

# KONA

## Installation & Operation Guide

Version 12.5

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**AJA**®  
VIDEO SYSTEMS

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## Contacting Support

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When calling for support, have all information at hand prior to calling. To contact AJA for sales or support, use any of the following methods:

*Telephone:* +1.530.271.3190

*FAX:* +1.530.271.3140

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

*Support Email:* [support@aja.com](mailto:support@aja.com)

*Sales Email:* [sales@aja.com](mailto:sales@aja.com)

# Chapter 1: Introduction

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KONA 4



KONA 3G



KONA LHe Plus



KONA LHi



KONA IP

## Overview

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The AJA KONA series brings the highest quality 4K/UHD, 2K, HD, and SD video and audio to Mac and Windows computers. This manual discusses the installation of KONA cards and the necessary software drivers and plug-ins for each platform.

### KONA Models Covered in this Manual

This manual covers the installation and operation of these models:

- KONA LHe Plus
- KONA LHi
- KONA 3G
- KONA 4
- KONA IP

### AJA Software & Utilities

AJA's KONA software and hardware were developed for powerful integrated video/audio capture, editing, and production with a variety of 3rd-party software. With KONA and a qualified computer, you have the ultimate system for production, post-production, broadcast, and streaming work. AJA software is distributed as a unified package which includes all the software, firmware, plugins, and utility programs for AJA's iO, KONA, and T-TAP products.

Three retail packages are available, one for Mac, one for Windows, and one for Linux.

*NOTE: Support for the Linux OS retail drivers is based on the Linux application used and comes from the application's vendor.*

The Mac and Windows packages include:

**Drivers** AJA device drivers for tightly integrated hardware/software operation.

**AJA Control Panel** The Control Panel provides:

- Source selection and control of your AJA hardware.
- A block diagram to show visually what routing and processing is being performed.

**AJA Control Room** Control Room is a cross-platform software application for ingest, playback and output with AJA products.

**AJA System Test** System Test provides accurate and detailed evaluations of drive and PCIe performance statistics, allowing you to measure the capabilities of your system for recording and playing back various resolutions and codecs.

**3rd-Party Plugins** AJA-provided plugins for popular 3rd-party Professional Video Applications from Adobe, Avid, Apple, Telestream, and others.

To download AJA software, go to the AJA website:

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

For a complete software compatibility list, see the AJA website link:

<http://www.aja.com/en/category/edit/compatibility>

## System Requirements

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AJA Video recommends that your system meet minimum hardware and software requirements to achieve a satisfactory level of performance. Updates to system requirements are subject to change.

*NOTE: See Software Vendor system requirements for GPU recommendations and additional hardware requirements and recommendations.*

AJA recommends:

- Mac OS 10.9.5 or later
- Windows 7/8.1/10 with all updates
- 2.0 GHz quad core i7 minimum, for HD. For 4K, especially high frame rate, please consult a system integrator, and the software vendor.
- 8GB RAM minimum, 32GB recommended, especially for 4K and/or High Frame Rate applications

## Disk Storage Methods

To ensure performance and quality, the disk storage system used with the workstation must be able to meet the demands of storing realtime uncompressed media. At the very minimum, the disk storage system must be able to provide and maintain a consistent transfer rate from the workstation to disk (read/write). There are a variety of system configurations and peripherals that can provide this level of performance.

For more on disk storage performance see *"System Test Application" on page 19.*

## KONA 4/3G Features

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The KONA 4 and 3G cards offer many unique features for optimum quality, ease of use, and support for a wide variety of post production workflows. KONA 3G features include:

- Video I/O**
- SD-SDI, HD-SDI, Dual Link HD-SDI, HSDL, and 3G HD-SDI inputs
  - HDMI 1.4a output
    - KONA 3G I/O supports SD and HD over HDMI
  - HDMI v2.0
    - 30/36 bits/pixel, RGB or YUV, 2.25 Gbps
    - 2K, HD, and SD, UltraHD with HFR support up to 60p 4:2:0
    - HDR10 Support - HDR Infoframe metadata, in accordance with HDMI 2.0a/CTA-861.3
  - 2K support that includes 2048x1556 and 2048x1080 formats
  - 4K and Ultra HD capture and playout
    - KONA 3G supports framerates up to 30 fps

- KONA 4 supports framerates up to 60 fps
- 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

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

KONA 4 supports both Quadrant and Two Sample Interleave transport standards for UHD and 4K video formats.

- Conversion**
- Broadcast quality hardware-based 10-bit down-conversion
  - Broadcast quality hardware based 10-bit up-conversion
  - Broadcast quality hardware based 10-bit cross-conversion (1080 to 720 and 720 to 1080)
  - Broadcast quality hardware based 10-bit SD aspect ratio conversion (anamorphic to letterbox, etc.)

KONA 4/3G 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 4/3G is virtually identical to AJA's award winning stand-alone converter products used throughout the post production market. The KONA 4/3G built-in up-converter uses 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.

- Audio I/O**
- 8-channel 24-bit, 48kHz digital AES/EBU audio
  - 16 channels of SDI embedded digital audio

KONA 4/3G 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 4/3G'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 4/3G video. Sample rate conversion is done at very high quality (over 120db THD).

- Signal Timing**
- Genlock input with optional looping capability via the K3G- Box (terminated on the supplied breakout cable)
  - LTC (longitudinal timecode) input/output

- Cabling**
- Standard 2-meter length connection cables including HDMI mini to HDMI output

**UHD/4K Mode Capture and Playback** In 4K Mode, KONA 4/3G offers 4K capture and playback in both YCbCr and RGB.

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

When 4K payout in Quadrant mode 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 workflow; see the specifications (*"KONA 4 Specifications" on page 81*) for supported 4K formats. For a description of Two Sample Interleave output mapping, see *"2SI Mode" on page 68*.

#### **Internal HD/SD Hardware Downstream Keyer**

KONA 4/3G 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). 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.

## **KONA LHe Plus Features**

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

- Video I/O**
- 10-bit uncompressed SD/HD QuickTime capture card
  - 12-bit HD Analog Component I/O
  - 12-bit SD Analog Component/Composite/S-Video I/O
  - One SDI or HD-SDI Input
  - Two independent SDI/HD-SDI outputs

- Conversion**
- Broadcast quality hardware-based 10-bit down-conversion

- Audio I/O**
- 2-channel analog balanced XLR audio I/O
  - 2-channel AES XLR audio I/O
  - 8-channel SDI embedded audio I/O

- Signal Timing**
- HD/SD genlock on analog video inputs

- Cabling**
- Cables standard
  - Optional KL-box Breakout Box—provides rack mounting and flexible easy I/O (KL-box cabling is included with the KL-box). When ordering, specify a KL-box for the KONA LHe Plus since it uses a unique cable.

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

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

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

## KONA LHi Features

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

- Video I/O**
- 10-bit uncompressed QuickTime capture card
  - 3G/HD/SD SDI I/O
  - HDMI v1.3a w/Deep Color at 30 bits per pixel input/output
  - 12-bit SD and HD Analog Component/Composite/S-Video I/O

- Conversion**
- Broadcast quality hardware-based 10-bit down-conversion
  - Broadcast quality hardware based 10-bit up-conversion
  - Broadcast quality hardware based 10-bit cross-conversion (1080 to 720 and 720 to 1080)
  - Broadcast quality hardware based 10-bit SD aspect ratio conversion (anamorphic to letterbox, etc.)

- Audio I/O**
- 2-channel analog balanced XLR audio I/O
  - 2-channel AES XLR audio I/O
  - 8-channel SDI embedded audio I/O

- Signal Timing**
- HD/SD genlock on analog video inputs
  - LTC Input (on Reference input)

- Cabling**
- Cables standard
  - Optional KLHi-box Breakout Box—provides rack mounting and flexible easy I/O (KLHi-box cabling is included with the KLHi-box).

**KONA LHi Audio** KONA LHi supports 2-channel 24-bit 48kHz or 96kHz AES audio via XLR connections, and 8 channel embedded 24 bit 48kHz audio over HDMI or the same single SDI connection as the video. If you are using a digital deck—you'll have the proper connections to the deck.

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

KONA LHi also features AES input sample rate conversion; this feature eliminates the requirement for audio source synchronization. Sample rate converters auto-lock to any AES or HDMI input, 32-96KHz, and then convert it to 24 bit 48KHz audio, perfectly locked to internal KONA LHi video. Sample rate conversion is done at very high quality (over 120db THD). (HDMI audio can be 20 to 24 bit and will be saved as 24 bit samples.)

## KONA IP Features

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KONA IP is desktop video and audio I/O for professional IP-based workflows. KONA IP is the next generation of AJA's industry-leading KONA line of PCIe capture and playback cards, and works with AJA's Control Room, Control Panel software and SDK tools, providing support for leading third party content creation applications. Designed as a flexible platform with support for SMPTE 2022-6/7 uncompressed IP video needs, KONA IP offers you the flexibility to keep current as the IP transition proceeds.

- Operating Systems Supported**
- Mac
  - Windows
  - Linux

*NOTE: See the AJA Driver Release Notes, available on the AJA website and also installed with the driver, for the exact OS versions supported.*

- Video Formats**
- (HD) 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
  - (HD) 1080PsF 23.98, 24, 25, 29.97, 30
  - (HD) 1080i 25, 29.97
  - (HD) 720P 50, 59.94, 60
  - (SD) 625i 25
  - (SD) 525i 29.97

- Physical Connection for IP Video**
- 2 x 10 Gb Ethernet SFP+ Cages - SFP+ modules not included.

For a list of 10GbE SFP+ modules tested by AJA, use the link below:

[www.aja.com/en/products/kona-ip#techspecs](http://www.aja.com/en/products/kona-ip#techspecs)

- Inputs and Outputs**
- Retail package configured by default with 2 inputs and 2 outputs on the top SFP
  - SDK can support any input or output configuration up to 4 streams and up to 10 Gb in any direction over one link

- Video Output Digital**
- HDMI 1.4a output
    - 30/36 bits/pixel, RGB or YUV, 2.25 Gbps
    - HD/SD

- Digital Audio Input**
- 16-Channel embedded audio

- Digital Audio Output**
- 16-Channel embedded audio, 24-bit per channel, 48 kHz sample rate, synchronous
  - 8-Channel HDMI embedded audio, 48 kHz sample rate, synchronous

- Signal Timing**
- 1 x BNC assignable to reference video or LTC input

**Internal HD/SD Hardware Downstream Keyer** KONA IP 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). 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.

## Cable Connections

---

KONA offers unsurpassed cable connectivity for a video/audio capture card. Connections are made via the breakout cable (included with the card) and connectors mounted on the KONA Card endplate. These connectors, for all three KONA models, are illustrated on the following pages.

### KONA LHi and LHe Plus Connectors

- The Breakout cable used for both KONA LHi and LHe Plus models provides:
- Reference Input (BNC connector)

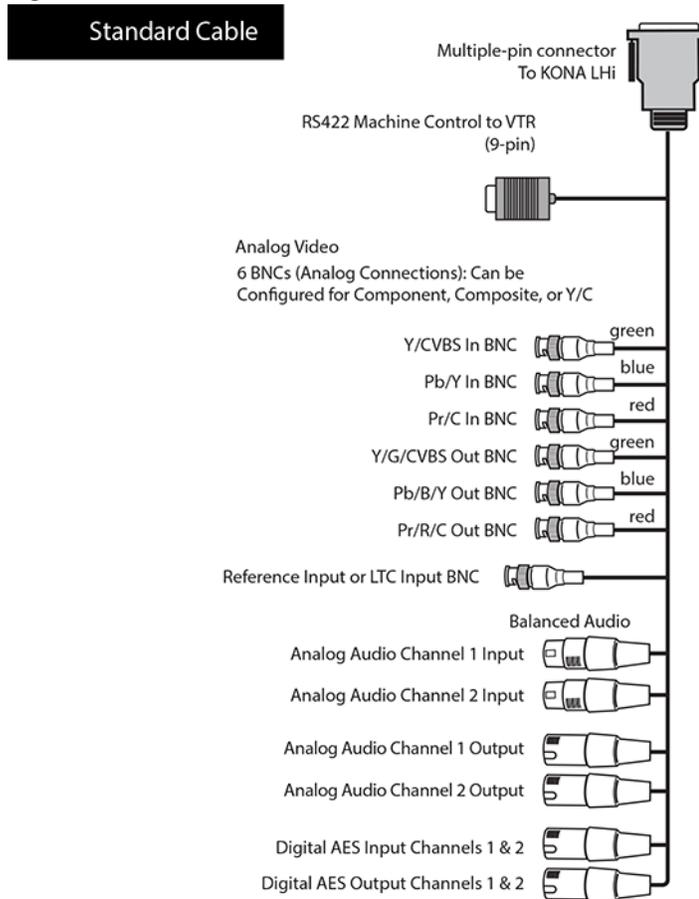
- Component/Composite/S Video Input (3x BNC)
- Component/Composite/S Video Output (3x BNC)
- AES In (2x XLR)
- AES Out (2x XLR)
- Balanced Audio In (2x XLR)
- Balanced Audio Out (2x XLR)
- RS-422 Machine Control (9-pin)

**LHi Endplate** Connectors on the KONA LHi card endplate additionally provide:

- Standard-definition or High-definition SDI input (1 BNC) and output (1 BNC)
- HDMI input and output (2x HDMI mini-connectors)

**LHe Plus Endplate** The KONA LHe Plus endplate provides one BNC for SDI/SDI HD input and two independent SDI/SDI HD output BNC's.

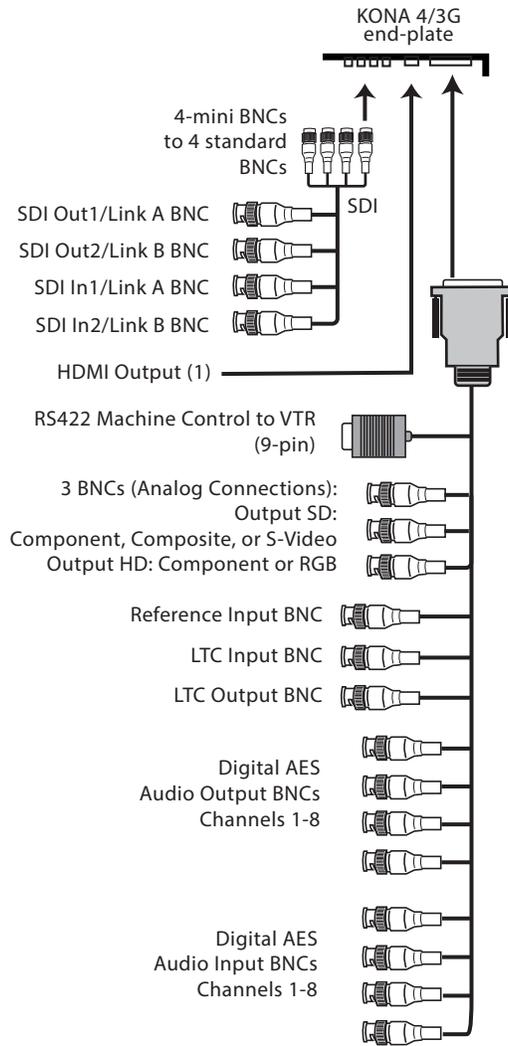
**Figure 1. Breakout Cables for LHe Plus and LHi Models**



## KONA 4/3G Connectors

KONA 4/3G provides complete I/O connectivity choices in two multi-signal breakout cables and one HDMI-to-HDMI mini output cable. One multi-signal cable provides AES/EBU digital BNC connections and analog video monitoring connections. The other has 4 mini-connectors on one end and 4 BNCs on the other providing SDI connections. Cable connections are marked on both the KONA card endplate and on the cable connectors for easy identification.

**Figure 2. KONA 4/3G Breakout Cables**



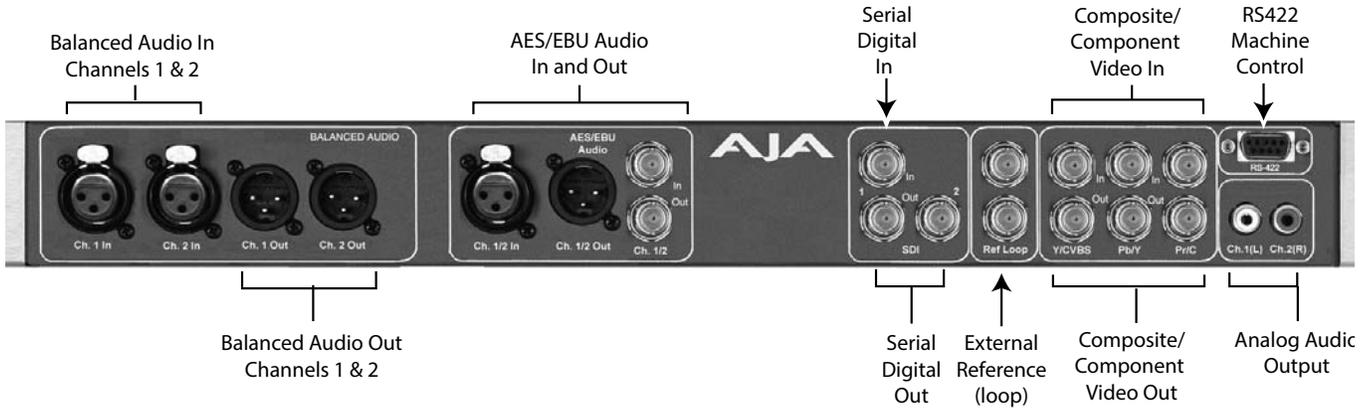
## Using Breakout Boxes

The KONA product line offers two optional 19" 1RU rack-mountable breakout boxes that attach to the KONA card via cables that connect to the back of the Box. These cables are supplied with the Box. The breakout boxes offer the same inputs and outputs as the standard breakout cables and more. Breakout boxes can be easily rack mounted or placed on top of a broadcast monitor or editing desk.

### KONA KL-Box for LHe Plus

The KONA KL-Box is connected via one 60-pin to 60-pin, and one 3-BNC to 3-BNC cable. When you purchase the KL-Box, you get two-channel unbalanced audio output (2 RCA Jacks) not available with the standard cable. When ordering a KL-Box, specify the KONA card model you'll be using the KL box with to ensure you get the proper cable set.

**Figure 3. KL-Box Model Breakout Box**

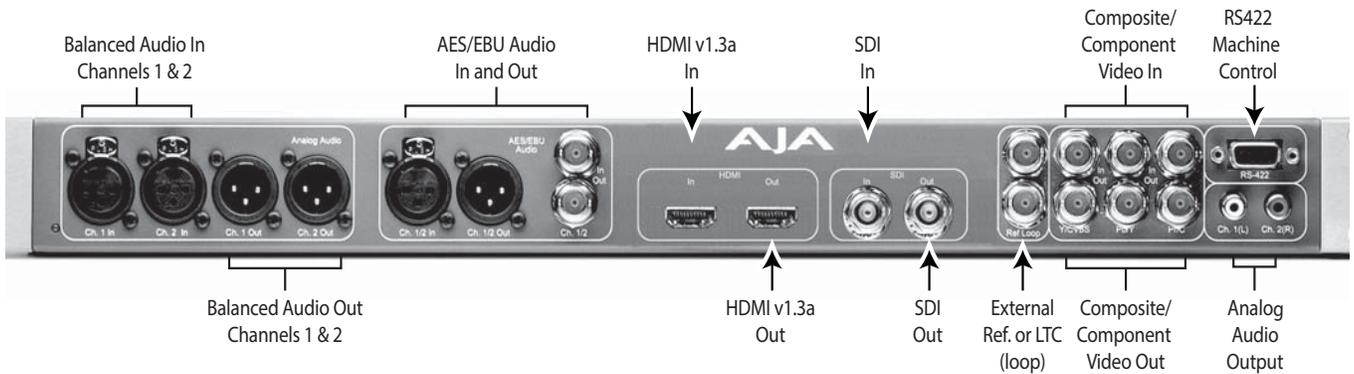


**KONA KLHi-Box**

The KONA KLHi-Box offers the same connections as the KL-Box except a single connector is provided for the following: SDI input, SDI output, HDMI v1.3a input, and HDMI v1.3a output.

*NOTE: The HDMI connectors on the breakout box are full-size, not mini as on the LHi endplate*

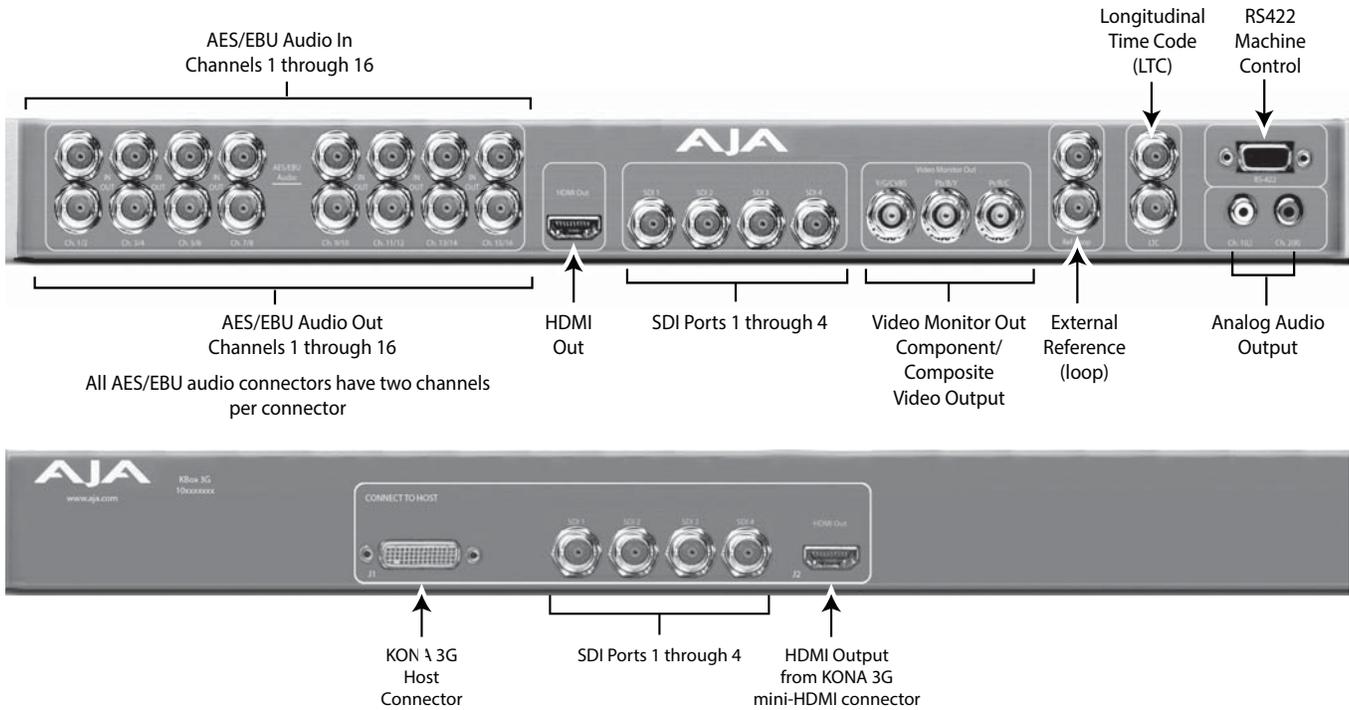
**Figure 4. KLHi-Box Model Breakout Box.**



**K3G-Box for KONA 4 & 3G**

The K3G-Box for KONA 4 and 3G offers convenient connector access and additional functionality including simultaneous BNC AES output, 2-channel RCA analog audio monitoring, and looping BNC connection for Genlock reference and LTC timecode. If you're using a digital Betacam deck, HDCAM, DVCPRO HD, D5, D9 or even an HDCAM SR, you'll have the proper connections.

**Figure 5. K3G-Box Model Breakout Box (front & rear view)**



## Detailed Connector Descriptions

### LHe Plus/LHi Connectors

Connectors on the standard cable set are labeled by their function for easy installation and maintenance. Connectors on the optional KL-Box are similarly labeled

#### SDI Input and Outputs

BNC connectors are provided on the KONA LHe and LHi card endplates for one SD-SDI or HD-SDI input. The LHe Plus has two, and LHi has one SDI output (format independent of the input). The SDI input and outputs support video and embedded 24-bit digital audio. Use SDI wherever possible for the best quality 10-bit uncompressed video input, capture and output. If peripheral equipment has a variety of inputs/outputs, look to see if it has SDI I/O, and use it where possible. Most high-end professional broadcast equipment supports SDI (VTRs, cameras, media storage servers, etc.).

