# KONA Series

## Capture, Display, Convert



# Installation and Operation Manual

AJA
VIDEO SYSTEMS

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Please have all pertinent information at hand prior to contacting AJA support or sales.

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|---|---|
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# Contents

# Chapter 1 – Introduction

**KONA 5**          **KONA 4**          **KONA 1**

## Overview

AJA KONA cards bring the highest quality 8K/UltraHD2, 4K/UltraHD, 2K, HD, and SD video and audio to computers running Mac, Windows or Linux Operating Systems. KONA cards support the broadest range of creative software for editorial, color, mastering, HDR, dailies, live streaming, graphics, game capture and much more.

KONA cards have incredibly wide application compatibility. Out-of-the-box, your AJA hardware and software supports Adobe Premiere Pro, Adobe After Effects, Apple Final Cut Pro X, Avid Media Composer, Avid ProTools and Telestream Wirecast via AJA's unified Desktop Software package.

AJA hardware is also supported by an enormous range of additional applications for all types of video, graphics and effects work, via the support of 3rd party development partners:

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

Pick your application of choice and KONA connects it to your world.

### KONA Models Covered in this Manual

This manual covers the installation and operation of these KONA card 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.

KONA cards have varying capabilities, depending on the KONA model and installed firmware version, and are suited for various real-world applications.

## 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. However, ProRes family capture and playback for macOS, Windows and Linux is supported via AJA Control Room.*

- 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. 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

*Figure 1.  KONA 5 Card*



KONA 5 Card with labeled connectors: Multi-pin Breakout Cable Connector, HDMI 2.0 Output Connector, Four Locking Bi-directional HD-BNCs Supporting Up to 12G-SDI (1, 2, 3, 4), Reference/LTC Input Locking HD-BNC, ATX Power Connector

KONA 5 is AJA's blazingly fast, 8-lane PCIe 3.0 I/O card, designed for today's most demanding video and audio workflows. Whether you are working with 8K/UltraHD2, HFR 4K/UltraHD, 2K/HD, SD, Deep Color and/or HDR, experience the quality and peace of mind that KONA 5 brings to your world. Supporting 10-bit 4:2:2 and 4:4:4, or even 12-bit* color spaces for pristine imagery, KONA 5 allows the flexibility to ingest and output with 12G/6G/3G-SDI and monitor with a full-size HDMI 2.0 port. The bidirectional 12G-SDI ports provide immense flexibility for capture and simultaneous pass through, and with the appropriate software, multi-channel capture and streaming. For HDR workflows, KONA 5 supports HDR10 and HLG for rich color delivery over HDMI 2.0. KONA 5 also supports Dolby Vision HDR with the appropriate 3rd party software.

*Bit depth is application dependent.

## KONA 5 Card Only

Besides shared features (see *"Shared KONA Features" on page 5*), KONA 5 offers:
- 8K/UltraHD2, 4K and UltraHD ingest and output at frame rates up to 50/60 fps
- 4:4:4 and 4:2:2 workflows
- 12-bit color support (application dependent)
- Four bidirectional twist-lock HD-BNC SDI 12G-SDI HD-BNCs connectors
- One twist-lock HD-BNC reference input connector
- Single Link I/O for 4K/UltraHD 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)
- Dual Link I/O for 8K/UHD2 Low Frame Rate signals (2x 12G-SDI BNC in 8K mode)
- Quad Link I/O for 8K signals (4x HD-BNC in 8K Mode)
- In 8K Mode, Dual & Quad Link signals output 6G/12G-SDI as opposed to 1.5G/3G-SDI
- Supports Quadrant or Two Sample Interleave transport
- Automatically downsamples Single Link 4K/UltraHD 12G input to HD on the KONA 5 SDI 4 output for confidence monitoring (4K Mode only)
- HDMI 2.0 Output
- VPID signaling for SDR/HDR Transfer Characteristics, Colorimetry and Luminance via SDI
- PQ, HLG and HDR10 Supported
- Dolby Vision support for Dolby Vision licensed applications
- Up to 16 channels of SDI embedded audio
- Up to 8 channels of HDMI embedded audio
- Audio Monitor mixing of sources, including Host Computer and Application (4K Mode only)
- Reference Input on card (Analog black burst or Tri-level)
- 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)
- Five short HD-BNC (locking) to full size BNC adapter cables are provided
- When using 3rd party software that utilizes the "KONA 5 (8K)" bitfile, DSK is possible up to 4K/UltraHD
- Extend external connectivity with included breakout cable

*Figure 2. KONA 5 Breakout Cable*



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

- 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

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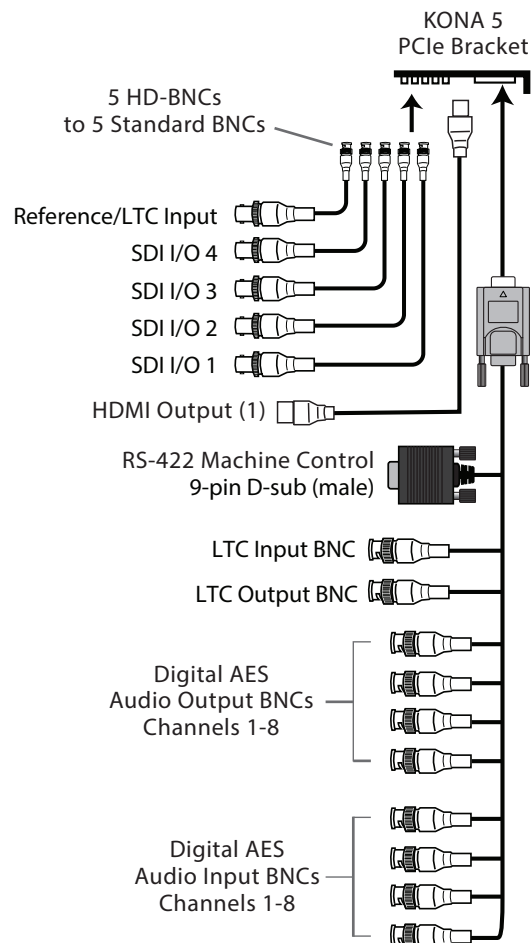
# AJA Control Panel User Interface For KONA 5

KONA 5 supports three versions of firmware which can be installed as needed to meet your specific requirements.

## 4K Firmware

- Supports 4K/UltraHD over 3G/6G/12G
- Supports colorspace conversion
- Supports downstream keyer
- Does not support 8K/UltraHD2 video

## 8K Firmware

- Supports 8K/UltraHD2, 4K/UltraHD over 6G/12G
- Does not support 4K/UltraHD over 3G, colorspace conversion, downstream keyer

## 12-Bit Firmware

- Supports 4K, UltraHD, 3G, 6G and 12G, color space conversion and downstream keying
- Supports 12G Input on SDI 1 & SDI 2
- Supports 12G Output on SDI 3 & SDI 4
- Supports, 12 bit LUT
- Does not support 8K/UHD2 or 4K Quad Mode

*Figure 4.  KONA 5 in 8K Mode Control Panel Screen Example*
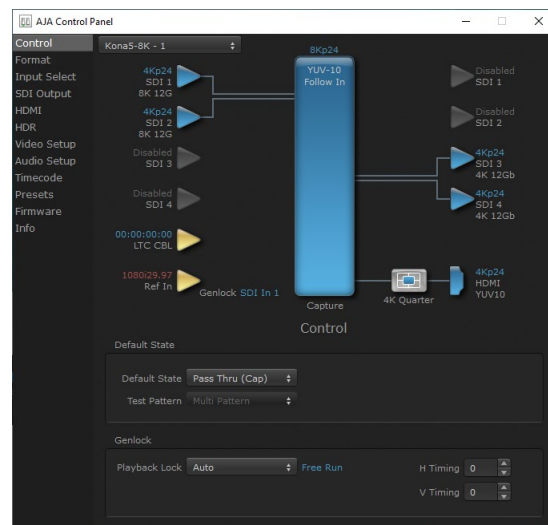


## Dynamic Reconfiguration

KONA 5 supports fast reconfiguration between 4K, 8K, or 12-Bit firmwares. Using this method, you can change your KONA 5 card's capabilities without the need to reboot your computer. See *"KONA 5 Fast Bitfile Switching" on page 26*.

The AJA Control Panel application provides an easy to use graphical user interface for configuration control. See *"AJA Control Panel User Interface" on page 28* for detailed information.

# KONA 4 Features

*Figure 5. KONA 4 Card*

Multi-pin Breakout Cable Connector

Mini-HDMI 1.4b Output Connector

Four DIN 1.0/2.3 sliding sleeve BNCs

1
2
3
4
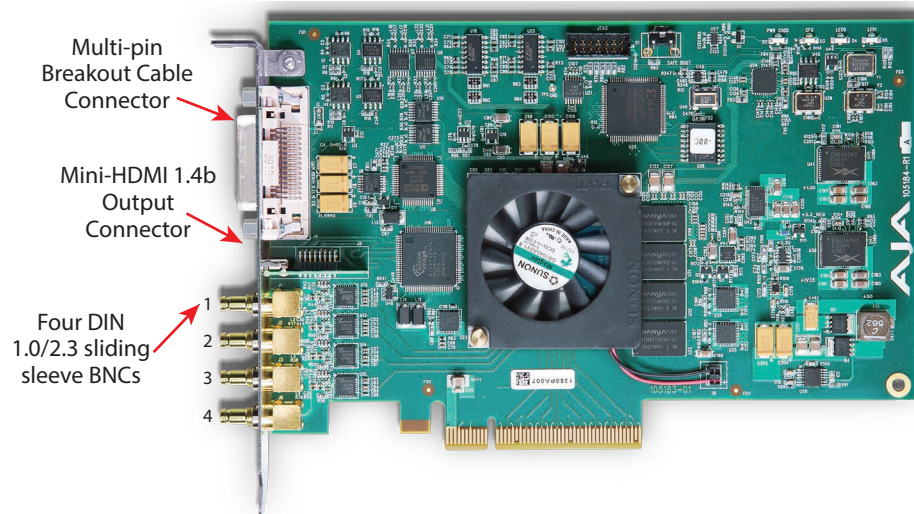
KONA 4 features hardware-based full 10-bit broadcast quality motion adaptive SD to HD up-conversion, HD to SD down-conversion and HD to HD cross-conversion. The KONA 4's built-in up-converter uses a full 10-bit path, fully motion adaptive de-interlacing, and large multi-point digital interpolators. Down-conversion 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.

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.

Besides shared features (see *"Shared KONA Features" on page 5*), KONA 4 offers:

- 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)
- SD-SDI, HD-SDI, Dual Link HD-SDI, and 3G HD-SDI inputs
- HDMI 1.4b output (mini HDMI connector on card, full size connector on optional K3G-Box)
- 2K support that includes 2048x1556 and 2048x1080 formats
- 4K and UltraHD capture and playout, up to 60 fps (4K Mode only)
- Quadrant and Two Sample Interleave transport (4K Mode only)
- 12-bit HD Component analog video and SD analog Component or Composite/S-Video (Y/C)
- 10-bit HD/SD Video+Key Output
- 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
- VPID signaling for SDR/HDR Transfer Characteristics, Colorimetry and Luminance via SDI
- PQ, HLG and HDR10 Supported

- Dolby Vision support for Dolby Vision licensed applications
- Broadcast quality hardware-based 10-bit up-, down- and cross-conversion (UFC Mode only)
- Broadcast quality hardware based 10-bit SD aspect ratio conversion, anamorphic to letterbox, etc. (UFC Mode only)
- 8-channel 24-bit, 48kHz digital AES/EBU audio
- 16 channels of SDI embedded digital audio
- Audio Monitor mixing of sources, including Host Computer and Application (4K Mode only)
- Genlock input with optional looping capability via the K3G-Box (terminated on the supplied breakout cable)
- LTC (longitudinal timecode) input/output

## KONA 4 Breakout Cable Connections

*Figure 6.  KONA 4 Breakout Cable*



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 7. 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
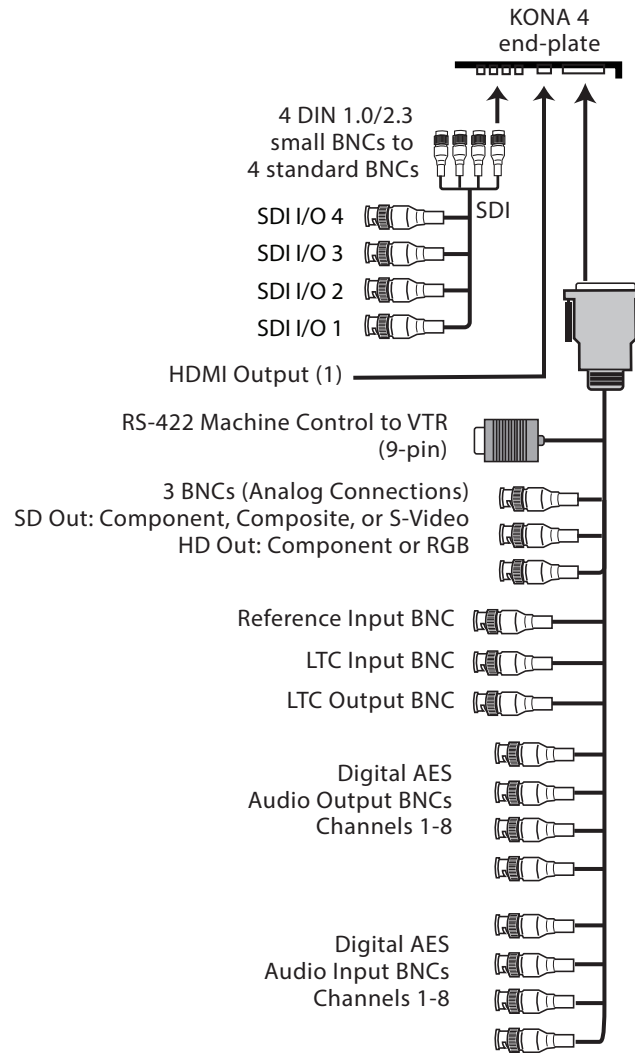
## K3G-Box for KONA 4

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. See *"K3G-Box for KONA 4" on page 21* for K3G-Box connections and capabilities.

## AJA Control Panel User Interface For KONA 4
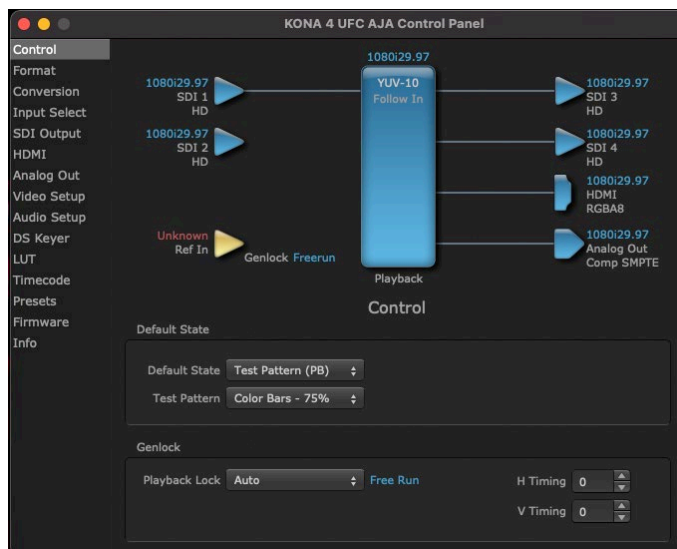
KONA 4 supports two versions of firmware, which can be installed as needed to meet your specific requirements.

### 4K Firmware

• Supports 4K/UltraHD, HD, SD video
• Supports Audio Monitor mixing
• Does not support UFC format conversion for HD/SD

- Supports SD, HD, and 2K formats
- Supports up/down/cross-conversion
- Does not support 4K/UltraHD video or Audio Monitor mixing

*Figure 8.  KONA 4 in UFC Mode 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 28* for detailed information.

# KONA 1 Features

*Figure 9.  KONA 1 Card*
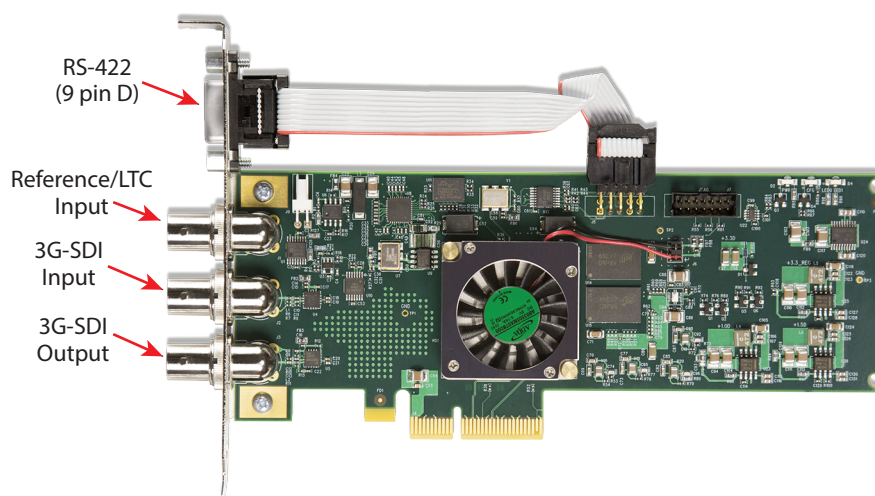


Designed for broadcast, post and ProAV, as well as OEM developers, KONA 1 is a robust, cost efficient single-channel 3G-SDI 2K/HD 60p I/O card with serial control and reference/LTC. KONA 1 enables simultaneous pass-thru monitoring during capture.

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

- The KONA 1 endplate provides three full-size BNC connectors:
  - Reference/LTC input (top)
  - 3G-SDI input (middle)
  - 3G-SDI output (bottom)
- Most 3G-SDI formats supported (see *"KONA 1 Tech Specs" on page 85* for a complete listing
- VPID signaling for SDR/HDR Transfer Characteristics, Colorimetry and Luminance via SDI
- PQ, HLG and HDR10 Supported
- Dolby Vision support for Dolby Vision licensed applications
- Up to 16-Channels of Embedded SDI audio in
- Up to 16-Channels of 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) using RS-422 SMPTE (Sony) protocol

NOTE: *A Low Profile version of the KONA 1 card with the same functionality is available for developers.*

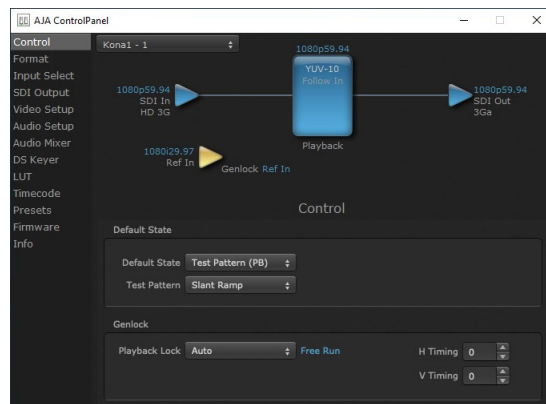## AJA Control Panel User Interface For KONA 1



The AJA Control Panel application provides an easy to use graphical user interface for configuration control. See *"AJA Control Panel User Interface" on page 28* for detailed information.

