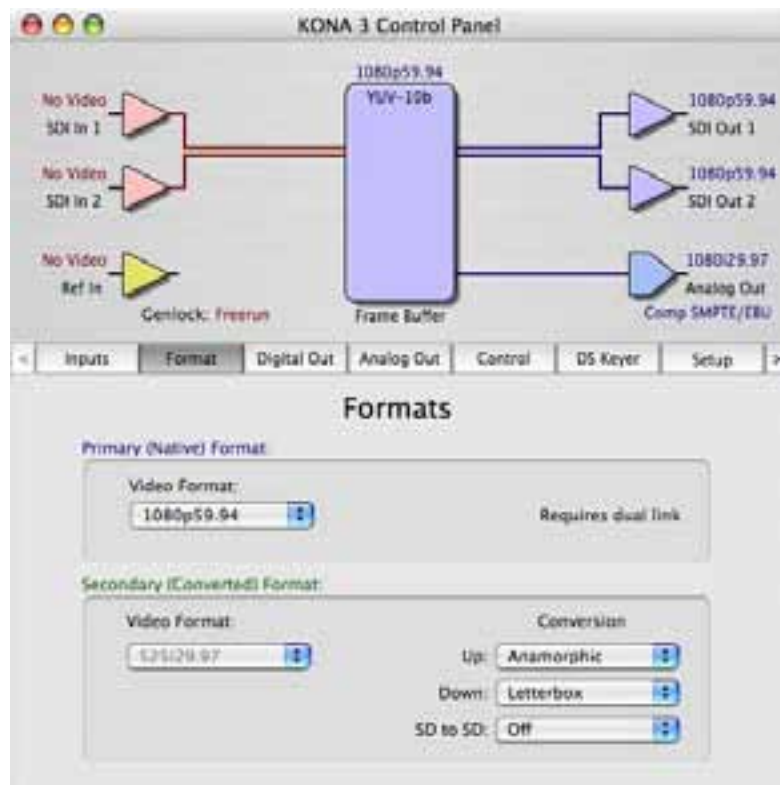
KONA 3 Control Panel, Formats Tab Showing Crossconversion, 720p to 1080PsF



KONA 3 Control Panel, Formats Tab Showing Crossconversion, 1080i Downconvert



KONA 3 Control Panel, Formats Tab Showing Crossconversion, SD to 720p Upconvert



KONA 3 Control Panel, Formats Tab Showing Dual-link In/Out (no conversion)

Up (Conversion)—the *Up* and *Down* pull-down menus are available when conversion has been selected for the video path to/from the framebuffer and like Hz formats are selected (the one exception is 1080PsF 23.98 which can be downconverted to 525i 29.97.) Different choices will be available depending on the type of conversion and formats being converted. SD to SD conversions are essentially aspect ratio conversions to accommodate transforming anamorphic images to letterbox or vice versa.

For Upconversion the following choices are available:

Anamorphic: full-screen “stretched” image

Pillar box 4:3: results in a 4:3 image in center of screen with black sidebars

Zoom 14:9: results in a 4:3 image zoomed slightly to fill a 14:9 image with black sidebars

Zoom Letterbox: results in image zoomed to fill full screen

Zoom Wide: results in a combination of zoom and horizontal stretch to fill a 16:9 screen; this setting can introduce a small aspect ratio change

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

SD to SD—this pulldown is for SD to SD aspect ratio conversion.

Letterbox: this transforms SD anamorphic material to a letterboxed image.

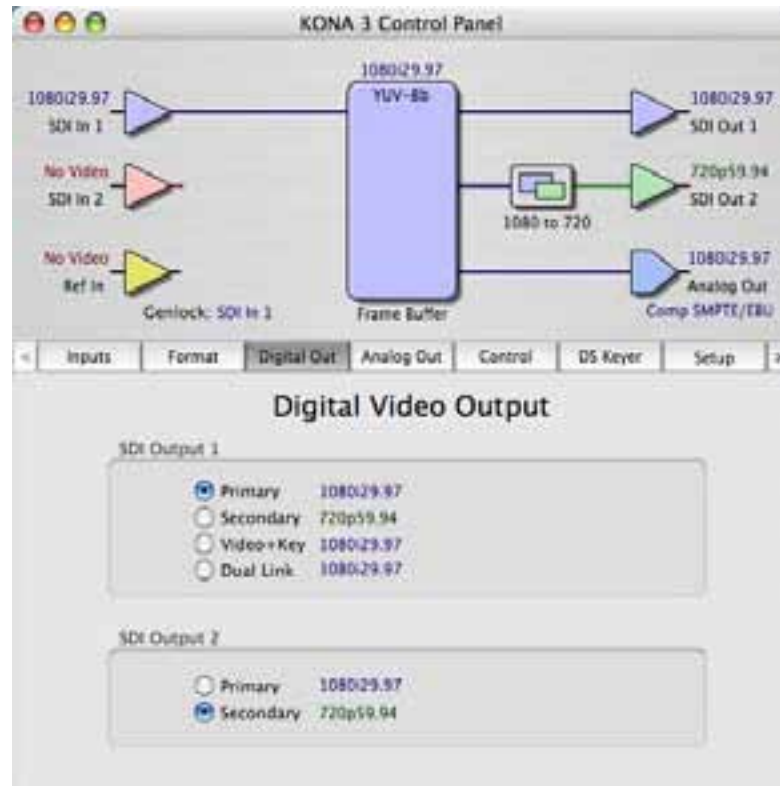
H Crop: will produce a horizontally stretched effect on the image; transforms anamorphic SD to full frame SD

Pillarbox: will produce an image in the center of the screen with black borders on the left and right sides and an anamorphized image in the center

V Crop: will transform SD letterbox material to an anamorphic image

Digital Out Tab Screen

The Digital Out tab shows the current settings for both of the SDI outputs. Because the outputs can be configured independently, one output may be the Primary format and the other output may be the Secondary format. If an input/output has no video, it will be indicated on the block diagram (“No Video”).



KONA 3 Control Panel, Digital Out Tab

Digital Out Tab Screen Settings

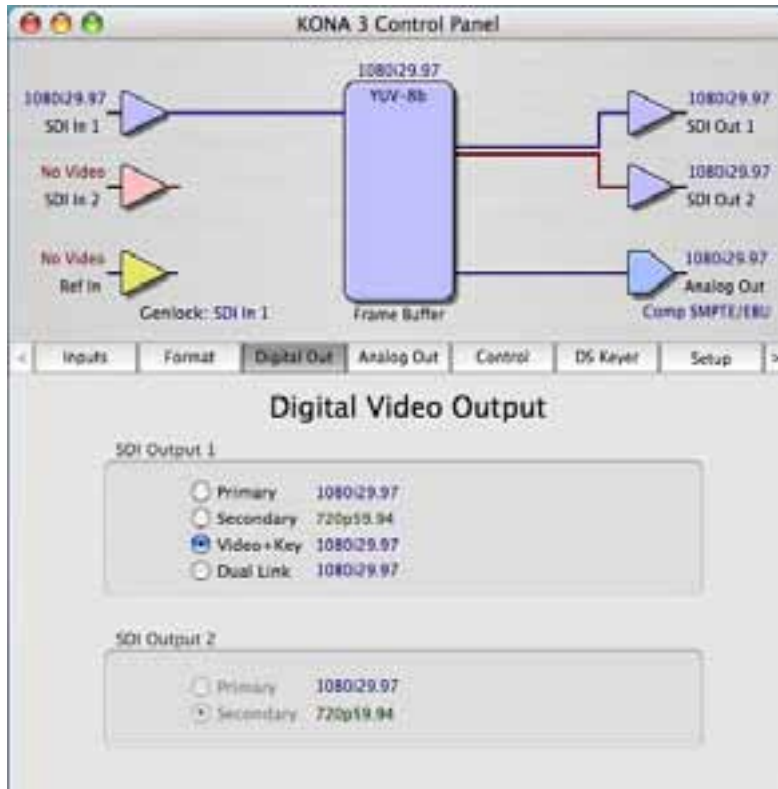
Separate information panes will be listed (as applicable) for SDI Outputs 1 and 2. Information that can appear includes the following items. You can view the current setting or click on another to change to it:

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

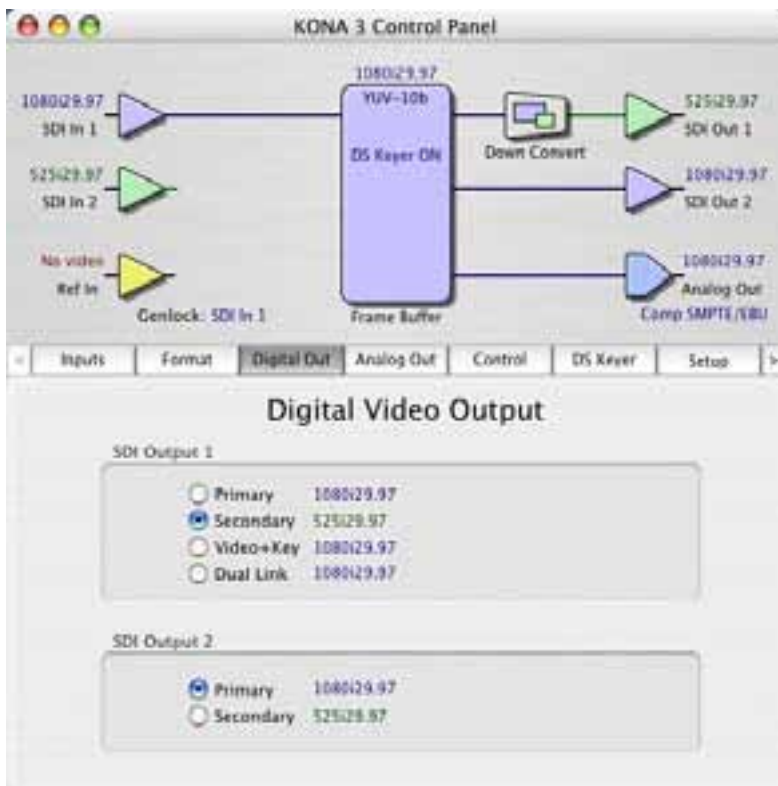
Secondary—when selected, this indicates that the SDI output is set to a format different from the framebuffer (Primary Format). That secondary format value will be listed in green. This shows that active processing of the video is taking place (format change and possibly even up/down-conversion).

Dual Link—when selected, this indicates that both SDI outputs are being used together to output a 4:4:4 dual-link signal from the KONA 3 card.

Video+Key—when selected, this indicates that the SDI output 1 video is set to the same format as the framebuffer. SDI output 2 is set to a video key signal associated with output 1 (the shape to be cut out from the video - this will appear as a black and white image/matte). Using the second KONA output as an Alpha Channel key, with the video output, may be useful for feeding production switchers, DVEs or other professional video equipment. If Video+Key has been selected as an output, the block diagram will indicate the SDI outputs with video in blue and the key in red.



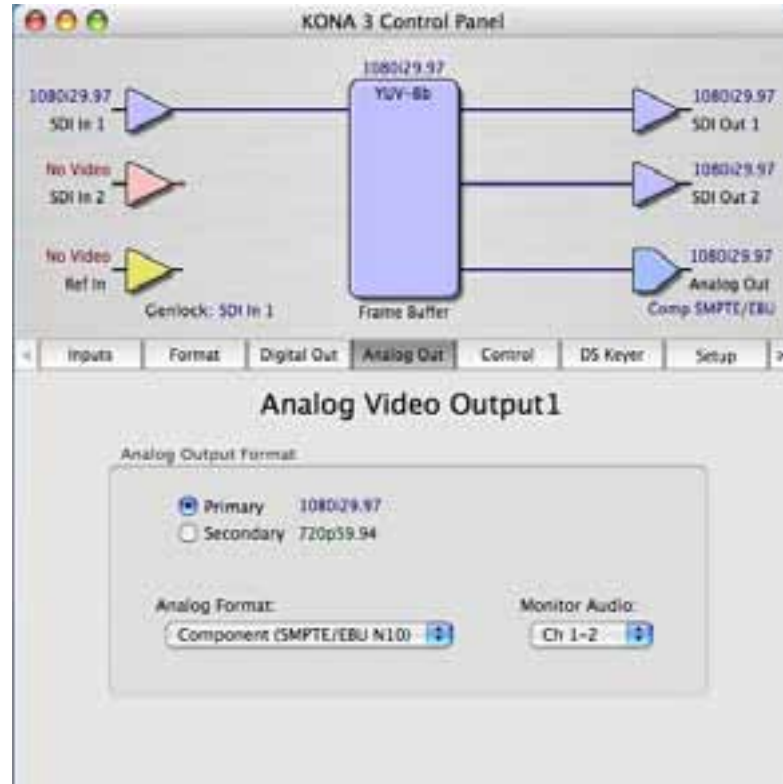
KONA 3 Control Panel, Digital Out Tab, Video+Key Output



KONA 3 Control Panel, Digital Out Tab, Showing Downconvert (secondary format)

Analog Out Tab Screen

KONA 3 provides a high-quality analog component or composite + Y/C output, generally used for monitoring. This screen shows the current settings for that analog output, and allows you to re-configure it when desired (format and black-level).



KONA 3 Control Panel, Analog Out Tab

Analog Out Tab Screen Settings

Analog Output 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:

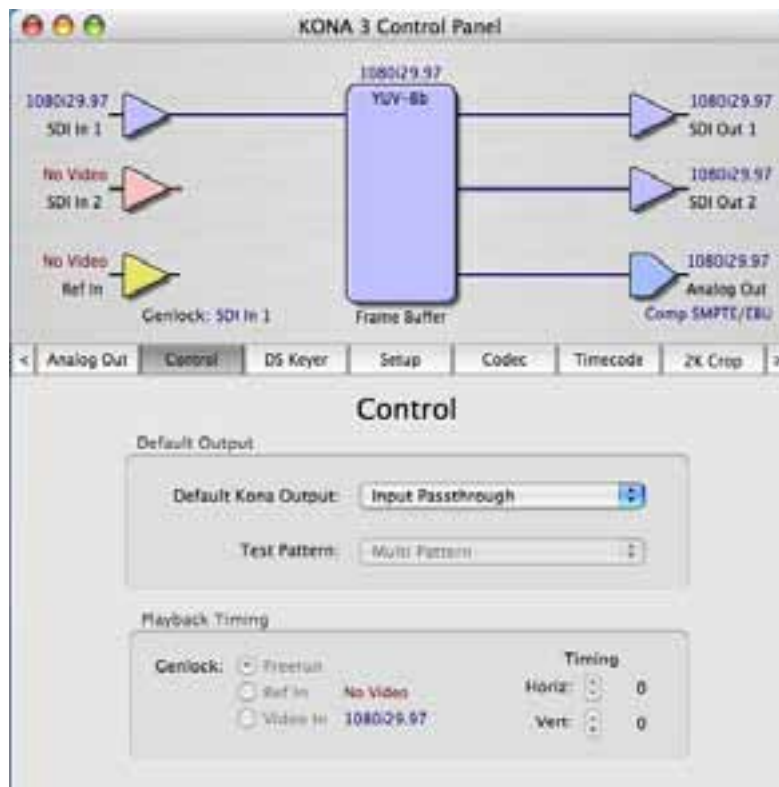
- Composite +Y/C (one composite output *and* a simultaneous Y/C (S-Video) output)
- Component (SMPTE/EBU N10)
- Component (Beta)
- Component (RGB)
- Component (RGB -HV)

Monitor Audio—here you can select which two channels will be mapped to the analog audio output (K3-Box only).

