KONA3G

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Installation and Operation Guide

Because it matters.

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VIDEO SYSTEMS

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Notice

Contacting Support

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

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

Email: support@aja.com

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

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Chapter 1: Introduction

Overview

The AJA KONA 3G provides the highest quality whether working with SD, HD, Dual Link HD, or 3G signals. KONA 3G even supports 2K digital cinema and film resolutions and now offers a 4K capture and playback mode for the highest resolution possible. AJA drivers deliver extensive codec and media support within all professional 3rd-party Video applications. KONA 3G offers:

- 3D workflow support – discrete left and right eye output in SDI and HDMI 1.4a
- 4K I/O mode with support for capture andplayout in both YCbCr and RGB

    Note: In 4K Mode, all four mini-BNC connectors are used either for inputs (when a 4K capture application controls the card) or for outputs. 4K requires bootup from its own alternate firmware image, see *"Firmware Tab Screen" on page 62*. For details on 4K Mode operation, see *"Using 4K Mode" on page 64*

- Hardware-based upconversion from SD to HD; hardware-based downconversion from HD to SD; and HD to HD crossconversion between 720 and 1080 HD
- DVCProHD and HDV hardware scaling support

KONA 3G is designed to be the ultimate capture and playback card. AJA provided software utilities and applications deliver leading features for broadcasters and filmmakers.

A state of the art PCI-Express card, KONA 3G plugs into a PCI-e expansion slot in PCI-Express enabled computers. The card comes with software that allows it to work seamlessly with third-party capture/edit/compositing applications 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 is a cable set that can be connected to a variety of SD, HD, Dual Link,3G, and 2K capable equipment. For even easier connectivity, an optional K3G-Box rack mountable breakout box is available and ships with it's own multi-connector cables.This manual covers the installation of the KONA 3G, the optional K3G-Box, and provides an overview of AJA's Control Panel software.

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Features

The KONA 3G card offers many unique features for optimum quality, ease of use, and support for a wide variety of post production workflows. 3G features include:

- SD-SDI, HD-SDI, Dual Link HD-SDI, HSDL, and 3G HD-SDI inputs
- HDMI 1.4a output for stereoscopic monitoring to consumer 3D displays
- 2K support that includes 2048x1556 and 2048x1080 formats
- 4K capture and playout (see *"Video Formats" on page 79*)
- x4 Lane PCI-Express Bus Interface
- DVCProHD hardware scaling acceleration
- HDV hardware scaling acceleration
- 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
- LTC (longitudinal timecode) input/output

    8-channel 24-bit, 48kHz 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 K3G- Box (terminated on the supplied breakout cable)
- Standard 2 meter length connection cables including HDMI mini to HDMI output cable.

3D Stereoscopic Workflow

KONA 3G offers you the simplest path through 3D stereoscopic workflows.

Through SDI, you can output Discrete Left and Right Eye feeds with a simple Stereo button choice in the AJA control panel. Additionally, muxed stereo output is possible using a single SDI output. AJA hardware and software works in close collaboration with CineForm's Neo3D software tools and CineForm codec to allow stereoscopic editorial and viewing when working with compliant professional video editing applications.

Through it's HDMI 1.4a output, KONA 3G makes it possible to connect to affordable 3D-capable monitors for stereoscopic monitoring.

Broadcast-Quality Conversion

KONA 3G features hardware-based full 10-bit broadcast quality motion adaptive SD to HD up-conversion, HD to SD down-conversion and HD to HD cross-conversion. The quality of the conversion features found in the KONA 3G is virtually identical to AJA's award winning stand-alone converter products used throughout the post production market. The KONA

3G built-in up-converter uses a a full 10-bit path, fully motion adaptive de-interlacing, and large multi-point digital interpolators. Down-conversion uses large multi-point digital interpolators, anti-alias filtering and interpolation.

Cross-conversion 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 project to an HD deliverable.

KONA 3G Audio

KONA 3G supports 8-channel 24-bit 48kHz AES audio via BNC connections on the supplied breakout cable—or with the optional K3G-Box,16-channels of AES audio.

KONA 3G's high-quality input sample-rate conversion on AES inputs eliminates the need for audio source synchronization. Sample rate converters auto-lock to any AES input, 32-96kHz, and then convert it to 24-bit 48kHZ audio, locked to internal KONA 3G video. Sample rate conversion is done at very high quality (over 120db THD).

Dual Link

KONA 3G supports Dual Link HD-SDI (4:4:4). KONA 3G supports the ingest and output of SMPTE-372M compliant 4:4:4 RGB video and high-bandwidth 4:2:2 1080p 50, 1080p 59.94, and 1080p 60 at 10-bit.

2K Workflow Support

The KONA 3G 2K path offers potentially significant cost and labor savings over a tape-based approach to a 2K workflow. In a unique development for customers on Mac or PC platforms, 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 3G saves time and steps in the process by directly and simultaneously creating 2K DPX files and 2K QuickTime. 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 3G 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 playout can be down-converted to SD in real time, giving the 2K DI pipeline a powerful solution for multi-format video playout of 2K material.

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

4K Mode Capture and Playout

In 4K Mode, KONA 3G offers 4K capture and playback in both YCbCr and RGB.

When using a capture application that supports 4K geometry, the 3G maps connectors SDI1 through SDI 4 as inputs for 4K video.

When 4K playout is selected, the four SDI connectors are remapped as outputs for driving the four quadrants of a 4K display. A large number of 4K formats are supported for this emerging workflow; see the specifications (*"Video Formats" on page 79*) for supported 4K formats.

Internal HD/SD Hardware Downstream Keyer

KONA 3G provides 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 (including AJA TV /AJA's VTR Xchange). Key a bug or text over picture and avoid what might normally be a lengthy software render. Also, working with these software applications, you can key video that has an alpha-channel over video input or a matte. For example, you can load a QuickTime clip that has an alpha-channel (a flying logo generated in the Animation codec) into AJA TV and then place it over live video coming into the card and then passing both on to a VTR for recording or broadcast.

AJA Support Software

On a Mac

AJA KONA for Mac drivers are optimized for use on OS X, with applications and advanced AJA hardware capabilities controlled easily at-a-glance in the application you're using. KONA for Mac software integrates within the native environment where used – whether Avid Media Composer, Apple Final Cut Pro, Adobe Creative Suite, Autodesk Smoke for Mac, or a wide array of other Mac applications.

Supported applications include:

- Avid® Media Composer® 6, Symphony® 6, and NewsCutter® 10
- Apple Final Cut Pro X
- Adobe Creative Suite
- Autodesk Smoke® for Mac

The KONA Desktop feature allows broadcast design elements to be viewed with the proper aspect ratio and color depth on a broadcast monitor via the KONA card. KONA Desktop is available on the entire range of KONA cards, supporting Adobe After Effects, Photoshop, Apple Motion, Autodesk Smoke for Mac and more. Powerful AJA utilities, Easy Setups, and plug-ins round out the Mac environment, providing support for all popular Mac application workflows.

On a PC

KONA for PC software allows Windows to access the hardware power of your KONA within major editing and graphics applications. Other software vendors have also provided integrated support for KONA in their own PC applications through direct collaboration with AJA. Choose the right KONA card for any format you need, including DPX, Cineon, TGA, TIFF, BMP, AVI and QuickTime. You can playback and master material, at a variety of frame rates, on a high-resolution widescreen monitor or digital projector. Custom AJA software allows full control over your playback, parameters are clearly laid out, including provisions for choosing a user-specified LUT. Supplied AJA plug-ins integrate your KONA card into a variety of graphics/visual-effects software applications to make operations even easier to use. Using AJA plug-ins, sophisticated features appear as if they were native to the software application user interfaces.

Directly supported applications include:

- Avid® Media Composer® 6, Symphony® 6, and NewsCutter® 10
- Adobe Premiere® Pro
- Adobe After Effects®
- Adobe Photoshop®
- Sony® Vegas®
- Eyeon Fusion®

KONA 3G users will also find the powerful AJA Control Panel automatically installed with their KONA package. The AJA Control Panel provides easy I/O configuration monitoring, audio/video source selection, conversion and control of KONA 3G within the overall MacOS or Windows 7 environment.

Available Utilities from AJA include: AJA Utilities: AJA TV, VTR Xchange, AJA System Test, AJA DataCalc, AJA QTtoDPXtranslator, and AJA DPXtoQTtranslator.

Understanding Typical Workflows

KONA 3G allows more post production workflow flexibility than ever before . A variety of formats, frame rates, and codecs for capture and editorial manipulation are available. KONA 3G 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, 3G HD or 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 development of the DVCPRO HD codec, native HD editing in the codec became possible, providing very high-quality (true HD) editing at very low data rates—in some cases lower than 6 MB/sec. The benefits are clear when compared to 100MB/sec and higher for uncompressed HD formats.

Following are summaries of the most common codecs used in various workflows, providing 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 (as noted where supported).

PhotoJPEG

Data rate: approximately 1-3 MB/second (megabyte per second) standard definition or high definition—supported by internal system drive

Quality: Very Good

The PhotoJPEG codec offers excellent compressed media for near on-line quality at low data rates. PhotoJPEG can use full-raster 4:2:2 sampling. KONA 3G allows PhotoJPEG monitoring and output in both SD and HD and can capture from almost any HD or SD input, directly to PhotoJPEG media.

DV (DV25)

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

Quality: Good

DV is commonly input to an Apple computer via FireWire. KONA 3G can capture directly to DV compressed media from an uncompressed SDI source. For devices without FireWire (IEEE1394 or i.Link) connections, this allows the user to capture to this low data rate/good-quality codec. While DV does offer good quality, it has lower chroma resolution compared to DV50, JPEG, or uncompressed. The KONA 3G can convert DV projects to Uncompressed, in real time, for monitoring and output even if the footage is not captured using the KONA 3G.

DV50

Data rate: 6+ MB/second standard definition only—supported by internal system drive

Quality: Very Good

Panasonic DV50 standard definition codec. DV50 is a 4:2:2 compressed format and has higher chroma resolution than DV25. As with DV25, KONA 3G can convert DV50 projects to uncompressed, in real time, for monitoring and output. KONA 3G 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 3G has hardware support for capture from HD-SDI to the DVCPRO HD codec. KONA 3G's hardware also takes some of the DVCPRO HD codec processing load off the CPU, allowing more computer processor time for Dynamic RT.

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 3G to convert HDV projects to uncompressed-in real time on playback-for monitoring and output.

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

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

Quality: Excellent (broadcast quality)

Capturing uncompressed produces clearly defined video, at full-raster size and 4:2:2 chroma sampling. Using uncompressed maintains high quality from capture through effects rendering. KONA 3G supports capture of uncompressed media through its SDI input. Uncompressed media can be output from all of the KONA 3G 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 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.

AJA KONA10-bit Log RGB and RGB Codecs

Data rate: 200 to 300+ MB/second high definition and 2K; 4K 200 to 850MB/second

Quality: Excellent (highest quality available)

Offering all the benefits noted previously for 10-bit uncompressed 4:2:2, Dual Link 4:4:4 video using 2 HD-SDI channels and 3G 4:4:4 using one SDI channel provide full-color resolution and 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, and
- the highest level compositing and color correction.

AJA KONA10-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.

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

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

Quality: Excellent (broadcast quality)

Captured media is virtually indistinguishable from pristine uncompressed sources. Better yet, ProRes maintains the quality during editing, surviving multiple encoding/decoding generations without degradation. It was designed by Apple for editing, not as a transmission/distribution codec as are most popular codecs. Advantages include:

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

What's In The Box?

When you unpack your AJA KONA 3G, you'll find the following components (refer to):

- AJA KONA 3G Software and Documentation CD-ROM—this CD contains the software installer to place KONA 3G drivers and the Control Panel on your computer. Due to the pace of innovation, it is best to install the latest driver version from the AJA website.
- KONA 3G 4-Lane PCI-Express card.
- Cable, HDMI mini-to-HDMI output
- Cable, KONA 3G 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 BNC 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 3G.

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

System Requirements

AJA Video recommends that your system meet minimum hardware and software requirements to achieve a satisfactory level of performance when operating it. System requirements are subject to change as new versions of operating systems, QuickTime, and workstations become available. For the most up-to-date Mac Pro Minimum System Requirements see the AJA website at:

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

For the most up-to-date Windows system requirements for KONA, consult the AJA website:

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

Understanding Disk Storage Methods

To ensure performance and quality, the disk storage system used with the MacPro or PC 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 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 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 computer to disk (read/write). There are a variety of system configurations and peripherals that can provide this level of performance.

KONA 3G 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, like drive seek time and controller cache 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 increase storage capacity and provide the performance, reliability, and data protection needed for video production, that is 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 drive into data blocks, or stripes, that are distributed across an array of physical drives. Striping a set of disks improves 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 utility can be found in *Macintosh HD/Applications/Utilities*, where "*Macintosh HD*" is the name of the system drive.

Storage Example: AJA KONA 3G 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 DataCalc 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 DataCalc application 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 DataCalc 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

FORMAT	Data Rate in MB/sec	Storage Requirement in GB/Hour
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
MB = MegaBytes GB = GigaBytes		

Cable Connections

When KONA 3G 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 K3G-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 3G offers you complete I/O connectivity choices. One cable provides AES/EBU digital BNC 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 3G card endplate and on the cable connectors for easy identification.
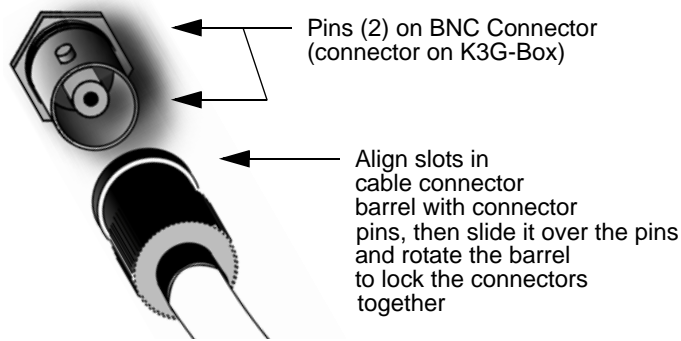
Using The Breakout Box

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

For additional functionality, the K3G-Box Breakout Box provides some features not present in the standard break-out cables: 16 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.

Pins (2) on BNC Connector
(connector on K3G-Box)

Align slots in
cable connector
barrel with connector
pins, then slide it over the pins
and rotate the barrel
to lock the connectors
together

The four mini-connectors found on the KONA 3G 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.

Knurled Barrel:
Pull back to release
connector.

4 Mini-connectors
on KONA 3G PC Board
endplate
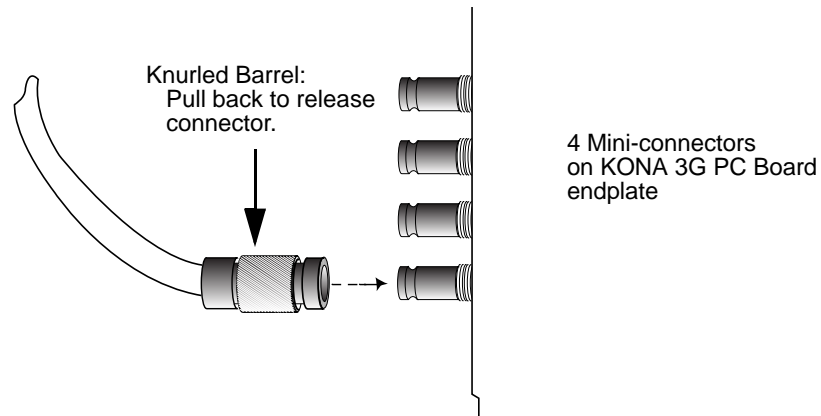
Connector Descriptions—Cables and K3G-Box

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, BNC connections are provided for 8 digital AES/EBU audio input/output.

The optional Breakout Box provides 16 BNC audio connections on the front panel.

Analog 2 Channel Unbalanced Audio (Breakout Box only)

On the optional K3G-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

In Standard Mode, 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 3G board to the optional K3-Breakout Box.

KONA 3G offers 4 video outputs in SD and 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. A fourth output via HDMI 4.1a is also provided.

When the KONA 3G is reconfigured for 4K Mode and a 4K format is selected, all four of the mini BNCs are used as outputs for each of the 4K playout quadrants. There are no SDI inputs available in 4K formats. If a format of 2K or less is selected the normal SDI inputs are available (see *"Using 4K Mode" on page 64* for more information on 4K output mapping).

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 3G 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.

HDMI 1.4a Monitor Output

KONA 3G offers an HDMI 1.4a output for monitoring in HDMI or DVI protocols (use DVI if you're outputting to a DVI monitor). The output also supports Stereo 3D output in either Side-by-Side or Top-Bottom (Stacked) output of left-eye and right-eye signals.

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

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

A Note About RGB—Although RGB is used less in today's video systems, KONA 3G supports it for A/V Monitor output. However, because KONA 3G'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 AJA Control Panel.

HDMI and Analog Output in 4K Format

When the KONA 3G is in 4K Mode with a 4K format selected, the HDMI and Analog Outputs can be selected to display one of the four 4K picture quadrants for output. A quadrant selection menu is provided in their respective AJA Control Panel tabs. (refer to *"Using 4K Mode" on page 64*).

Reference Video

A single BNC connector is standard on the KONA 3G 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 3G 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 3G reference input. When KONA 3G 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 AJA 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 provides complete instructions for installing and configuring the AJA KONA 3G card. The user is guided through unpacking, installing the card into a MacPro or PC tower, cabling the system, installing KONA 3G Mac and PC Driver Software. Information is also provided on the use of genlock/external reference.

Chapter 3 discusses operational aspects of KONA 3G when used with the AJA Control Panel.

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

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

Finally, an index section helps you rapidly find topics in the manual.