#### HDMI Input and Output

Two HDMI mini-connectors on the LHi endplate (full-size HDMI connectors on the KLHi Box) provide for input and output of HDMI compatible video (version 1.1) and multi-channel embedded audio (8 channels). HDCP is not supported on either input or output. The LHi's HDMI output does not have HDCP, and input sources having HDCP are not supported. The HDMI input is designed to support long cable runs—up to 100 ft. when using 22 or 24AWG HDMI cable, or up to 50 ft. using 28 or 30AWG HDMI cable. The HDMI output supports standard HDMI cables only.

#### 2-Channel Digital AES/EBU Audio Inputs And Outputs

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

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

- Analog 2-Channel Balanced Audio** Two sets of analog XLR connectors, one for each channel, support balanced audio connections. Male XLRs are provided for outputs and female XLRs are provided for inputs. Balanced audio (differential) connections provide better analog audio quality over longer cable runs. Most professional quality VTRs and audio equipment have XLR style connectors for analog audio. Analog audio signals are converted internally to 24-bit digital.
- Unbalanced Audio on KL-Box** On the KL-Box are two analog output connectors, one for each channel. These connectors are RCA-style phono jacks.
- RS-422 Machine Control** A female DE-9 connector on the LHi/LHe Plus breakout cable provides connection for VTRs, camcorders, disk media servers, and other devices using RS-422 SMPTE (Sony) protocol. This RS-422 connector is also present on the optional KL-Box (connector pinout is Sony 9-pin protocol).

## KONA 4/3G to K3G-Box Connectors

Connectors on the standard cable set are labeled for their function for easy installation and maintenance. Connectors on the optional K3G-Box (breakout box) are similarly labeled.

- 8-Channel Digital AES/EBU Audio I/O** When using the standard cables, BNC connections are provided for AES/EBU audio input/output. Four BNC connectors are provided for audio input and four for audio output. Each BNC carries two channels. The connectors are labeled for input/output and channels.

The optional K3G-Box provides BNC audio connections on the front panel for 16-channels of audio input and output.

- Unbalanced Audio on K3G-Box** On the K3G breakout box are two analog output connectors, one for each channel. These connectors are RCA-style phono jacks.
- RS-422 Machine Control** A female DE-9 connector provides connection for VTRs, camcorders, disk media servers, and other devices using RS-422 SMPTE (Sony) protocol. This connector is present on both the general I/O cables and the optional K3G-Box (connector pinout is Sony 9-pin protocol).

- SDI Inputs & Outputs** On the KONA 4/3G card, mini-connectors are provided for bi-directional SDI inputs and outputs for Single Link, Dual Link or 4K/UHD I/O. 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.

In Standard mode, KONA 4/3G offers four video outputs altogether:

- two SDI outputs that are used for both High- and Standard-definition (SD/HD-SDI)
- two monitor outputs (discussed later), one component analog and one HDMI 1.4a.

Each of the four outputs is independently switchable between HD and SD. For example, if you are working in HD, you can have simultaneous HD-SDI, SD-SDI, and HD-component analog output.

SDI inputs and outputs support video and 8-channel 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 wherever possible. Most high-end professional broadcast equipment supports SDI (VTRs, cameras, media storage servers, etc.).

- HDMI Output** An HDMI mini-connector on the KONA4/3G endplate (full-size HDMI connectors on the K3G-Box) provides HDMI 1.4 capability, supporting 4K up to 24fps and UHD at up to 60 fps.

*NOTE: KONA 3G supports SD and HD over HDMI. KONA 4 supports UHD and 4K over HDMI.*

HDMI also supports multi-channel embedded audio (8 channels). HDCP is not supported on the output.

**Analog Monitor Outputs** Both the standard I/O cable and the optional K3G-Box feature two groups of three BNC connectors each, for input and output of component, composite and Y/C functions. The signals are labeled on both the cable and K3G-Box connectors.

The analog component output can be switched between SD and HD. KONA 4/3G features 12-bit component video output for both HD and SD. SD can be switched to composite and Y/C. (The same three BNC connectors share component and Y/C functions.) This allows use of an inexpensive analog monitor for both HD and SD work. You can even use a composite video monitor. For Dual Link HD-SDI output, HD or SD can be monitored through the component output. Dual Link HD can be output as 4:4:4 RGB.

Component video signals are generally higher quality than composite, but not as high-quality as serial digital (SDI).

*NOTE: About RGB: Although RGB is used less in today's video systems, KONA 4/3G supports it for A/V Monitor output. However, because the KONA 4/3G (and SMPTE SDI's) native format is YPbPr, AJA recommends using 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 Playout setup panel of the specific application you are using with KONA 4/3G.*

*NOTE: About YPbPr: KONA 4/3G supports three different types of YPbPr:*

- SMPTE/EBU N10
- Betacam (NTSC)
- Betacam (NTSC-J [Japan]).

These three formats differ in level only and can be configured in the Playout setup panel of the specific application you are using with KONA 4/3G.

**Reference Video** A single BNC on the standard KONA cable—or two BNC connectors on the K3G-Box (looping)—allow you to synchronize KONA 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, connect its analog composite output here. When KONA outputs video, it locks to this reference signal. When connecting a reference video source, the locking signal should be the same format as the Primary format selected in KONA software. It is possible in some circumstances to use an alternate format video signal if the basic frame rate is compatible.

**KONA IP Connectors** KONA IP provides SFP+ cages for 10GbE connectivity, rather than the DIN connectors found on KONA 3G and KONA 4.

**SFP Cages and Modules** Two SFP+ cages are provided to connect two separate 10 Gigabit Ethernet Links. Both links are bi-directional. Inputs and outputs for most uses will be set up over the same link if bandwidth allows it. In this first version of KONA IP, SMPTE 2022-6/7 is supported for input and output. Up to four total streams of SD or HD each with 16 audio channels and Metadata may be input or output at a time, and can be configured in the AJA Control Panel, which is detailed later in this manual. Transport Methods other than SMPTE 2022-6/7 may become available in the future.

For a list of 10GbE SFP+ modules tested by AJA, use the link below:

[www.aja.com/en/products/kona-ip#techspecs](http://www.aja.com/en/products/kona-ip#techspecs)

**HDMI Output** A full-size HDMI connector on the KONA IP endplate provides HDMI 1.4 capability.

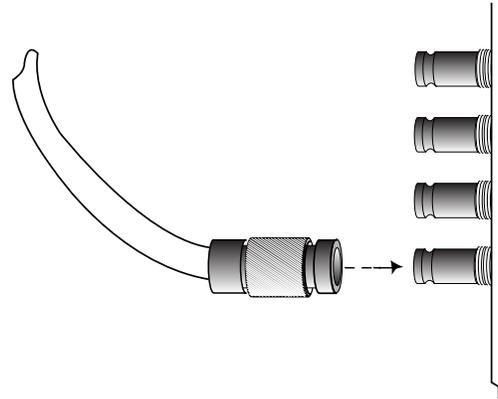
*NOTE: KONA IP supports SD and HD over HDMI.*

HDMI also supports multi-channel embedded audio (8 channels). HDCP is not supported on the output.

**Reference Video** A single BNC on the KONA IP endplate allows you to synchronize KONA 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, connect its analog composite output here. When KONA outputs video, it locks to this reference signal. When connecting a reference video source, the locking signal should be the same format as the Primary format selected in KONA software. It is possible in some circumstances to use an alternate format video signal if the basic frame rate is compatible. KONA IP can also lock to an incoming SMPTE 2022-6 signal, or it can free run.

# Chapter 2: Installation

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## Installation Overview

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The installation and set up of a KONA card 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 your computer has previously had another video capture or multimedia card installed, ensure you remove the card and uninstall any related software before installing the KONA card. This will prevent any hardware or software 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/>

**Card Placement**

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. 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 card. If you're instead using the standard cable set, then use those to connect directly to your equipment.
5. Install KONA drivers and plugins.

Each of these steps is discussed in greater detail in the pages of this chapter.

## System Test Application

AJA System Test is a utility for measuring system performance with AJA KONA Video Capture cards. It is installed with the KONA Driver. The application includes:

- System Disk Test
- AJA Device Test
- Disk + Device Test
- System Report

The application tests Read and Write, Capture and Playback speeds tests in both Megabytes per second and Frames per second. 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.

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.

## Unpacking

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### Shipping Box Contents

Your KONA shipment includes:

- KONA 4/8-lane PCI-Express card
- KONA I/O cables.

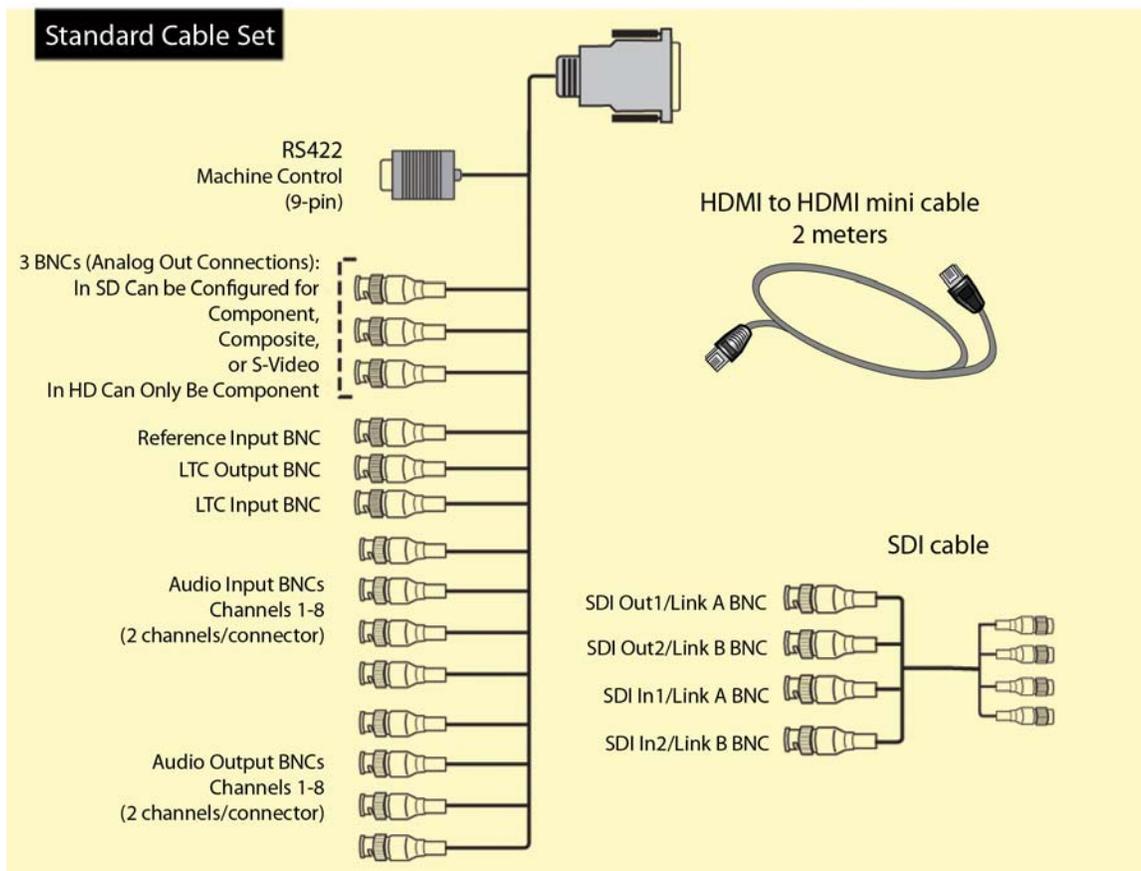
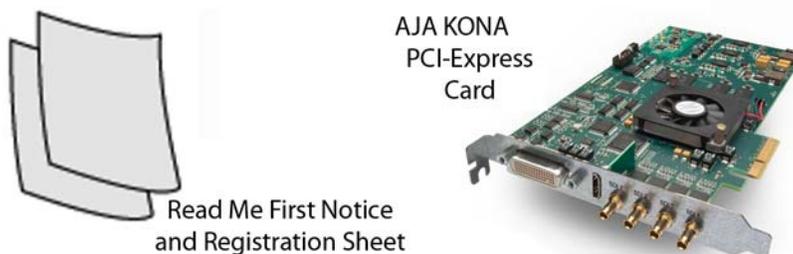
#### **KONA 4/3G Cables**

If you purchased the KONA 4 or 3G, you will receive this complement of cables:

- Cable, HDMI mini-to-HDMI output
- Cable, KONA 4/3G 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.

If you purchased the optional K3G-Box breakout box, it ships with a multi-pin to multi-pin cable for connecting from the KONA 4 or 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 KONA 4/3G card and the box rear panel.

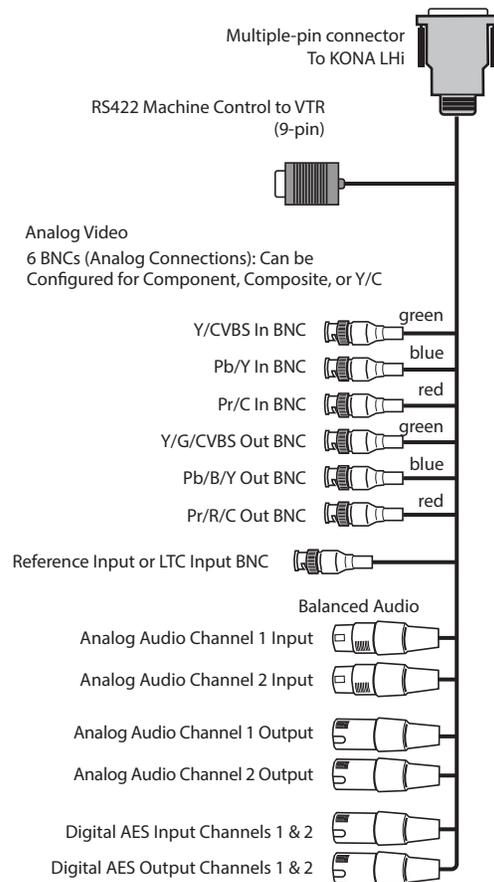
**Figure 1. Shipping Box Contents, (KONA 3G contents shown)**



The KONA LHi and LHe Plus cards use the breakout cable shown below providing XLR balanced audio connectors, an RS-422 9-pin connector, and BNCs for video I/O and reference connection.

**Figure 2. KONA LHe Plus/LHi Breakout Cable**

**Standard Cable**



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 card 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 Card in 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 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 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 card after installation.
7. Holding the KONA card by the end plate and an outside edge, carefully insert the 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.

**Figure 3. KONA Card (model 3G shown)**



**Figure 4. Mac Pro Cardcage Access**

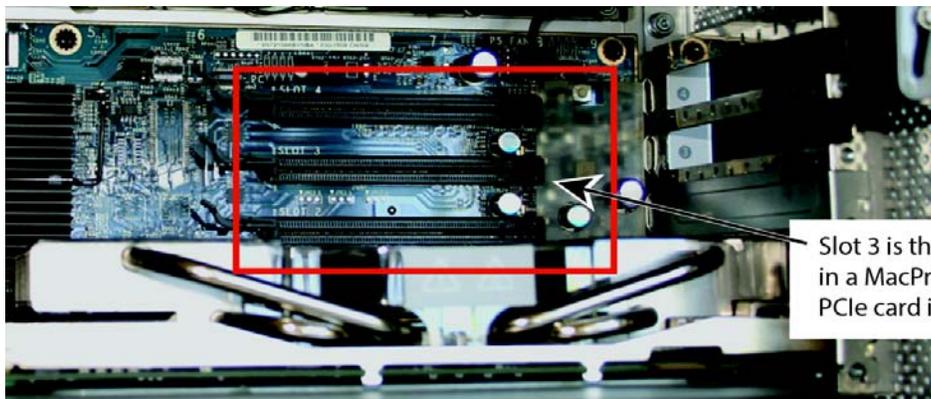


To install:

1. Remove Screw and Cover Plate and insert KONA Card
2. Secure KONA with screw removed earlier

PCI-Express Slots

**Figure 5. Card Slots, PCIe Mac Pro shown here**



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

## 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.

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 (see [“Installation Overview” on page 19](#) for links).

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

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.

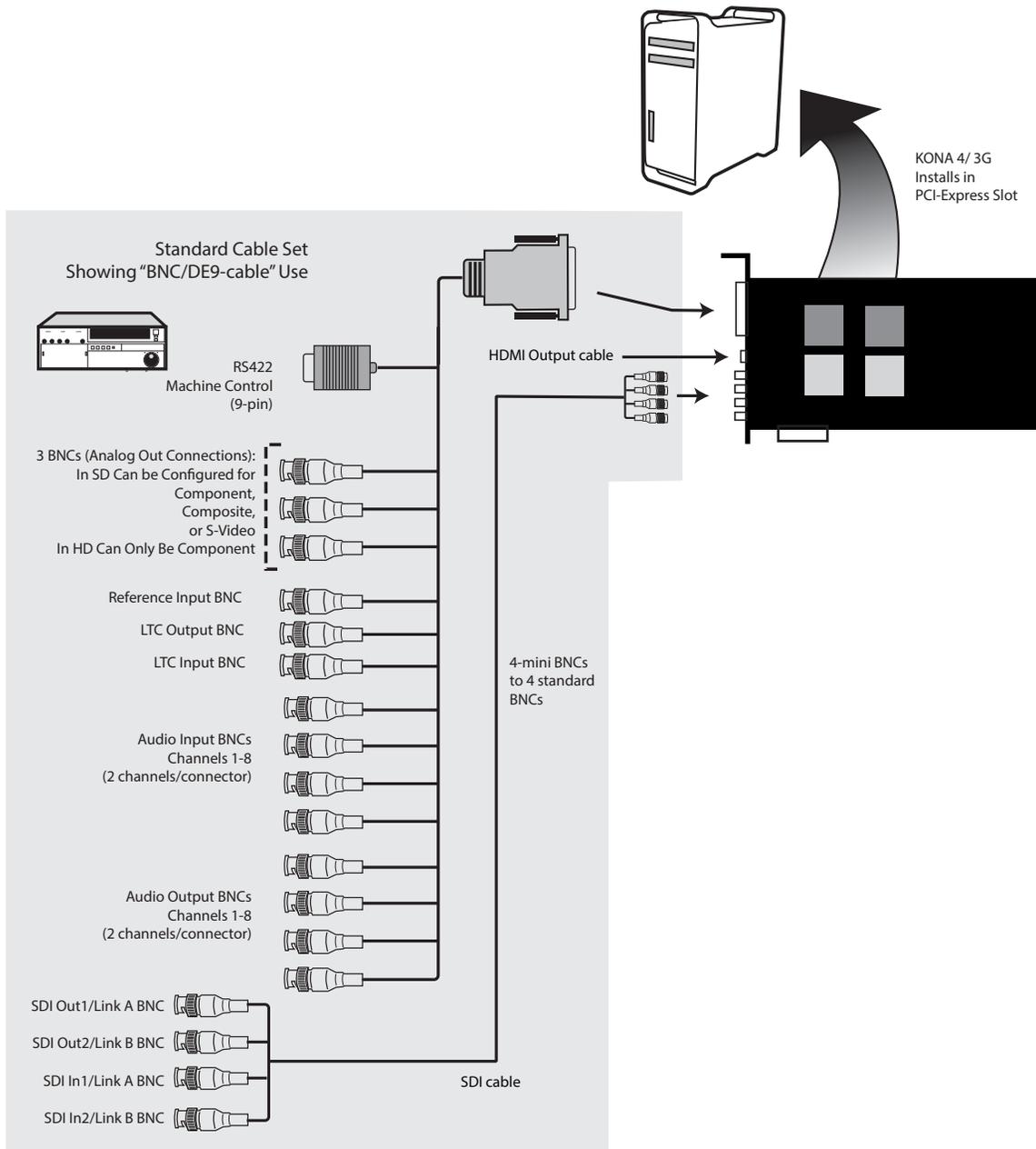
## Cabling the System

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When installing your system, you'll make video and audio input/output connections. These connectors are described individually in Chapter 1. The following diagrams illustrate and describe system interconnection for the three KONA models.

# KONA 4/3G Connections

Figure 6. KONA 4/3G System Using Breakout Cable

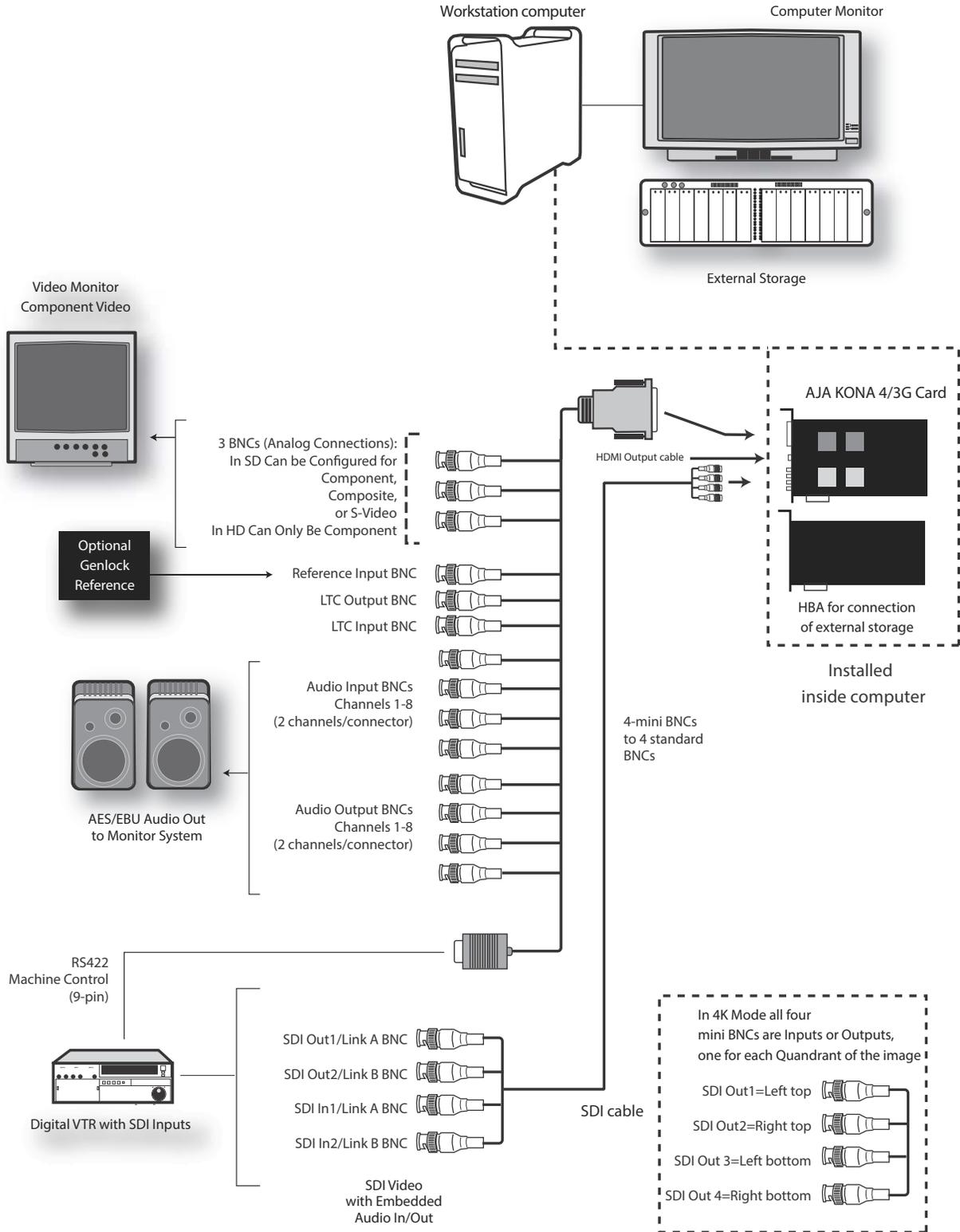


**Typical System** [Figure 7 on page 28](#) shows typical system interconnections for a system with digital A/V sources. Your system may differ depending on VTRs, audio monitoring, and video monitoring.

1. If desired, connect your house reference sync to the KONA 4/3G Ref Loop connector (BNC). On the breakout cable this is a terminated reference input. The second KONA 4/3G 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.

