

KONA^{LHi}



Published: 1/11/13

Installation and Operation Guide

Because it matters.

AJA[®]
VIDEO SYSTEMS

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Chapter 1: Introduction



Overview

The AJA KONA LHi brings the highest quality 3G/HD/SD-SDI and analog video/audio to an Apple Mac Pro or Windows workstation. AJA drivers deliver extensive codec and media support within all professional 3rd-party Video applications.

KONA LHi offers high quality digital and analog interfaces with support for 8- and 10-bit uncompressed video. DVCPRO HD, HDV, and Apple RT Extreme are also supported—and even accelerated by onboard hardware. Interfaces are included for HDMI v1.3a in and out, allowing use of low-cost cameras and high quality HD monitoring. In addition to digital HD, the LHi also supports analog HD. Using superb 12-bit video A/D and D/A converters, analog formats like BetaCam SP also look excellent. Add to that hardware based up-conversion from SD to HD, hardware based down-conversion from HD to SD and HD to HD cross-conversion between 720 and 1080 HD formats, and you're covered for realtime conversion at ingest or playout.

In addition to high quality video, KONA LHi also supports balanced analog, AES/EBU, and embedded audio I/O, all at 24 bits and 48Khz. For simplified system integration, KONA LHi includes hardware sample-rate conversion for AES inputs (eliminating annoying synchronization hassles)—and RS-422 machine control.

This manual covers the hardware and driver installation for the LHi and discusses using it with AJA's Control Panel application. AJA Plugins and related documentation are available for supported 3rd-party Video applications at the AJA Support site. Instructions for installing the KLHi-Box are shipped with the KLHi-Box.

Features

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

Hardware

- 10-bit uncompressed QuickTime capture card
- G/HD/SD SDI I/O
- HDMI v1.3a w/Deep Color at 30 bits per pixel input/output
- 12-bit SD and HD Analog Component/Composite/S-Video I/O
- Broadcast quality hardware based 10-bit up-conversion
- Broadcast quality hardware based 10-bit down-conversion
- Broadcast quality hardware based 10-bit cross-conversion (1080 to 720 and 720 to 1080)
- Broadcast quality hardware based 10-bit SD aspect ratio conversion (anamorphic to letterbox, etc.)
- DVCPRO HD hardware acceleration
- HDV hardware acceleration
- Dynamic RT Extreme hardware acceleration
- 2-channel analog balanced XLR audio I/O
- 2-channel AES XLR audio I/O
- 8-channel SDI embedded audio I/O
- HD/SD genlock on analog video inputs
- LTC Input (on Reference input)
- RS-422 Machine Control
- Cables standard
- Optional KLHi-box Breakout Box—provides rack mounting and flexible easy I/O (KLHi-box cabling is included with the KLHi-box).
- 3-year warranty

KONA LHi Audio

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

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

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

Software

- AJA Control Panel for audio/video source selection, conversion and control of KONA within the overall MacOS or Windows environment (Input Pass-through)
- AJA QuickTime™ Drivers for tightly integrated hardware/software operation
- AJA Utilities: AJA TV, VTR Xchange, AJA System Test, AJA DataCalc, AJA QTtoDPXtranslator, and AJA DPXtoQTtranslator.

Understanding Typical Workflows

KONA LHi allows more workflow flexibility than ever before. Users can independently select different formats for capture and storage media, while also outputting to an array of analog and digital uncompressed formats—with all outputs active simultaneously. Capture can range from analog, DV, or SD and HD digital uncompressed. Media can be stored on disk as:

- offline quality at low bit rates
- on-line quality at moderate bit rates
- or with the highest quality as 8 or 10 bit uncompressed SD and HD

As quality and codecs improve, the lines between offline and online are blurring. For example, with the Apple ProRes 422 codec, native HD editing in that codec is now possible, providing very high quality results (true HD editing) at very low data rates.

Following are summaries of the most common codecs used in various workflows, providing data rates and relative quality levels. Some workflows require a RAID array and some will work using the host computer's internal system drive (as noted where supported).

PhotoJPEG

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

Quality: Very Good

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

DV (DV25)

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

Quality: Good

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

DV50

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

Quality: Very Good

Panasonic DV50 standard definition codec. DV50 is a 4:2:2 compressed format and has higher chroma resolution than DV25. As with DV25, KONA LHi can convert DV50 projects to uncompressed, in real time, for monitoring and output. KONA LHi can capture from its SDI input, directly to DV50 compression.