Chapter 2: Installation
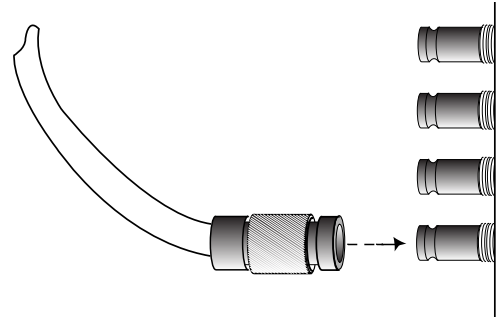
Installation Overview

The installation and set up of a KONA 3G is very simple. All of the steps of installation and configuration are documented in this chapter, summarized as follows:

1. Unpack and examine the contents of the shipping box

2. If not previously installed on your Mac or PC, ensure that the capture/editing application you intend to use is installed as detailed in its user documentation. Your application must be installed and run at least once for the *KONA Easy Setups* to be installed properly. 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. For the KONA Mac installation, AJA recommends that the card 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.) Refer to the AJA website at:

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

   For the most up-to-date Windows system requirements for KONA, consult the AJA website:

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

4. Install AJA KONA software on your computer. 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.

   http://www.aja.com/en/support/downloads/

5. 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 3G 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.

2

AJA KONA System Test and Data Rate Calculation

To guarantee maximum system performance, use KONA System Test and the AJA Data Rate Calculator to evaluate your workstation capabilities. They are available on the AJA website at the following support pages (See **Utilities and Optional** at the bottom of the webpage).

http://www.aja.com/en/products/software/

KONA System Test

KONA System Test is a utility for measuring system performance with AJA KONA Video Capture cards. The application includes disk drive speed tests and video data copy (DMA) speeds. The disk speed tests differ from standard disk I/O performance applications in that they specifically test the system under conditions typically encountered with video capture, playback, and editing.

Note: Note: Most of the disk performance tests are generic and don't require an AJA KONA Video Capture card. The DMA performance tests do require a KONA card and AJA KONA Driver software to operate.

We suggest the best test is to fill your storage disk to 80% and then test capture at the highest data rate you will use.

AJA Data Rate Calculator Application Version

This software application calculates data rates and storage requirements for a given video size, format, and frame rate. It's great for both KONA and Io users as a resource for configuring systems and determining storage requirements.

Unpacking

Shipping Box Contents

KONA 3G is shipped with a CD containing system software for installation and a user manual (a PDF on the CD), and three cables:

- Multi-pin to multi-connector breakout cable
- x4 BNC to 1.0/2.3 connectors cable
- HDMI Mini to HDMI audio/video output cable

If you purchased the optional K3G-Box breakout box, it ships with a multi-pin to multi-pin cable for connecting from the KONA 3G 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. Also, the HDMI cable connects between the 3G card and the box rear panel.

Installation Software CD

AJA KONA 3G
PCI-Express
Card

Read Me First Notice
and Registration Sheet

Installation and Operation Manual
in electronic form on the CD (PDF)

Standard Cable Set

RS422
Machine Control
(9-pin)

HDMI to HDMI mini cable
2 meters

3 BNCs (Analog Out Connections):
In SD Can be Configured for
Component,
Composite,
or S-Video
In HD Can Only Be Component

Reference Input BNC
LTC Output BNC
LTC Input BNC

SDI cable

Audio Input BNCs
Channels 1-8
(2 channels/connector)

SDI Out1/Link A BNC
SDI Out2/Link B BNC
SDI In1/Link A BNC
SDI In2/Link B BNC

Audio Output BNCs
Channels 1-8
(2 channels/connector)

Contents, KONA 3G Shipping Box Contents

As you unpack your shipment, carefully examine the contents. Ensure you received everything and that nothing was damaged during shipping. 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 3G 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 3G Card into a MacPro

1. Place the computer in a well-lit area, where you will have easy access when opening the MacPro 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 described in your Apple User Manual. Lay the machine on its side, motherboard facing up.

4. Remove the KONA 3G 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 (Mac Pro 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—(slot 3 is the preferred slot on the MacPro). You should configure the slots with the Apple Expansion Slot Utility application for the MacPro so that the KONA is at x4 or better speed.

6. Remove the card-edge access cover from the desired slot where you will be inserting the KONA 3G card. The card edge cover is secured by a tie-down bar with two secured screws on MacPro computers; remove and set them aside for securing the KONA 3G after installation.

7. Holding the KONA 3G card by the card edge plate and an outside edge, carefully insert the KONA 3G 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 outer access door on the MacPro.

KONA 3G Card

To Install:

1. Remove Screw and Cover Plate and Insert KONA Card

2. Secure KONA with Screw Removed Earlier

PCI-Express Slots

Mac Pro Cardcage Access

PCI-Express Slots

Slot 3 is the preferred slot on a MacPro for KONA 3G PCIe card installation

Card Slots, PCIe Mac Pro shown here

Installing the KONA Card in a Windows PC

1. Place the PC in a well-lit convenient area, where you will have easy access to the chassis access door.

2. Touch the outside of the PC to discharge any static electricity in your body. Remove the power cable from the back of the PC.

3. Open the PC to gain access to the card slots as described in your Workstation User Manual.

4. Remove the KONA card from its protective anti-static bag; place the card on top of the bag.

5. To install the KONA card and RAID controller card (SCSI or Fibre Channel), refer to the AJA website for the latest installation updates at the URL provided.

Because of hardware and software changes, AJA engineers are constantly testing and grading workstation performance. The AJA website is your best source of up-to-date approved workstation configurations.

Note: Always put the RAID controller and KONA on separate PCI busses. This improves performance by reducing bus contention.

HP Z800 Workstation
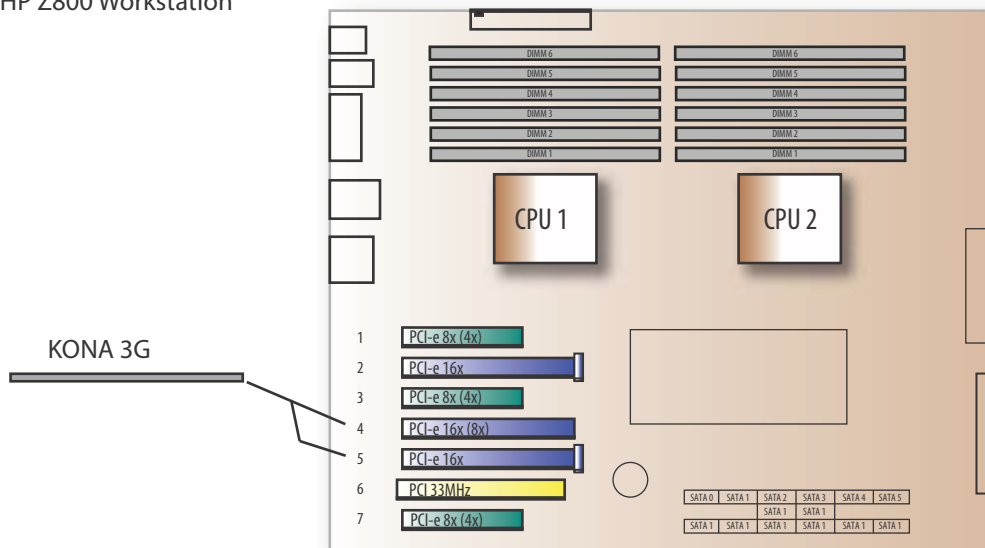
KONA Card placement in HP Z800 Motherboard

6. Open the card retainer bar on the left side of the chassis cardcage. Remove the card edge access cover from the desired slot where you will be inserting the KONA card.

7. Holding the KONA card by the card edge plate and an outside edge, carefully insert the KONA card by rocking it slowly into the slot. Ensure the card edge aligns properly with the PC's opening (where the card edge cover was just removed) and that it is fully seated in the slot.

8. Secure the card in the slot replacing the card retainer bar.

9. Replace the PC's panel/door removed in step 3.

Card edge covers
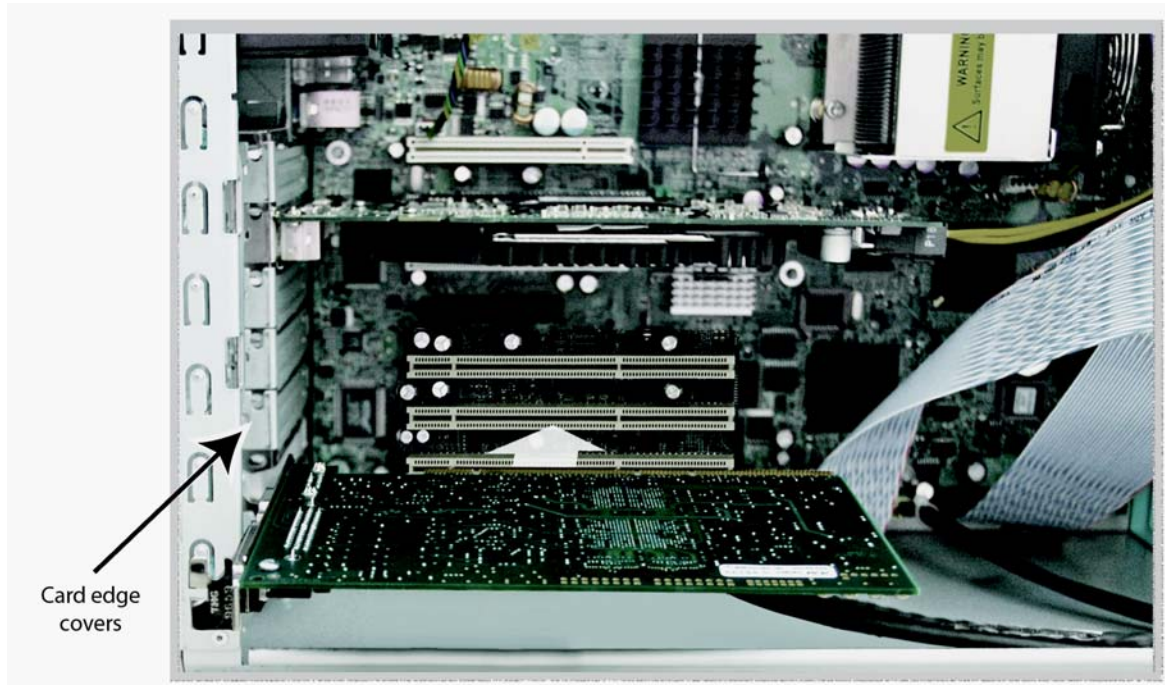
Locate the correct PCIe Slot and Insert the KONA Card (typical installation shown)

Cabling the System

System Video/Audio Cable Connections

When installing your system, you'll make video and audio input/output connections. These connectors are described individually in Chapter 1. The following diagram shows and describes system interconnection.

KONA 3G
Installs in
PCI-Express Slot

Standard Cable Set
Showing "BNC/DB9-cable" Use

HDMI Output cable

RS422
Machine Control
(9-pin)

3 BNCs (Analog Out Connections):
In SD Can be Configured for
Component,
Composite,
or S-Video
In HD Can Only Be Component

Reference Input BNC

LTC Output BNC

LTC Input BNC

4-mini BNCs
to 4 standard
BNCs

Audio Input BNCs
Channels 1-8
(2 channels/connector)

Audio Output BNCs
Channels 1-8
(2 channels/connector)

SDI Out1/Link A BNC

SDI Out2/Link B BNC

SDI In1/Link A BNC

SDI cable

SDI In2/Link B BNC

KONA 3G 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 3G Ref Loop connector (BNC). On the breakout cable this is a terminated reference input. The second KONA 3G 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 3G 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 KONASDI 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 3G and your digital VTR (Digital Betacam etc.): one from KONA 3G SDI In to the VTR SDI Out, and one from KONA 3G SDI Out (1 or 2) to the VTR SDI In. The KONA 3G 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 K3G-Box.

5. If you have an AES/EBU-ready audio monitoring system, then connect the eight channels of AES/EBU output from KONA 3G's BNC connectors: 1/2, 3/4, 5/6, and 7/8, to the monitoring system AES/EBU inputs. If instead you have an analog audio monitoring system, you can use the two RCA-style unbalanced stereo output jacks on the optional K3G-Box for output.

Workstation computer

Computer Monitor

External Storage

Video Monitor
Component Video

AJA KONA 3G Card

3 BNCs (Analog Connections):
In SD Can be Configured for
Component,
Composite,
or S-Video
In HD Can Only Be Component

HDMI Output cable

Optional
Genlock
Reference

Reference Input BNC

LTC Output BNC

LTC Input BNC

HBA for connection
of external storage

Installed
inside computer

Audio Input BNCs
Channels 1-8
(2 channels/connector)

4-mini BNCs
to 4 standard
BNCs

Audio Output BNCs
Channels 1-8
(2 channels/connector)

AES/EBU Audio Out
to Monitor System

RS422
Machine Control
(9-pin)

In 4K Mode all four
mini BNCs are Inputs or Outputs,
one for each Quandrant of the image

SDI Out1/Link A BNC

SDI Out2/Link B BNC

SDI In1/Link A BNC

SDI In2/Link B BNC

SDI Out1=Left top

SDI Out2=Right top

SDI Out 3=Left bottom

SDI Out 4=Right bottom

SDI cable

Digital VTR with SDI Inputs

SDI Video
with Embedded
Audio In/Out

Typical System Connections

Installing KONA 3G Software

First ensure that your capture/editing application is installed as detailed in its user documentation. You cannot use KONA 3G with Third-party software until the application has been installed and run at least once on your workstation. Next, install the KONA 3G driver package. After installing KONA drivers you will install your selected AJA third-party plugins integrating KONA functionality into your capture/editing application.

System software updates may occasionally become available to AJA KONA owners on our website at:

http://www.aja.com/en/support/kona/mac/kona-3g/.

We recommend checking occasionally for both software updates and additional product information.

Note: If your computer has previously had another video capture or multimedia card installed, ensure you remove the card and uninstall any related software before installing KONA 3G. This will prevent any hardware or software conflicts. KONA 3G will operate properly on a computer that also has an AJA Io product and its associated drivers installed.

Installing KONA Software for Mac

After securing the most recent KONA 3G driver package, read the details and requirements on the to ensure compatibility with your system configuration. Minimum system requirements for the host were described in "System Requirements" on page 8.

Mountain Lion OS and Gatekeeper

Note: Before installing KONA 3G software, turn off any virus protection and security software that you may have installed on your computer. Also, with the addition of Gatekeeper functionality in Mas OS Mountain Lion, you should go to System Preferences>Security & Privacy and choose to allow *Mac App Store and identified developers*.

Mac Security & Privacy Gatekeeper Setting

1. Visit the AJA website for the latest driver version appropriate to your configuration. Alternately, if you have no internet connection, insert the KONA 3G 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 3G 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.

Installer is trying to install new software. Type your password to allow this.

Name: vid tech 1

Password: •••••••

Cancel   Install Software

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.
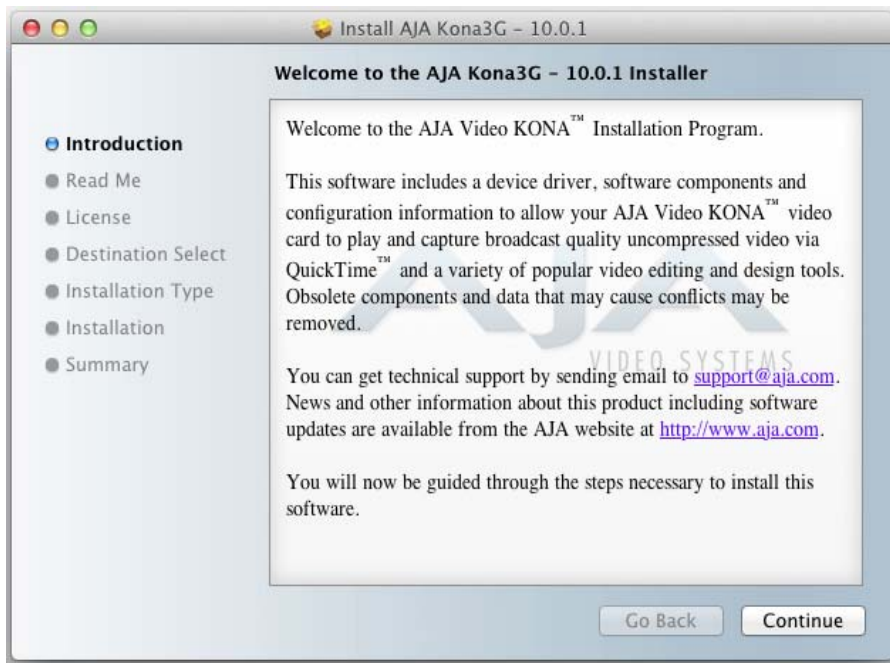
Initial Installer Screen

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).
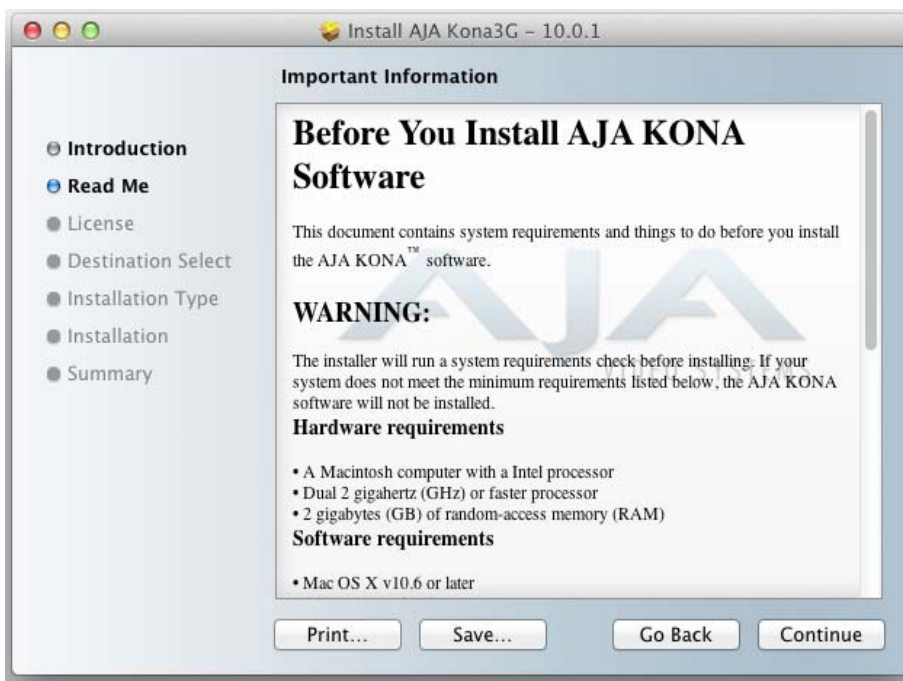
System Check Installer Screen