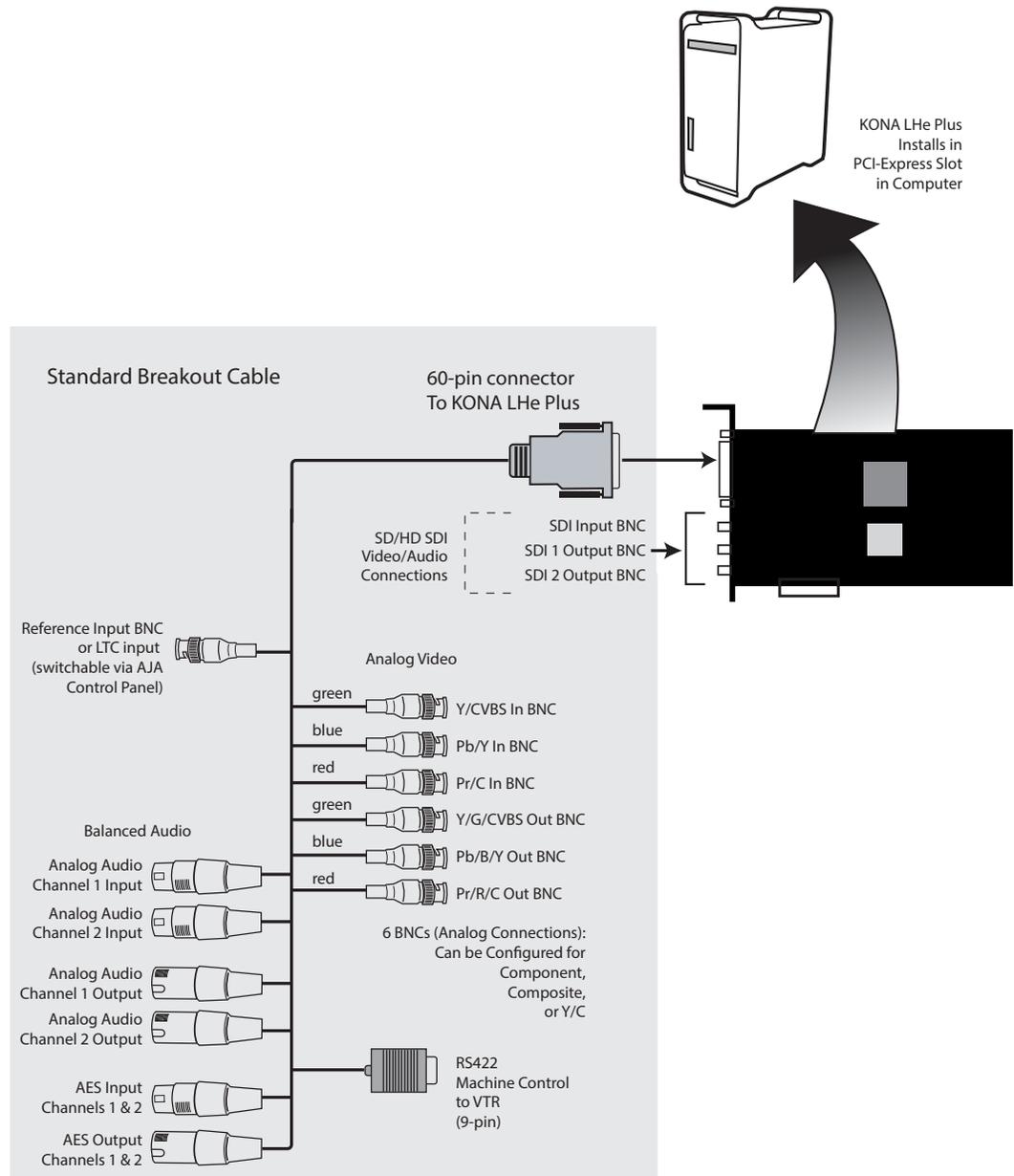
2. Connect a Video Monitor to the KONA 4/3G Component Analog Video Out BNC connectors (preferred), or instead connect to a composite monitor. (If you have an SDI or HD-SDI enabled monitor, you may also connect one of the KONASDI outputs to a monitor as well.)
3. Connect the 9-pin DE9 machine control cable on the supplied breakout cable to your VTR's RS422 control port or connect a 9-pin DE9 cable between the breakout box and the VTR's RS422 serial port.
4. Connect two SDI cables between KONA 4/3G and your digital VTR (Digital Betacam etc.): one from KONA 4/3G SDI In to the VTR SDI Out, and one from KONA 4/3G SDI Out (1 or 2) to the VTR SDI In. The KONA 4/3G 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 4/3G's BNC connectors: 1/2, 3/4, 5/6, and 7/8, to the monitoring system AES/EBU inputs. If 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.

**Figure 7. Typical KONA 4/3G System Connections**



# LHe Plus Cable Connections

Figure 8. KONA LHe Plus System Using The Breakout Cable

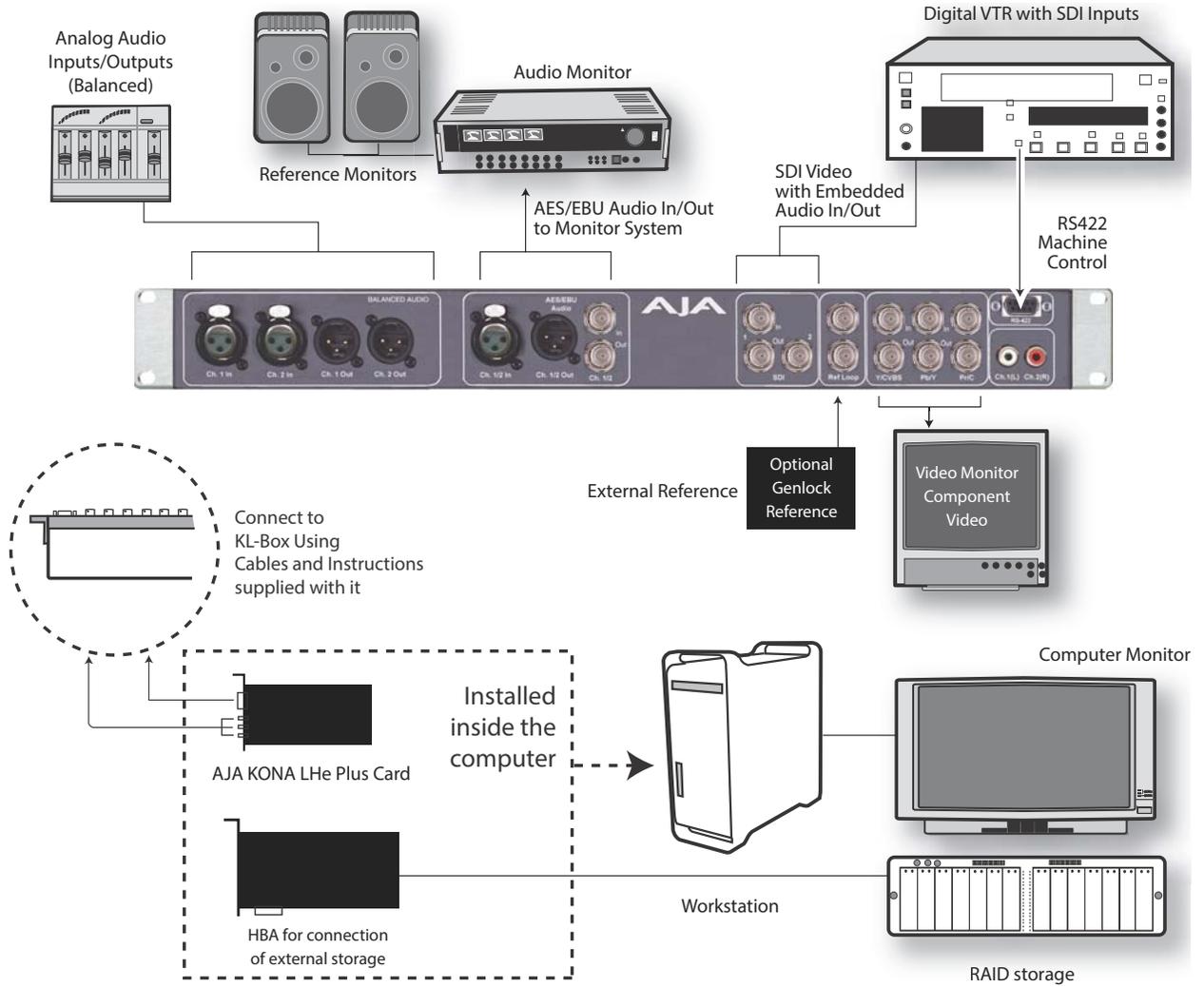


**Typical System** Figure 9 on page 30 shows typical system interconnections for KONA LHe Plus with digital A/V sources. Your system may differ depending on VTRs, audio monitoring, and video monitoring.

1. If desired, connect your house reference sync to the KONA LHe Plus *Ref Loop* connector (BNC). The second KONA Ref Loop connector on the KL-box (if used) can be connected to the VTR or terminated with a 75-ohm terminator.
2. Connect a Video Monitor to the KONA LHe Plus *Component Analog Video Out* BNC connectors (preferred), or instead connect to a composite monitor.
3. Connect a 9-pin DE9 machine control cable between your VTR's RS422 control port and the breakout cable's *RS-422* machine control connector.

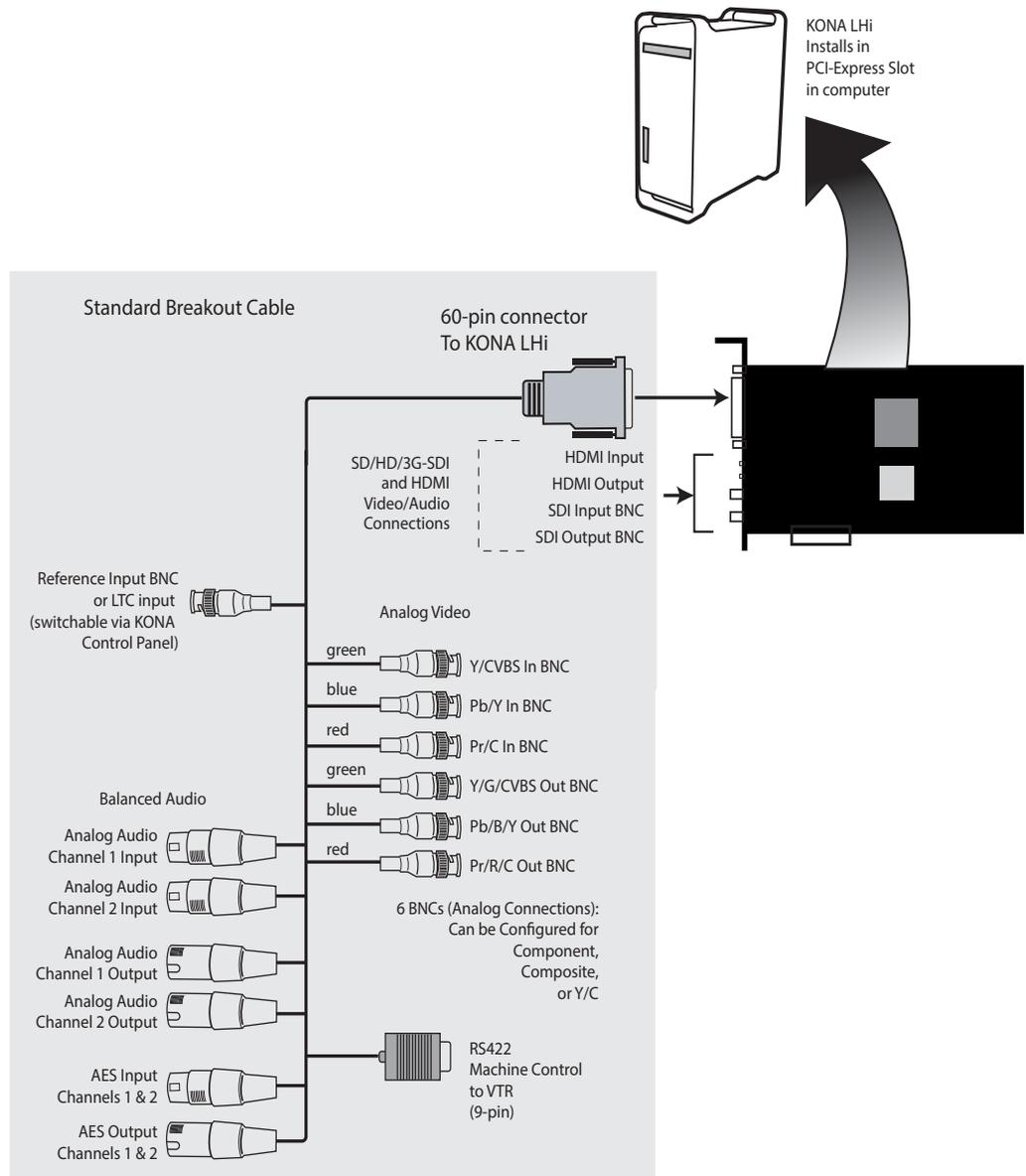
4. Connect two SDI cables between the KONA card (BNCs are on the card endplate) and your digital VTR (Digital Betacam etc.): one from KONA card's *SDI In* to the VTR *SDI Out*, and one from card's *SDI Out* (1 or 2) to the VTR *SDI In*. The KONA LHe Plus SDI connections have embedded audio so the VTR must be configured accordingly.
5. If you have an AES/EBU-ready audio monitoring system, connect the two channels of AES/EBU output from KONA's XLR connectors (channels 1 and 2) to the monitoring system AES/EBU inputs. If, instead, you have an analog audio monitoring system, you can use either the XLR balanced audio connectors or the two RCA-style unbalanced stereo output jacks on the Optional KL-box for output.

**Figure 9. Typical LHe Plus System Connections—Shown with Optional KL-Box**



# LHi Cable Connections

**Figure 10. KONA LHi System Using The Breakout Cable**

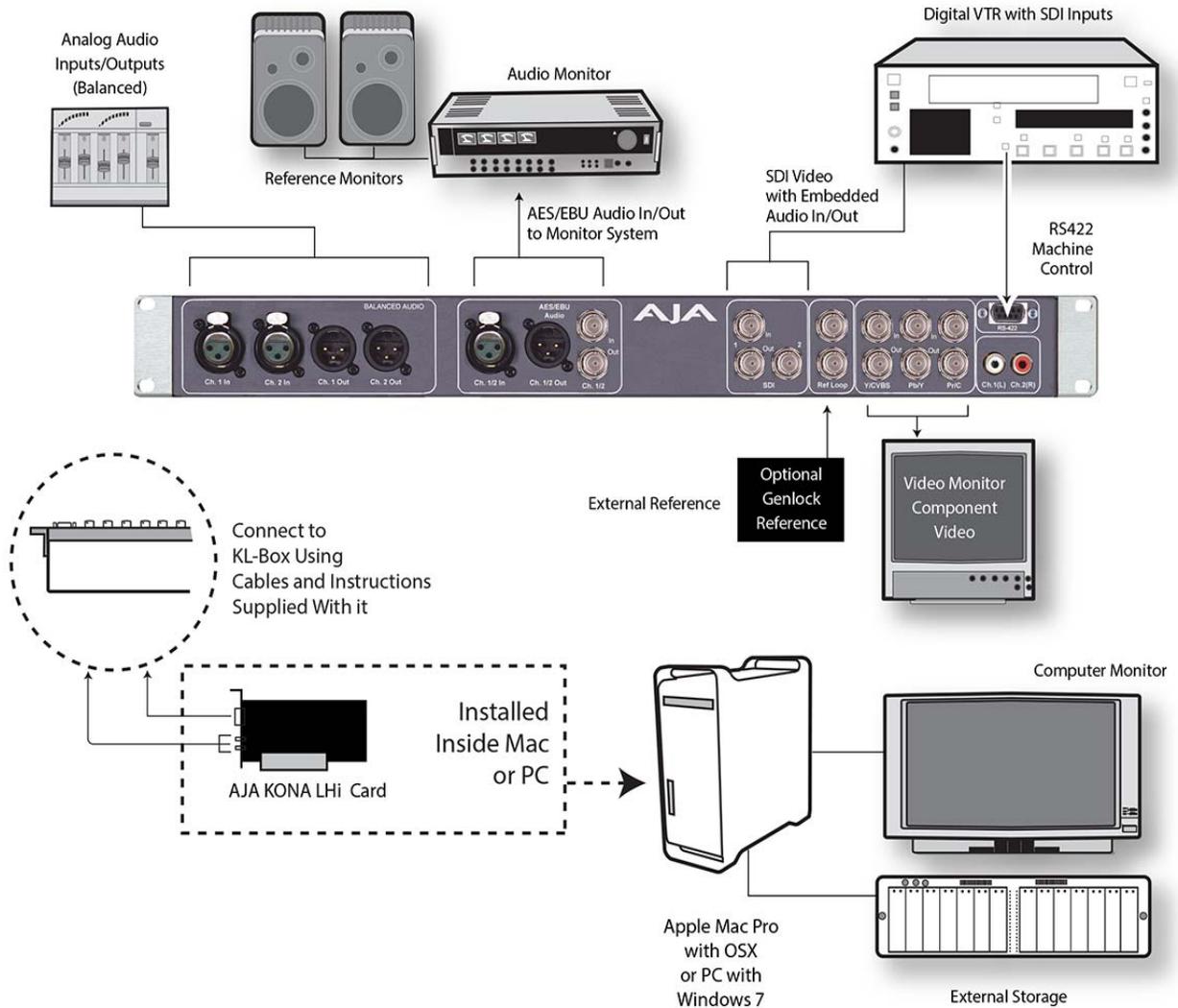


**Typical System** *Figure 11 on page 32* shows typical system interconnections for a system with digital A/V sources. Your system may differ depending on VTRs, audio monitoring, and video monitoring.

1. If desired, connect your house reference sync to the KONA LHi *Ref Loop* connector (BNC). The second KONA LHi *Ref Loop* connector on the KLHI-box (if used) can be connected to the VTR or terminated with a 75-ohm terminator. If instead using LTC timecode input, connect to the *Ref Loop* input.
2. Connect an HDMI Video Monitor to the KONA LHi HDMI Out connector. Or instead, use the Component Analog Video Out BNC connectors to go to an analog monitor.
3. Connect a 9-pin DE9 machine control cable between your VTR's RS422 control port and the breakout cable's *RS-422* machine control connector.

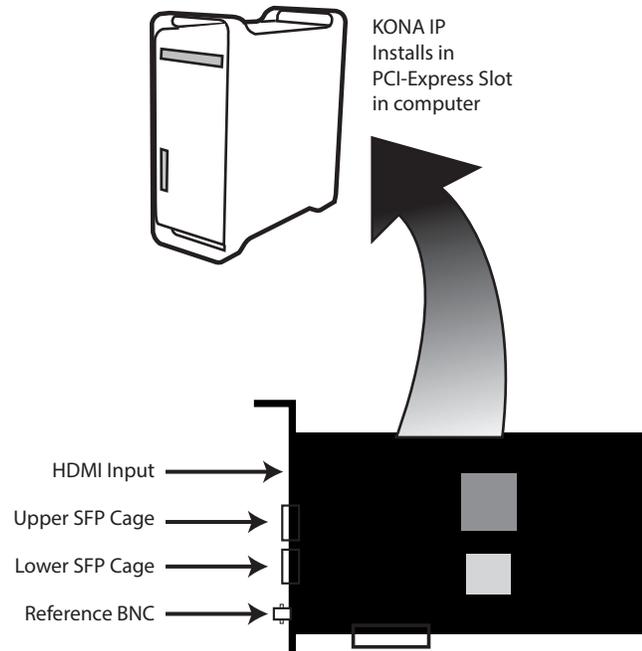
4. Connect two SDI cables between KONA LHi (BNCs are on the card endplate) and your digital VTR (Digital Betacam etc.): one from KONA LHi *SDI In* to the VTR SDI Out, and one from KONA LHi *SDI Out* to the VTR SDI In. The KONA LHi SDI connections have embedded audio so the VTR must be configured accordingly.
5. If you have an AES/EBU-ready audio monitoring system, then connect the two channels of AES/EBU output from KONA LHi's XLR connectors (channels 1 and 2) to the monitoring system AES/EBU inputs. If you instead have an analog audio monitoring system, you can use either the XLR balanced audio connectors or the two RCA-style unbalanced stereo output jacks on the Optional KLHi-Box for output.

**Figure 11. Typical KONA LHi System Connections—Shown with Optional KLHi-Box**



## KONA IP Connections

Figure 12. KONA IP Connectors



The KONA IP card fits into a standard PCIe slot of a computer or into PCIe chassis. The end spine has a full size HDMI output connector, two SFP cages (Upper and Lower), and a reference BNC connector.

Modules inserted into the two SFP+ cages can be used to connect two separate 10 Gigabit Ethernet Links. Both links are bi-directional. Inputs and outputs can be set up over the same link if bandwidth allows it. The Upper and Lower SFP modules are configured (input, output, network settings) using the AJA Control Panel application. In most cases, only the top SFP will be used, with 2 Input links and 2 output links running over the same SFP.

## Installing KONA Software

For AJA KONA software installation, go to the downloads page on the AJA website:

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

**NOTE:** Always uninstall previous versions of KONA software before updating your software. Before installing the KONA software package, ensure that your capture/editing application is installed as detailed in its user documentation. You cannot use KONA with a third-party application until the application has been installed and run at least once on your workstation. Next, install the KONA software package.

# Chapter 3: Operation

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## Using KONA with Professional Video /Audio Software

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After you install the AJA software package on your computer, you're ready to begin capturing and playing back video and audio using your choice of third-party software. You can go here for AJA software and documentation:

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

For further support information and downloads for third-party software and DirectShow for Developers, go to:

<https://www.aja.com/en/category/edit/compatibility>

### Capture Formats

When capturing, you can record data in the following file formats:

- DPX
- TGA
- BMP
- QuickTime

*NOTE: Other file types can be captured using third-party capture applications such as Sienna, Softron, Tools on Air, Drastic, or Quadrus.*

## AJA Control Panel Overview

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The AJA Control Panel is a software application that provides a simple visual showing how the KONA hardware is currently configured and allows you to make changes. You can change signal input and output parameters and define the video processing that will be performed.

The AJA software installer automatically installs the Control Panel application on your computer.

### Control Panel Screens Used In This Manual

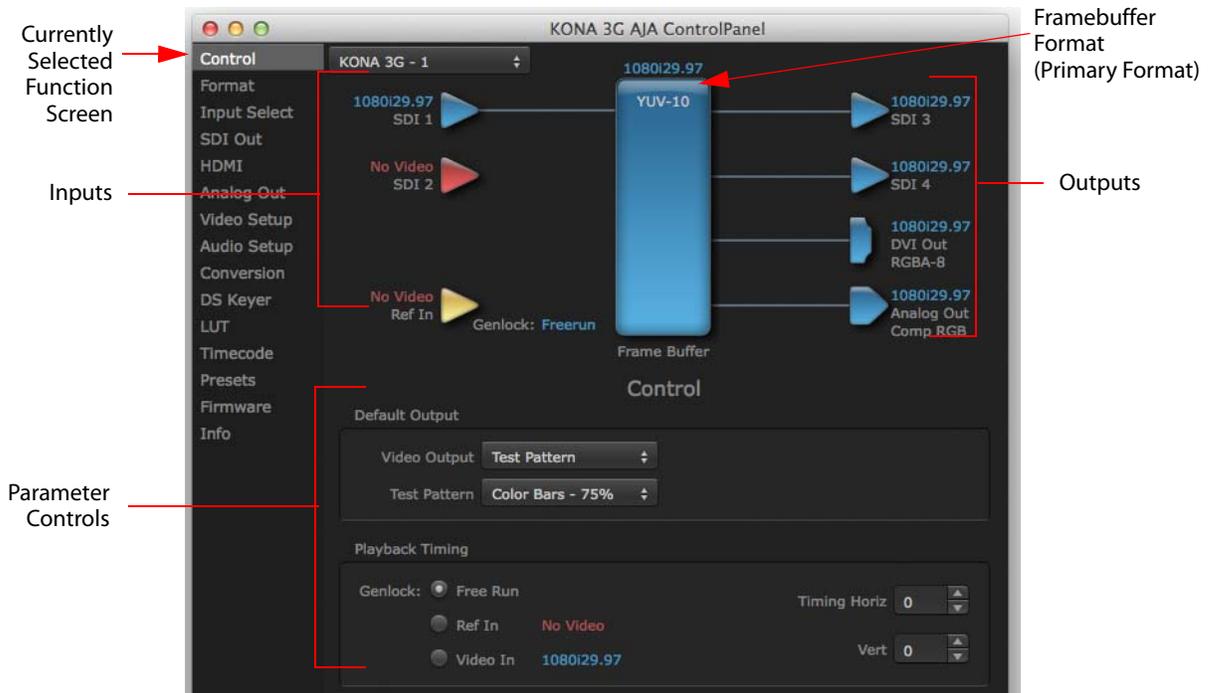
*KONA 4 and KONA 3G Control Panel functions are virtually the same except for KONA 4's higher frame rates and certain HDMI, Closed Caption, and Analog Out monitoring options for 4K/UHD formats. KONA 3G Control Panel screen shots are predominately used for this discussion.*

## AJA Control Panel User Interface

The AJA Control Panel user interface includes a visual block diagram of the unit's current configuration. The current status, input and output settings, and many other details are depicted in the color-coded block diagram. Below this block diagram are various controls for changing operating parameters, which will vary depending on which function screen has been selected.