Control Tab Screen

The KONA 3 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 KONA 3 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.

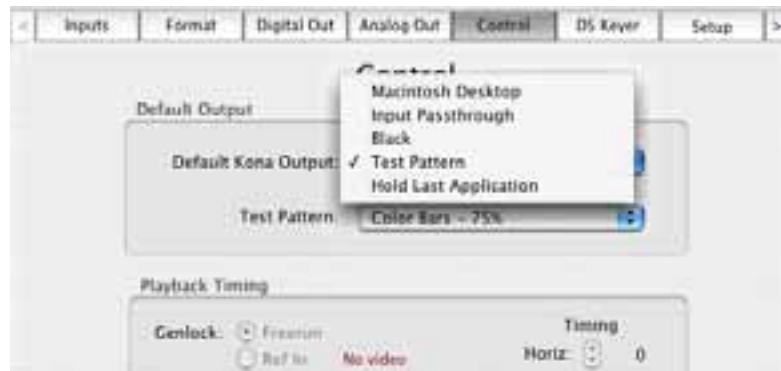
At the top of the Control screen it will show the current Default Output and the application currently controlling the KONA 3 card (if there is one). For example, in the screen shown here, the default output is the Macintosh Desktop and the only controlling application is the KONA 3 Control Panel itself.



KONA 3 Control Panel, Control Tab

Control Tab Screen Settings

Default Kona Output—this is where you select what KONA 3 will output as a default when no application has control of the board, such as when the Finder is active. Since KONA 3 can be controlled by software applications as well as its own control panel, the output can change dynamically. When you select many video applications, they will grab control of the KONA 3 card inputs/outputs. These settings determine what happens when an application that doesn't grab the KONA 3 inputs/outputs is active.



KONA 3 Control Panel, Control Tab, Default Kona Output Pulldown Menu

Default KONA Output Choices and their meanings:

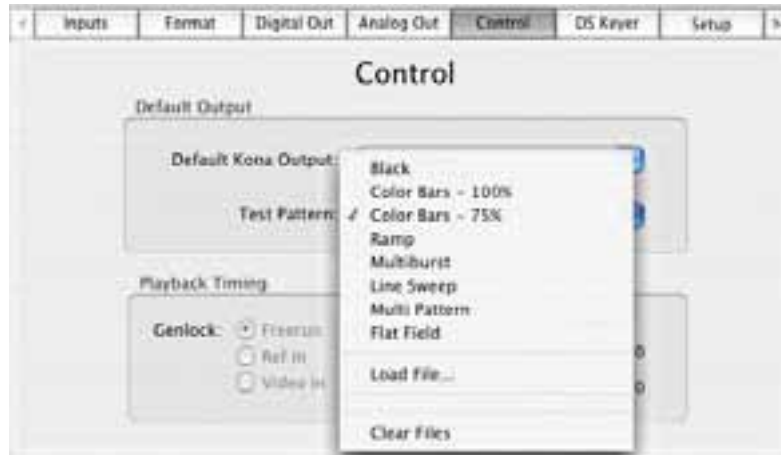
Macintosh Desktop: when selected, this selection causes the KONA 3 program video output (digital and analog) to be an extension of the Macintosh desktop. Mac OS windows and applications can appear (when applicable) on the KONA outputs. It is wise to select in the Mac OS System Preferences>Displays the checkbox “Show displays in menu bar” so that you can access the various settings for the extended desktop for your NTSC or HD monitor from the menu bar. Selecting “Number of Recent Items” and setting it to 10 is also beneficial for making configuration of the Macintosh Desktop mode simpler.

Input Pass through: this selection directs KONA 3 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 KONA 3 as a converter when used in conjunction with the Kona Control Panel application and a Mac. No applications other than the Kona 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 Kona card, configured for upconversion in the Kona Control Panel and then passed through to the HD VTR for recording.

Black: this selection directs KONA 3 to output video black whenever an application isn't controlling the card.

Test Pattern: this selection directs KONA 3 to output a choice of preset pattern when no other application is using the KONA board. In addition to the preset 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 3 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 Kona Control Panel application is running.



KONA 3 Control Panel, Test Pattern Choices

Hold Last Application: this selection directs KONA 3 to hold and output the last frame of video from the last application to control KONA 3. 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 KONA Control panel—while in any software application (Final Cut, etc.)—causes control of the KONA card to stay with that application, rather than shifting to the Control Panel. This works regardless of the setting of “Default Kona Output.”

Genlock (*Freerun, RefIn, Input 1, or Input 2*)—selects how KONA 3 will synchronize program video:

Freerun: In this mode, KONA 3 generates sync without an external reference source

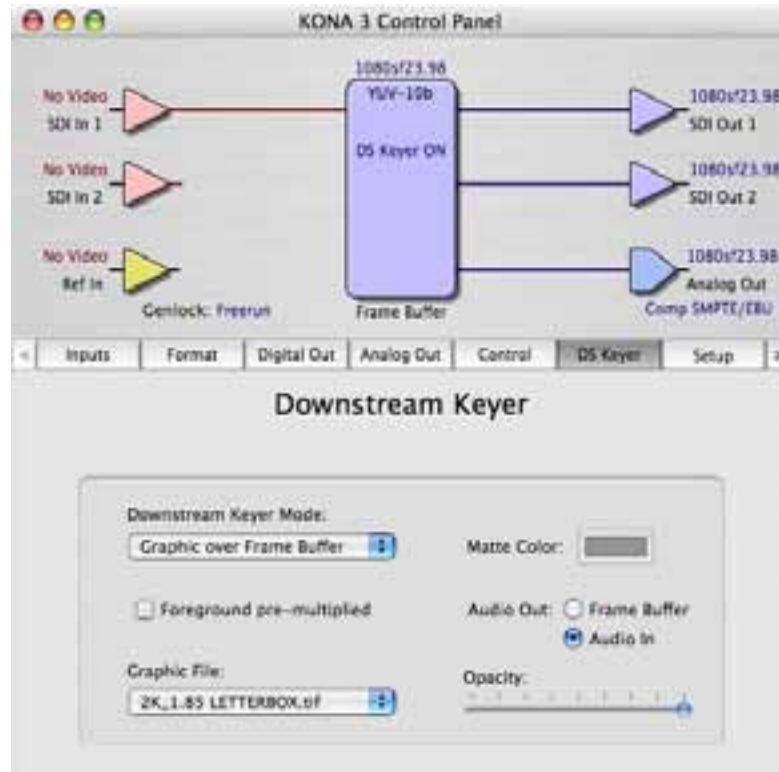
RefIn: Directs KONA 3 to use the Ref Video source for sync (usually an analog black burst video signal)

Video: Directs KONA 3 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.

DS Keyer Tab Screen

The KONA 3 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 3 Control Panel, Downstream Keyer Tab

Settings in the DS Keyer tab provide control over how the keyer operates and whether it's turned on or off. Controls and their meanings in the Tabbed screen are as follows:

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.

Graphic over Matte—places a graphics file having an alpha channel (chosen in “Graphic File” pulldown) over a fixed color matte determined by the “Matte Color” setting set separately.

Graphic over Video In—places a graphics file having an alpha channel (chosen in “Graphic File” pulldown) over the video input for playout or print-to-tape.

Graphic over Frame Buffer—places a graphics file having an alpha channel (chosen in “Graphic File” pulldown) over the current contents of the KONA card’s Frame Buffer (which might be from storage, video In, Kona TV, etc.).

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:

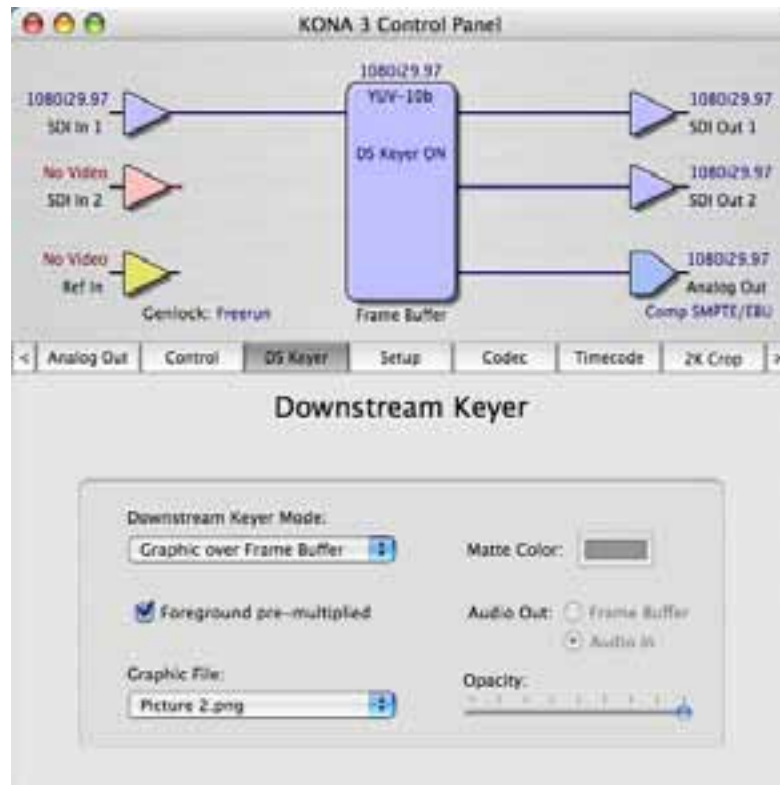
Frame Buffer—select audio out to be routed from the contents of the Frame Buffer.

Audio In—select audio out to be routed from KONA’s currently selected input(s).

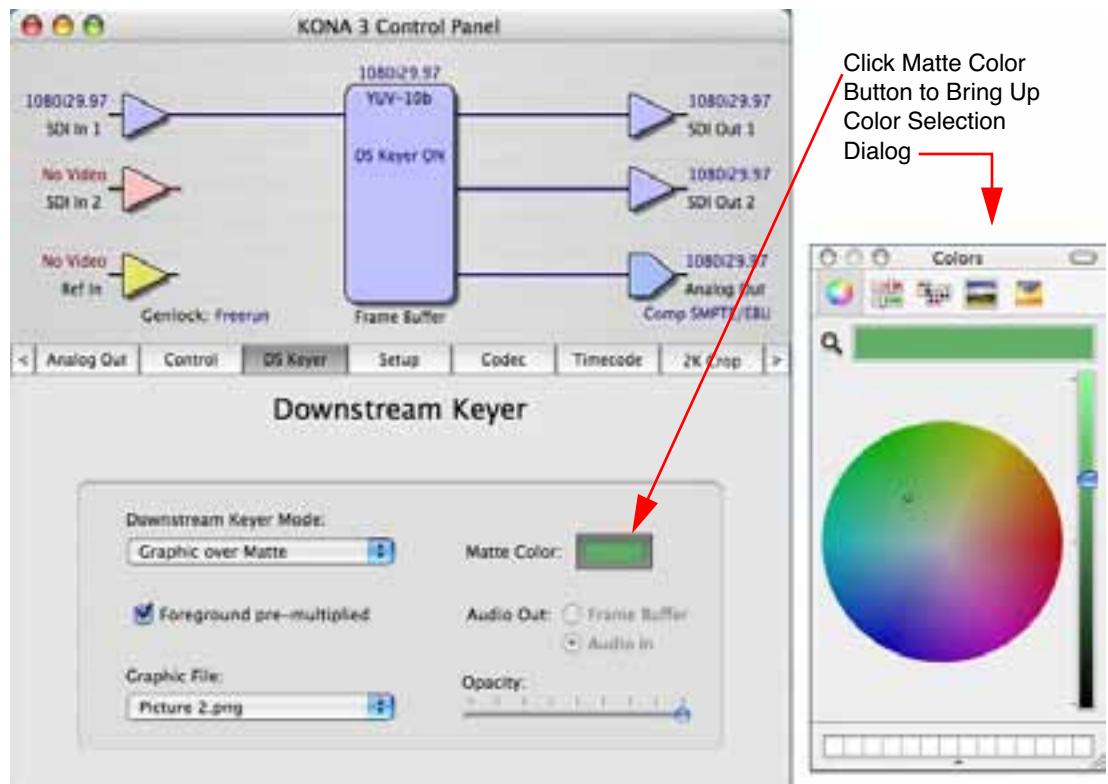
Opacity: this slider controls the transparency of the keyed video (over the background) from translucent to completely opaque.

Graphic File: this pulldown allows you to choose from any recently accessed file or select a new file (“Load File...”), which then brings up a file dialogue. Remember that the file raster (pixel x pixel count) should match the primary format in the frame buffer or the secondary format if upconverting. Example: you wish to key a logo on top of your 1920x1080 footage, the still image with alpha channel that you load should be 1920x1080.





