KONA Series

Capture, Display, Convert

Installation and Operation Manual

AJA
VIDEO SYSTEMS

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Contacting AJA Support

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:

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Sales Email	sales@aja.com

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Chapter 1 – Introduction

KONA 5   KONA 4   KONA 1

Overview

The AJA KONA series cards brings the highest quality 4K/UltraHD, 2K, HD, and SD video and audio to computers running Mac, Windows or Linux Operating Systems.

KONA Models Covered in this Manual

This manual covers the installation and operation of these models:

- KONA 5
- KONA 4
- KONA 1

NOTE: *The KONA LHe Plus and KONA LHi cards share a separate AJA manual, and the KONA IP and KONA HDMI cards each have a separate AJA manual.*

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.

Four retail packages are available, one for Mac, one for Windows, and two for Linux (one package for Ubuntu, one package for Red Hat/CentOS).

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

To download AJA software, go to the AJA website:

https://www.aja.com/support/downloads

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

https://www.aja.com/compatibility/kona

Mac, Windows and Linux Packages

These 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 devices.

AJA System Test

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

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

The application tests Read and Write, Capture and Playback speeds 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.

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

Additional with Mac and Windows Packages

3rd-Party Plugins

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

System Requirements

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 10.12 Sierra or later
- Win 10 or later with all updates
- Linux Redhat/CentOS 7
- Linux Ubuntu 14.04 LTS and Ubuntu 16.04 LTS
- 2.5 GHz quad core i7 minimum, for HD
- 3.5 GHz eight core minimum, faster processors and more cores recommended, for UltraHD/4K workflows, especially with high frame rate
- 16GB RAM minimum, 32GB or more recommended, especially for UltraHD/4K or High Frame Rate applications

- A reasonably fast and powerful graphics card, with plenty of on-board memory. Examples (may be specific to application version and/or host CPU) include:
  - Nvidia K5200
  - Nvidia K4200
  - Nvidia M6000
  - Nvidia M5000
  - Nvidia M4000
  - AMD W7100
  - AMD W8100
- Media storage with adequate bandwidth to sustain the capture and playback of the material you expect to be working with.

NOTE: *For large scale installations with shared storage, or for very high performance requirements, AJA recommends consultation with an experienced a system integrator. A consultant will be able to assist with many important variables.*

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 real-time 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 *"AJA System Test Application" on page 20*.

Shared KONA Features

The following information applies to all the KONA products covered in this manual.

Capture Formats

When capturing, you can record data in the following file formats:
- BMP
- DPX
- MOV (QuickTime)

NOTE: *Support by KONA of QuickTime for Windows has been discontinued.*

- MXF
- TGA

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

Internal HD/SD Hardware Downstream Keyer

KONA cards have a powerful HD/SD hardware keyer that can place graphic files with an alpha channel over HD/SD 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. The downstream keyer operates with HD/SD video, and is not available for UltraHD/4K signals.

RS-422 Machine Control

9-pin D style connectors provide a control path for VTRs, camcorders, disk media servers, and other devices using RS-422 SMPTE (Sony) protocol. RS-422 connectors located on the KONA card itself and the K3G-Box are female, while the RS-422 connectors on break-out cables are male.

KONA 5 Features

KONA 5 Card Only

- Four bidirectional SDI locking 12G-SDI HD-BNCs connectors
- Single Link I/O for 4K/UltraHD, HD and SD across 12G-SDI, 6G-SDI, 3G-SDI, and 1.5G-SDI
- Dual Link I/O for 1.5G-SDI and 3G-SDI (2x HD-BNC)
- Quad Link I/O for 1.5G-SDI, 3G-SDI (4x HD-BNC)
- Supports Quadrant or Two Sample Interleave transport
- Automatically downconverts Single Link 4K/UltraHD 12G input to HD on the KONA 5 SDI 4 output
- HDMI 2.0 Output
- HDR (HDR10 or HLG via HDMI, 12 Bit RGB, BT2020)
- Up to 16 channels of SDI embedded audio
- Up to 8 channels of HDMI embedded audio
- Reference In HD-BNC

KONA 5 Card with Breakout Cable

- Up to four channel pairs of AES audio on full size BNC connectors, configurable as two pairs in and two pairs out, or all four pairs in, or all four pairs out.
- Reference In/LTC In (selectable)
- LTC Output
- RS-422 control via 9-pin D connector

KONA 5 Card Connectors

Figure 1. KONA 5 Card

Multi-pin Breakout Cable Connector

HDMI 2.0 Output Connector

Four Locking Bi-directional HD-BNCs Supporting Up to 12G-SDI

Reference/ LTC Input Locking HD-BNC

ATX Power Connector

Each KONA 5 card is equipped with:

- Five twist-lock HD-BNC connectors:
  - One Reference/LTC input HD-BNC connector (#5 bottom)
  - Four 12G-SDI capable bi-directional HD-BNC connectors (#1-#4).
  - Five short HD-BNC (locking) to full size BNC adapter cables are provided.
  - KONA 5 offers one 4K/UltraHD input (over 1x 12GSDI) and passthrough of one 4K/UltraHD Output (over 1x 12GSDI)
- Additional monitoring is also available via HDMI 2.0.
- A multi-pin connector at the top of the card attaches to the supplied breakout cable.
- An ATX power connector (Molex p/n 45558-0003) is located at the rear of the card, and its use is required for operation (the retail KONA 5 card does not use PCIe bus power).

KONA 5 Breakout Cable

Figure 2. KONA 5 Breakout Cable

NOTE: *KONA 5 breakout cables cannot be used with KONA 4 cards, and vice versa.*

The six-foot long KONA 5 breakout cable has a multi-pin connector for the rear of the KONA 5 card, and on the other end has the following full size BNC connectors:

- AES Ch 1/2 In
- AES Ch 3/4 In
- AES Ch 5/6 In
- AES Ch 7/8 In
- AES Ch 1/2 Out
- AES Ch 3/4 Out
- AES Ch 5/6 Out
- AES Ch 7/8 Out
- LTC In
- LTC Out

In addition, one male 9-pin D connector on the breakout cable provides machine control for devices using RS-422 SMPTE (Sony protocol).

Figure 3. KONA 5 Breakout and Adapter Cables
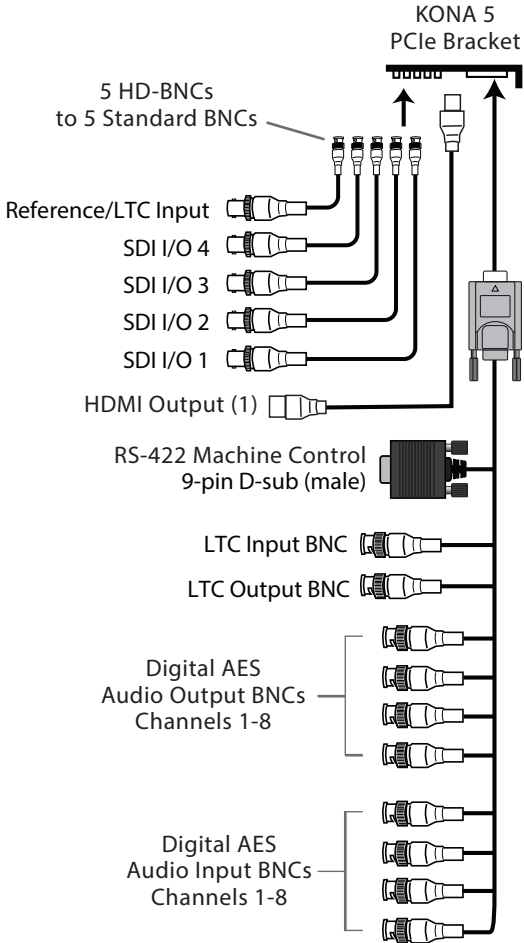
AJA Control Panel User Interface For KONA 5

Figure 4. KONA 5 AJA Control Panel Screen Example
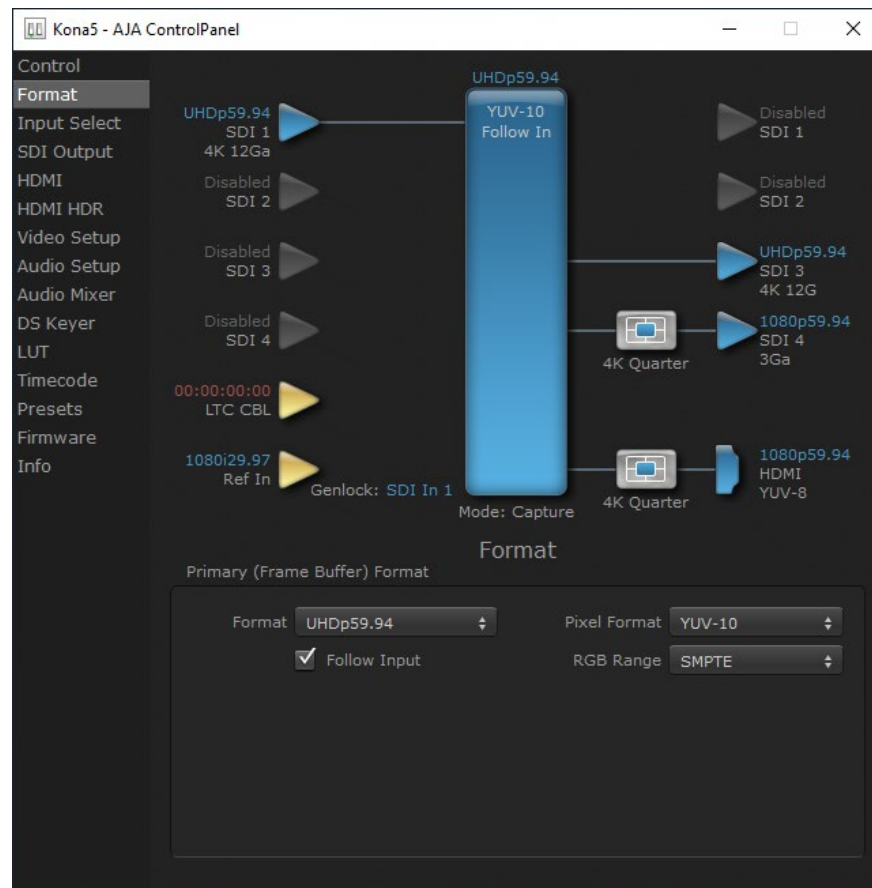
The AJA Control Panel application provides an easy to use graphical user interface for configuration control. See for detailed information.

KONA 4 Features

Video I/O

- SD-SDI, HD-SDI, Dual Link HD-SDI, HSDL, and 3G HD-SDI inputs
- HDMI 1.4b output
- 2K support that includes 2048x1556 and 2048x1080 formats
- 4K and UltraHD capture and playout
  - KONA 4 supports frame rates 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 supports Dual Link HD-SDI (4:4:4), and 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.

Quadrant and Two Sample Interleave transport

- Used for UltraHD and 4K video formats.

HDR signaling and monitoring

- Used for HDR10 and HLG High Dynamic Range video.

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 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 is virtually identical to AJA's award winning stand-alone converter products used throughout the post production market. The KONA 4's 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 real time. 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 supports 8-channel 24-bit 48kHz AES audio via full size BNC connections on the supplied breakout cable—or with the optional K3G-Box,16-channels of AES audio.

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

Audio Monitoring Mixer

- Monitor mixing of sources, including Host Computer and Application.

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

UltraHD/4K Mode Capture and Playout

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

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

When 4K playout 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 Tech Specs" on page 74*) for supported 4K formats. For a description of Two Sample Interleave output mapping, see *"2SI Mode" on page 61*.

Internal HD/SD Hardware Downstream Keyer

Available for HD/SD signals. See *page 8* for more information.

KONA 4 Connectors On Card

Each KONA 4 card is equipped with:

- Four DIN 1.0/2.3 sliding sleeve video connectors on the card endplate (a DIN to full size BNC adapter cable snake is provided).
- One mini-HDMI output connector
- One multi-pin female D connector for use with the breakout cable provided with the card.

KONA 4 Breakout Cable Connections

NOTE: *KONA 4 breakout cables cannot be used with KONA 5 cards, and vice versa.*

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.

KONA 4 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 four DIN 1.0/2.3 small connectors on one end and four full size 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 5. KONA 4 Breakout and Adapter Cables

KONA 4
end-plate

4 DIN 1.0/2.3
small BNCs to
4 standard BNCs

SDI I/O 4   SDI
SDI I/O 3
SDI I/O 2
SDI I/O 1

HDMI Output (1)

RS-422 Machine Control to VTR
(9-pin)

3 BNCs (Analog Connections)
SD Out: Component, Composite, or S-Video
HD Out: Component or RGB

Reference Input BNC

LTC Input BNC

LTC Output BNC

Digital AES
Audio Output BNCs
Channels 1-8

Digital AES
Audio Input BNCs
Channels 1-8
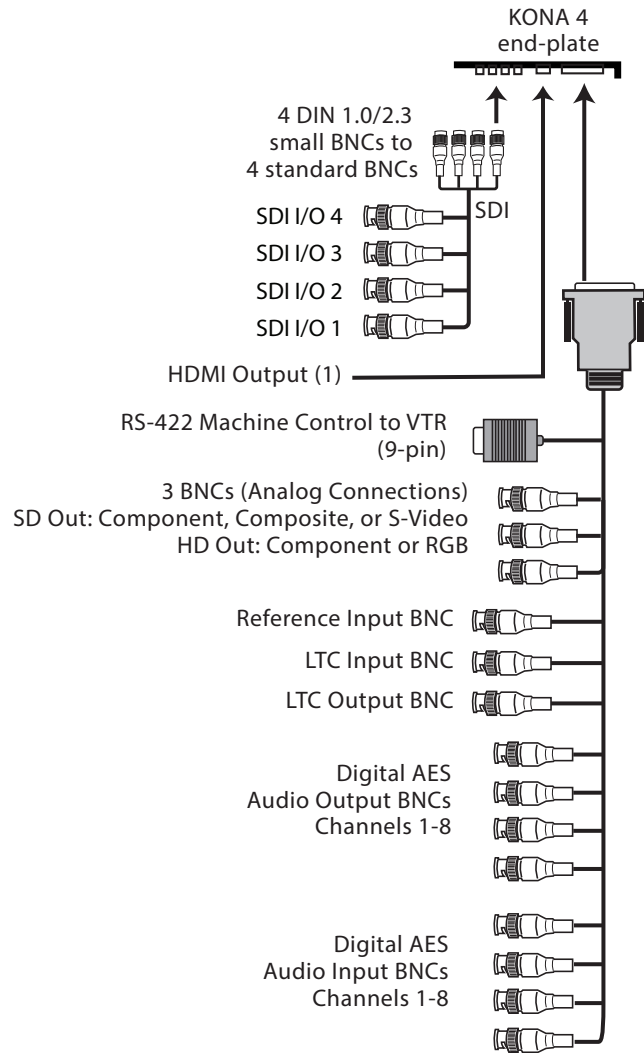
K3G-Box for KONA 4

An optional 19" 1RU rack-mountable breakout box is available that attaches to the KONA 4 card via cables that connect to the back of the breakout box. These cables are supplied with the breakout box. Breakout boxes can be easily rack mounted or placed on top of a broadcast monitor or editing desk.

The K3G-Box for KONA 4 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 6. K3G-Box Model Breakout Box (front view)

AES/EBU Audio In
Channels 1 through 16

Longitudinal
Time Code
(LTC)

RS422
Machine
Control

AES/EBU Audio Out
Channels 1 through 16

HDMI
Out

SDI Ports 1 through 4

Video Monitor Out
Component/
Composite
Video Output

External
Reference
(loop)

Analog Audio
Output

All AES/EBU audio connectors have two channels
per connector

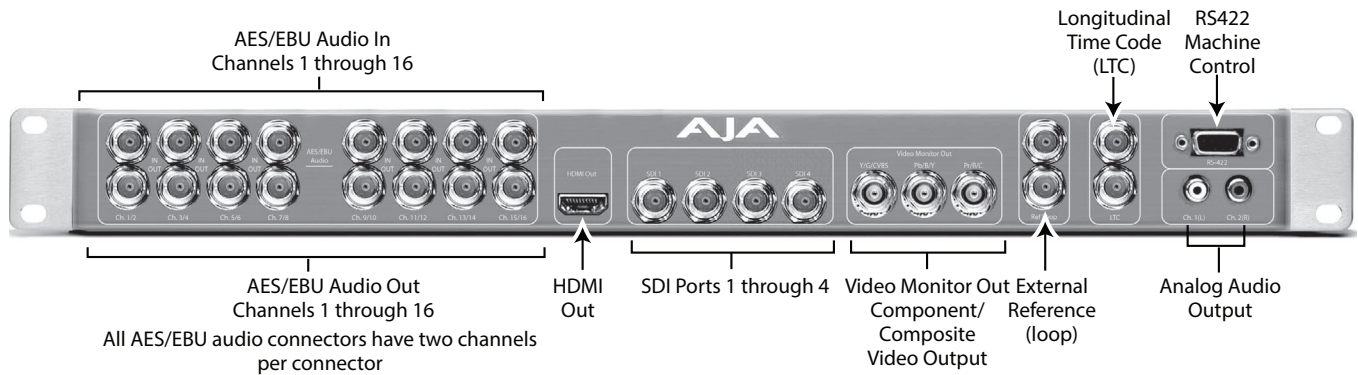Figure 7. K3G-Box Model Breakout Box (rear view)

KONA 3G
Host
Connector

SDI Ports
1 through 4

HDMI Output
from KONA 3G
Mini-HDMI connector
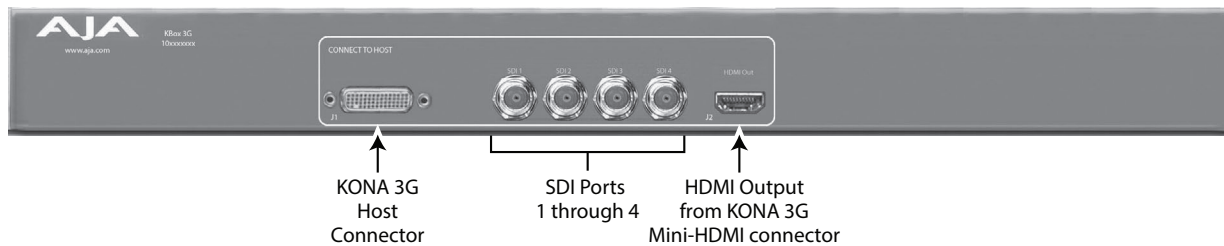
KONA 4 to K3G-Box Connectors

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

The K3G breakout box has two analog output connectors, one for each channel. These connectors are RCA-style phono jacks.

RS-422 Machine Control

A female 9-pin D connector is available for 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 card, DIN 1.0/2.3 sleeve locking small connectors are provided for bi-directional SDI inputs and outputs for Single Link, Dual Link or 4K/UltraHD I/O. A cable with four DINs 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 offers four video outputs altogether:

- 2 SDI outputs that are used for both High- and Standard-definition (SD/HD-SDI)
- 2 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.