10. Read and agree to the Software License Agreement.
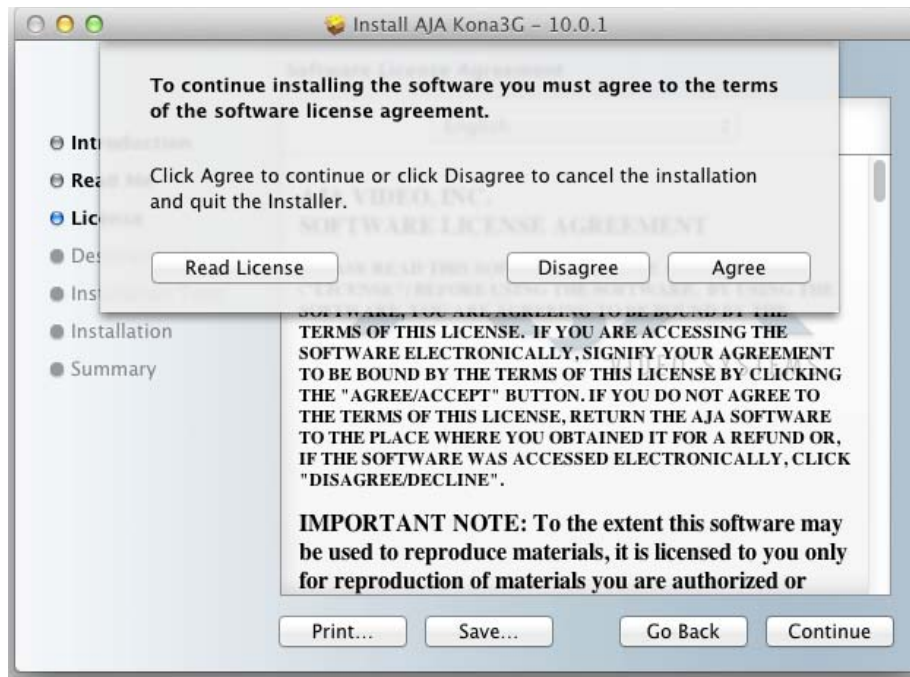
KONA 3G Software License Agreement Screen

11. At the next screen, click the *Install* button to place the software on your computer.
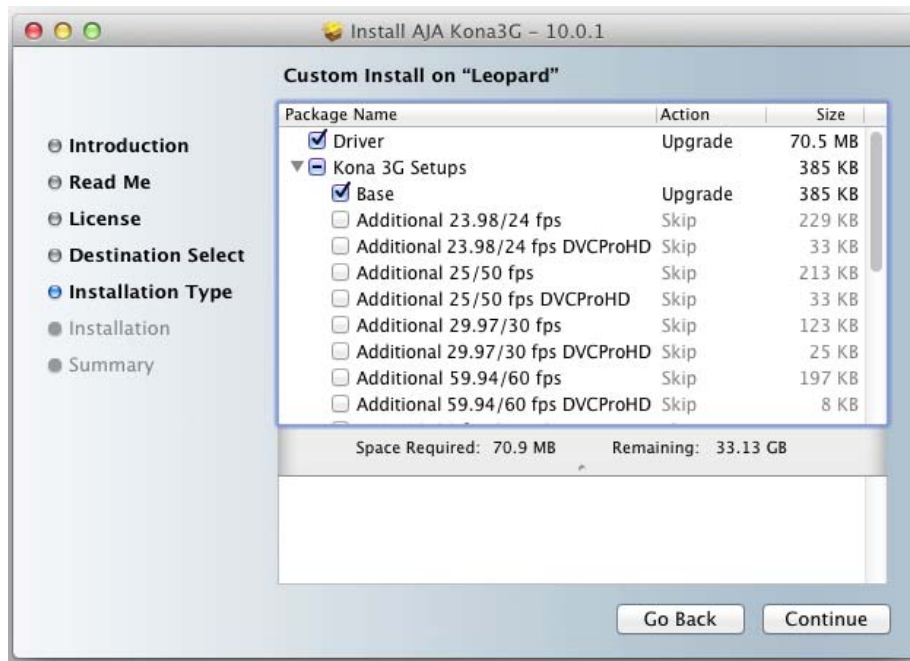
Easy Install, Installer Screen

12. The installer will run and put all the necessary KONA 3G drivers, AJA Control Panel, presets and additional software on the desired hard drive. When it has completed installation, you'll be asked to restart. the computer.

Installation Progress Bar
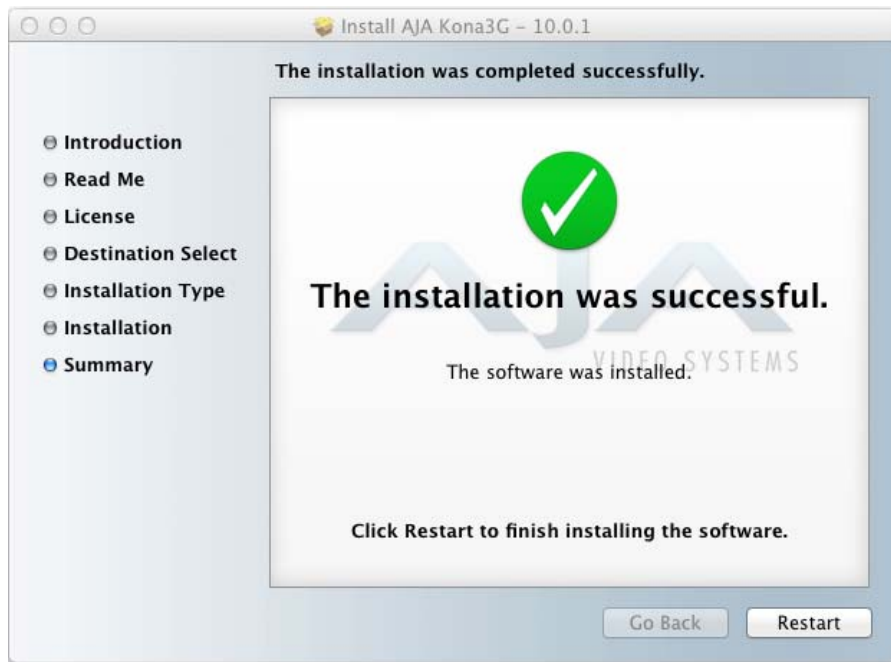
Final Installation Screen

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

Note: You may be required to update the KONA card's firmware if installing a new version. See *"Updating KONA 3G Firmware" on page 36*.

Installing KONA Software for Windows

If your PC has previously had another video capture or multimedia card installed, remove the card and uninstall any related software before installing KONA. Also, always uninstall existing KONA software before installing a new version. This will prevent hardware/software conflicts.

The installation procedure is described below. You cannot use KONA with third-party applications until the AJA KONA software has been installed on the host workstation.

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

Software Installation Procedure

Locate the AJA KONA Software download or CD ROM packaged with your system and follow the procedure below to install the required software on the host system. The KONA for PC software is intended for Windows 7 64-bit workstations.

The KONA for PC 10.0 Installation Software is divided into separate installer packages containing:

  • Retail Drivers and Control Panel applications

  • Plugins for the various third-party applications supported.

The AJA Retail Software package must be installed first. Next, install the plugin package for your desired Application Software.
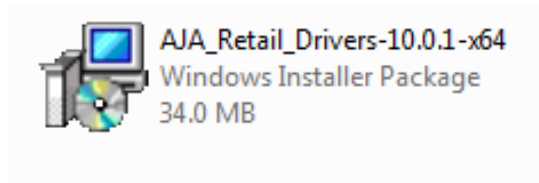
KONA for PCRetail Drivers Installer Package

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

This section describes the AJA Retail Software package installation. The subsequent installations are essentially the same but do not require restart of the computer. Refer to your specific plugin package Installation Guide.

Double click on the download package or insert the KONA CD into the PC.

Install Wizard

The KONA installation program will launch and extract the necessary KONA drivers for installation on the desired hard drive.
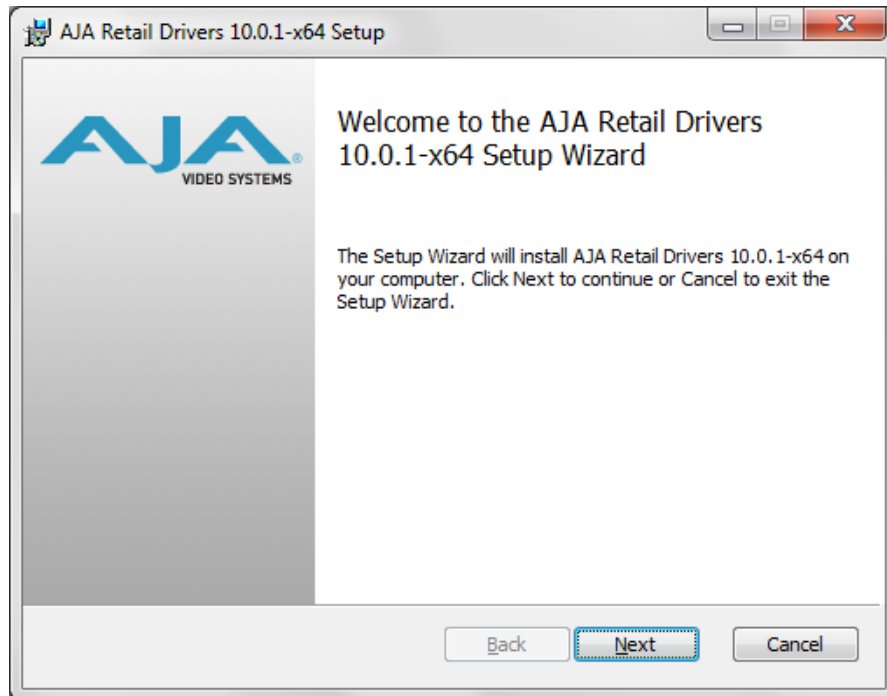
Install Wizard Welcome

When you see the Welcome page, click "Next" to view the KONA license agreement.
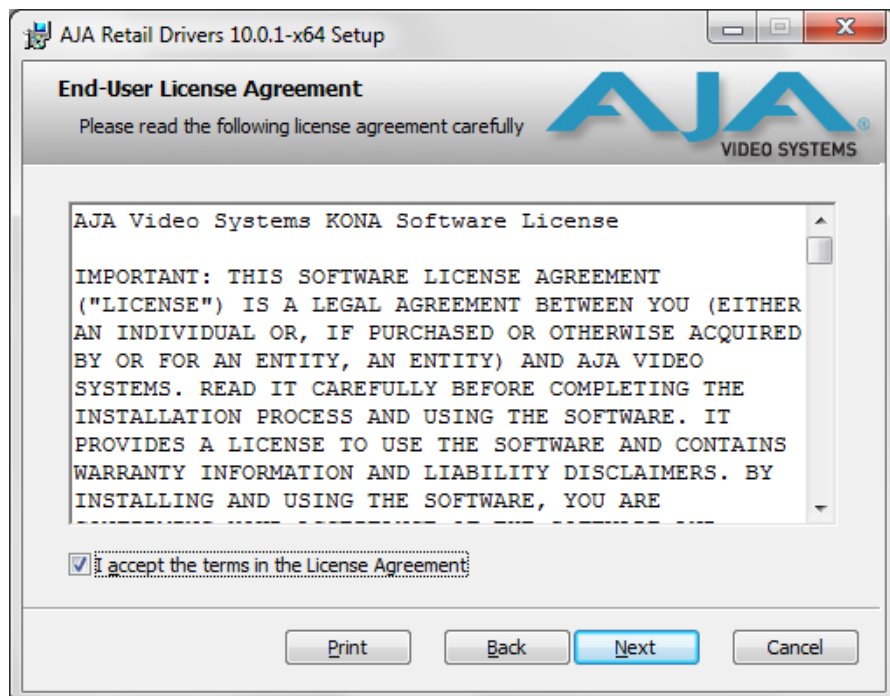
License Agreement

Read the KONA license agreement and check the Agreement box to accept. You will be asked to choose the type of installation you would like to perform.
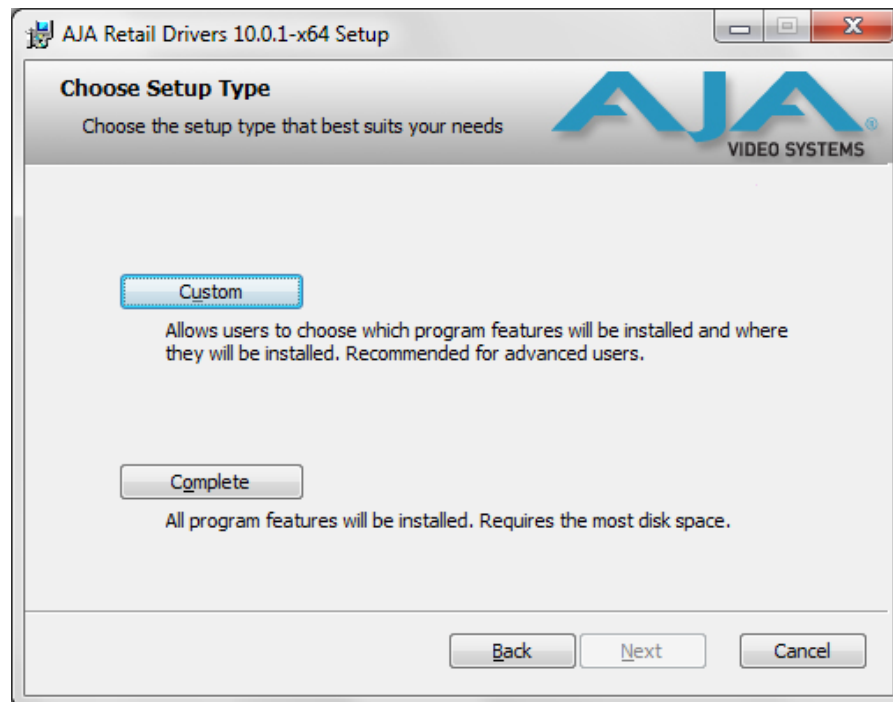
Installation Type

If you don't have all the KONA supported products installed on your workstation, you may choose to perform a Custom installation (default) and select only the software necessary for your applications. Otherwise, use the "Typical" installation. The following screens depict the more elaborate Custom installation.
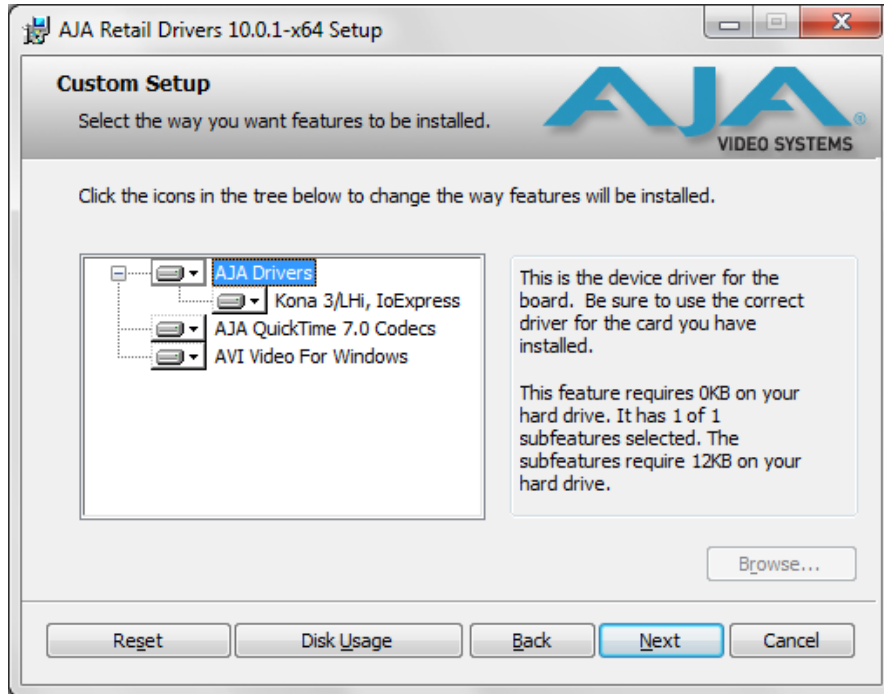
Custom Installation Menu

You may deselect an Item for installation by using the pulldown to make it unavailable.
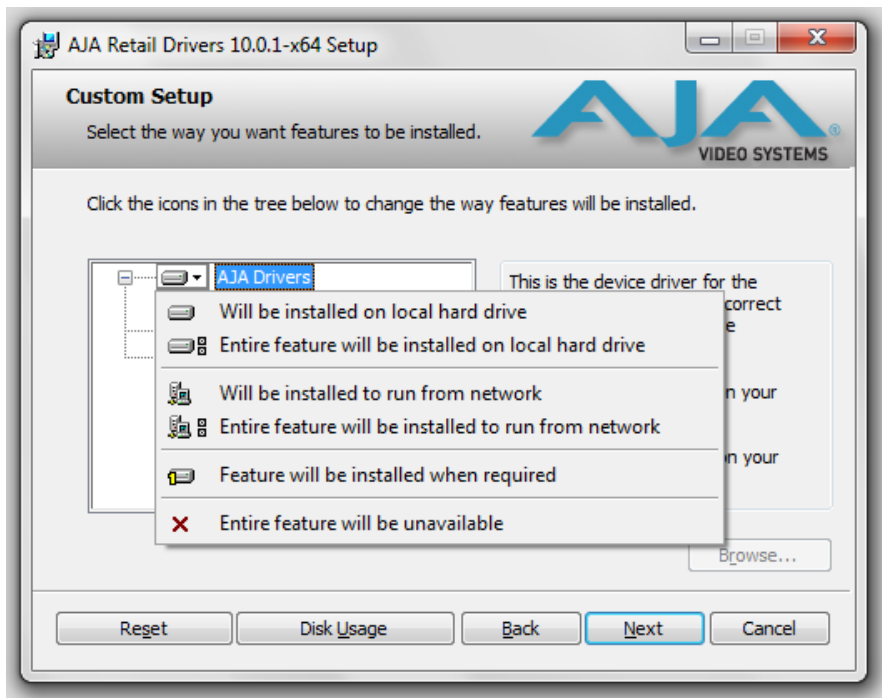
Custom Selections Pulldown Menu