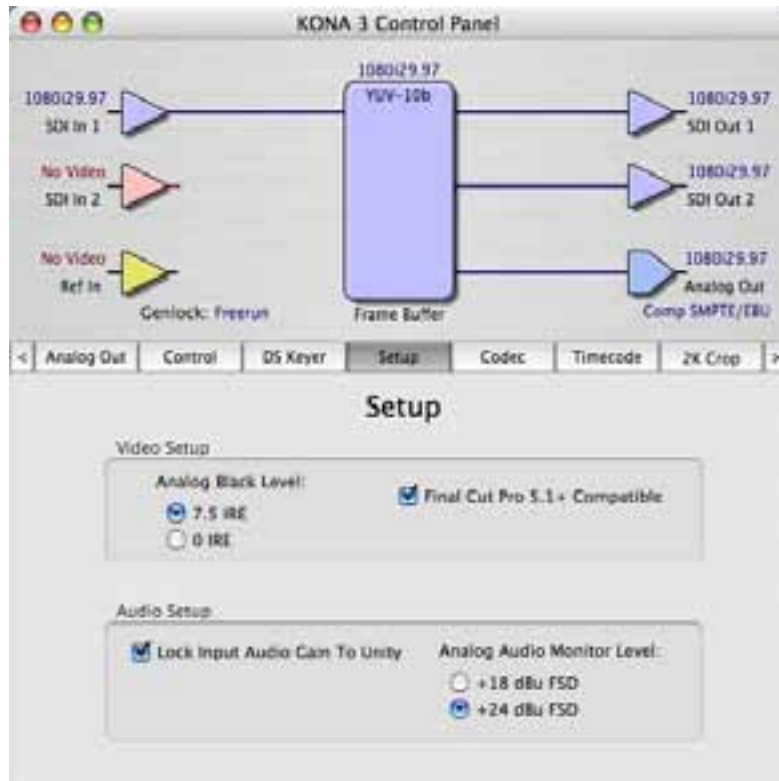
KONA 3 Control Panel, DS Keyer Tab, Loading a Graphic File to Place Over Framebuffer



KONA 3 Control Panel, DS Keyer Tab, Loading a Graphic File to Place Over a Matte

Setup Tab Screen

KONA 3 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 3 Control Panel, Setup Tab

Setup Tab Screen Settings

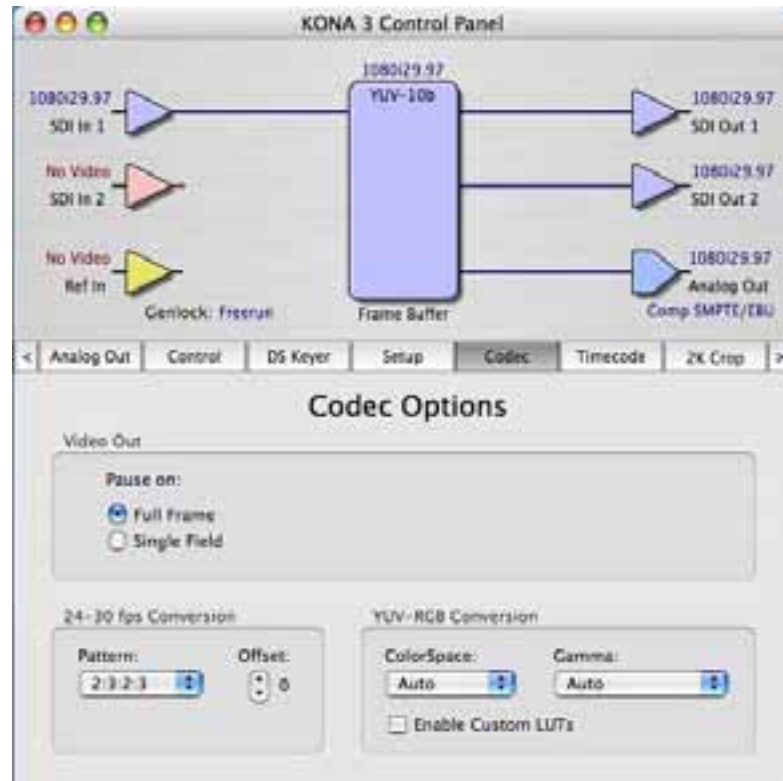
Analog Black Level—choices in the black Level pulldown menu are only available for the two Composite analog formats. Choices presented are for US or Japan:
 7.5 IRE (NTSC US)
 0 IRE (NTSC Japan)

Analog Audio Monitor Level Audio—when a Breakout Box is connected to KONA 3, 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.

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

Codec Tab Screen

This screen offers a variety of controls that determine how the card behaves under Final Cut Pro.



KONA 3 Control Panel, Codec Tab

Codec 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).

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



KONA 3 Control Panel, Codec Tab, Frame-padding Pattern Choices

YUV-RGB 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

Gamma—choose from the following:

Linear (1.8)

Rec 601 (2.20)

Rec 709 (2.22)

Auto

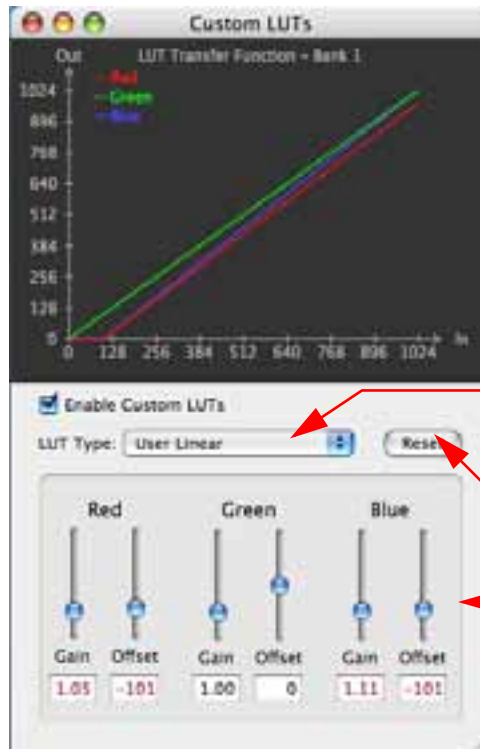
Enable Custom LUTs—this checkbox enables a custom color lookup table (LUT) for use in Final Cut Pro. When checked, there will be a new “Custom LUT” menu item under the *Windows* menu in the KONA Control Panel. Selecting that item brings up the “Custom LUTs” dialog shown on the following page. Defining a LUT applies it to the KONA 3 output. The custom LUT will be saved with the Final Cut Pro presets. 1D LUTs are supported for import, but not 3D LUTs.

The KONA 3 has an additional window in the Kona Control Panel for Custom LUTs. In this window there is a pulldown where users see choices like Linear, User Linear, etc. In this list is “Load File...” AJA can only support 1D LUTs, not 3D LUTs—and 1D LUTs should be considered appropriate for viewing purposes and tape mastering to video, but *not* for hyper-critical color correction where the goal is to go back to film. In these cases a hardware or software application that can use 3D LUTs would be more appropriate. 1D LUTs can be created or obtained from a number of companies including Kodak and Thomson Grass Valley, to name a few. Often a 1D LUT can be derived from a 3D LUT, so you still will have an accurate reference for viewing and video mastering.

LUTs have two major parameters to remember: they are for turning material from its raw form to a viewable representational form, and they should also be calibrated for the device being displayed upon: LCD, CRT or projector.

The AJA Custom LUT supports the loading of a tabbed text file which could be created in either an application like TextEdit or Microsoft's Excel. The document would consist of 3 columns representing 1024 values for each of the R, G and B columns.

Note: Custom LUTs only work with RGB material.



Select a "canned" LUT or create your own

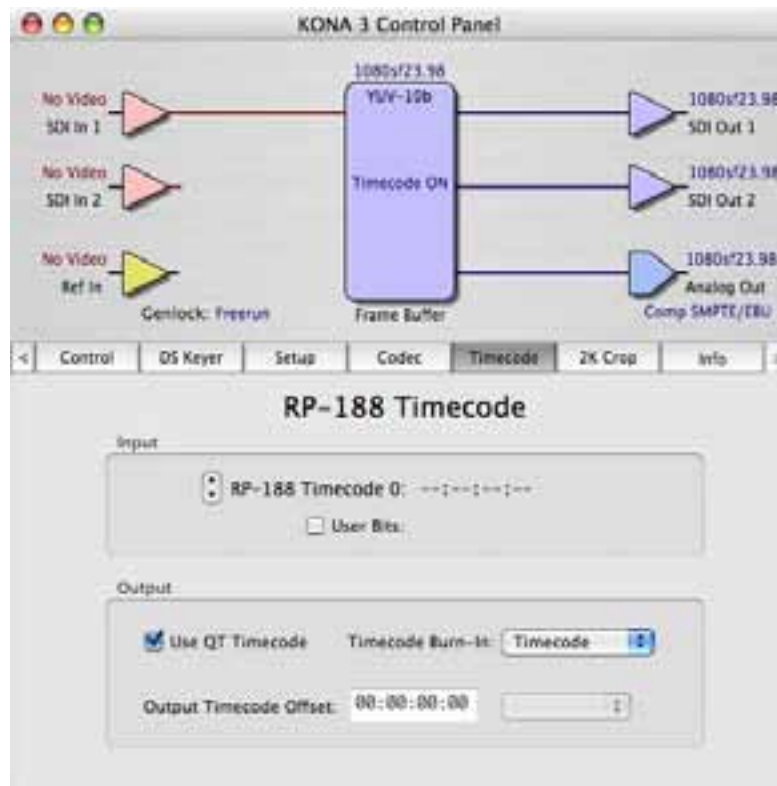
Click to restore factory defaults

Adjust Gain & Offset sliders to change color. Changed values will appear in red in text fields. You can also enter specific numbers to explicitly set a value.

KONA 3 Custom LUTs Dialog

Timecode Tab Screen

The timecode screen is used for both monitoring the RP-188 timecode embedded in the digital data stream and for selecting a timecode offset on output (if desired). Settings for the output section of the tab can be used to create window burn superimposed timecode outputs.



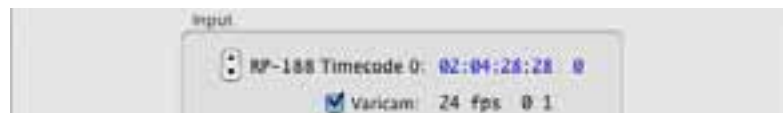
KONA 3 Control Panel, Timecode Tab

Timecode Tab Screen Settings

Input

RP-188 Timecode—in RP-188 timecode 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 Varicam timecode, you may wish to monitor the user bits embedded in the timecode. If you set this checkbox, KONA 3 will detect and interpret the Varicam user bits and display them next to the checkbox.



KONA 3 Control Panel, Timecode Tab, User Bits Checked

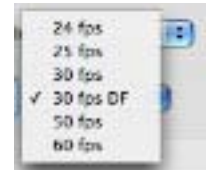
Output

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.

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.

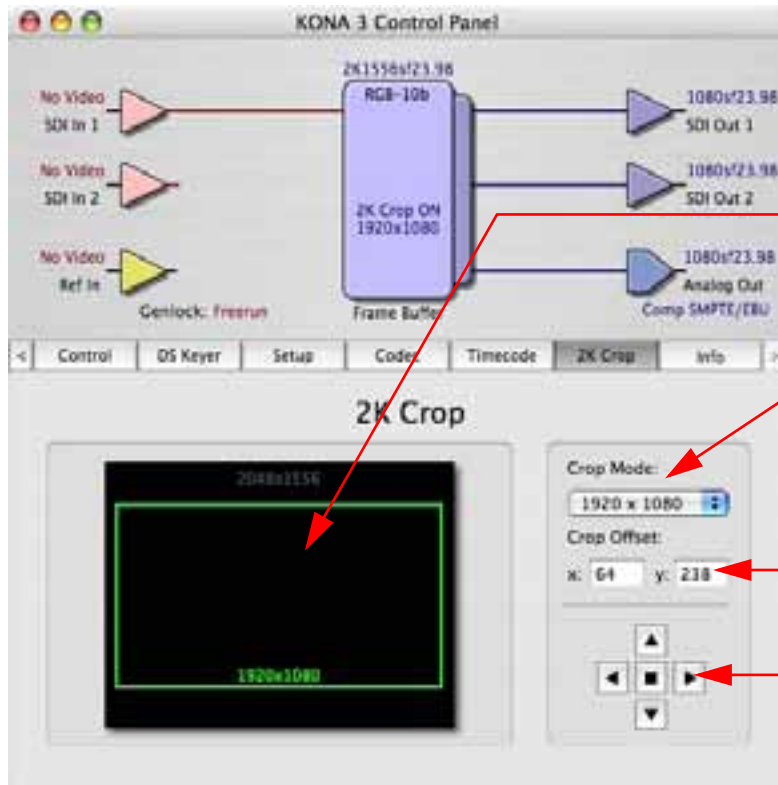
Timecode Burn-in—this pulldown selects whether the timecode value is “burned-in” on video output from KONA 3. If set to “OFF”, timecode will not be keyed over the video. If set to “timecode”, then the timecode value will be keyed over the output video. This can be useful for synchronizing, choosing edit 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.

2K Crop Tab Screen

This Tabbed screen allows you to determine how 2K frames captured with VTR Exchange and brought into Final Cut will be cropped. You can select a crop mode and then pan and scan around to choose the area that will be displayed. This can be done dynamically with a mouse or by entering explicit numbers



One way to move the crop area:
Moving the mouse cursor while holding the mouse button down moves the crop rectangle within the 2K frame

Select crop mode via pulldown

Two other ways to move the crop area:

Explicitly specify an X and/or Y Offset for the crop

Select a crop area by moving the rectangle using these navigation buttons (arrows). Square button at center is used to re-center the crop.

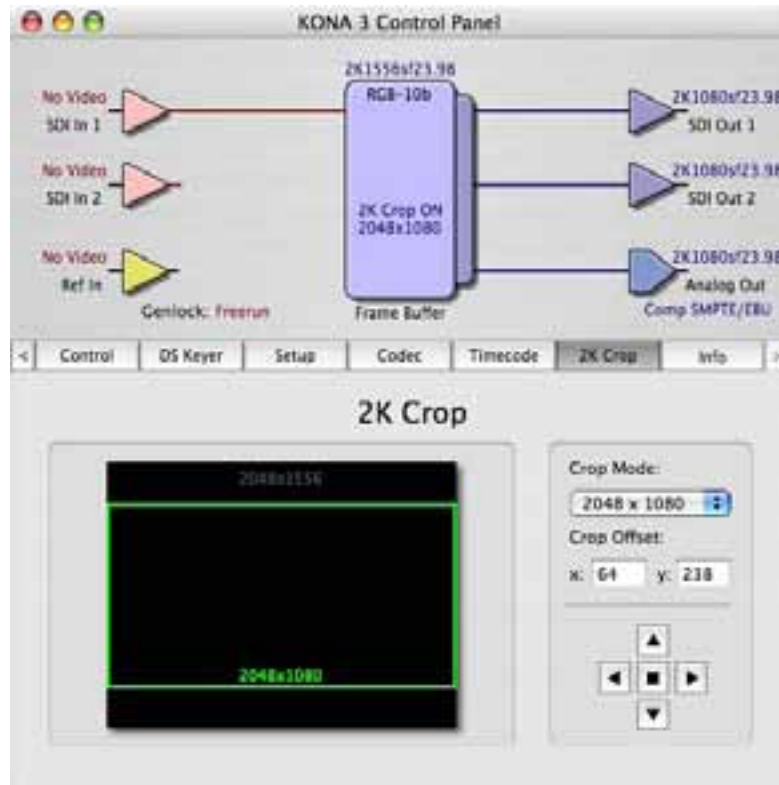
KONA 3 Control Panel, 2K Crop Tab, Showing a 2K Crop to 1080PsF from Film Raster

Select a crop mode by choosing 1920 x 1080 or 2048 x 1080 from the pulldown menu; choosing “Off” turns off 2K frame cropping.