DVCPRO HD

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

Quality: Excellent

KONA LHi has hardware support for capture from HD-SDI to the DVCPRO HD codec. KONA hardware also takes some of the DVCPRO HD codec processing load off the CPU, allowing more computer processor time for Dynamic RT.

HDV

Data rate: 19 MB/second high definition 720p, 25 MB/second high definition 1080i—supported by internal system drive

Quality: Excellent

You can use KONA LHi to convert HDV projects to uncompressed—in real time—for monitoring and/or output. KONA LHi can capture uncompressed from any input, directly to HDV media. The KONA LHi advanced scaling engine takes the native frame (long GOP 1440 HD) and outputs it via hardware—in real time. Precision AJA circuitry re-sizes the video to proper 1920 x 1080, providing quick playback of HDV captured by third-party applications for monitoring and recording.

HDV captures HD images via MPEG2 compression and allows for recording the signal to a MiniDV tape. This MPEG2 compression is similar to a DVD (although DVD is a program stream vs. HDV's transport stream and HDV uses a constant bit rate whereas DVDs use variable bit rates). The issue for post production is that the HDV transport stream is based around a long-GOP structure (group of pictures) which produces images based on information over a section of time, via I, P and B frames; Intraframes, predicted frames and bi-directional frames. Formats that do not use this scheme treat frames as individual units, as in the progressive formats where a frame truly is a frame, or as interlaced frames where two fields create the image. Sometimes we refer to these formats in contrast to MPEG formats, as I-frame formats where frames can be easily defined as individual.

Since the frames of HDV have the long GOP structure to define them, herein lies the problem for post-production; how can we work with the material if we must know what lies before, after and during? Luckily, the transport stream MPEG2 can be transmitted over IEEE1394 (aka FireWire). This means that the compressed HD material can be transferred into systems with the appropriate hardware and software. While this seems like a simple solution for post-production, it means that the footage must be brought into the system as a rather heavily compressed format and that the computer must continue to work with the material as a MPEG2 transport stream, which is incredibly processor intensive for the computer.

How does the AJA KONA LHi card connect to HDV and digitize material to uncompressed HD files for editing—or at the very least, to a lightly compressed I-Frame HD format? The answer to this is provided in a feature common to many HDV devices: analog HD output via component video. The component connectors on JVC cameras and decks, along with Sony cameras and decks, allows for the output of the long GOP MPEG2 data as a standard HD video format such as 720P in the JVC products—or 1080i in the Sony products.

Since the KONA LHi has the ability to digitize analog HD signals, the analog component output of the HDV devices can simply be connected to the KONA inputs. Note that HD signal cannot be transported over composite or S-Video (Y/C) cables, so the HDV device must have an analog component HD output. The KONA LHi also has the ability to ingest analog audio, so the analog audio outputs of the HDV devices can be sent to the Kona card as well. (Also note that these analog audio outputs on the HDV devices are usually unbalanced RCA connections where the KONA card uses balanced XLR style connection so some sort of audio level correction device, such as a mixer or a stand alone active interface amplifier, should be used for accurately attenuated audio.)

Finally, you will want to control your device. Where all of the video, audio and timecode information moved over the FireWire cable, now you are dividing those tasks. Device control is the most difficult to configure for HDV devices because so few HDV devices have implemented any form of device control other than IEEE1394. The one notable exception is the JVC BR-HD50 HDV deck which has a remote serial port for RS422 protocol and device control. Check the KONA LHi support area on the AJA website for a whitepaper on HDV, which gives details on using KONA LHi with various HDV equipment.

Note: direct capture into HDV media on the LHi is not possible. Direct capture into the LHi can only be done using uncompressed, DVCPRO HD, or Pro Res. Regarding ProRes 422, capturing HD resolution ProRes 422 from an HD source requires a Mac Pro with an Intel Xeon processor.

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

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

Quality: Excellent, broadcast quality

Captured media is virtually indistinguishable from pristine uncompressed sources. Better yet, ProRes maintains the quality during editing, surviving multiple encoding/decoding generations without degradation. It was designed by Apple for editing, rather than as a transmission/distribution codec as are most popular codecs. Some of the advantages include:

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

Uncompressed 8-bit

Data rate: 21 MB/second standard definition, or 100-124 MB/second high definition (see later “Storage Capacity” chart in Chapter 1 for the various transfer rates per format)—requires SCSI, Fibre Channel, or ATA drive array

Quality: Excellent

Uncompressed media is KONA LHi’s native storage format, offering the highest quality available. Capturing in uncompressed results in no compression artifacts, and video is sampled over the full raster at a 4:2:2 rate.