# 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 Pro products.

Four retail packages are available, one for Mac, one for Windows, and two for Linux (one package for Ubuntu, one package for Rocky Linux).

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/

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
- 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: *One way to test storage performance is to fill the target disk to 80% and then test capture at the highest data rate you will use. This may not be practical in all use cases.*

# Additional with Mac and Windows Packages

## 3rd-Party Plugins

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

# System Requirements

*NOTE:* *On macOS, the KONA supports Apple silicon processors as well as earlier Intel processors*

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.

See the Release Notes for you AJA Card or Device, available on the AJA website and also installed with the software package, for minimum and recommended system requirements including OS, CPU, RAM, and GPU.

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

*NOTE:* *For large scale installations with shared storage, IP, or for very high performance requirements, AJA recommends consultation with an experienced 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" on page 15*.

# Chapter 2 – Installation

## Installation Overview

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

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

https://www.aja.com/page/system-configuration/

### Third Party Software Support

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

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

## 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

Provided with the KONA 4 card are:
- 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

##### KONA 3G-Box Cables for KONA 4

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.
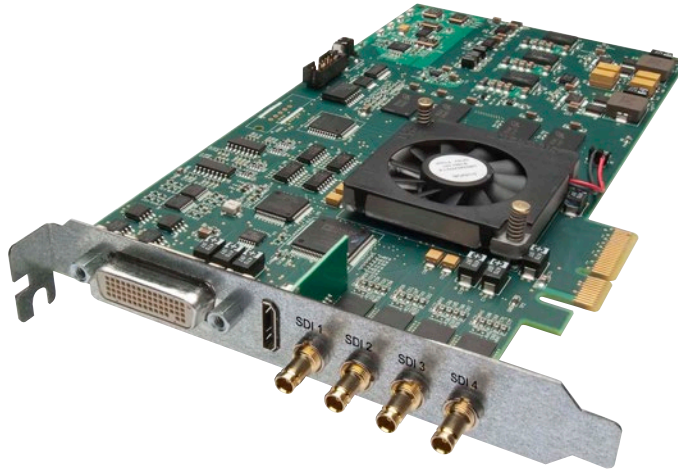
Provided with the KONA 5 card are:

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

# Installing the KONA Card

*Figure 10.  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 *"Installation Overview" on page 17* 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 11.  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 5 Example Cable Connections

*Figure 12.  Typical KONA 5 System Connections, 4K Mode*

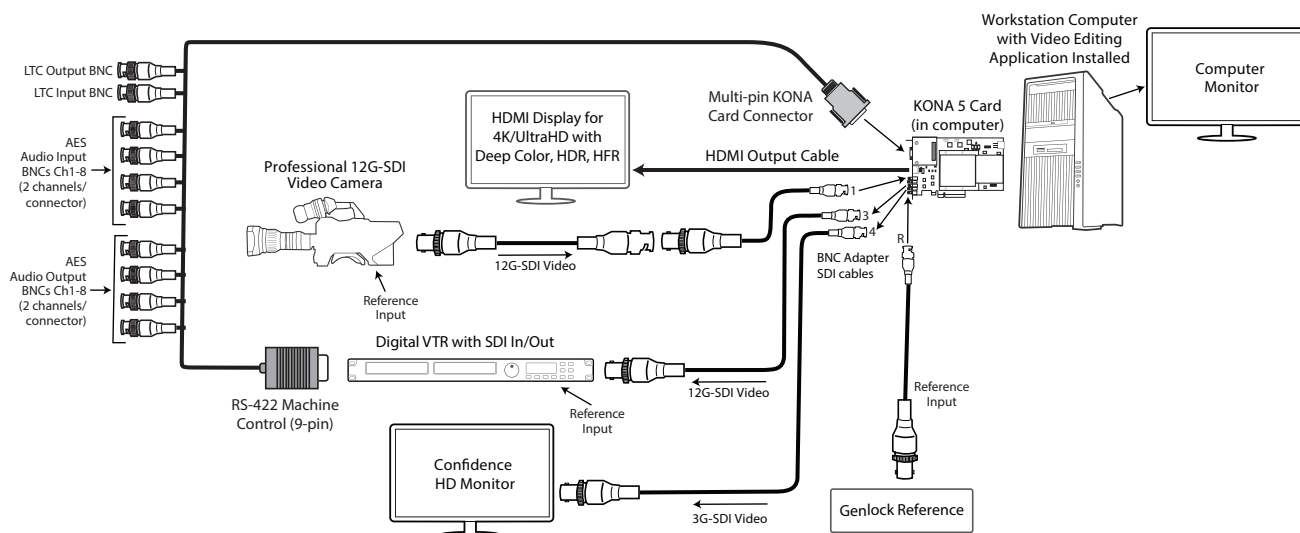In the KONA 5 system example above operating in 4K Mode, a single link 12G-SDI camera signal is received by the KONA 5 card, sent to a 12G-SDI video production switcher, and simultaneously downconverted to 3G-SDI for recording to a digital VTR.

1. If desired, connect your house reference sync to the KONA 5 Ref BNC on the card (labeled "R"). This is a terminated reference input.

2. Connect an HDMI monitor to the KONA 5 card's HDMI output connector.

3. Connect the 9-pin machine control cable on the supplied breakout cable to your VTR's RS-422 control port.

4. Connect the KONA 5's SDI 1 BNC to the SDI output of the camera, using one of the provided mini-to-full size BNC adaptor cable provided.

5. Connect the KONA 5's SDI 3 BNC to the production switcher. This will provide the full 12G signal received by the KONA card to the switcher.

6. Connect the KONA 5's SDI 4 BNC to the input an HD SDI digital video recorder. This will provide a downconverted camera signal to the recorder.

7. Connect an HDMI or SDI monitor directly to an output of the digital video recorder. Eight or sixteen channels of embedded audio are supported, so the VTR must be configured accordingly.

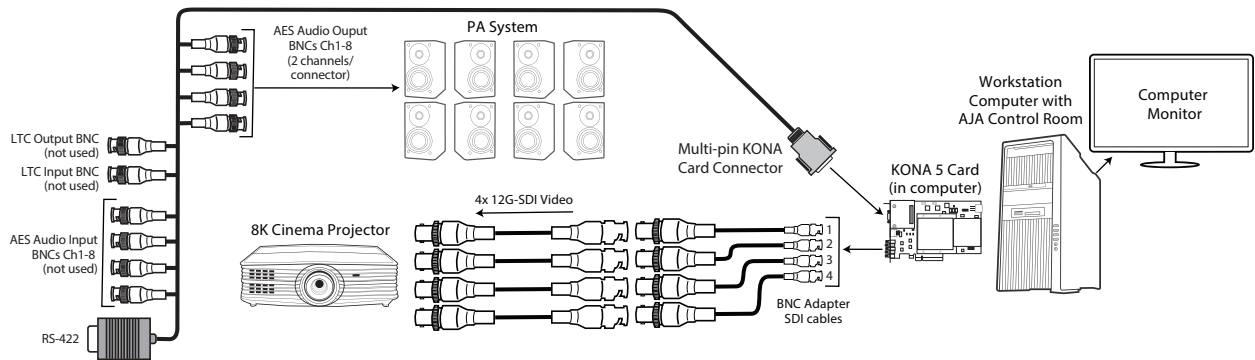*Figure 13.  Typical KONA 5 System Connections, 8K Mode*



In the KONA 5 system example above operating in 8K Mode, an 8K ProRes video file is played back with the AJA Control Room application, and sent to a cinema projector using four 12G-SDI signals. Eight channels of AES embedded audio from that file are also routed to the facility PA system.

# KONA 4 Example Cable Connections

*Figure 14. Typical KONA 4 System Connections*
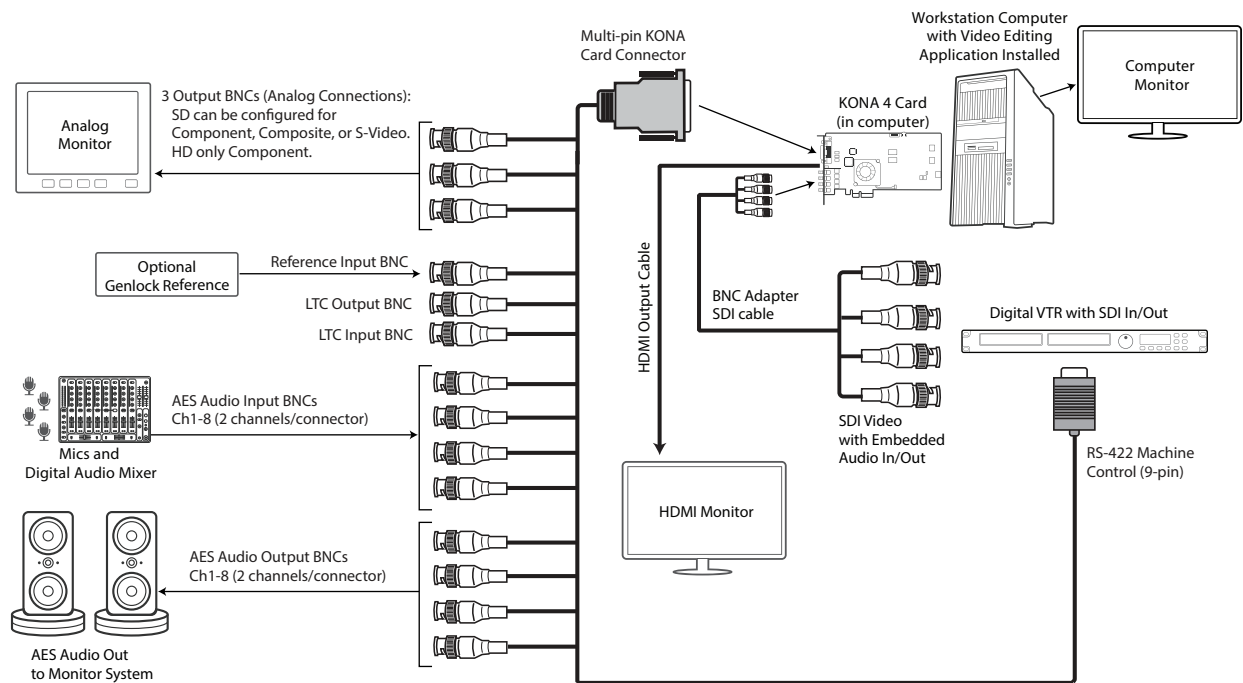


In the KONA 4 system example above, the KONA card's inputs and outputs are connected to an SDI digital video recorder, to an analog video monitor, and to an HDMI monitor, and AES digital audio can also be input to the recorder, and be output to an audio monitoring system.

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

2. Connect an HDMI monitor to the KONA 4 card, using the provided mini-to-full size HDMI adaptor cable. Alternatively, you can connect an analog video monitor to the KONA 4 Analog Video Out BNC connectors for a low cost monitoring solution.

3. Connect the 9-pin machine control cable on the supplied breakout cable to your VTR's RS-422 control port.

4. Connect two SDI cables between KONA 4 and your digital VTR, 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 up to 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. (Sixteen AES audio channels are available when connected to the optional K3G-Box).

# K3G-Box for KONA 4

The optional K3G-Box for KONA 4 offers convenient connector access and additional functionality, and can be easily rack mounted or placed on top of a broadcast monitor or editing desk.

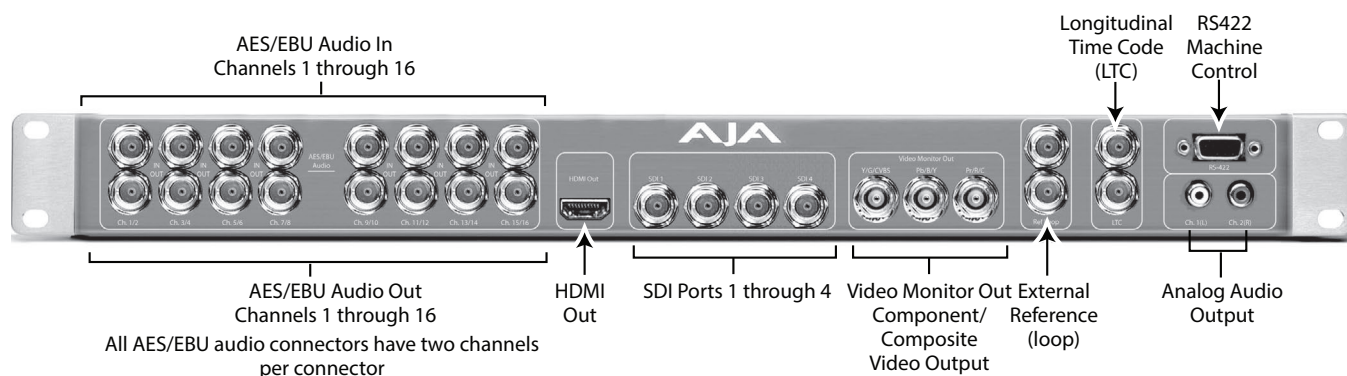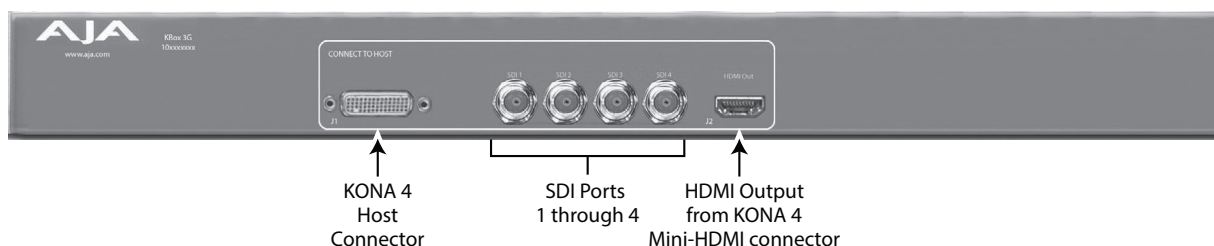Figure 15.  *K3G-Box Model Breakout Box (front view)*



AES/EBU Audio In
Channels 1 through 16

Longitudinal
Time Code
(LTC)

RS422
Machine
Control

AES/EBU Audio Out
Channels 1 through 16

All AES/EBU audio connectors have two channels
per connector

HDMI
Out

SDI Ports 1 through 4

Video Monitor Out
Component/
Composite
Video Output

External
Reference
(loop)

Analog Audio
Output

Figure 16.  *K3G-Box Model Breakout Box (rear view)*



KONA 4
Host
Connector

SDI Ports
1 through 4

HDMI Output
from KONA 4
Mini-HDMI connector

## KONA 4 to K3G-Box Connections

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. Connect the K3G-Box to the KONA 4 card using the provided adaptor cables.

- A multi-pin host connector attaches the K3G-Box to the KONA 4 card, using the provided multi-pin cable.

- Four full size 3G-SDI BNC connectors on the K3-Box rear panel connect to the KONA 4 card's four SDI connectors with the provided DIN to BNC adapter cable. These signals are routed to the K3-Box's four front panel SDI-BNC connectors. The 3G-SDI inputs and outputs each support 16-channel embedded 24-bit digital audio.

- Eight BNC connections are provided for AES/EBU audio input/output, carrying two channels each, for a total of 16 channels in and out. (The standard breakout cable supports a total of 8 AES channels in and out.)

- Two analog audio RCA-style unbalanced audio phono output jacks.

- A female RS-422 9-pin D connector is available to control an external device using RS-422 SMPTE (Sony) protocol.

- A full size HDMI connector on the rear panel of the K3G-Box connects to the HDMI mini-connector on the KONA 4 card with the provided mini-to-full size adapter cable. The HDMI output signal from the KONA 4 card is then routed to the full size HDMI connector on the front of the K3G-Box. The HDMI output supports up to 8 channels of embedded 24-bit digital audio (HDCP is not supported).

- Three BNC connectors are available for the output of component, composite or Y/C analog video. KONA 4 features 12-bit component video output for both HD and SD. SD can be switched between composite and Y/C. 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).

- Two looping reference BNC connectors allow you to synchronize KONA 4 outputs to your house analog reference video signal (or black burst). If you do not loop through the reference, the second connector should be terminated with a 75-ohm terminator.

## KONA 1 Example Cable Connections

*Figure 17.  Typical KONA 1 System Connections*
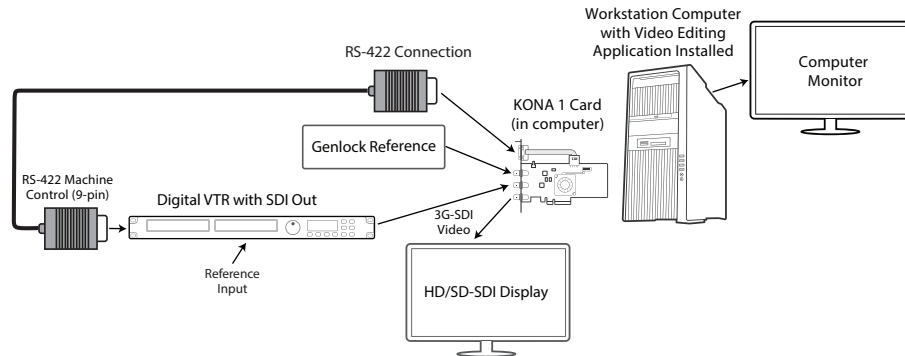


KONA 1 supports simultaneous HD/SD SDI video input and output using full sized BNC connectors on the card. No breakout cable is required.

# KONA Audio Monitoring

NOTE:    The audio monitoring feature described below is not available on KONA 1 or KONA 4 in UFC Mode.

Supported KONA hardware can be used as your single audio monitoring solution whether you are auditioning music in a web browser, playing a movie file on the desktop, creating music, or playing a YouTube clip. As long as the output of your work or application is normally output via the host system audio, your AJA hardware can route this audio for monitoring. This cuts down on unnecessary cabling, and means you can take advantage of a consistent audio monitoring environment whatever you are currently doing with your host system.

NOTE:    On first use, you will need to tell your operating system to use AJA hardware as the default Input and Output hardware.

KONA lets you listen to Host System audio concurrently with your NLE audio. This is useful if you need to audition music tracks against playback of your NLE timeline, or if you need to Skype with a remote producer during an edit session, or for a myriad of other reasons.