In the Format Tab window, this corresponds to:



Here's another 2K crop, this time showing cropped output to a 2K projector:



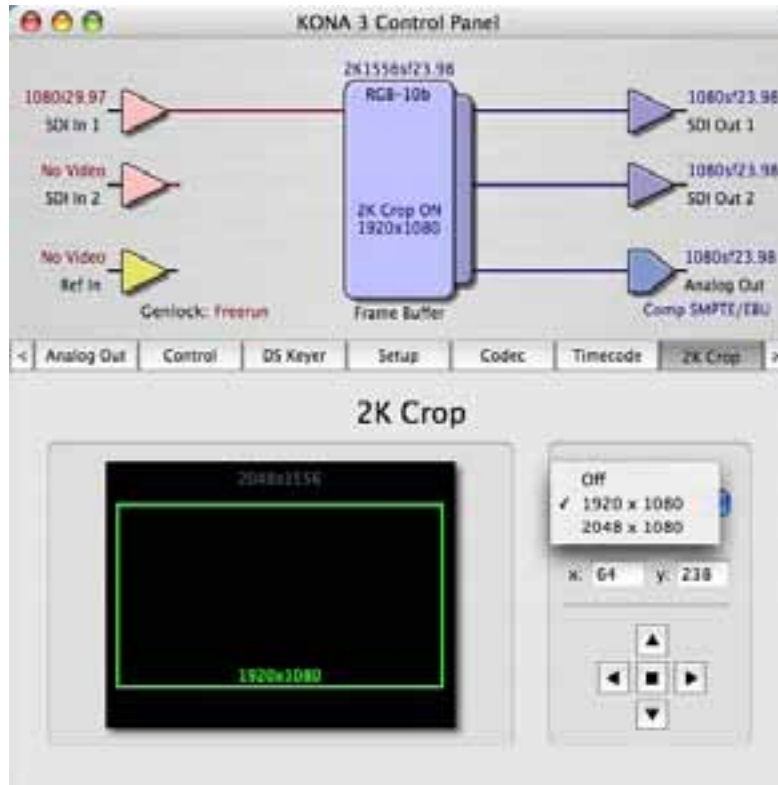
KONA 3 Control Panel, 2K Crop Tab, Showing a 2K Crop to 2K Projector

In the Format Tab window, this corresponds to:

Once a crop is selected, KONA 3 defaults to the crop being placed in the center area of the 2K frame. You can change or move the cropped area from within the frame by selecting the green rectangle with the mouse cursor and dragging it to a desired spot.

Tip: Using the Command key held down in conjunction with the mouse cursor within the Control Panel 2K Crop screen—while in another application (i.e., Final Cut)—allows that application to retain control of the KONA output while adjusting the crop. This is highly useful for visualizing the changes you're making.

Or, you can also use the arrow buttons at the right of the screen to move the crop area up, down or sideways. The square button in the center returns the crop area to the center of the screen. Alternatively, you can also enter a specific X and/or Y pixel offset by typing a number into the text fields above the arrow buttons.

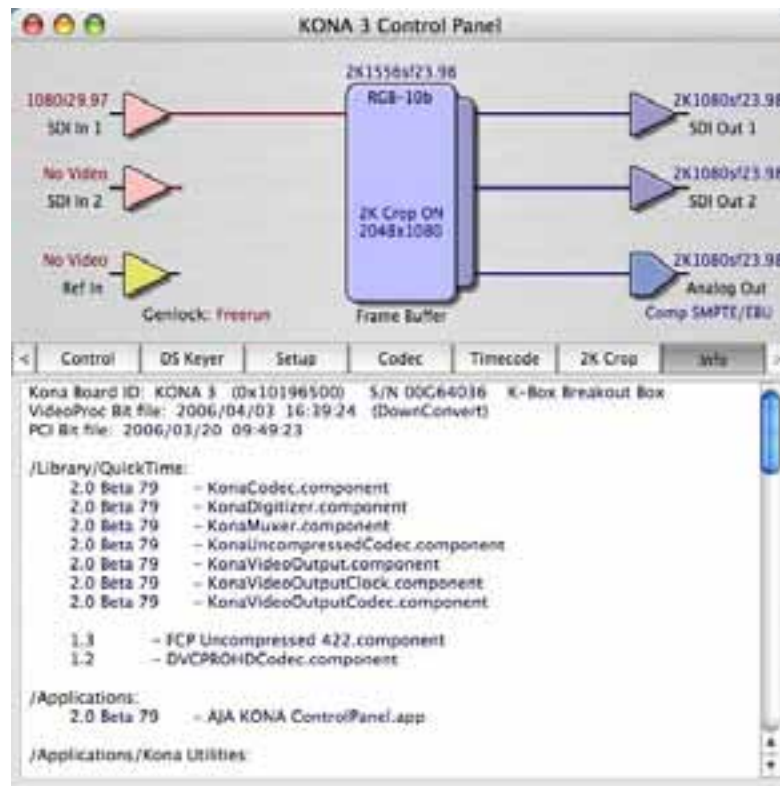


KONA 3 Control Panel, 2K Crop Tab, Selecting Crop Mode

Important Note about 2K: Operational procedures and information for working with 2K workflows are presented in Appendix C at the back of this manual. 2K workflows are unique and require the use of KONA's VTR Exchange software and Final Cut Pro, in conjunction with the 2K Crop features discussed above in the KONA Control Panel.

Info Tab Screen

This Tabbed screen shows the KONA 3 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 3 Control Panel, Info Tab

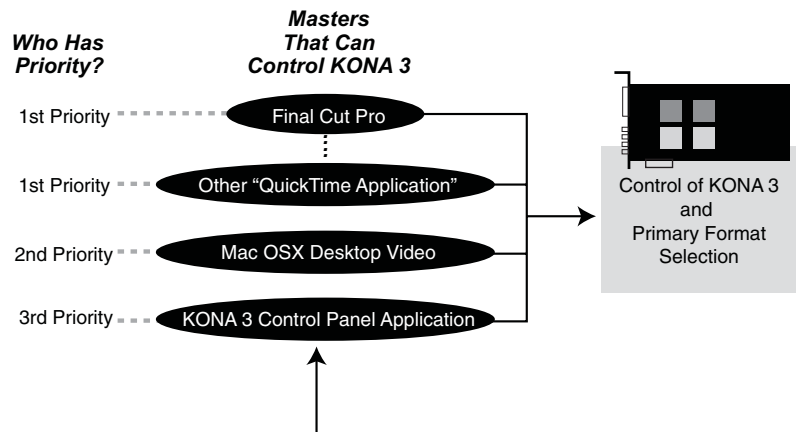
Saving Your Control Panel Presets

After configuring the KONA 3 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 3?

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 3 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 3 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 3 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 3 and what the current format selections are.

For further understanding, read on and we'll give you some further background on KONA 3 control. The main issue you'll generally want to know, is what application *has control of KONA 3's Primary Format at the current moment.*



When you click in an application window, the “Master” controlling KONA 3 changes, possibly changing the Format Selections in effect. This happens because each application has its own sets of control parameters

TIP: If you keep the KONA 3 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 3 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, KONA TV, 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 3 Control Panel

By “*Master*”, we mean a process that can control and change what the KONA 3 is doing and the Primary and Secondary formats that it uses (as set in the Control Panel “Formats” tab screen).

QuickTime Application—1st Priority

If a running QuickTime application uses KONA 3 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 3 as its “A/V Device”, then the KONA 3’s Primary format is determined by Final Cut’s “Video Playback” submenu (under the “View” menu) or in its “Audio/Video Settings...” dialog under A/V Devices.

When a QuickTime application is in control of the KONA 3 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 3 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.

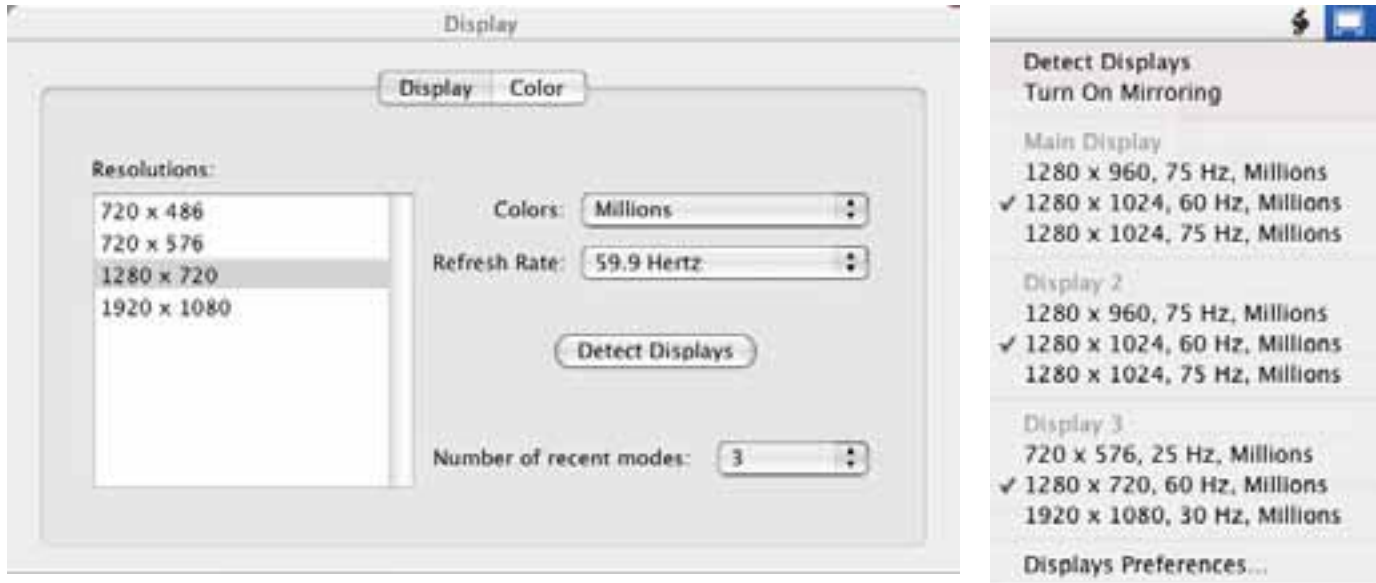
To illustrate such possible confusion, consider this multiple application scenario:

1. Open Final Cut Pro, select KONA 3 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 3 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 3—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 (in the Control Tab), then the Mac Finder uses the KONA 3 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-hand side of the main menu bar).



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 3 Control Panel gets control of the board.

Control Recommendations

To avoid surprises, run the KONA 3 Control Panel, keep it visible on the desktop—and stay consistent in your settings within the various QuickTime applications while 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.

Easy Setups for Typical Uses

Final Cut and KONA 3 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 3 and installed along with the KONA 3 software. 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.

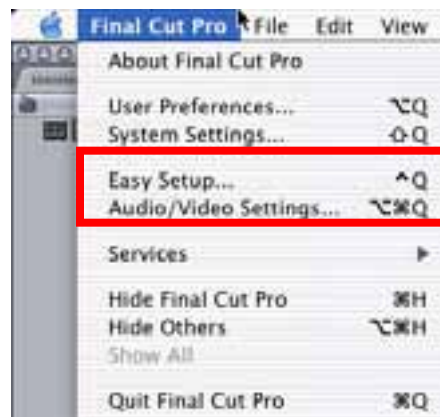
Although this manual assumes you're familiar with Final Cut Pro and have read its documentation, let's review Easy Setups and how to use them effectively with KONA 3.

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

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

Easy Setups Menu

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



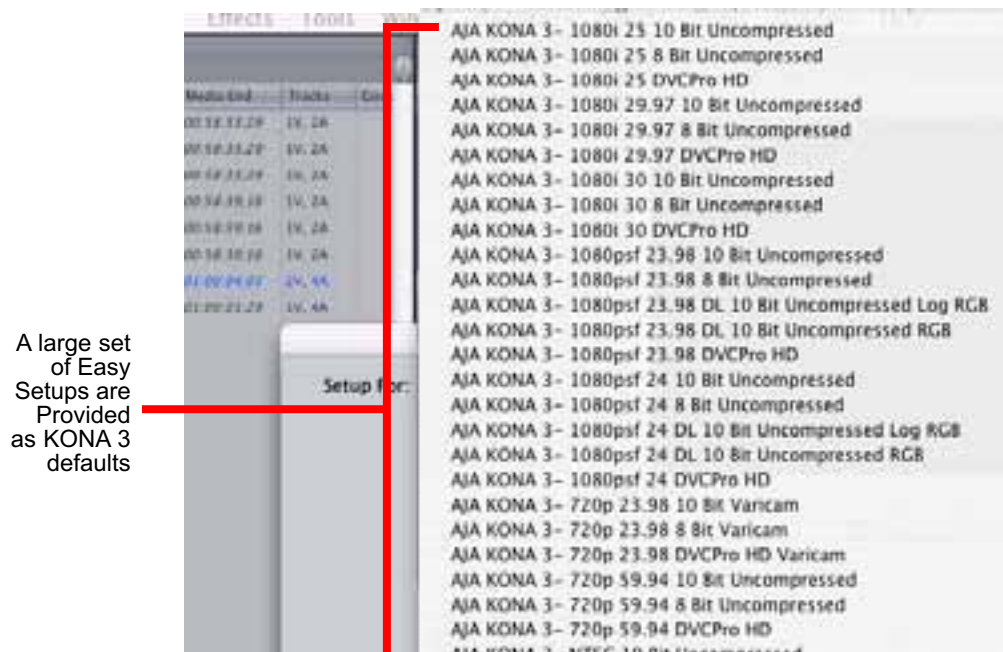
Easy Setup and Audio/Video Menu Items

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



Easy Setup Dialog

At the top of the Easy Setup dialog is the currently selected Easy Setup. It can be changed by clicking on the pulldown arrow at the right. Doing so results in a long list of the factory Easy Setups stored on the system. 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 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 3

The factory default Easy Setups currently shipped with KONA 3 are shown below and may not be inclusive as AJA attempts to add to this list regularly as is the case for emerging HDV formats for KONA supported playback. In addition to this, there are additional easy setups available on your KONA Software CD and on the AJA website. Your list may differ as AJA is continually improving and adding functionality.