Using uncompressed maintains a higher quality in your project from capture all the way through effects rendering. KONA LHi supports capture of uncompressed through any of its inputs, and uncompressed projects are output to all of its outputs simultaneously.

Uncompressed 10-bit

Data rate: 28 MB/second standard definition, or 133-166 MB/second high definition with 3G double that—uncompressed 10-bit requires SCSI, Fibre Channel or SATA drive arrays.

Quality: Excellent, very high quality

Offering all the benefits noted previously for 8-bit uncompressed, 10-bit additionally offers the very highest quality available. With 10-bit media video quality is second to none. For more information on this subject, please see the topic [“Using 8-bit Versus 10-bit Video” on page 57](#).

What's In The Box?

When you unpack your AJA KONA LHi, you'll find the following components (refer to "Unpacking" on page 15):

- AJA KONA LHi Software and Documentation CD-ROM—this CD contains the software installer to place KONA LHi drivers and the Control Panel on an Apple MacPro or Windows Workstation. Install the software as discussed in this manual in *Chapter 2: Installation and Configuration*. The CD also contains a wide variety of useful information, including this manual you're reading (PDF format).
- KONA LHi PCI Express card.
- Cable, KONA LHi Standard Breakout, with Analog video, audio, AES, Reference Input, and RS-422 Machine Control.

3G/HD/SD-SDI (1 in and 1 out) and HDMI In/Out connectors (1 in and 1 out) are on the LHi card itself—not on the breakout cable.

- Read Me First Notice—Contains late-breaking news and/or errata related to KONA LHi and the documentation.
- Registration Sheet—allows you to register your card by mail or online (details provided).

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

System Requirements

AJA Video recommends that your system meet minimum hardware and software requirements to achieve a satisfactory level of performance when operating it. System requirements are subject to change as new versions of operating systems, QuickTime, and workstations become available. For the most up-to-date Minimum System Requirements see the AJA website (see "[Installation Overview](#)" on page 13.)

Understanding Disk Storage Methods

Together, the KONA LHi card, a Mac Pro or Windows 7 PC, and third-party video editing application, offer an unprecedented level of features and performance for audio/video post production applications. However, to ensure performance and quality, the disk storage system used with the host computer must be able to meet the demands of the media.

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

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

About RAIDs

Redundant Array of Independent Disks, or RAID, is a group of hard drives that appears to the host computer as a single high-speed storage unit. RAID systems enable you to increase storage capacity and get the performance, reliability, and data protection needed for video production, but not possible from a single hard drive. RAID drives inside the array operate simultaneously, increasing overall throughput. RAID technology is comprised of these techniques (some or all):

- Striping data across multiple drives for storage performance (RAID 0).
- Mirroring for redundancy (RAID 1).
- Parity for data protection (RAID 5 [plus others]).

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

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

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

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

Software For Striping

AJA recommends the Disk Utility software provided by Apple with OS X for creating and striping RAIDs, including 3rd-party, SCSI, and Xserve RAIDs. It is very easy to use and has been tested to work well. The utility can be found in *Macintosh HD/Applications/Utilities*, where "Macintosh HD" is the name of the system drive.

AJA KONA LHi and Fibre Channel RAID (Xserve or other)

For the optimum in disk storage, we recommend a Fibre Channel or SATA RAID array. Apple's Xserve RAID, for example, holds up to 14 hot-swap Apple Drive Modules—5.6TB of storage—in a rack-optimized 3U enclosure. Each 7200-RPM hard drive connects to a dedicated ATA/100 drive channel, eliminating a traditional source of bottlenecks and maximizing the 2Gb/s Fibre Channel host connection(s). By adding more Xserve RAID systems, you'll have very large expansion capabilities: A standard 42U rack can hold over 78TB of Xserve RAID storage.

Note: When creating and striping an Xserve RAID for KONA LHi using the Apple Disk Utility provided with OS X, use *RAID 50*: in other words, the internal Xserve RAID drives are set up as RAID 5; the Xserve RAID then shows up in Disk Utility as two drives (regardless of the number of internal drives) which must be configured together as RAID 0. Apple calls this configuration "RAID 50."

Storage capacity

No matter which storage system you choose, pick one that can scale to meet your needs over time. Ideally, you should be able to increase storage capacity or switch to a RAID level offering increased data protection in the future. Balance current and future storage needs with your budget and choose accordingly.