In 4K Mode, KONA 4 supports one 4K/UltraHD signal that can be sent or received over 4x 3G-SDI Dual Link via 4K-2SI, or 2x 4K-Quad when it is a low frame rate (23.97 - 30) signal. Additional monitoring is also available via HDMI.

SDI inputs and outputs support video and 16-channel embedded 24-bit digital audio.

HDMI Output

An HDMI mini-connector on the KONA 4 endplate (full-size HDMI connectors on the K3G-Box) provides HDMI 1.4 capability, supporting UltraHD at up to p60 on KONA 4.

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 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).

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.

AJA Control Panel User Interface For KONA 4

Figure 8. KONA 4 AJA Control Panel Screen Example

The AJA Control Panel application provides an easy to use graphical user interface for configuration control. See for detailed information.

KONA 1 Features

- 3G-SDI formats supported
- Embedded SDI audio in
- Embedded SDI audio out
- Mini PCIe form factor
- Genlock with reference input
- LTC input
- Internal HD/SD Hardware Downstream Keyer
- RS-422 machine control (9-pin)

NOTE: *A Low Profile version of the KONA card with the same functionality is available for developers.*

KONA 1 BNC Connectors on Card

Figure 9. KONA 1 Card

RS-422
(9 pin D)

Reference/LTC
Input

3G-SDI
Input
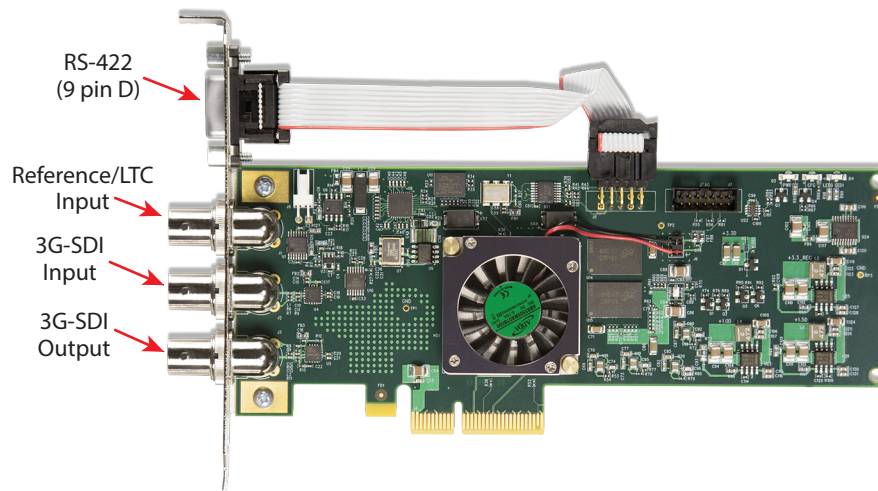
3G-SDI
Output

BNC Connectors

The KONA endplate provides three full-size BNC connectors:

- Reference/LTC input (top)
- 3G-SDI input (middle)
- 3G-SDI output (bottom)

NOTE: KONA 1 uses on-card connectors only. No breakout cable or breakout box is available.

RS-422 Machine Control

A female 9-pin D connector provides connection for VTRs, camcorders, disk media servers, and other devices using RS-422 SMPTE (Sony) protocol.

AJA Control Panel User Interface For KONA 1

Figure 10. KONA 1 AJA Control Panel Screen Example
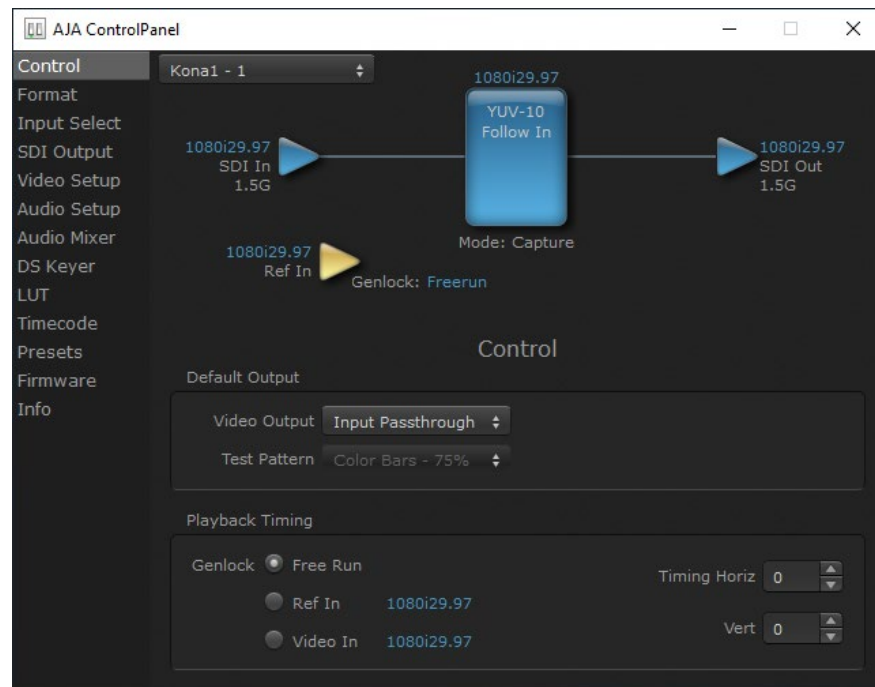
The AJA Control Panel application provides an easy to use graphical user interface for configuration control. See *"AJA Control Panel User Interface" on page 26* for detailed information.

Chapter 2 – Installation

Installation Overview

The installation and set up of a KONA card is simple, and may vary slightly depending on your system.

Optimum PCIe Slot Placement

For the most up-to-date Mac system requirements for KONA, see the following AJA website:

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

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

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

Third Party Software Support

For further support information regarding third-party software compatibility, see:

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

AJA 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

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.

Shipping Box Contents

Your KONA shipment includes:

- KONA 1, KONA 4, or KONA 5 PCI-Express card
- Associated cables for the KONA card (see below)

KONA 4 Cables

If you purchased the KONA 4 you will also receive these cables:

- HDMI mini-to-HDMI output cable
- KONA 4 SDI In/Out adapter—small 4x DIN 1.0/2.3 sliding sleeve connectors on the adapter cable are used to connect the KONA card to full-size BNCs for ease of use and compatibility with professional equipment.
- AES BNC digital audio connectors, RS-422, 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 card to the breakout box. The 4x BNC cable to DIN 1.0/2.3 connectors cable that shipped with the card is needed to connect the SDI connectors out of the card to the breakout box. Also, the HDMI cable connects between the KONA 4 card and the box rear panel.

NOTE: *KONA 4 breakout cables cannot be used with KONA 5 cards, and vice versa.*

KONA 5 Cables

Provided with the KONA 5 card are:

- 1x multi-pin breakout cable, 6 feet
- 5x HD-BNC (twist lock) to full-size BNC adapter cables

Installing the KONA Card

Figure 11. KONA 4 Card Example

The KONA card can be installed into a PC chassis, legacy Mac Pro chassis with PCIe slots, or into a Thunderbolt PCIe external chassis.

IMPORTANT: *The KONA 5 card requires ATX power. For customers who wish to use a Thunderbolt 3 expansion chassis, the chassis must provide ATX connectivity and adequate power.*

1. Turn off power to the host chassis.

2. Touch the outside of the chassis to discharge any body static.

3. Remove the power cable from the back of the chassis.

4. Open the chassis.

5. Locate a recommended PCIe slot (see *"Optimum PCIe Slot Placement" on page 20* for more information).

6. Remove the backplate from the PCIe slot.

7. Touch the chassis to discharge any body static.

8. Remove the KONA card from its anti-static bag.

9. Carefully insert the card by rocking it slowly into the slot. Ensure the card aligns properly with the slot opening and is fully seated.

10. (KONA 5 card only) Connect an ATX power cable from the host motherboard to the rear of the KONA 5 card.

Figure 12. KONA 5 Only, ATX Power Connection
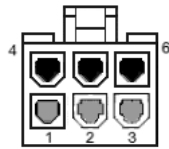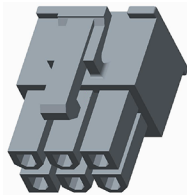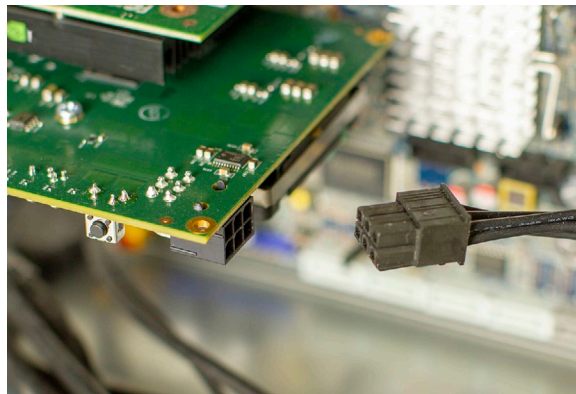
PC Internal ATX
Power Connector
1, 2, 3 = +12v
4, 5, 6 = COM
(Molex p/n 45559-0002)

11. Secure the card in the chassis.

12. Close the chassis.

13. Power up the chassis.

NOTE: *Always put a RAID controller and KONA on separate PCIe buses. This improves performance by reducing bus contention.*

Cabling the System

KONA 4 Example Cable Connections

Figure 13. Typical KONA 4 System Connections

Typical System

Figure 13 shows typical system interconnections for a system with digital A/V sources. Your system may differ depending on VTRs, audio monitoring, and video monitoring.

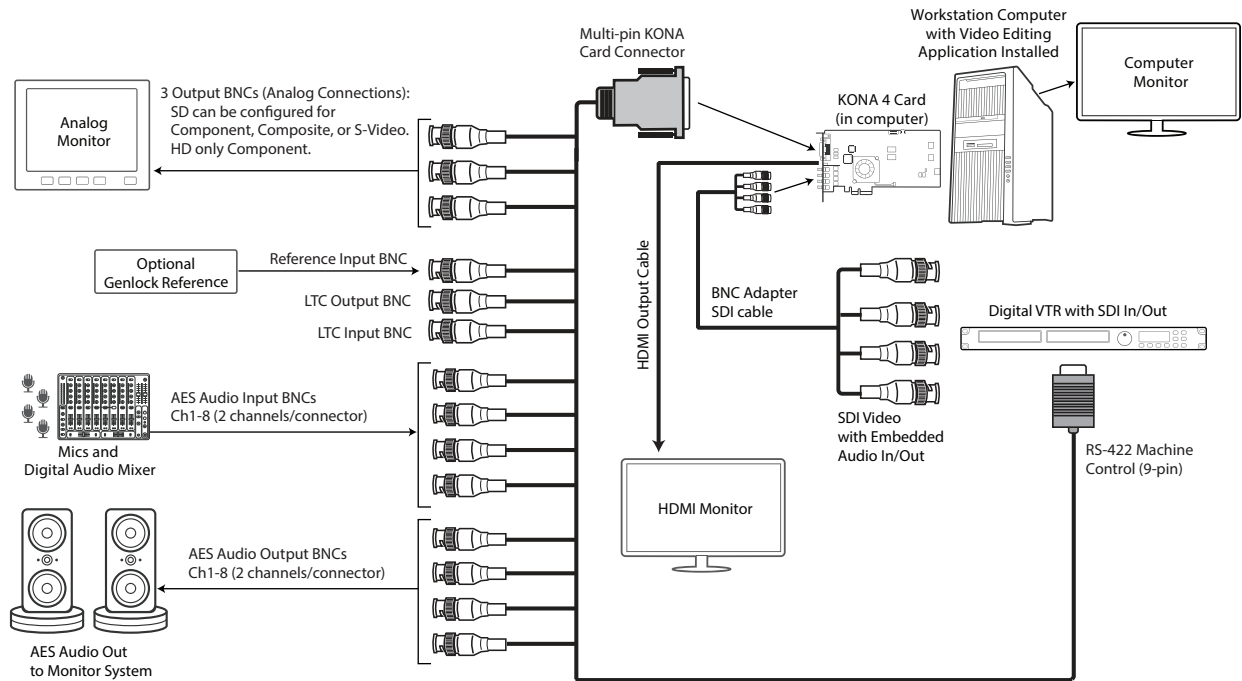1. If desired, connect your house reference sync to the KONA 4 Ref Loop connector (BNC). On the breakout cable this is a terminated reference input. The second KONA 4 Ref Loop connector on the optional Breakout Box can be connected to your VTR. If you do not loop through the reference, the second connector should be terminated with a 75-ohm terminator.

2. Connect a Video Monitor to the KONA 4 Component Analog Video Out BNC connectors (preferred), or instead connect to a composite monitor. (If you have an SDI or HD-SDI enabled monitor, you may also connect one of the KONA SDI outputs to a monitor as well.)

3. Connect the 9-pin machine control cable on the supplied breakout cable to your VTR's RS-422 control port or connect a 9-pin cable between the breakout box and the VTR's RS-422 serial port.

4. Connect two SDI cables between KONA 4 and your digital VTR (Digital Betacam etc.), one from KONA 4 SDI In to the VTR SDI Out, and one from KONA 4 SDI Out (1 or 2) to the VTR SDI In. The KONA 4 SDI connections have embedded audio (16-channels) so the VTR must be configured accordingly. These connections will be made via the small DIN 1.0/2.3 sleeve connectors to full size 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'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.

Installing KONA Software

NOTE: *Always uninstall previous versions of KONA software before updating your software.*

Download

Go to the AJA website and download the latest KONA driver software containing the AJA Control Panel application:

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

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

NOTE: *If your computer has previously had another video capture or multimedia device installed, ensure you uninstall any related software before installing KONA This will prevent any hardware or software conflicts.*

Software Package Installation and Re-installation

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 AJA software package.

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

Firmware Update Procedure

After the AJA Software Package has been installed on a computer with your AJA hardware installed, the firmware on that AJA device can be updated if a newer version of firmware is included with that software package.

1. Open the AJA Control Panel application.

2. If more than one AJA device is connected, choose the device you want to update by selecting its name from the drop-down menu at the top of the screen.

3. Go to the Control Panel Firmware Screen.

4. Select the firmware version (if multiple versions exist) in the **Desired** dropdown.

5. Click on **Install**. Messages appear and when finished, firmware update completed messages are shown (*Figure 14*).

Figure 14. Update Completed Messages
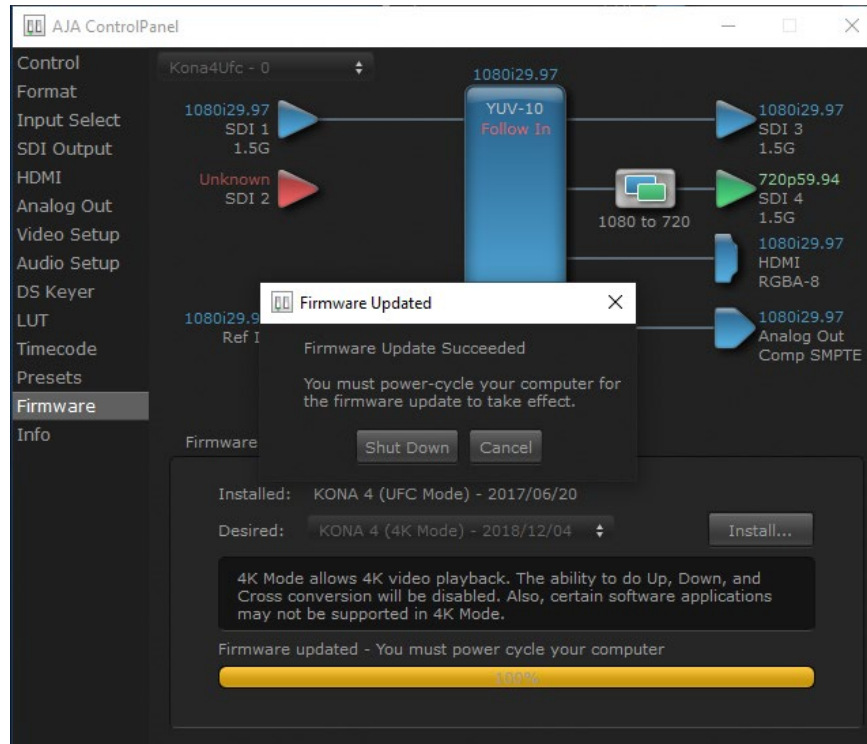
6. Click **Shut Down** to power down the computer.

7. Restart the computer.

8. Open AJA Control Panel. The AJA hardware with the updated firmware should be recognized by the Control Panel application.

Firmware Versions

KONA 4 supports two different versions of firmware that have different capabilities. One version of firmware can be installed at a time.

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

NOTE: KONA 5 and KONA 1 each currently support a single firmware version.

Chapter 3 – Operation

AJA Control Panel Overview

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

NOTE: *KONA 4 and KONA 5 Control Panel functions are virtually the same. KONA 4 Control Panel screen shots are predominately used for this discussion.*

AJA Control Panel Operating Modes

AJA Control Panel has two fundamental operating modes.

Playback Mode - Used for playing back video files from the computer, usually with a non-linear editing application (NLE) or AJA Control Room, through the KONA card to that card's video/audio outputs for viewing and/or external recording.

Capture Mode - Used for capturing video/audio signals that are coming into the KONA card from an external source to create video files on the computer using AJA Control Room or an NLE, or just for display on the KONA outputs. This mode is also used for stand-alone video display or conversion when Control Panel is being used without an external controlling application.

The current KONA operating mode is reported on the Control Panel UI screen, below the block diagram (see *Figure 15 on page 27*).

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 15. AJA Control Panel, Block Diagram and Controls
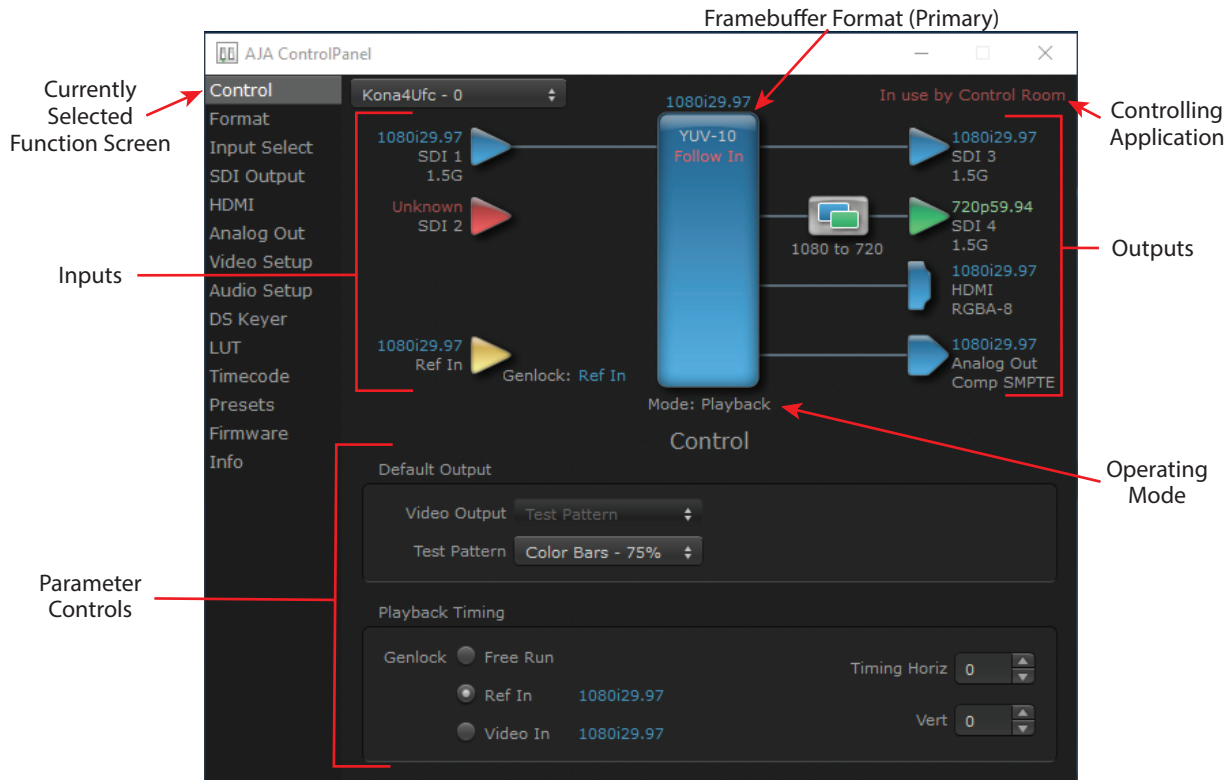
Some controlling applications can switch the card's mode from Playback to Capture, and vice-versa. When Control Panel is not being controlled by an external application, you can change the operating mode in the Control Panel Control Screen using the Default Output settings.