Easy Setup (as listed in FCP Pulldown)	Description/Usage
AJA KONA 3- PAL 8 bit uncompressed	Use this preset when working with 625 at a 25 framerate. Material will be processed as Uncompressed 8-bit.
AJA KONA 3- PAL 10 bit uncompressed	Use this preset when working with 625 at a 25 framerate. Material will be processed as Uncompressed 10-bit.
AJA KONA 3- PAL DV	Use this preset when working with 625 at a 25 framerate. Material will be processed as DV.
AJA KONA 3- PAL DVCPRO	Use this preset when working with 625 at a 25 framerate. Material will be processed as DVCPRO.
AJA KONA 3- PAL DVCPRO50	Use this preset when working with 625 at a 29.97 framerate. Material will be processed as DVCPRO50.
AJA KONA 3- NTSC 8 bit uncompressed	Use this preset when working with 525 at a 29.97 framerate. Material will be processed as Uncompressed 8-bit.
AJA KONA 3- NTSC 10 bit uncompressed	Use this preset when working with 525 at a 29.97 framerate. Material will be processed as Uncompressed 10-bit.
AJA KONA 3- NTSC 8 Bit to DV	Use this preset when working with 525 at a 29.97 framerate. Material will be processed as DV.
AJA KONA 3- NTSC 8 Bit to DVCPRO50	Use this preset when working with 525 at a 29.97 framerate. Material will be processed as DVCPRO50.
AJA KONA 3- NTSC 23.98 8 Bit uncompressed	Use this preset when working with 525 at a 23.98 framerate. Material will be processed as 8 bit uncompressed.
AJA KONA 3- NTSC 23.98 10 Bit uncompressed	Use this preset when working with 525 at a 23.98 framerate. Material will be processed as 10 bit uncompressed.
AJA KONA 3- 720p 23.98 8 bit Varicam	Use this preset when working with high-definition Varicam 720p at a 23.98 framerate. Material will be processed as 8 bit uncompressed Varicam.
AJA KONA 3- 720p 23.98 10 bit Varicam	Use this preset when working with high-definition Varicam 720p at a 23.98 framerate. Material will be processed as 10 bit uncompressed Varicam.
AJA KONA 3- 720p 23.98 DVCPRO HD Varicam	Use this preset when working with high-definition Varicam 720p at a 23.98 framerate. Material will be processed as DVCPRO HD Varicam.
AJA KONA 3- 720p 59.94 DVCPRO HD	Use this preset when working with high-definition 720p at a 59.94 framerate. Material will be processed as DVCPRO HD.
AJA KONA 3- 720p 59.94 8 bit uncompressed	Use this preset when working with high-definition 720p at a 59.94 framerate. Material will be processed as 8 bit uncompressed.
AJA KONA 3- 720p 59.94 10 bit uncompressed	Use this preset when working with high-definition 720p at a 59.94 framerate. Material will be processed as 10 bit uncompressed.
AJA KONA 3- 1080i 25 8 bit uncompressed	Use this preset when working with high-definition 1080i at a 25 framerate. Material will be processed as 8 bit uncompressed.
AJA KONA 3- 1080i 25 10 bit uncompressed	Use this preset when working with high-definition 1080i at a 25 framerate. Material will be processed as 10 bit uncompressed.
AJA KONA 3- 1080i 25 DVCPRO HD	Use this preset when working with high-definition 1080i at a 25 framerate. Material will be processed as DVCPRO HD.
AJA KONA 3- 1080i 29.97 8 bit uncompressed	Use this preset when working with high-definition 1080i at a 29.97 framerate. Material will be processed as 8 bit uncompressed.
AJA KONA 3- 1080i 29.97 10 bit uncompressed	Use this preset when working with high-definition 1080i at a 29.97 framerate. Material will be processed as 10 bit uncompressed.

Easy Setup (as listed in FCP Pulldown)	Description/Usage
AJA KONA 3- 1080i 29.97 DVCPRO HD	Use this preset when working with high-definition 1080i at a 29.97 framerate. Material will be processed as DVCPRO HD.
AJA KONA 3- 1080i 30 8 bit uncompressed	Use this preset when working with high-definition 1080i at a 30 framerate. Material will be processed as 8 bit uncompressed.
AJA KONA 3- 1080i 30 10 bit uncompressed	Use this preset when working with high-definition 1080i at a 30 framerate. Material will be processed as 10 bit uncompressed.
AJA KONA 3- 1080i 30 DVCPRO HD	Use this preset when working with high-definition 1080i at a 30 framerate. Material will be processed as DVCPRO HD.
AJA KONA 3- 1080psf 23.98 8 bit uncompressed	Use this preset when working with high-definition 1080psf at a 23.98 framerate. Material will be processed as 8 bit uncompressed.
AJA KONA 3- 1080psf 23.98 10 bit uncompressed	Use this preset when working with high-definition 1080psf at a 23.98 framerate. Material will be processed as 10 bit uncompressed.
AJA KONA 3- 1080psf 23.98 DVCPRO HD	Use this preset when working with high-definition 1080psf at a 23.98 framerate. Material will be processed as DVCPRO HD.
AJA KONA 3- 1080psf 23.98 DL 10 Bit Uncompressed Log RGB	Use this preset when working with high-definition dual link input (both SDI inputs being fed a dual link source) at 1080psf with a 23.98 framerate. Material will be processed as 10-bit uncompressed 4:4:4 log RGB.
AJA KONA 3- 1080psf 23.98 DL 10 Bit Uncompressed RGB	Use this preset when working with high-definition dual link input at 1080psf with a 23.98 framerate. Material will be processed as 10-bit uncompressed 4:4:4 RGB.
AJA KONA 3- 1080psf 24 8 bit uncompressed	Use this preset when working with high-definition 1080psf at a 24 framerate. Material will be processed as 8 bit uncompressed.
AJA KONA 3- 1080psf 24 10 bit uncompressed	Use this preset when working with high-definition 1080psf at a 24 framerate. Material will be processed as 10 bit uncompressed.
AJA KONA 3- 1080psf 24 DVCPRO HD	Use this preset when working with high-definition 1080psf at a 24 framerate. Material will be processed as DVCPRO HD.
AJA KONA 3- 1080psf 24 DL 10 Bit Uncompressed Log RGB	Use this preset when working with high-definition dual link input (both SDI inputs being fed a dual link source) at 1080psf with a 24 framerate. Material will be processed as 10-bit uncompressed 4:4:4 log RGB.
AJA KONA 3- 1080psf 24 DL 10 Bit Uncompressed RGB	Use this preset when working with high-definition dual link input at 1080psf with a 24 framerate. Material will be processed as 10-bit uncompressed 4:4:4 RGB.
AJA KONA 3- 2K x 1556 psf 23.98 10 Bit Uncompressed Log RGB	Use this preset when working with high-definition 2K frame Log RGB input via HSDL. Material will be processed as 10-bit uncompressed.
AJA KONA 3- 2K x 1556 psf 23.98 10 Bit Uncompressed RGB	Use this preset when working with high-definition 2K frame RGB input via HSDL. Material will be processed as 10-bit uncompressed.

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 3 device (NTSC or PAL as desired). This tells Final Cut that the KONA 3 will control the VTR attached to KONA 3.

A/V Devices (Audio and Video Playback)—select the KONA 3 as video and audio playback devices for Final Cut and the format to be output.



Audio/Video Settings, Summary Window

To Create A New Easy Setup

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

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

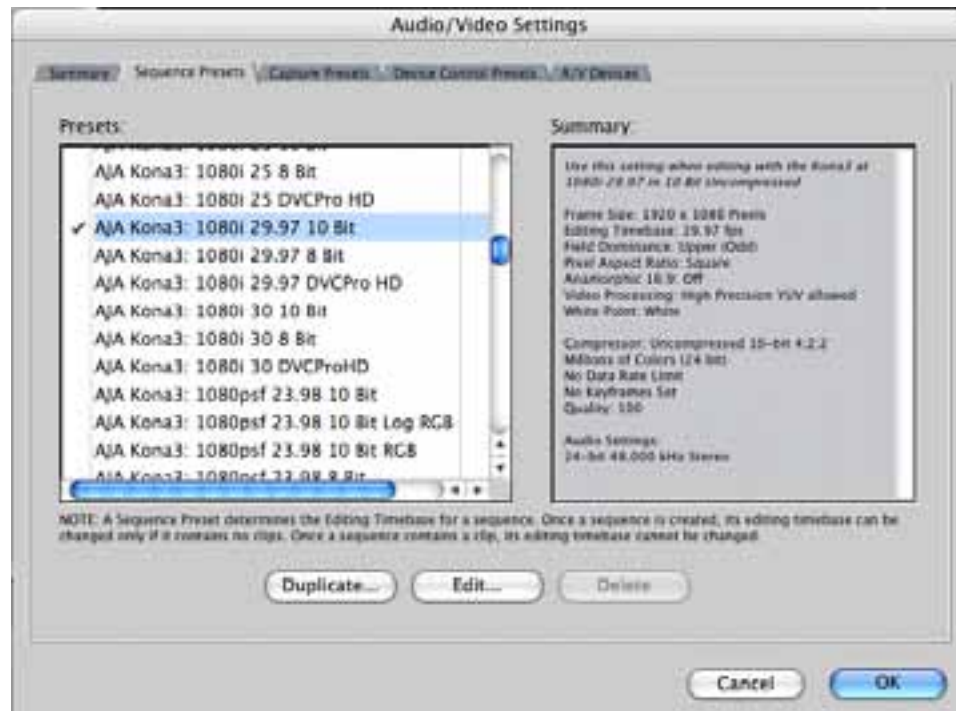


Audio/Video Settings, Creating a New Easy Setup

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

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

The Sequence Presets Window



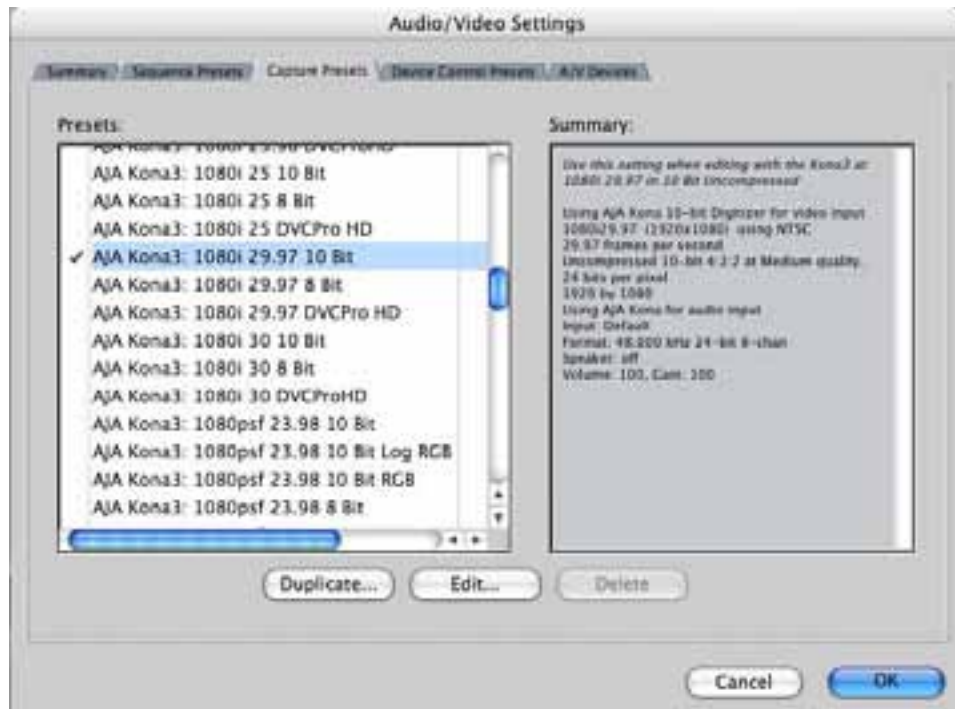
Audio/Video Settings, Sequence Presets Window

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

The Capture Presets Window



Audio/Video Settings, Capture Presets Window

This window lets you choose a preset format for incoming source video and audio media you'll be capturing. Select the maximum quality format you'll be using for most of the material so there will be no need to re-render later. The information on the right window pane describes the preset and all its 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 3, we'll discuss the edit screen next.

Capture Presets Editing



Audio/Video Settings, Capture Presets Editing Window

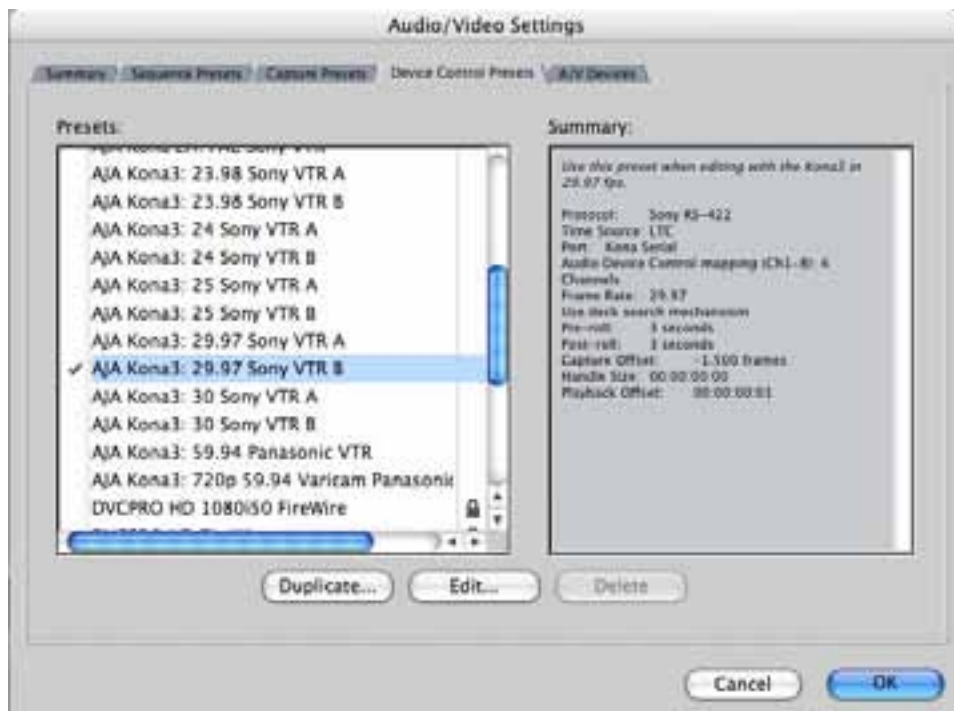
Note: Whenever a Preset is being copied as the basis of a new preset, always change the name and description to fit the new preset so users aren't confused between it and the original.

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 3. The Input pull-down selects the primary format KONA 3 will use to capture input video. The Compressor pull-down selects a codec that tells Final Cut how to process the video; the codec selected should be chosen for compatibility with the Digitizer setting selected. For example, if your Digitizer setting is 10-bit Uncompressed, then the Compressor setting should be one of the 10-bit choices available. The Quality slider should be set to 100 percent when capturing uncompressed; for other formats use an appropriate quality level. Set the FPS (Frames Per Second) setting to the correct frame rate. The Advanced settings button opens a new screen providing choices of codec-specific options. For uncompressed codecs these probably are not unneeded; for other codecs choose the options desired.

QuickTime Audio Settings—these settings select an audio input source and affect how it's processed by Final Cut Pro. The Device pull-down should be set to KONA 3. The Input pull-down selects that KONA 3 will be used for capturing audio—it does not select the specific inputs. For specific audio input selection use the KONA 3 Control Panel. The Rate pull-down selects a sample rate; it should always be set to 48 kHz for KONA 3. 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 3 supports 24-bit embedded HD audio, 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 3 is handling the machine control parameters for the VTR attached to KONA 3. Alternatively, you could also select a different device for input/output instead of KONA 3; for example, if you have a IEEE 1394 camcorder attached to the Power Mac's FireWire port you might choose "FireWire NTSC." The information on the right window pane describes the current machine control settings and parameters for the VTR attached. For KONA 3 presets this means the VTR attached at the RS422 port on KONA 3. For non-KONA 3 presets, this means camcorder/VTRs attached directly at the FireWire port or via some other interface.

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

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

- Name and description of Device Control preset
- Protocol for capture/playback VTR (for KONA 3 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 3 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.

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 3 for both playback devices. The format chosen determines the Primary format for the KONA 3 board during playback.

The Video *Options* button is greyed out for KONA 3 (use the KONA 3 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.