The left side of the AJA Control Panel provides a navigation list of available function screens. Clicking on a link (or alternatively, a related element in the block diagram) displays a function screen corresponding to that topic.

**Figure 1. AJA Control Panel, Block Diagram and Controls**



**Block Diagram Area** The top block diagram area of the Control Panel screen is a visual representation of 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, there is no connection; this can be because an input or output isn't selected in the Input Select menu. The lines will also show whether the outputs are video or video + key.

You can click any of the function screen selection links in the left column to view its current settings or click on an icon to call up its related settings screen. You can also right-click or Control-click to see context-sensitive information and choices. [Figure 2](#)

**Figure 2. Context Sensitive Menu**

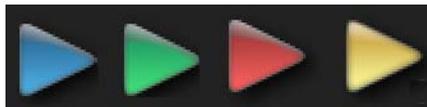


**Color Meanings** All items in the AJA Control Panel block diagram are color-coded to show what is happening in realtime. This applies to both icons and text. These colors indicate:

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

**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.

**Figure 3. Input/Output Icons**



**Framebuffer** The framebuffer is the “engine” where your third-party applications interface with the AJA device. The framebuffer has a format (called the “Primary Format”) and color space that it follows, as defined in the linked menu screens or via external application software. The “Secondary Format” is a selection for format conversion.

**Primary Format** The Primary Format is the media format written to disk and used in your project. This is the format that the framebuffer will use and is shown in the Control Panel using the color blue. It is the format that the third-party application software will either receive from the AJA hardware, or is sending to the hardware. 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 indicate that something is in the primary format. For example:

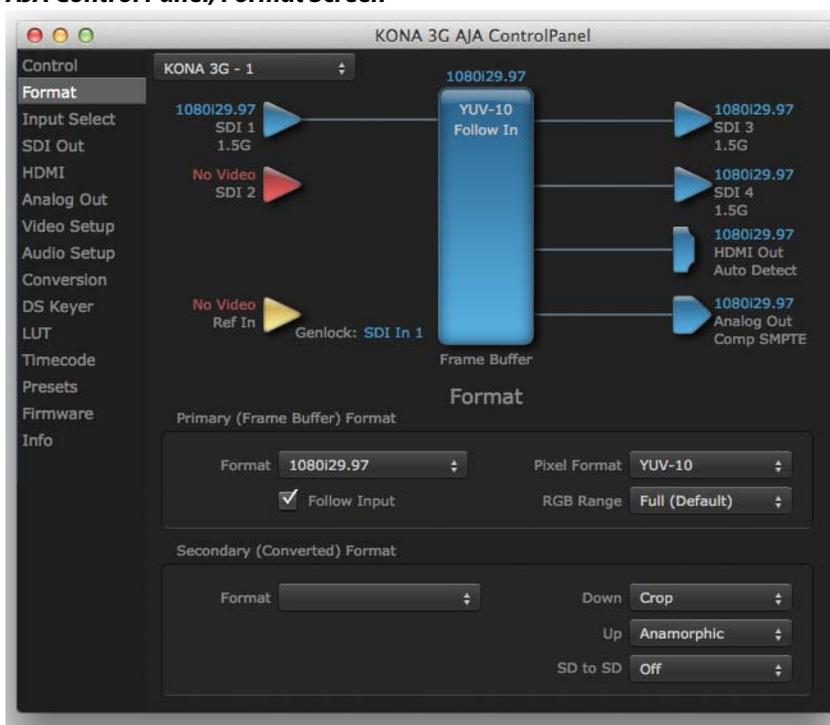
- If the input and output icons are blue, you know that the same format is used throughout the video path. No format conversion is being performed.
- If the input or output icon colors differ (blue input and green output icons for example), you know that a format conversion is being performed.

**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—the Primary Format. A conversion is readily apparent because of the color change from blue.

*NOTE:* In some cases the application you use with the KONA will automatically set the Primary Format, overriding the user’s selected primary format in the AJA Control Panel.

**Format Screen Conversion** Format function screen conversion allows selection of a format conversion between High-definition and Standard-definition. The choices offered depend on the AJA device present in your system and the Primary and Secondary format selected.

## AJA Control Panel, Format Screen



**NOTE:** When converting an Input to the Primary Format, select the Secondary Format option that has (I), for input only, appended to it. Conversely, when converting an Output from the Primary Format, you must select an output signal with (O) for output only.

**IMPORTANT:** Do not confuse this Format function screen conversion, which uses AJA hardware and operates on either Mac or PC, with the separate Conversion function screen, which uses Quicktime for conversion and is only available on Mac.

**Conversion Icons** When an input or output is a different standard than the framebuffer, the KONA 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.

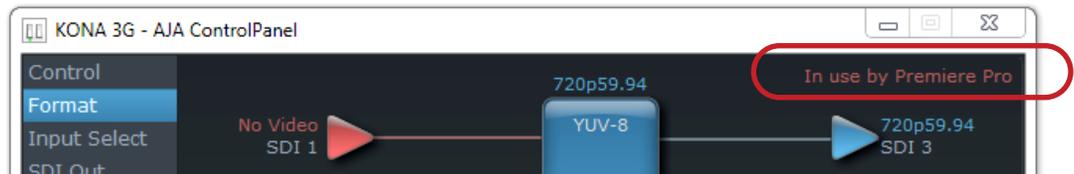
**Figure 4. Up, Down, and Cross-convert Icons**



## Controlling Application

It is important to understand that the computer can contain many applications that can use the AJA device (as you switch from window to window) and it may not always be obvious which currently controls it.

**Figure 5. Control Panel In Use Message (in red)**



In the top right corner, the Control Panel displays the name of the application controlling the unit. 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.

## Presets

Setups can be named and saved as a snapshot (Preset) for recall at any time. You can save various Control Panel configurations associated with your frequent tasks. You don’t have to spend time resetting interface configurations—just load the previously saved Preset for each task. If you work on multiple systems and want to carry your saved setup to another location, you can copy your saved Presets file on to movable storage and load it into any computer running the AJA Control Panel application. Presets are described in more detail later in this manual.

## Single-User & Shared Preferences

When an AJA device starts up, preferences can determine what settings it will have it when it begins to operate. The AJA Control Panel offers preference settings that support both:

- User Preferences— Preferences stored from the last Control Panel State to be used on next startup of AJA Control Panel.
- Shared Preferences— Preferences saved by an Administrator for use as a default start state for AJA Control Panel.

**User Preferences** This file exists to immediately, automatically, store preference changes made by a user on a particular AJA device. When any control is changed in the Control Panel, that change is recorded in the preferences file stored in a unique user preferences location dedicated to that particular device and serial number. Then, when AJA control panel is restarted for any reason, it will restart with the same preferences it used when it closed.

However, if a user sets their preferences, and then replaces the AJA device with a different one, the Control Panel will either:

- Start up with the factory defaults, or
- Start up with the “house defaults” dictated by the system administrator (if a Shared Preferences file exists).

The User Preferences File can be found in the following locations.

On Mac:

- /Users/<USER\_NAME>/Library/Preferences/com.aja.devicesettings

On Windows:

- C:\Users\<USER\_NAME>\AppData\Local\Aja\com.aja.devicesettings

**Shared Preferences** An administrator can establish house standards for the AJA Control Panel by creating the user preferences file (described above) and placing it in a shared location where it will establish a standard default startup state for all users of a given computer system. These settings preempt the initial AJA default settings.

To establish the *House Default* for every user on every system, a system or network administrator can move this default file to all systems on the network (manually or by pushing it out across the network). All users on the network will then open to the *House Defaults* when they launch the AJA control panel for the first time.

*NOTE: If the user makes changes to the control panel themselves, those changes will be saved in their user preferences, which will take priority over the house default dictated by the shared preferences file.*

The Shared Preferences file should be a file created at the User Preferences location described above, and placed by the System Administrator in the following locations.

On Mac:

/Users/Shared/Library/Preferences/com.aja.devicesettings

On Windows:

C:\Users\All Users\Aja\com.aja.devicesettings

## Function Screens

---

Listed below are the function screens for KONA and what they are used for.

- Control** Configure some basic KONA operation options 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 audio mapping.
- SDI Out** Select output format.
- HDMI** Configure the HDMI I/O (not LHe Plus)
- HDMI HDR** Configure High Dynamic Range settings for HDMI output (KONA 4/ IP only)
- Analog Out** Configure the component format and audio monitor setup.
- Video Setup** Configure Video such as composite black level, progressive format and ancillary data (Closed Caption) option.
- Audio Setup** Configures Audio options such as analog audio monitor level.
- IP Network** On KONA IP, define network parameters for the location of each KONA IP physical SFP cage.
- IP Input** On KONA IP, define parameters for receiving inputs from the network.
- IP Output** On KONA IP, define parameters for sending outputs to the network.
- Conversion** (Mac platform only) 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.

- LUT** Load a lookup table (LUT) file to adjust the calibration of color for any source.
- Timecode** Monitors SMPTE 12M-2 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 card for varied workflows and then saving them as canned configuration for quick and easy recall).
- Firmware** Install firmware from your currently installed AJA software package.
- Info** Display status information and the firmware version number. This information is generally intended for troubleshooting/support.

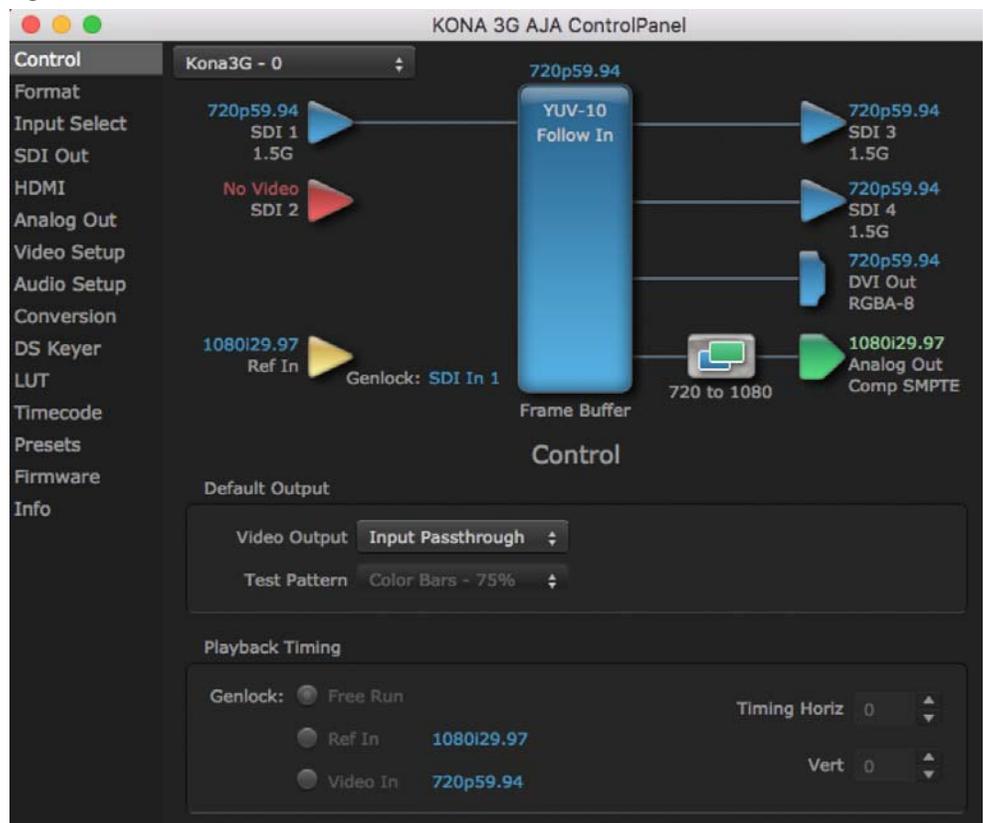
## Control Panel Operation of KONA in Standard or UFC Mode

*NOTE: This section discusses KONA standard mode Control Panel operation. The KONA 4 and 3G cards also offer 4K Mode which will be discussed later (see "Control Panel Operation of KONA 4 and 3G in 4K Mode" on page 67).*

### Control Screen

The KONA card can be controlled by various software applications running on a host computer. The Control screen is where you select how the KONA 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. The top of the Control Screen shows the currently selected AJA device if more than one is available in your system.

**Figure 6. AJA Control Panel, Control Screen**



## Default Output

This is where you select what the KONA card will output as a default when no application has control of the board, such as when the Mac Finder or Windows Navigation Pane is active. Since KONA 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 take control of the KONA inputs and outputs. However, when an application that doesn't take control is active, these settings determine what KONA will output.

**Black** This selection directs the KONA card to output video black whenever an application isn't controlling the card.

**Input Passthrough** This selection directs KONA to route video from its selected input through the card for processing and output. When this selection is chosen, all Primary/Secondary Format selections are available for selection in controlling the output. This in effect makes the KONA card a converter. No applications other than the AJA Control Panel need be open to convert audio and video from one format to another. For example, if you have KONA 3G or LHi and need to dub an SD source tape needs to be HD, the signal can be routed from the SD VTR to the KONA card configured for up-conversion in the AJA Control Panel and then passed through to the HD VTR for recording. (Note: LHe Plus performs down-conversion only.)

**Test Pattern** This selection directs the KONA card to output a choice of preset pattern when no other application is using the KONA card. 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 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 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 until the AJA Control Panel application closed.*

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

## Playback Timing

Use these controls to set Genlock and Timing adjustment.

**Genlock** Selects how KONA will synchronize program video:

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

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

*Video In:* Directs KONA to use whichever video input source has been selected in the Inputs Screen for sync

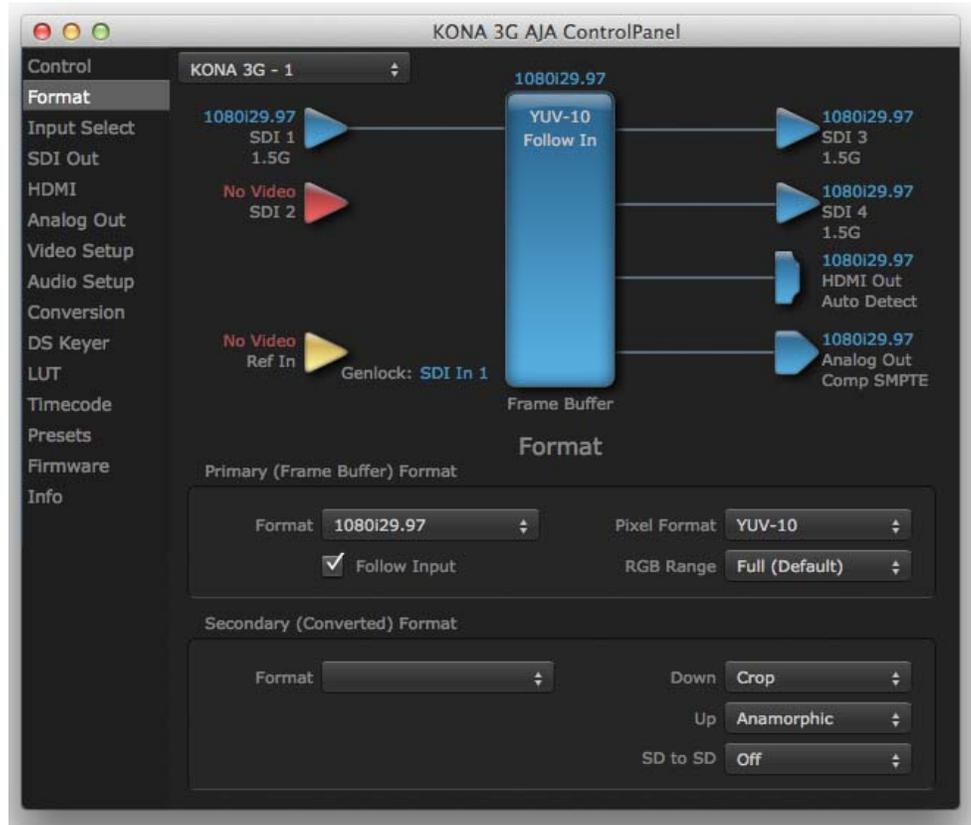
**Timing (Horiz and Vert):** These two pull-downs allow output timing adjustment with reference to the Ref Video source selected:

- Horizontal selects a number of pixels (clocks) to offset
- Vertical specifies a number of lines to offset

## Format Screen

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

**Figure 7. AJA Control Panel, Format screen**



**IMPORTANT:** Do not confuse this Format function screen conversion, which uses AJA hardware and operates on either Mac or PC, with the separate Conversion function screen, which uses Quicktime for conversion and is only available on Mac.

## 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's framebuffer.

When a change is made via the Video Format pull-down or by clicking an icon 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.

**Pixel Format** Use this pulldown menu to choose: YUV-10, YUV-8, RGB-10, or ARGB-8 or RGB-12.

**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.

For video formats supported by the KONA models, refer to *“Specifications” on page 81*.

**NOTE:** *The AJA Control Panel software uses the abbreviation “sf” instead of “psf” when referring to “progressive segmented frame” formats. In the manual and in other literature you may see either of these acronyms used interchangeably. Visually, it is easier to recognize:*

- “sf” for progressively segmented frame formats
- “p” for progressive frame formats

**Follow Input** Enabling the Follow Input checkbox allows the Control Panel Buffer to auto-switch to whatever is the detected input format. This feature works **only** if the controlling application supports input-based capture—AJA Control Room for example.

## Format Conversions

**Cross-Conversion** If you have an HD format as your primary and then select a secondary HD format with a different frame size, the KONA 4/3G will perform a cross-conversion 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 4/3G for cross-conversions. 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.

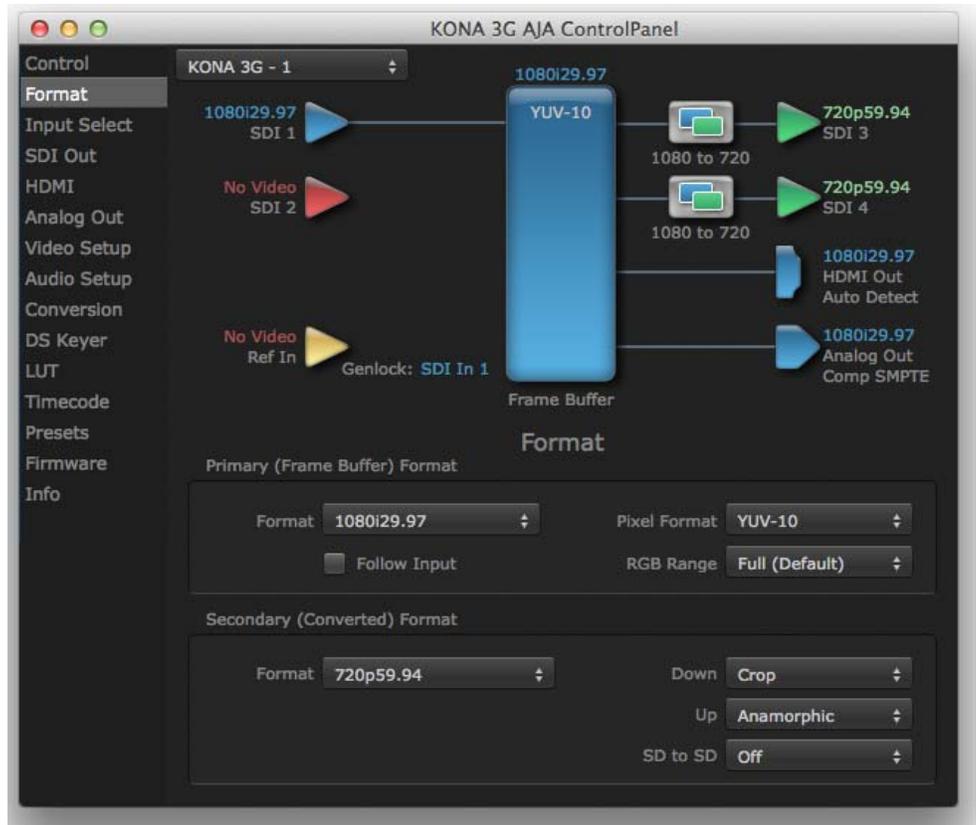
For up-conversion the following choices are available:

- *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 down-conversion 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

**Figure 8. AJA Control Panel, Format screen, Example shows cross-conversion**



- 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

## 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.

**Figure 9. AJA Control Panel, Inputs Screen**



## Input Select Screen Settings

**Video Input** The pulldown menu allows you to see and change the currently selected video format that KONA has detected (if any). In the KONA 3G example shown above, video is selected at the SDI1 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 the 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.

**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 from the 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 eight embedded will be mapped to that application.

## SDI Output Screen

The SDI Output Screen 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”).

**Figure 10. AJA Control Panel, SDI Output Screen**



**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 up- or 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 4/3G also offers single link 3Gb output of multiplexed Stereo 3D.

### Transport 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 4, 3G and LHi models offer HDMI output while the LHi card accepts HDMI input also. The following descriptions and figures show the 3G output configuration options followed by LHi HDMI Input options.

**Figure 11. AJA Control Panel, HDMI Screen**



## HDMI Output Settings

**Select** The *Select* pulldown menu allows you to select either the primary video format (framebuffer) or a secondary one (up/down/cross-conversion).

**Stereo 3D** 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 4/3G) pulldown menu.

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

**Protocol** The Protocol pulldown allows you to choose *Auto Detect*, *HDMI* or *DVI* protocol—use DVI if you're outputting to a DVI monitor using an HDMI to DVI adapter.

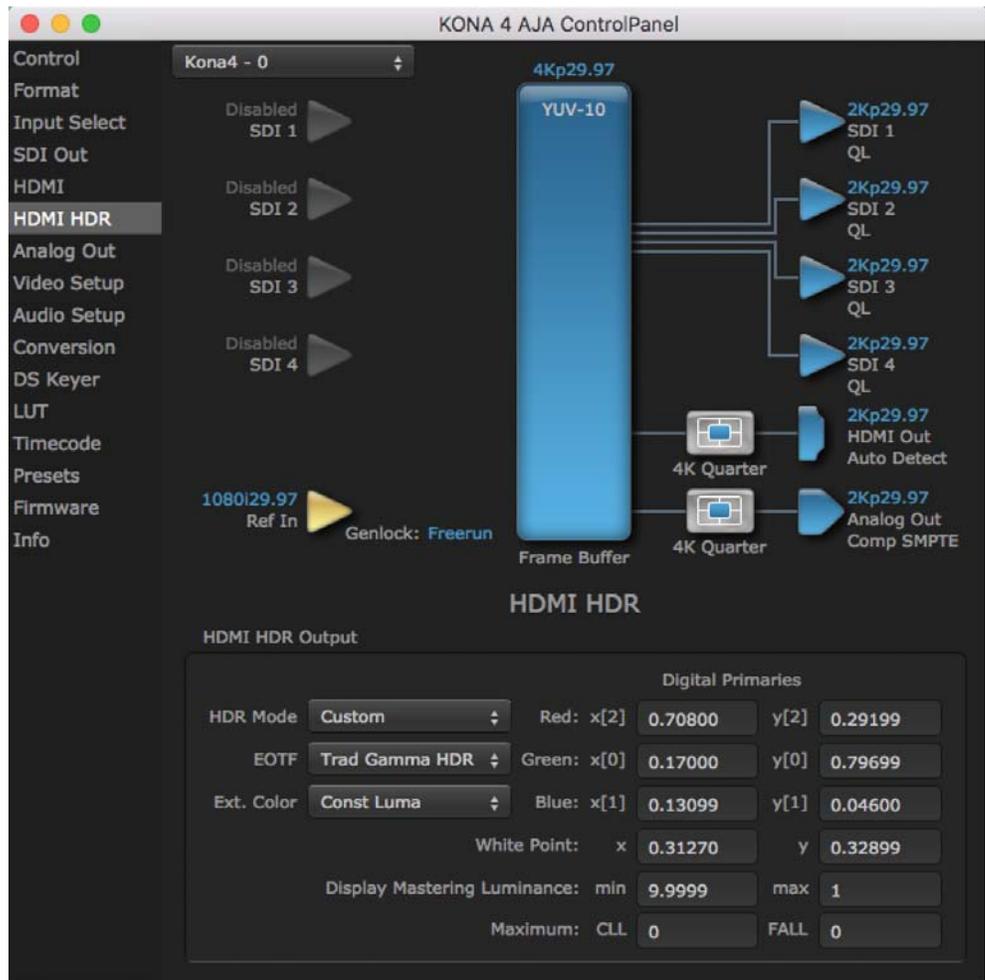
- Color Space** Selects the HDMI output color space and depth. These are the choices:
- **Auto**—UDC automatically selects the mode based on getting the attached HDMI device's EDID information. This is the recommended setting. The selected mode is shown to the right of the pull-down control.
  - **RGB 8Bit**—UDC uses 8-bit RGB mode regardless of the attached device's EDID.
  - **RGB 10Bit**—UDC uses 10-bit RGB mode regardless of the attached device's EDID.
  - **YCbCr 10Bit**—UDC uses 10-bit YCbCr mode regardless of the attached device's EDID.