- Selecting Input Passthrough sets the card to Capture Mode.
- Selecting either Color Bars or Hold Last App sets the card to Playback Mode.

See *"Default Output" on page 34* for more information

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 16. Context Sensitive Menu
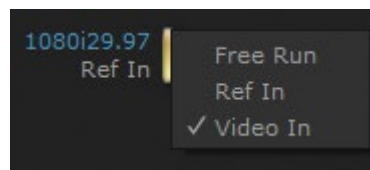
Color Meanings

All items in the AJA Control Panel block diagram are color-coded to show what is happening in real time. 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
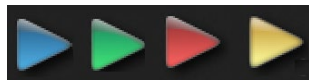
Input/Output Icons

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 17. 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

NOTE: *A secondary format is not available on a KONA 4 operating in 4K Mode, or on the KONA 5 or KONA 1 cards.*

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.

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.

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 has 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 18. Up, Down, and Cross-convert Icons

Controlling Application

It is important to understand that your computer may 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. In the top right corner, the Control Panel displays the name of the application controlling the unit.

Figure 19. Control Panel In Use Message (in red)
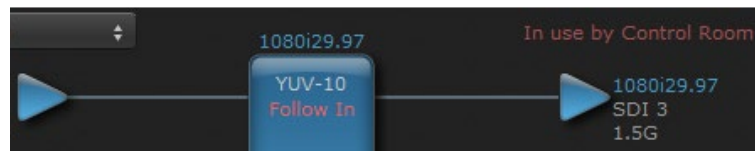
KONA is very flexible and most controlling applications perform the necessary housekeeping so they work correctly when they're active and when they're not. This means that the application that is "active" (in front) will be granted control of the KONA video output. Generally, when you switch to a different application, the previous application lets go of the video output and the new application gets control.

In some cases, however, applications may not always properly "let go" of the I/O interface as another takes over. If this occurs you'll be able to tell by looking at the Control Panel's in use application name.

Controlling Application Format Selection

If a running controlling 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.

Controlling applications can start and stop and change modes—even while they are running. And the behavior of different controlling 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 controlling 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.

Presets

Control Panel 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.

Table 1. KONA Function Screens

Screen	Functions
Control	Configure some basic 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 Output	Select output format.
HDMI	Configure the HDMI I/O (not KONA 1).
HDMI HDR	(KONA 5 and KONA 4 in 4K Mode) Configure High Dynamic Range settings for HDMI output.
Analog Out	Configure the component format and audio monitor setup (not KONA 1, KONA 5).
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.

Screen	Functions
Audio Mixer	(KONA 5 and KONA 4 in 4K Mode) Select and mix audio sources for playback and capture.
DS Keyer	Setup and control the insertion of keyed video from the framebuffer 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.
Presets	Add or delete saved preset configurations (handy for quick and easy recall of different KONA settings for varied workflows).
Firmware	Install device 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.

About KONA Modal Operation

The KONA 4 card supports modal operation. Functionality depends on what firmware has been installed on that card.

For KONA 4 you can choose to install either:

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

Most UFC Mode functionality is also present in 4K Mode, with some exceptions. Refer to *"Control Panel 4K/UltraHD Operation" on page 6060)* for information about these differences.

NOTE: *KONA 5 and KONA 1 currently support one card-specific firmware version each.*

Using Multiple AJA Products

More than one AJA product can be installed and available to 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 4-0 and the pane heading will read "AJA Control Panel" if you have more than one product and the associated drivers installed (if only one product is installed, you'll see no product or pulldown and the product name will appear in the header). To "target" a specific installed product for use, click on the text in the upper left hand side of the UI and select from the list of available products that appear in the pulldown.

Figure 20. Control Panel Screen Showing Multiple AJA Devices
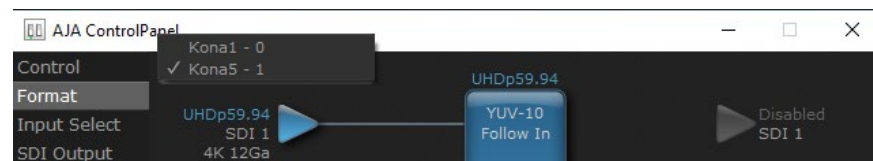
When you launch an editing application, or AJA Control Room, the application will use the product that is currently selected in the AJA Control Panel for its input/output. When an application is running, you can change the "targeted" product selection using the Control Panel pulldown menu. The running application will retain its connection to the product. If you change the "targeted" product and launch a different application, that application will use the new product for its input/ output, while the first application you launched will continue to use the other AJA product.

Example: if you select a KONA card as the targeted product in AJA Control Panel and launch the AJA Control Room application, Control Room will now use the KONA card for its input/output. Go back to the AJA Control Panel and select an installed T-TAP as the "targeted" product. Now if you launch Adobe Premier Pro, that application will use T-TAP for playback output. If you switch back to the Control Room application, you will see that it is still using the KONA card for its input/output. Note that some applications have a provision for playing in the background, so playback on one product could continue when switching the targeted device for use with another application. For example, provided you have a sufficiently powerful host computer running a recent OS, then a possible setup could be to capture video using the KONA card with the Control Room application, while simultaneously viewing playback video from the Adobe Premier Pro application through T-TAP.

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 card 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 continue when switching the targeted device for use with another application. In such cases, it may be possible to build a workflow whereby the output from one AJA product is fed to another AJA product on the same system (accepting of course, that the downstream device will have an offset from the upstream device of around 3 frames).

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.

General Control Panel Operation

The following Control Panel screens, primarily of KONA 4 in UFC mode, describe operation of the available device control parameters. Control Panel screens that differ significantly for other devices (KONA 5, KONA 1) are also shown as appropriate.

See *"Control Panel 4K/UltraHD Operation" on page 60* for detailed information about KONA 4 in 4K Mode, which also can apply to the KONA 5 card operation.

Control Screen

Figure 21. Control Screen, KONA 4 in UFC Mode
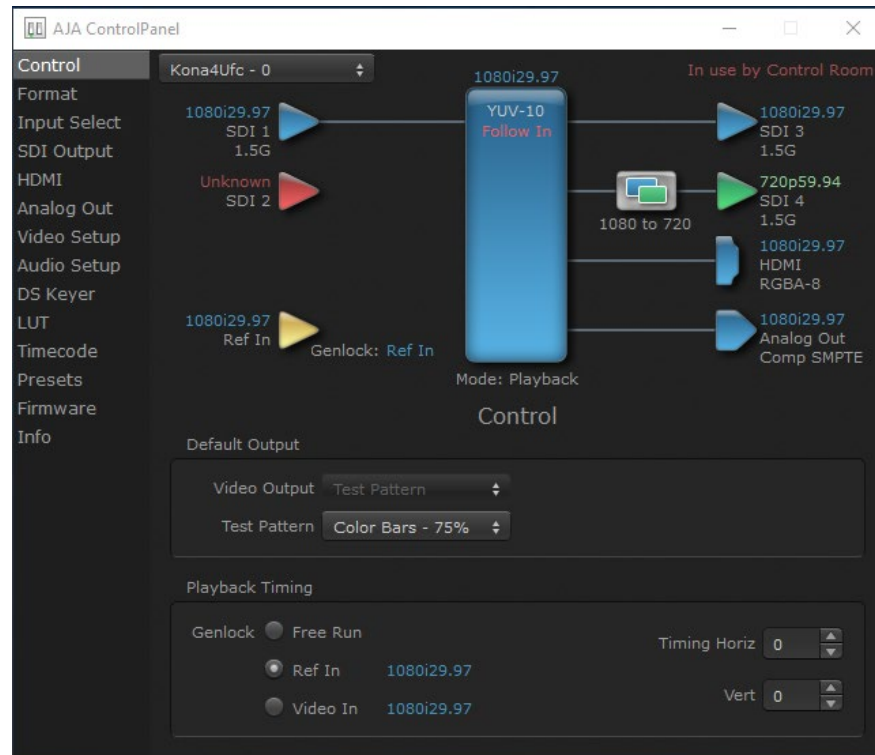
The KONA card can be controlled by various software applications running on a host computer. The Control screen is where you select how the KONA directs video and is used by application software. This screen also provides control for configuring output timing with regard to external reference video and horizontal/vertical delay.

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 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.

Input Passthrough

This selection directs KONA to route video from its selected input through the card for processing and output, and enables Capture Mode.

NOTE: *Selecting Input Passthrough on a KONA 4 card in UFC Mode essentially 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 need to dub an SD source tape that 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.*

Test Pattern

This selection directs the KONA card to output a choice of preset pattern when no other application is using the KONA card, and enables Playback Mode. The test patterns you can choose are:

- 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 framebuffer for display.

NOTE: The graphic file will not be scaled to fit. If it's smaller than the current framebuffer format, KONA will center it in the frame. If it's larger than the current framebuffer 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 framebuffer 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 closes.

Hold Last App

This selection directs KONA to hold and output the last frame of video from the last application to control KONA, and enables Playback Mode. 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

NOTE: For best results when capturing using Avid Media Composer or AJA Control Room, set Ref In to Video In with AJA KONA, AJA Io products and Avid DNxIV, DNxIP.
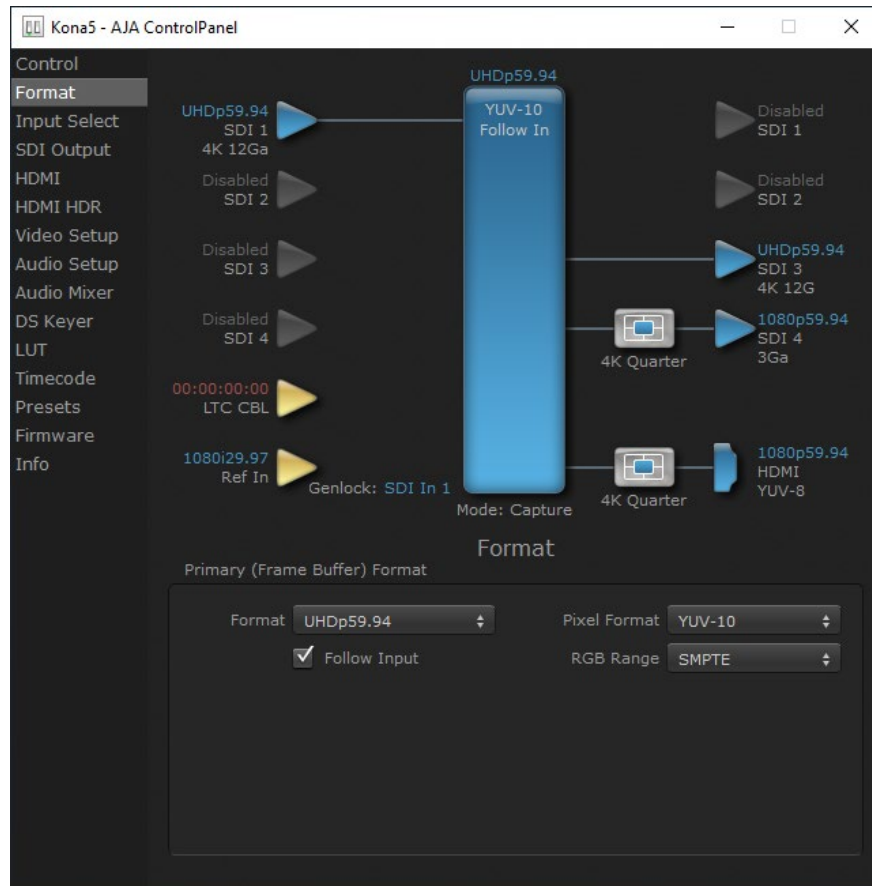
Timing (Horiz and Vert):

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

Figure 22. Format Screen, KONA 5

The Format Screen shows the video format currently in use by the KONA framebuffer (called the Primary Format) and allows you to change it.

The KONA 4 Format Screen in UFC mode also displays a Secondary Format for hardware conversion (not available on KONA 5 or KONA 1 or KONA 4 in 4K Mode). See *"Secondary (Converted) Format" on page 37* for more information

Primary (Frame Buffer) Format

This pull-down menu shows the currently selected format. 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.

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.

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.

Secondary (Converted) Format

The KONA 4 Format Screen in UFC mode displays Secondary Format controls for hardware conversion.

Figure 23. Format Screen, KONA 4 in UFC Mode
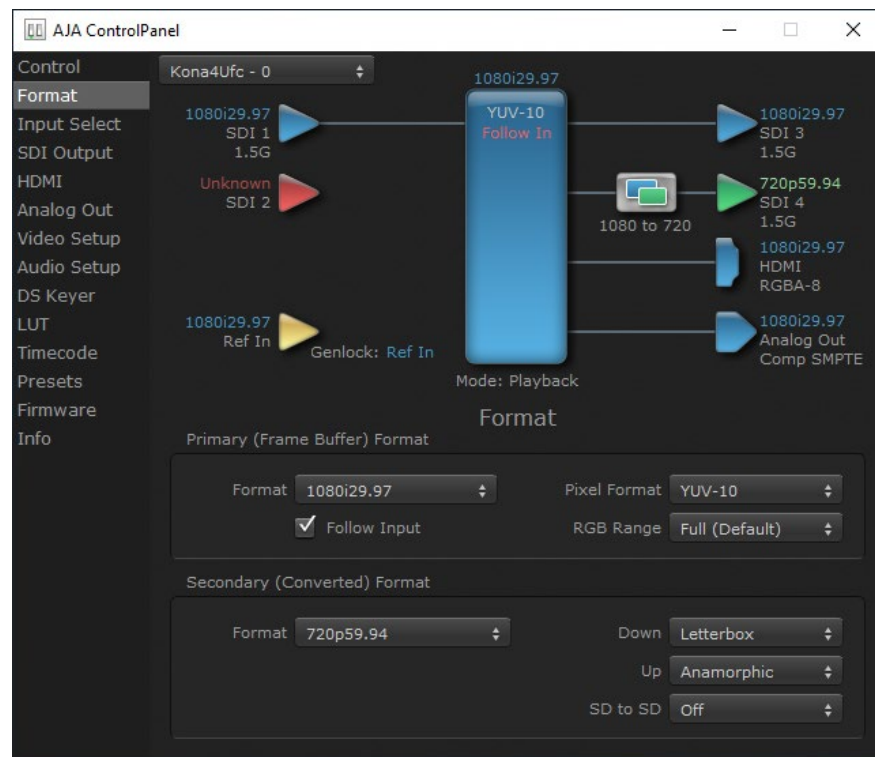
NOTE: Format screen conversions are not available on the KONA 4 card in 4K mode, or on the KONA 5 and KONA 1 cards.

The Secondary Format shows the currently selected Secondary format. When the Secondary Format is different from the Primary Format, a conversion will be performed on the output, and the block diagram changes to reflect the new processing.

The Secondary 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 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.

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

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 down-converted 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

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

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 will perform a cross-conversion where necessary (input or output) for "like frame rate" formats. For example, 720P 59.94 may be converted to 1080i 29.97. Converting from disparate frame rates is not supported on the KONA 4 for cross-conversions.

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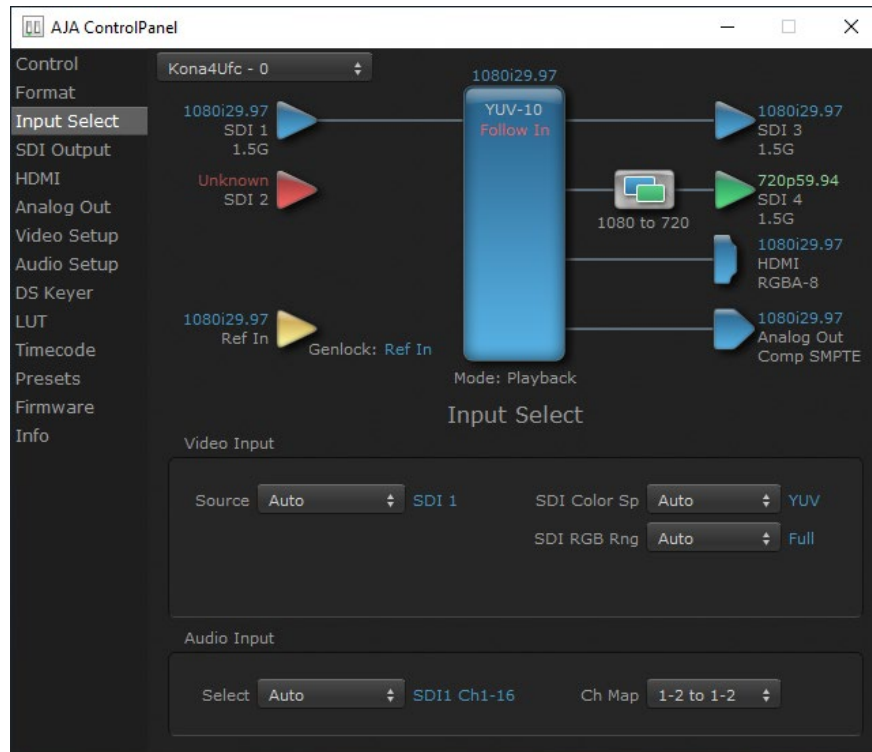
On the Input Select Screen, you can or set view the currently selected video and audio input sources and map audio sources to the channels supported by your editing application. Two information panes in the screen are provided: Video Input and Audio Input.

Video Input

Source

The pulldown menu allows you to select the currently selected video input source. Different KONA cards have different input capabilities. Select from:

- Auto - Automatically selects the source depending on input format.
- SDI (KONA 1)
- SDI 1
- SDI 2
- SDI 2xHD
- SDI 2x4K
- SDI 4x4K

SDI Color Sp

Sets the color space. Select from Auto, YUV, or RGB.