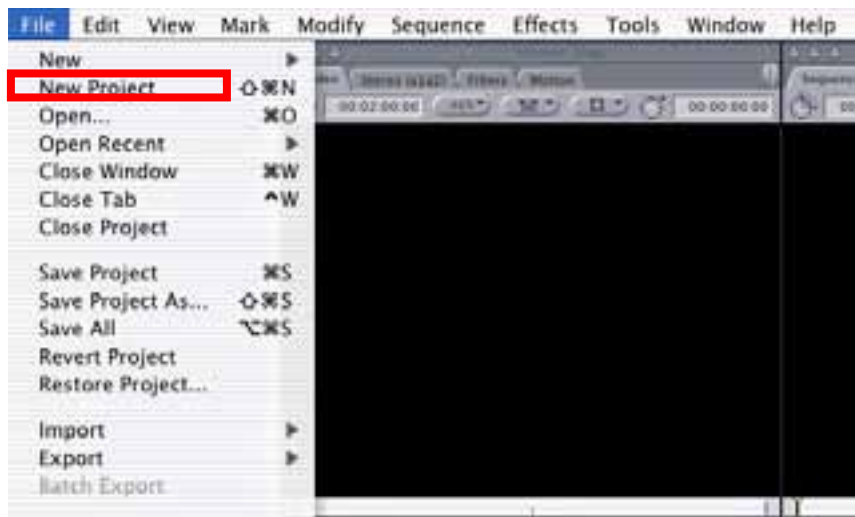
You may wish to use a different KONA 3 output for final Print-to-tape from Final Cut. You can select that in this window by clicking the checkbox “Different Output for Edit to Tape/Print to Video.” This allows you to select via a pull-down menu any KONA 3 video output and audio output.

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

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

To test that you’ve installed the KONA 3 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 then 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 3 is selected in the Easy Setups and Audio/Video Settings as necessary.



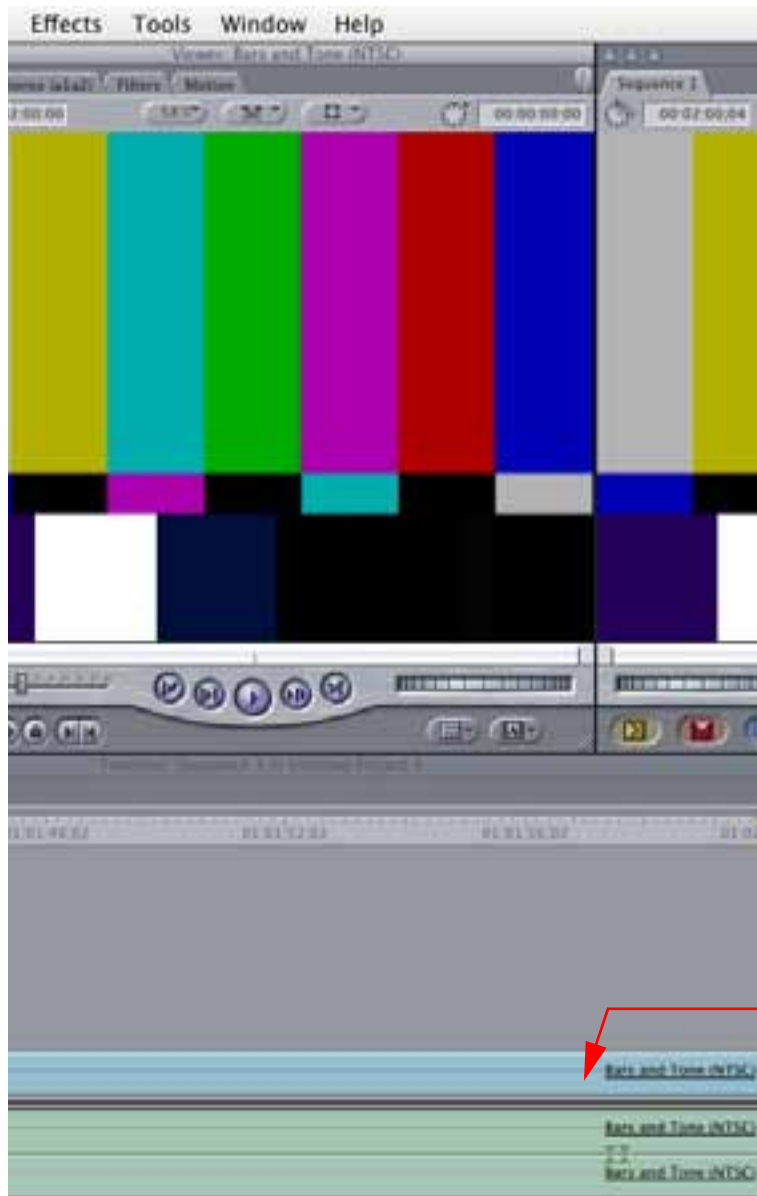
Click Filmstrip Button in Viewer Window

...Then select "Bars and Tone"

Finally, click in the viewer window and drag the "bars" to the Sequence window.



Click and Drag Bars and Tone From Viewer Window to Sequence



Bars and Tone
In Sequence
Window

Click "Play" to
Test the
System

Sequence Window Showing Bars and Tone Clip Dragged from Viewer

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

Using 8-bit Versus 10-bit Video

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

Because 10-bit video has four times the numerical precision 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.

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 make finding the problem easier.

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

Table 5-1. Problem Solving by Matching Symptoms to Remedies

Symptom	Check
Disk RAID cannot keep up (dropped frames etc.).	Ensure the disk system is providing at least 50 MB/second sustained transfer rate
Dropped frames during playback.	<ol style="list-style-type: none">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.	<ol style="list-style-type: none">1. RAID cannot sustain the data rate of the capture preset codec.2. Virus checking software running in the background (disable it).3. Scratch drive not set to the RAID.
Media is not being captured from desired external device.	Check the settings in the <i>Input</i> tab of the KONA 3 Control Panel application. Also check equipment cables.

Table 5-1. Problem Solving by Matching Symptoms to Remedies

Symptom	Check
Dropped frames during playback	Look for scroll bars in the viewer or canvas as a warning sign that the zoom setting exceeds the fit-to-window.
Changes made to Final Cut's configuration aren't remembered or you need to force a change to them.	<p>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.</p> <p>To do so, follow this procedure:</p> <ol style="list-style-type: none"> 1. Locate the file named "Final Cut Pro Preferences". <i>Note: path to file is "Macintosh HD/users/username/library/preferences/final cut user data."</i> 3. Click and drag that file to the Trash Can icon and drop it there. <p>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 3 input format in the "Setup For" pulldown and re-enter a desired system scratch disk (your RAID).</p>
Video in the canvas stays frozen during playback.	<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 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 3 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/html/support_kona3_swid.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 system issue, or Xserve RAID issue, then call Apple Customer Support for help.

If the problem is an AJA Video KONA 3 issue, then contact AJA Video Customer Support using one of the methods listed below:

Contacting by Mail Address:

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

Telephone: +1.800.251.4224 or +1.530.274.2048

Fax: +1.530.274.9442

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

Support Email: support@aja.com

Apple Resources

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

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

General Apple Support Website for information on all products:

<http://www.info.apple.com/>

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

or: <http://www.apple.com/support/powermac/>

Xserve Support Area: <http://www.apple.com/support/xserve/index.html>

Xserve Discussion Area:

<http://discussions.info.apple.com/>

WebX?f50@176.UAD8aKWnubr.0@.3bb84b79

Final Cut Pro Web Support:

<http://www.apple.com/support/finalcutpro/index.html>

Appendix A: Specifications

Video Input

Dual-rate (SD or HD)
SD and HD-SDI, SMPTE-259/292/296
Single Link 4:2:2
Dual-link HD 4:4:4
2K HSDL (High Speed Data Link) 4:4:4

Video Formats

525i 23.98 (intermediate format only)
525i 29.97
625i 25
720P 23.98 (intermediate format only)
720P 50
720P 59.94
720P 60
1080i 25
1080i 29.97
1080i 30
1080PsF 23.98
1080PsF 24
1080P 24
1080P 25
1080P 29.97
1080P 30
1080P 50
1080P 59.94
1080P 60
2048 x 1080P 23.98
2048 x 1080P 24
2048 x 1080PsF 23.98
2048 x 1080PsF 24
2048 x 1556PsF 14.98 (HSDL data rate)
2048 x 1556PsF 15 (HSDL data rate)
2048 x 1556psf 23.98 (playback rate)
2048 x 1556PsF 24 (playback rate)

Video Output

Digital:
SD-SDI, SMPTE, 259M, 10-bits, BNC
HD-SDI SMPTE, 292/296, 10-bits, BNC
Dual-link HD 4:4:4 and 2K HSDL 4:4:4
Analog SD and HD Output, 12-bits, BNC:
HSD and HD Output, 12-bits, BNC
HD: YPbPr, RGB
SD: YPbPr, RGB (component mode) or
Composite + Y/C (composite mode with
simultaneous Y/C)

Downstream Keyer: can output graphics with alpha channel over video,
matte or framebuffer or framebuffer content over video or matte



Audio

24-bit SDI embedded audio, 16 channel, 48kHz
 24-bit AES audio, 8 channel, 96kHz or 48kHz, 16-bit capable

Up-Conversion

Hardware 10-bit
Anamorphic: full-screen
Pillar box 4:3: results in a 4:3 image in center of screen with black sidebars
Zoom 14:9: results in a 4:3 image zoomed slightly to fill a 14:9 image with black sidebars
Zoom Letterbox: results in image zoomed to fill full screen
Zoom Wide: results in a combination of zoom and horizontal stretch to fill a 16:9 screen; this setting can introduce a small aspect ratio change

Down-Conversion

Hardware 10-bit
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 to fit new screen size

Cross-Conversion

Hardware 10-bit
 1080i to 720P
 720P to 1080i
 720P to 1080PsF

SD to SD Aspect Ratio Conversion

Letterbox: This transforms SD anamorphic material to a letterboxed image.
H Crop: Will produce a horizontally stretched effect on the image; transforms anamorphic SD to full frame
SD Pillarbox: Will produce an image in the center of the screen with black borders on the left and right sides and an anamorphized image in the center
V Crop: Will transform SD letterbox material to an anamorphic image.

Reference Input

Analog Color Black (1V) or Composite Sync (2 or 4V) Non terminating, Looping, 75 ohm on K3-Box, terminated on supplied breakout cable

Machine Control

RS-422, Sony 9-pin protocol. 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

Appendix B:

Glossary

Reference Terms

- 3:2 Pull Down** 3:2 pull down is a process where six frames are added to a film's original 24-frames-per-second format so that it can work within the 30 fps NTSC standard.
- 24P** A term for 24 full frames per second digital video progressively captured. It generally refers to the HD format of 1920x1080, although it is also used with 1280x720 images as well.
- 1080i** Refers to a picture resolution of 1920 vertical pixels by 1080 horizontal pixels. The "i" stands for interlaced scanning. Interlaced scanning is based on the principle that the screen shows every odd line at one scan of the screen and then all the even lines in a second scan.
- 1080p** Refers to a picture resolution of 1,920 vertical pixels by 1,080 horizontal pixels. The "p" stands for progressive scanning. This format works on the same principle as 720p; the only difference is that in this type there are more pixels and the resolution is better.
- 1080psf** 1080psf differs from 1080p defined previously; PSF is an acronym for "Progressive Segmented Frame". Like 1080p, psf is progressive, but it differs in that the data is written as two separate "fields" (but without inter-field motion as interlaced video carries). This provides psf with the temporal motion characteristics of progressive video, but with the data transport ease of interlaced video. There should be no visual difference between the display of a progressive frame communicated as 1080p, and the same frame communicated as 1080psf.

- 16:9** Refers to the aspect ratio of movie screen and widescreen DTV formats used in all HDTV (High Definition TV) and some SDTV (Standard Definition TV). The ratio is 16 arbitrary units of width for every 9 arbitrary units of height.
- 4:3** The aspect ratio of traditional National Television Systems Committee (NTSC) TV screens. The ratio refers to four units of width for every three units of height.
- 720p** Refers to a picture that is 1,280 vertical pixels by 720 horizontal pixels. The “p” stands for progressive scanning. Progressive scanning offers a smoother picture as 720 horizontal lines are scanned progressively or in succession in a vertical frame repeated 30 times a second.
- Anamorphic video** Refers to video images that are “squeezed” or “stretched” (depending on whether the video is being upconverted or downconverted) to fit a video frame. When 16:9 anamorphic video is displayed on a 4:3 screen size (downconvert), the images will appear unnaturally tall and narrow.
- Aspect ratio** A ratio of screen width to height. It may be traditional 4:3 or 16:9 widescreen.
- ATSC** An acronym for Advanced Television Systems Committee, which is responsible for developing and establishing Digital-HDTV Standards. It is also the name of the DTV system used by broadcasters in the U.S.
- Barn Doors** When a 4:3 image is viewed on a 16:9 screen, the viewer sees black bars on the sides of the screen, sometimes referred to as “barn doors.”
- Codec** A short term used for both “Compressor-decompressor” and “Coder-decoder.” In terms of Final Cut Pro and most editing and graphics applications, codec generally means “Compressor-decompressor”, which, whether hardware or software, converts video and audio signals to and from a compressed digital format. (“Coder-decoder” is generally a device that converts analog video and audio signals into a digital format for transmission, and also converts digital signals back into an analog format; depending on the application, it can also have alternate meanings.)
- Decoder** See “codec.” A device or program that translates encoded data into its original format (i.e., it decodes the data.).
- Deinterlacing** The process of converting an interlaced-scan video signal (where each frame is split into two sequential fields) to a progressive-scan signal (where each frame remains whole). Advanced de-interlacers include a feature called 3-2 pulldown processing. Sometimes de-interlacing is referred to as “line-doubling.”
- Downconvert** Refers to format conversion from a higher resolution input standard to a lower one. For example, converting a 1080 input to a 525 display (HD to SD).

DTV (Digital Television)	DTV stands for Digital Television. It refers to all digital television formats and standards established by the Advanced Television Systems Committee (ATSC). Two basic DTV standards are HDTV (high-definition television) and SDTV (standard-definition television)
Frame rate	The rate at which frames are displayed per second. Frame rates are used in synchronizing audio and pictures for video and film. In motion pictures and television, the frame rates are standardized by SMPTE (Society of Motion Picture and Television Editors). SMPTE frame rates of 24, 25 and 30 frames per second are very common, with a great number of others also used. Frame rates have different applications and uses in different workflows. For motion pictures 24 frames per second is common, while in standard definition television 30 frames per second is common in the US (NTSC). Higher frame rates produce smoother motion but also create larger file storage requirements.
HDTV (High-Definition Television)	High Definition Television refers to the highest-resolution formats of the DTV formats. Offering twice the vertical and horizontal picture resolution of standard definition, an HD picture is much sharper. HDTV has a widescreen aspect ratio of 16:9. HD formats 1080i and 720p both offer reduced motion artifacts like ghosting and dot crawl.
HD-SDI	Refers to a high definition signal provided on a serial digital connection.
High Definition	A video format consisting of either 720 active lines of progressive video or 1080 active lines, using either progressive or interlaced scanning.
Interlaced Scanning	A scanning method based on the visible screen showing every odd line at one scan of the screen and the even lines in a second scan.
Letterbox	Letterbox refers to the image of a wide-screen picture on a standard 4:3 aspect ratio screen. Usually black bars are shown above and below the picture to fill the unused space. Letter-boxing maintains the original aspect ratio of the source (often a film source of 16:9 aspect ratio or wider).
Luminance	The brightness or black-and-white component of a color video signal. Luminance determines the level of picture detail.
Progressive Scanning	Progressive scanning provides a picture made up of 720 or 1080 horizontal lines scanned progressively in succession, within a vertical frame. The frame repeats 30 times a second.
Resolution	Resolution usually refers to the density of lines, and dots per line, that represent an image. It is measured by the number of pixels displayed. A higher number of lines and dots provides sharper and more detailed picture content. Analog television pictures have over 200,000 color pixels while HDTV—at 1080 vertical pixels by 1920 horizontal pixels—offer greater than 2 million pixels per picture.
Sampling	A digital process by which analog information is measured in intervals to convert analog to digital.