FORMAT	Transfer Rate in MB/sec	Storage Requirement in GB/Hour	Hours of Storage Per Terabyte of Disk
10-bit Uncompressed Standard Definition	28	101	9.9
8-bit Uncompressed Standard Definition	21	76	13.1
DV50 Standard Definition	6.3	23	43.4
DV25 Standard Definition	3.1	11	90.0
Photo JPEG Standard Definition	2.5	9	111
High Definition			
8-bit Uncompressed 1080i @59.94/60Hz	124	448	2.2
10-bit Uncompressed 1080i@59.94/60Hz	166	597	1.7
High Definition			
8-bit Uncompressed 1080i @50Hz	104	373	2.7
10-bit Uncompressed 1080i@50Hz	138	498	2.0
High Definition			
8-bit Uncompressed 1080psf@23.98/24Hz	100	358	2.8
10-bit Uncompressed 1080psf@23.98/24Hz	133	478	2.1
High Definition			
8-bit Uncompressed 720p@59.94/60Hz	100	358	2.8
10-bit Uncompressed 720p@59.94/60Hz	133	478	2.1
High Definition			
DVCPRO HD	12.5	45	22.2
MB = MegaBytes GB = GigaBytes			

Note: for uncompressed formats, PAL and NTSC transfer rates and storage requirements are about the same because PAL has a lower frame rate, but more lines.

Cable Connections

KONA LHi offers unsurpassed cable connectivity for a video/audio capture card. Connections are made via a supplied breakout cable, plus two BNCs and two HDMI connectors on the KONA LHi Card endplate.

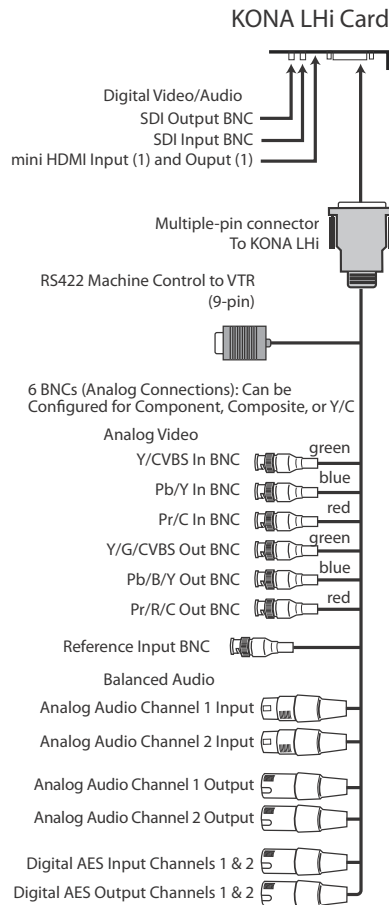
Using the Breakout Cable and 3 BNCs

The breakout cable supports:

- Reference or LTC input (BNC)
- Component/Composite/S Video Input (3x BNC)
- Component/Composite/S Video Output (3x BNC)
- AES In (1x XLR)
- AES Out (1x XLR)
- Balanced Audio In (2x XLR)
- Balanced Audio Out (2x XLR)
- RS-422 Machine Control (9 pin D)

Four connectors on the KONA LHi Card endplate additionally provide:

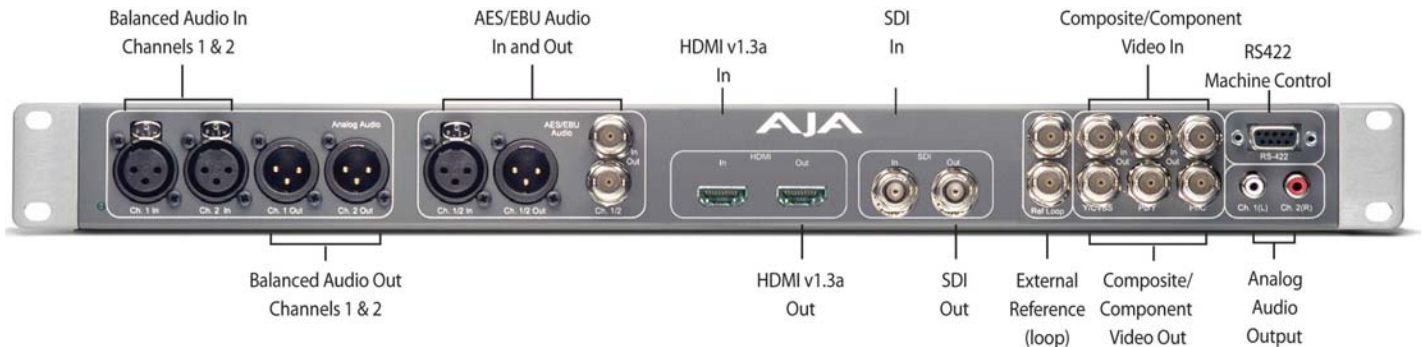
- HDMI v1.3a input and output (2x HDMI)
- 3G-, HD-, and SD-SDI input (1x BNC)
- 3G-, HD-, and SD-SDI output (1x BNC)



KONA LHi Breakout Cable

Using KLHi-box

The KLHi-box attaches to the KONA LHi card via cables that attach to the back of the box. These cables are supplied with the KLHi-Box. When you purchase the optional box, you get two-channel unbalanced audio output (2 RCA Jacks)—not available with the standard cable.