- RGB Range** The RGB Range pulldown menu allows you to select the type of RGB color output.
- **SMPTE**— (typically 64-940)
  - **Full**—(0-1023)

## HDMI HDR Screen

The HDMI-HDR screen, available in KONA IP and the 4K mode of KONA4/3G, provides a mechanism to inform an HDMI sink device (such as a TV or monitor) that the video content is HDR. This includes generation of the Dynamic Range and Mastering Infoframe and the static metadata descriptors as defined in CTA-861.3 and HDMI v2.0a. Included are pre-canned primaries values for BT.2020 and DCI P3 color gamuts.

**Figure 12. HDMI HDR Screen with 4K Primary Format**

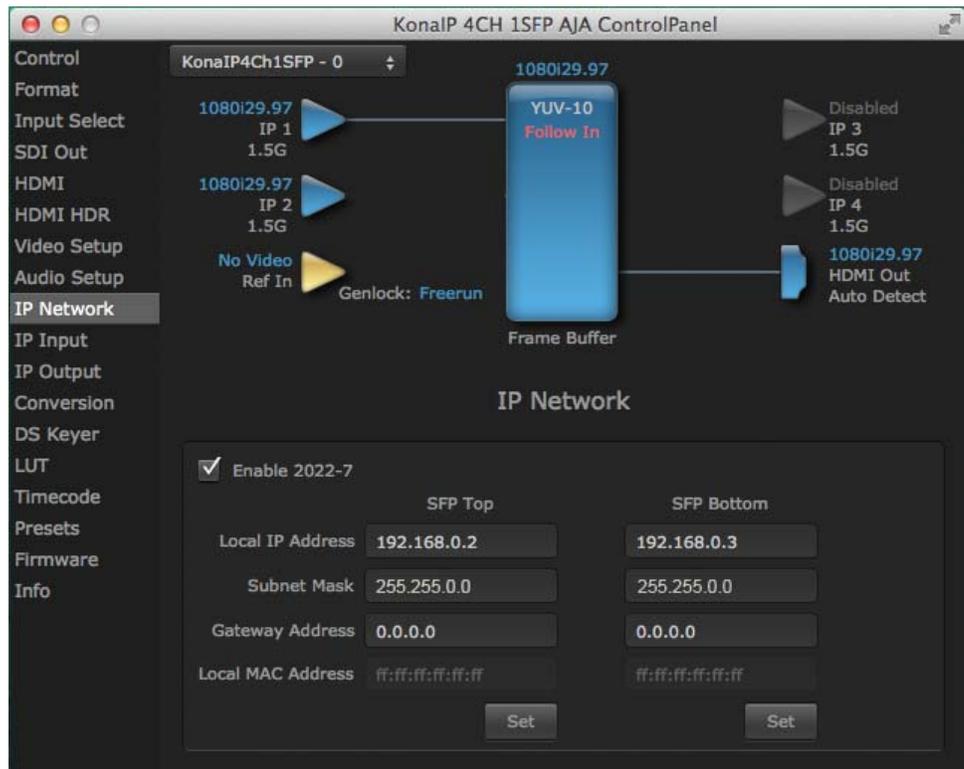


- HDR Mode**
  - Off - HDR Mode disabled (default).
  - DCI-P3 D65
  - BT-2020
  - Custom - Allows custom values for the Digital Primaries.
- EOTF** The Electrical Optical Transfer Function metadata bit tells the HDMI display which EOTF to use. Most TV's will require this to be set to ST 2084 for their HDR modes.
- Ext. Color** Most TV's require this be set to Non-Const Luma to go into their HDR modes.

## IP Network Screen

The IP Network Screen, available only on KONA IP, lets you input the network parameters that define the location of each physical SFP+ cage of the KONA IP hardware.

**Figure 13. AJA Control Panel, IP Network Screen**



- Enable 2022-7** Enables 2022-7 redundant network operation. See ["2022-7 Operation" on page 52](#) for more information.
  - **SFP Top** - Indicates the top physical SFP cage on the KONA IP board, farthest from the copper contacts where the KONA card connects to its PCIe slot.
  - **SFP Bottom** - Indicates the bottom physical SFP cage on the KONA IP board closest to the copper contacts where the KONA card connects to its PCIe slot.

**Local IP Address** This is the IP address that identifies each physical KONA IP SFP+ link on the network. This field must be filled in for at least one of the KONA IP SFPs for KONA IP to work properly

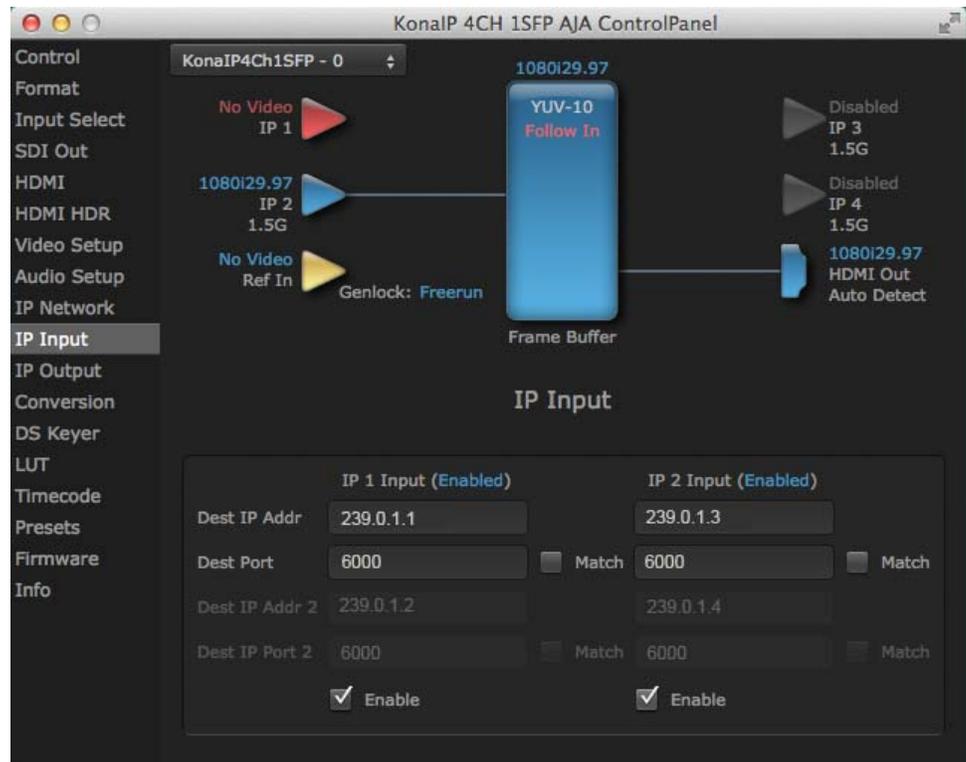
**Subnet Mask** This is the subnet mask defined by the system administrator. Generally speaking, this value must be defined in the AJA Control Panel for KONA IP to work correctly on the network.

- Gateway Address** This is the IP address of a network gateway to a remote network. This value must be defined if/when the KONA IP needs to send signals to, or receive signals from a remote network.
- Local MAC Address** This is an information display field that cannot be changed. It is the MAC address that is assigned to the specific SFP cage on the KONA IP.
- Set Button** Click the 'Set' button to apply the changes.

## IP Input Screen

The IP Input Screen, only available on KONA IP, lets you define parameters for receiving inputs to the KONA IP from another device on the network.

**Figure 14. AJA Control Panel, IP Input Screen**



**NOTE:** The IP 1 Input and IP 2 Input labels do not represent the physical SFP cages on the KONA IP. They represent different transmissions being received by the KONA IP card, possibly over the same 10GbE link.

- Dest IP Addr** This filter lets you specify the network address where a multicast from another device on the network can be found.
- Dest Port** This filter lets you specify the port number being used to send a multicast to the 'Destination IP' address specified above.
- Dest IP Addr 2** This field will only be available when 2022-7 is Enabled in the IP Network section. This filter lets you specify the network address where a duplicate multicast from another 2022-7 device on the network can be found. That device should be sending two duplicate IP video multicasts and the IP addresses of those streams will be specified in 'Dest IP Addr' and 'Dest IP Addr 2'.
- Dest Port 2** This filter lets you specify the port number being used to send a multicast to the 'Dest IP Addr 2' address specified above.

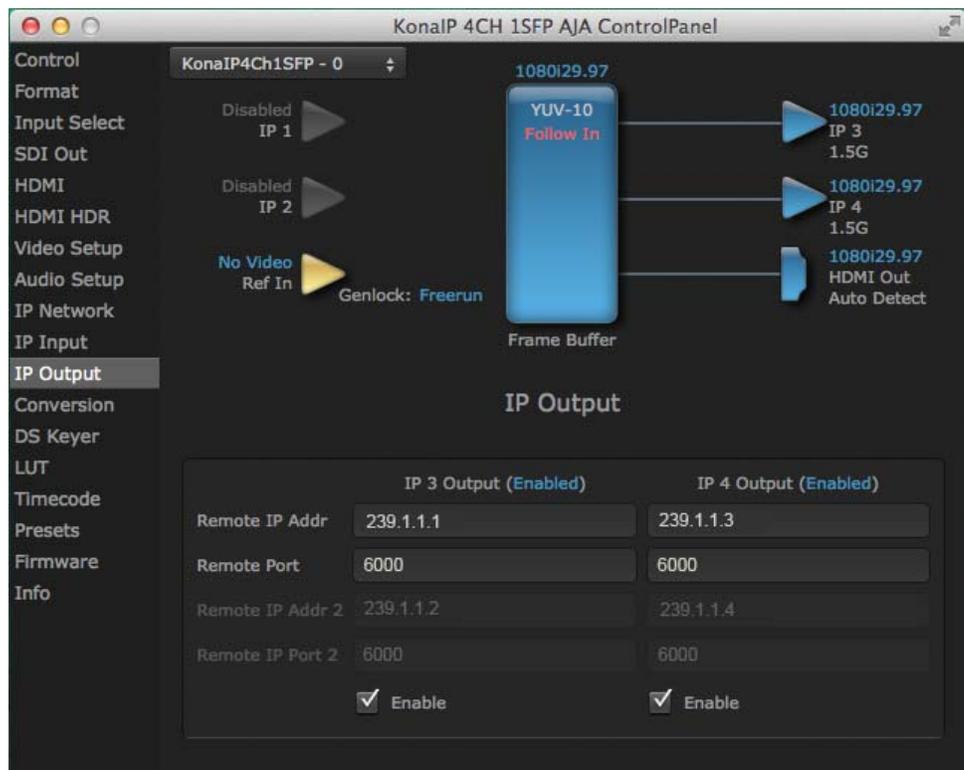
**Match Checkboxes** The 'Match' checkbox next to each of the parameters described above can be used to match the Destination Port to the Dest IP Address.

**Enable Checkboxes** The 'Enable' checkbox below each IP input connects the KONA IP to the network address specified by all the matched input parameters.

## IP Output Screen

The IP Output Screen, only available on KONA IP, lets you define parameters for sending outputs from the KONA IP card onto the network.

**Figure 15. AJA Control Panel, IP Output Screen**



**NOTE:** The IP Output 3 and IP Output 4 labels do not represent the physical SFP cages on the KONA IP. They represent different transmissions being sent by the KONA IP card, possibly over the same 10GbE link.

**Remote IP Addr** This parameter lets you specify the network address where a multicast from this KONA IP can be sent for use by other devices on the network.

**Remote Port** This lets you specify the port number being used to send a multicast to the Destination IP address specified above.

**Remote IP Addr 2** This field will only be available when 2022-7 is Enabled in the IP Network section. This filter lets you specify the network address where a duplicate multicast from this KONA IP output can be sent. This IP output will then be sent to both the address specified in 'Remote IP Addr', and also to the address specified in 'Remote IP Addr 2'.

**Remote Port 2** This lets you specify the port number being used to send a multicast to the 'Remote IP Addr 2' address specified above.

**Enable Checkbox** The 'Enable' checkbox connects the KONA IP to the network address specified by all the matched output parameters. Any time a parameter is changed, the output should be re-enabled.

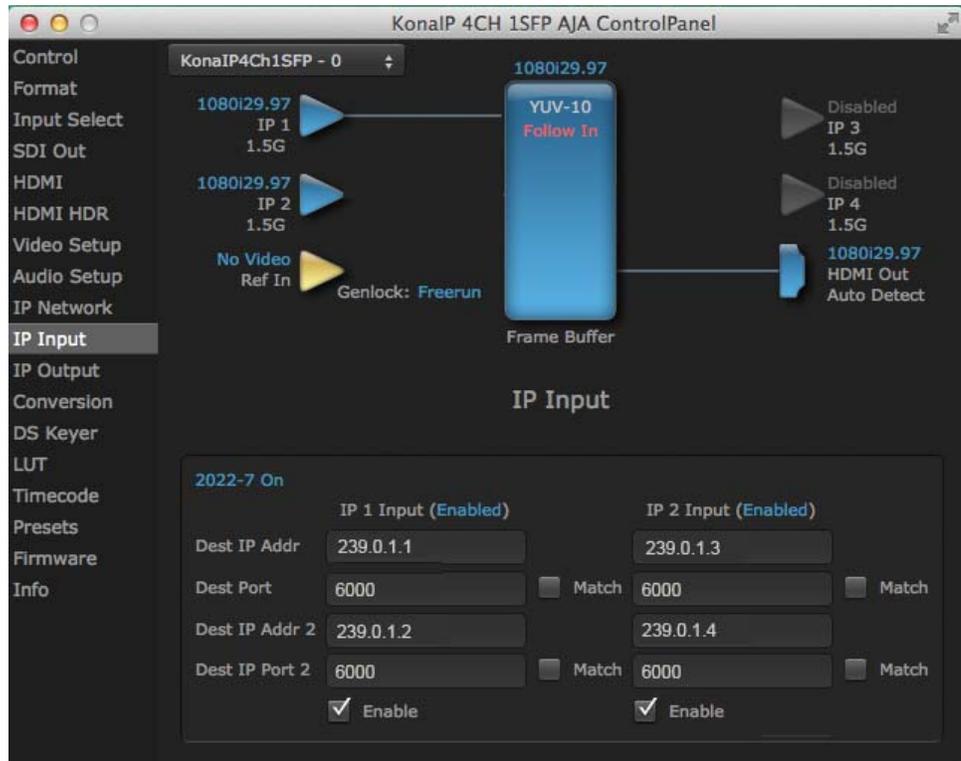
## 2022-7 Operation

Enabling 2022-7 (see ["Enable 2022-7" on page 49](#)) makes it possible to configure redundant networking capabilities using both SFP modules. No additional inputs or outputs are activated (KONA IP supports a maximum of two in and two out when using AJA Control Panel), but with 2022-7 operation each SFP transmits and receives the same information. This allows using two separate network paths, making it possible to recover if one path fails.

When 2022-7 is enabled, additional settings are available for configuring your network settings. See [Figure 16](#) and [Figure 17](#).

### IP Input Screen with 2022-7

**Figure 16. AJA Control Panel, IP Input Screen, 2022-7 Enabled**



**IP Output Screen with 2022-7**

*Figure 17. AJA Control Panel, IP Output Screen, 2022-7 Enabled*



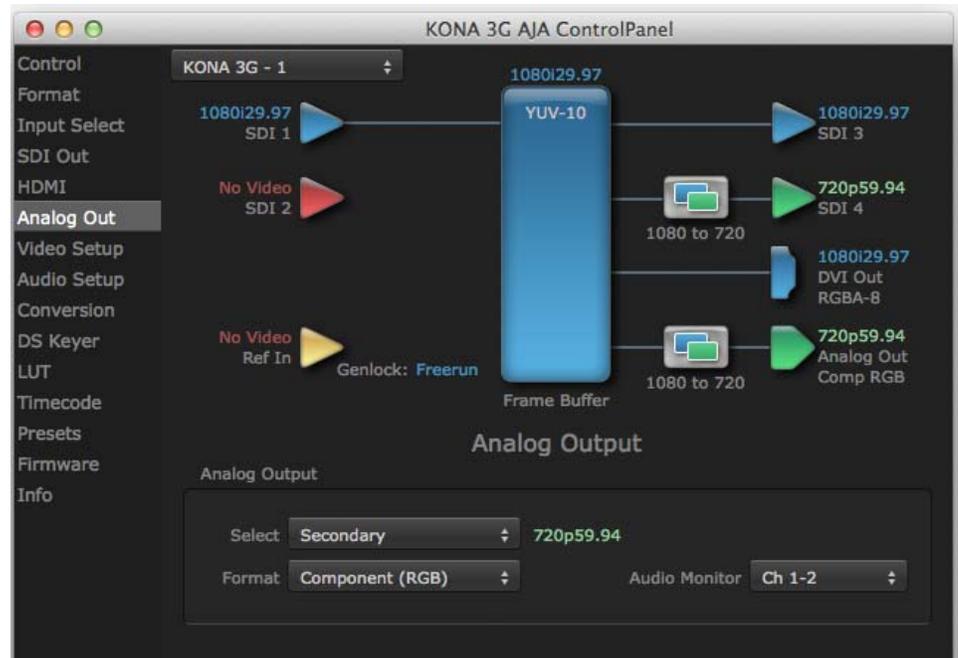
**KONA LHi HDMI Input Settings**

The detected HDMI input video format is displayed and you're given pull-down menus 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 4/3G 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).

**Figure 18. AJA Control Panel, Analog Out Screen**



## Analog Out 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.

**Formats** Select the video format from the *Format* pulldown.

- Component (SMPTE/EBU N10)
- Component (Beta)
- Component (RGB)

**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 uses the modern YPbPr terminology exclusively. KONA supports three different types of YPbPr:

- SMPTE/EBU N10
- Betacam (NTSC)
- Betacam (NTSC Japan).

These three formats differ in level only and are configured here.

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

## Video Setup Screen

The Video Setup screen shows various other settings which will affect how video inputs and outputs behave, and how KONA interacts with some software applications.

**Figure 19. AJA Control Panel, Video Setup Screen**



### Video 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)

**Progressive Formats** Radio buttons allow you to choose between *psf* (progressive segmented frames) and *p* (progressive frames) non-interlaced output. This feature is used to default the hardware to use either p or psf output over SDI when it has not been specified by the application.

**VANC Checkbox** When checked ON, the VANC checkbox tells the KONA cards (previous to KONA 4) to capture and process any ancillary data in the SDI stream. This can include Closed Captioning data, and other types of metadata. Applications such as Premiere Pro and Final Cut Pro will not capture or output this data through the KONA, if this box is not checked on.

**NOTE:** KONA 4 does not require enabling the VANC checkbox for Closed Captioning.

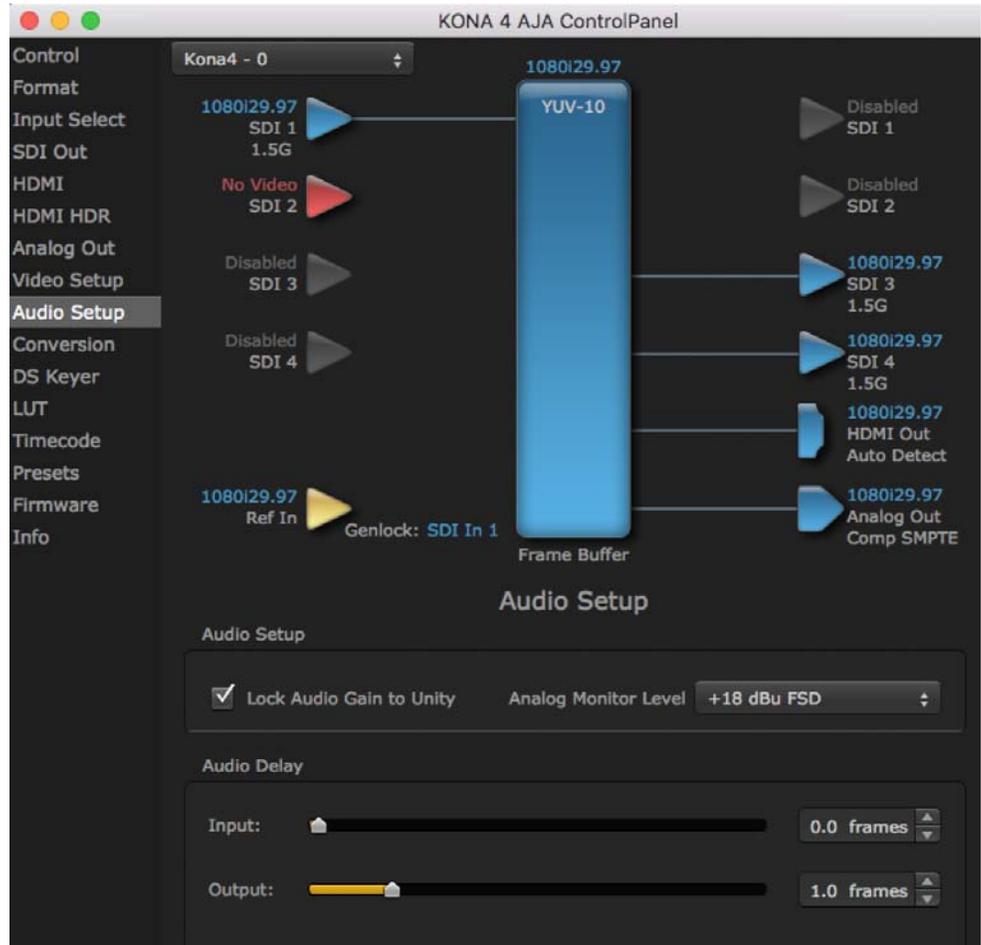
**VOut Filters** These controls enable/disable output capabilities in the Quicktime VOut filter. This filter is used by older applications that are built on legacy Quicktime architecture such as FCP7, AJA TV, VTR Exchange, and older versions of After Effects. Boxes that are checked will define what framerate and resolution types will appear in the list of available formats

in the AJA hardware. For example, if 25/50 is unchecked, then all resolution/framerate combinations with 25 or 50 fps will not appear in the list of capabilities for the installed AJA hardware, when using software that relies on the Quicktime VOut filter.

## Audio Setup Screen

This screen shows the current settings for the analog audio output, allowing you to re-configure it when desired.

**Figure 20. AJA Control Panel, Audio Setup Screen**



### Audio Setup Screen Settings

#### Lock Audio Gain To Unity

When set, the KONA 4/3G will ignore the third-party application gain setting and set the audio gain at unity. When not set, this checkbox tells the KONA 4/3G to get the audio gain setting from the application.