You can also listen to KONA Input concurrently with your NLE. This is useful if you need to listen out for the readiness of talent, or the presence of some other feed, whilst you continue to work.
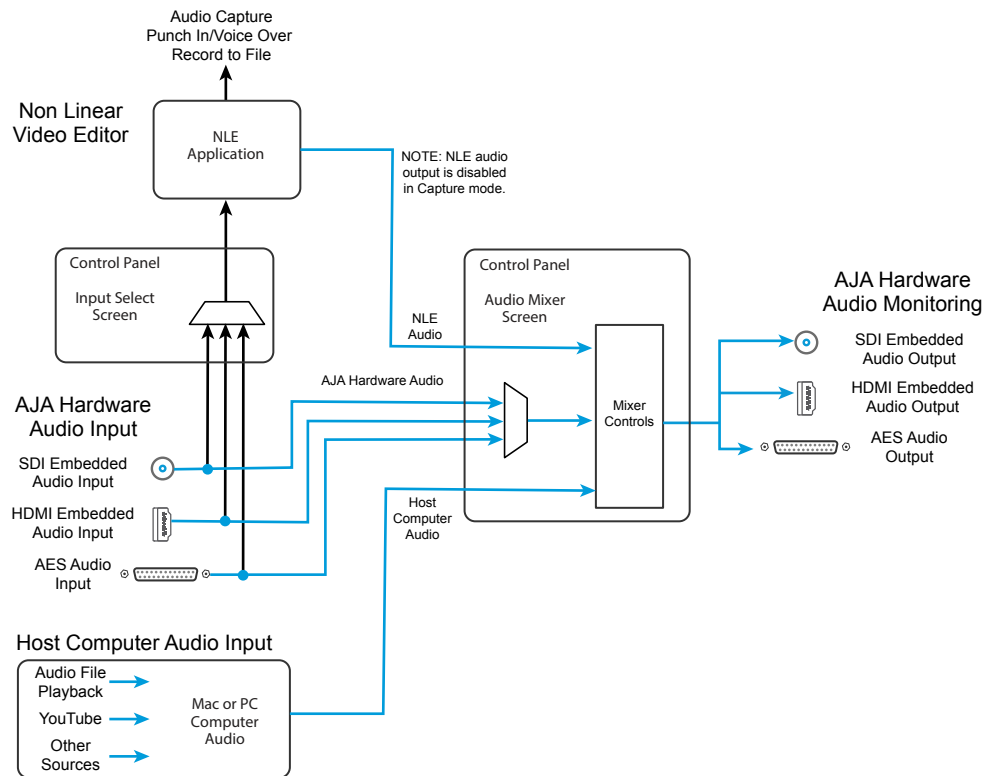
KONA audio monitoring is routed and mixed using the Control Panel application's Audio Mixer screen. You can select sources to be monitored, and can adjust their levels. If you are using the 1/4 inch monitor output connector, an additional overall mix gain control is conveniently available on the KONA's front panel.

The mixed audio monitor signal is also routed to:

- SDI Audio out
- HDMI Audio Out
- AES Audio Out (via breakout cable or DB25 cable)

*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. The Audio Mixer screen is dedicated for monitoring only, not program mixing.*

*Figure 18.  KONA Audio Monitoring Routing Diagram*



To control which AJA hardware audio is used during recording, you use the Control Panel application's Input Select Screen, Audio Input Select drop down to select from

- SDI embedded
- HDMI embedded
- AES (via breakout cable or KG3 box)

Any level adjustments to Capture or Audio Punch In / Voice Over to Timeline recording 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).

# 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/support/

System software updates may occasionally become available to AJA KONA owners on our website. 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.
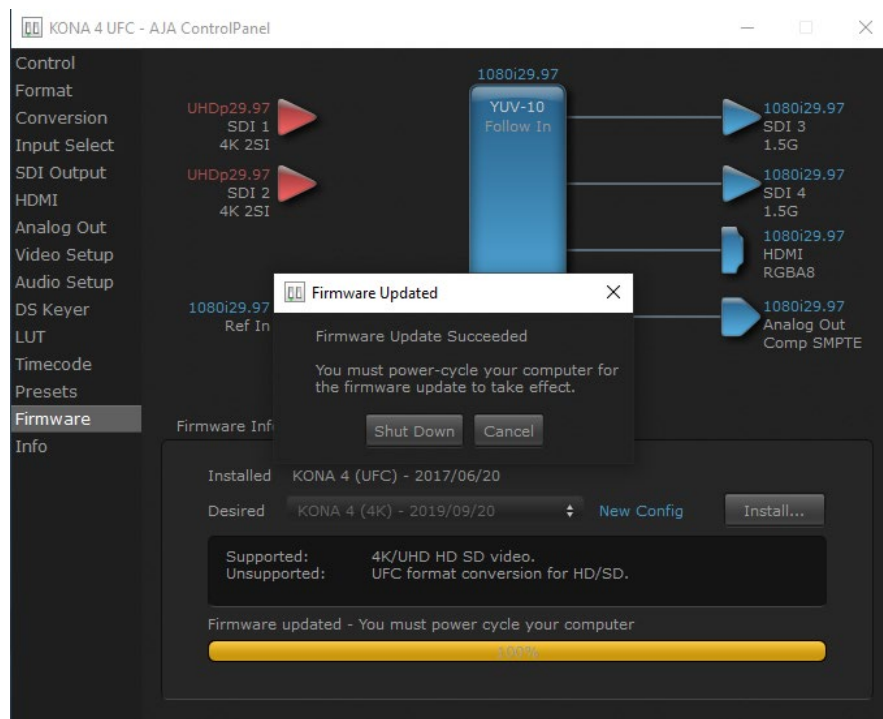
## macOS Installations

macOS versions from High Sierra (10.13) through macOS Sonoma (14.x) all have security requirements that may present dialogs during installation. Please refer to the Release Notes for guidance.

## 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.

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 1 currently supports a single firmware version.

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

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

KONA 5 supports three different versions of firmware that have different capabilities. One version of firmware can be installed at a time.

- 4K Mode—Supports 4K, UltraHD, 2K, HD, SD at 12-bit, 10-bit, and 8 bit with the appropriate 12G-SDI, 6G-SDI, 3G-SDI & 1.5G-SDI links. One channel of 12G-SDI is available for input on SDI 1 and output on SDI 3. Also supports color space conversion and downstream keying. 8K video is not supported.
- 8K Mode—Supports 8K and UltraHD2 over four 12G-SDI links at 10-bit and 8-bit. Also supports 4K, UltraHD, 2K, HD, and SD over single 12G link. This mode does not support color space conversion or downstream keying.
- 12-Bit Mode—Supports 4K, UltraHD, 3G/6G, 12-Bit LUT, color space conversion and downstream keying. Does not support 8K/UHD2 or 4K Quad Mode.

### KONA 5 Fast Bitfile Switching

With v16.0 or newer software, KONA 5 has a fast bitfile switching option. This can be used when a workflow requires moving back and forth between different projects.

For example, if the base firmware loaded is the 4K variant, each time the system is rebooted the KONA 5 card will start up with the 4K version of firmware. However, once booted with the 4K firmware running, Advanced Fast Options can be accessed to use fast bitfile switching to rapidly refresh KONA 5 with the 8K or 12-Bit firmware. This takes just a few seconds and can be performed without rebooting.

*Figure 19. KONA 5, Show Advanced Fast Options Selection*
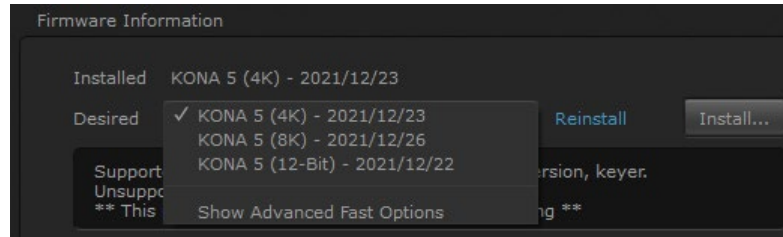


*Figure 20. KONA 5, Fast Reconfiguration*
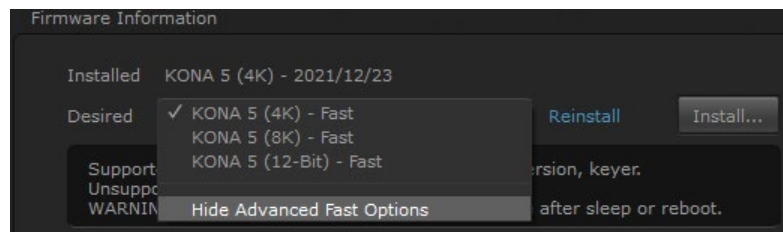


Likewise, if the base firmware loaded is the 8K variant, each time the system is rebooted the card will start up with the 8K version of the firmware, and you can again use Advanced Fast Options to quickly revert back to the 4K or 12-Bit version bitfile without the need to reboot.

NOTE:    *After fast switching your KONA 5 firmware, you should close and re-open your NLE/Capture/or Playback software (for example, AJA Control Room), to prevent potential bad capture for UltraHD2/8K content. In addition, you may want to close and reopen AJA Control Panel if you experience any issues after making a fast firmware switch.*

This feature is only available for KONA 5 running v16.0 or newer software, and the first installation of that version will require a system reboot to complete.

NOTE:    *Fast updates will revert to the previous fast firmware version installed if the computer enters sleep mode, is power cycled or reset.*

# 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 21 on page 29*).

## 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.

NOTE: *AJA devices can automatically adjust settings for specific signal inputs, outputs, and processing. This information is reported on the AJA Control Panel's block diagram. One example is if outputting 4K, HFR, YCbCr 4:2:2 10-bit from the framebuffer, if the HDMI transmitter is version 1.4b the video is automatically adjusted to 4:2:0 8-bit (e.g. KONA 4, KONA IP).*

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 21.  AJA Control Panel, Block Diagram and Controls*
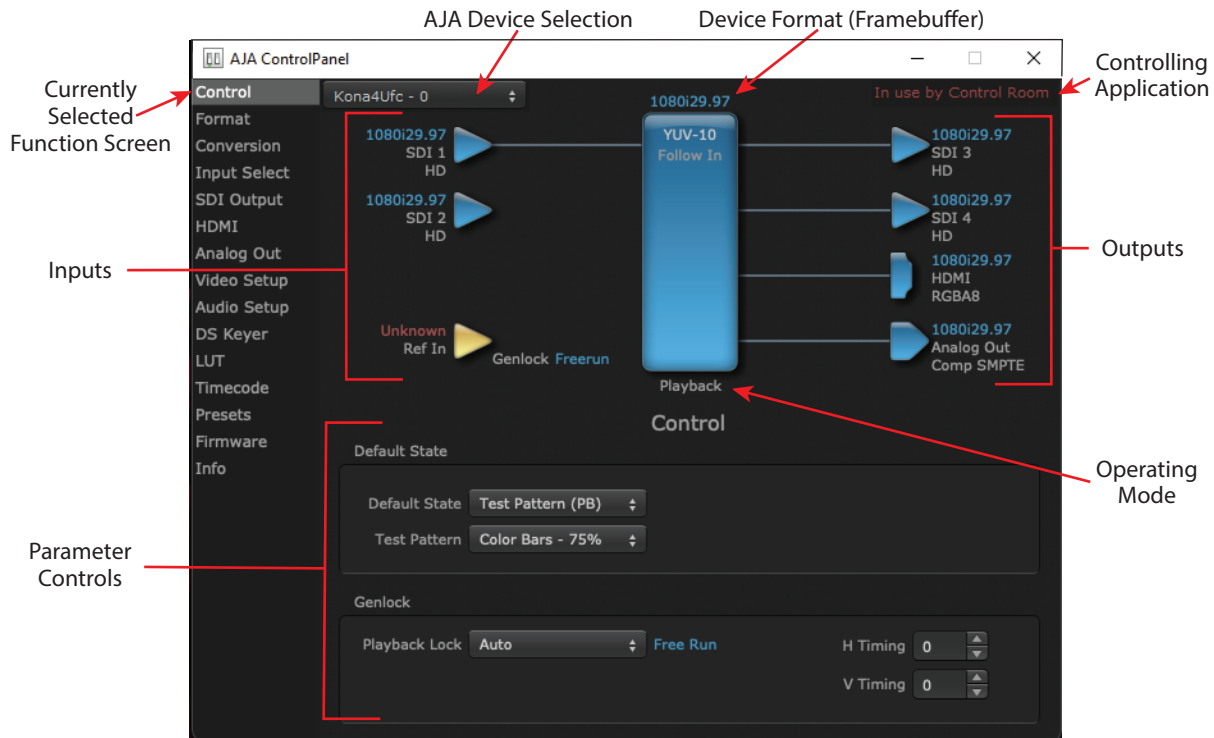


Some controlling applications can switch the card's mode from Playback to Capture, and vice-versa. When Control Panel is not being controlled by an external application, you can change the operating mode in the Control Panel Control Screen using the Default Output settings.

- Selecting Passthrough (Cap) sets the card to Capture Mode
- Selecting either Test Pattern (PB) or Hold Last App sets the card to Playback Mode

See *"Default State" on page 36* 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.

NOTE: *If a KONA card's SDI output BNC is available, that card's output signal will be routed to that extra BNC, providing two identical SDI output signals.*

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 22. Context Sensitive Menu*
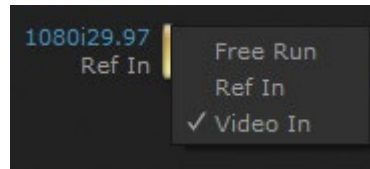


## Color Meanings

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 Device Format (framebuffer).

### Green

Indicates that KONA is performing an active change to the video making it different from the Device Format (e.g., down-conversion).

### Red

The selected operation cannot be performed.

### Yellow

Reference video (black burst or other reference source).

## 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 23. Input/Output Icons*



NOTE:   Hovering your cursor over an Input or Output icon opens a tooltip that reports that connector's signal status (Input signal detected, Output signal enabled, Input or Output disabled).

## Framebuffer

The framebuffer is the "engine" where your third-party applications interface with the AJA device. The framebuffer has a format (called the "Device Format") and color space that it follows, as defined in the linked menu screens or via external application software.

## Device Format

The Device 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 Device Format used by the framebuffer. Also any text descriptions in the block diagram that appear in blue indicate that something is in the Device 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.

## Converted Format

NOTE: A Converted 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 Device Format is a Converted Format. As described previously, this means that either the Inputs or Outputs are somehow different from the framebuffer's assigned format—the Device 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 Device Format, overriding the user's selected Device Format in the AJA Control Panel.

## Conversion Icons

When an input or output format is different from the framebuffer,'s the KONA card 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 24.  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 25.  Control Panel In Use Message (in red)*
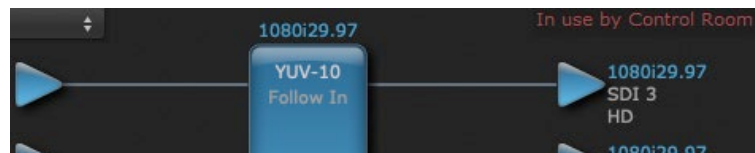
KONA is very flexible and most controlling applications perform the necessary housekeeping so they work correctly when they're active and when they're not. This means that the application that is "active" (in front) will be granted control of the KONA video output. Generally, when you switch to a different 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 Device 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 Device 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.

## AJA Control Panel Restart Services

AJA Control Panel Restart Services is new functionality (since v6.1) that allows for restarting the AJA services if necessary. This can help if various applications begin contesting for access to the Video I/O device. In this situation an **AJA Agent is not running** message can appear as the controlling application status. Hovering your cursor over that message displays a **Restart Agent** button, which clicking on will bring Control Panel back to its startup state. Then an application can freshly acquire control of the I/O device. Currently this feature is only available for macOS installations.

*Figure 26.  Restart Services Popup Message*
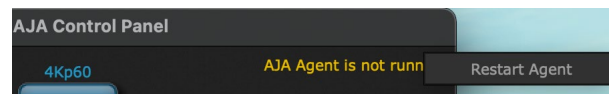


## Control Recommendations

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. |
| Conversion | (KONA 4 in UFC mode only) Permits selection of a Conversion Format. |
| Input Select | View and edit input selections and audio mapping. |
| SDI Output | Select output format. |
| HDMI | Configure the HDMI output (not KONA 1). |
| HDR | Configure High Dynamic Range settings for SDI and HDMI output (not KONA 4 in UFC mode). |
| 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. |
| Audio Mixer | Select and mix audio sources for playback and capture (not KONA 4 in UFC Mode). |
| 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. |

# 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 27. Control Panel Screen Showing Multiple AJA Devices*
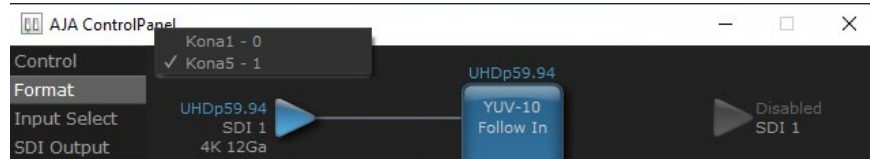


When you launch an editing application, or AJA Control Room, the application will use the product that is currently selected in the AJA Control Panel for its input/output. When an application is running, you can change the "targeted" product selection using the Control Panel pulldown menu. The running 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.

NOTE:    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) may also be shown as appropriate.

See *"Control Panel 4K/UltraHD Operation" on page 61* for detailed information about KONA 4 in 4K Mode, which also can apply to KONA 5 card operation.

See *"Control Panel 8K Operation (KONA 5 only)" on page 75* for more information about 8K operation.

## Control Screen
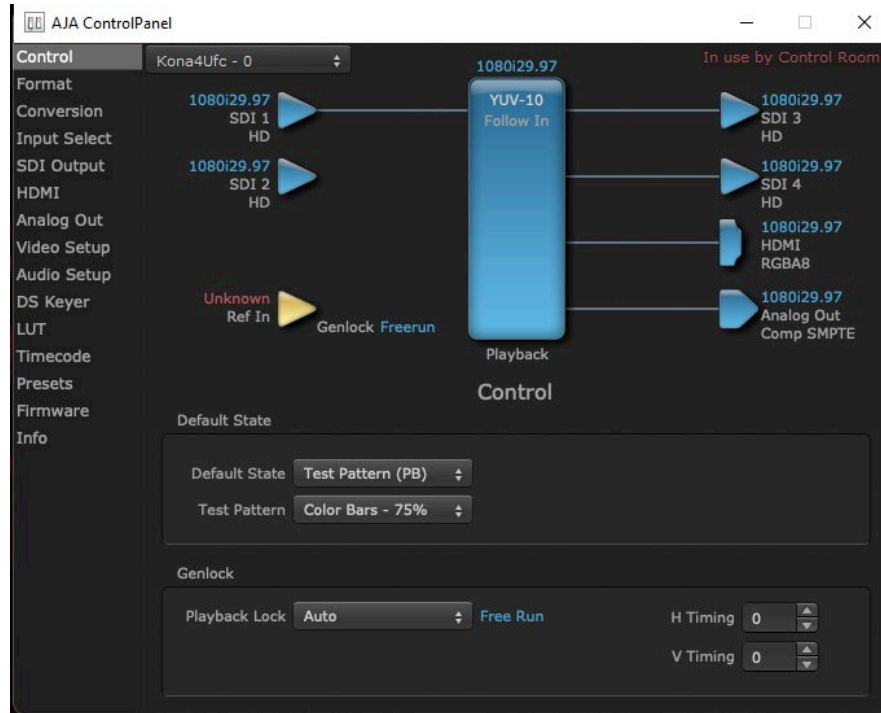


The Control Screen is where you set the Default State, which is what the device outputs when no application has control of the board. This screen also has controls for setting the genlock source, and for setting the Horiz and Vert timing offsets. The top of the Control Screen shows the current state of the device and also shows the name of the Application which has control of the board, if there is one.

## Default State

Many video applications can grab control of the KONA, so its outputs can change dynamically. The Default State settings are used to select what state the KONA will have when no third-party video application is controlling it.