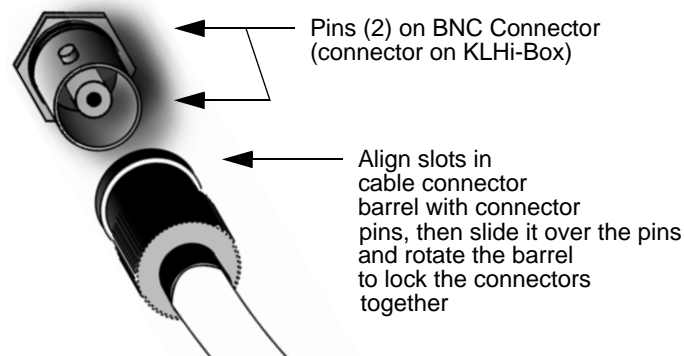


AJA KLHi-Box Panel Connectors

About BNC Connectors

Although most video professionals are used to BNC connectors, you may not have seen them if you've been using primarily desktop video equipment. BNC connectors ensure a positive connection by the act of locking the connectors together via pins in one connector that fit into slots in the corresponding connector.

To make a BNC connection, slide the cable connector over the panel connector and then when seated, rotate the barrel of the cable connector 90° clockwise until the connectors are locked together. When properly locked, the cable cannot accidentally be pulled out.



Connector Descriptions—Cables & KLHi-Box

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

3G/HD/SD SDI Input and Output

BNC connectors are provided on the KONA LHi card endplate for one 3G/HD/SD-SDI input and one 3G/HD/SD-SDI output. The input and output support video and embedded 24-bit digital audio. Use SDI wherever possible for the best quality 10-bit uncompressed video input, capture and output. If peripheral equipment has a variety of inputs/outputs, look to see if it has SDI I/O, and use it where possible. Most high-end professional broadcast equipment supports SDI (VTRs, cameras, media storage servers, etc.).

HDMI Input and Output

Two HDMI connectors on the LHi endplate provide for input and output of HDMI compatible video and multi-channel embedded audio (8 channels). HDMI v1.3a capability at 30 bits per pixel allows full support of the latest 10-bit monitors.

HDCP is not supported on either input or output. The LHi's HDMI output does not have HDCP, and input sources having HDCP are not supported. The HDMI input is designed to support long cable runs—up to 100 ft when using 22 or 24AWG HDMI cable, or up to 50 ft using 28 or 30AWG HDMI cable. The HDMI output supports standard HDMI cables only.

The KONA control panel allows selection and adjustment of some HDMI parameters.

2 Channel Digital AES/EBU Audio Inputs And Outputs

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

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

Analog 2 Channel Balanced Audio

Two sets of analog XLR connectors, one for each channel, support balanced audio connections. Male XLRs are provided for outputs and female XLRs are provided for inputs. Balanced audio (differential) connections provide better analog audio quality over longer cable runs. Most professional quality VTRs and audio equipment have XLR style connectors for analog audio. Analog audio signals are converted internally to 24-bit digital.

Analog 2 Channel Unbalanced Audio (KLHi-Box only)

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

RS422 Machine Control

A female DE-9 connector on the breakout cable provides connection for VTRs, camcorders, disk media servers, and other devices using RS422 SMPTE (Sony) protocol. This connector is also present on the optional KLHi-Box. (Connector pinout is listed in Appendix A: Specifications.)

Analog Monitor Out (Component/Composite HD/SD)

Both the standard I/O cable and the optional KLHi-Box feature two groups of 3 BNC connectors (each) for input and output of component, composite and Y/C functions. The signals are labelled on both the cable and KLHi-Box connectors.