#### Audio Delay

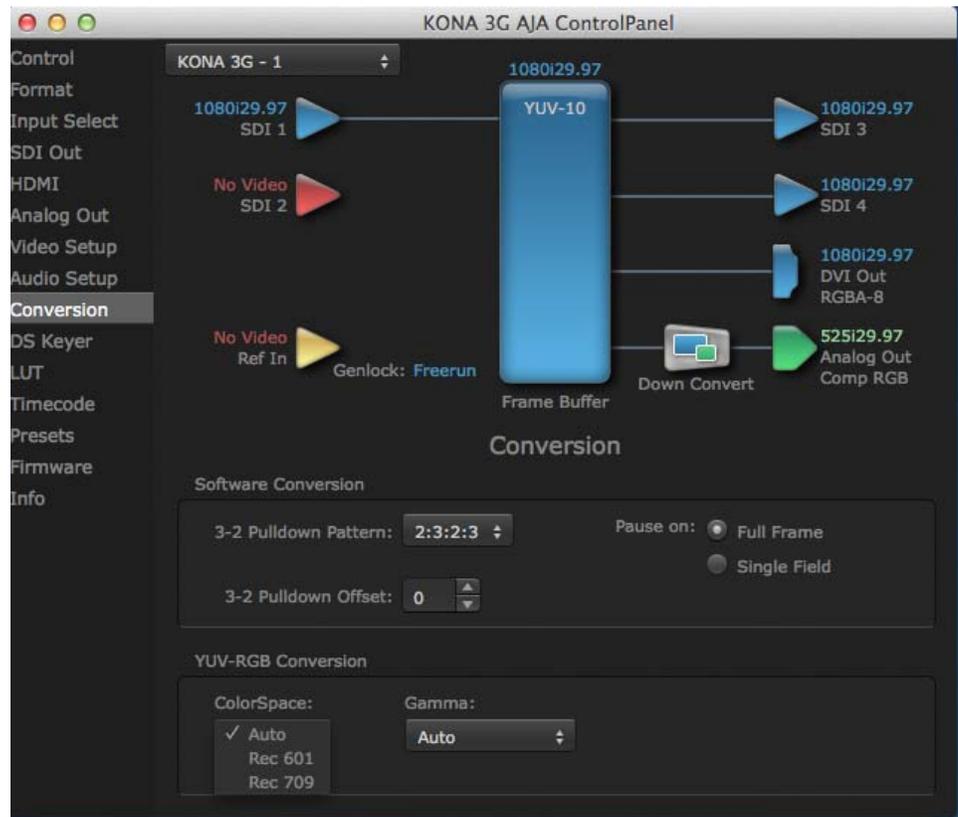
(Not available for KONA 3G) Here you can set up to 6 frames (in tenths of a frame) of delay for KONA audio input and output. The AJA Control Panel delays all audio outputs—SDI, HDMI, and Analog

**IMPORTANT:** *If you use this Control Panel delay, do not use other delay settings in your applications. They can conflict.*

## Conversion Screen (Mac OS only)

In the Mac OS version of the AJA Control Panel, this screen offers controls that determine how the card behaves with 3rd-party applications.

**Figure 21. AJA Control Panel, Conversion Screen**



**IMPORTANT:** Do not confuse this Conversion function screen, which uses Quicktime for conversion and is only available on Mac, with the Format function screen which uses AJA hardware for conversion and operates on either Mac or PC.

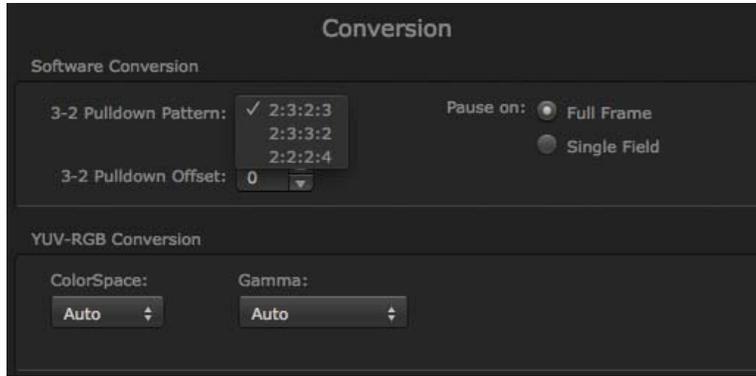
## Conversion Screen Settings

**Software Conversion** These parameters can affect pulldown and pause behavior. This group of software conversion parameters apply ONLY when using legacy quicktime based applications on Mac OS. These applications include things like FCP7, VTR Exchange, and AJA TV. Applications like FCPX, Premiere Pro, Media Composer and Control Room, no longer use these legacy Quicktime Components.

**3:2 Pulldown Pattern** The value selected from this list 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.

**3:2 Pulldown Offset** The 3-2 Pulldown offset is used if the 3-2 pulldown feature is removing the wrong frames. This setting lets you adjust when the pulldown begins in a sequence of frames.

**Figure 22. AJA Control Panel, Codec Screen, Frame-padding Pattern Choices**



- 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).

**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:

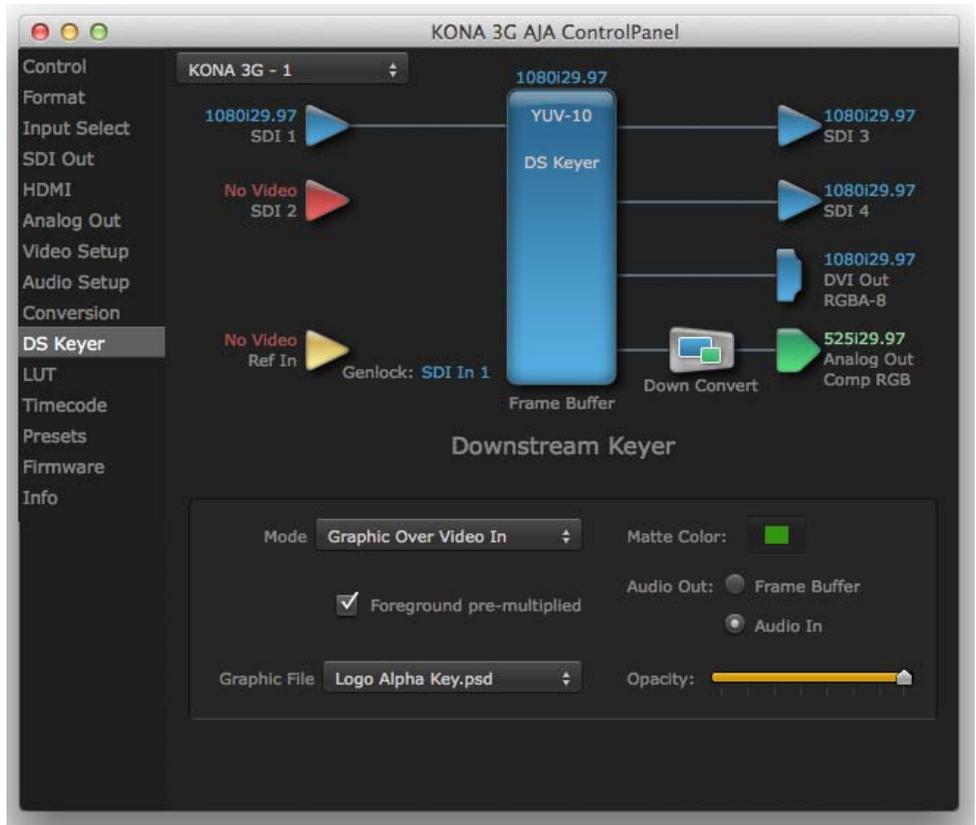
- Linear (1.8)
- Rec 601 (2.20)
- Rec 709 (2.22)
- Auto

## DS Keyer Screen

The KONA 4/3G/IP have 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.*

**Figure 23. 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 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

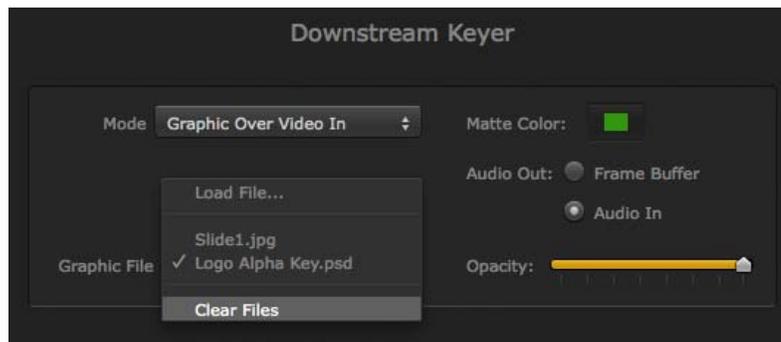
**Frame Buffer** Select audio out to be routed from the contents of the Frame Buffer.

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

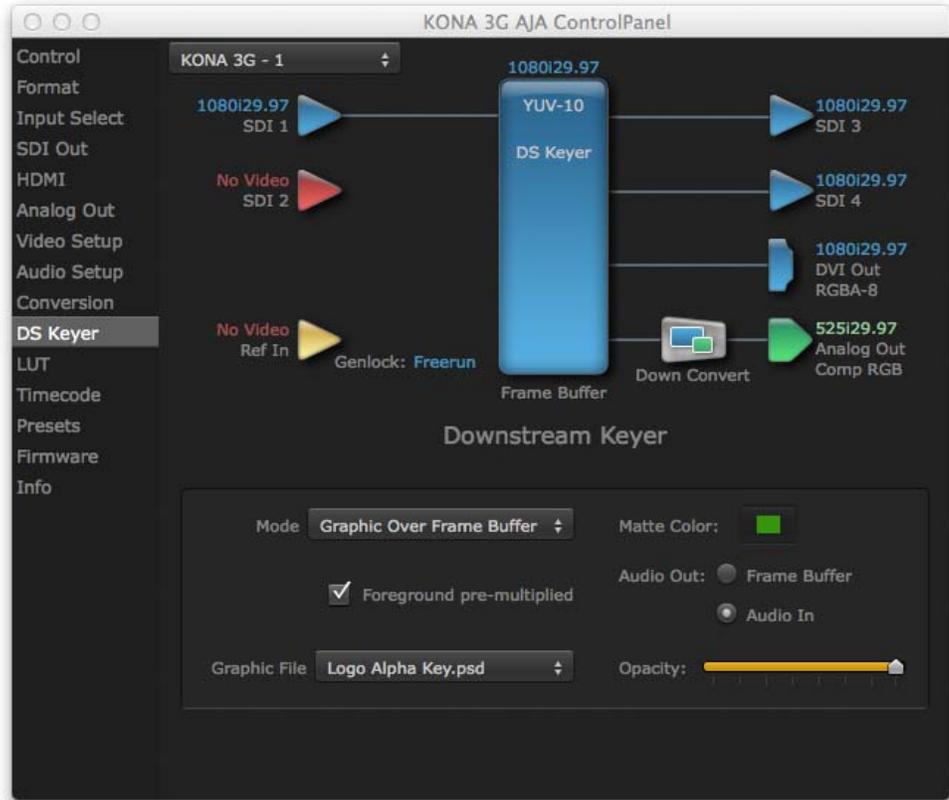
**Opacity** This slider controls the transparency of the keyed video (over the background) from translucent to completely opaque.

**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.

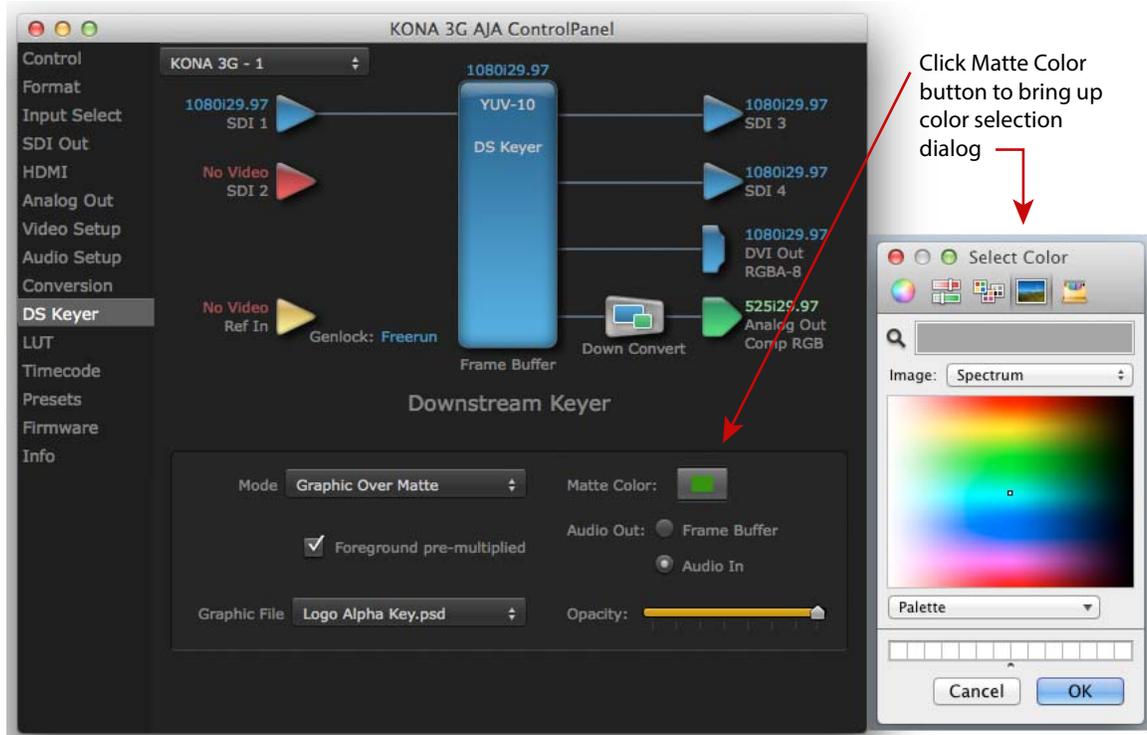
**Figure 24. Downstream Keyer Graphic Selection**



**Figure 25. DS Keyer Screen, Loading a Graphic Over Framebuffer**



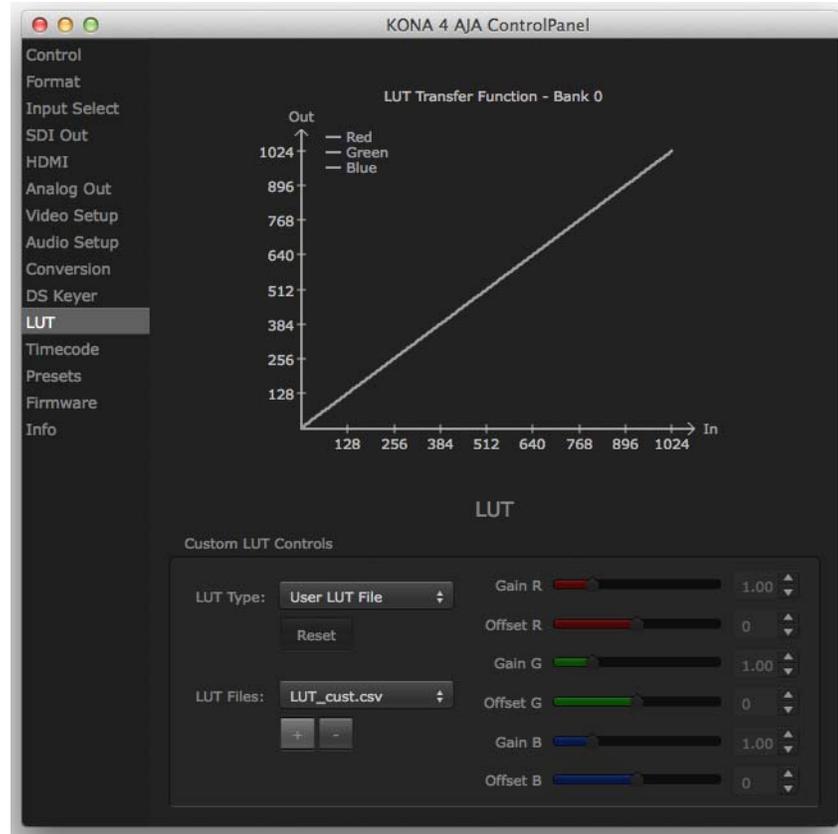
**Figure 26. DS Keyer Screen, Loading a Graphic File Over a Matte**



## LUT Screen

Users can specify their own custom LUTs by creating a LUT file and uploading it to an AJA Video Device using the LUT (lookup table) screen in the Control Panel. You can create a custom LUT file using most text editors or spread sheets, provided the data is arranged according to the LUT File Format Specification that follows (see [“LUT File Format Specification” on page 62](#)).

**Figure 27. LUT Screen**



### Uploading Custom User LUT file

Once the LUT file is created, you can upload it with the following steps:

1. Before loading a LUT, make sure you are using an RGB/RGBA frame buffer format, and that you have a AJA Video Device that supports LUTs.
2. Open AJA Control Panel and select the “LUT” pane.
3. Click the “LUT Type” popup and choose “User LUT File” menu item. Note “LUT Files” options become enabled.
4. Click the “+” button and use the navigation dialog to choose a custom LUT file. The LUT is now loaded.

### LUT File Format Specification

LUT files are normal text files that contain 1025 lines (numbered 0 - 1024).

Each line contains 3 integer values in the range 0 - 1023, representing 10 bit R, G, B component output values. Component values may be separated by one or more commas, spaces, or tabs. The example below show LUT File contents for Line 0, Line 1, Line 2, and Line 1024, with several valid ways to separate the numbers in a line.

- 16, 17, 17
- 17 18 18
- 19 19 21

- ...
- 1000, 1022, 1023

In the example above, the first line (Line 0) represents the output values for the case where R=0, G=0, or B=0. In other words, if the R component of a pixel is set to 0, then set R component value to 16. Likewise, if G is set to 0, then set G to 17. The second line (Line 1) does a similar thing for input component values equal to 1.

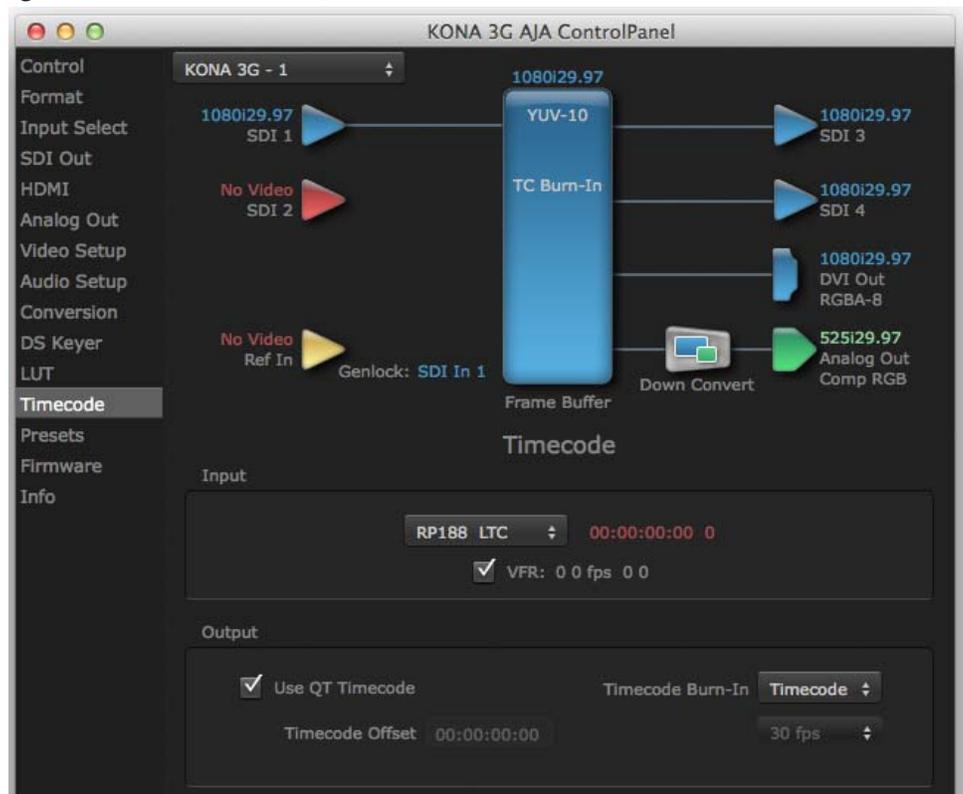
A simple way to construct a LUT file is to use a Spreadsheet like Excel. Simply fill 3 columns and 1025 rows with LUT data, and save the result as a "CSV" file.

## Timecode Screen

The Timecode input:

- Selects the timecode stream read for applications that use it (for example, when the timecode source is set to "Use control panel setting," AJA Control Room will read the selected stream)
- Is used for monitoring the RP-188 timecode embedded in the digital data stream
- Is used for selecting a timecode offset (if required)

**Figure 28. AJA Control Panel, Timecode Screen**



## Timecode Input Settings

**RP-188 Timecode <n>** In RP-188 timecode (SMPTE 12M-2) there can be multiple timecode types in the data stream. Use this pull-down to select the one you wish to monitor:

- RP188 LTC (Linear timecode)
- RP188 VITC 1 (Vertical Interval timecode)
- RP188 VITC 2
- LTC Port input

The selection will be displayed in the timecode value to the right of the pull-down.

**User Bits** For monitoring a variable framerate (VFR) timecode (such as Varicam), you may wish to check the User-bits box. If you set this checkbox, KONA will detect and interpret the user-bits and display them next to the checkbox. You will see the original framerate (30 fps in the figure below) followed by the adjusted frame padding (two digits reporting discarded and retained frame padding).

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

## Timecode Output Settings

**Use QT Timecode (Mac OS Only)** This feature is for Final Cut Pro 7 (or earlier), AJA Control Room, and AJA TV only. When checked, it directs KONA to output timecode from the QuickTime timecode track.

**Timecode Burn-in** This pulldown selects whether the timecode value is displayed in a “burned-in” window in video output. 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 for all of the KONA outputs. This can be useful for synchronizing, choosing edit points, dailies, and many other purposes.

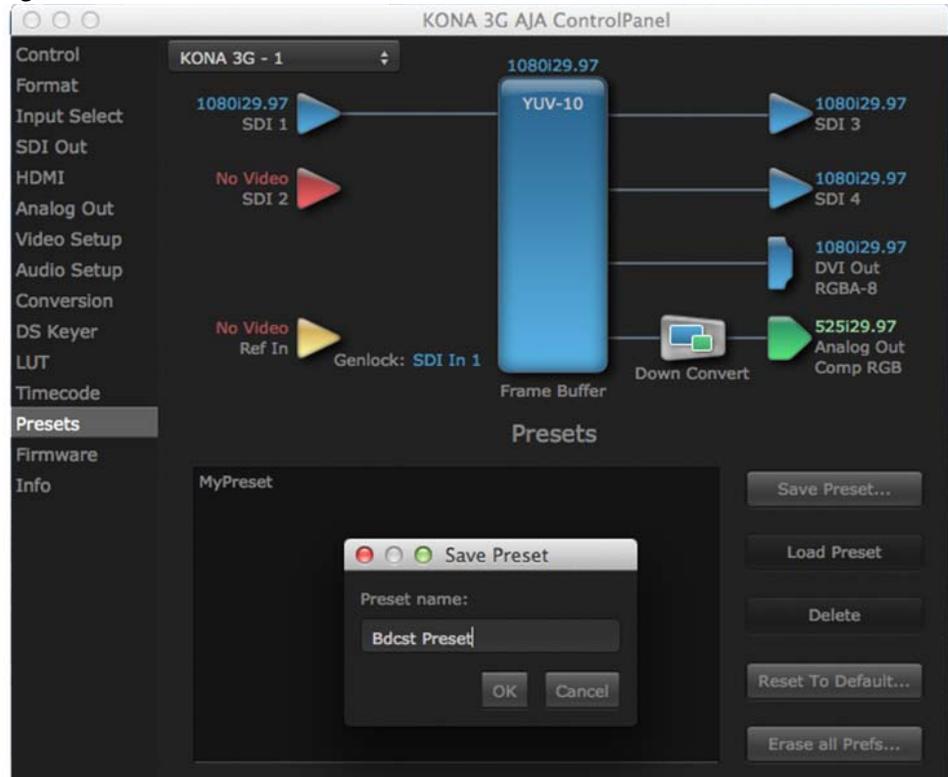
**Timecode Offset (entry field and FPS pull-down)** When QuickTime timecode in disabled, this text entry field allows you to generate a timecode based on the offset entry. You can select a framerate from the pulldown menu at the right side of the pane. Use that same value here as the source video to ensure the timecode is synchronized.

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

## 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.

**Figure 29. 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.

### **Transferring Saved Presets**

If you want to use a saved Preset on another workstation, you can simply copy the file on removable storage and install it at the new location. The Preset file is always stored at:

- ~/Library/Application Support/AJA/<device name> Presets/ [on Mac]
- c:\Users\<username>\AppData\Local\AJA\Control Panel\<device name> Presets\ [Windows 8]

### **Reset to Default**

When you click the 'Reset to default' button the control panel will delete the User's preference file and do one of the following:

- If “Shared” preferences exist, they are reloaded and the device is set to this state.
- If the “Shared” preferences file does not exist, “factory defaults” are loaded and the device is set to this state.

### **Erase all Prefs**

For technical support purposes you may be required to remove Preference settings. This button automates that function. If activated, all your preference setting will be lost.

For more information on Preset preferences see [“Single-User & Shared Preferences” on page 38](#).

## **Firmware Screen**

Use the Firmware link to access the firmware update/changeover screen. For the KONA 4/3G, the *Desired* pulldown menu allows you to select either:

- Std Mode (KONA 3G)—for SD, HD, and 2K formats (allows up/down/cross-conversion).
- UFC Mode (KONA 4)—for SD, HD, and 2K formats (allows up/down/cross-conversion).

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

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

**Figure 30. Firmware Changeover to 4K**



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

**Figure 31. Changeover Completed**



## Info Screen

This screen shows the KONA 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.

**Figure 32. Information Screen in Standard Mode**



## Control Panel Operation of KONA 4 and 3G in 4K Mode

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.