SDI RGB Rng

Sets the RGB range. Select from Auto, SMPTE, or Full.

LTC/Ref (KONA 5, KONA 1)

KONA 5 and KONA 1 cards support LTC on the Reference. Select from:
- Reference - Receives only reference on the Reference input
- Ref + LTC - Receives both reference and timecode on the Reference input
- LTC - Receive only timecode on the Reference input

Audio Input

Select

The select pulldown menu allows you to pick where the audio comes from. Different KONA cards have differrent audio input capabilities. Select from:
- AES/EBU (BNC)
- SDI 1 Ch1-16
- SDI 2 Ch1-16

Ch Map

If only two channels were selected in the third-party application you are using, you can select which two channels will be mapped to that application. Different Audio Input selections can have different channel mapping capabilities. Select from:
- 1-2 to 1-2
- 3-4 to 1-2
- 5-6 to 1-2
- 7-8 to 1-2
- 9-10 to 1-2
- 11-12 to 1-2
- 13-14 to 1-2
- 15-16 to 1-2

NOTE: *This setting does not affect the embedded audio being sent to the KONA's BNC or HDMI output connectors.*

SDI Output Screen
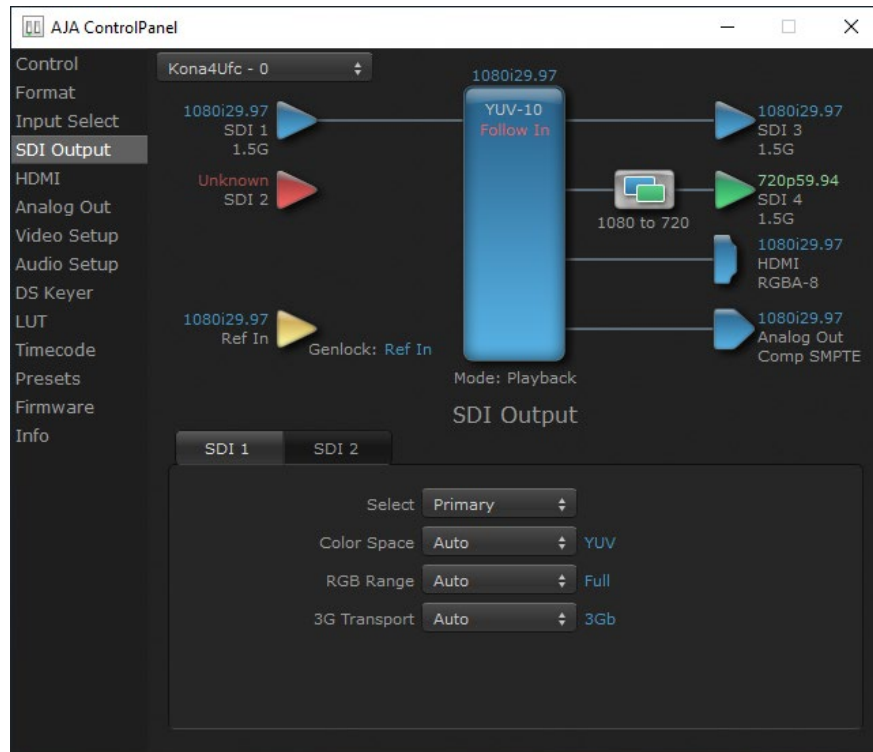
On KONA 5, KONA 1, and KONA 4 in 4K Mode the SDI Output screen is used to configure the KONA card's SDI Output signal.

Output Options

Select

- Auto - Automatically selects the output format, based on the input or selected format.
- Primary - Selects the framebuffer format for output.
- 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.

Color Space

Sets the color space. Select from Auto, YUV, or RGB.

RGB Range

Sets the RGB range. Select from Auto, SMPTE, or Full.

3G Transport

Sets the output transport. Select from:
- Auto - Auto selection based on input or selected format
- 3Gb - Single link HD output using one BNC. The Level B-DS format is the dual-stream carriage of two independent HD-SDI/SMPTE 292M signals (720p up

to 60 fps or 1080i/1080p up to 30 fps) in a single serial digital interface at the nominal 3 Gbit/s.

- 3Ga - Single link HD output using one BNC. The Level A format is the direct mapping of uncompressed 1080p (up to 60 fps) video into a serial digital interface at the nominal 3 Gbit/s.
- 2xHD-DL: Dual link HD output using two BNCs. The Level B-DL format is the mapping of dual-link HD-SDI/SMPTE 372M (i.e.: 1080p up to 60 fps) in a single serial digital interface at the nominal 3 Gbit/s.

NOTE: See *"SDI Output Screen in 4K Mode" on page 65* for information about 4K Transports.

SDI Output Screen, KONA 4 in UFC Mode

On KONA 4 in UFC Mode, two SDI output are available, (SDI 1 and SDI 2) which can be configured differently from each other. For example, one output can be the Primary format and the other output cab be the Secondary format.

Figure 24. SDI Output Screen, KONA 4 in UFC Mode
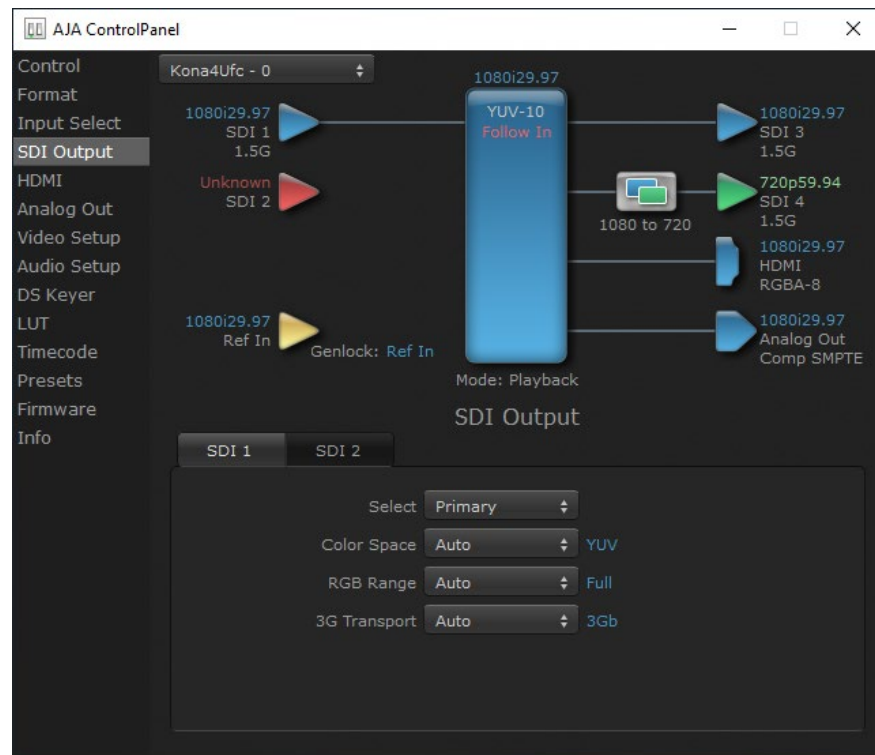
SDI 1

Sets the output format for SDI 1. Parameters are the same as *"Output Options" on page 41* above, except you can select a Secondary Format and 4K Transport settings are not available:
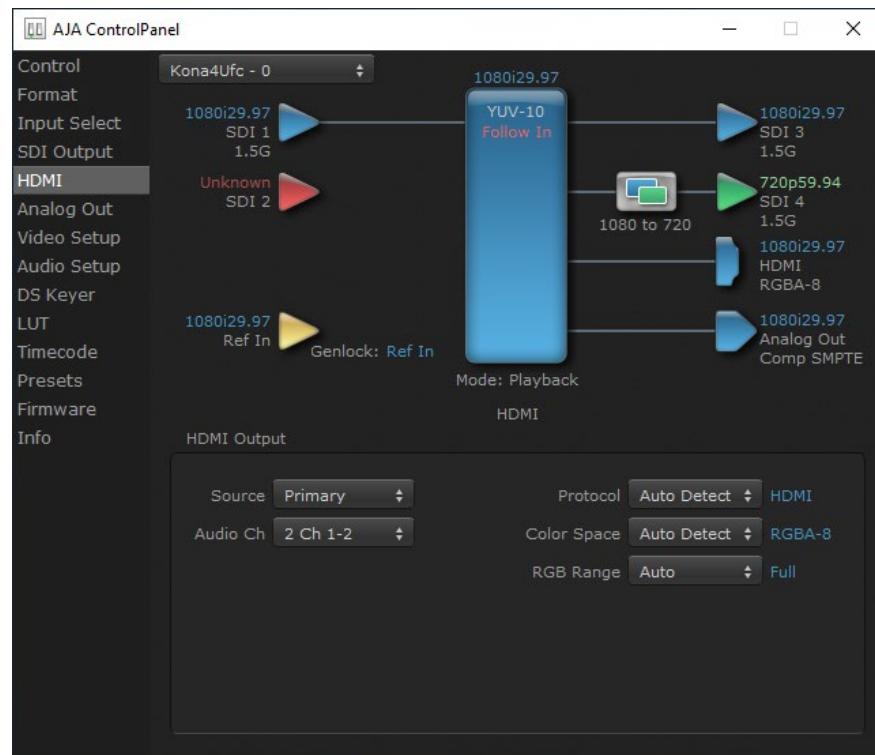
Select

Same as above with the addition of a Secondary output format:

- 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).

SDI 2

Same parameters as SDI Output 1, but are applied to the KONA card SDI Output 2.

HDMI Screen

NOTE: *This screen is not available on KONA 1.*

The HDMI screen is used to configure the KONA card's HDMI Output signal.

HDMI Output

Source

- Auto - Automatically sets the HDMI output format, based on the input or selected format.
- Primary - Selects the framebuffer format for output.
- Secondary (KONA 4 in UFC mode) - Sets the HDMI output to the Secondary format (set in the Format screen) for up/down/cross-conversion).
- 4K Quarter (KONA 5, KONA 4 in 4K mode) - Sets the HDMI output to downconvert to HD.

NOTE: *The 4K Transport setting on the SDI Out screen also affects the KONA HDMI output signal, even if the SDI inputs are not being used. A SMPTE 2Si setting is required for UltraHD/4K HDMI output. Other 4K Transport settings will downconvert HDMI output to HD or 2K.*

Audio Ch

This pulldown allows you to select the number of embedded audio channels for the HDMI output. Two or eight channels can be chosen. Select from:

- 2 Ch 1-2 through 15-16
- 8 Ch 1-8
- 8 Ch 9-16

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. Select from:

- Auto Detect – Automatically selects the mode based on 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.
- RGBA-8 - Uses 8-bit RGB mode regardless of the attached device's EDID.
- RGB 10 - Uses 10-bit RGB mode regardless of the attached device's EDID.
- YUV-8 - Uses 8-bit YCbCr mode regardless of the attached device's EDID.
- YUV-10 - 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.

- Auto
- SMPTE– (typically 64-940)
- Full–(0-1023)

Analog Out Screen
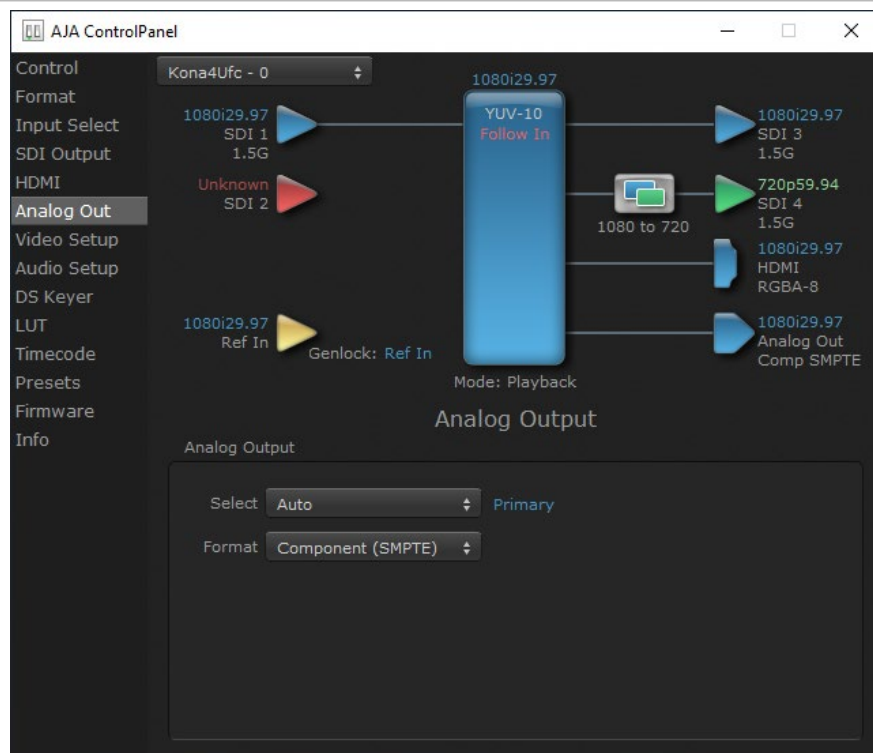
NOTE: This screen is not available for the KONA 5 or KONA 1 cards.

KONA 4 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).

Analog Output

Select

Sets the analog output format. If a conversion is applied, you'll see the conversion icon appear on the block diagram.

- Auto - Automatically sets the analog video output format, based on the input or selected format.
- Primary - Selects the framebuffer format for output.
- Secondary (KONA 4 in UFC mode) - Sets the output to the Secondary format (set in the Format screen) for up/down/cross-conversion).
- 4K Quarter (KONA 4 in 4K mode) - Sets a downconversion to 2K x 1080 in 4K or 1920 x 1080 for UltraHD.
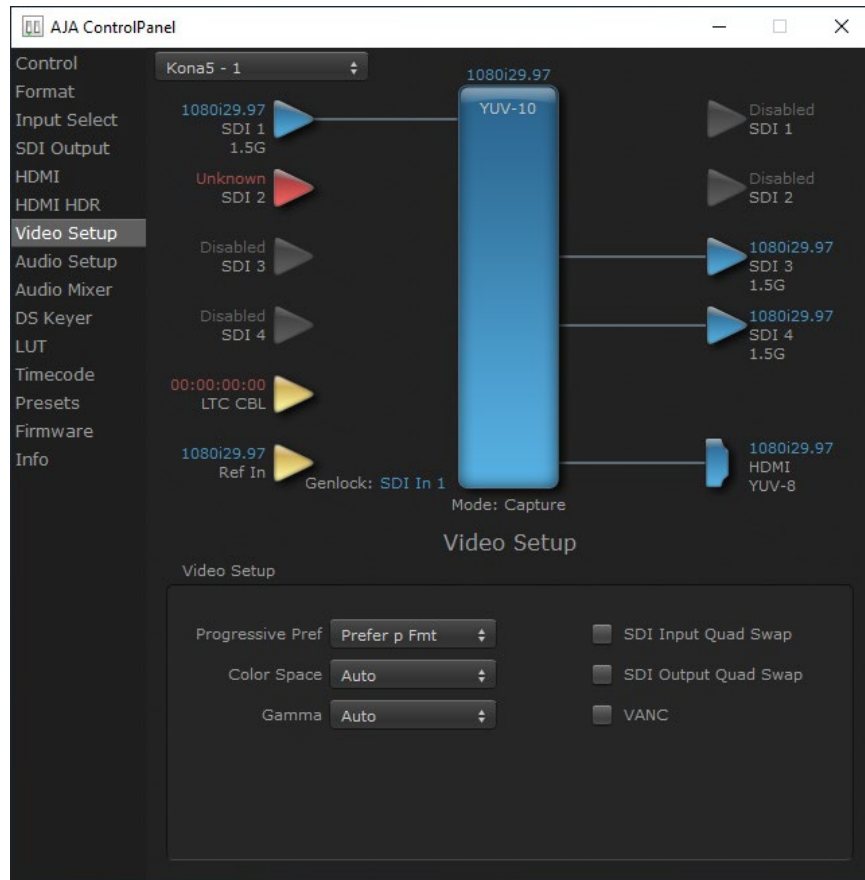
Format

Select the video format from the Format pulldown.

- Composite + Y/C
- Component (SMPTE)
- Component (Beta)
- Component (RGB)

Video Setup Screen

Figure 25. Video Setup Screen, KONA 5

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.

Video Setup

Progressive Pref

Allows you to choose to prefer p (progressive frames) or PsF (progressive segmented frames) on 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.

Color Space

Sets the video color space. Select from:
- Auto
- Rec 601
- Rec 709

Gamma

Sets the video gamma. Intended for use with legacy Apple displays. Select from:
- Auto
- Gamma 1.8

SDI Quad Swap

- See *"Video Setup Screen in 4K Mode" on page 47* for information about the Quad Swap settings, available with 4K/UltraHD signals.

Analog Black (KONA 4 only)

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)

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.*

Audio Setup Screen
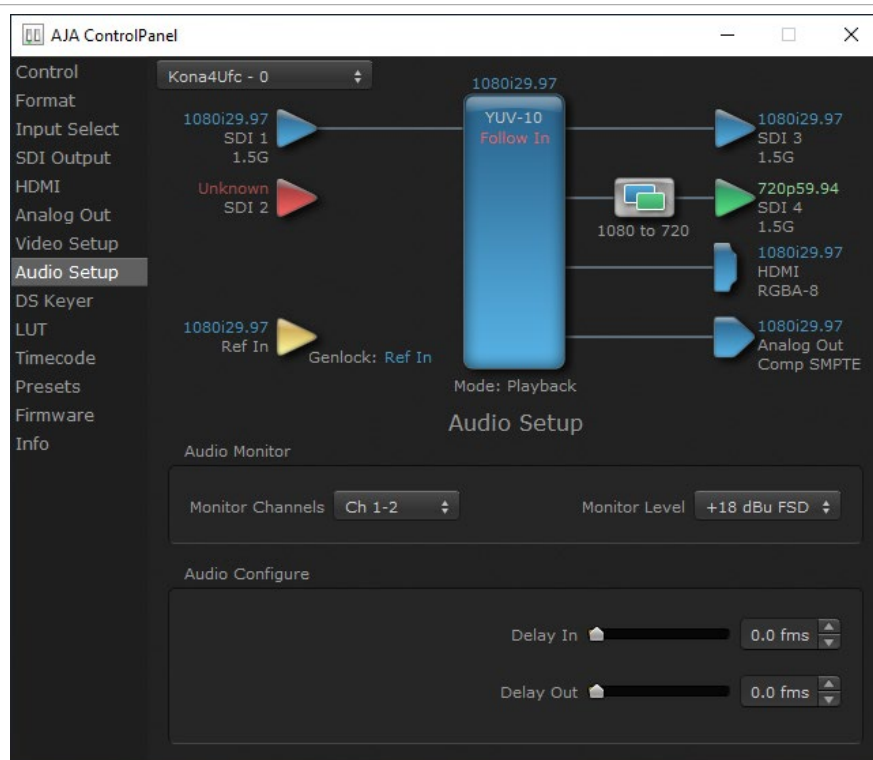
The Audio Setup Screen shows the current settings for the analog audio output, allowing you to re-configure it when desired. Different screens are displayed depending on the KONA product.