Use the second level options choose the specific drivers and plugins you would like installed. Disabled selections are marked with a red X. Before clicking Next to install, you can verify your disk space availability by clicking the Disk Usage button.
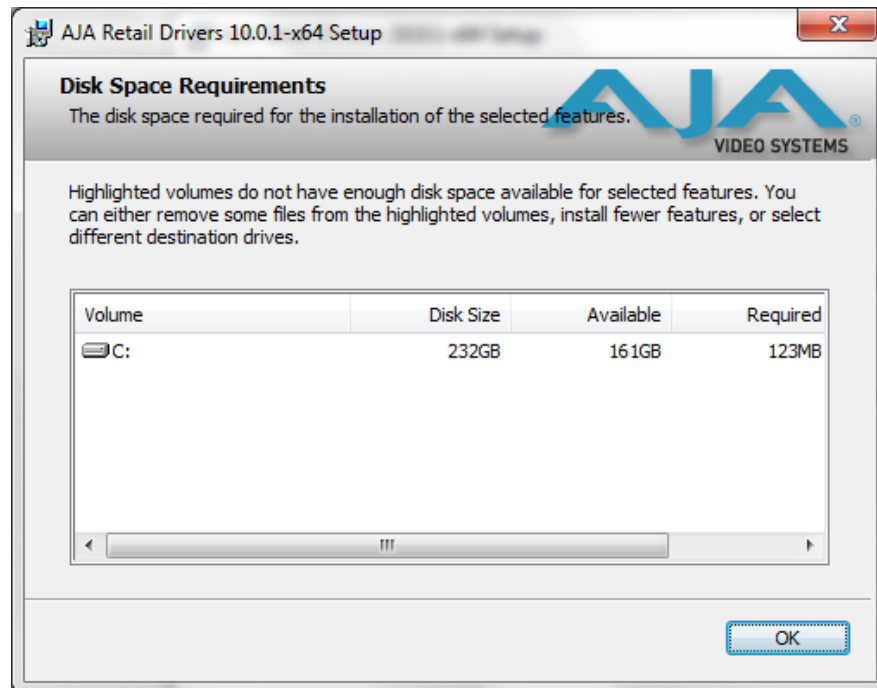
Workstation Disk Usage Display

To return to the installation click OK. Click Next to begin the installation. screen.
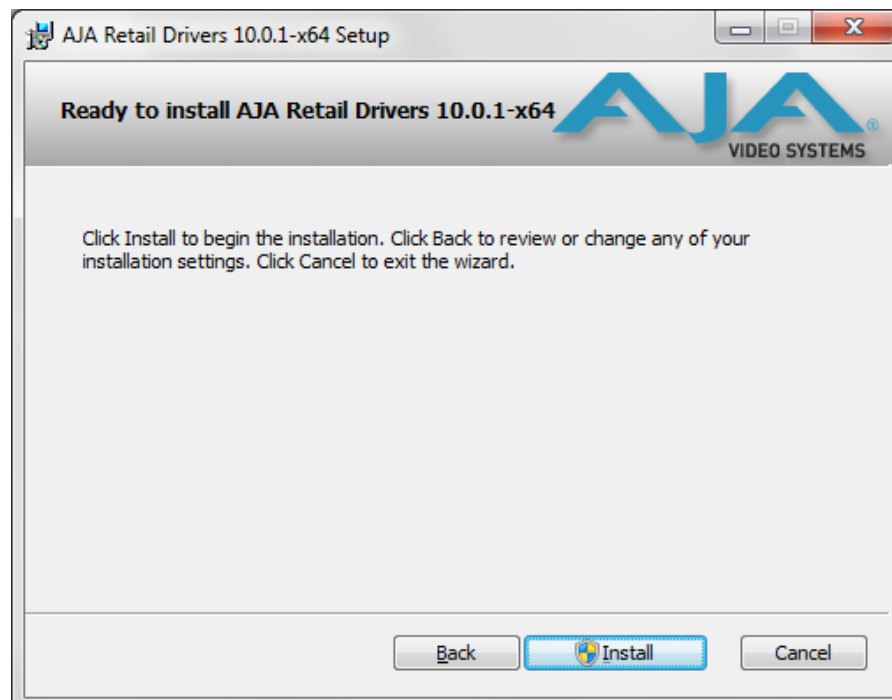
Begin Driver and Plugin Installation

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

When the installation is completed, a final screen will be displayed announcing that "Setup has finished installing AJA KONA on your computer." Click on the Finish button after the installation is complete. The AJA Retail installation requires you restart the computer after installation to activate the KONA card.
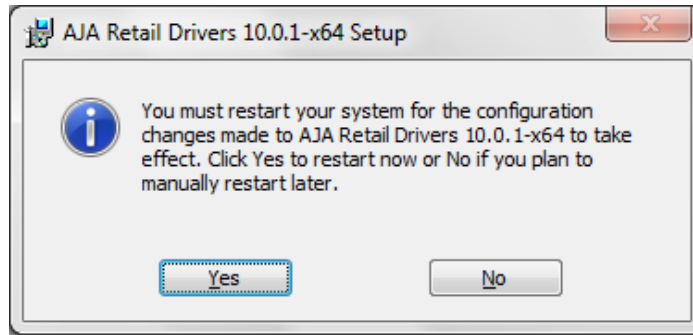
Restart Screen

You may now repeat this installation procedure for your chosen Application plugins.

Re-Installation & Repair

If you have problems running your newly installed pluggins or need to re-install to add AJA drivers or application plugins, you can relaunch the install package and access the following window.

Note: Note: Always uninstall KONA software before running a newer version software installation package.
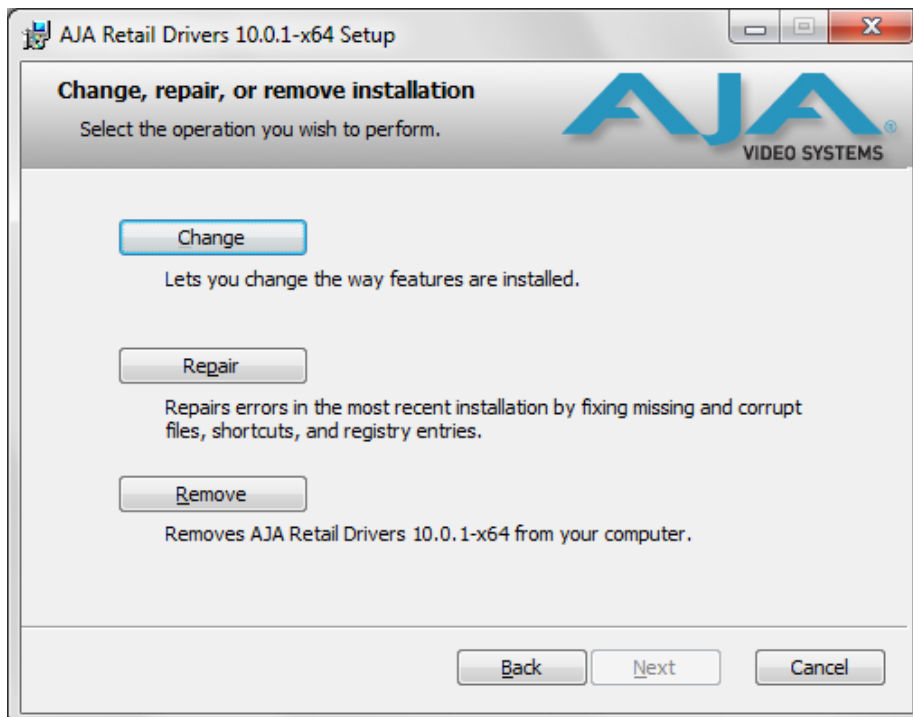
Change, Repair, or Remove Installation Menu

Updating KONA 3G Firmware

When you update your KONA 3G software by downloading new versions from the aja.com website, it is possible that some versions may also require a firmware update to update the software stored in non-volatile memory on the board. Always carefully read the release notes that accompany each version to be installed. The release notes will spell out all required software and hardware necessary to ensure a successful update of your KONA 3G.

Follow these instructions when a firmware update is required:

1. First install the new version of KONA 3G software.

2. After successfully installing the new KONA software, the AJA KONA Updater will automatically launch. (The updater application is located in the *AJA Utilities folder.*)

3. When the updater starts, the following screen will display indicating the current firmware and update firmware creation date.

Firmware Update Welcome Screen

4. Click *Update Firmware* to begin the update process. Do not interrupt the update process

Firmware Update Warning Screen

5. After the firmware installation completes, you'll be asked to **Shut Down** the computer, wait for two seconds, and then start up again.

Firmware Update Power-down Screen

Important: A **Restart** of the computer will not load the new firmware—click **Shut Down** to initiate a complete ON/OFF power cycle to load the new firmware into the hardware.

Genlock and Your System

For video stability and proper system operation, it's best to genlock all equipment to house sync. Although genlock is not required for KONA 3G or your system, better quality will be seen by doing so. Usually, this means using a black burst generator output looped through the system. On the KONA 3G cables and optional K3-Box breakout box, house sync is connected to "Ref Loop".

Using KONA 3G with Professional Video /Audio Software

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

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

http://www.aja.com/en/support/downloads/

To get the most out of your KONA 3G, please read this manual.

Once you've installed all the AJA software as detailed in Chapter 2, you'll find the AJA Control Panel installed on your Mac.

AJA Control Panel Overview

The AJA KONA 3G Control Panel is a software application that provides a simple visual window showing how the KONA 3G interface is currently configured, and that allows you to make changes. Settings—both those you changed and those you didn't—can be saved as a snapshot for recall at anytime. This lets you save settings associated with all your frequent tasks; then as you switch tasks you don't have to spend extra time resetting interface configurations—just load the previously saved settings for each task.

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

To ensure you make the most of the software, launch the AJA/KONA 3G Control Panel application and look at its display. Then refer to the "Basics" described here to fully understand what you're seeing and learn how to view and change the KONA 3G system configuration.

Control Panel Basics

Control-Clicking an Icon Produces a Context-sensitive Menu

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

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 Control Panel screens.)

Note: You can use the Up/Down arrows on your keyboard to navigate Tab selections

3

Currently selected
Tab Screen

Framebuffer
Format
(Primary Format)

Outputs:
SDI, HDMI
and Analog

Inputs

Tab Screen Choices – Click One to Edit/View a Topic
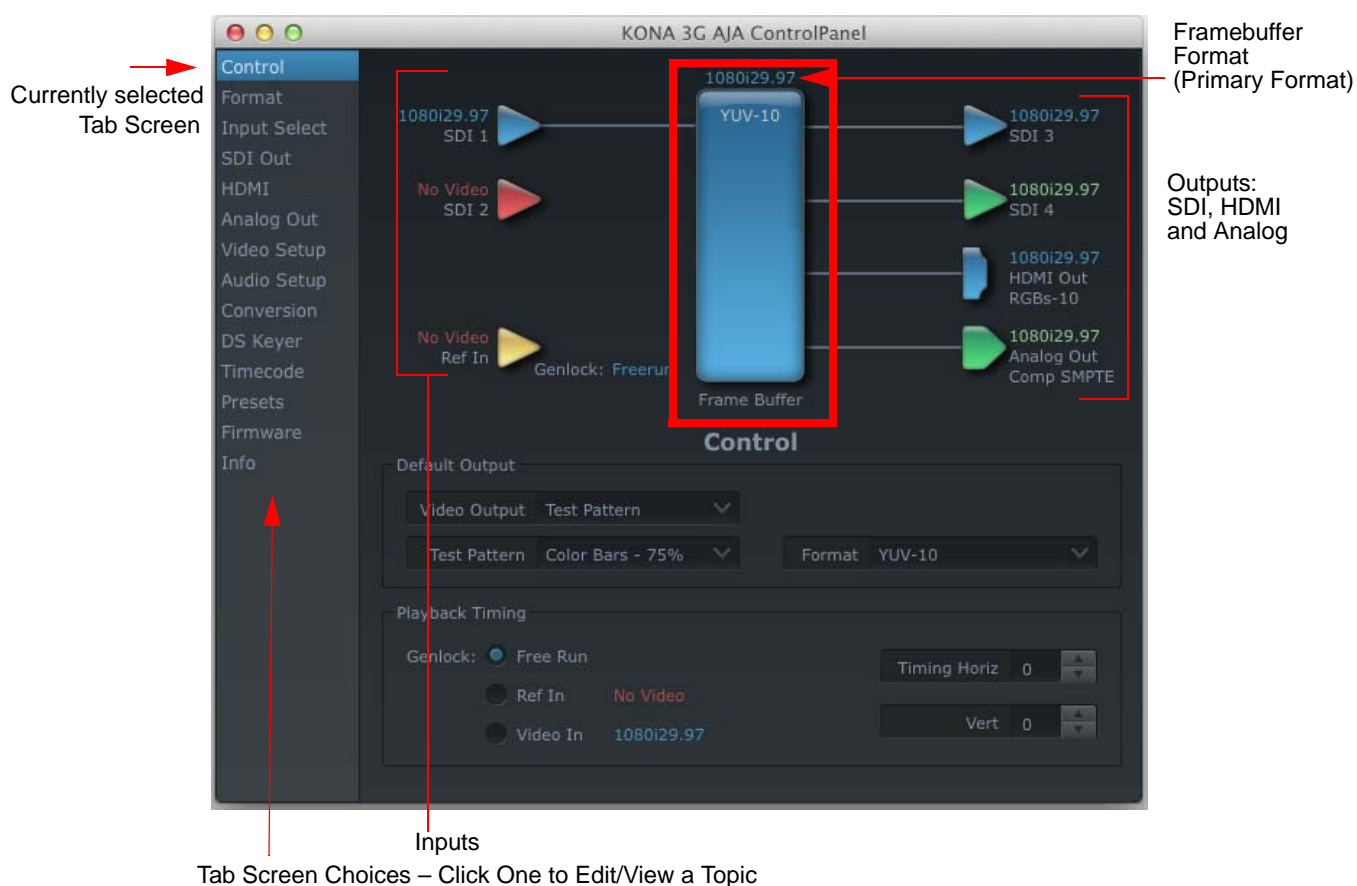
AJA Control Panel, Block Diagram

Framebuffer—The framebuffer is the "engine" in KONA 3G where active video operations take place using third-party editing applications, or even KONA 3G itself. The framebuffer has a format (called the "Primary Format" and color space that it follows, as defined in the Tabbed Windows or third-party application Easy Setups. It is important to realize that inside the Macintosh many applications can use the KONA 3G (as you switch from window to window) and it may not always be obvious which currently controls it.

The Control Panel displays the name of the application controlling the KONA 3G. In some cases, applications may not always properly "let go" of the I/O interface as another takes over—you'll be able to tell by looking at the Control Panel.

Primary Format—The video format currently assigned to KONA 3G. This is the format that the framebuffer will use and is shown in the Control Panel using the color blue. All icons in blue are the same as the Primary Format used by the framebuffer. Also any text descriptions in the block diagram that appear in blue also indicate that something is in the primary format. So, for example, if you see that the input and output icons are blue, then you know that the same format is used throughout the video path and that no format conversion is being performed. If a different color is displayed on the input or output, say green for example, then you know that KONA 3G is performing a format conversion in the video path.

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

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

Input/Output Icon

Conversion Icons—when an input or output is a different standard than the framebuffer, the KONA 3G may be up- down- or cross-converting the signal to the selected standard. This may be automatic, because it's detected an input signal that differs from the standard currently selected, or because you've explicitly told it to convert. In either case, the block diagram will show the conversion by displaying a conversion icon in between the input/output and the framebuffer.

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

>   Blue: video is same format as the Primary Format (framebuffer)
>   Red: the selected operation cannot be performed
>   Yellow: reference video (black burst or other reference source)
>   Green: indicates that KONA 3G is performing an active change to the video making it different from the Primary Format (e.g., down-conversion).

Control Panel Screens—The side area of the KONA 3G Control Panel provides different information categorized by topics. Clicking on a topic—or a block diagram element—displays an information screen corresponding to that topic. Screens that can be selected are:

Control: configures KONA 3G operation and output timing.
Format: select the framebuffer primary video format and any secondary formats for conversion of inputs/outputs
Input Select: view and edit input selections and how they are mapped
SDI Out: select output format
HDMI: configure the HDMI I/O
Analog Out: configure the component/composite analog output
Video Setup: configures Video such as composite black level.
Audio Setup: configures Audio options such as analog audio monitor level.
Conversion: 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. Select RGB range, and Stereo 3D signal configuration (if applicable).
DS Keyer: setup and control the insertion of keyed video from the frame buffer or graphics files with alpha channel.
Timecode: monitors RP-188 timecode and configure timecode window burn output (Note: SMPTE 12M-2 is the updated name and specification for what was RP-188).
Presets: add or delete saved preset configurations (handy for setting up the KONA 3G for certain workflows and then saving it as a canned configuration for easy later recall)
Firmware: choose between Standard and 4K Modes and initiate installation of the firmware.
Info: displays status information and firmware version # of the KONA 3G and how it is installed in the host Macintosh. This information is generally intended for troubleshooting/support.

Control Panel Operation

Control Screen

The KONA 3G can be controlled by various software applications running on a host Mac. The Control Screen is where you select how the KONA 3G 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 3G.

AJA Control Panel, Control Screen

Control Screen Settings

Default KONA Output—this is where you select what KONA 3G will output as a default when no application has control of the board, such as when the Finder is active. Since KONA 3G 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 3G inputs/outputs. These settings determine what happens when an application that doesn't grab the KONA 3G inputs/outputs is active.