### 4K Transport Modes

The 4K and UHD SDI formats can use different transport modes, associated with the number of links used to transport the signal, the data rates involved, and the way the image data is organized. KONA 4K mode supports both Quadrant and Two Sample Interleave (2SI) transport standards. Many different combinations of modes and data organization exist. In 4K mode, besides single link transport SD, HD and 2K signals, KONA also supports the following transport modes for UHD and 4K:

- Quadrant 4-wire (transported on four links), available on KONA 4 and KONA 3G
- Quadrant 2-wire (transported on two links), available on KONA 4 and KONA 3G
- 2SI (two or four links automatically selected), available on KONA 4

The amount of data in the signal affects the number of links and data rates necessary to carry that signal.

**Quadrant Mode** In Quadrant Mode (KONA4/3G), you can input (for capture) or output four channels of SDI HD 1080 or 2K video at 30 fps or less, representing individual quadrants of the higher definition UHD 3840x2160 or 4K 4096x2160 4K formats. Physical connections of the quadrants will be mapped to the SDI connectors as shown. Monitoring one of these HD signals on a standard SDI monitor will display one quadrant of the picture.

**Figure 33. Mapping of Quad SDI Outputs**



For UHD and 4K frame rates higher than 30, the same mechanism can be used to transport four 3G signals.

**2SI Mode** Two Sample Interleave is an alternative method to organize the data of SDI UHD and 4K formats. Instead of dividing the picture raster into quadrants, this method samples pixels to create four lower resolution versions of the entire picture. These are combined later to create the full resolution image.

**Figure 34. Mapping of 2SI Outputs**



For 2SI UHD or 4K SDI video at 30 fps or less, monitoring one of these four signals on a standard SDI monitor displays the entire picture, but at a lower resolution. Above 30 fps, 3G bandwidth is required, so this type of signal cannot be monitored on a standard SDI monitor using only one connector.

*NOTE: In some versions of AJA Control Panel, the 2SI method is referred to as '425' which is a reference to the SMPTE 425 standard which defines this method.*

**2-Wire and 4-Wire Modes** Using higher data rates, it is possible to carry UHD and 4K signals on two SDI links, instead of four. In this situation, half (two quarters) of the image data is carried on one link, with the other half carried on the other link. These types of signals also cannot be viewed on a standard SDI monitor using one connector.

You can choose 2-wire or 4-wire input and output (depending on the type of signal). If the number of links selected is not sufficient, the number of links is automatically increased to accommodate the signal. UHD or 4K SDI signals 30 fps and below can be input and output simultaneously, using two connectors in each direction. However, all four connectors are required above 30 fps. You will be able to either input or output a high frame rate SDI signal, not both at the same time. In this situation, you can use the HDMI output or a down-converted Analog output to monitor the input signal.

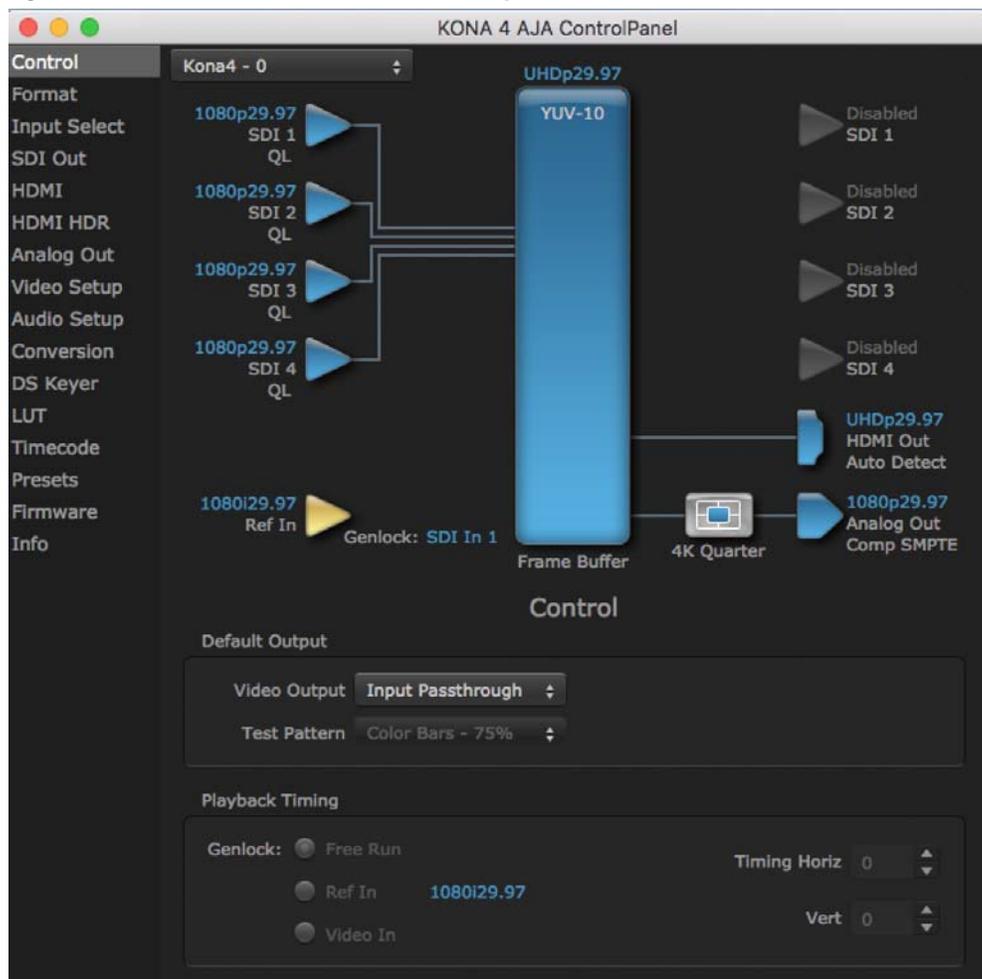
Specifying the number of wires for output forces Quadrant mode. You cannot specify the number of links when 2SI output is selected (the lowest number of links will be set automatically).

## Control Screen in 4K Mode

Besides SD and HD input and output, 4K mode permits UHD or 4K input and/or output over 2 or 4 links.

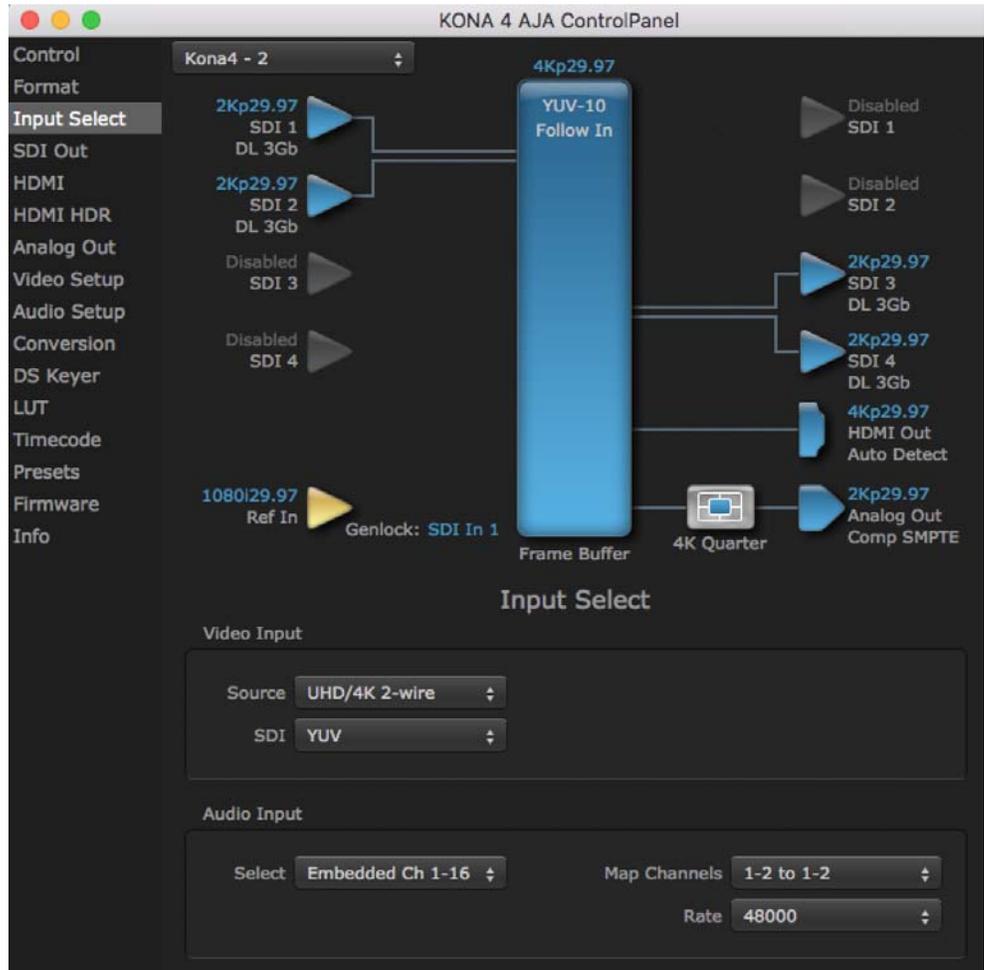
For example, setting the Control Screen Default Video Output to Input Passthrough with a UHD 29.97 four link input connected, and selecting UHD/4K 4-wire Source on the Input Select menu, four connectors are used receive the signal to process. UHD signals report their links as 1080. No SDI BNC output connectors are available for use.

**Figure 35. Control Screen with UHD 4 Link Input**



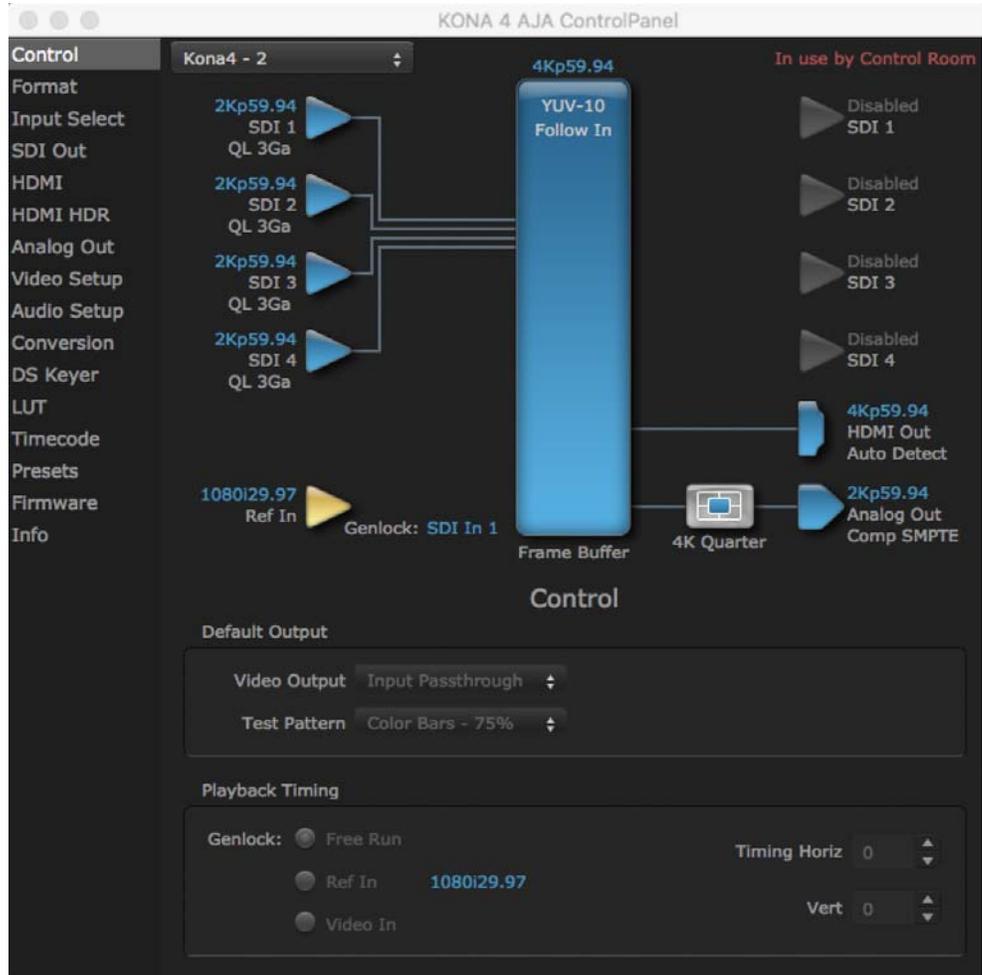
If a 4K 29.97 two link input is connected and a UHD/4K 24-wire Source is selected on the Input Select menu, two BNC connectors are used for input, allowing the other two to be used for SID output. 4K signals report their links as 2K.

**Figure 36. Control Screen with 4K 2 Link Input and Output**



**4K Controlled Mode** Alternatively, if you launch an appropriate control application (such as AJA Control Room), the SDI input and output ports will be mapped automatically. If you connect a UHD or 4K input signal higher than 30 fps, all four BNCs are required for SDI input or output. You can use the HDMI output to monitor an input signal.

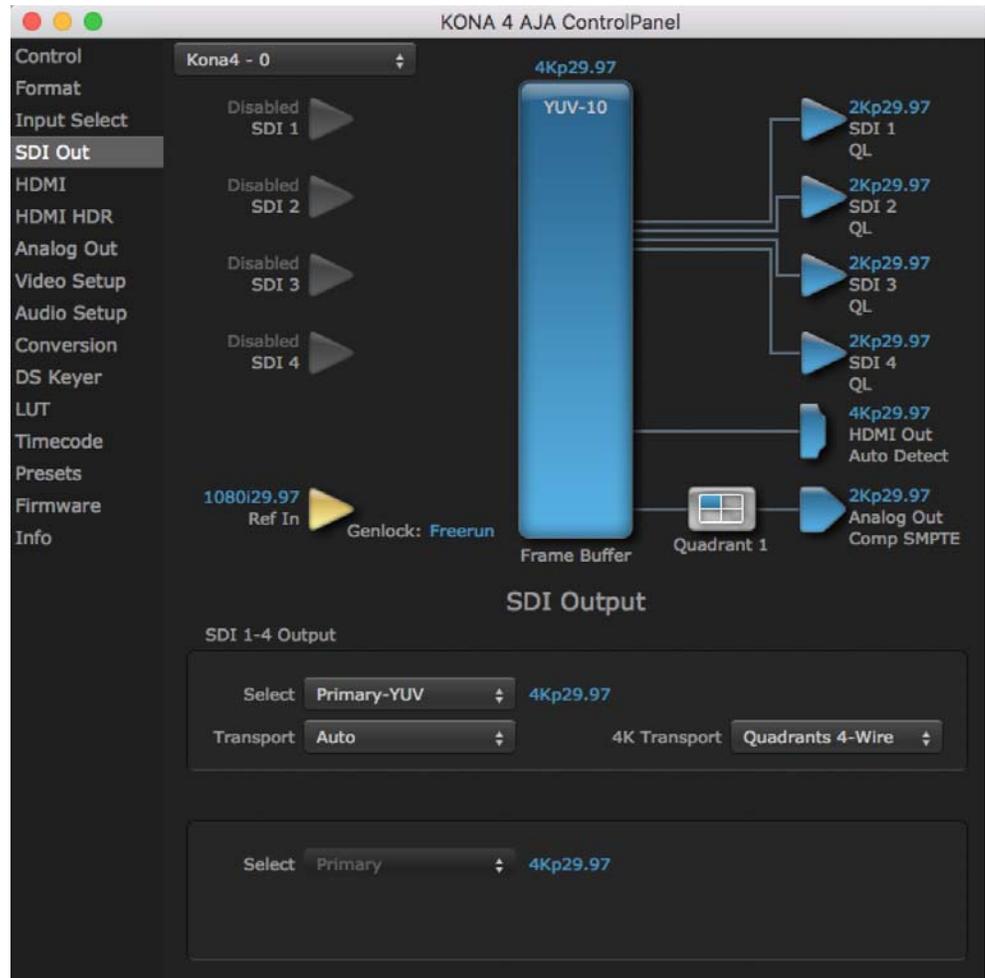
**Figure 37. Control Screen with a Controlling Application**



## SDI Output Screen in 4K Mode

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

**Figure 38. SDI Output Screen with 4K Format**



Additional 4K related settings are available in 4K mode.

**Transport** Select from:

- Auto - Set automatically based on input.
- Dual Link - Output (SMPTE 372M) using SDI 1 and SDI 1 in concert.
- 3Gb - Output (SMPTE 424M) using a single-link transport.

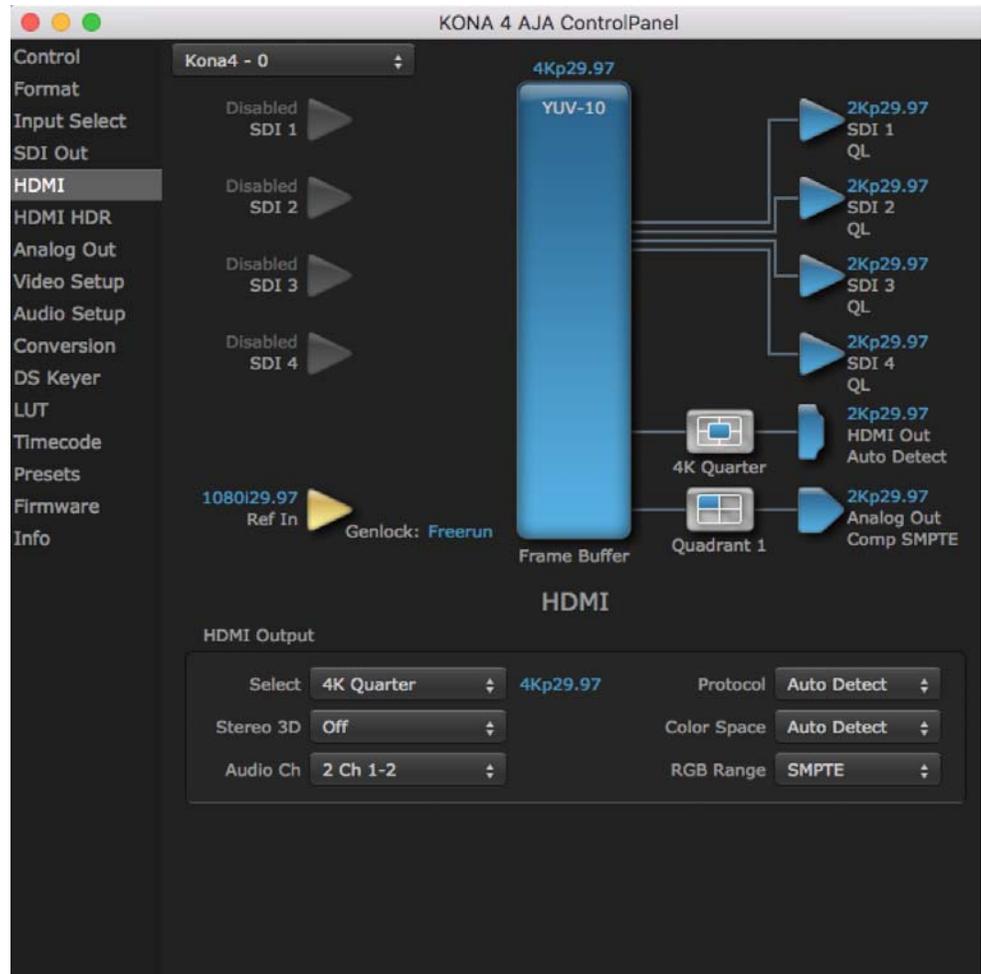
**4K Transport** Select from:

- Quadrant 4-Wire
- Quadrant 2-Wire
- 2SI (Two Sample Interleave)

## HDMI Screen 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 47](#)).

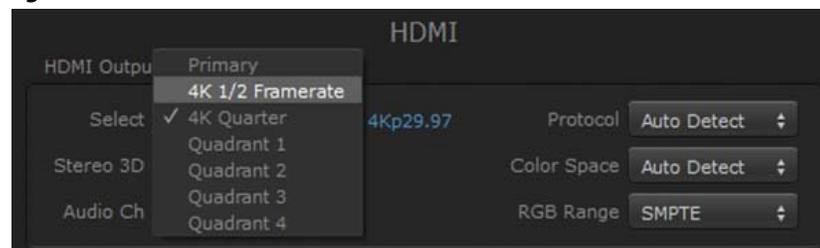
**Figure 39. HDMI Output Screen with Quad HD Output Configuration**



For UHD/4K formats, an HDMI monitor output Select menu is available to choose:

- Primary – the full 4K or UHD format
- 4K 1/2 Framerate – outputs every other frame
- 4K Quarter – (in KONA 4) a downconversion to 2K x 1080 in 4K or 1920 x 1080 for UHD.
- A single Quadrant (1, 2, 3, or 4) of the 4K or UHD signal (see the discussion on 4K quadrant mapping at this beginning of this section).

**Figure 40. HDMI 4K Quadrant Selection Menu**



## Analog Output Screen 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 54](#)).

**Figure 41. Analog Output Screen with 4K Primary Format**



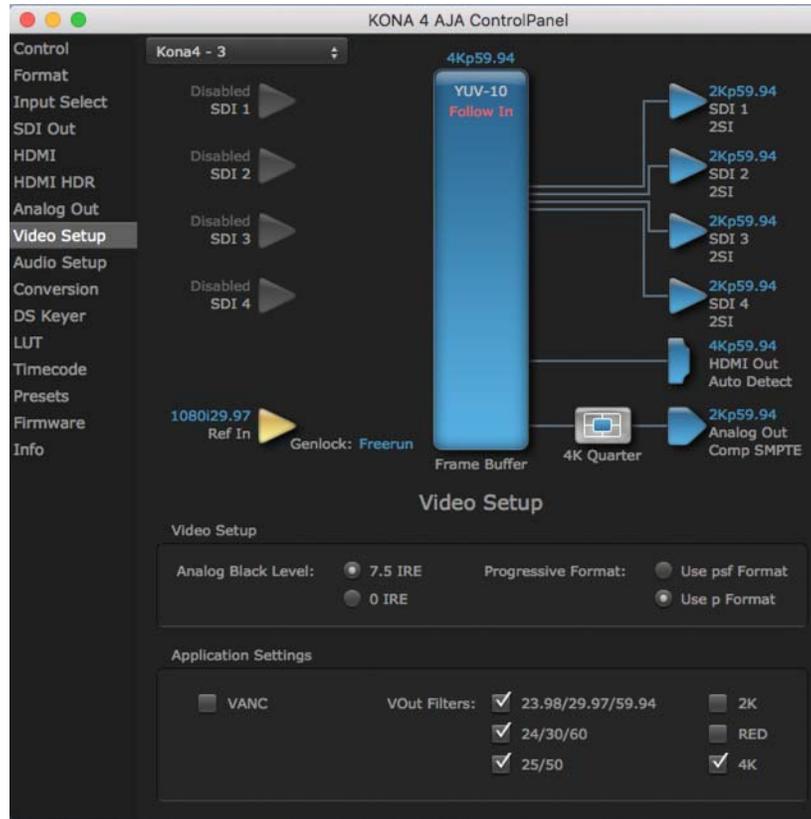
For 4K formats, a Quadrant Select menu is available to choose the desired quarter-segment of the 4K display for Analog Output to a monitor (see the discussion on 4K quadrant mapping at this beginning of this section).

**NOTE:** KONA 4 offers a *4K Quarter* output that is a downconversion to 2K x 1080 for 4K format or 1920 x 1080 for UHD.

## Video Setup Screen in 4K

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

**Figure 42. QuickTime Video Output Filter 4K Geometry Checkbox**



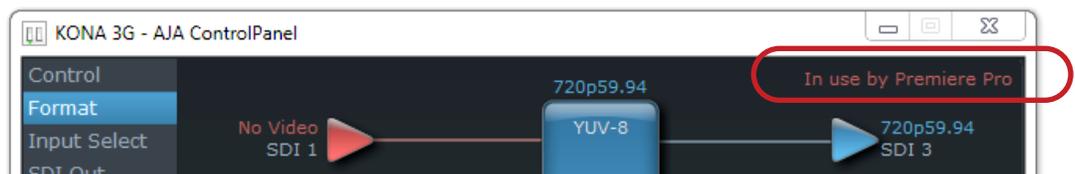
## No Downstream Keyer in 4K Mode

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

## 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.

**Figure 43. AJA Control 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 “In use” application. 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.

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 pull-down 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 pull-down.