Audio Monitor

Monitor Channels

Use the drop-down menu to select which two audio channels to monitor. Select from Ch 1-2 through Ch 15-16.

NOTE: *This setting only applies to dual channel monitoring environments.*

Monitor Level

Allows adjustment of the analog monitor level, to match the audio to your operating levels. Select from:
- +24 dBu FSD
- +18 dBu FSD (default)
- +15 dBu FSD
- +12 dBu FSD

Audio Configure

IO Select (KONA 5 only)

Allows you to configure the AES audio breakout cable inputs and outputs.
- 8-Out - All eight AES BNC connectors are used for output, each carrying a stereo AES audio channel.
- 4-In 4-Out - AES 1/2-7/8 In BNCs are used for input, AES 1/2-7/8 Out BNCs are used for output.
- 4-Out 4-In- AES 1/2-7/8 In BNCs are used for output, AES 1/2-7/8 Out BNCs are used for input.
- 8-In - All eight BNC AES connectors are used for input, each carrying a stereo AES audio channel.

Delay In/Out

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.*

Audio Mixer Screens (KONA 5, KONA 1, KONA 4 in 4K Mode)

NOTE: *The Audio Mixer screens are not available in KONA 4 in UFC Mode.*

The Audio Mixer screen has two tabs; Capture Monitor and Playback Monitor. These tabs display what sources are available for monitoring / mixing via the AJA hardware when in either of those two modes (if applicable). The controls on this screen are dedicated only to monitoring adjustments, and do not affect the level at which inbound audio signals are captured to storage.

The selection check boxes and screen slider controls affect the following KONA outputs:
- SDI Embedded Audio Out
- HDMI Embedded Audio Out.

IMPORTANT: *Even though you can hear changes in the signals and levels adjusted with the Audio Mixer screen, these changes are NOT recorded to disk during NLE Capture or Audio Punch In / Voice Over to Timeline. In addition, muting or activating sources on this screen will not affect audio signals being recorded. The Audio Mixer screen is dedicated for monitoring only, not program mixing.*

The branching arrow on the lower right indicates which sources are being routed for monitoring in that operating mode, and is colored blue when active and red when disabled.

*Figure 26. Audio Mixer Screen Example, KONA 5*
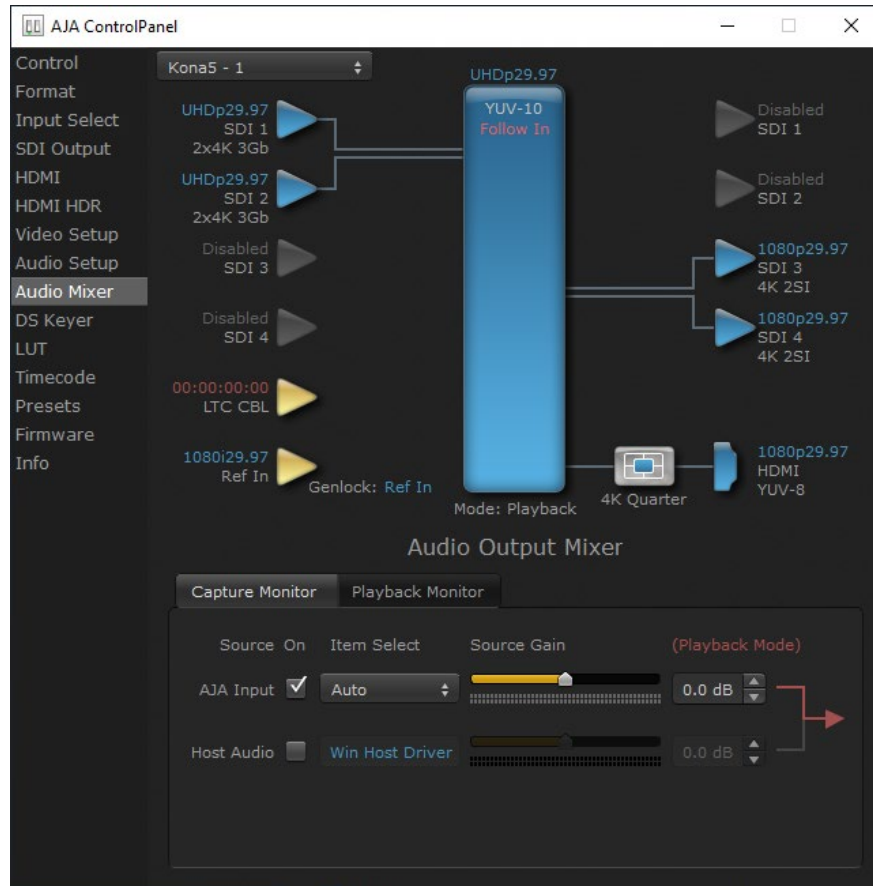
Each source has a confidence meter, which enables you to tell immediately if you have a source arriving correctly at the AJA hardware (without having to launch any other software). The level sliders allow a simple plus or minus adjustment to the Source level being monitored. This is to allow for fine-tuning of your listening environment (on occasions the host system audio can be unexpectedly loud, or an incoming feed may be very loud or very quiet).

Two different Audio Mixer screens are available, selected by clicking on the Capture Monitor or Playback Monitor tabs. During capture operations, the Capture tab is used for your monitoring experience. During regular editing, the Playback tab is used to control your monitoring experience.

Controls in each tab are only in effect when KONA is in the correct operating mode, as determined by the controlling application or the Control Panel application's Default Output setting. When the mode doesn't match, the mode indicator on the right goes red (see *Figure 26*). However, settings can be adjusted while in that disabled mode, and will be applied when you return to that operating mode.

Audio Mixer Capture Monitor Mode Screen

Figure 27. Audio Mixer Screen, Capture Monitor Mode, KONA 5
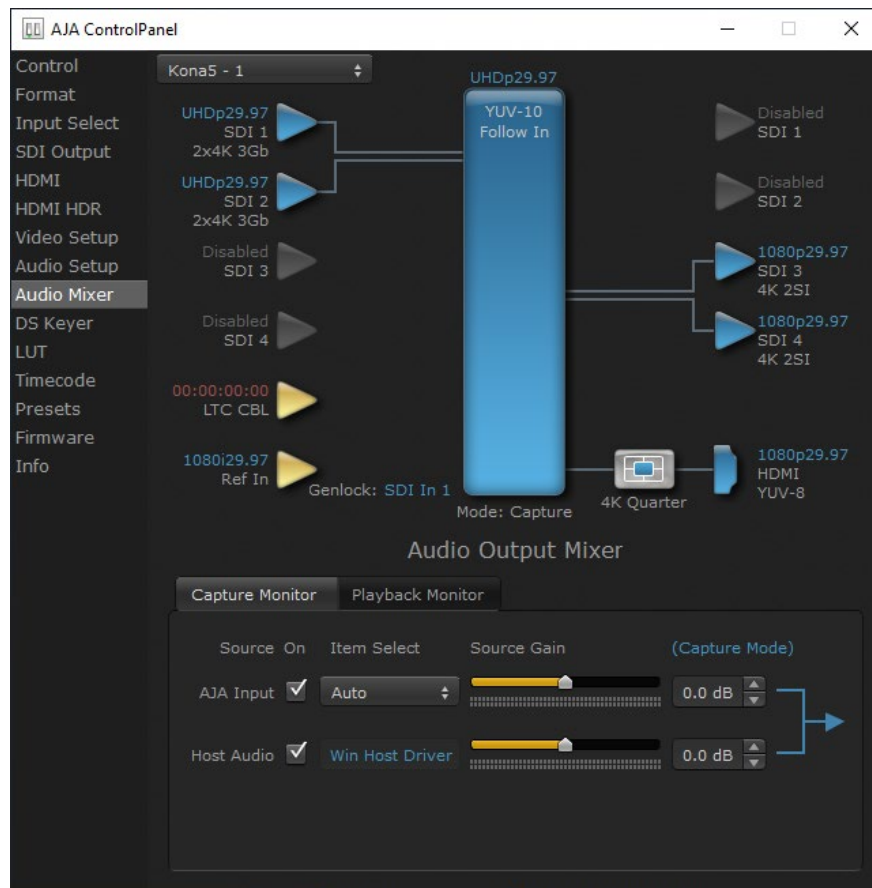
The Capture Monitor Mode screen is used to select and mix audio to be monitored during capture operations.

IMPORTANT: Even though you can hear changes in the signals and levels adjusted with the Audio Mixer screen, these changes are NOT recorded to disk during NLE Capture or Audio Punch In / Voice Over to Timeline. In addition, muting or activating sources on this screen will not affect audio signals being recorded. The Audio Mixer screen is dedicated for monitoring only, not program mixing.

The controls on this screen are similar to those on the Playback Monitor Mode screen, except the Main App is not available for selection (you cannot capture from the application that is capturing). See *"Audio Mixer Playback Monitor Mode Screen" on page 51* for more information.

NOTE: If you want different behavior when the Capture tab is triggered; i.e. for host system audio to be muted, then simply check the host system audio in the Capture tab only. This way when you exit NLE Capture and return to regular editing, the Playback tab settings will be applied and your host system audio monitoring will resume.

Audio Mixer Playback Monitor Mode Screen

Figure 28. Audio Mixer Screen, Playback Monitor Mode, KONA 5
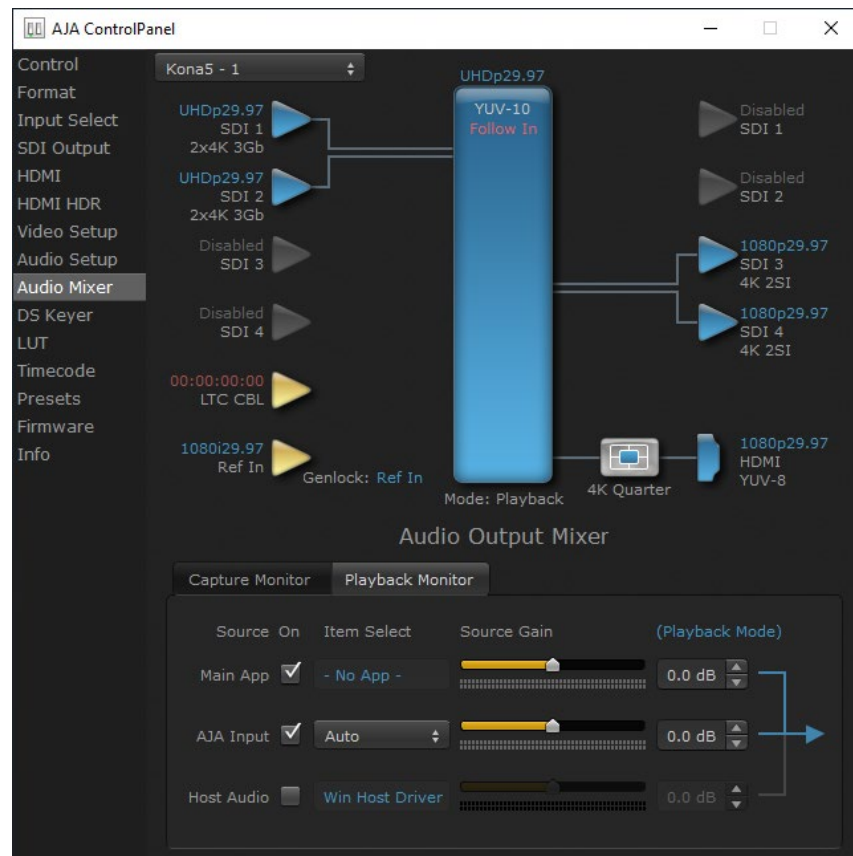
Playback Source Selection

Clicking the **On** checkbox selects the audio for that item for playback to the audio monitor outputs. Multiple sources can be selected simultaneously.

Main App

If an external application is controlling the KONA, it will be displayed in the **Item Select** column and its audio can be selected for playback with the checkbox.

AJA Input

Selects for monitoring the audio being input to KONA.

NOTE: *The AJA Input Item Select dropdown selection is linked to the Input Select screen's Audio Input Select dropdown. Changing the setting on one screen will also change the setting on the other screen.*

In the **Item Select** column, click on the dropdown and choose from:

- Auto - Automatically selects audio as detected.
- AES/EBU - Digital audio being received on the breakout cable BNCs or breakout box (not KONA 1).
- SDI Ch 1-16 - The embedded audio being received on the KONA SDI In connectors.

Host Audio

Selects the audio from the host computer, thus enabling the AJA hardware to monitor anything that would normally be presented via the host laptop, CPU or computer monitor. For example, an editor could sample music from an online library, while concurrently playing back their NLE timeline. Or, a producer and editor could be communicating live during an editing session, using Skype or some other video calling tool.

Source Gain

Meters display the input audio levels of the source, colored green when that source is On, and gray when that source is not selected. The levels shown do not change when the gain is adjusted, because the input levels are being monitored, not the output levels.

When activated, the source gain controls can be used to adjust the monitoring output gain of that source, from +6dB to - infinity (mute). Adjustment methods include:

- Sliders - The sliders on the right can be used to change the values for each color.
- Numeric Entry - You also enter a numeric value by clicking on the displayed number, and can increase or decrease the values clicking on the up/down arrow boxes.
- Cut and Paste - Right clicking on a displayed number opens a Cut, Copy, Paste dropdown menu for convenient numeric entry.

As mentioned before, these controls are for monitoring only, and do not change the audio recorded to a NLE file. Any actual recording level adjustments to Capture or Audio Punch In / Voice Over to Timeline operations will either need to be made upstream of the AJA input, or else via adjustments within the main NLE application (e.g. via a pass through mix tool).

Downstream Keyer Screen
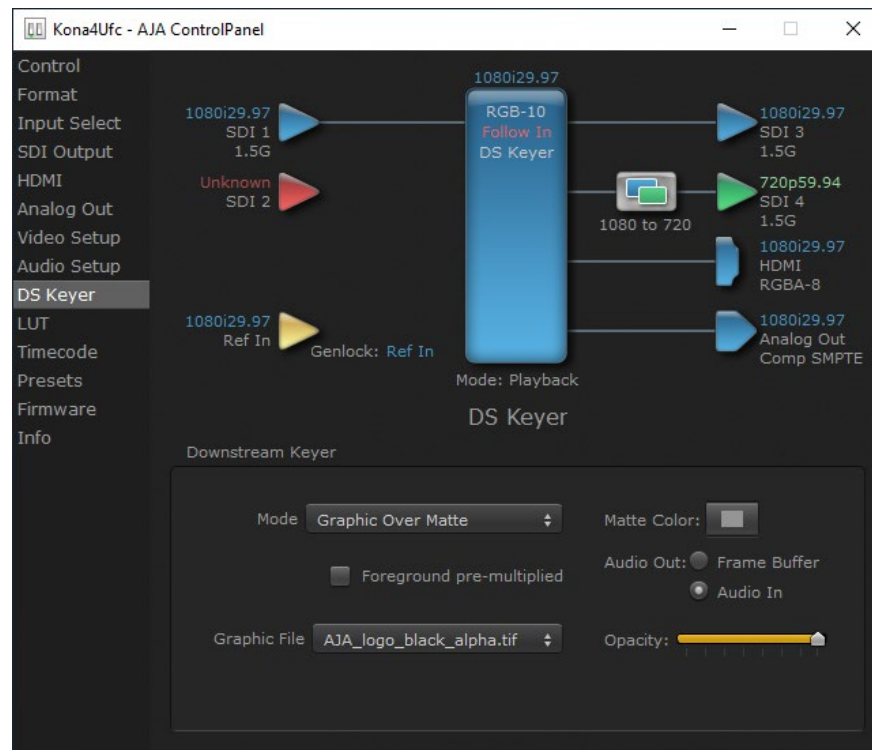
KONA cards have a hardware-based downstream keyer that is ideal for putting logos, "bugs" or other video material with an alpha channel on top of video being played out or printed to tape. Keyed video can be from the KONA's internal framebuffer (from storage, video In, KONA TV, etc.) or from a graphics file that has an alpha channel (PhotoShop etc.). Downstream keyer operation requires Control Panel to be in Playback mode (select Test Pattern as the Video Output in the Control screen).

NOTE: KONA's downstream keyer works with SD/HD/2K signals only, not 4K/UltraHD signals.

Settings in the DS Keyer Screen provide control over how the keyer operates and whether it's turned on or off.

Downstream Keyer

Mode

- Downstream Keyer Off - When this pulldown menu item is selected the downstream keyer will be turned off.
- Frame Buffer over Matte - fixed color matte determined by the "Matte Color" setting set separately.
- Frame Buffer over Video In - Places the keyed video currently in the framebuffer 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 framebuffer (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 framebuffer.
- Audio In - Select audio out to be routed from KONA's currently selected input(s).
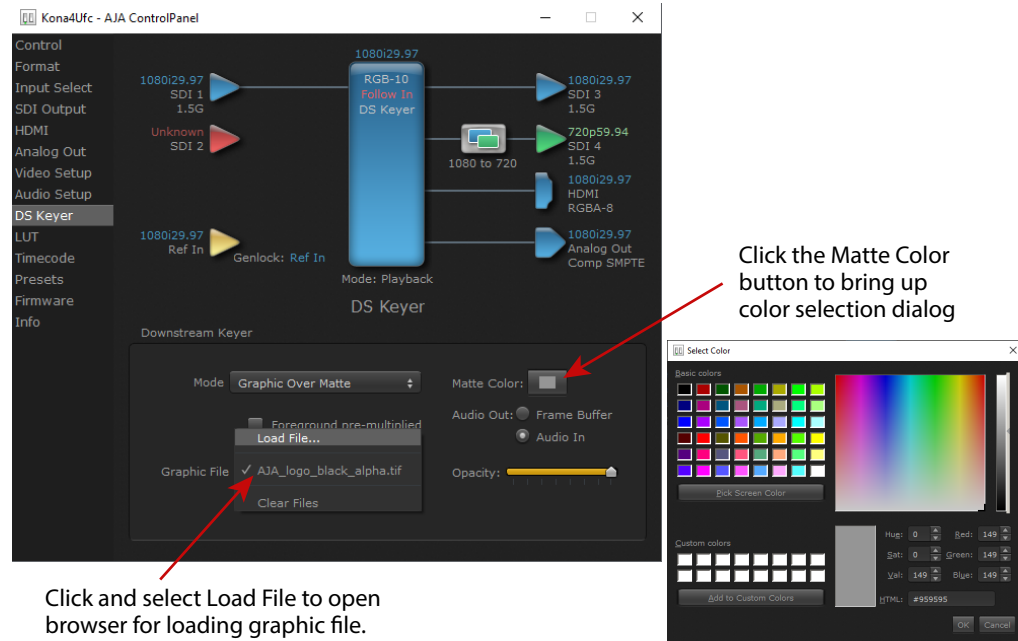
Opacity (slider)

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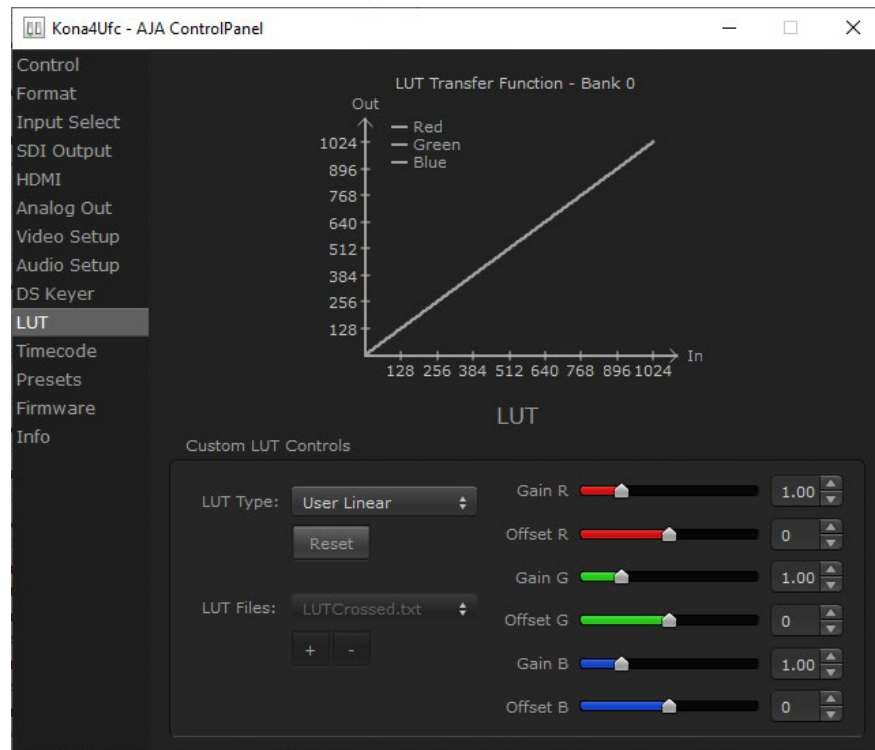
Graphic File

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 framebuffer 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 29. Graphic Selection and Matte Color Selection

Click the Matte Color button to bring up color selection dialog

Click and select Load File to open browser for loading graphic file.