Default KONA Output Choices and their meanings:

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

Input Pass through: this selection directs KONA 3G 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 3G 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.

Test *Pattern*: this selection directs KONA 3G to output a choice of preset pattern when no other application is using the KONA 3G. You can choose from:

Black, Color bars (75% or 100%), *Ramp, Multiburst, Line Sweep, Multi Pattern,* or *Flat Field*.

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.

While in Test Pattern mode, you can select RGB or YUV output via a pulldown menu.

Note: the graphic file will not be scaled to fit. If it's smaller than the current frame buffer format, KONA 3G will center it in the frame. If it's larger than the current frame buffer format, it will be cropped on the right and bottom. Also some graphics formats and bit depths may not be supported. Once a graphic file is loaded into the frame buffer it will be retained until it is overwritten by another graphic or test pattern, or when power is turned off. Graphic file names are only "remembered" in the menu as long as the AJA Control Panel application is running.

Hold Last Application: this selection directs KONA 3G to hold and output the last frame of video from the last application to control KONA 3G. This can be helpful when operating in an environment where you're switching back and forth between multiple application windows.

Tip: pressing and holding the Apple *COMMAND* key while clicking in the AJA Control panel—while in any software application—causes control of the KONA 3G to stay with that application, rather than shifting to the Control Panel. This works regardless of the setting of "Default Output."

Playback Timing—Use these controls to set Genlock and Timing adjustment.

Genlock (*Freerun*, *Ref In*, *Video In*)—selects how KONA 3G will synchronize program video:

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

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

Video In: Directs KONA 3G 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.

Format Screen

The Formats screen shows the video format currently in use by the KONA 3G framebuffer (called the *Primary Format*) and allows you to change it. All throughout the Control Panel, choices are always presented based on what KONA 3G can do with the signals available and the inputs/outputs selected. For example, on the Format 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.
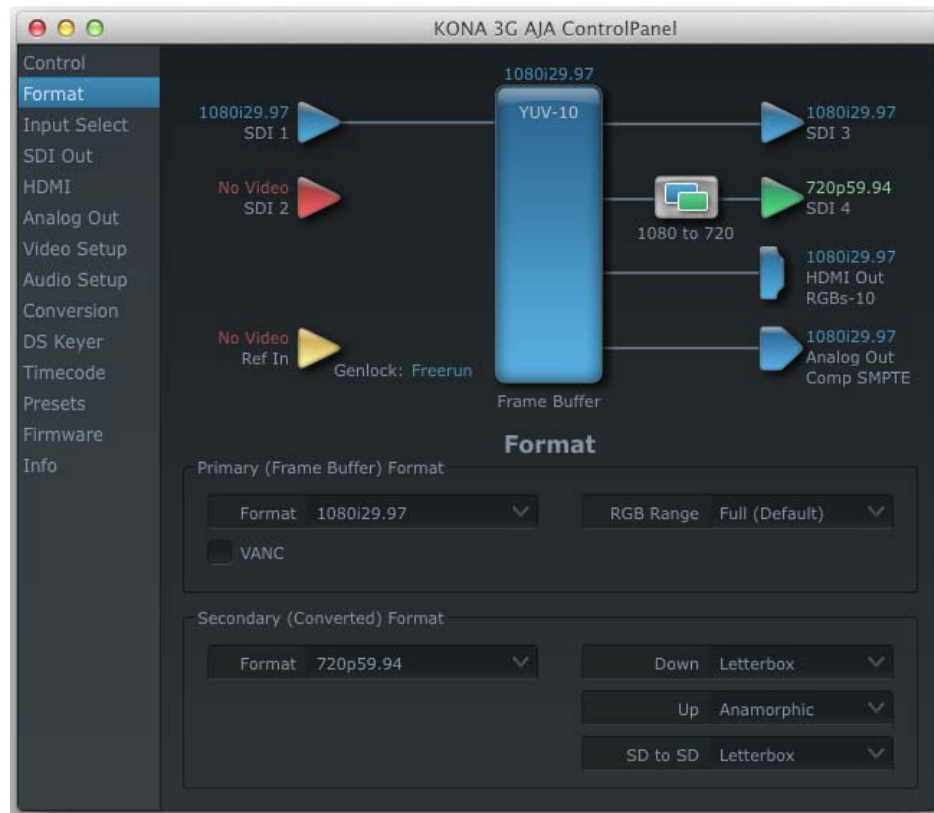
AJA Control Panel, Formats Screen

Format Screen Settings

Video Format (Primary and Secondary)—these pull-down menus show the currently selected formats. If you select an alternate value in the Primary Format using the pull-down, it will change the format used by KONA 3G'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 for selection (incompatible formats are not shown). This allows you to see what you've chosen, and also see those formats that are compatible with the selected Primary format.

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

KONA 3G Formats: for a complete list see *"Video Formats" on page 79.*
The AJA Control Panel software uses the abbreviation "sf" instead of "psf" when referring to "progressive segmented frame" formats. In the manual and in other literature you may see either of these acronyms used interchangeably. Visually it is easier to discern at a glance if you are working with progressively segmented frame formats (sf in the AJA Control Panel) as compared to progressive frame formats which will show only "p."

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

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:
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
Anamorphic: full-screen "stretched" image

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

AJA Control Panel, Formats, Example shows cross-conversion

Input Select Screen

On the Inputs screen, you can view the currently selected video and audio input sources and map audio sources to the channels supported by your editing application. Two information panes in the screen are provided: Video Input and Audio Input.

AJA Control Panel, Inputs Screen

Input Select Screen Settings

Video Input—the pulldown menu allows you to see and change what's currently selected and the video format that KONA 3G has detected (if any). In the example shown previously, it shows that video is selected at the HDMI 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 matches the framebuffer's primary format selected 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 use the pulldown to select either SDI 1, 2 or Dual Link for two-wire 4:4:4 RGB, or Stereo 3D. For 3G single-link, choose the SDI Source used and select Stereo 3D from the SDI pulldown menu.

Use the LTC/Ref menu pulldown next to Video Input to select how the LTC BNC is used: selecting Reference means it's used a Reference standard; selecting LTC means it's used for lateral time code (LTC) input.

Audio Input—this pulldown menu allows you to pick where the audio comes from. KONA supports up to 8 channels of embedded audio. You can choose out of 16 channels embedded in the SDI which 8 to bring in (1-8 or 9-16). Here, if only two channels were selected in the third-party application you are using, you can select which two channels from the 8 embedded would be mapped to that application.

SDI Output Screen   The SDI Output 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").

SDI Output Screen Settings—SDI Output 1 and 2

Configure SDI 1 and 2 via pulldowns:
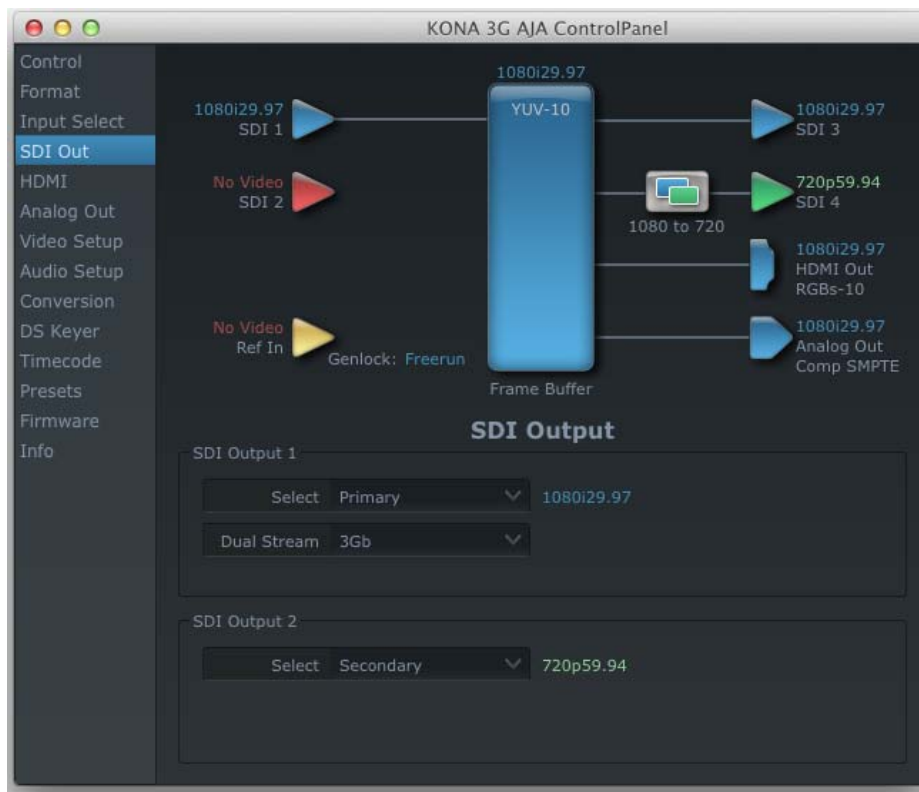
AJA Control Panel, SDI Output Screen

Select Options:

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).

Video+Key—when selected, this indicates that the SDI 3 video is set to the same format as the framebuffer. SDI 4 is set to a video key signal associated with SDI 3 (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.

Stereo—when selected, this indicates that SDI 1 represents the left eye output and SDI 2 represents the right eye output of stereoscopic material.KONA 3G also offers single link 3Gb output of multiplexed Stereo 3D.

Dual Stream Options:

Dual Link—output (SMPTE 372M) using SDI 1 and SDI 1 in concert.

3Gb—output (SMPTE 424M) using a single-link transport.

HDMI Screen

The KONA 3G's HDMI input and output are shown and configured at this tab screen.

AJA KONA 3G HDMI Screen

HDMI Output Settings—the Source pulldown menu allows you to select either the primary video format (framebuffer) or a secondary one (up/down/cross-conversion).

Pulldowns are also provided for configuring the video output range, color space and number of embedded audio channels (2 or 8) for the HDMI output. A Protocol pulldown allows you to choose either "HDMI" or "DVI" protocol—use DVI if you're outputting to a DVI monitor using an HDMI to DVI adapter.

A pulldown menu for 3D output allows you to select either Side-by-Side or Top-Bottom (Stacked) output of left-eye and right-eye signals.

Note: This selection must agree with format selection in the third-party CineForm Codec (**NOT** included with AJA KONA 3G) pulldown menu.

Audio Channels—an Audio Channel pulldown allows you to select the number of embedded audio channels for the HDMI output.

HDMI Input Settings—the detected HDMI input video format is displayed and you're given a chance to configure the RGB range (SMPTE or FULL) and select any two embedded channel pairs from those supplied for stereo output (if applicable).

Analog Out Screen

KONA 3G 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).

AJA Control Panel, Analog Out Screen

Analog Out Screen Settings

Analog Output—select Primary or Secondary (any conversion applied) for the analog output; if a conversion is applied, you'll see the conversion icon appear on the block diagram. Next, select the video format from the *Format* pulldown.

Analog formats can be:

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

Audio Monitor—here you select which two channels will be mapped to the analog audio stereo output (headphone jack).

Video Setup Screen   KONA 3G provides a high-quality analog component or composite output, generally used for monitoring. This screen shows the current settings for that analog video output, and allows you to re-configure it when desired.
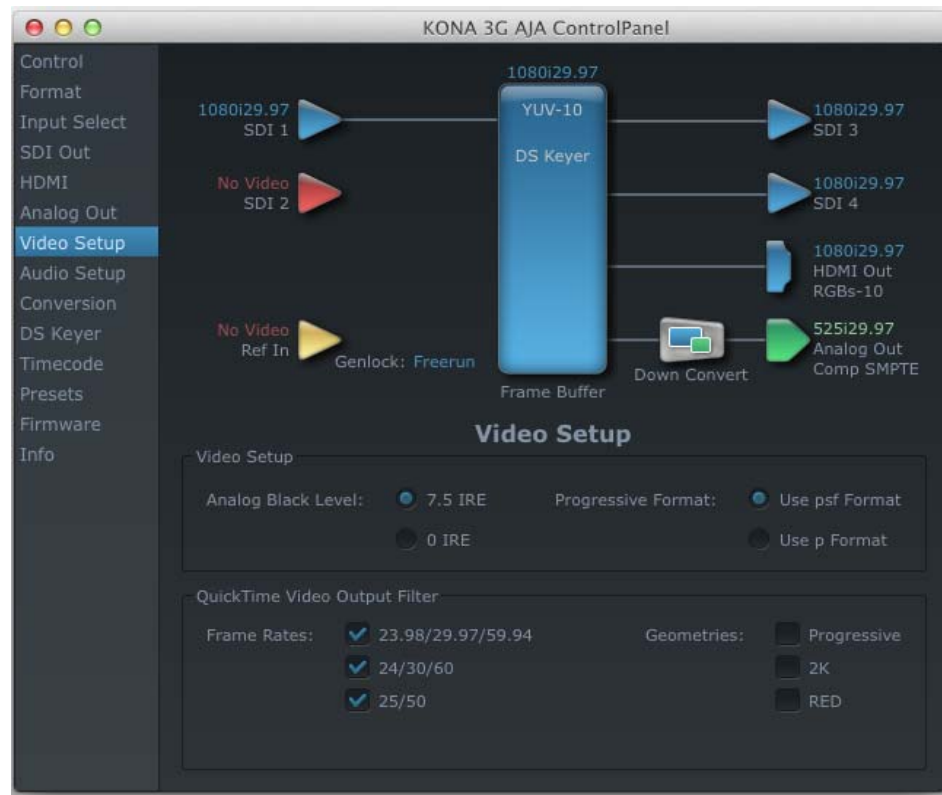
AJA Control Panel, Video Setup Screen

Setup Screen Settings

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

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

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

Audio Setup Screen

This screen shows the current settings for the analog audio output, allowing you to re-configure it when desired.
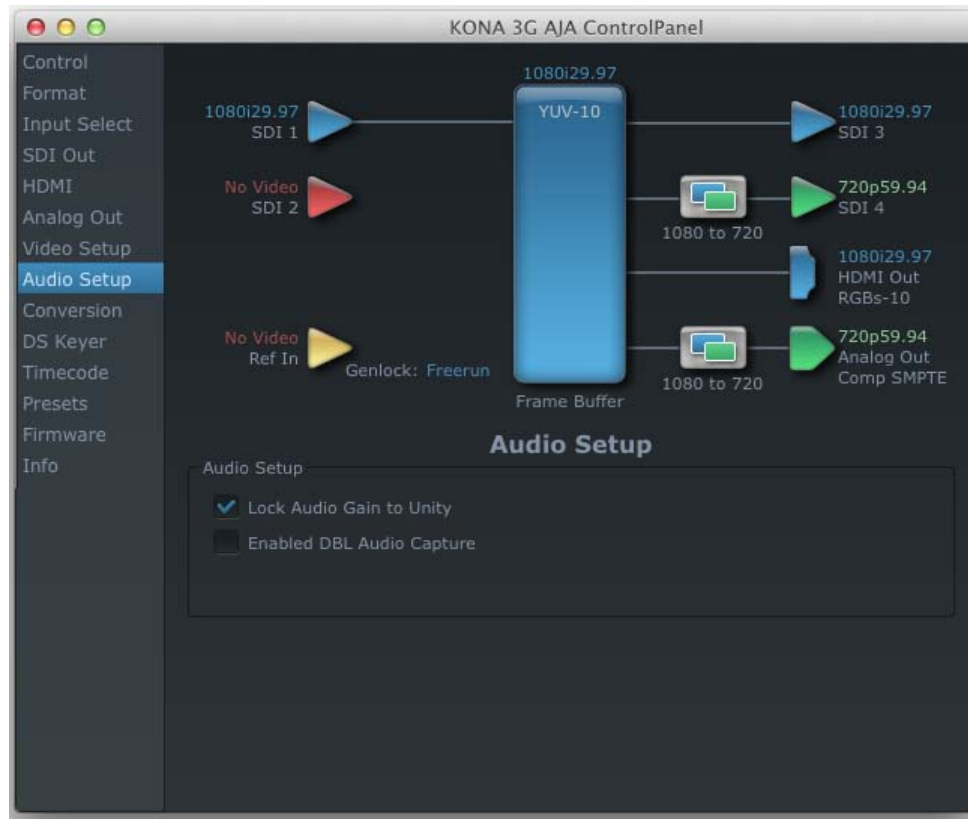
AJA Control Panel, Audio Setup Screen

Audio Setup Screen Settings:

Lock Audio Gain To Unity—When set, the KONA 3G will ignore the third-party application gain setting and set the audio gain at unity. When not set, this checkbox tells the KONA 3G to get the audio gain setting from the application.

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

Conversion Screen   This screen offers controls that determine how the card behaves with 3rd-party applications.
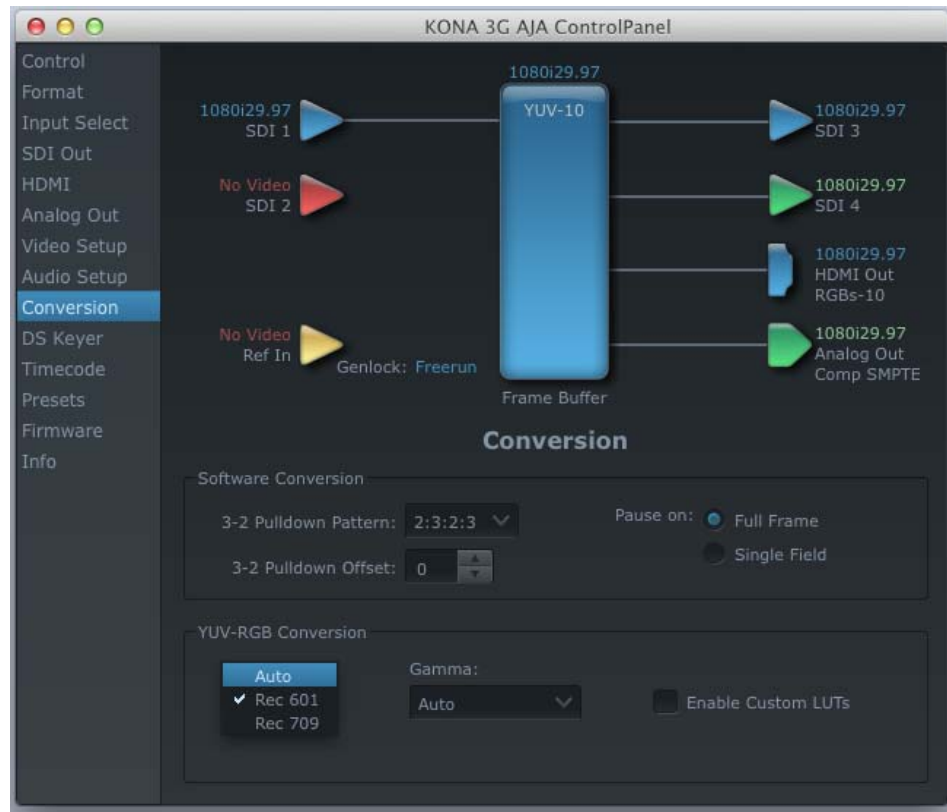
AJA Control Panel, Conversion Screen

Conversion Screen Settings

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

Software 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.