### Default State

- Pass Through (Cap) - This selection directs KONA to route video from its selected input through the card for processing and output.
- Test Pattern -  This selection directs KONA to output a  preset pattern when no other application is in control.  The pattern is selected from the Test Pattern dropdown list below, or a graphic file can be chosen.
- Hold Last App - This selection directs KONA to hold and output the last frame of video from the last application to control KONA. This can be helpful when operating in an environment where you're switching back and forth between multiple application windows.

### Test Pattern

With Test Pattern selected above, you can choose the pattern type. Select from:

- Black, Color bars (75% or 100%), Ramp, Multiburst, Line Sweep, Multi Pattern, or Flat Field, Check Field, White, Border, Linear Ramp, Slant Ramp, Zone Plate, Color Quadrant, Color Quad Border, or 2SI Alignment (see below).

**2SI Alignment -** This test pattern consists of 1-pixel diagonal crosshairs plus a 3-pixel rectangle. If there is a misalignment, the diagonal crosshairs will not be a continuous line. If it is a top-bottom misalignment, the top and bottom of the square line will be broken, with white between them. If it is a left-right misalignment, the left and right lines of the square will be fuzzy or broken. This can easily be simulated by clicking the "Quad Swap" buttons in the control panel "Video Setup" tab.

For HD and UltraHD with RGB-12 Pixel Formats the following HDR test patterns are available:

- HDR Zone Plate, HDR Linear Ramp, HDR HLG Narrow, HDR PQ Narrow, or HDR PQ Wide.

### Graphic File Display

In addition to the test patterns above, a "Load File…" selection at the bottom of the Test Pattern dropdown menu allows you to load a standard RGB/RGBA graphics file (.tif,.psd, etc.) into the frame buffer for display (including alpha channel). Some graphics formats and bit depths may not be supported. Files that have been loaded are listed for quick reuse. Loaded graphic files are retained for redisplay if another test pattern is selected, and even if KONA is power cycled.

*NOTE: A loaded graphics file will not be scaled to fit. If it's smaller than the current frame buffer format, KONA will center it in the frame. If larger than the current frame buffer format it will be cropped.*

- Clear Files - This selection on the pulldown clears all the Graphic Display files.

## Genlock

Use these controls to select KONA Genlock settings and adjust Timing.

KONA can be configured to use a different genlock source for its Playback and Capture modes of operation. The combination of these selections affects KONA performance when switching between Capture and Playback in Avid Media Composer (and potentially other NLEs).

Playback Mode has three Playback Lock settings:

- Free Run: Generates sync without an external reference source
- Reference In: Uses the Ref Video source for sync (usually an analog black burst video signal)
- Video In: Uses whichever video input source has been selected in the Inputs screen for sync

### Timing (Horiz and Vert)

These two pull-downs allow output timing adjustment with reference to the Ref Video source selected.

- Horizontal: The Horizontal reference can be adjusted by selecting a number of pixels (clocks) to offset
- Vertical: The vertical reference can be adjusted by specifying a number of lines to offset.

# Format Screen
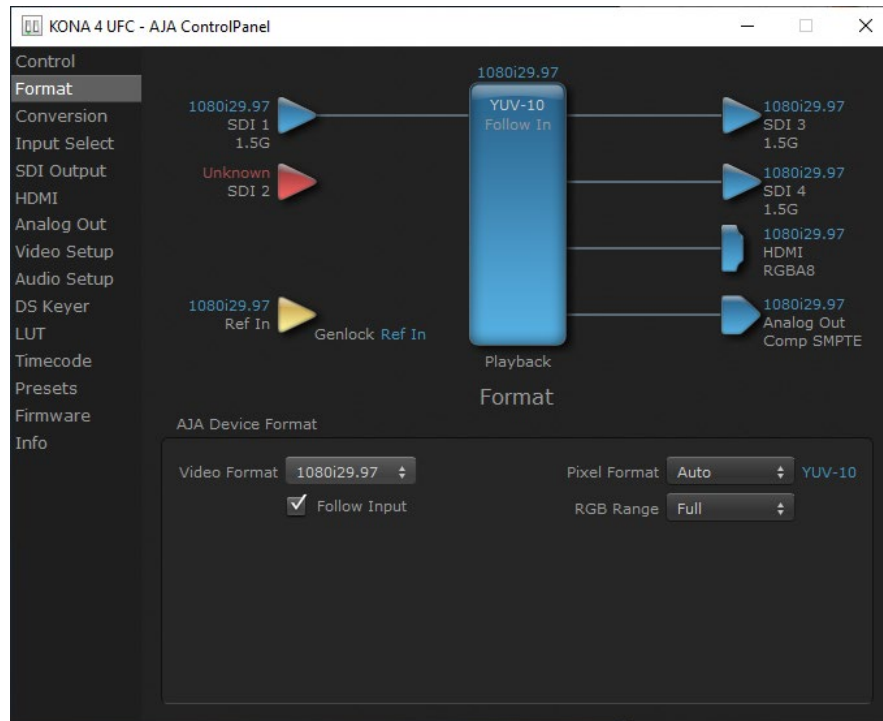


The Format Screen shows the video format currently in use by the KONA framebuffer (called the Device Format) and allows you to change it.

## AJA Device Format

### Video Format

This pull-down menu shows the currently selected Device format. If you select an alternate value 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 Auto, 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:
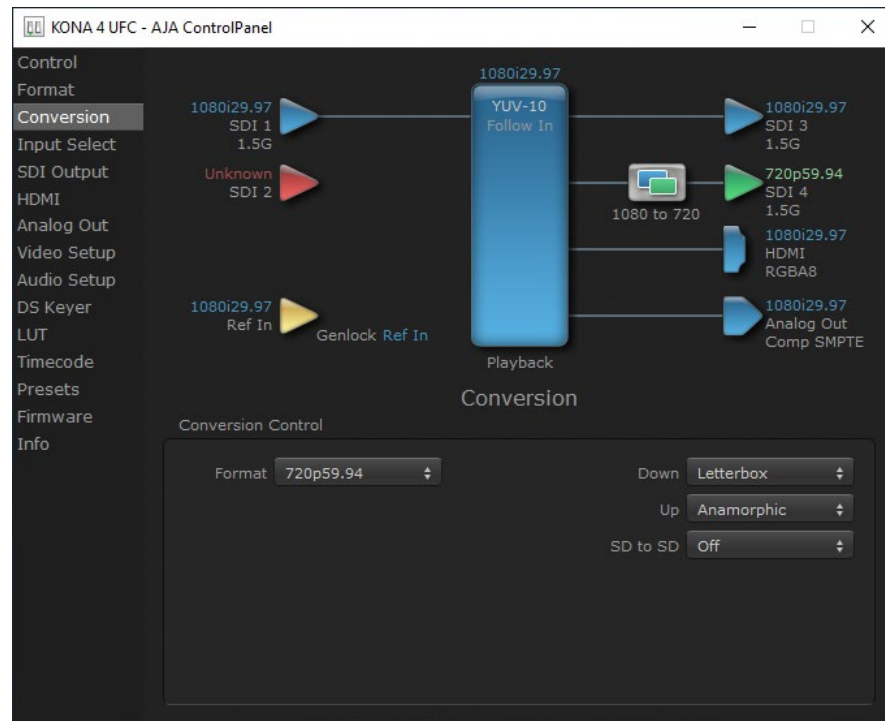
- "sf" for progressively segmented frame formats
- "p" for progressive frame formats

### Follow Input

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

## Conversion Screen

> NOTE: Conversion screens are not available on the KONA 4 in 4K mode, or on the KONA 5 or KONA 1 cards.



The Conversion Screen allows you to select an alternative Conversion format that can be defined for the KONA 4 card's outputs, when operating in UFC mode.

## Conversion Control

### Format

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

The Conversion Formats available can vary based on what the Device 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 Device format.

### Down

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

The Up and Down pull-down menus are available when conversion has been selected for the video path to/from the framebuffer and identical frame rates are selected (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

## Input Select Screen
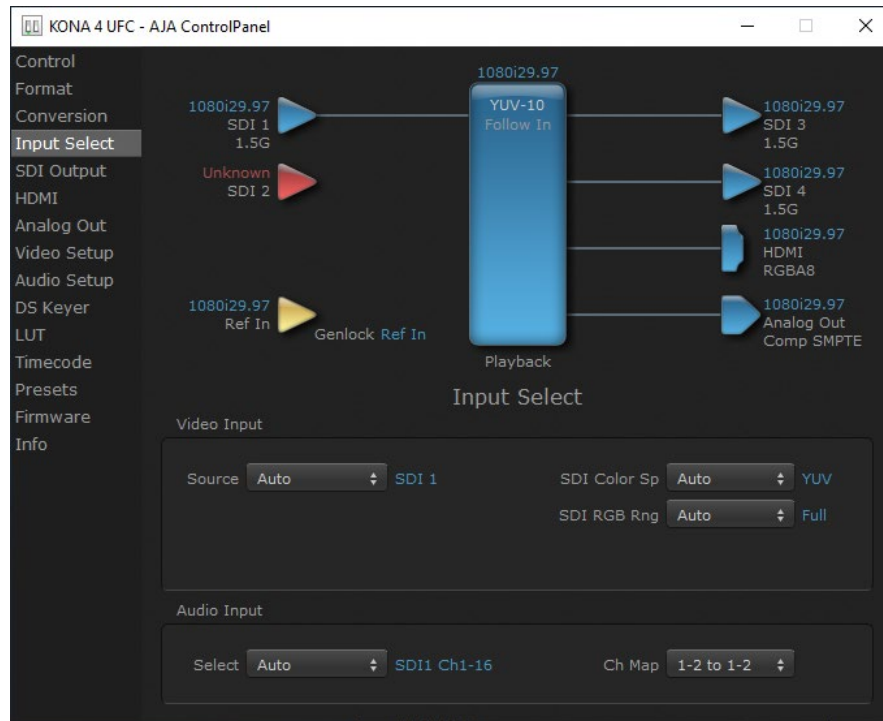


On the Input Select Screen, you can or set view the currently selected video and audio input sources and map audio sources to the channels supported by your editing application. Two information panes in the screen are provided: Video Input and Audio Input.

## 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.

NOTE: Automatic selection does not work with Quadrant (SQD) input signals in 4K and 8K mode. See and for more information.

• SDI (KONA 1)
• SDI 1
• SDI 2
• SDI 2xHD
• SDI 2x4K (KONA 4 and KONA 5 in 4K mode)
• SDI 4x4K (KONA 4 and KONA 5 in 4K mode)
• SDI 4x8K (KONA 5 in 8K mode only)

### SDI Color Sp

Sets the input color space. Select from:

• Auto - Automatically selects the color space depending on input format.
• YUV - Forces a YUV input color space.
• RGB - Forces an RGB input color space.

### SDI RGB Rng

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

### LTC/Ref (KONA 5, KONA 1)

KONA 5 cards support both Reference and Linear Time Code inputs, including from both simultaneously. Select from:

- Reference - Receives only reference on the "R" labeled HD-BNC input on the KONA 5 card.
- Ref + LTC - Receives both reference and timecode. The reference source must be connected to the "R" labeled HD-BNC on the KONA 5 card, and the timecode signal must be connected to the LTC Input BNC on the provided breakout cable.
- LTC - Receives only timecode on the "R" labeled HD-BNC input on the KONA 5 card.

KONA 1 cards support either Reference or Linear Time Code LTC: Select from:

- Reference - Receives only reference on the Reference/LTC input BNC on the KONA 1 card.
- LTC - Receives only timecode on the Reference/LTC input BNC on the KONA 1 card.

## Audio Input

### Select

The select pulldown menu allows you to pick where the audio comes from. Different KONA cards have different audio input capabilities. Select from:

- Auto - defaults to SDI 1 Ch1-16
- 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 (default)
- 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.*
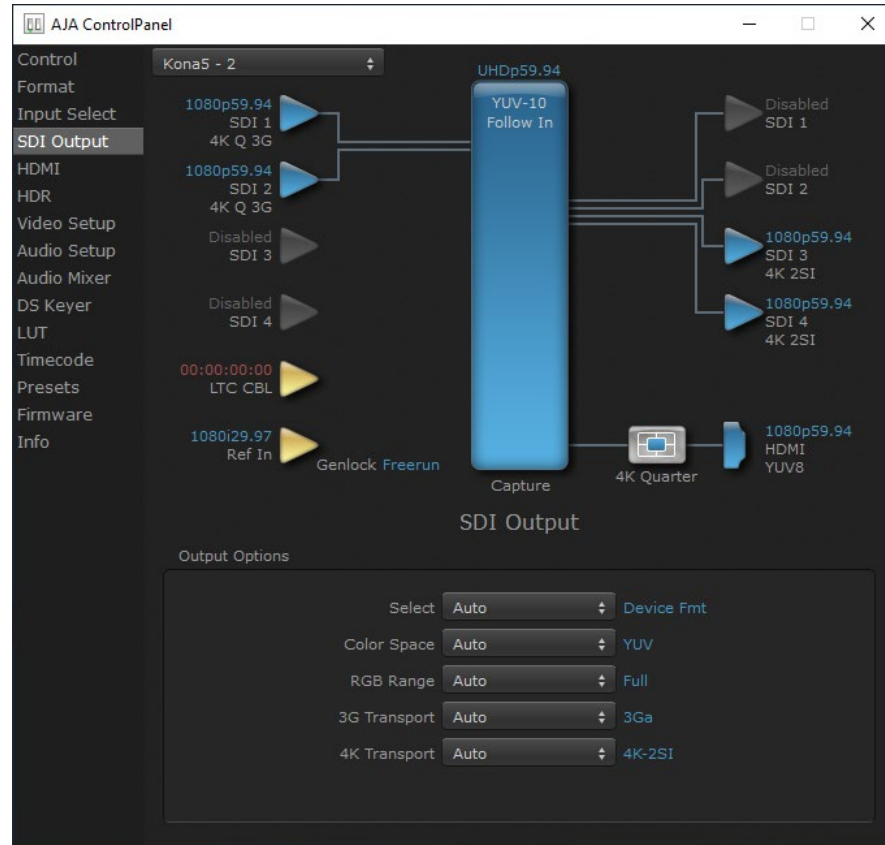
## SDI Output Screen

The Control Panel SDI Output screen is different, depending on the KONA device and the operating firmware.

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

NOTE: *If all KONA card SDI output BNC connectors are not required for the  currently configured transport, the same SDI signal will be routed to both SDI output BNC connectors.*

*Figure 28.  SDI Output Screen, KONA 5 in 4K Mode*



## Output Options

### Select

- Auto - Automatically selects the output format, based on the input or selected format.
- Device Format - 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
- 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.
- 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.

NOTE:     See *"SDI Output Screen in 4K Mode" on page 68* and *"SDI Output Screen in 8K Mode" on page 77* for information about higher capacity transports.

*Figure 29.  SDI Output Screen, KONA 4 in UFC Mode*
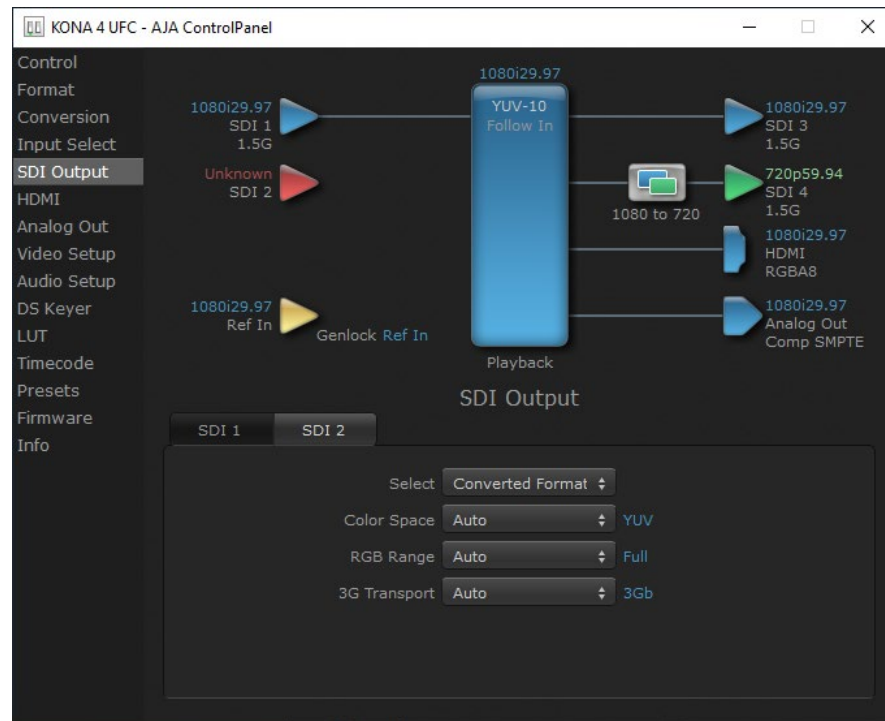


On KONA 4 in UFC Mode, two SDI output are available (SDI 1 and SDI 2) which can be configured differently from each other. For example, one output can be the Device format and the other output can be the Converted format.

## SDI 1

Sets the output format for SDI 1 (SDI output BNC 3). Parameters are the same as *"Output Options" on page 43*, except you can select a Converted 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 (Device Format). That Converted 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 (SDI output BNC 4).

# HDMI Screen
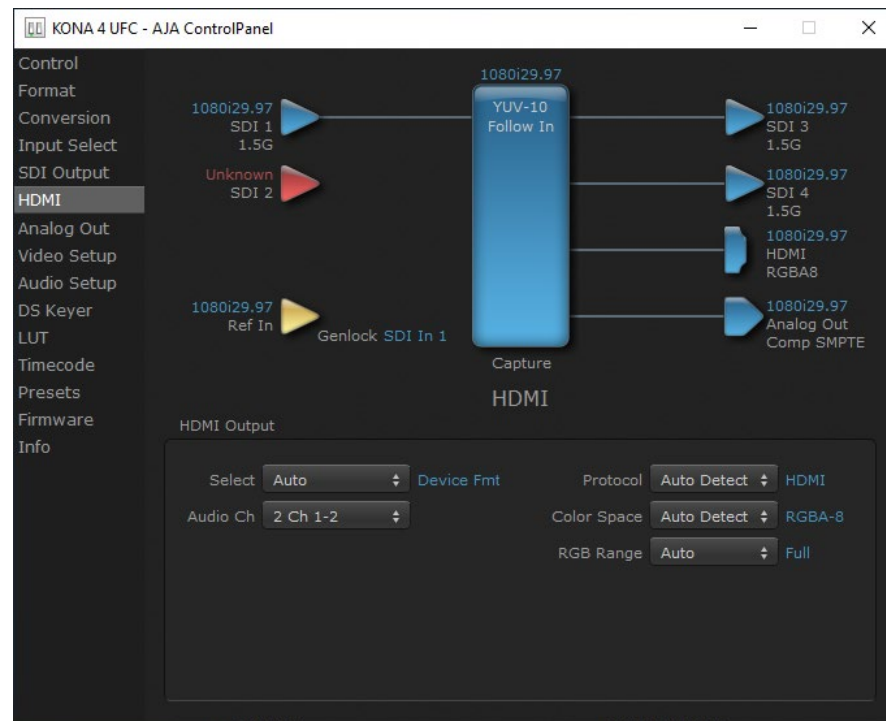


The HDMI screen is used to configure the KONA card's HDMI Output signal.