LUT Screen

The LUT screen controls allow you to create a custom color look up table (LUT) on the output, for matching a production "look" on a specific display.

Users can also 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.

Custom LUT Controls

The LUT Transfer Function screen displays an approximate representation of the effect of the current LUT settings. When the controls are activated by selecting a User LUT Type, Red, Blue, and Green curves show the transfer functions of each color.

NOTE: The displayed curves are approximate. Curves for some extreme settings may diverge significantly from the actual transfer functions.

LUT Type

Selects the type of LUT. Choose from
- Auto - LUT will be automatically selected. This setting intelligently applies the type of LUT required in the majority of use cases. For example, if the framebuffer is set to SD 608 and the Output set to HD 709, then an industry standard curve for changing 608 to 709 color space is applied.
- Linear - A linear 1:1 LUT is applied, resulting in no color change (every value for source is mapped to the same value for output).
- SMPTE-FullRange - A conversion LUT from SMPTE to Full Range is applied.
- FullRange-SMPTE - A conversion LUT from Full Range to SMPTE is applied.
- User Linear - Activates the Gain and Offset controls, allowing the manual creation of a custom LUT. Initial default setting is linear.

Figure 30. Example LUT Transfer Function Curves

- User Film Stream - Activates the Gain and Offset controls with a default curve matching Grass Valley FilmStream cameras, and also allowing manual creation of a custom LUT.
- User LUT File - See *"LUT Files"* below.

Gain and Offset Controls

When activated, the controls on the right allow adjustment of Gain and Offset for Red, Blue and Green.
- Sliders - The sliders on the right can be used to change the values for each color.
- Numeric Entry - You also enter a numeric value by clicking on the displayed number, and can increase or decrease the values clicking on the up/down arrow boxes.

- Cut and Paste - Right clicking on a displayed number opens a Cut, Copy, Paste dropdown menu for convenient numeric entry.

Reset

Clicking on the Reset button resets the currently selected LUT Type to its default values (not active for a User LUT file).

LUT Files

The User LUT File setting above activates the LUT Files dropdown, allowing the selection of a previously saved LUT file. 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 56*).

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 framebuffer 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
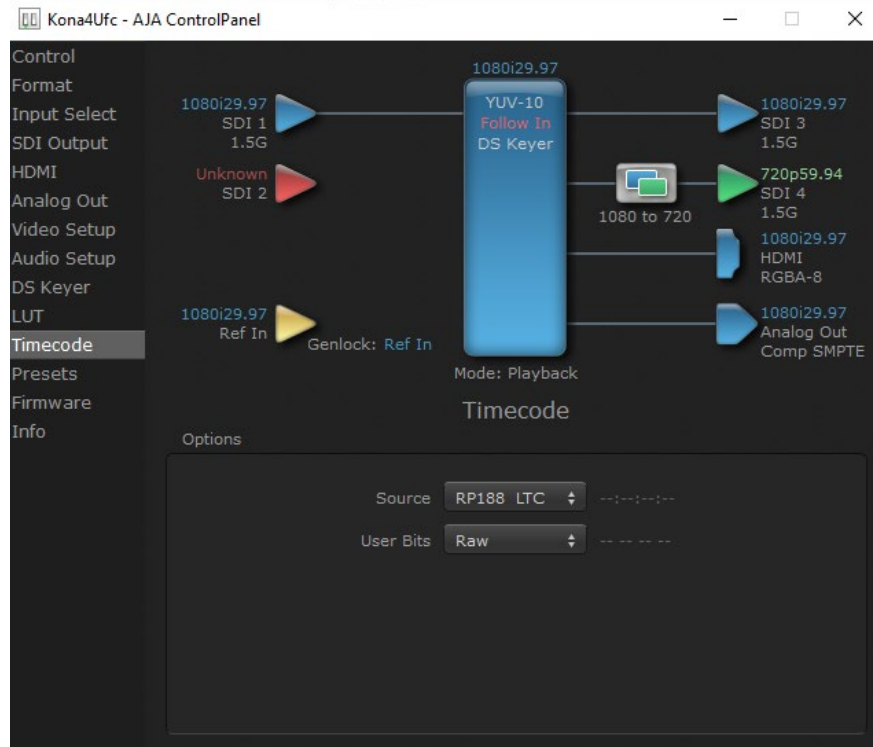
The Timecode Screen selects the timecode stream read for applications that use it (for example, when the timecode source is set to "Use control panel setting," AJA Control Room will read the selected stream). It is also used for monitoring the RP-188 timecode embedded in the digital data stream.

Options

Source

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 (Vertical Interval timecode)
- LTC Port input

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

User Bits

Select from Raw or VFR. For monitoring a variable framerate (VFR) timecode (such as Varicam), you may wish to select VFR for User-bits. 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. 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
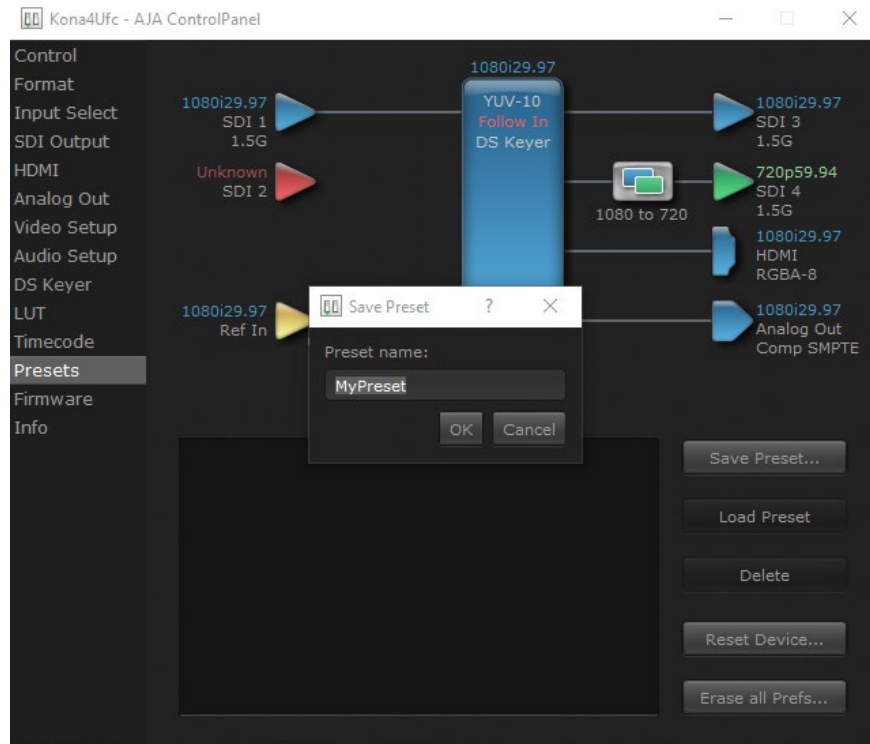
After configuring the AJA Control Panel screens, you can then save all your settings as a snapshot for later recall—called a preset. In this way, you can organize presets for all your typical tasks, eliminating time-robbing manual reconfiguration each time. To save a preset, go to the Presets screen 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.

Loading and Saving Presets

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 30*.

Firmware Screen
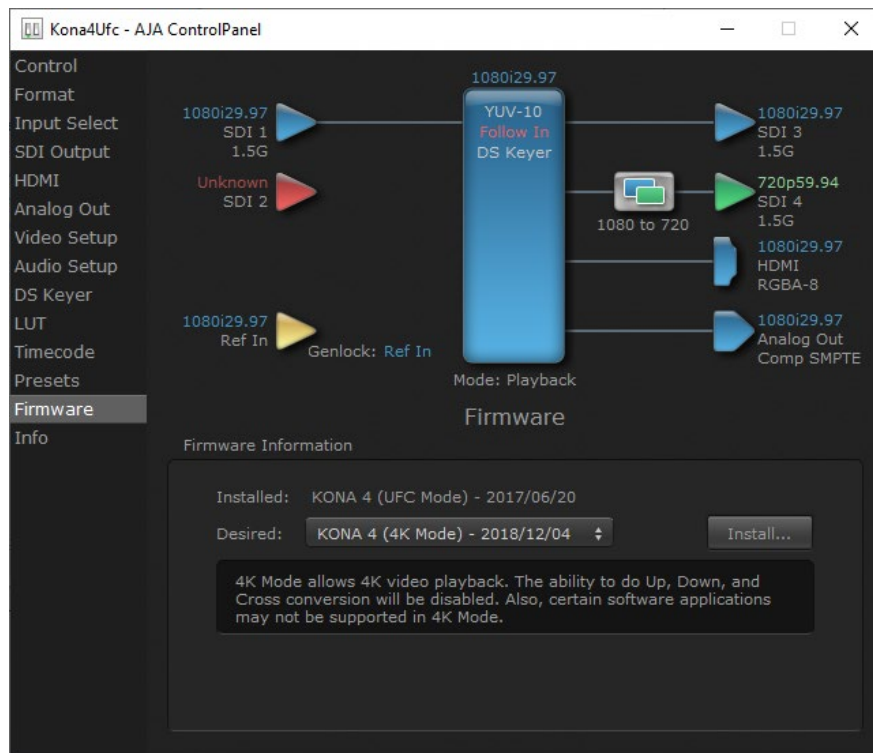
Use the Firmware link to access the firmware update/changeover screen.

For the KONA 4, the Desired pulldown menu allows you to select either:

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

Click **Install** to erase the current firmware and load the desired firmware.

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

See *"Firmware Update Procedure" on page 24* for details.

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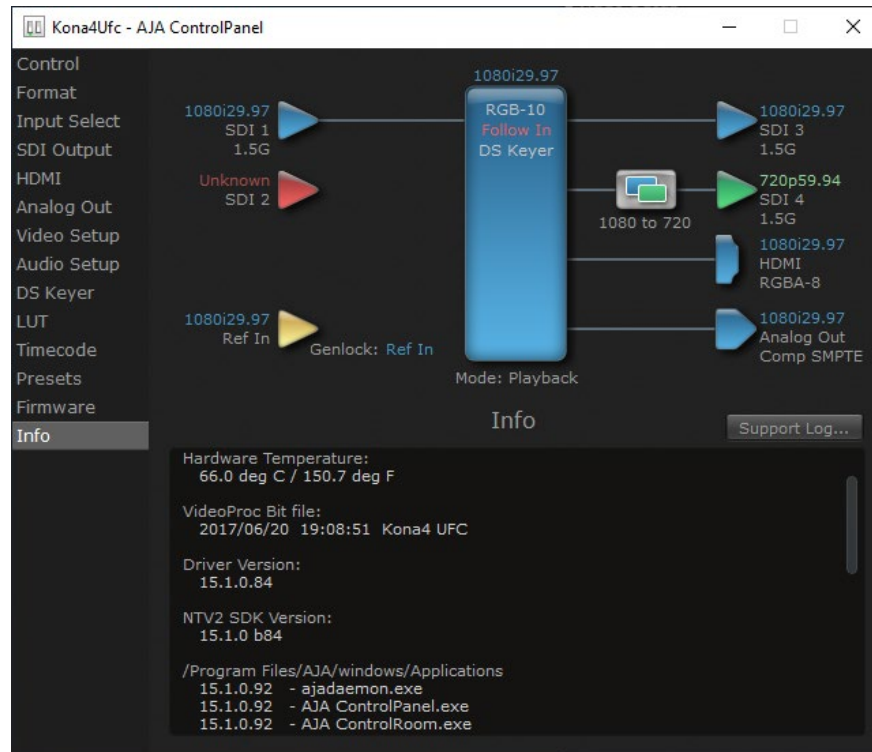
This screen shows the KONA software files that have been installed on your system. This information may be needed if you talk to an AJA Customer Service representative to determine if files are missing or need updating.

Control Panel 4K/UltraHD Operation

This section describes the AJA Control Panel operations specific to KONA 4 in 4K Mode and KONA 5. Note that in 4K Mode, you can still capture and playback SD, HD, and 2K formats.

4K Transport Modes

The 4K and UltraHD 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 (Square Division) 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 2Ksignals, KONA also supports the following transport modes for UltraHD and 4K:

- Quadrant 4-wire (transported on four links), available on KONA 4 and KONA 5.
- Quadrant 2-wire (transported on two links), available on KONA 4 and KONA 5.
- 2SI (two or four links automatically selected), available on KONA 4 and KONA 5.
- 12G single-wire (transported on one link), available on KONA 5.

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 (Square Division) 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 UltraHD 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 31. Mapping of Quad SDI Outputs

For UltraHD 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 UltraHD 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 32. Mapping of 2SI Outputs

For 2SI UltraHD 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.

2-Wire and 4-Wire Modes

Using higher data rates, it is possible to carry UltraHD 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. UltraHD 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).

Single-Wire Mode

KONA 5 supports 12G SDI and 6G transport over a single link. All formats described above can be carried on this link, but the associated source and destination equipment must support single-link 12G (high frame rate) or 6G (lower frame rate) video.

In Single-Wire 12G output mode, KONA 5 automatically outputs a down-converted 2K or HD signal on SDI output 4, along with the 4K/UltraHD signal sent to SDI output 3.

Control Panel Block Diagram Area in 4K Mode

Figure 33. Control Screen with UltraHD 4 Link Input (KONA 4)
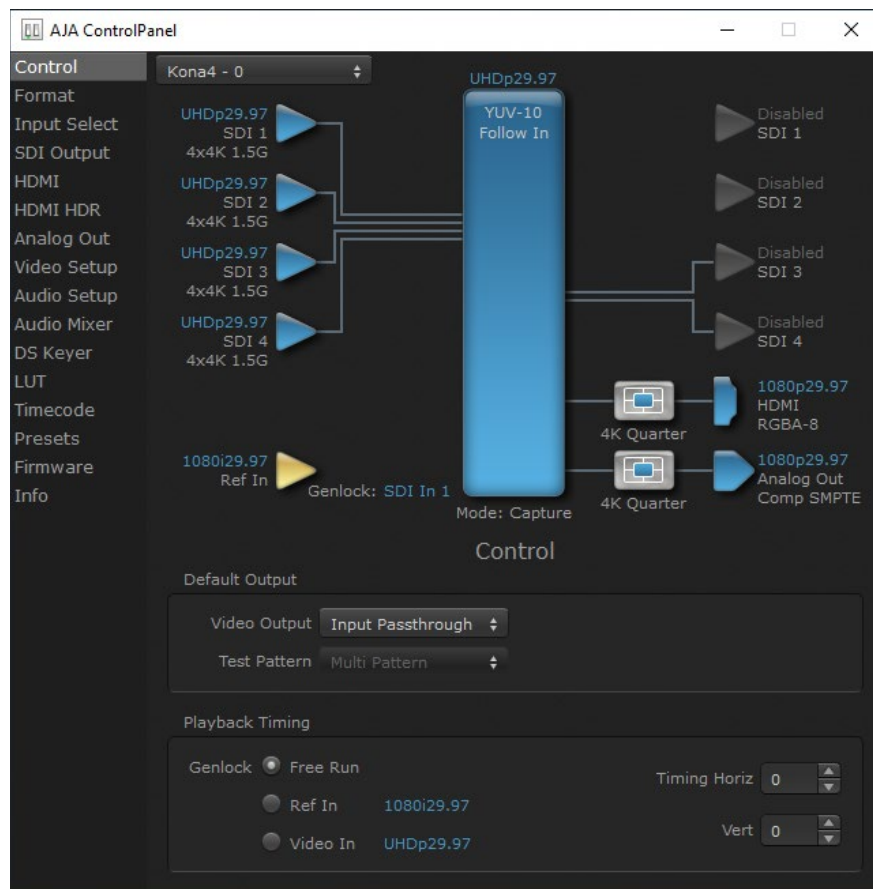
Besides SD and HD input and output, 4K mode permits UltraHD or 4K input and/or output.

For example, setting the Control Screen Default Video Output to Input Passthrough with a UltraHD 29.97 four link input connected, and selecting UltraHD/4K 4-wire Source on the Input Select menu, four connectors are used receive the signal to process. UltraHD signals report their links as1080. No SDI BNC output connectors are available for use.

If a 4K 29.97 two link input is connected and a UltraHD/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 SD output. 4K signals report their links as 2K.