**SDTV
(Standard-
Definition
Television)**

Standard Definition Television pictures are higher quality than NTSC, however, they do not reach the quality and resolution of HD. SDTV is based on 480 lines of vertical resolution, available with both interlaced and progressively scanned formats.

SD-SDI

Refers to a standard definition signal provided on a serial digital connection.

Upconverting

Process by which a standard definition picture is changed to a simulated high-definition picture.

Widescreen

Widescreen TV is a picture with a 16:9 aspect ratio. 16:9 is the aspect ratio of movie screen and widescreen DTV formats used in all HDTV (High Definition TV) and some SDTV (Standard Definition TV); it stands for 16 units of width for every 9 units of height.

Appendix C:

Working With 2K Workflows

Introduction

This chapter provides a simple overview of 2K workflow and how the KONA 3 can be used as an integral part of it.

Overview of 2K and Its Uses In Digital Cinema

2K is a term, like SD and HD, used to describe a particular image size and quality of data. 2K data exceeds our pre-existing television broadcast standards for both SD and HD and is therefore most commonly associated with traditional cinema and the emerging digital cinema initiative.

As a point of reference, HD is commonly referred to by the 1920x1080 or 1280x720 pixel frame sizes. 2K, like HD, is commonly defined by two basic frame sizes. When working with data for eventual cinematic projection, FX work or digital intermediate purposes, 2K is usually defined as 2048x1556 pixels. This size represents the “full” size of the 35mm film between the sprockets. Therefore the result, 2048x1556 pixels, appears as a 4x3 image when compared to an HD image which is typically 16x9. In 2K, other images sizes can be derived from this 2048x1556 source by taking a cropped portion of the image for use or via scaling of the image. For a traditional cinematic projection scenario, the final delivery of this 2048x1556 data is onto 35mm film. The film then undergoes photochemical and mechanical processes before the image (digital image) reaches the screen.

The other common size attributed to 2K is 2048x1080 and this is the standard to which digital cinema currently adheres. Most digital cinema projectors have this 2048x1080 image size as a supported resolution and in many cases, as a maximum resolution.

So the first obvious advantage of working with 2K images as opposed to HD images when considering a traditional cinematic path is the size of the image that can be generated, worked with, and ultimately projected. Some will argue that a better choice for cinematic work is a 4K resolution. Certainly this is true, but this requires double 2K's already large data requirements to be handled and therefore is beyond the scope of nearly most modern equipment be it scanners, storage or projectors. To be fair, some 4K and beyond resolution is already being performed for select feature films and even then for select shots in many cases. Perhaps in the future 4K will supplant 2K as HD has SD but that day seems to be quite distant so for now a large body of the motion picture community has settled on 2K as a high quality image size.

2K Color: More Like Film than Video

2K images, like SD and HD images, can come in 8 bit, 10 bit, 12 bit, 16 bit, and other sizes. But most commonly, 2K files are written in a 10 bit Log RGB or RGB format. This provides for 1024 gradations of a given color in three equivalent colors of red, green and blue. By using RGB, 2K data can emulate, to some extent, film—which achieves its color reproduction via red, green and blue layers of emulsion.

The actual 2K image sizes of 2048x1556 and 2048x1080 are usually written in two similar, but slightly differing, file formats: Cineon or DPX (Digital Picture Exchange format). The Cineon file format traces its roots back to one of the earliest “film as digital” devices, the Kodak Cineon. The Kodak Cineon, introduced in 1992, was a scanner that took film images and translated them into digital data. Today many devices from a number of manufacturers allow for such a process.

Since files bearing the .cin extension were always related to film, they tend to always be in Log RGB. Log RGB is a color scheme designed to best approximate the characteristics of film emulsion in a digital environment. An easy analogy is this: Log RGB is like a “digital film negative” while linear RGB (usually just referred to as RGB) is like a “digital film positive.” To transform a log RGB image into a “positive”, Look Up Tables (LUTs) can be applied to the image so that before, during or after processing the raw image can be seen as it would be if it were a finished product.

As already mentioned, Cineon files are not the only file format that can be used to house the 2K data. DPX (Digital Picture Exchange) is quickly becoming the standard since being defined by SMPTE. Like files bearing the .cin extension, files bearing the .dpx extension can be Log RGB, but they can also be linear RGB.

Cineon and DPX files at full size, 2048x1556 and full 10 bit quality tend to exist as individual frames that occupy 12.2 MB of data. At 12.2 MB/sec., data rates for a second of video climb to 291.5 MB/sec. By comparison, the highest quality HD video images rarely exceed 200MB/sec. and most HD formats use only a little over 100MB/sec. Furthermore, HD material is usually somewhat compressed in order to be recorded onto tape formats, whereas the 2K data can achieve an uncompressed status having never had to be recorded onto a tape, but instead directly recorded onto a harddrive.

If the first major advantage of working with 2K images is their size, then the second advantage is their handling of color. A 2K color scheme can be used that more closely emulates film's properties than video. Furthermore, this color information need not be compressed due to the limitations of tape recording, but rather the data can be dealt with as uncompressed.

The Source of 2K Data: Scanning, Telecine and Digital Cameras

Until recently, the only way to acquire a 2K image was to shoot on 35mm film and then scan the original camera negative (OCN). To be fair, most 2K data is still generated in this method since film is still seen as the de facto medium for recording moving images for projection at the highest possible resolution. 2K scanning has persisted as the solitary method of creating 2K data until recently when a handful of telecine machines have come on the market that can move data at 2K resolution.

Now we are seeing the first generation of what can truly be referred to as “digital cinema” cameras as they lack video recording devices, specifically tape recording capability, in their design and instead concentrate on producing electronic data that aims to emulate the image quality of traditional photochemical film processes. This era is still early in its development but the pace of development promises that it will soon draw close to the quality, and in some users opinions, the ease of use of capturing images to motion picture film.

Transporting 2K Data: HSDL Defined

Moving 2K data is no small task; remember that at 12.2MB/frame, data moves at nearly 300MB/sec. Storage devices, such as RAIDs or SANs must have very high bandwidth capabilities to handle recording or playing back data at full speed. The storage devices must also have adequate space to hold this data as an hour of 2K just exceeds 1 Terabyte.

But storage devices are for storing the data; transporting the data is something different. HSDL (High Speed Data Link) is easiest for video professionals to understand in this way: HSDL is like Dual Link HD for the transmission of 2K data. Where Dual Link HD moves across two SDI cables as video, HSDL moves 2K data over the SDI cables. Because of the amount of data previously mentioned, full size 2048x1556 images cannot be transmitted over the dual SDI lines at full frame rate. Instead of moving the data at 23.98 (24) frames per second, the HSDL transport stream often adheres to 14.98 frames per second. Because this is transmitted data, not video, the data can be recorded at the 14.98 frames per second rate to a high speed storage device and then played back from this high speed storage device at full speed, typically 23.98 frames per second. In contrast to 2048x1556 images, 2048x1080 digital cinema 2K can move across HSDL at the full frame rate of 23.98 frames per second.

Facilities with two lines of HD-SDI rated cable, in a limited sense, are already prepared for the transmission of 2K data when attached to HSDL devices. If a facility already has storage that can exceed 300MB per second, that facility might also be ready to record and play back 2K data at full frame rate. Again, this transition to a “digital film” environment is far less cumbersome than a 4K digital environment where such numbers double those of 2K.

So a third advantage, beyond image size and color reproduction, is the ability of 2K data to use pre-existing elements of HD infrastructure when adopting 2K. For many facilities, be they large full-service or boutique, this makes the financial transition from HD to 2K less of a burden. While a transition to 4K would produce higher quality for most facilities, it would not be nearly as easy to achieve financially.

The AJA KONA 3: An Ideal 2K Input/Output Device

Opening the door to data-centric workflow and universal mastering, the AJA KONA 3 card represents a perfect input/output device (capture card) for facilities considering entering the “film as digital” landscape. The card is ideal because it’s capable of working with SD, HD, Dual Link HD and 2K. The KONA 3 card can receive and send 2K data via HSDL—making it compatible with a number of devices such as telecines and digital disk recorders (DDRs) already on the market and working with 2K data.

The advantages of using the KONA 3 as an input/output device extend beyond its 2K HSDL functionality. Not only can users ingest 2K data as simultaneous 2K DPX files and QuickTime files, edit this information, and then output 2K data, but users can also elect to ingest 2K data and output simultaneous HD from a crop directly derived from the 2K media. An SD downconvert of this HD video can also be created simultaneously, if so desired. For review of 2K data on HD and SD monitors, and for some mastering scenarios, the KONA 3 card can be used as a very flexible and effective tool.

Existing 2K data files in the Cineon and DPX file formats can be “wrapped” into 2K QuickTime Reference Movies via AJA’s DPXToQT Translator application so that users can take advantage of the aforementioned flexibility without writing any new data to their drives. QuickTime reference movies only point back to the source original DPX files from which they are derived. The main advantage of this, beyond not writing any new data to the drives, is that the cumbersome sequence of potentially thousands of frames can be consolidated non-destructively to a single file.

Furthermore, once media exists as a 2K QuickTime movie, it can be converted back into sequential DPX files that can be given to facilities using software or hardware, such as film recorders, that do not accept QuickTime files. This conversion can be accomplished via the AJA QTToDPX Translator application. This process, it should be noted, does require writing new data because it may reflect creative changes to the images that the user desired, such as effects.

Note: The QTToDPX Translator and DPXToQT Translator are both available from the AJA website in the KONA 3 support area:
www.aja.com/html/support_kona3_sw.html

AJA Video Systems, Inc. along with other 2K HSDL device manufacturers, has seen the growing need for a high quality image source, like 2K, in an evolving data-centric workflow. A 2K source can be used to derive the high quality film, digital cinema, HD and SD deliverables without compromise outside of a cumbersome leap to 4K. 2K capable devices, like the AJA KONA 3 card, will help facilities and filmmakers enter a data-centric workflow that results in a universal mastering environment.

The KONA 3 2K Process—Ingest to Output

The following step-by-step procedure outlines the task of bringing in 2K material from telecines or other HSDL devices connected to the dual SDI inputs on the KONA 3 card. The 2K ingest process requires the use of the AJA *VTR Xchange* software and configuration of the AJA KONA Control Panel.

The procedure for ingest of 2K is as follows:

1. Connect the telecine with HSDL output (or other HSDL output capable device) to the KONA 3’s two SDI inputs. (If you already have 2K DPX or Cineon files on storage capable of 300MB/sec., you can elect to use the AJA *DPXToQT Translator* application to “wrap” the sequential DPX or Cineon files to QuickTime Reference Movies. If this is the case, skip ahead to step 6 of these instructions.
2. Configure the AJA Kona Control Panel as follows:
 - A. For the Input tab of the KONA Control Panel, make certain that *Dual Link* is selected for Video Input.

- B. For the Format tab of the KONA Control Panel, make certain that the Video Format for Primary and Secondary is matched and matches the incoming “video”—which should be indicated in the graphic portion of the KONA Control Panel next to the SDI in 1 and SDI in 2 icons.
3. Run AJA VTR Xchange software. Go to the *Capture* pulldown menu in the application and select Video Settings. Choose *Source* from the three options of Adjustments, Compression and Source. From within this menu, select the appropriate format that is being indicated in the KONA Control Panel, i.e. 1556x2Kpsf14.98 10 Bit (2048x1556) Now select *Compression* from the three choices of Adjustments, Compression and Source. In the pulldown for Compression type, select *AJA Kona 10-bit Log RGB Codec* or *AJA Kona 10-bit RGB Codec*. (For maximum flexibility, and with most equipment, the *AJA Kona 10-bit Log RGB Codec* will be the best choice.) For the *Frames per second*, select 23.98 as this is the frame rate that will be set for the QuickTime Reference Movie that you will create simultaneously with the sequential DPX files. From the Preferences (AJA VTR XChange pulldown menu), look under the Capture heading and select *Save as Numbered Files*. You should also select a storage device capable of a minimum of 300+MB/sec. for the data under the Capture heading, Captured Clips Folder; if no selection is made, the application will prompt you to choose a location for your captured media.
 4. You're now ready to capture the material from the 2K output device. Begin playback on a non-controllable device or mark in and out points for a clip coming from a controllable device (like a digital disk recorder). If you have no device control, you can only select “*capture now*”—meaning that you will be crash recording the data onto your disks. If you do have a device that can be controlled, you can set in and out points and then select “capture”.
 5. While capturing, VTR Xchange is creating the QuickTime Reference Movie and the series of sequential DPX files; these files are written to the target folder defined by the VTR Xchange application based on the selection you made for their location from within the *Preferences>Captured Clips* Folder.
 6. For editorial, run Final Cut Pro. From within the Final Cut Pro application, go to the Final Cut Pro pulldown menu and choose Easy Setup. If the *Show All* checkbox is not checked, check it and then from the pulldown, select the 2K easy setup that reflects your media (If you ingested from telecine, in all likelihood you will select the *AJA Kona 3-2K x 1556 psf 23.98 10 Bit Uncompressed Log RGB* as an example.) Within your new project you can import the QuickTime Reference Movies created by VTR Xchange into the Browser window.

Note: Note: Since these QuickTime movies reference the 2K sequential DPX files, you will be able to play and scrub the footage as expected, however if you wish to play the footage backward, be sure to adhere to first holding down the “K” key on the keyboard and while holding this key, then the “J” key can be depressed for reverse playback. This is simply a limitation of reading the sequential DPX files; all other functions such as scrubbing the playhead in the timeline or using the “L” key for forward play and transport will behave as expected. In the event that you do use the “J” key solely, you may experience a lag and will need to wait for the application before further operations can be performed.

7. You can elect to either view the footage out of the card on monitors in one of three ways (two of which may occur simultaneously) or output from the Kona 3 card via HSDL to another HSDL compliant device. For monitoring, the 2K Crop tab of the Kona Control Panel can be configured to output 1920x1080 from the 2K source. These settings are described in Chapter 4 earlier in this manual under the description of the “2K Crop Screen.”