# 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 Converted 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

This pull down allows you to choose between two "Auto" modes, or to explicitly force the output to a desired protocol.

- Auto Detect – (most reliable) AJA device attempts to reconfigure the HDMI output to match the current protocol setting of the output monitor. This option will be the most reliable in creating an output image. However, the output may result in loss of audio.
- Auto Set – (best quality) The AJA device HDMI out will attempt to automatically set the output monitor into the best protocol, usually HDMI.
- HDMI – Forces the use of the HDMI protocol regardless of the attached device's EDID. Connection may fail if output monitor does not support the HDMI protocol.
- DVI – Forces the use of the DVI protocol regardless of the attached device's EDID.

### Color Space

This pulldown Color Space pulldown allows you to choose between two "Auto" modes, or to explicitly force the output to a desired color space.

- Auto Detect – (most reliable) AJA device attempt to reconfigure the HDMI output to match the current color space setting of the output monitor EDID. This option will be the most reliable in creating an output image. However, the output may result in an inferior image due to color space conversion and loss of bit depth.
- Auto Set – (best quality) The AJA device will attempt to automatically set the output monitor into the best color space and bit depth that matches the user's application needs regardless of EDID of the output monitor. This may result in loss of image if the output monitor does not support a specific color space mode.
- RGBA-8 – Forces the use of RGBA-8 regardless of the attached device's EDID or user application needs.
- RGB-10 – Forces the use of RGB-10 regardless of the attached device's EDID or user application needs.
- RGB-12 – Forces the use of RGB-12 regardless of the attached device's EDID or user application needs.
- YUV-10 – Forces the use of YUV-10 regardless of the attached device's EDID or user application needs.
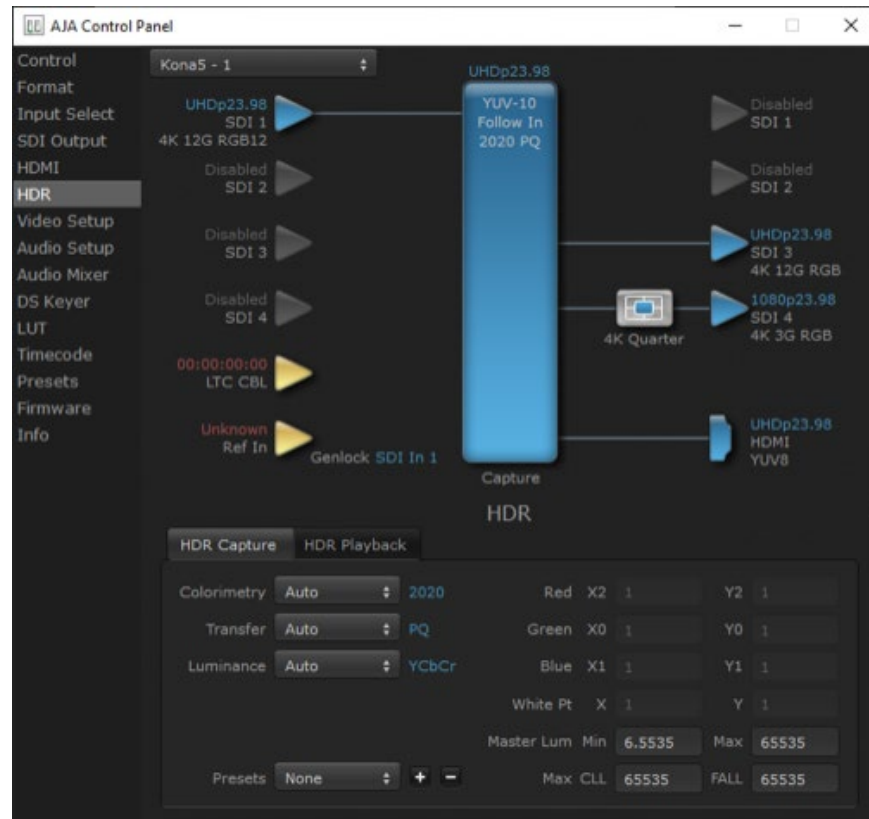
### RGB Range

The RGB Range pulldown menu allows you to select the type of RGB color output.

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

# HDR Screens

*Figure 30. HDR Capture Screen Tab*



The HDR screen provides a sub tab setup for HDR playback simultaneously via both SDI and HDMI.

For SDI destinations, the HDR data is delivered in-band using VPID signaling for SDR/HDR Transfer Characteristics, Colorimetry and Luminance.

For HDMI destinations, side-band information is used to inform an HDMI sink device (such as a TV or monitor) that the video content is HDR. This includes generation of the Dynamic Range and Mastering Infoframe and the static metadata descriptors as defined in CTA-861.3 and HDMI v2.0a.

Included are preset primaries values for BT.2020 and DCI P3 color gamuts.

Two tabbed screens are available. The HDR Capture tab settings affect the HDR metadata saved with your captured video, while the HDR Playback tab settings affect what HDR metatdata is included the KONA's HDMI and SDI outputs.

KONA 5 and KONA 4 support HDR over both their SDI and HDMI outputs. KONA 1 supports HDR over its SDI output.

## HDR Capture Settings

### Colorimetry

- Auto - (default)
- SDR - Standard Dynamic Range
- P3 - P3 colorspace
- 2020 - BT.2020, typically used with HDR
- Custom - Allows custom values for the Digital Primaries.

### Transfer

The Electrical Optical Transfer Function metadata bit tells the HDMI display which EOTF to use.

- Auto - (default)
- SDR - Standard Dynamic Range
- PQ -
- HLG (Hybrid Log Gamma) - No meta-data for Digital Primaries.

### Luminance

- Auto - (default)
- YCbCr -
- ICtCp - IPT color space

## 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.
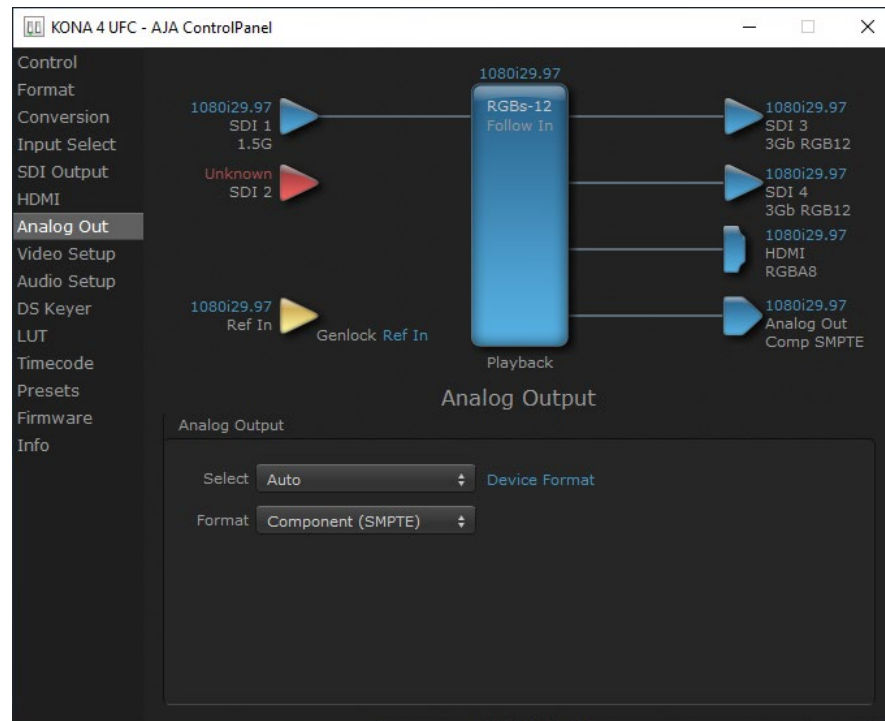
- Range: 1 cd/m2 to 65535 cd/m2.
- Step size: 1 cd/m2.

## HDR Playback Settings

The HDR Playback tab settings are identical to the HDR Capture settings, but affect the KONA's HDMI and SDI outputs.

# Analog Out Screen

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 Converted 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
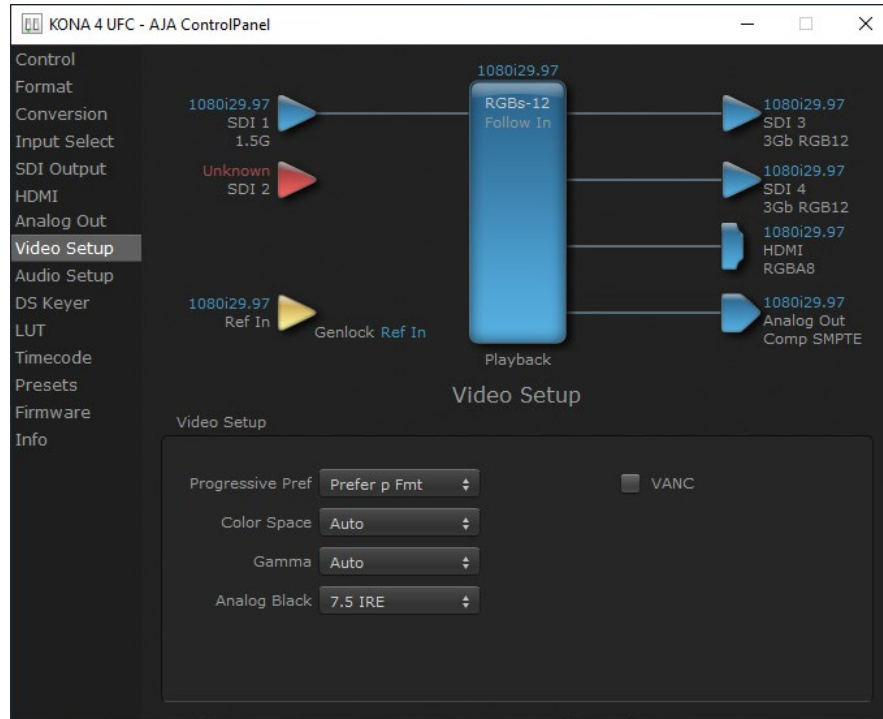


The Video Setup screen shows various other settings which will affect how video inputs and outputs behave, and how KONA interacts with some software applications.

## Video Setup

### Progressive Pref

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. Choose between:

- Prefer p Format - progressive frames non-interlaced output
- Prefer psf Format - progressive segmented frames

NOTE: *If you change this option while your NLE is open and running, you may need to then make a change in one of your NLE settings in order for this to be reflected dynamically in the project. For example in Media Composer, simply toggling the Video Quality menu in the Timeline should cause a project format refresh to occur, thus recognizing the change you just made in Control Panel..*

### 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 69* 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:
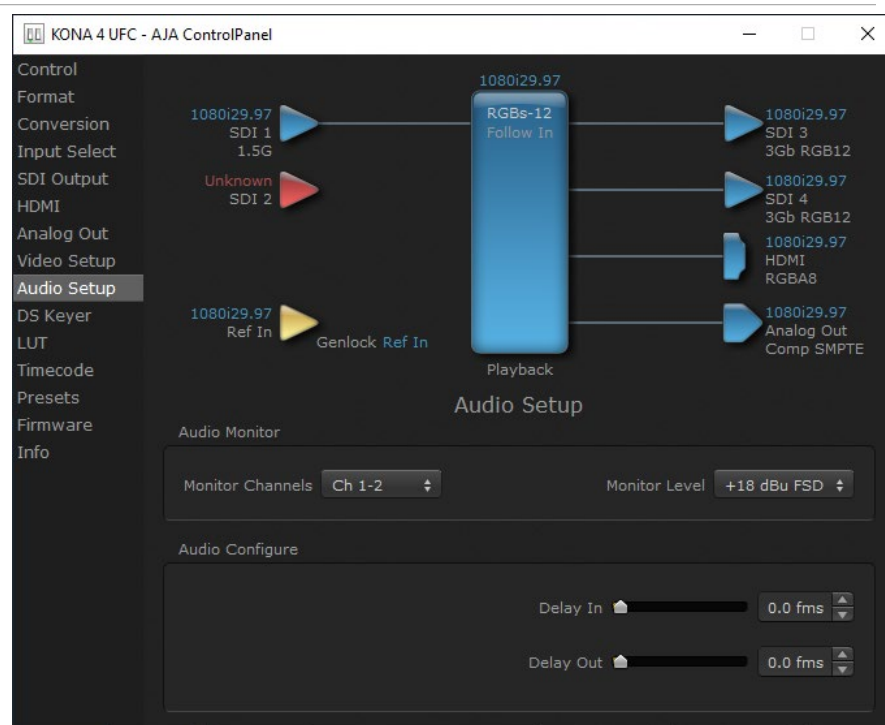
- 7.5 IRE (NTSC US)
- 0 IRE (NTSC Japan)

### 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
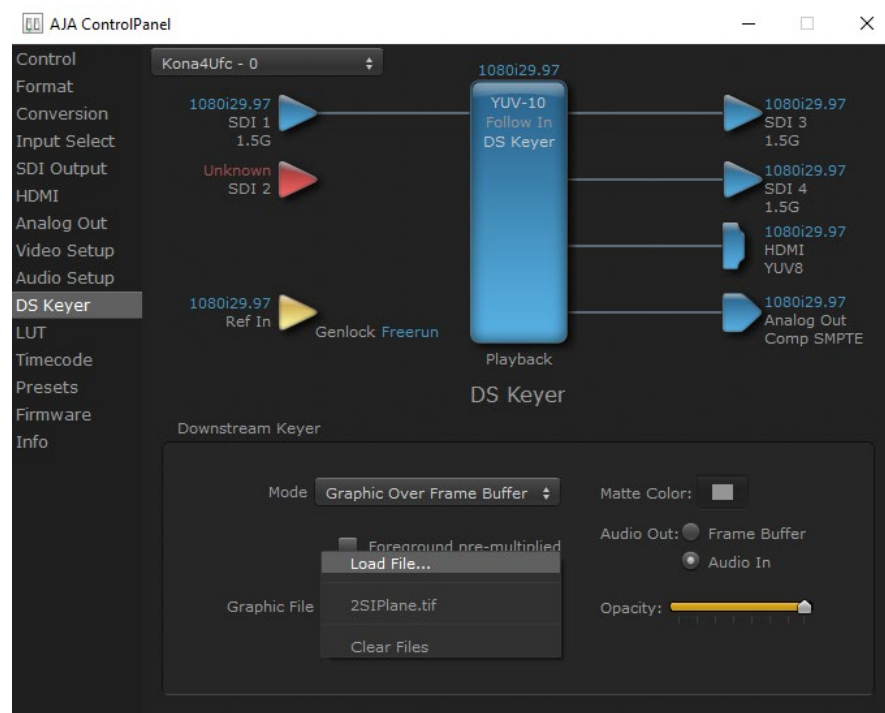- +18 dBu FSD (default)
- +15 dBu FSD
- +12 dBu FSD

## Audio Configure

### 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.*

## 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, 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, 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).
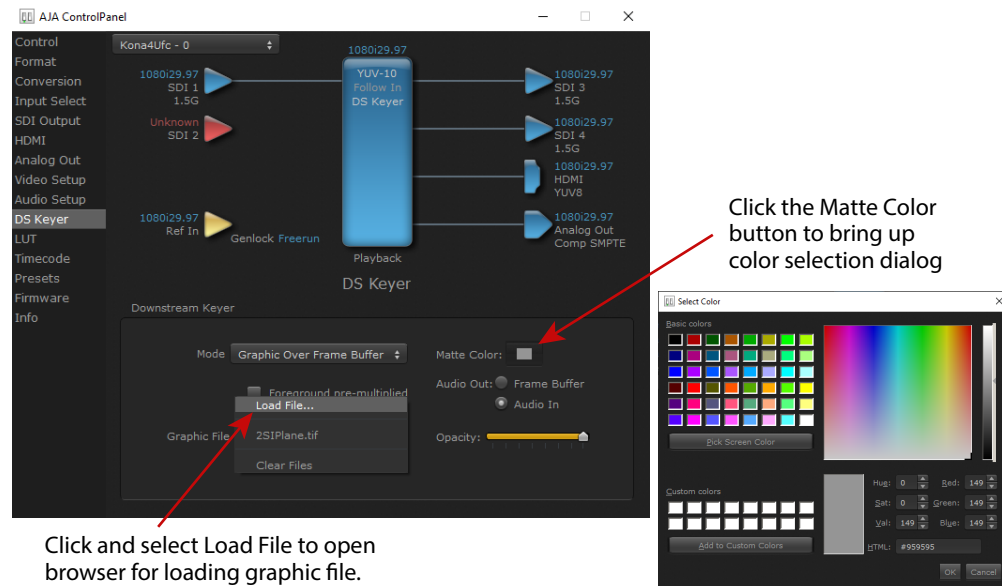
### Opacity (slider)

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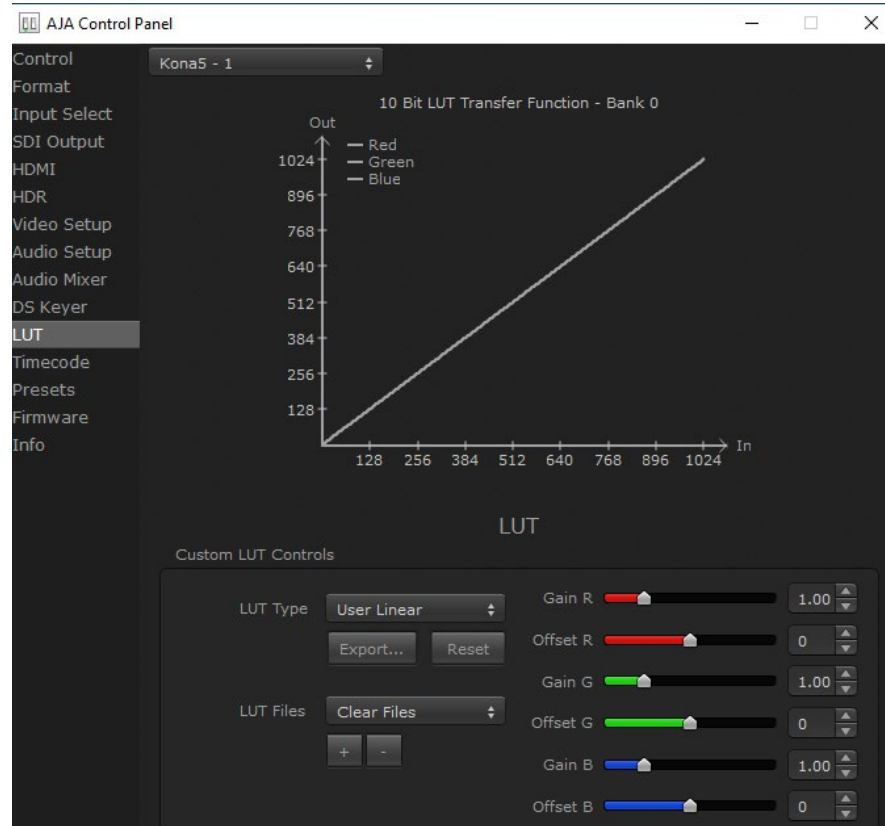
## Graphic File

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 Device Format in the framebuffer or the Converted 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 31. 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 allows you to create a custom 10-bit color look up table (LUT) on the KONA output, for matching a production "look" on a specific display. These custom LUTs can also be exported as .cube files for use with supported AJA devices and compatible professional applications. Users can also load externally generated LUT files into the KONA to ensure consistent color among different devices.