AJA Control Panel, Codec Screen, 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
>
> **RGB Range**—The RGB Range pulldown menu allows you to select either Full range (0-1023) or SMPTE range (typically 64-940) for RGB color output.
>
> **Enable Custom LUTs**—this checkbox enables a custom color lookup table (LUT).

DS Keyer Screen

The KONA 3G 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.).

Note: The Downstream Keyer is for use with Standard Mode firmware, not 4K Mode.

AJA Control Panel, Downstream Keyer Screen

Settings in the DS Keyer screen provide control over how the keyer operates and whether it's turned on or off. Controls and their meanings in the Downstream Keyer 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.
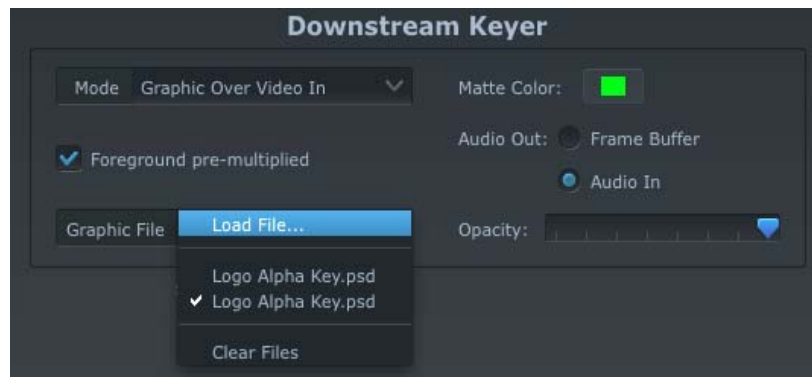
DS Keyer Screen, Loading a Graphic Over Framebuffer

Click Matte Color Button to Bring Up Color Selection Dialog
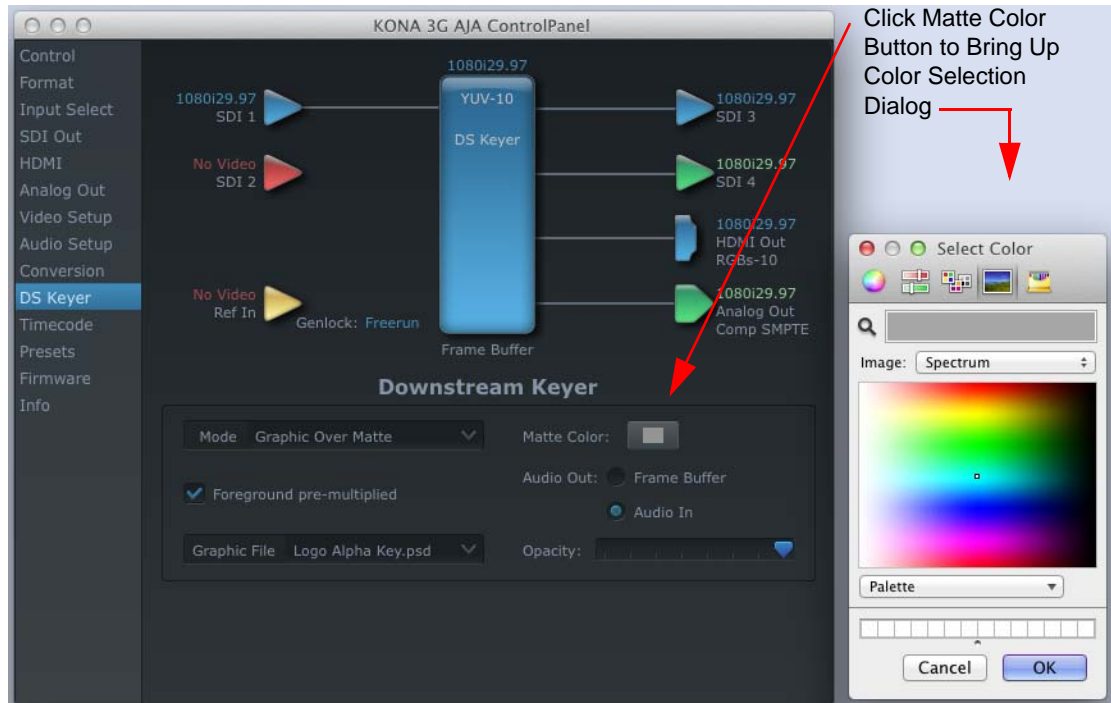
DS Keyer Screen, Loading a Graphic File Over a Matte

Timecode 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.

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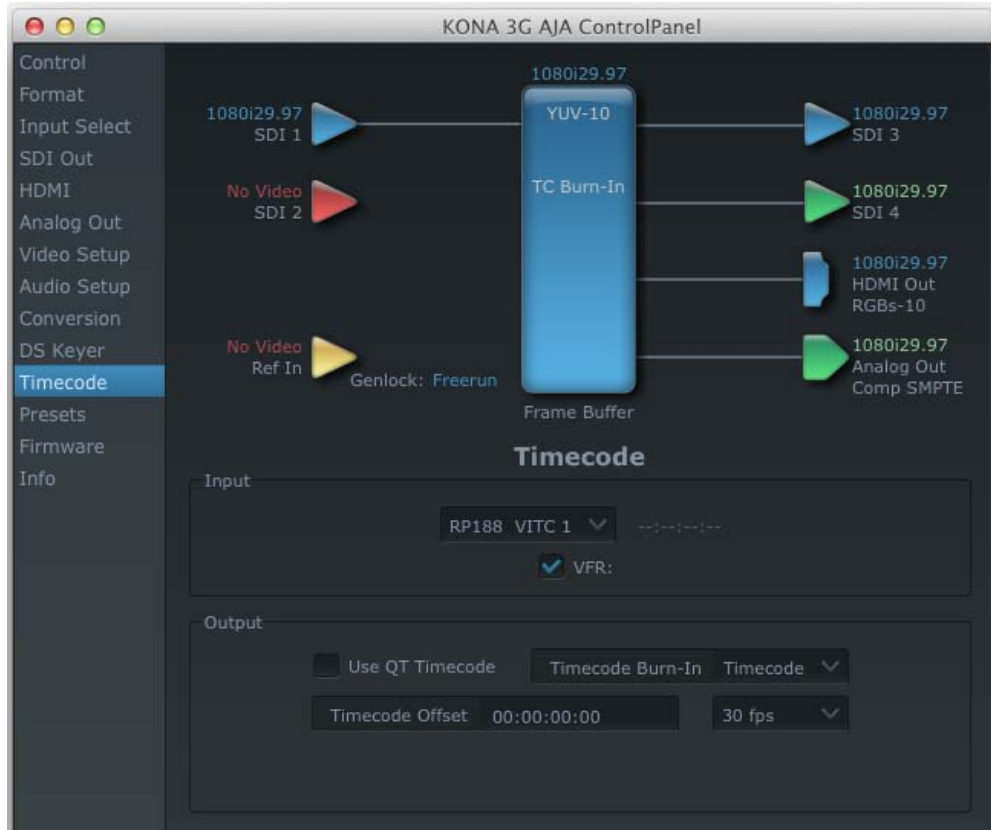
Timecode Screen

Timecode Screen Settings

Input

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

> **User Bits**—for monitoring variable framerate timecode (for example, Varicam), you may wish to monitor the user bits embedded in the timecode. If you set this checkbox, KONA 3G will detect and interpret the user bits and display them next to the checkbox.
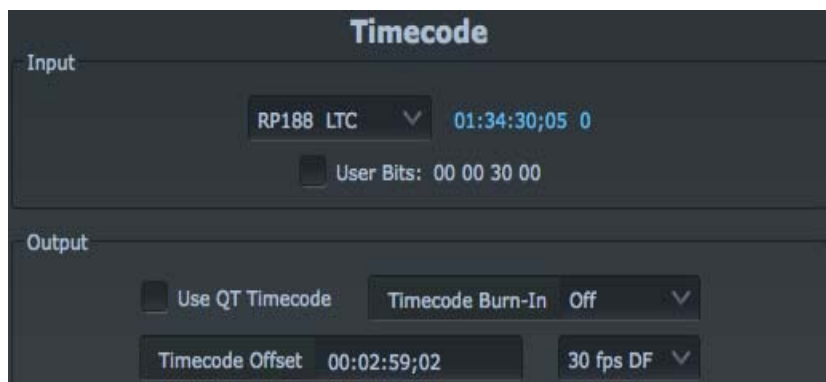
Timecode Screen, User Bits Checked

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 your editing application if it allows timecode offsets that are user-controlle). 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 3G. 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.
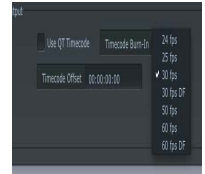
Note: SMPTE RP 188/SMPTE 12M-2 defines a standard for the transmission of time code and control code in the ancillary data space of a digital television data stream. Time code information is transmitted in the ancillary data space as defined in ANSI/SMPTE 291M. Multiple codes can be transmitted within 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.

Presets Screen

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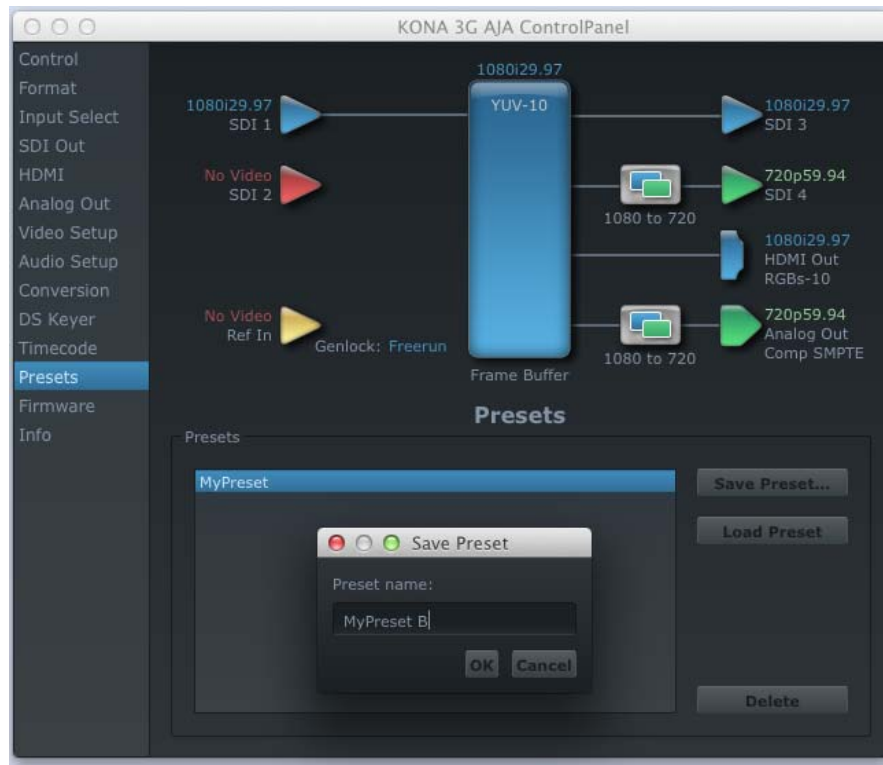
Presets Screen

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

Firmware Screen

Use the KONA 3G tab to access the firmware changeover screen. The Desired pulldown menu allows you to select either:

- Standard Mode—for SD, HD, and 2K formats (allows up/down/crossconversion)
- 4K Mode—for SD, HD, 2K and QuadHD (3840x2160) and 4K (4096x2160) formats (disables up/down/crossconversion)

Click install to erase current firmware and load the desired mode. Note the Installation message shown below.

Firmware Changeover to 4K

You will be required to power-cycle your computer to finish the changeover.

Changeover Completed

Info Screen

This screen shows the KONA 3G 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.
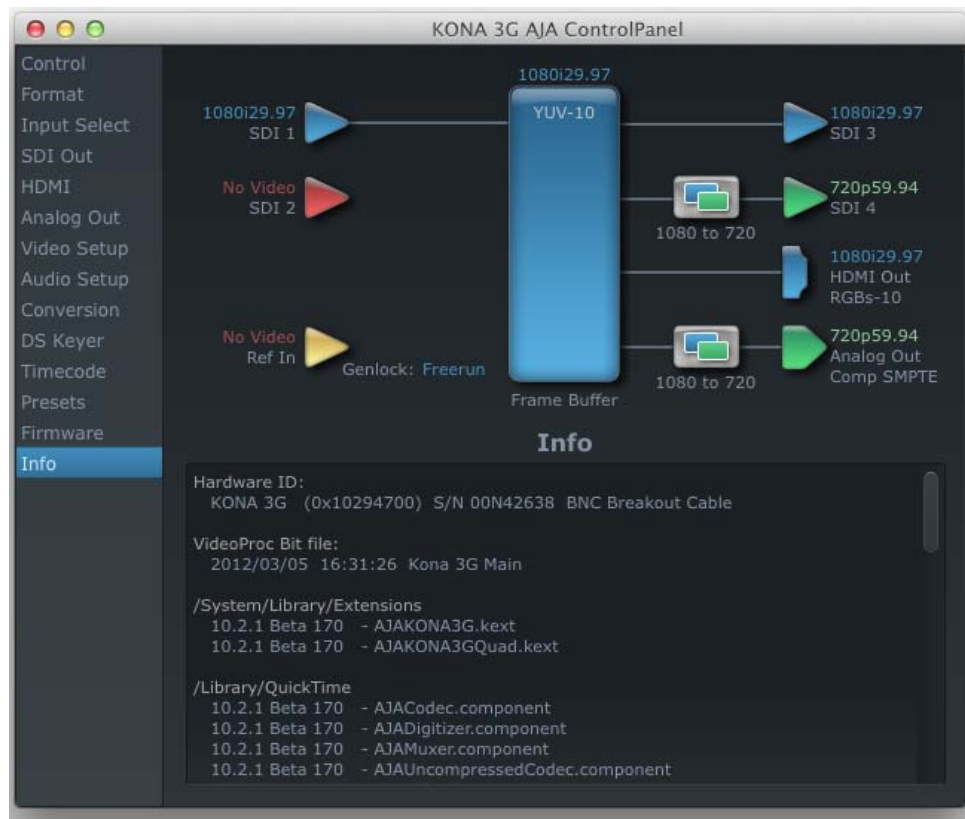
Information Screen in Standard Mode

Using 4K Mode

In 4K Mode, you can input (for capture) or output four channels of video representing individual quadrants of the higher definition 3840x2160 and 4096x2160 4K formats, see *"Format Screen in 4K Mode" on page 65.*

Note: The KONA 3G can only be configured for either input or output of 4K at a time. It cannot support 4K input and output at the same time since both require four BNCs.

Physical connections of the quadrants will be mapped to the KONA 3G SDI connectors as shown in the following screens. For the HDMI and Analog Outputs, you can select just one of the quadrants for viewing (see their respective tabs for quadrant selection).

Mapping of Quad SDI Outputs

This section describes the AJA Control Panel operations specific to 4K Mode. Note that in 4K Mode, you can still capture and playback SD, HD, and 2K formats, though there are no up/down/cross conversions available. You will see SDI inputs only when SD, HD, or 2K inputs are selected. SDI Outputs 1 & 2 will be reconfigured as SDI 1 & 2 Inputs on the screen.
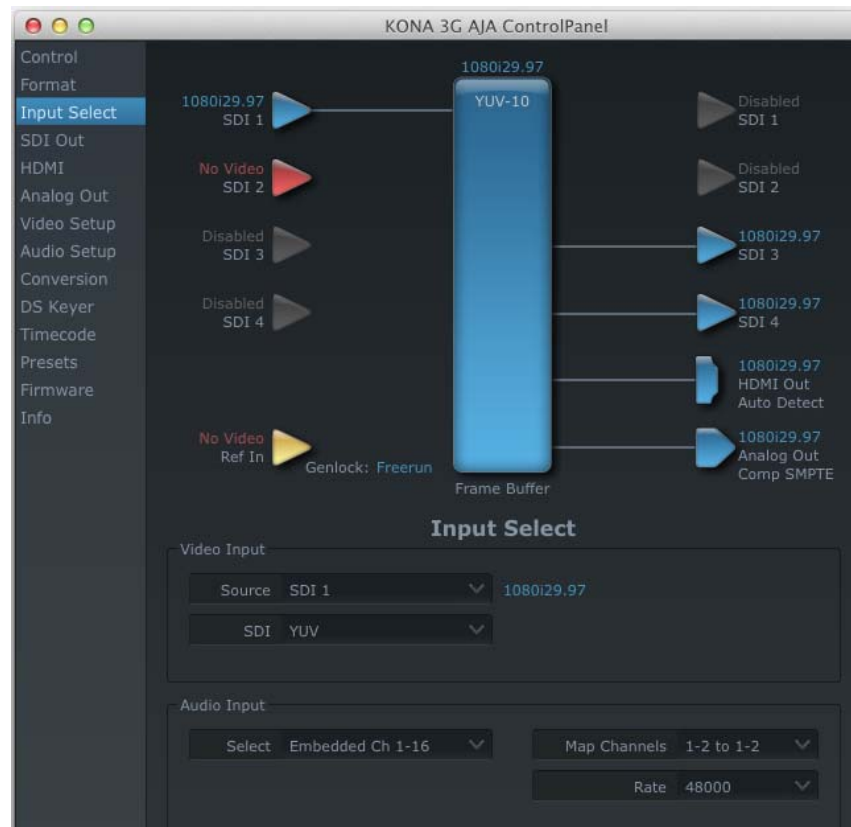
HD SDI Inputs in 4K Mode

Note: Up, Down, and Cross Conversion are available only when the KONA 3G module has Standard Mode firmware installed (see *"Firmware Screen" on page 62*).