The 1920x1080 crop can be sent to a Dual Link HD-SDI capable monitor by connection of both of the HD-SDI outputs (Link A and Link B) of the KONA to the Dual Link inputs of a monitor. Or if a single link HD output is desired, the signal may be routed via single link HD-SDI out from the card. An additional single link HD-SDI output can be obtained from the card or one SD-SDI output from the card—both of which can happen simultaneously. The component output of the card can also be configured to output HD or SD in conjunction with the SDI outputs. The settings for the various outputs are accessed via the KONA Control Panel's *Format* tab by setting the Secondary (Converted) Format. For HSDL output, the 2K Crop function must be turned to *Off* in the Crop Mode and from the *Digital Out* tab of the KONA Control Panel, *Dual Link* must be selected.

8. For HSDL output, you can select to output 2048x1556 at 14.98fps (which is a standard among many HSDL devices), or you may elect to output via HSDL 2048x1080 at 23.98fps, which is what digital cinema devices tend to use. Or, you may elect to output the timeline as a QuickTime movie that can be translated back into a sequence of DPX files via the AJA *QuickTimeToDPX* Translator application.

Note: Note: This may be necessary for some devices and applications that do not accept QuickTime files or the AJA Kona 10-bit Log RGB or AJA Kona 10-bit RGB codecs but instead accept DPX files.

Additional Advice

Due to the flexible nature of Final Cut Pro, the timeline where the 2K files reside during editing, can be sent to other applications to be worked on at 2K resolution; Motion and Shake are examples of this. The 2K edit in Final Cut Pro can be referred to by other applications via XML or EDL, like Silicon Color's Final Touch 2K, so that the 2K DPX files or their associated QuickTime Reference Movies may be accessed.



Note: *KONA Utility Applications that can be used for 2K Workflow. All are available free from: www.aja.com/html/support_kona3_swf.html*



VTR Xchange Preferences Screen—Click “Save as Numbered Files” for file-per-frame capture



VTR Xchange Main Window Screen

Index

Symbols

.pkg file 33

Numerics

10 bit Log RGB 2

1080i 1

1080p 1

10-bit video 88

1D LUT 63

24 frames-per-second to 30 conversion 62

24P 1

2K 10

2K Color 2

2K Crop 67

2K ingest 22

2K sequential DPX 22

2K support 2

2K Workflow 3

2K Workflows 22, 1

2K workflows procedures, Appendix C 69

3:2 Pull Down 1

8 Channel audio 13

8-bit Versus 10-bit Video 88

9-pin D-connector 2

A

A/V Devices 78

A/V Devices window 84

A/V sources 31

AES digital audio 3

AES/EBU 13, 32

AES/EBU audio 2

AES/EBU Audio Inputs 13

AES/EBU inputs, selection 44

AJA Utilitie 5

Alpha channel 4, 59

Alpha channel, Video + Key 52

Analog 4 Channel Balanced/Unbalanced Audio 13

Analog audio output 54

Analog component 61

Analog component or composite 2

Analog component output 54

Analog composite 61

Analog connections 14

Analog Format 54, 61, 62

Analog monitor output 14

Analog Out Screen 54

Analog Out Screen Settings 54, 61, 62

Anamorphic 51, 2

Anamorphic SD to full frame SD 51

Apple Disk Utility 9

Apple Expansion Slot Utility 25

Apple Support 91

Aspect ratio 80

Aspect ratio conversion 2, 51

Aspect Ratio value 82

Audio 3, 2

Audio 2

Audio channel mapping 44

Audio connections 3

Audio Input 44

Audio input source 83

Audio input, pulldown menu 44

Audio input/output 30

Audio Inputs And Outputs 13

Audio Mapping 84

Audio Monitor Level 61

Audio monitoring connections 12

Audio Out 59

Audio, Monitor 61

Audio, select between 8- and 16-bit sampling 83

Audio/Video Settings 74, 79

Audio/Video settings 74

Audio/Video Settings Menu 77

Audio/Video Settings, Device Control Presets Window 83

B

Balanced 13

Bars and Tone, sample FCP project 85

Betacam 14

Black 56

Black borders 51

Black burst 14

Black burst generator 37

Black Level 61, 62

Black Level pulldown menu 61

Block diagram element 42

Block Diagram Screen 40

BNC Connectors 12

Borders, black 51

Box 5

- Box Contents 26
- Breakout Box 12
- Breakout Cable diagram 31
- Browser window 85
- Burn-in, timecode 66
- C**
- Cable Connections 11, 30
- Cable connector descriptions 13
- Cables 2
- Cabling the System 30
- Capacity 10
- Capture Preset 77
- Capture Presets Window 81
- Card installation, MacPro or G5 28
- Card Slots, recommended installation 30
- CD 5
- CD, KONA Software 5
- Chassis 5
- Chassis Connections 32
- Checking the System 85
- Cineon file format 2
- Codec settings 80
- Codec Tab Screen 62
- Color matte 58
- Color Meanings, Control Panel 42
- Color selection dialog 59
- Colors, meaning of 42
- Colorspace choices 63
- COMMAND key 57
- Component video output 14
- Component/Composite 14
- Composite 2, 54
- Composite output 61
- Configuration 33
- Connector Descriptions 13
- Connectors 13
- Connectors 12, 30
- Control Panel 39
- Control Panel Basics 40
- Control Panel Presets 70
- Control Panel, importance of keeping visible 72
- Control Panel, KONA 3 39
- Control Recommendations 73
- Control Screen 55, 58
- Control Screen Settings 55
- Conversion 2
- Conversion icon 42
- Conversion Icons 42
- Conversion Icons, Control Panel 42
- Conversion, YUV-RGB 63
- Create A New Easy Setup 78
- Crop 51
- Crop mode selection 67
- Crossconversion 2, 47
- Custom LUTs 63
- Custom LUTs Dialog 64
- Customer service 89
- D**
- Data Rate Calculator 5, 10
- Data Rate Table 11
- Default Kona Output 55
- Definitions, control panel 40
- Device Control Preset 78
- Device Control Presets 83
- Device pull-down 83
- Digital audio 2
- Digital Cinema, overview of 2K and its uses 1
- Digital intermediate 1
- Digital Out Screen 51
- Digital Out Screen Settings 52
- Digital System 31
- Digitizer pull-down menu 82
- Disk storage 8
- Disk Utility 9
- Down (Conversion) 51
- Down-Conversion 2
- Downconversion 2, 51
- Downstream Keyer 2, 4
- Downstream keyer 58
- DPX (Digital Picture Exchange format) 2
- DPX files 3
- DPXtoQT Translator 4
- DPXtoQTtranslator 5
- Drop Frame 84
- DS Keyer 58
- Dual Link 2, 3, 44, 52
- Dual Link HD 10
- DV (DV25) 19
- DV50 19
- DVCProHD 20

- DVCProHD Acceleration 4
- DVCProHD hardware scaling 2
- Dynamic RT 4
- E**
- Easy Setup (as listed in FCP Pulldown) 76
- Easy Setup, creating an 78
- Easy Setups 74
- Easy Setups For Use With KONA 3 76
- Easy Setups Menu 74
- EBU N10 14
- Editing long form content, scenario 21
- Editing timebase 80
- Embedded audio channel selection 44
- Embedded digital audio 2
- F**
- Factory Easy Setups 75
- Feature films, HD offline scenario 21
- Features 2
- Features, KONA 3 software 5
- Fibre Channel 9
- Field dominance 80
- Final Cut Pro 5, 39
- Final Cut Pro menu 74
- FireWire 83
- Flying logo 4
- Foreground pre-multiplied (checkbox) 59
- Format Screen Settings 46
- Formats and Transfer Rates/Storage Table 11
- Formats Screen 45
- Formats, video 47
- Frame Buffer over Matte 58
- Frame Buffer over Video In 58
- Frame Rate 84
- Frame Size 82
- Frame size 80
- Frame size settings 82
- Framebuffer 41
- Freerun 57
- Full Frame 62
- Full-screen 51
- G**
- G5 1
- Gamma 63
- Genlock 2, 14, 57
- Genlock and Your System 37
- Getting Help 90
- Glossary 1
- GOP 4
- Graphic File 59
- graphic file, test pattern output 56
- graphic files 4
- Graphic over Frame Buffer 59
- Graphic over Matte 58
- Graphic over Video In 59
- H**
- H Crop 51
- Hard drives 8
- Hardware 2, 4
- Hardware and software requirements 7
- Hardware scaling 1
- HD Offline Scenario 22
- HD Offline Scenarios 21
- HD-component analog connections 13
- HD-SDI connections 13
- HDV codec 4
- HDV hardware scaling 2
- Hold Last Application 57
- Horizontal reference 57
- Horizontally stretched 51
- House sync 37
- HSDL (High Speed Data Link) 3
- HSDL Defined 3
- HSDL ingest 22
- I**
- I/O connectivity 11
- Icons 42
- Icons 40
- Icons, Control Panel 42
- IEEE 1394 83
- Info Screen 69
- Info Tab 70
- Ingest of 2K media via HSDL 22
- Input Pass through 56
- Input pull-down 82
- Input Screen 43
- Input Screen Settings 44
- Input/Output 42
- Installation Overview 25

Installation Software CD-Rom 5
Installer Screen 34
Installing Software 33
Installing the KONA Card 28
IRE 61

K

K3-Box 12
K3-Box connector descriptions 13
Key a bug 4
Keyed video 58
Keyer 2
Kodak Cineon 2
KONA 3 2K Process—Ingest to Output 4
KONA 3 control 70
KONA 3 Control Panel 39
KONA 3 Control Priorities 71
KONA 3 Formats 47
KONA 3 installation 25
KONA 3 Software 33
KONA 3X 1
KONA 3X, installation 25
Kona Output Pulldown Menu 56
KONA TV 5

L

Letterbox 51
Linear 63
Linear RGB 2
Load File 59
Lock Input Audio Gain To Unity 61
Log On Authenticate Prompt 34
Log RGB 20
Looping 2
LTC 84
LUT 63

M

Machine Control 13
Machine control parameters 83
Machine Control, pinout 2
Macintosh Desktop 56, 72
MacPro 1
Manual 15
Matte 58
Matte Color 59
Menus, context-sensitive 40

Mini-connectors 12
Minimum hardware and software requirements 7
Mixing 22
Mixing and Matching Formats 22
Monitor Audio 54, 61, 62
Monitor Out 14
Monitoring, analog outputs 54
Motion adaptive de-interlacing 2
MPEG 4
Multi-cam 5
Multi-channel input 44

O

Offline quality at low bit rates 18
Offset, timecode 66
Offset, video adjustment (timing) 57
On-line quality at moderate bit rates 18
Opacity 59
Operating System 7
OS X installer files 33
Output Timecode Offset value 66
Output video black 56
Overview 1

P

Packaging 6
Pattern, test 56
PCIe version of KONA 3 7
PCI-Express 1
PCI-X version 1
PCI-X version (KONA 3X) 7
PhotoJPEG 19
Pillar box 51
Pillarbox 51
Pinout, RS-422 D-connector 2
Pixel aspect ratio 80
Playback device 84
Post-roll 84
Pre-roll 84
Presets 70
Presets 74
Presets, KONA 3 Control Panel 70
Primary 52
Print-to-tape 85
Problem symptoms 89
Problems, what to do 89

Problems, what to do if you encounter 89
Progressive frame 47
Progressive segmented frame 47
psf 47

Q

QTtoDPX Translator application 4
QTtoDPXtranslator 5
Quality and codecs 18
Quality, lowest to highest 18
QuickTime Audio Settings 83
QuickTime Timecode 66
QuickTime video 80
QuickTime Video Settings 82
QuickTime™ Drivers 5

R

RAID 9
RAIDs 8
RCA connector pair, K3-Box configuration 61
Read/write 8
Rear panel 13
Rec 601 63
Rec 709 63
Recommended System Requirements 7
Ref In 57
Ref Loop 14, 37
Reference Input 2
Reference Terms 1
Reference Video 14
Requirements 7
Requirements, System 7
RGB 14
RGB Codec 20
RP-188 64
RP-188 Timecode 65
RS422 13, 83
RS-422 control 2
RS-422, Sony 9-pin protocol. 9-pin D-connector pinout 2

S

Sample rate 80
Sample rate conversion 3
SATA drives 10
Save Preset.. 70
Scenarios, workflow 17

SD letterbox material to an anamorphic image 51
SD to SD aspect ratio conversion 51
SDI Input and Outputs 13
SD-SDI connections 13
Secondary 52
Select audio 59
Sequence Preset 77
Sequence Preset Window 80
Sequence window 85
Set up 25
Settings 74
Shipping 28
Shipping Box Contents 6
Shipping Box Contents, illustration 27
Shipping box, unpacking 25
Sidebars 51
Simple Test Project 85
Single Field 62
SMPTE RP 188 66
SMPTE-372M compliant 4
Snapshot, Control Panel settings 70
Software 5
Software files that have been installed 69
Software For Striping 9
Software installation 33
Software License Agreement 35
Software License Agreement Screen 35
Software on a PowerMac 33
Software requirements 7
Software updates 90
Source of 2K Data 2
Specifications, Appendix A 1
Standard Cables 11
Storage capacity 10
Storage Methods 8
Storage Requirement Table 11
Support 90
S-Video connections 14
Symptoms and remedies 89
Symptoms, problem 89
System Connections 32
System interconnections 31

T

Tabbed Windows 41, 42
Tabs available 43

Tabs available, KONA Control Panel 43
Telecine 2
Telecine to KONA 3 3
Test Pattern 56
Testing the system 85
Time Source 84
timebase 80
Timecode 84
Timecode Burn-in 66
Timecode Offset 66
Timecode Screen 61, 64
Timecode Screen Settings 65
Timing adjustment, Control Panel 57
Transforming 51
Transporting 2K Data 3
Troubleshooting 89
Typical applications 17
Typical system interconnections 31
Typical Workflows 18

U

Uncompressed 10-bit 20
Uncompressed 8-bit 20
Unpack 5
Unpacking 26
Upconversion 2, 50, 51
Upconverter 2
Updating Software 90
User and password 34
User Bits, RP-188 65
Using K3-Box 12

V

V Crop 51
Varicam timecode 65
Vertical reference 57
Video and audio input/output connections 30
Video connections 11
Video Format 46
Video Input 44, 1
Video input source 57
Video input source selection 82
Video Output 1
Video path 41, 42
Video processing properties 80
Video+Key 52

Video+Key Output 2
Video/Audio connections 30
VITC 84
VTR 83
VTR connections 32
VTR Device Control Presets 84
VTR Xchange 5
VTR Xchange software 5

W

Workflow 17
Workflow General Notes 21

X

Xserve RAID 9

Y

Y/C connection 14
Y/C output 54
Y/R-Y/B-Y 14
YPbPr 14
YUV 14
YUV-RGB Conversion 63

Z

Zoom 14
Zoom Letterbox 51
Zoom Wide 51