Figure 34. Control Screen with 4K 2 Link Input and Output (KONA 4)
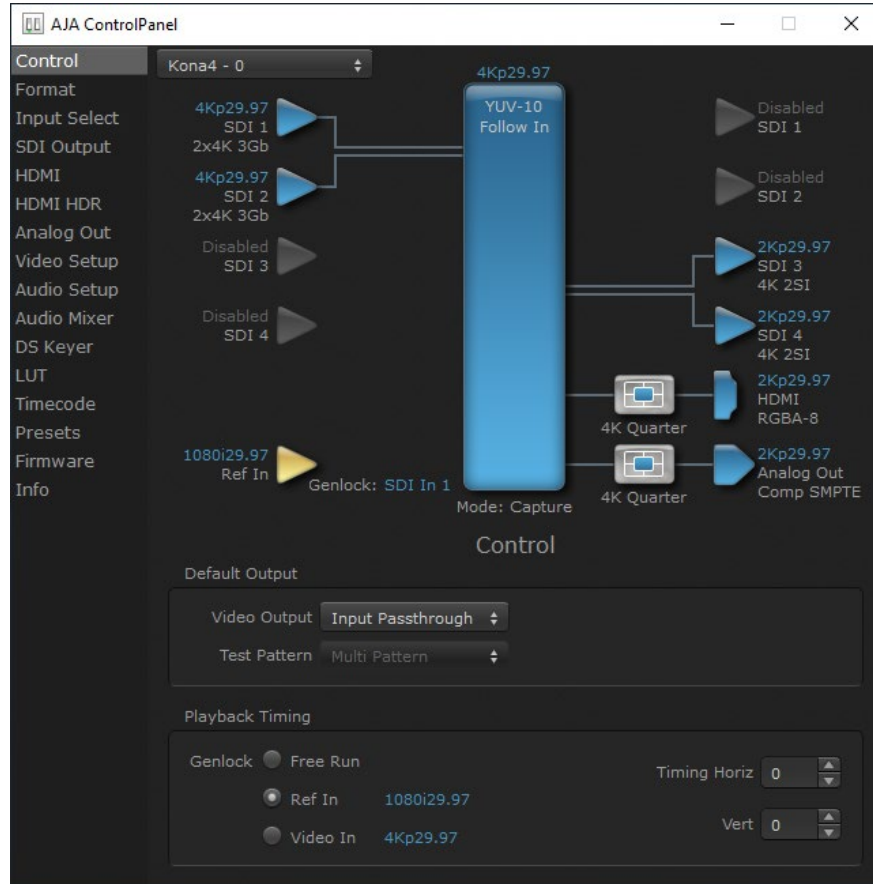
On KONA 5, when a single link UltraHD/4K input is being received, specifying a single link output will route the UltraHD/4K signal out SDI 3, and will simultaneously output a downconverted HD signal on SDI 4.

*Figure 35. Control Screen with UltraHD and HD Output (KONA 5)*
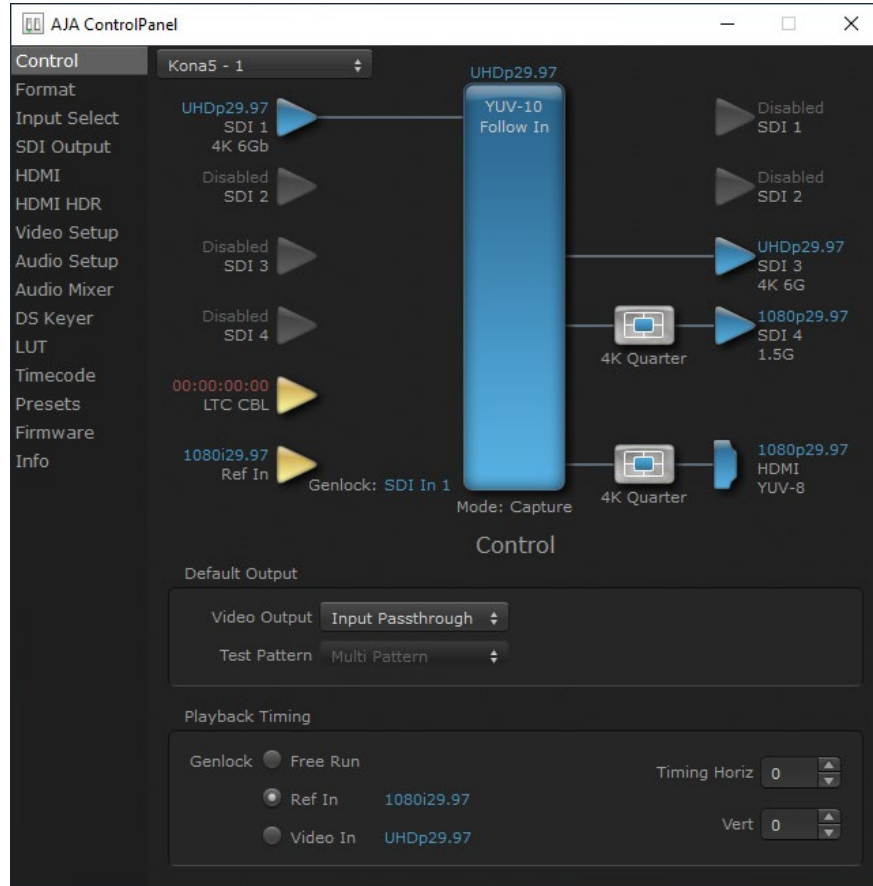
4K Controlled Mode

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 UltraHD or 4K input signal higher than 30 fps, all four BNCs may be required for SDI input or output. You can use the HDMI output to monitor an input signal.

SDI Output Screen in 4K Mode

Figure 36. SDI Out Screen with 4K Format
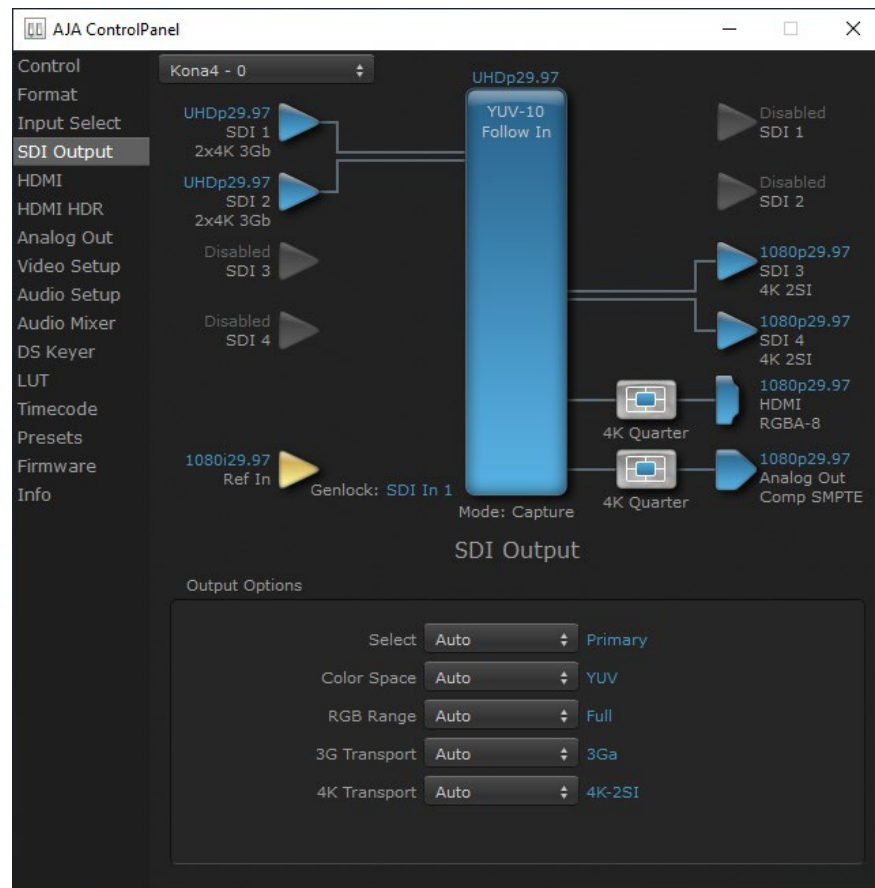
Besides the general settings described in *"SDI Output Screen" on page 41*, additional 4K related settings on this screen include:

4K Transport (KONA 5 or KONA 4 in 4K Mode)

Sets the 4K output transport. Select from:

- Auto - Automatically selects the transport, based on the input or selected format.
- 4K-2si - Sets 2si output, using multiple links.
- 1x 4K-12G (KONA 5 only) - Single link 12G output. This signal will also automatically be downconverted and routed to the SDI 4 output.
- 2x 4K-Quad - Dual Link 4K/UltraHD output, SQD.
- 4x 4K-Quad - Quad Link , SQD.
- 1x 4K-Quarter - Downconverts the 4K/UltraHD signal to HD.

NOTE: The 4K Transport setting also affects the HDMI output of the KONA card, even if the SDI inputs are not being used. A SMPTE 2Si setting is required for UltraHD/4K HDMI output. Other 4K Transport settings will downconvert HDMI output to HD or 2K.

HDMI HDR Screen in 4K Mode

Figure 37. HDMI HDR Screen with 4K Primary Format
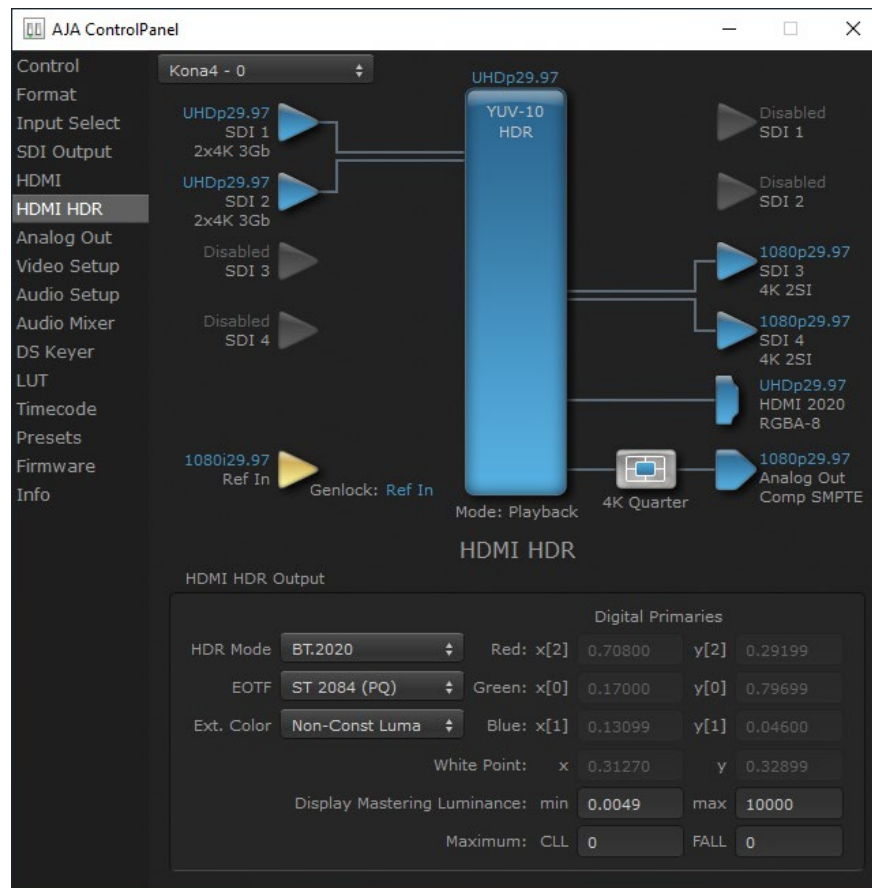
The HDMI-HDR screen, available in KONA 5 the 4K mode of KONA 4, provides a mechanism to inform an HDMI display device (such as a TV or monitor) that the video content is HDR. This includes generation of the Dynamic Range and Mastering Infoframe and the static metadata descriptors as defined in CTA-861.3 and HDMI v2.0a. Included are pre-defined primaries values for BT.2020 and DCI P3 color gamuts.

HDR Mode

- Off - HDR Mode disabled (default).
- DCI-P3 D65 - Only Display Mastering Luminance available for Digital Primaries.
- BT.2020 - Typically used with HDR.
- 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.

- Trad Gamma SD
- Trad Gamma HD
- ST 2084 (HDR-10)
- HLG (Hybrid Log Gamma) - No meta-data for Digital Primaries.

Ext. Color

Most TV's require this be set to Non-Const Luma to go into their HDR modes.

Digital Primaries

Selecting Custom HDR Mode allows the editing of digital primaries information that is passed as metadata accompanying the video signal. However, when HLG selected as the EOTF digital primaries information cannot be edited, because HLG does not use metadata.

Display Mastering Luminance

Represents the minimum and maximum Display Mastering Luminance.
- Minimum: Defines the floor of the SMPTE ST 2086 color volume (in the case of HDR) and is determined by the mastering environment.
  - Range: 0.0000 cd/m2 to 1.0000 cd/m2.
  - Step size: 0.0002 cd/m2.
- Maximum: Defines the ceiling of the SMPTE ST 2086 color volume (in the case of HDR) and is determined by the mastering environment.
  - Range: 1 cd/m2 to 65535 cd/m2.
  - Step size: 1 cd/m2.

Maximum Content Light Level (CLL)

Represents the highest-value pixel component in an entire scene. It is determined by analyzing each frame of video, and can be determined in the post environment.
- Range: 1 cd/m2 to 65535 cd/m2.
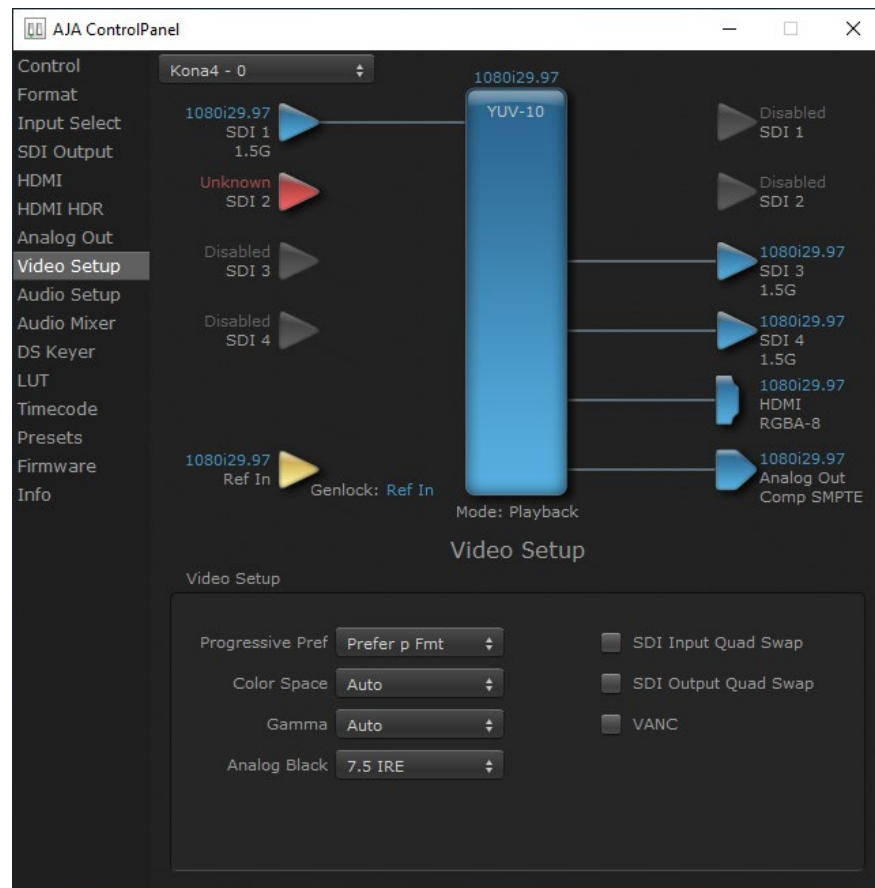- Step size: 1 cd/m2.

Maximum Frame Average Light Level (FALL)

Represents the maximum of frame-based average light levels taken over an entire scene, and can be determined in the post environment.
- Range: 1 cd/m2 to 65535 cd/m2.
- Step size: 1 cd/m2.

Video Setup Screen in 4K Mode

Figure 38. AJA Control Panel, Video Setup Screen

4K Mode adds Quad Swap controls to the Video Setup Screen.

SDI Input Quad Swap

- When checked (default setting is Off), changes the input Quad to SDI quadrant mapping from 1 to 1 to:
  - Quad1 - SDI3
  - Quad2 - SDI4
  - Quad3 - SDI1
  - Quad4 - SDI2.

SDI Output Quad Swap

- When checked (default setting is Off), changes the output Quad to SDI quadrant mapping from 1 to 1 to the mapping shown above.

Automatic KONA 4-Link to 2-Link Switching

You can use Quad Swap settings to automatically switch KONA 4K operation from 4-Link to 2-Link transport, without the need to repatch KONA BNCs for each transport change. This can be useful if, for example, you want to connect KONA's outputs to an SDI monitor that sometimes views 4-Link 4K/UltraHD inputs, and sometimes views 2-Link or Single-Link HD inputs. All that is required is to re-orient KONA's output BNC connectors once, and turn on SDI Output Quad Swap.

For 4K/UHD monitoring (Frame Buffer set to 4K raster – transport set to 4x 4K):

1. Connect the KONA output SDI BNCs in the following manner:
   - KONA SDI 1 Output -> to -> Monitor SDI 3 Input
   - KONA SDI 2 Output -> to -> Monitor SDI 4 Input
   - KONA SDI 3 Output -> to -> Monitor SDI 1 Input
   - KONA SDI 4 Output -> to -> Monitor SDI 2 Input

   At this time when you view 4K/UHD over the 4x 3G-SDI links on the monitor, the quadrants will not be displayed correctly.

2. Enable the Control Panel "SDI Output Quad swap" feature. Now the 4K/UHD monitor will display the quadrants correctly.

To make the monitor display a single or dual link 2K/HD RGB or YUV output, simply set the KONA framebuffer to 2K Raster and the transport to 2xHD-DL. With the settings above, KONA will automatically change its outputs to SDI 3 and SDI 4, and the monitor will display the 2K/HD image correctly, and vice versa.