Format Screen in 4K Mode

In 4K Mode, you will see SDI inputs when the selected Primary Format is standard SD, HD or 2K. SDI inputs are reconfigured as Outputs SDI 1 & 2 when a 4K format is selected.
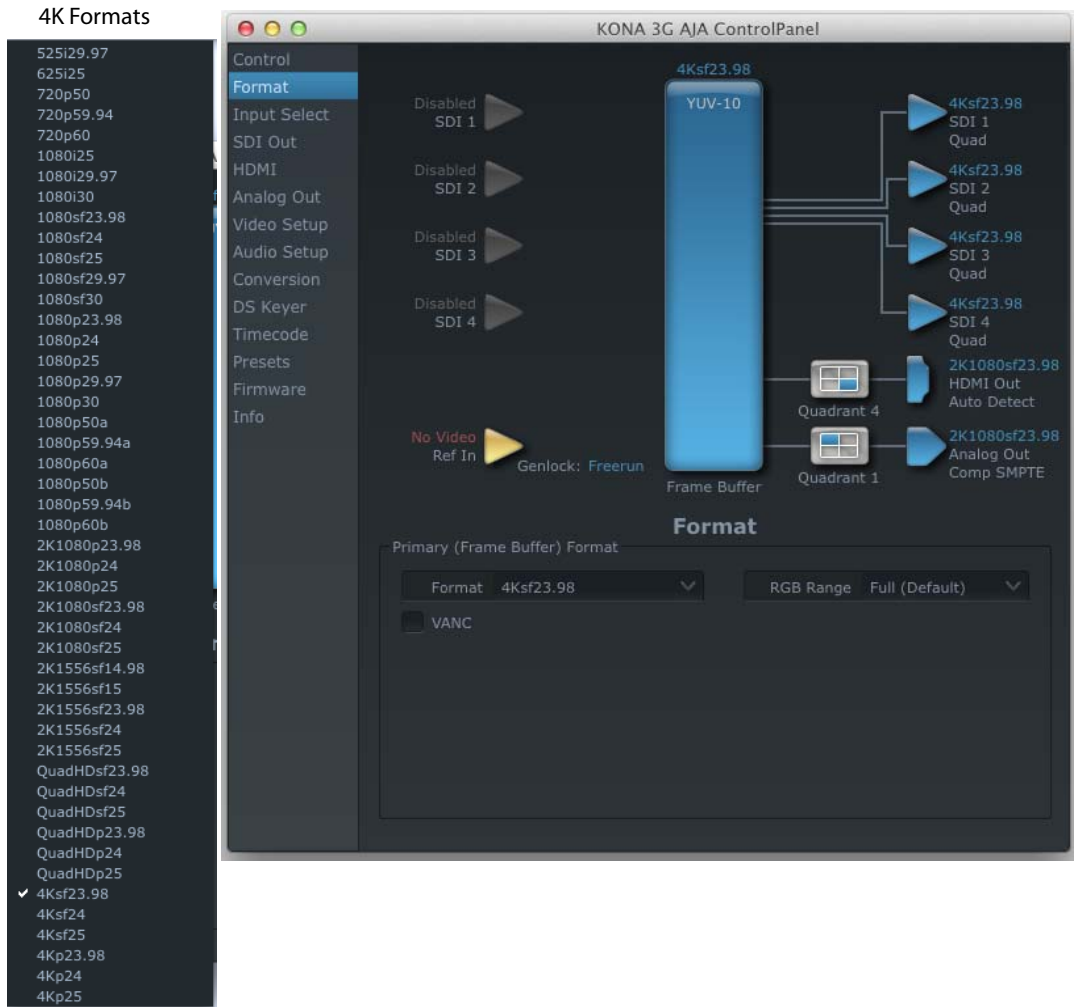
4K Formats

Format Screen with 4K Primary Selected

4K Capture

You can capture 4K video using an appropriate capture application (such as AJA VTR Xchange shown) by selecting a 4K digitizer in the application. When KONA 3G is controlled by the application, it will automatically map the SDI ports to 4x HD(1080) for QuadHD. The inputs will show 2Kx1080 for "true" 4K.
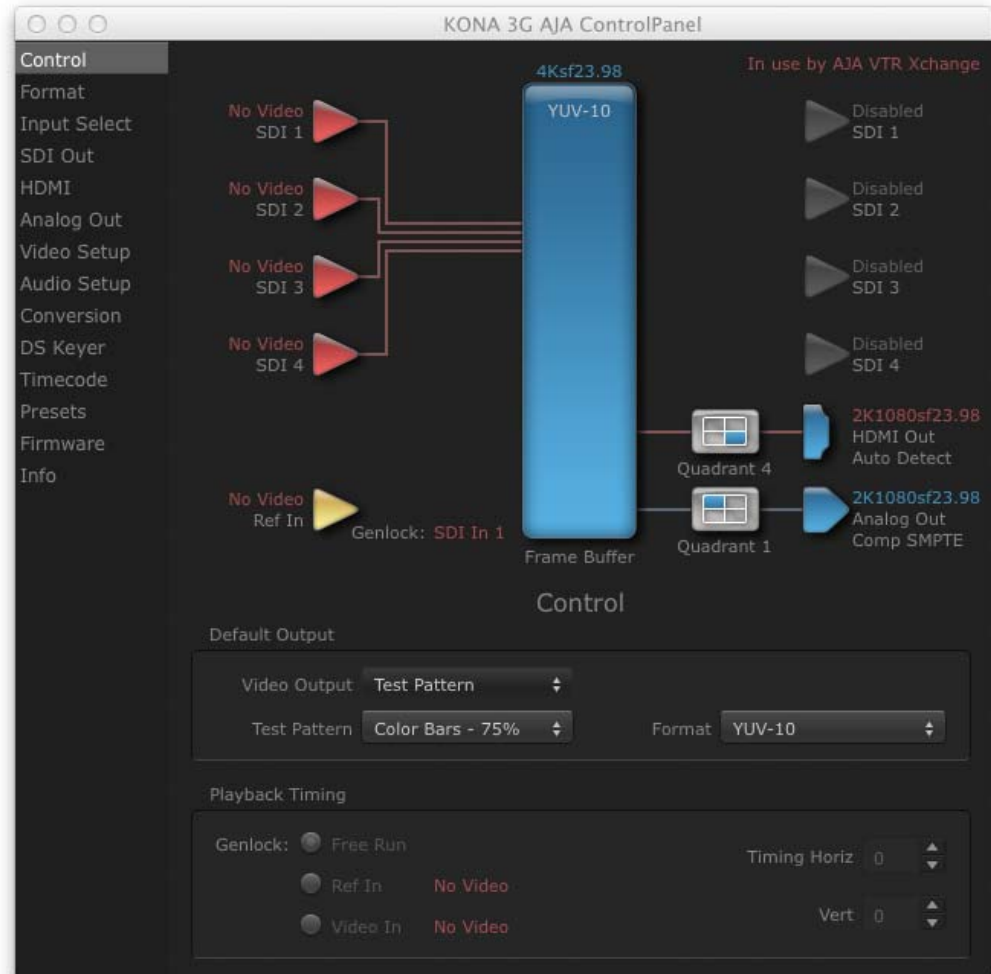
Control Screen with a Controlling 4K Capture Application

SDI Output Tab in 4K Mode

The SDI Output Screen allows you to select the Primary format or RGB for 4K output. Video+Key and Stereo 3D are available selections for SD, HD, or 2K formats only.
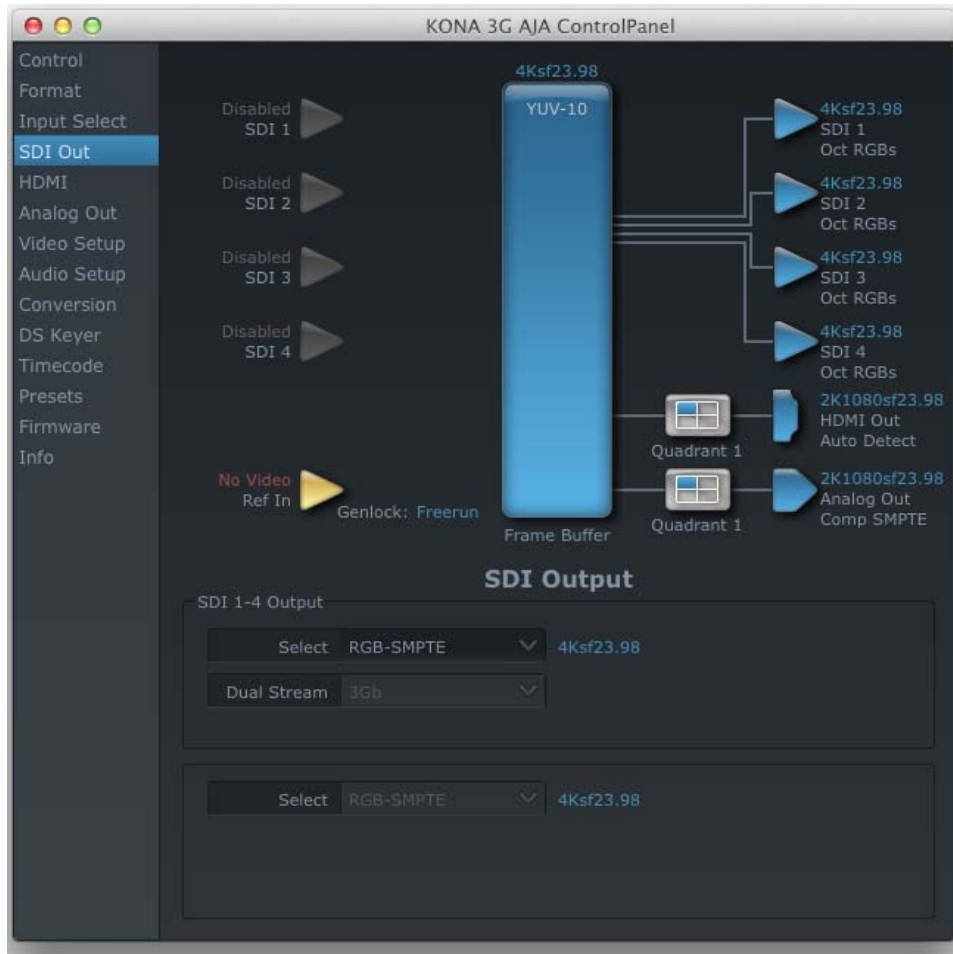
SDI Output Screen with 4K Format

HDMI Tab in 4K Mode

The HDMI screen allows you to make the same selections previously described for Standard Mode when an SD, HD, or 2K format is selected (refer to *"HDMI Screen" on page 50*).

HDMI Output Screen with Quad HD Format

For 4K formats, a Quandrant Select menu is available to choose the desired quarter-segment of the 4K display for HDMI output to a monitor (see the discussion on 4K quadrant mapping at this beginning of this section).

HDMI 4K Quadrant Selection Menu

Analog Output Tab in 4K Mode

The Analog Output screen allows you to make the same selections previously described for Standard Mode when an SD, HD, or 2K format is selected (refer to *"Analog Out Screen" on page 51*).
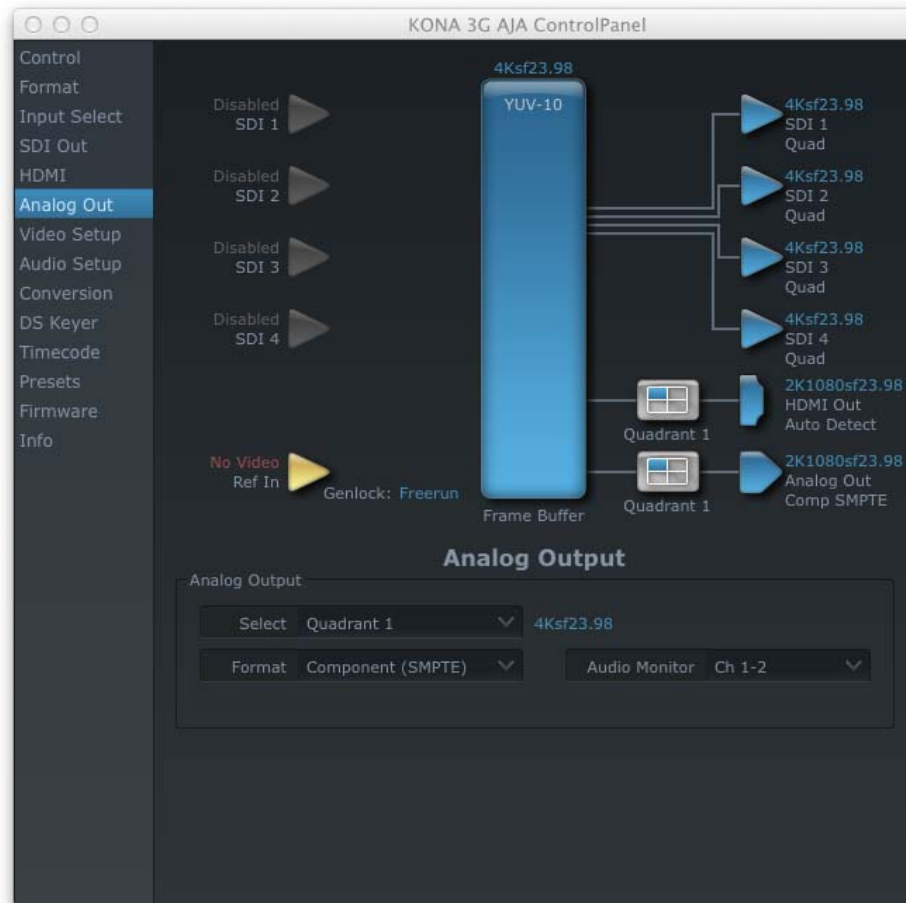
Analog Output Screen with Quad HD Format

For 4K formats, a Quandrant Select menu is available to choose the desired quarter-segment of the 4K display for Analog Output to a monitor (see the discussion on 4K quadrant mapping at this beginning of this section).

Video Setup Tab in 4K Mode

4K Mode also adds the 4K Geometry selection (check box). Like other raster sizes, the Geometries checkbox needs to be enabled for 4K for the format to be presented and selectable in applications like AJA VTR Xchange and AJA TV.
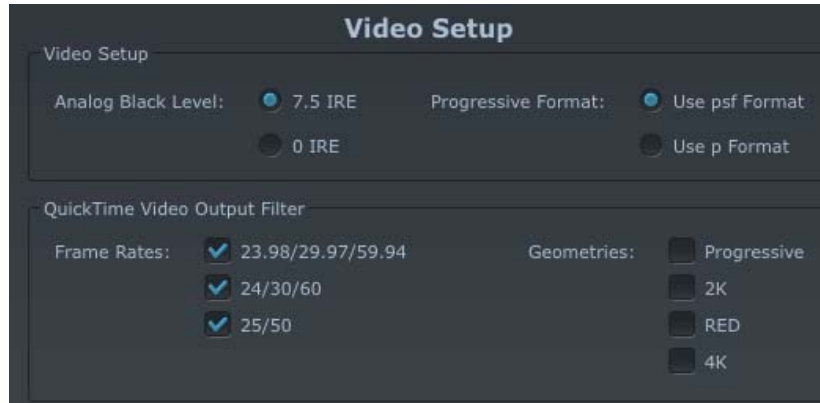
Video Setup Adding 4K Geometry Checkbox

Downstream Keyer Tab in 4K Mode

The Downstream Keyer is not available for use in 4K Mode. If you select the tab, you will see:

Downstream Keyer Screen in 4K Mode

Firmware Tab for Standard Firmware Update

Use the KONA 3G tab to access the firmware changeover screen. The Desired pulldown menu allows you to select either:

> • Standard Mode—for SD, HD, and 2K formats (allows up/down/crossconversion)

> • 4K Mode—for SD, HD, 2K and QuadHD (3840x2160) and 4K (4096x2160) formats (disables up/down/crossconversion)

Select Standard Mode and click install to erase 4K firmware and load the Standard Mode. Note the Installation message shown below.
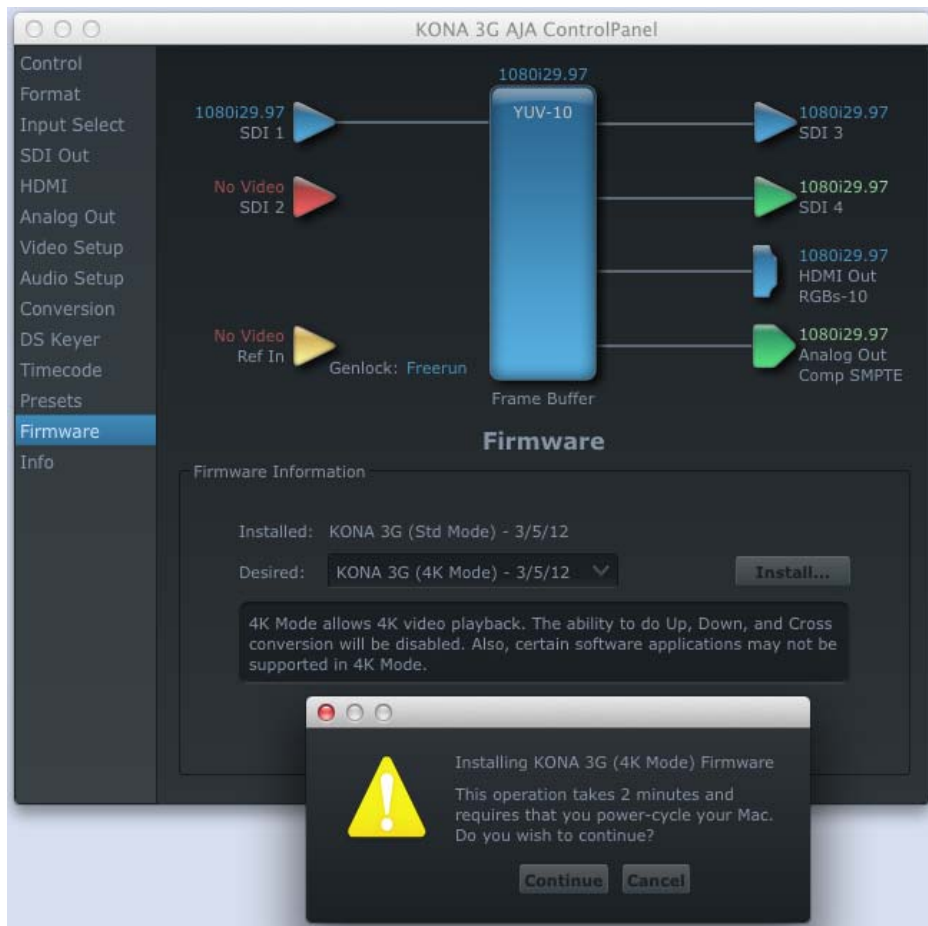
Firmware Changeover to 2K

You will be required to power-cycle your computer to finish the changeover.