## KONA 5 Firmware Versions and Bit Depth

KONA 5 offers three firmware versions, one of which (s2110-RGB) supports 12-bit LUT files. KONA 1 and KONA 4 support only 10-bit LUTs.

For KONA 5, the bit depth of LUT files depends on the version of firmware installed into that KONA 5 device.

- When s2110 or s2022 firmware is installed, KONA 5 creates and uses 10-bit LUT files.
- When s2110-RGB firmware is installed, the KONA 5 creates and uses 12-bit LUT files.
- 10-bit LUT files can only be used with 2110 and 2022 firmware, and 12-bit LUT files can only be used with s110-RGB firmware.

## 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 32. 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" on page 56* for more information.

### 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.

### Export

The Export button can be used to save the current LUT values as a .cube file. The LUT file can be named and you can specify the location to save the file. This Export feature lets you take the custom LUT with you and re-import it to another system or location for consistency.

### 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 57*).

### 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 go to user linear in Control Panel and make some modifications, then click export and you will have a .cube file. You can then either import that LUT on a different workstation, or else use a text editor to make manual adjustments if desired.

## Timecode Screen
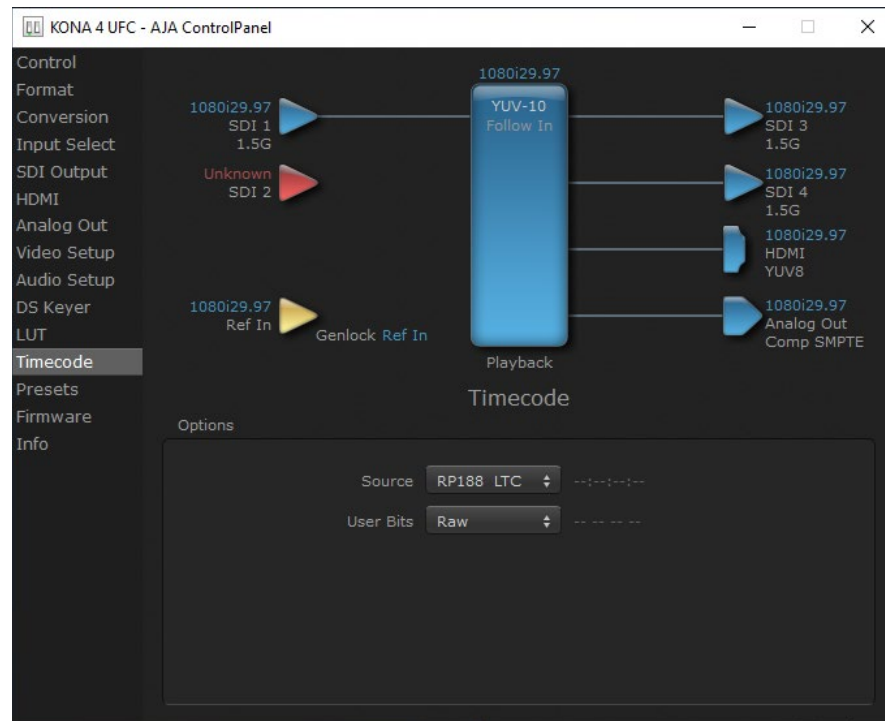


The Timecode Screen selects the timecode stream read for applications that use it (for example, when the timecode source is set to "Use control panel setting," AJA Control Room will read the selected stream). It is also used for monitoring the RP-188 timecode embedded in the digital data stream.

## 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
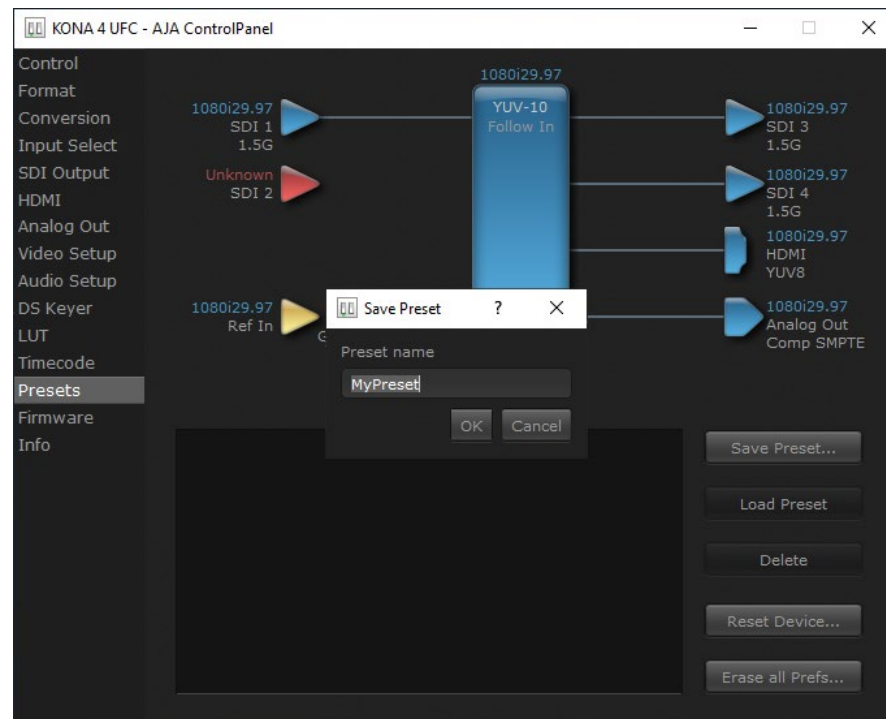
After configuring the AJA Control Panel screens, you can then save all your settings as a snapshot for later recall—called a preset. In this way, you can organize presets for all your typical tasks, eliminating time-robbing manual reconfiguration each time. To save a preset, go to the Presets screen 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 33*.

# Firmware Screen
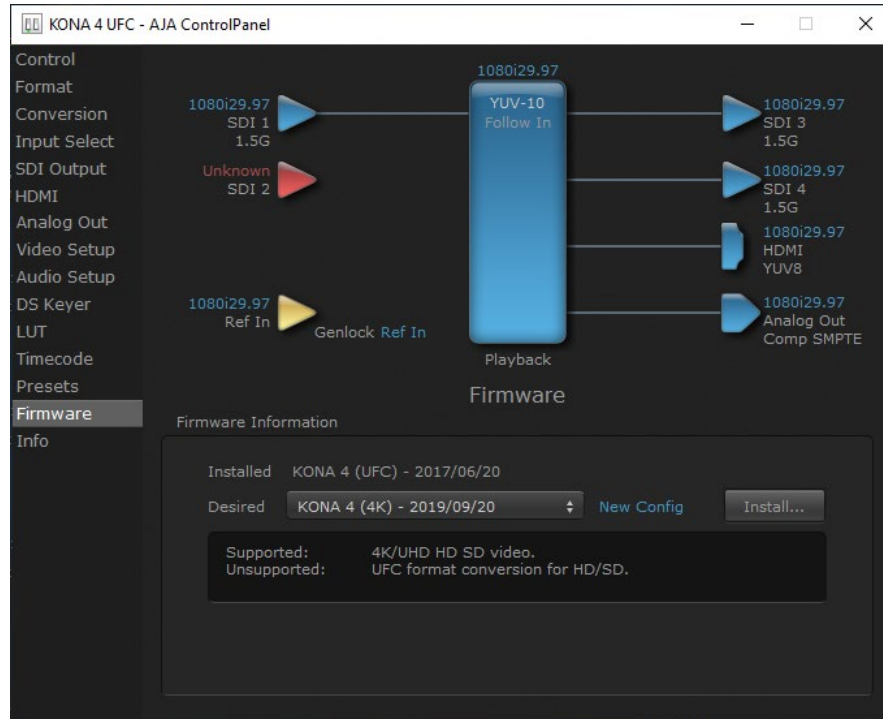


Use the Firmware link to access the firmware update/changeover screen. See *"Firmware Update Procedure" on page 25* for details.

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

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

For KONA 5 the following firmware versions are available:

- 4K—supports SD, HD, 2K, UltraHD (3840x2160) and 4K (4096x2160) formats.
- 8K Mode—supports the capture or playback of 8K material, as well as lower bitrate material.
- 12-Bit—supports 4K, UltraHD, 3G, 6G, 12G, 12 Bit Lut, color space conversion and downstream keying. Does not support 8K/UHD2 or 4K Quad Mode.

Click **Install** to erase the current firmware and load the desired firmware.
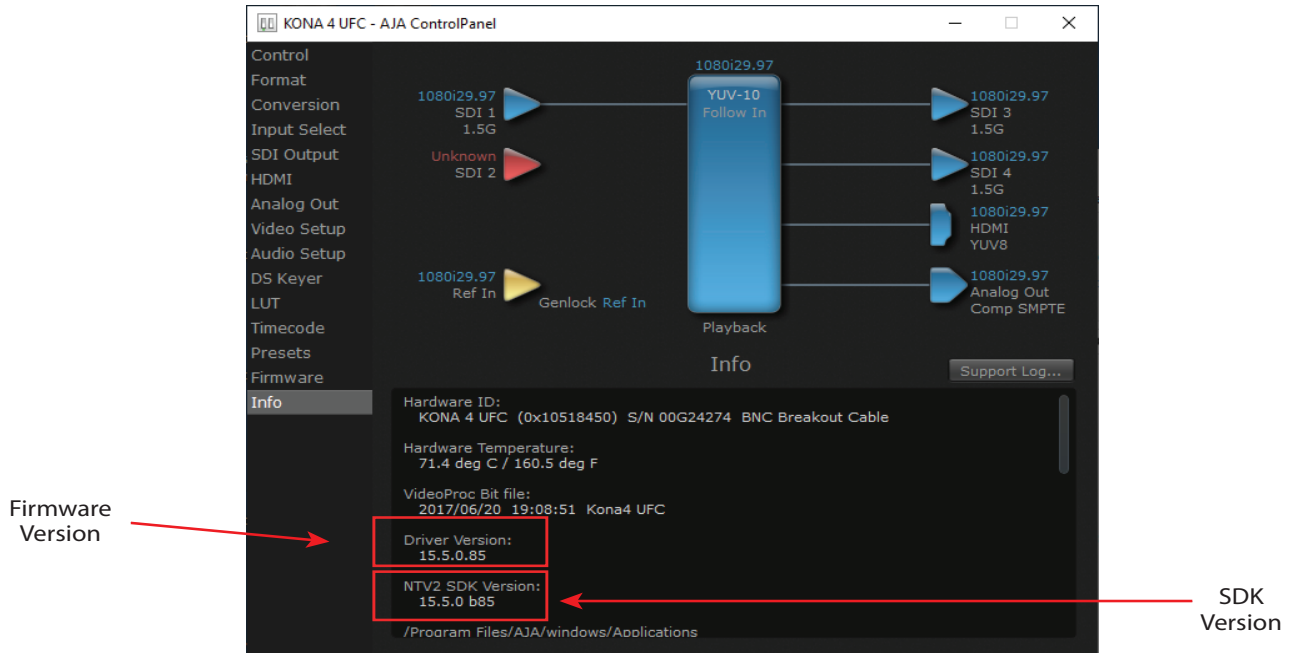
You will be required to power-cycle your computer to finish the changeover, (unless you use the fast reconfiguration feature for KONA 5).

KONA 5 also provides an option to quickly switch between different firmware versions. See *"KONA 5 Fast Bitfile Switching" on page 26* for more information. This feature is only available for KONA 5 running v16.0 or newer software, and the first installation of that version will require a system reboot to complete.

NOTE: *Fast updates will revert to the previous fast firmware version installed if the computer enters sleep mode, is power cycled or reset.*

## Info Screen



Firmware Version

SDK Version

This screen shows the 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.

The current firmware and SDK versions for the KONA Series are shown in the fields specfied above.

# Control Panel 4K/UltraHD Operation

This section describes the AJA Control Panel operations specific to KONA 4 and KONA 5 in 4K Mode. 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.

*Figure 33.  Mapping of Quad SDI Outputs*



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.

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 34.  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 1.5G 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, the KONA 5 sends a 4K/UltraHD signal to SDI output 3 and automatically outputs a down-converted 2K or HD signal on SDI output 4. The down-converted signal is not broadcast quality and should be used for conference monitoring purposes only.

See , for more information about 8K video.

## About SMPTE Standards

The SMPTE standards actually specify only 2SI for 4K/UltraHD (no SQD), and only the following multi-link transports are defined to support 4K/UltraHD:

*Table 2.  SMPTE Standards*

| 2x6G-SDI | 2SI | Low Frame Rate (30 or less) or High Frame Rate (up to 60) | |
| --- | --- | --- | --- |
| 4x3G-SDI | 2SI | LFR/HFR | Level A or Level B-DS |
| 2x3G-SDI | 2SI | LFR only | Level B-DS only |

However, the SMPTE standards recognize that manufacturers have built multi-link transports that use SQD, possibly developed before the standards were established. These recognized multi-link transports are:

*Table 3.  SMPTE Recognized Alternative Transports*

| 4x3G-SDI | SQD | LFR/HFR | Level A or Level B-DS |
| --- | --- | --- | --- |
| 2x3G-SDI | SQD | LFR | Level B-DS |

Because of the unofficial nature of the alternative transports above, manufacturer's products may not interpret these signals correctly. For example, a downstream device may not accept them because the VPIDs are incorrect, no VPID exists for square division transports, or the image may display all four quadrants superimposed on top of each other.

# Control Panel Block Diagram Area in 4K Mode

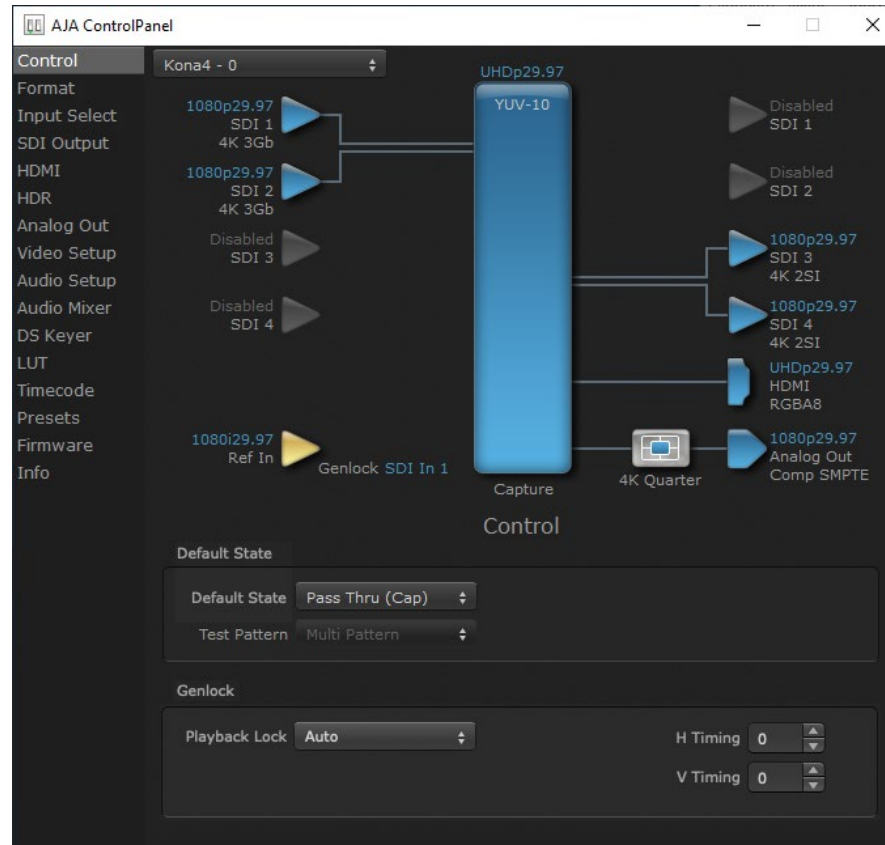*Figure 35. Control Screen with UltraHD 4 Link Input (KONA 4)*
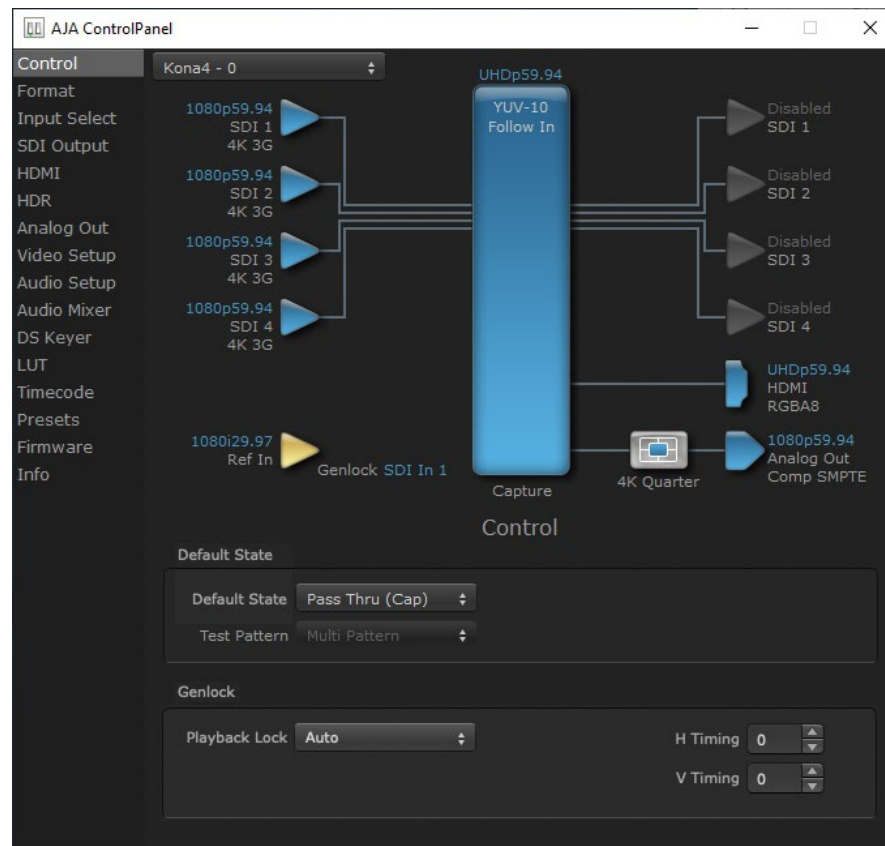


Besides SD and HD input and output, 4K mode permits UltraHD or 4K input and/or output.