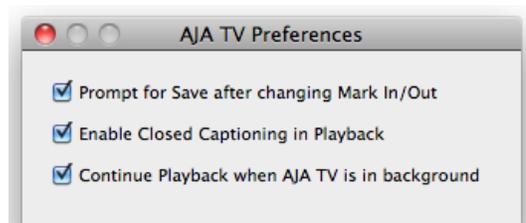
**Figure 44. Control Panel Screen Showing Multiple AJA Devices**



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 pull-down 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.

**Figure 45. 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

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

Because 10-bit video has four times the numerical precision when compared to 8-bit, it has a signal-to-noise ratio 12 db higher than 8-bit video.

Visually, in 8-bit video compared to 10-bit video, you will notice a substantial difference. In 8-bit video there will be “contour lines” or “striations” visible, particularly noticeable in scenes having soft gradients like a ramp or sunset. For example, if a sky region is mostly the same color but varies by only a few digital numbers from one side of the picture to another, you may see contour lines where the signal passes from one digital value to the next higher value.

Since each numerical value in a 10-bit system is only one fourth as large as an 8-bit system's, these contours become invisible and the sky varies smoothly.

10-bit video is often used when the source and output video (or “master”) is also 10-bit. Even if the input and/or output video is 8-bit, a 10-bit “project” will still maintain a higher quality when there is a significant amount of effects rendering involved.

Industry standard professional mastering formats—Sony Digital Betacam for Standard Definition and Panasonic D5 for High Definition—are both true 10-bit formats.

# Chapter 4: Troubleshooting

## If You Run Into Problems

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

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

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

Symptom	Check
Disk RAID cannot keep up (dropped frames etc.).	Ensure the disk system is providing at least 50 MB/second sustained transfer rate
Dropped frames during playback.	<ol style="list-style-type: none"><li>1. Canvas/Viewer zoom setting exceeds the fit-to-window setting. Change to "Fit-to-Window."</li><li>2. RAID cannot sustain the data rate of the clip/sequence.</li><li>3. The sequence setting does not match the "playback output setting" found at FCP Audio/Video Settings -&gt; AV Output.</li><li>4. Virus checking software running in the background (disable it).</li><li>5. Scratch drive not set to the RAID.</li></ol>
Dropped frames during record.	<ol style="list-style-type: none"><li>1. RAID cannot sustain the data rate of the capture preset codec.</li><li>2. Virus checking software running in the background (disable it).</li><li>3. Scratch drive not set to the RAID.</li></ol>
Media is not being captured from desired external device.	Check the settings in the <i>Input</i> tab of the KONA 3 Control Panel application. Also check equipment cables.
Dropped frames during playback	Look for scroll bars in the viewer or canvas as a warning sign that the zoom setting exceeds the fit-to-window.

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

Symptom	Check
Changes made to Final Cut's configuration aren't remembered or you need to force a change to them.	<p>Under some circumstances, Final Cut Pro may need to be initialized back to the factory default state as it was when you installed it. The easiest way to do this is to locate Final Cut's preference file and discard it.</p> <p>To do so, follow this procedure:</p> <ol style="list-style-type: none"><li>1. Locate the file named "Final Cut Pro Preferences". Note: path to file is "Macintosh HD/users/username/library/preferences/final cut user data."</li><li>3. Click and drag that file to the Trash Can icon and drop it there.</li></ol> <p>When you next start up Final Cut Pro, it will present the "Choose Setup" prompt (as in initial installation) where you can again choose a desired KONA 3 input format in the "Setup For" pulldown and re-enter a desired system scratch disk (your RAID).</p>
Video in the canvas stays frozen during playback.	<ol style="list-style-type: none"><li>1. The sequence setting does not match the "playback output setting" found at FCP Audio Video Settings -&gt; AV Output.</li><li>2. Canvas/Viewer zoom setting exceeds the fit-to-window setting. Change to "Fit-to-Window."</li></ol>
Video output is black.	<ol style="list-style-type: none"><li>1. External video is set to "No Frames" (View -&gt; External Video).</li><li>2. The "Playback output setting" found at FCP Audio Video Settings -&gt; AV Output is set to "none" or to a non-KONA 3 device.</li></ol>
Video stutter during playback.	RAID cannot sustain data rate.
Red render bar occurs when placing a clip on a sequence.	The sequence setting does not match the clip setting.

## Updating Software

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Check on the AJA Video website for software updates.

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

Select the link for your specific KONA model to find either Mac or Windows software downloads. If any are available, download the file and read any associated instructions prior to installing the software.

## Support

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When calling for support, first check over your system configuration and ensure everything is connected properly. Even if you cannot find the cause of the problem, having this information at hand will help when you call AJA Customer Support for help.

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

If the problem is a 3rd-party software operational issue, Mac system issue, then call Apple Customer Support or the 3rd-party software manufacturer for help.

If the problem is an AJA Video product issue, then contact AJA Video Customer Support.

# Appendix A: Specifications

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## KONA 4 Specifications

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- Video Formats**
- 525i 29.97
  - 525i 23.98\*
  - 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, 47.95, 48, 50, 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, 29.97, 30, 50, 59.94, 60
    - 4096x2160P 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 60
    - 3840x2160PsF 23.98, 24, 25
    - 4096x2160PsF 23.98, 24, 25

- Video Output Digital**
- 3G-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)
  - 2K HSDL (High Speed Data Link) 4:4:4, (2 x BNC)
  - 4K/UltraHD 4:2:2 and 4:4:4 up to 50/60 fps
  - HDMI v2.0, 30/36 bits/pixel, RGB or YUV, 2.25Gbps, SD, HD and UHD with HFR support up to 50/60 fps 4:2:0

- Video Input Digital**
- 3G-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)
  - 2K HSDL (High Speed Data Link) 4:4:4, (2 x BNC)
  - 4K/UltraHD 4:2:2 and 4:4:4 up to 50/60 fps
  - 1D LUT Support

- Video Output Analog**
- Composite/S-Video (Y/C) (1 x BNC/2x BNC+adapter)
  - NTSC, NTSCJ, PAL
  - 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 5.0 MHz Y Frequency Response
  - +/- .2 dB to 1 MHz C Frequency Response
  - 5% 2T pulse response
  - <1% Diff Phase
  - <1% Diff Gain
  - <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 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, 24-bit AES/EBU audio, 48 kHz sample rate, Synchronous (via 8 x BNC on optional K3G-Box)
- Audio Output Digital**
- 16-channel, 24-bit 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, 24-bit AES/EBU audio, 48 kHz sample rate, Synchronous (via 8 x BNC on optional K3G-Box)
- SD to SD Aspect Ration 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)
- Machine Control**
- RS-422, Sony 9-pin protocol (via breakout cable or optional K3G-Box)
  - 9-pin D-connector pinout is as follows:
    - 1 - GND
    - 2 - RX-
    - 3 - TX+
    - 4 - GND
    - 5 - No Connection
    - 6 - GND
    - 7 - RX+
    - 8 - TX-
    - 9 - GND
    - Shell - GND
- Reference Input**
- Analog Color Black (1V) or Composite Sync (2 or 4V)
  - Looping
  - 75 ohm on optional K3G-Box, terminated on supplied breakout cable

# KONA 3G Specifications

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- Video Formats**
- 525i 29.97
  - 525i 23.98\*
  - 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, 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, 29.97, 30
    - 4096x2160P 23.98, 24, 25, 29.97, 30
    - 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/UltraHD 422 and 444 (4 x BNC)
  - 1D LUT Support

- 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)
  - 2K HSDL (High Speed Data Link) 4:4:4, (2 x BNC)
  - 4K/UltraHD 422 and 444 (4 x BNC)
  - HDMI v1.4, 30/36 bits/pixel, RGB or YUV, 2.25Gbps, SD, HD, 1080p-50/60 (1 x mini-HDMI)

- Video Output Analog**
- Composite/S-Video (Y/C) (1 x BNC/2x BNC+Adapter)
  - NTSC, NTSCJ, PAL
  - 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 5.0 MHz Y Frequency Response
  - +/- .2 dB to 1 MHz C Frequency Response
  - .5% 2T pulse response
  - <1% Diff Phase
  - <1% Diff Gain
  - <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, 24-bit AES/EBU audio, 48 kHz 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, 24-bit AES/EBU audio, 48 kHz 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
    - 2 - RX-
    - 3 - TX+
    - 4 - GND
    - 5 - No Connection
    - 6 - GND
    - 7 - RX+
    - 8 - TX-
    - 9 - GND
    - Shell - GND

# LHe Plus Specifications

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- 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

- Video Input Digital**
- SD/HD SDI, SMPTE-259/292/296, 8- or 10-bits
  - Single link 4:2:2 (1 x BNC)

- Video Input Analog**
- Composite/S-Video (Y/C) (1 x BNC/2x BNC+Adapter)
  - NTSC, NTSCJ, PAL
  - Component (3 x BNC)
  - HD: YPbPr, RGB
  - SD: YPbPr, RGB (component mode)
  - SMPTE/EBU N10, Betacam 525 line, Betacam 525J, RGB
  - 12-bit A/D, 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
  - <1 ns Y/C delay inequity

- Video Output Digital**
- SD SDI, SMPTE-259M, 10-bit
  - HD SDI, SMPTE-292/296, 10-bit

- Video Output Analog**
- Composite/S-Video (Y/C) (1 x BNC/2x BNC+Adapter)
  - NTSC, NTSCJ, PAL
  - 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 5.0 MHz Y Frequency Response
  - +/- .2 dB to 1 MHz C Frequency Response
  - .5% 2T pulse response
  - <1% Diff Phase
  - <1% Diff Gain
  - <1 ns Y/C delay inequity

- Audio Input Digital**
- 8-channel, 24-bit SMPTE-259 SDI embedded audio, 48kHz sample rate, Synchronous
  - 2-channel, 24-bit AES/EBU audio, 48kHz or 96 KHz sample rate, Synchronous or Non-synchronous, Internal sample rate conversion (via 1 x XLR on breakout cable or optional KL-Box)

- Audio Input Analog**
  - 2-channel, 24-bit A/D analog audio, 48kHz sample rate, balanced (via 2 x XLR on breakout cable or optional KL-Box)
  - +24dbu Full Scale Digital
  - +/- 0.2db 20 to 20kHz Frequency Response
- Audio Output Digital**
  - 8-channel, 24-bit SMPTE-259 SDI embedded audio, 48kHz sample rate, Synchronous
  - 2-channel, 24-bit AES/EBU audio, 48kHz or 96 KHz sample rate, Synchronous or Non-synchronous, Internal sample rate conversion (via 1 x XLR on breakout cable or optional KL-Box)
- Audio Output Analog**
  - 2-channel, 24-bit D/A analog audio, 48kHz sample rate, balanced (via 2 x XLR on breakout cable or optional KL-Box)
  - +24dbu Full Scale Digital (0dbFS)
  - +/- 0.2db 20 to 20kHz Frequency Response
  - 2-channel unbalanced output (via 2 x RCA jacks on optional KL-Box)
- 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: Crop: image is cropped to fit new screen size
- Reference Input**
  - Analog Color Black (1V) or Composite Sync (2 or 4V)
  - Looping
  - 75 ohm on optional KL-Box, terminated on supplied breakout cable
- Machine Control**
  - RS-422, Sony 9-pin protocol (via DB-25 breakout cable or optional KLHi-Box)
  - 9-pin D-connector pinout is as follows:
    - 1 - GND
    - 2 - RX-
    - 3 - TX+
    - 4 - GND
    - 5 - No Connection
    - 6 - GND
    - 7 - RX+
    - 8 - TX-
    - 9 - GND
    - Shell - GND

# KONA LHi Specifications

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- Video Formats**
- 525i 29.97
  - 625i 25
  - 720P 50, 59.94, 60
  - 1080i 25, 29.97, 30
  - 1080PsF 23.98, 24
  - 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
  - 2K
    - 2048 x 1080P 23.98, 24, 25, 29.97, 30
    - 2048 x 1080PsF 23.98, 24

- 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

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

- Video Input Analog**
- Composite/S-Video (Y/C) (1 x BNC/2x BNC+Adapter)
  - NTSC, NTSCJ, PAL
  - 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 5.0 MHz Y Frequency Response
  - +/- .2 dB to 1 MHz C Frequency Response
  - .5% 2T pulse response
  - <1% Diff Phase
  - <1% Diff Gain
  - <1 ns Y/C delay inequity

- Video Output Digital**
- 3G/SD/HD SDI, SMPTE-259/292/296/424
  - Single link 4:2:2 or 4:4:4 (1 x BNC)
  - HDMI v1.3 30 bits/pixel, RGB or YUV, 2.25 Gbps, SD, HD, 1080p-50/60 (1 x mini-HDMI)

- Video Output Analog**
- Composite/S-Video (Y/C) (1 x BNC/2x BNC+Adapter)
  - NTSC, NTSCJ, PAL
  - 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 5.0 MHz Y Frequency Response

- +/- .2 dB to 1 MHz C Frequency Response
  - .5% 2T pulse response
  - <1% Diff Phase
  - <1% Diff Gain
  - <1 ns Y/C delay inequity
- Audio Input Digital**
- 8-channel, 24-bit SMPTE-259 SDI embedded audio, 48kHz sample rate, Synchronous
  - 8-channel, 24-bit HDMI embedded audio, 48kHz sample rate, Synchronous
  - 2-channel, 24-bit AES/EBU audio, 48kHz sample rate, Synchronous or Non-synchronous, Internal sample rate conversion (via 1 x XLR on breakout cable or optional KLHi-Box)
- Audio Input Analog**
- 2-channel, 24-bit A/D analog audio, 48kHz sample rate, balanced (via 2 x XLR on DB-25 breakout cable or optional KLHi-Box)
  - +24dbu Full Scale Digital
  - +/- 0.2db 20 to 20kHz Frequency Response
- Audio Output Digital**
- 8-channel, 24-bit SMPTE-259 SDI embedded audio, 48kHz sample rate, Synchronous
  - 8-channel, 24-bit HDMI embedded audio, 48kHz sample rate, Synchronous
  - 2-channel, 24-bit AES/EBU audio, 48kHz sample rate, Synchronous or Non-synchronous, Internal sample rate conversion (via 1 x XLR on breakout cable or optional KLHi-Box)
- Audio Output Analog**
- 2-channel, 24-bit D/A analog audio, 48kHz sample rate, balanced (via 2 x XLR on DB-25 breakout cable or optional KLHi-Box)
  - +24dbu Full Scale Digital (0dbFS)
  - +/- 0.2db 20 to 20kHz Frequency Response
  - 2-channel unbalanced output (via 2 x RCA jacks on optional KLHi-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.

**Reference Input**

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

**Machine Control**

- RS-422, Sony 9-pin protocol (via DB-25 breakout cable or optional KLHi-Box)
- 9-pin D-connector pinout is as follows:
  - 1 - GND
  - 2 - RX-
  - 3 - TX+
  - 4 - GND
  - 5 - No Connection
  - 6 - GND
  - 7 - RX+
  - 8 - TX-
  - 9 - GND
  - Shell - GND

# KONA IP Specifications

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- Video Formats**
  - 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
  - 1080PsF 23.98, 24, 25, 29.97, 30
  - 1080i 25, 29.97
  - 720P 50, 59.94, 60
  - 625i 25
  - 525i 29.97
- Media Transport Interface for 2022-6**
  - 2 x SFP+ Cages - SFPs not included
    - Recommended SFP modules: Finisar's FTLX1471D3BCL and Avago AFBR-709SMZ
- Video Output Digital**
  - HDMI v1.4
    - 30/36 bits/pixel, RGB or YUV, 2.25 Gbps
    - 2K/HD/SD
- Audio Input Digital**
  - 16-Channel SDI embedded audio, 24-bit per channel, 48 kHz synchronous
- Audio Output Digital**
  - 16-Channel SDI embedded audio, 24-bit per channel, 48 kHz sample rate, synchronous
  - 8-Channel HDMI embedded audio, 48 kHz sample rate, synchronous
- Downstream Keyer**
  - Supports graphics with alpha channel over video, matte or framebuffer, or framebuffer content over incoming video or matte
- Reference and LTC I/O**
  - 1 x BNC assignable to reference video or LTC input
    - Reference**
      - Analog color black (1V) or composite sync (2 or 4V)
      - Nonterminating
    - User Interface**
      - 8-lane PCIe 2.0
    - Size (w x d x h)**
      - .75" x 8.25" x 5" (19.05mm x 209.55mm x 127mm)
    - Weight**
      - 0.7 lb (0.4 kg)
    - Power**
      - 25W typical, 27W maximum
    - Environment**
      - Safe Operating Temperature Range: 0 to 40C (32F to 104F)
      - Operating Altitude: <3,000 meters (<10,000 feet)

# Appendix B: Safety & Compliance

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## Federal Communications Commission (FCC) Compliance Notices

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### **Class B Interference Statement**

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

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

### **FCC Caution**

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

### **Canadian ICES Statement**

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Canadian Department of Communications Radio Interference Regulations

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

Règlement sur le brouillage radioélectrique du ministère des Communications

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

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

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

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

## Declaration of Conformity

Marking by this symbol indicates compliance with the Essential Requirements of the EMC Directive of the European Union 2014/30/EU.



This equipment meets the following conformance standards:

*Safety:* EN 60065: 2002 + A1: 2006 + A11: 2008 + A2: 2010 + A12: 2011 (Bauart License)

IEC 60065: 2001 + A1: 2005 + A2: 2010 (CB Scheme Report/Certificate)

Additional licenses issued for specific countries available on request.

*Emissions:* EN 55032: 2012, CISPR 22: 2008

EN 61000-3-2: 2014, EN 61000-3-3: 2013

*Immunity:* EN 55103-2: 2009, EN 61000-4-2:2009, EN 61000-4-3:2006 +A1:2008 +A2:2010,

EN 61000-4-4:2004+ A1:2010, EN 61000-4-5:2006, EN 61000-4-6:2009,

EN 61000-4-11:2004

Environments: E2, E3 and E4

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



### Warning!

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

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

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

## Recycling Notice

	<p>This symbol on the product or its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste for recycling, please contact your local authority, or where you purchased your product.</p>
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## Korea KCC Compliance Statement

<p>B급 기기 (가정용 방송통신기자재)</p> <p>Class B (Broadcasting Communication Equipment for Home Use)</p>	<p>이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.</p> <p>As an electromagnetic wave equipment for home use (Class B), this equipment is intended to use mainly for home use and may be used in all areas.</p>
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## Taiwan Compliance Statement

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

This is a Class B product based on the standard of the Bureau of Standards, Metrology and Inspection (BSMI) CNS 13438, Class B. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

## Japanese Compliance Statement

### 2. Class B ITE

この装置は、クラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。

取扱説明書に従って正しい取り扱いをして下さい。

VCCI-B

This is a Class B product based on the standard of the VCCI Council (VCCI V-3/2015.04). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

## Translated Warning and Caution Messages

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



Warning Symbol



Caution Symbol

## Before Operation Please Read These Instructions

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	<p><b>Warning!</b> Read and follow all warning notices and instructions marked on the product or included in the documentation.</p> <p><b>Avertissement !</b> Lisez et conformez-vous à tous les avis et instructions d'avertissement indiqués sur le produit ou dans la documentation.</p> <p><b>Warnung!</b> Lesen und befolgen Sie die Warnhinweise und Anweisungen, die auf dem Produkt angebracht oder in der Dokumentation enthalten sind.</p> <p><b>¡Advertencia!</b> Lea y siga todas las instrucciones y advertencias marcadas en el producto o incluidas en la documentación.</p> <p><b>Aviso!</b> Leia e siga todos os avisos e instruções assinalados no produto ou incluídos na documentação.</p> <p><b>Avviso!</b> Leggere e seguire tutti gli avvisi e le istruzioni presenti sul prodotto o inclusi nella documentazione.</p>
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	<p><b>Warning!</b> Do not use this device near water and clean only with a dry cloth.</p> <p><b>Avertissement!</b> N'utilisez pas cet appareil près de l'eau et nettoyez-le seulement avec un tissu sec..</p> <p><b>Warnung!</b> Das Gerät nicht in der Nähe von Wasser verwenden und nur mit einem trockenen Tuch säubern.</p> <p><b>¡Advertencia!</b> No utilice este dispositivo cerca del agua y límpielo solamente con un paño seco.</p> <p><b>Aviso!</b> Não utilize este dispositivo perto da água e limpe-o somente com um pano seco.</p> <p><b>Avviso!</b> Non utilizzare questo dispositivo vicino all'acqua e pulirlo soltanto con un panno asciutto.</p>
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**Warning!**

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

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

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

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

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

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

**Warning!**

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

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

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

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

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

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

**Warning!**

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

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

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

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

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

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

**Warning!**

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

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

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

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

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

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

**Warning!**

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

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

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

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

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

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

**Warning!**

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

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

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

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

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

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

**Warning!**

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

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

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

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

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

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

**Warning!**

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

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

**Warnung!** Vermeiden Sie, dass auf das Netzkabel getreten oder das Kabel geknickt wird, insbesondere an den Steckern, den Steckdosen und am Kabelausgang am Gerät.

**¡Advertencia!** Proteja el cable de energía para que no se le pise ni apriete, en especial cerca del enchufe, los receptáculos de conveniencia y el punto del que salen del equipo.

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

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

**Warning!**

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

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

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

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

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

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

# Warranty and Liability Information

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## Limited Warranty

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AJA Video Systems, Inc. (AJA Video) warrants that the product, not including hard-disk based Storage Modules (HDD), will be free from defects in materials and workmanship for a period of three years from the date of purchase. AJA Video warrants that the hard-disk based Storage Modules (HDD), will be free from defects in materials and workmanship for a period of one year from the date of purchase. If a product proves to be defective during this warranty period, AJA Video, at its option, will either repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

To obtain service under this warranty, the Customer must notify AJA Video of the defect before expiration of the warranty period and make suitable arrangements for the performance of service by contacting AJA Video support through the channels set forth on the support contacts web page at <http://www.aja.com/support/index.php>. Except as stated, the Customer shall bear all shipping, packing, insurance and other costs, excluding parts and labor, to effectuate repair. Customer shall pack and ship the defective product to a service center designated by AJA Video, with shipping charges prepaid. AJA Video shall pay to return the product to Customer but only if to a location within the country in which the AJA Video service center is located.

This warranty shall not apply to any defect, failure or damage caused by negligent, inadequate or improper use, handling or maintenance. Without limiting the foregoing, AJA Video shall not be obligated to furnish service under this warranty or repair any damage or malfunction a) resulting from attempts by personnel other than AJA Video representatives to install, repair or service the product, b) resulting from improper use or connection to incompatible equipment, c) caused by the use of non-AJA Video parts or supplies, d) if the product has been modified or integrated with other products when the effect of such a modification or integration increases the time or difficulty of servicing the product, or (e) resulting from being dropped or otherwise subjected to undue force, exposure to moisture or other corrosive or conductive substances, exposure to strong magnetic fields, use with improperly regulated power supplies, exposure to electric shock, use in temperatures outside the specified operating range, or otherwise failing to treat the product in accordance with the standard of care appropriate to sensitive and delicate electronic equipment.

EXCEPT AS STATED ABOVE, AJA VIDEO AND ITS VENDORS DISCLAIM IN THEIR ENTIRETY ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. AJA VIDEO'S RESPONSIBILITY TO REPAIR OR REPLACE TIMELY REPORTED DEFECTIVE PRODUCTS IS THE WHOLE AND EXCLUSIVE REMEDY CUSTOMER IS PROVIDED.

THE PRODUCT IS NOT INTENDED, STATED, OR WARRANTED TO OPERATE UNINTERRUPTED OR ERROR-FREE. YOU UNDERSTAND AND ACKNOWLEDGE THAT THE PRODUCT IS NOT INTENDED TO BE USED AS THE SOLE OR PRIMARY DATA SOURCE OR TARGET FOR CRITICAL DATA, AND THAT IT IS YOUR RESPONSIBILITY TO IMPLEMENT REDUNDANT CAPTURE AND BACKUP SYSTEMS AS APPROPRIATE.

## Limitation of Liability

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UNDER NO CIRCUMSTANCES SHALL AJA VIDEO BE LIABLE IN ANY WAY FOR ANY LOST, CORRUPTED OR DESTROYED DATA, FOOTAGE OR WORK, OR FOR ANY OTHER INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, OR FOR ANY THIRD PARTY CLAIM, IN CONNECTION WITH THE PRODUCT, WHETHER RESULTING FROM DEFECTS IN THE PRODUCT, SOFTWARE OR HARDWARE FAILURE, OR ANY OTHER CAUSE WHATSOEVER, EVEN IF AJA VIDEO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. AJA VIDEO'S LIABILITY IN CONNECTION WITH THIS PRODUCT SHALL UNDER NO CIRCUMSTANCES EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCT.

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