The reverse function is also possible, using "SDI Input Quad swap", allowing swapping back and forth between quad 4K input and dual link 2K input without having to re-patch.
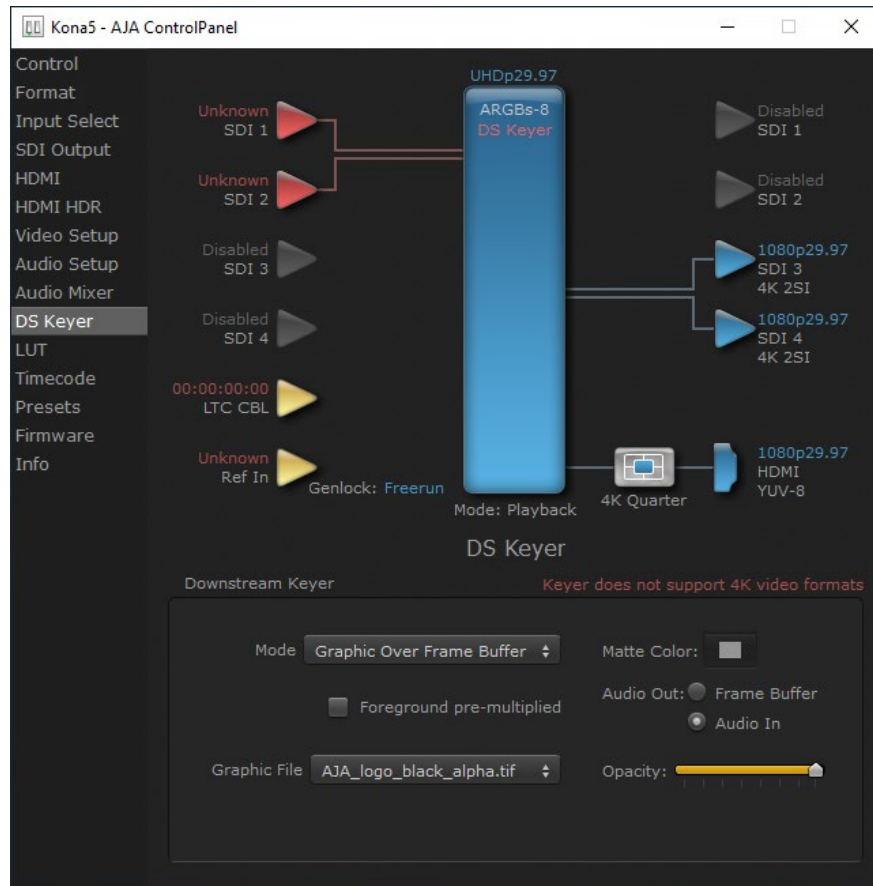
Audio Mixer Screens (KONA 4 in 4K Mode)
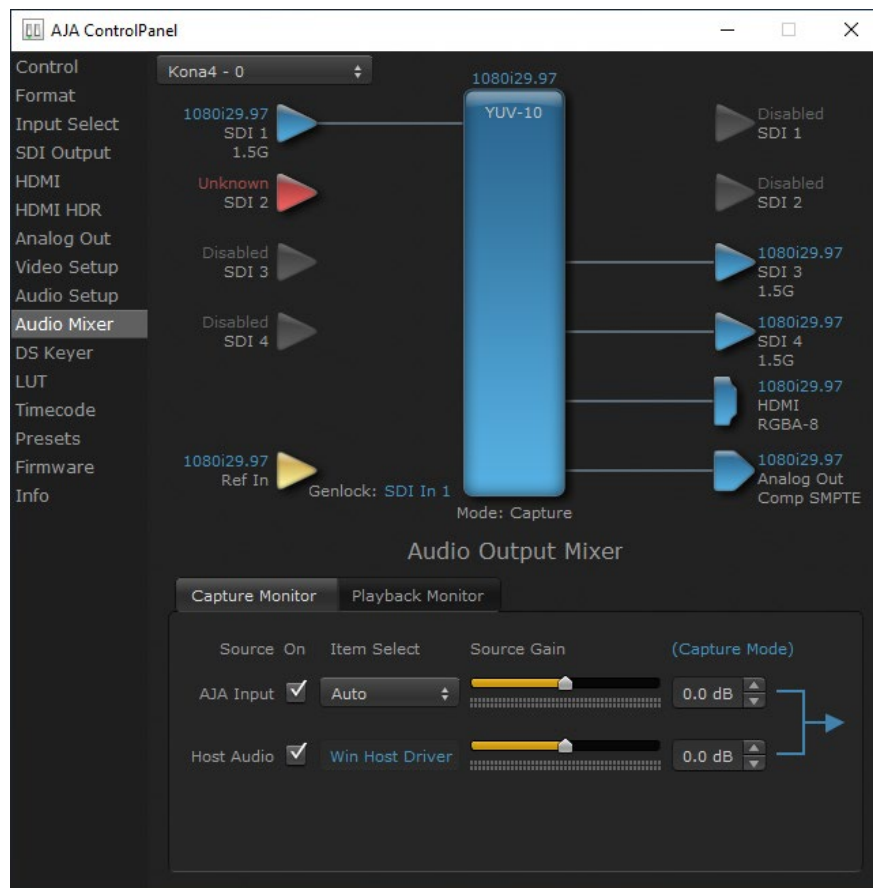
KONA 4 in 4K mode supports the Control Panel Audio Mixer Screens.

NOTE: These screens are not available on KONA 4 in UFC Mode.

See for detailed information.

Downstream Keyer Screen in 4K Mode

Figure 39. AJA Control Panel, DS Keyer Screen with Unsupported Message

The KONA Downstream Keyer does not support UltraHD/4K formats, but is available for use with other video formats. If this screen is selected with a UltraHD/4K format configured, a "Keyer does not support 4K video formats" message will be displayed.

Additional Information

The following information may apply to all the KONA products covered in this manual.

About 8-bit Versus 10-bit Video

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

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.

About 12-bit Video

With the emergence of High Dynamic Range and Wide Color Gamut video, support for even more colors became necessary. 12-bit video theoretically has 4x color resolution of 10-bit video, but current video monitor technology cannot display this full resolution. However, 12-bit video can be useful for postproduction and color grading purposes, as it allows greater control of subtle colors.

About RGB and YPbPr Video

RGB Video

Although RGB is used less in today's video systems, KONA supports it for A/V Monitor output. However, because the KONA (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.

YPbPr Video

KONA 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.

Appendix A – Specifications

KONA 5 Tech Specs

Video Formats

- (4K) 4096 x 2160P 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60
- (UltraHD) 3840 x 2160P 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60
- (2K) 2048 x 1080p 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60
- (2K) 2048 x 1080PsF 23.98, 24, 25, 29.97, 30
- (HD) 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (HD) 1080PsF 23.98, 24, 25, 29.97, 30
- (HD) 1080i 50, 59.94, 60
- (HD) 720p 50, 59.94, 60
- (SD) 625i 50
- (SD) 525i 59.94

Note: High Frame Rate capabilities are dependent on host system attributes. Not all systems and configurations will support all frame rates.

Video Inputs Digital

- 12G-SDI*, SMPTE-2082, 12-bit**, 10-bit and 8-bit
- 6G-SDI*, SMPTE-2081, 10-bit and 8-bit
- 3G-SDI, SMPTE-259/292/296/424/425, 12-bit*, 10-bit and 8-bit
- 4K/UltraHD 4:4:4 (4x BNC)
- 1.5G-SDI, SMPTE 372M, Dual Link HD 4:4:4 (2x BNC), 12-bit**, 10-bit and 8-bit
- 1.5G-SDI, SMPTE 292M, Single Link 4:2:2 (1x BNC), 10-bit and 8-bit

*SDI connections are bidirectional. For 2K/HD, capture and monitoring can be simultaneous. For 4K/UltraHD with 12G-SDI, capture and monitoring can also be simultaneous. For 4K/UltraHD with 3G-SDI, all four connections must be used for either Input or Output. Additionally, 12G-SDI, 6G-SDI configured inputs support UltraHD / 4K only.

**Bit depth support is application dependent. Check with your software manufacturer for compatibility.

Note: KONA 5 SDI connectors are HD BNC

Video Outputs Digital

- 12G-SDI*, SMPTE-2082, 12-bit**, 10-bit and 8-bit
- 6G-SDI*, SMPTE-2081, 10-bit and 8-bit
- 3G-SDI, SMPTE-259/292/296/424, 12-bit*, 10-bit and 8-bit
- 4K/UltraHD 4:4:4 (4x BNC)
- 1.5G-SDI, SMPTE 372M, Dual Link HD 4:4:4 (2x BNC), 12-bit**, 10-bit and 8-bit
- 1.5G-SDI, SMPTE 292M, Single Link 4:2:2 (1x BNC), 10-bit and 8-bit
- HDMI v2.0
- 30/36 bits/pixel, RGB or YUV, 6 Gbps per color component
- 4K, UltraHD, 2K, HD and SD with HFR support up to 60p (4:2:2), 10-bit and 8-bit
- HDR10 Support - HDR Infoframe metadata, compatible with HDMI 2.0a/CTA-861.3
- HLG Support - compatible with HDMI 2.0b/CTA-861-G***

*SDI connections are bidirectional. For 2K/HD, capture and monitoring can be simultaneous. For 4K/UltraHD with 12G-SDI, capture and monitoring can also be simultaneous. For 4K/UltraHD with 3G-SDI, all four connections must be used for either Input or Output. Additionally, 12G-SDI, 6G-SDI configured outputs support UltraHD / 4K only.

**Bit depth support is application dependent. Check with your software manufacturer for compatibility.

***HLG support is application dependent. Check with your software manufacturer for compatibility.

Note: KONA 5 SDI connectors are HD BNC

Audio Inputs Digital

- 16-Channel, 24 and 16-bit SDI embedded audio, 48 kHz sample rate, synchronous
- 8-Channel, 24 and 16-bit HDMI embedded audio, 48 kHz sample rate, synchronous
- 8-Channel, 16 and 24-bit AES/EBU audio, 48 kHz sample rate, synchronous or nonsynchronous, internal sample rate conversion (via 4x BNC on breakout cable)

Audio Outputs Digital

- 16-Channel, 24-bit SDI embedded audio, 48 kHz sample rate, synchronous
- 8-Channel, 24-bit HDMI embedded audio, 48 kHz sample rate, synchronous
- 8-Channel, 16 and 24-bit AES/EBU audio, 48 kHz sample rate, synchronous or nonsynchronous, internal sample rate conversion (via 4x BNC on breakout cable)

Downstream Keyer

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

Reference

- Analog Color Black (1V) or Composite Sync (2 or 4V) or HD Tri-Level Sync (1V) (via 1x HD-BNC at PCIe bracket)
- Reference input is terminated into 75 ohms when Genlock is set to Ref In

Timecode

- LTC timecode input and output (via 2x BNC on breakout cable)
- LTC timecode input (via 2-pin header on PCIe card)
- LTC timecode input (via HD-BNC at PCIe bracket)

Electrical Interface

- 8-lane PCIe 3.0

Note: Unlike other KONA cards, KONA 5 uses PCIe power from a 6 pin ATX connector, rather than the PCIe slot.

- PC Internal ATX Power Connector (Molex p/n 45559-0002)

    1, 2, 3 = +12v

    4, 5, 6 = COM

Machine Control

- 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

Noise

- <50dBA (A-weighted at 1m in free air)

Size (w x d x h)

- 0.75" x 6.9" x 5.0" (19.05 x 175.26 x 127.00 mm)

Weight

- PCIe Card: 0.6 lbs (0.3 kg)
- Cables (all combined): 1.3 lbs (0.6 kg)

Power

- 28W typical, 35W maximum

Environment

- Safe Operating Temperature: 0 to 40 C (32 to 104 F)
- Safe Storage Temperature (Power OFF): -40 to 60 C (-40 to 140 F)
- Operating Relative Humidity: 10-90% noncondensing
- Operating Altitude: <3,000 meters (<10,000 feet)

KONA 4 Tech Specs

Video Formats

- (4K) 4096 x 2160p 23.98, 24, 25, 50, 59.94, 60
- (UltraHD) 3840 x 2160p 23.98, 24, 25, 29.97, 50, 59.94, 60
- (2K) 2048 x 1556p 15, 14.98
- (2K) 2048 x 1556PsF 15, 23.98, 24
- (2K) 2048 x 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (2K) 2048 x 1080PsF 23.98, 24, 25
- (HD) 1080i 50, 59.94, 60
- (HD) 1080PsF 23.98, 24, 25, 29.97, 30
- (HD) 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (HD) 720p 23.98*, 24*, 25*, 29.97*, 30*, 50, 59.94, 60
- (SD) 625i 50
- (SD) 525i 23.98*, 59.94

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

Video Input Digital

- 3G-SDI, SMPTE-259/292/296/424/425, 8-bit, 10-bit and 12-bit*
- 4K/UltraHD 4:2:2 and 4:4:4 up to 50/60 fps
- 2K HSDL (High Speed Data Link) 4:4:4, (2x BNC)
- Dual Link HD 4:4:4 (2x BNC)
- Single Link 4:2:2 or 4:4:4 (1x BNC)
- 1D LUT support

*Bit depth support is application dependent. Check with your software manufacturer for compatibility.

Video Output Digital

- 3G-SDI, SMPTE-259/292/296/424, 8-bit, 10-bit and 12-bit*
- 4K/UltraHD 4:2:2 and 4:4:4 up to 50/60 fps
- 2K HSDL (High Speed Data Link) 4:4:4, (2x BNC)
- Dual Link HD 4:4:4, (2x BNC)
- Single Link 4:2:2 or 4:4:4 (1x BNC)
- HDMI v1.4b
  - 30/36 bits/pixel, RGB or YUV, 2.25 Gbps
  - 2K, HD, and SD, UltraHD with HFR support up to 60p 4:2:0
  - HDR 10 Support - HDR Infoframe metadata, in accordance with HDMI 2.0a/CTA-861.3
  - HLG Support - in accordance with HDMI 2.0b/CTA-861-G**

*Bit depth support is application dependent. Check with your software manufacturer for compatibility.

**HLG support is application dependent. Check with your software manufacturer for compatibility.

Video Output Analog

- Composite/S-Video (Y/C) (1x BNC/2x BNC+adapter)
- NTSC, NTSCJ, PAL
- Component (3x 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

- 16-Channel, 16- and 24-bit SDI embedded audio, 48 kHz sample rate, synchronous
- 16-Channel, 16- and 24-bit AES/EBU audio, 48 kHz sample rate, synchronous (via 8 x BNC on optional K3G-Box)
- 8-Channel, 16- and 24-bit AES/EBU audio, 48 kHz sample rate, synchronous or nonsynchronous, internal sample rate conversion (via 4x BNC on breakout cable)

Audio Output Digital

- 16-Channel, 16- and 24-bit SDI embedded audio, 48 kHz sample rate, synchronous
- 16-Channel, 16- and 24-bit AES/EBU audio, 48 kHz sample rate, synchronous (via 8 x BNC on optional K3G-Box)
- 8-Channel, 16- and 24-bit HDMI embedded audio, 48 kHz sample rate, synchronous
- 8-Channel, 16- and 24-bit AES/EBU audio, 48 kHz sample rate, synchronous or nonsynchronous, internal sample rate conversion (via 4x BNC on breakout cable)

Downstream Keyer

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

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 1x BNC each)

Reference Input

- Analog color black (1V) or composite sync (2 or 4V)
- Looping
- 75 ohms on optional K3G-Box, terminated on supplied breakout cable

Electrical Interface

- 8-lane PCIe 2.0

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

Size (w x d x h)

- .75" x 6.9" x 5.0" (19.05mm x 175.26mm x 127mm)

Weight

- 0.7 lb (0.4 kg)

Power

- 22W typical, 24W maximum

Environment

- Safe Operating Temperature: 0 to 40 degrees C (32 to 104 degrees F)
- Safe Storage Temperature (Power OFF): -40 to 60 degrees C (-40 to 140 degrees F)
- Operating Relative Humidity: 10-90% noncondensing
- Operating Altitude: <3,000 meters (<10,000 feet)

KONA 1 Tech Specs

Video Formats

- (2K) 2048 x 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (2K) 2048 x 1080PsF 23.98, 24, 25
- (HD) 1080i 50, 59.94, 60
- (HD) 1080PsF 23.98, 24, 25, 29.97, 30
- (HD) 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (HD) 720p 50, 59.94, 60
- (SD) 625i 50
- (SD) 525i 59.94

Video Input Digital

- 3G-SDI, SMPTE-259/292/296/424

Video Output Digital

- 3G-SDI, SMPTE-259/292/296/424

Audio Input Digital

- 16-Channel 24-bit SDI embedded, 48 kHz synchronous

Audio Output Digital

- 16-Channel 24-bit SDI embedded, 48 kHz synchronous

Reference / LTC Input

- Analog Color Black or HD Tri-level sync
- LTC

Electrical Interface

- 2-lane PCIe 2.0

Machine Control

- RS-422, Sony 9-pin protocol
- 9-pin D-connector pinout is as follows:

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

Size (w x d x h)

- 0.55" x 6.61" x 2.16" (13.97 x 167.89 x 54.86 mm)

Weight

- 0.3 lb (0.3 kg)

Environment

- Safe Operating Temperature: 0 to 40 C (32 to 104 F)
- Safe Storage Temperature (Power OFF): -40 to 60 C (-40 to 140 F)
- Operating Relative Humidity: 10-90% noncondensing
- Operating Altitude: <3,000 meters (<10,000 feet)

Appendix B – Safety & Compliance

Federal Communications Commission (FCC) Compliance Notices

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

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.

CE This equipment meets the following conformance standards:

Safety

EN 60065: 2014 (T-Mark License),

IEC 60065: 2014, (CB Scheme Report/Certificate)

Additional licenses issued for specific countries available on request.

Emissions

EN 55032: 2012 + AC: 2013, CISPR 32: 2015

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

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.

Korea KCC Compliance Statement

B급 기기 (가정용 방송통신기자재)	이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.
Class B (Broadcasting Communication Equipment for Home Use)	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.

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.

Japan Compliance Statement

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 32: 2016). 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

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

Warning! Read and follow all warning notices and instructions marked on the product or included in the documentation.

Avertissement! Lisez et conformez-vous à tous les avis et instructions d'avertissement indiqués sur le produit ou dans la documentation.

Warnung! Lesen und befolgen Sie die Warnhinweise und Anweisungen, die auf dem Produkt angebracht oder in der Dokumentation enthalten sind.

¡Advertencia! Lea y siga todas las instrucciones y advertencias marcadas en el producto o incluidas en la documentación.

Aviso! Leia e siga todos os avisos e instruções assinalados no produto ou incluídos na documentação.

Avviso! Leggere e seguire tutti gli avvisi e le istruzioni presenti sul prodotto o inclusi nella documentazione.

Warning! Do not use this device near water and clean only with a dry cloth.

Avertissement! N'utilisez pas cet appareil près de l'eau et nettoyez-le seulement avec un tissu sec.

Warnung! Das Gerät nicht in der Nähe von Wasser verwenden und nur mit einem trockenen Tuch säubern.

¡Advertencia! No utilice este dispositivo cerca del agua y límpielo solamente con un paño seco.

Aviso! Não utilize este dispositivo perto da água e limpe-o somente com um pano seco.

Avviso! Non utilizzare questo dispositivo vicino all'acqua e pulirlo soltanto con un panno asciutto.

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

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

Avertissement! Débranchez cet appareil pendant les orages avec éclairsou 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.

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! 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! 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 expiga 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! 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 rimane prontamente accessibile e operabile.

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! 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.

Warranty and Liability Information

AJA VIDEO SYSTEMS, INC.

Limited Warranty on Hardware

AJA Video Systems, Inc. (AJA Video) warrants that the hardware product, not including storage modules or software components, will be free from defects in materials and workmanship for a period of three (3) years from the date of purchase. AJA Video warrants that the storage modules provided as part of the hardware product will be free from defects in materials and workmanship for a period of one year from the date of purchase. AJA Video provides a separate software warranty as part of the license agreement applicable to software components.

If a hardware product or storage module (hereafter, a "product") proves to be defective during the applicable 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. 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.

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Governing Law and Language; Your Rights.

This limited warranty is the only warranty provided by AJA Video on the hardware product. It supersedes all prior or contemporaneous understandings regarding such subject matter. No amendment to or modification of this warranty will be binding unless in writing and signed by AJA Video. The laws of the State of California, USA will govern this warranty and any dispute arising from it. Any translation of this Agreement is intended for convenience and to meet local requirements and in the event of a dispute between the English and any non-English versions, the English version of this warranty will govern. This limited warranty gives you specific legal rights and you may have other rights that vary from jurisdiction to jurisdiction, some of which are noted above.

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