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

A Note About RGB—Although RGB is used less in today's video systems, KONA LHi supports it. However, because the KONA LHi (and SMPTE SDI) native format is YPbPr, AJA recommends the use of YPbPr whenever possible for analog monitoring. Although component video monitors often have RGB inputs, it's better to use YPbPr when the monitor supports it. The YPbPr format provides "headroom" for "superwhite" and "superblack"—and these video levels *will be clipped* when transcoding to RGB. Also, the RGB/YPbPr transcoding involves a level translation that results in mathematical round-off error. RGB can be configured in the KONA LHi Control Panel.

A Note About YPbPr—Component Video, or YPbPr, has been given several names over time. YUV, Y/R-Y/B-Y, and YCbCr, are just some examples. Although these various formats have some differences in levels, they are all basically the same. KONA LHi uses the modern YPbPr terminology exclusively. KONA LHi supports three different types of YPbPr: SMPTE/EBU N10, Betacam (NTSC), and Betacam (NTSC Japan). These three formats differ in level only and are configured in the KONA LHi Control Panel.

Reference Video and LTC Input

A single BNC on the standard KONA LHi cable—or two BNC connectors on KLHi-Box (it loops through)—allow you to synchronize KONA LHi outputs to your house analog reference video signal (or black burst). If you have a sync generator or central piece of video equipment to use for synchronizing other video equipment in your studio, then connect its analog composite output here. When KONA LHi outputs video it uses this reference signal to lock to. When connecting a reference video source, the locking signal should be the same format as the Primary format selected in the KONA Control Panel. It is possible in some circumstances to use an alternate format video signal as long as the basic frame rate is compatible.

The Reference Video input can also be used for LTC input. The hardware automatically detects sync or LTC and acts appropriately.

In This Manual

Chapter 1 is the introduction you're reading, listing features, box contents, and system requirements.

Chapter 2 provides complete instructions for installing and configuring the AJA KONA LHi card. The user is guided through unpacking, installing the card into a Mac or PC, installing KONA LHi Mac or PC compatible driver software, cabling the system and then getting it up and running. Important configuration information is also provided on video settings and use of genlock/external reference.

Chapter 3 discusses operational aspects of KONA LHi when used with AJA's Control Panel.

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

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

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

Chapter 2: Installation



Installation Overview

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

1. Unpack and examine the contents of the shipping box
2. If not previously installed on your Mac or PC, ensure that the capture/editing application you intend to use is installed as detailed in its user documentation. Your application must be installed and run at least once for the *KONA Easy Setups* to be installed properly. If other capture cards have been installed, the software for those products should be removed before installing the KONA driver to avoid possible conflicts.
3. For the KONA LHi Mac installation, AJA recommends that the card be placed in Slot 3 and the Apple Expansion Slot Utility be configured so that the slot is running at x4 lane speed or higher. (The choice of x4, x4, x1 and x16 is ideal.) Refer to the AJA website at:
<http://www.aja.com/en/support/kona-system-configuration/>

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

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

4. Install AJA KONA LHi software on your computer. While the CD supplied with your card will likely have a recent version of the driver, the fast-paced nature of feature releases and updates means that visiting the AJA website for the latest driver is usually a better choice.
<http://www.aja.com/en/support/kona/mac/kona-lhi/>
5. Cable the system audio and video sources, VTR, audio monitor, and video monitor. If you purchased the optional Breakout Box, then install it into an equipment rack or place it on a desk and connect its cables to the KONA LHi card. If you're instead using the standard cable set, then use those to connect equipment.

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

AJA KONA System Test and Data Rate Calculation

To guarantee maximum system performance, use KONA System Test and the AJA Data Rate Calculator to evaluate your workstation capabilities. They are available on the AJA website at this support page:

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

AJA System Test

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

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

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

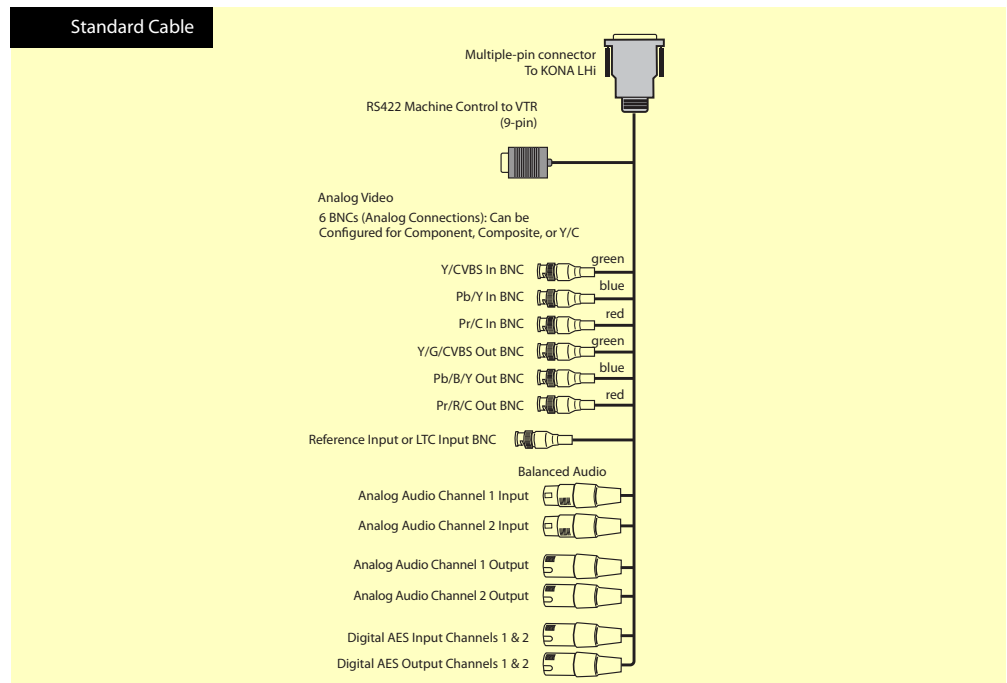
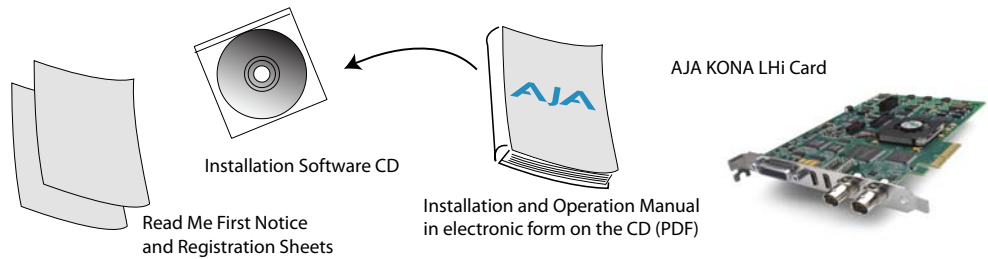
AJA Data Rate Calculator

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

Unpacking

Shipping Box Contents

KONA LHi is shipped with a CD containing system software and an Installation and User manual (a PDF on the CD), and a cable. If you purchased the optional KLHi-box breakout box, it ships with its own set of cables and instructions for connection to the KONA LHi card.



Contents, KONA LHi Shipping Box

As you unpack the shipping box(es), carefully examine the contents. Ensure you received everything and that nothing was damaged during shipment. If you find any damage, immediately notify the shipping service and supply them with a complete description of the damage. AJA will repair or replace damaged items. If you find shipping damage, contact your AJA dealer or distributor for details on how to have your KONA LHi repaired or replaced.

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

Installing the KONA LHi Card into a MacPro

1. Place the computer in a well-lit area, where you will have easy access when opening the MacPro chassis.
2. Using your hand, touch the outside of the Mac to discharge any static electricity you have. Remove the power cable from the back of the chassis.
3. Remove the side access door and described in your Apple User Manual. Lay the machine on its side, motherboard facing up.
4. Remove the KONA LHi card from its protective anti-static bag; place the card on top of the bag.
5. Visually locate the PCI-Express slots inside the Mac chassis (Mac Pro photo shown on the following page). The KONA card only requires a x4 lane PCI-Express slot, so any of the available slots will work correctly—(slot 3 is the preferred slot on the MacPro). You should configure the slots with the Apple Expansion Slot Utility application for the MacPro so that the KONA is at x4 or better speed.
6. Remove the card-edge access cover from the desired slot where you will be inserting the KONA LHi card. The card edge cover is secured by a tie-down bar with two secured screws on MacPro computers; remove and set them aside for securing the KONA LHi after installation.
7. Holding the KONA LHi card by the card edge plate and an outside edge, carefully insert the KONA LHi card by rocking it slowly into the slot. Ensure the card edge aligns properly with the computer's slot opening (where the card edge cover was just removed) and that it is fully seated in the slot.
8. Secure the card in the slot using the screw removed earlier or with the tie-down bar found on MacPro machines.
9. Replace the outer access door on the MacPro.