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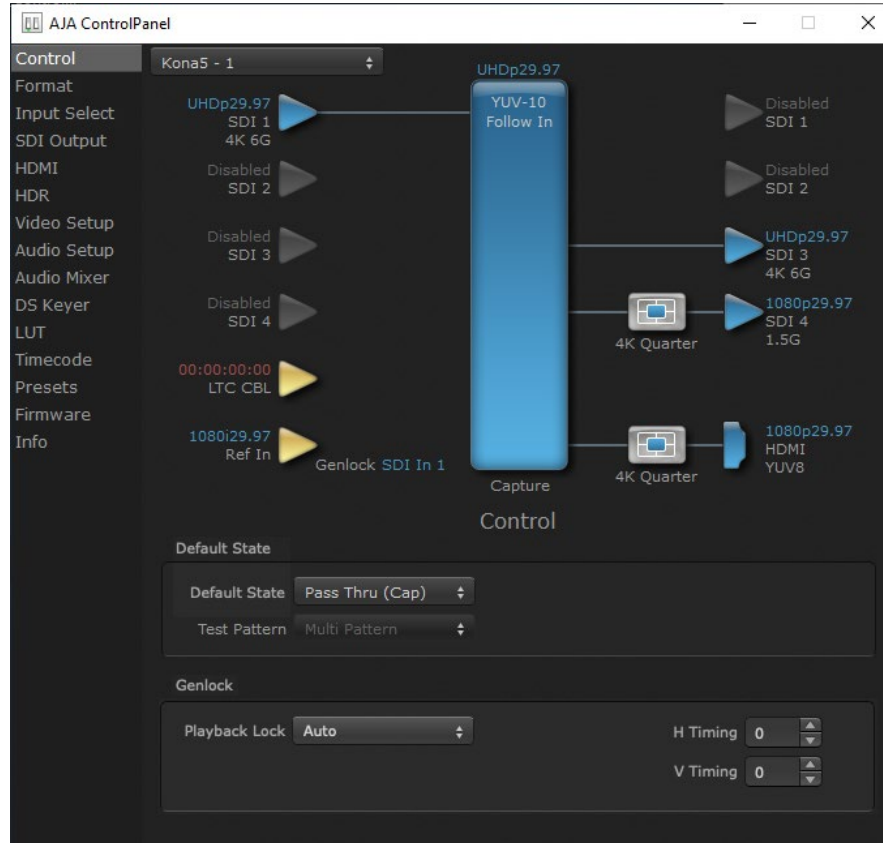
If a 4K 29.97 two link input is connected and a UltraHD/4K 24-wire Source is selected on the Input Select menu, two BNC connectors are used for input, allowing the other two to be used for SD output. 4K signals report their links as 2K.

*Figure 36.  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/2K signal on SDI 4.

*Figure 37.  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 the SDI input signal.
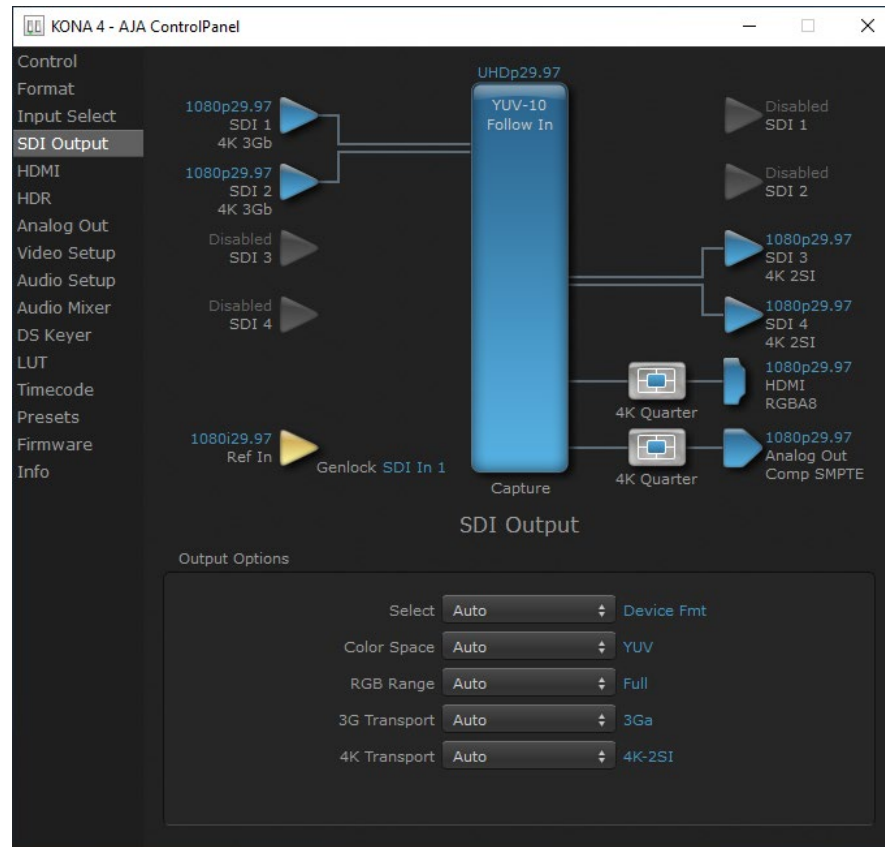
## SDI Input Screen in 4K Mode
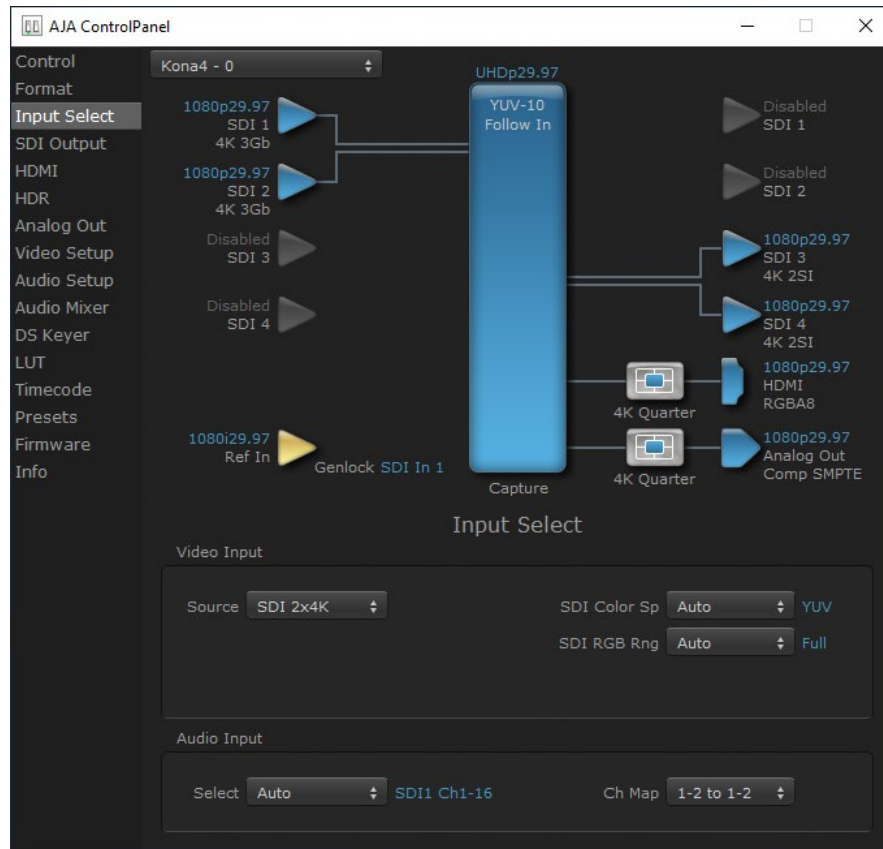


In 4K Mode, additional KONA sources can be selected for Video and Audio Input.

NOTE:    The Video Input Auto source selection works for 2SI input signals, but does not work with Quadrant (SQD) inputs. With SQD input signals the Auto setting defaults to SDI 1 only, and you must then manually select the correct number of input sources.

# SDI Output Screen in 4K Mode



Besides the general settings described in *"SDI Output Screen" on page 42*, 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 on the SDI 3 output, which will also automatically be downconverted and routed to the SDI 4 output.
- 12-Bit-Quad - Dual Link 4K/UltraHD output, SQD
- 4x 4K-Quad - Quad Link , SQD
- 1x 4K-Quarter - Downconverts the 4K/UltraHD signal to HD/2K

*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.*

## Video Setup Screen in 4K Mode

*Figure 38.  AJA Control Panel, Video Setup Screen*
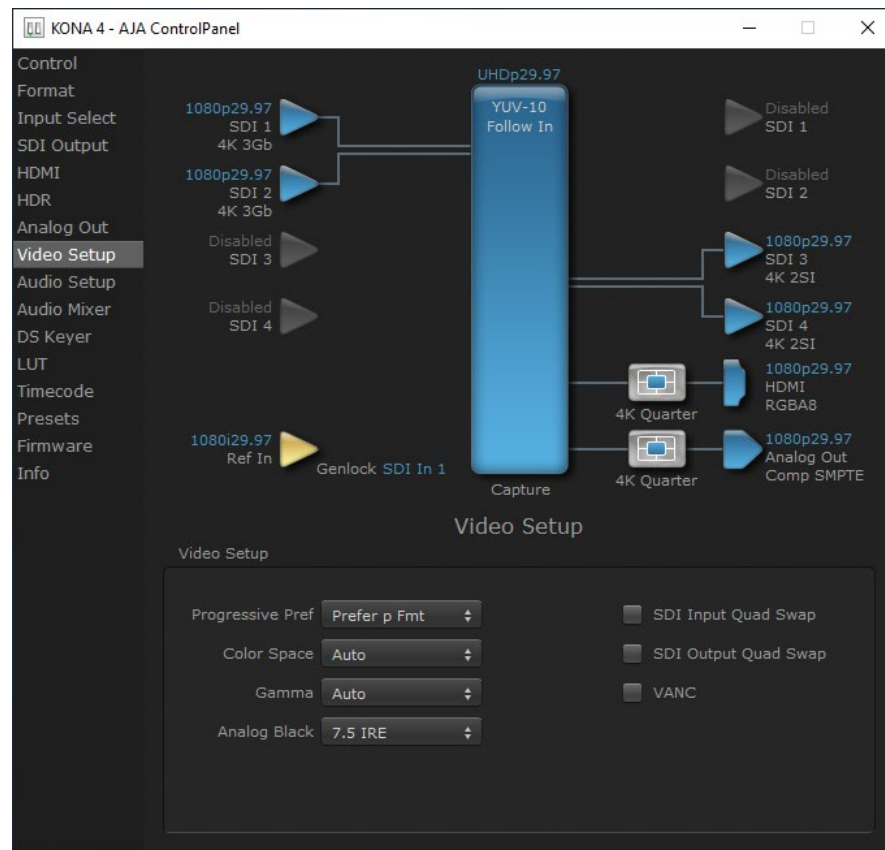


4K Mode adds Quad Swap controls to the Video Setup Screen.

### 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/Ultra HD 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/UltraHD 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/UltraHD 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

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.
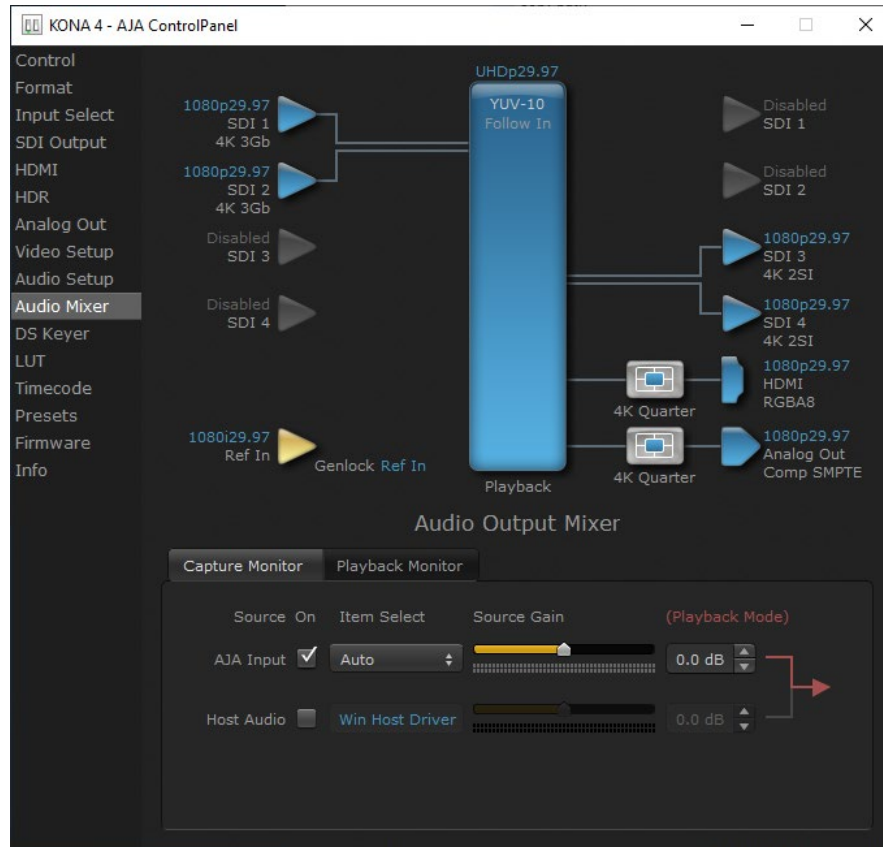
The selection check boxes and screen slider controls affect the following KONA outputs:

- 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 39. Audio Mixer Screen Example, KONA 4 in 4K Mode*



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 39*). However, settings can be adjusted while in that disabled mode, and will be applied when you return to that operating mode.

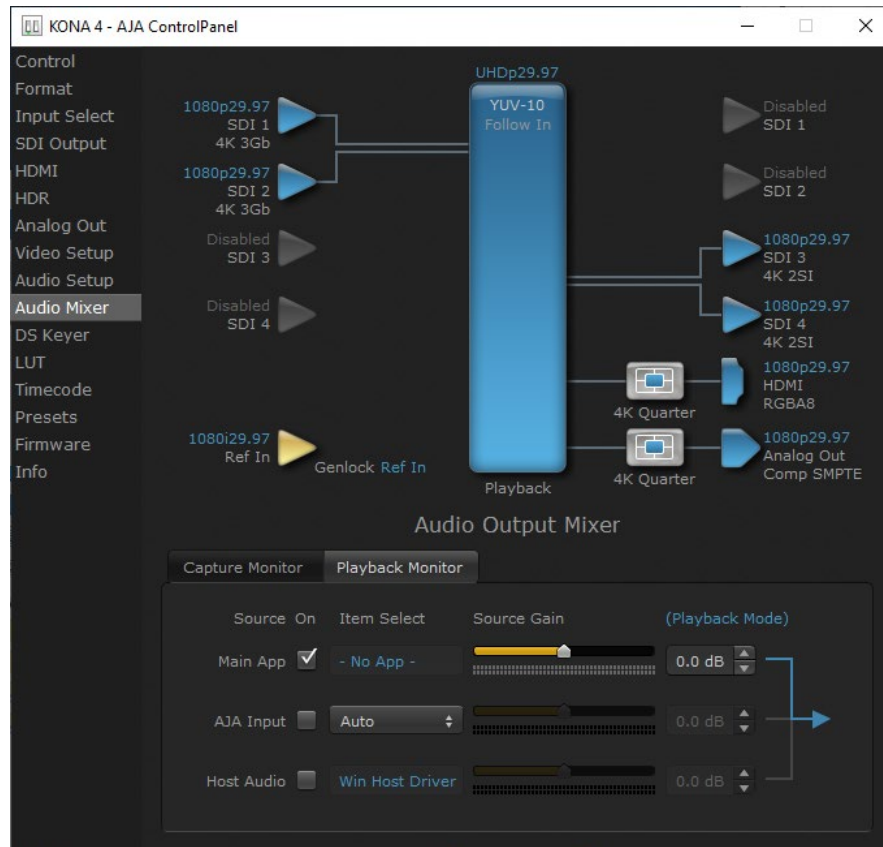# Audio Mixer Capture Monitor Mode Screen
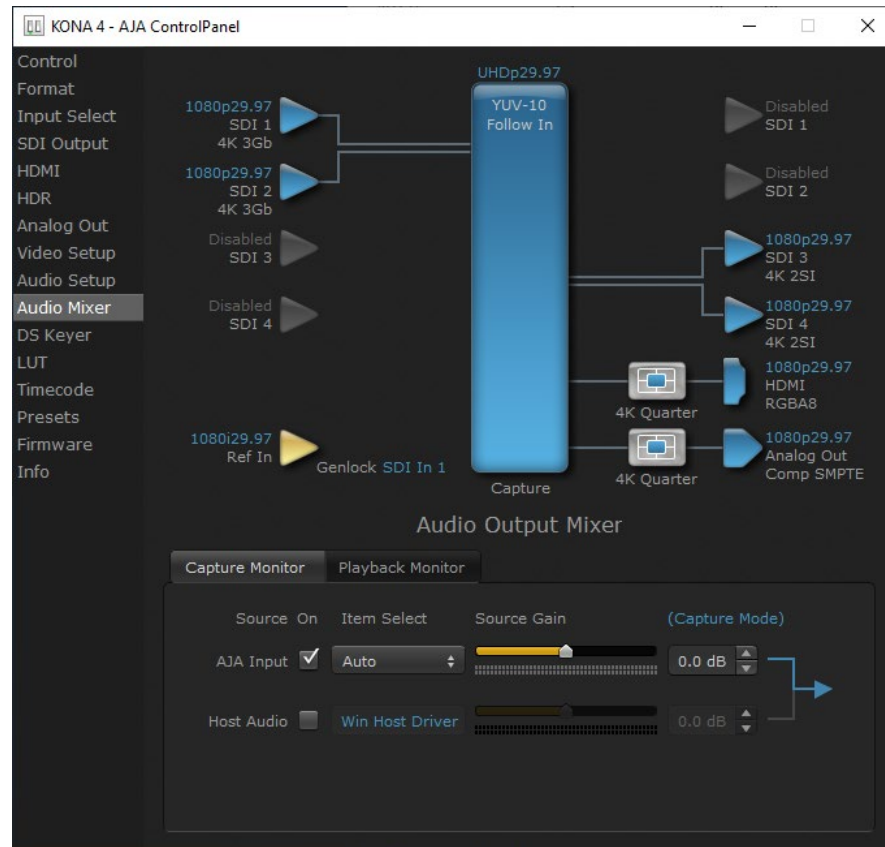


The Capture Monitor Mode screen is used to select and mix audio to be monitored during capture operations.