Saving Your Control Panel Presets

After configuring the AJA 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?

There are times when you might have several Quicktime applications open at one time, and each of these might want to output their video thru the KONA video output. KONA is very flexible and most applications perform the necessary housekeeping so they work correctly when they're active and when they're not. This means that the application that is "active" (in front) will be granted control of the KONA video output. Generally, when you switch to a different application, the previous application lets go of the video output and the new application gets control.
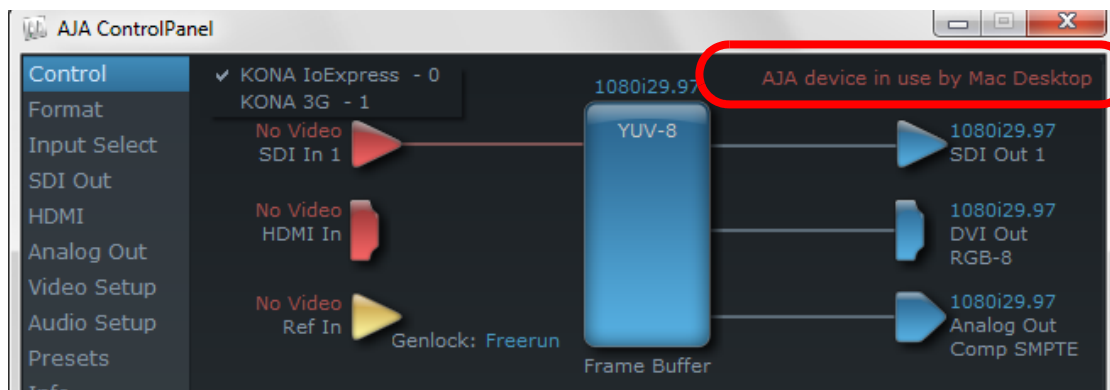
AJAControl Panel Control Message

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

QuickTime Application Format Selection

If a running QuickTime application uses KONA for capture or output, it controls the Primary format via its own menus and settings. For example, when the Third-party editing application is active (it's the front-most application) and has KONA as its "A/V Device", the KONA's Primary format is determined by the application's "Video Playback" settings. These format selections are reported in the AJA Control Panel block diagram.

Note: QuickTime applications can start and stop and change modes—even while they are running. And the behavior of different QuickTime applications can vary: some applications take control of the interface as soon as they are launched and don't give it up until they quit, while other applications take control of the interface only when they are the "front-most" running application and then relinquish control when they're not. Even these QuickTime applications may not relinquish control until capture or output operations are completed.

Control Recommendations

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

Using Multiple AJA Products

Starting with the v7.5 drivers, more than one AJA product can be used with your host computer. Using the AJA Control Panel application, you can choose which installed product an application uses for input/output. In the upper left corner of the AJA Control Panel application, you will see a board name, such as KONA 3G-0 and the pane heading will read "AJA Control Panel" if you have more than one product and the associated drivers installed (if only one product is installed, you'll see no product or pulldown and the product name will appear in the header). To "target" a specific installed product for use, click on the text in the upper left hand side of the UI and select from the list of available products that appear in the pulldown.
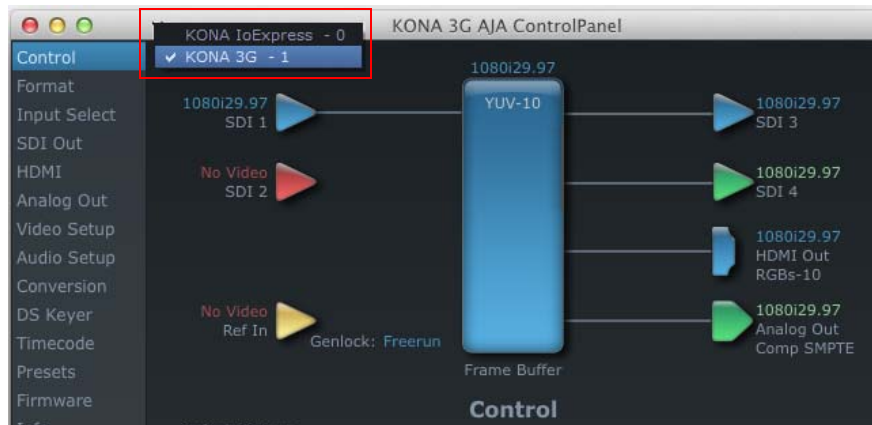
Multiple AJA Devices Pulldown Menu

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

Example: if you select a KONA card as the targeted product in the AJA Control Panel application and launch an Adobe video editing application, that application is now using the KONA card for its input/output. Go back to the AJA Control Panel application and select an Io Express as the "targeted" product. Launch the AJA TV application. AJA TV will now use the Io Express for its output. If you switch back to the Adobe application, you will see that it is still using the KONA 3G for its input/output. Note that some applications, like AJA TV, have a provision for playing in the background, so playback on one product could even continue when switching the targeted device for use with another application. In such cases, you can even feed the output from one AJA product to another AJA product on the same system.
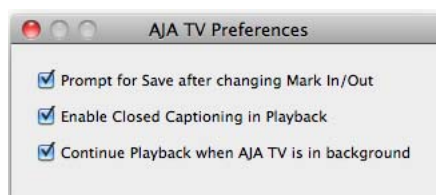
AJA TV Preferences, Continue Playback when AJA TV is in background

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

Notes on using multiple AJA Products:

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

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.

If You Run Into Problems

One useful way to find the source of problems is to isolate your system to the smallest size wherea 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.

Updating Software

Check on the AJA Video website:

> http://www.aja.com/en/support/downloads/

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 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 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 an AJA Video KONA issue, contact AJA Video Customer Support. See *"Contacting Support" on page ii.*

Frequently Asked Questions

Can I use SATA Drives for RAID storage with the KONA product line?

AJA always recommends the use of SCSI or Fibre Channel storage solutions for use with KONA products.

I updated the KONA software and my KONA hardware is now missing, Why?

A function of the uninstaller is removing the current driver for the KONA card. In doing this the KONA hardware is removed completely. A "plug and play" request must be made to install a new driver for the hardware. This can be done be either restarting the system or going into device manager and searching for new hardware. On startup the computer automatically looks for new or uninstalled hardware.

4

Can the KONA handle HDV, P2, XDCam, or AVCHD? If so how?

HDV, XDCam, P2, and AVCHD files will play real-time in Premiere Pro when using AJA supplied project presets. Alternatively, you can use KONA to capture uncompressed from these cameras if they have SDI, HDMI, or Analog outputs.

Does KONA Offer Support for compressed codecs?

All KONA cards can capture DV 25 and DV 50 compressed QuickTime files from analog and digital sources through their available inputs. Also, DVCProHD compressed QuickTime files can be captured for HD resolutions. Please see our DVCProHD white papers (see the whitepaper DVCProHD Editing with KONA and XENA at

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

I am using After Effects for compositing and sometimes my preview is not in real time—why is this?

RAM Preview should be very close to real-time for HD in After Effects. Please ensure you have the following settings for proper RT RAM preview.

1. Make sure that the "Primary Format" of the AJA Preview Panel in AE matches the resolution and frame rate of your After Effects Composition.

2. Also, RT RAM Preview is only possible with 8-bit AE Projects and with the "8-bit RGBA 4:4:4:4" setting for the "Output 8-bit As:" found in the AJA Preview Panel Color Options. Other color spaces and AE Project depths require a software transformation of the video data before being displayed—thus slowing down preview.

3. Next, please ensure that the "Resolution" setting for "Time Controls" is set to "Full". If not set to "Full," the image that the AJA Preview Panel receives and sends to the KONA board during RAM Preview will not be sent at "Full Resolution" and thus will either be software resized to Full Resolution before sending to the KONA Board for display, or will be center cropped before sending. The latter choice is controlled by the checkbox in the AJA Preview Panel labeled "Auto Resize Image" under the "Primary Format" Setting.

4. If RAM Preview is still not real-time, you can try some of the following – setting your Zoom to "100%" in your AE Composition, making sure the "Frame Rate" of the AE Time Controls" matches the frame rate of the "Primary Format" in the AJA Preview Panel, and muting audio in the AE Time Controls.

Note: In some cases the available bandwidth of the motherboard limits the cards ability to output full frame rate 1080i 29.97 RGBA.

How does KONA hardware Up-convert, Cross-convert or Down-convert?

The KONA 3G and LHi can perform many different conversions of a video source. They can convert only when video is passing across the board. So in capture or playback you have the ability to convert video in hardware in real-time with no CPU/Memory cost.

Can I work with 720p variable frame rates?

KONA will automatically remove duplicate frames from varicam footage as long as the RP-188 flags are set correctly. However, this footage will have 29.97 fps timecode. KONA does not attempt time code conversion, so the timecode in captured files will not be reliable.

What file formats are supported by KONA?

We support the following formats:

AVI files in the following Subtypes	QuickTime files in the following Subtypes
8-Bit YUV 4:2:2 – '2vuy' 8-Bit YUV 4:2:2 – '2Vuy' 8-Bit YUV 4:2:2 – 'uyvy' 8-Bit YUV 4:2:2 – 'v210' 8-Bit RGB 4:4:4 – 'bgr' 8-Bit RGB 4:4:4:4 – 'bgra' 8-Bit RGB 4:4:4 – 'bgr' T2B 8-Bit RGB 4:4:4:4 – 'bgra' T2B 10-Bit Log RGB 4:4:4 – 'R10g' 10-Bit RGB 4:4:4 – 'R10k' 10-Bit RGB 4:4:4 – 'r10k'	8-Bit YUV 4:2:2 – '2vuy' 8-Bit YUV 4:2:2 – '2Vuy' 8-Bit YUV 4:2:2 – 'v210' 8-Bit RGB 4:4:4 – 'rgb' 8-Bit RGB 4:4:4 – 'bgr' 8-Bit RGB 4:4:4:4 – 'argb' 8-Bit RGB 4:4:4:4 – 'bgra' 8-Bit RGB 4:4:4:4 – 'rgba' 10-Bit Log RGB 4:4:4 – 'R10g' 10-Bit RGB 4:4:4 – 'R10k' 10-Bit RGB 4:4:4 – 'r10k'
DPX Sequences in the following Subtypes	**Cineon Sequences in the following Subtypes**
10-Bit Log RGB 4:4:4 (BE) T2B 10-Bit RGB 4:4:4 (BE) T2B 10-Bit Log RGB 4:4:4 (BE) B2T 10-Bit RGB 4:4:4 (BE) B2T 10-Bit Log RGB 4:4:4 (LE) T2B 10-Bit RGB 4:4:4 (LE) T2B 10-Bit Log RGB 4:4:4 (LE) B2T 10-Bit RGB 4:4:4 (LE) B2T	10-Bit Log RGB 4:4:4 (BE)
TGA Sequences in the following Subtypes	**BMP Sequences in the following Subtypes**
8-Bit RGB 4:4:4 B2T 8-Bit RGB 4:4:4:4 B2T 8-Bit RGB 4:4:4 T2B 8-Bit RGB 4:4:4:4 T2B	8-Bit RGB 4:4:4 B2T 8-Bit RGB 4:4:4:4 B2T 8-Bit RGB 4:4:4 T2B 8-Bit RGB 4:4:4:4 T2B
TIF Sequences in the following Subtypes	**YUV Sequences in the following Subtypes**
8-Bit RGB 4:4:4(LE) B2T 8-Bit RGB 4:4:4:4(LE) B2T 8-Bit RGB 4:4:4(LE) T2B 8-Bit RGB 4:4:4:4(LE) T2B 8-Bit RGB 4:4:4(BE) B2T 8-Bit RGB 4:4:4:4(BE) B2T 8-Bit RGB 4:4:4(BE) T2B 8-Bit RGB 4:4:4:4(BE) T2B	8-Bit YUV 4:2:2

Are there any important things to be aware of when setting up a RAID for Video capture?

Many SCSI and Fiber raids that use SATA or IDE with a backplane and controller often offer user settings for configurations. Be sure to format the Physical disk in a 512 Block size and never exceed a single volume size of 2TB. Multiple 2TB (or below) can be striped together by the OS for larger capacity storage.

I captured a QuickTime file and then renamed it when the system prompted me to save it—why did it take so long to save?

When KONA is capturing, it creates separate audio & video files based on the name the clip is logged with and then multiplexes the audio & video together at the end of the capture. If the user renames this clip after the capture, a duplicate clip has to be regenerated and re-multiplexed.

Appendix A: Specifications

Video Formats

- 525i 29.97
- 625i 25
- 720P 50, 59.94, 60
- 1080i 25, 29.97, 30
- 1080PsF 23.98, 24, 25, 29.97, 30
- 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- 2K
  - 2048 x 1080P 23.98, 24, 25, 29.97, 30, 50 and 60
  - 2048 x 1080PsF 23.98, 24, 25
  - 2048 x 1556p 15, 14.98
  - 2048 x 1556PsF 15, 23.98, 24
- 4K
  - 3840x2160P 23.98, 24, 25
  - 4096x2160P 23.98, 24, 25
  - 3840x2160PsF 23.98, 24, 25
  - 4096x2160PsF 23.98, 24, 25

Software-dependent Formats

These formats are dependent on specific software functionality and are not normal 'over-the-wire' formats.

- 525i 23.98
- 720P 23.98, 24 , 25 , 29.97, 30

Video Input Digital

- 3G/SD/HD SDI, SMPTE-259/292/296/424, 8- or 10-bits
- Single Link 4:2:2 or 4:4:4 (1 x BNC)
- Dual Link HD 4:4:4 (2 x BNC)
- 2K HSDL (High Speed Data Link) 4:4:4, (2 x BNC)
- 4K/QuadHD 4:4:4 (4 x BNC)
- 1D LUT Support (Mac and PC)

Video Output Digital

- 3G/SD/HD SDI, SMPTE-259/292/296/424
- Single Link 4:2:2 or 4:4:4 (1 x BNC)
- Dual Link HD 4:4:4, (2 x BNC)

A

- 2K HSDL (High Speed Data Link) 4:4:4, (2 x BNC)

- 4K/QuadHD 4:4:4 (4 x BNC)

- HDMI v1.4, 30/36 bits/pixel, RGB or YUV, 2.25Gbps, SD, HD, 1080p-50/60

Video Output Analog:

- Composite/S-Video (Y/C) (1 x BNC/2x BNC+adapter)

- NTSC, NTSCJ, PAL

- 12-bit D/A, 8x oversampling

- +/- .2 dB to 5.0 MHz Y Frequency Response

- +/- .2 dB to 1 MHz C Frequency Response

- .5% 2T pulse response

- <1% Diff Phase

- <1% Diff Gain

- Component (3 x BNC)

- HD: YPbPr, RGB

- SD: YPbPr, RGB (component mode)

- SMPTE/EBU N10, Betacam 525 line, Betacam 525J, RGB

- 12-bit D/A, 8x oversampling

- +/- .2 dB to 5.5 MHz Y Frequency Response

- +/- .2 dB to 2.5 MHz C Frequency Response

- .5% 2T pulse response

- <1 ns Y/C delay inequity

Downstream Keyer:

Supports graphics with alpha channel over video, matte or framebuffer, or framebuffer content over incoming video or matte.

Audio Input Digital

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

- 8-channel, 24-bit AES/EBU audio, 48kHz sample rate, Synchronous or Non-synchronous, Internal sample rate conversion (via 4 x BNC on breakout cable)

- 16-channel, 16- or 24-bit AES/EBU audio, 48 sample rate, Synchronous (via 8 x BNC on optional K3G-Box)

Audio Output Digital

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

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

- 8-channel, 24-bit AES/EBU audio, 48kHz sample rate, Synchronous or Non-synchronous, Internal sample rate conversion (via 4 x BNC on breakout cable)

- 16-channel, 16- or 24-bit AES/EBU audio, 48 sample rate, Synchronous (via 8 x BNC on optional K3G-Box)

Audio Output Analog

- 2-channel unbalanced output (via 2 x RCA jacks on optional K3G-Box)

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 side bars
- 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.

Timecode

- LTC timecode input and output (via 1 x BNC each)

Reference Input

- Analog Color Black (1V) or Composite Sync (2 or 4V)
- Looping
- 75 ohm on optional K3G-Box, terminated on supplied breakout cable

Machine Control

- RS-422, Sony 9-pin protocol (via breakout cable or optional K3G-Box)
- 9-pin D-connector pinout is as follows:

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

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