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 73* 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



## 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 in 4K Mode

*Figure 40.  AJA Control Panel, DS Keyer Screen with Unsupported Message*
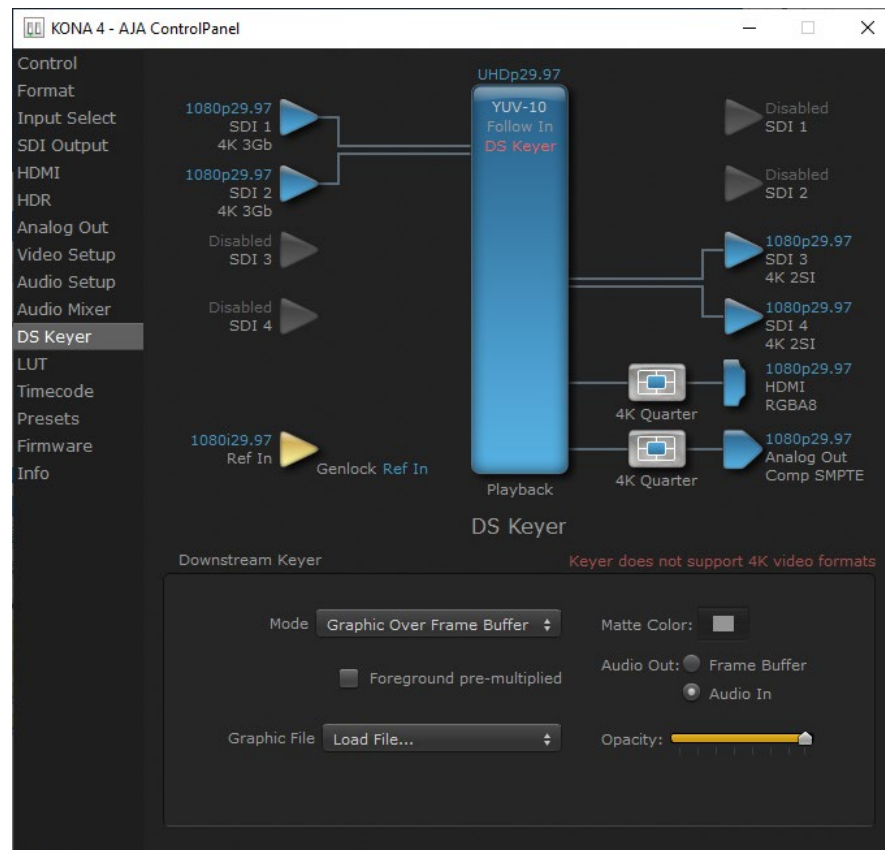


The KONA Downstream Keyer does not support UltraHD/4K formats, but is available for use with other video formats. If this screen is selected with a UltraHD/4K format configured, a "Keyer does not support 4K video formats" message will be displayed.

# Control Panel 8K Operation (KONA 5 only)

This section describes the AJA Control Panel operations specific to KONA 5 in 8K Mode. This mode supports the capture or playback of 8K material, using four or two input or output 12G-SDI signals. Note that in 8K Mode, you can still capture and playback single link SD, HD, and 2K formats.

When KONA 5 is operating in 8K mode, the following Control Panel screens and capabilities are not available:

- Audio Mixer Screen
- DS Keyer Screen
- LUT Screen
- Color space conversion.- You must manually match the output color space to incoming signal's colorspace. For example, if using 444 signals the RGB colorspace is required.

NOTE:     *AJA recommends always using KONA 5 in 4K mode, unless you specifically need 8K functionality.*

# 8K Transport Modes

Similar to *"4K Transport Modes" on page 61*), 8K video can be carried on four or two links, but with 8K each link carries a 4K signal (6G or 12G) instead of an HD (3G) signal. These 8K signals can also be organized as either Quadrant (Square Division) or 2SI (Two Sample Interleave).

- Quadrant - Four SDI links are required for a complete image raster. With this selection on KONA 5, the HDMI output displays one of the quadrants, user selectable.
- 2SI - Four SDI links (High Frame Rate) or two SDI links (Low Frame Rate) are required for a full resolution 8K image. Each link carries a down-sampled version of the entire image raster. With this selection on KONA 5, the HDMI output displays a down-sampled image of the full raster.

# Format Screen in 8K Mode

*Figure 41. AJA Control Panel, KONA 5 Format Screen in 8K Mode*
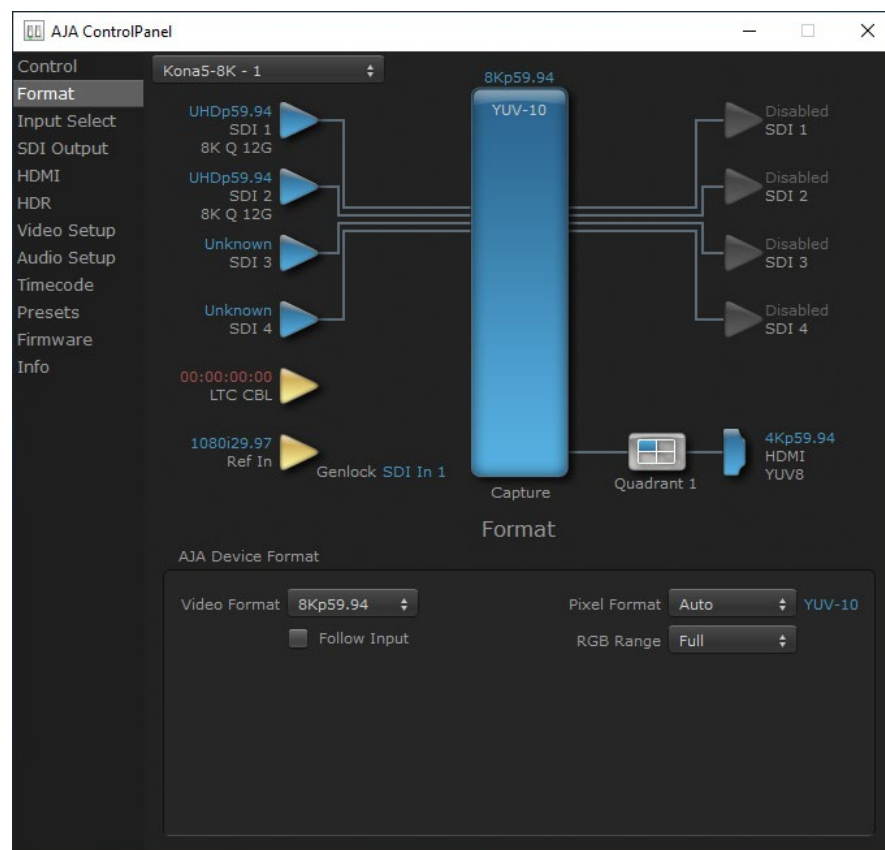


## Video Format

KONA 5 operating in 8K Mode adds the following UHD2 and 8K formats:

- UHD2 p23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- 8K p23.98, 24, 25, 29.97, 30, 47.95, 48 50, 59.94, 60
- YCbCr colorspace, 10-bit up to 60p
- RGB, 12-bit up to 30p

The formats above require use of four or two 12G SDI links. If using four links, you can choose to either capture or playback these signals with the KONA 5 card.

For Quadrant signals, the HDMI output will display only a quadrant of the entire image. You can select which quadrant is shown using the HDMI menu, or by right clicking on the HDMI output connector on the Control Panel UI to display a drop-down list.
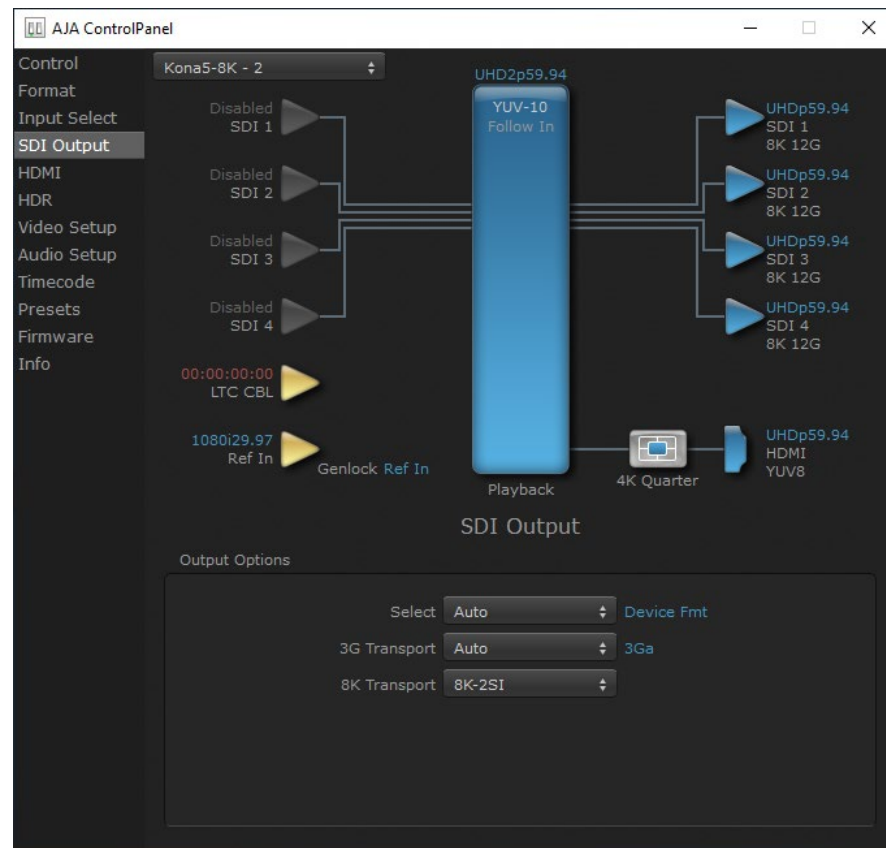
For 2SI signals, the HDMI output displays a down-sampled version of the entire image.

### Pixel Format

KONA 5 in 8K Mode does not support color space conversion. This means you must manually match the colorspace in your controlling application to the KONA card's selected pixel format.

## SDI Output Screen in 8K Mode

*Figure 42. AJA Control Panel, KONA 5 SDI Output Screen in 8K Mode*
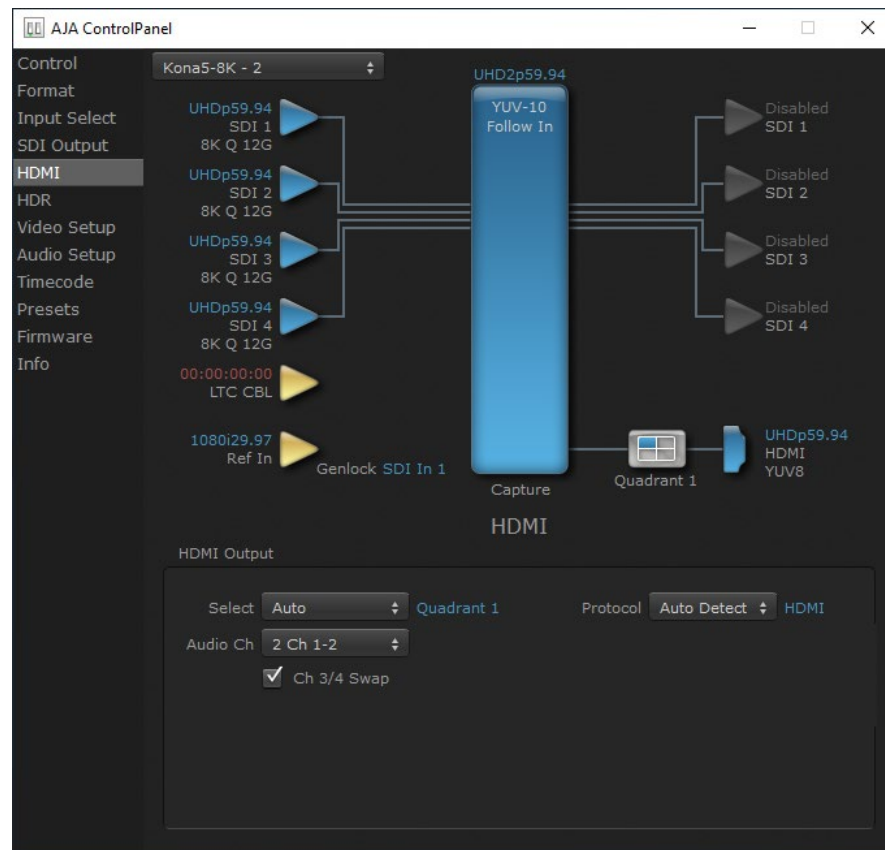


## 8K Transport

KONA 5 operating in 8K Mode adds the following 8K Transports:

- Auto
- 8K-2SI
- 4x 8K Quad
- 1x 8K Quarter

The KONA 5 HDMI output signal will be affected by this selection. See *"HDMI Screen in 8K Mode (KONA 5 only)" on page 78*.

## HDMI Screen in 8K Mode (KONA 5 only)

*Figure 43. AJA Control Panel, KONA 5 HDMI Screen in 8K Mode*



### Select

Configures the KONA 5's HDMI output signal. Select from:

- Auto
- Device Format
- Quadrant 1
- Quadrant 2
- Quadrant 3
- Quadrant 4

NOTE:   The SDI Output Screen settings affects the KONA 5's HDMI output signal.
• Quadrant - With this SDI Output setting, the HDMI output displays one of the image quadrants, user selectable.
• 2SI - With this SDI Output setting, the HDMI output displays a down-sampled image of the full raster.

# 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 YCbCr (YUV) Video

KONA supports both YCbCr (also commonly called YUV) and RGB pixel formats. Because the KONA (and SMPTE SDI's) native format is YCbCr, AJA recommends using a YUV Pixel Format. YUV provides headroom for "superwhite" and "superblack", and these video levels will be clipped when transcoding to RGB. Also, RGB/YUV transcoding involves a level translation that results in mathematical round-off error.

# Appendix A – Specifications

## KONA 5 Tech Specs

### Video Formats

- (8K) 8192 x 4320p 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60
- (UltraHD2) 7680 x 4320p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (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, 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
- (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 and 8K/UltraHD2 capabilities are dependent on host system attributes. Not all systems and configurations will support all frame rates and raster sizes.

### Video Inputs Digital

- 12G-SDI, SMPTE-2082, 12-bit*, 10-bit
- 6G-SDI, SMPTE-2081, 10-bit
- 3G-SDI, SMPTE 425
  - RGB 4:4:4 12-bit*, YCbCr 4:2:2 10-bit
- 1.5G-SDI, SMPTE 292M
  - Single Link HD-SDI YCbCr 4:2:2 10-bit
  - Dual Link RGB 4:4:4 12-bit*, Dual Link YCbCr 4:2:2 10-bit
- 270 Mbps SDI, SMPTE 259M-C
  - YCbCr 4:2:2 10-bit, 8-bit

*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
- 6G-SDI*, SMPTE-2081, 10-bit
- 3G-SDI, SMPTE 425
    - RGB 4:4:4 12-bit*, YCbCr 4:2:2 10-bit
- 1.5G-SDI, SMPTE 292M
    - Single Link HD-SDI YCbCr 4:2:2 10-bit
    - Dual Link RGB 4:4:4 12-bit*, Dual Link YCbCr 4:2:2 10-bit
- 270 Mbps SDI, SMPTE 259M-C
    - YCbCr 4:2:2 10-bit, 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

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

Note: KONA 5 SDI connectors are HD BNC

## HDR

- SDI: VPID signaling for SDR/HDR Transfer Characteristics, Colorimetry and Luminance
- HDMI: HDR10 Support - HDR Infoframe metadata, compatible with HDMI 2.0a/CTA-861.3
- HDMI: HLG Support - compatible with HDMI 2.0b/CTA-861-G

Note: HDR support is application dependent. Check with your software manufacturer for compatibility.

## SDI I/O

- SDI connections are bidirectional
    - 2K/HD, capture and monitoring is simultaneous
    - 4K/UltraHD with 12G-SDI, capture and monitoring is simultaneous.
    - 4K/UltraHD with 3G-SDI, all four connections must be used for either Input or Output.
    - 8K/UltraHD2 with 12G-SDI, connections must be used for either Input or Output.

Note: When connections are configured for 12G-SDI or 6G-SDI, only UltraHD/4K/UltraHD2/8K formats are supported.

## Audio Inputs Digital

- 16-channel, 24 and 16-bit SDI 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 up to 2K/HD 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

### Machine Control

- RS-422, Sony 9-pin protocol (via breakout cable)
- 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 via ATX power.
- PC Internal ATX Power Connector (Molex p/n 45559-0002)

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

### 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, 29.97, 30, 47.95, 48, 50, 59.94, 60
- (UltraHD) 3840 x 2160p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (2K) 2048 x 1080p 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 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 425
  - RGB 4:4:4 12-bit*, YCbCr 4:2:2 10-bit
- 1.5G-SDI, SMPTE 292M
  - Single Link HD-SDI YCbCr 4:2:2 10-bit
  - Dual Link RGB 4:4:4 12-bit*, Dual Link YCbCr 4:2:2 10-bit
- 270 Mbps SDI, SMPTE 259M-C
  - YCbCr 4:2:2 10-bit, 8-bit

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

## Video Output Digital

- 3G-SDI, SMPTE 425
  - RGB 4:4:4 12-bit*, YCbCr 4:2:2 10-bit
- 1.5G-SDI, SMPTE 292M
  - Single Link HD-SDI YCbCr 4:2:2 10-bit
  - Dual Link RGB 4:4:4 12-bit*, Dual Link YCbCr 4:2:2 10-bit
- 270 Mbps SDI, SMPTE 259M-C
  - YCbCr 4:2:2 10-bit, 8-bit
- 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

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

## HDR

- SDI: VPID signaling for SDR/HDR Transfer Characteristics, Colorimetry and Luminance
- HDMI: HDR10 Support - HDR Infoframe metadata, compatible with HDMI 2.0a/CTA-861.3
- HDMI: HLG Support - compatible with HDMI 2.0b/CTA-861-G

Note: HDR support is application dependent. Check with your software manufacturer for compatibility.

## Video Output Analog

- Composite/S-Video (Y/C) (1x BNC/2 x 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 8x 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 8x 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 up to 2K/HD 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) or HD Tri-Level Sync (1V) (via breakout cable or optional K3G-Box)
- Reference input is terminated into 75 ohms when Genlock is set to Ref In on optional K3G-Box, also 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)

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

### Weight

- 0.7 lb (0.4 kg)

### Power

- 22W typical, 24W 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 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 425
  - RGB 4:4:4 12-bit*, YCbCr 4:2:2 10-bit
- 1.5G-SDI, SMPTE 292M
  - Single Link HD-SDI YCbCr 4:2:2 10-bit
- 270 Mbps SDI, SMPTE 259M-C
  - YCbCr 4:2:2 10-bit, 8-bit

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

## Video Output Digital

- 3G-SDI, SMPTE 425
  - RGB 4:4:4 12-bit*, YCbCr 4:2:2 10-bit
- 1.5G-SDI, SMPTE 292M
  - Single Link HD-SDI YCbCr 4:2:2 10-bit
- 270 Mbps SDI, SMPTE 259M-C
  - YCbCr 4:2:2 10-bit, 8-bit

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

## HDR

- SDI: VPID signaling for SDR/HDR Transfer Characteristics, Colorimetry and Luminance.

## 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)

- T = 0.88" x 7.38" x 4.75" (22.36 x 187.46 x 120.65 mm)
- S = 0.75" x 7.25" x 3.125" (19.05 x 184.15 x 79.36 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, European Free Trade Association (EFTA) and United Kingdom Regulatory Compliance

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

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

## Declaration of Conformity

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

This equipment meets the following conformance standards:

Safety

EN 62368-1: 2014 + A11 (T-Mark License),

IEC 62368-1: 2014 (CB Scheme Certificate).

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

| 사 용 자 안 내 문 |
| --- |
| 이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다. |

## 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.

**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.

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**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.

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**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.

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**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 corriente 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.

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**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.

# 3 Year Warranty and Liability Information

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- Repair or facilitate the repair the product within a reasonable period of time, free of charge for parts and labor.
- Replace the product with a direct replacement or with a product that performs substantially the same function as the original product.
- Issue a refund of the original purchase price less depreciation to be determined based on the age of the product at the time remedy is sought under this limited warranty.

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# Index