KONA LHi Card

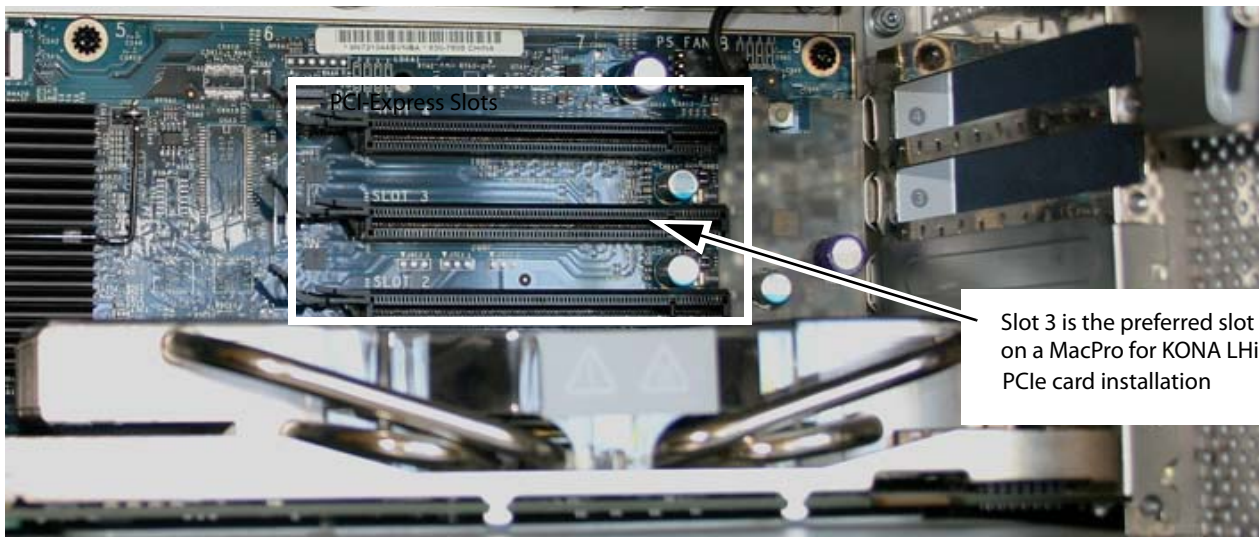


To Install:

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

PCI-Express Slots

Mac Pro Cardcage Access



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

Card Slots, PCIe Mac Pro shown here

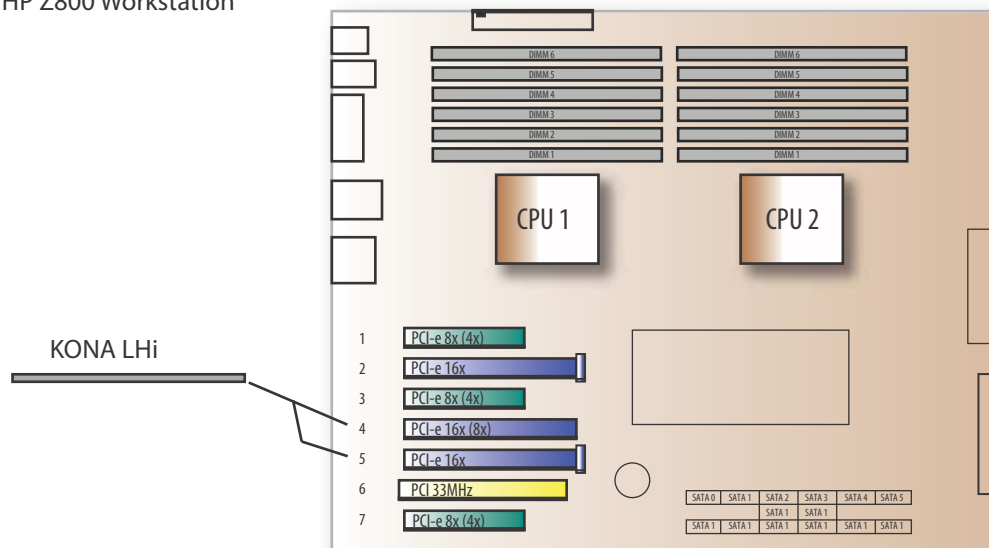
Installing the KONA Card in a Windows PC

1. Place the PC in a well-lit convenient area, where you will have easy access to the chassis access door.
2. Touch the outside of the PC to discharge any static electricity in your body. Remove the power cable from the back of the PC.
3. Open the PC to gain access to the card slots as described in your Workstation User Manual.
4. Remove the KONA card from its protective anti-static bag; place the card on top of the bag.
5. To install the KONA card and RAID controller card (SCSI or Fibre Channel), refer to the AJA website for the latest installation updates at the URL provided.

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

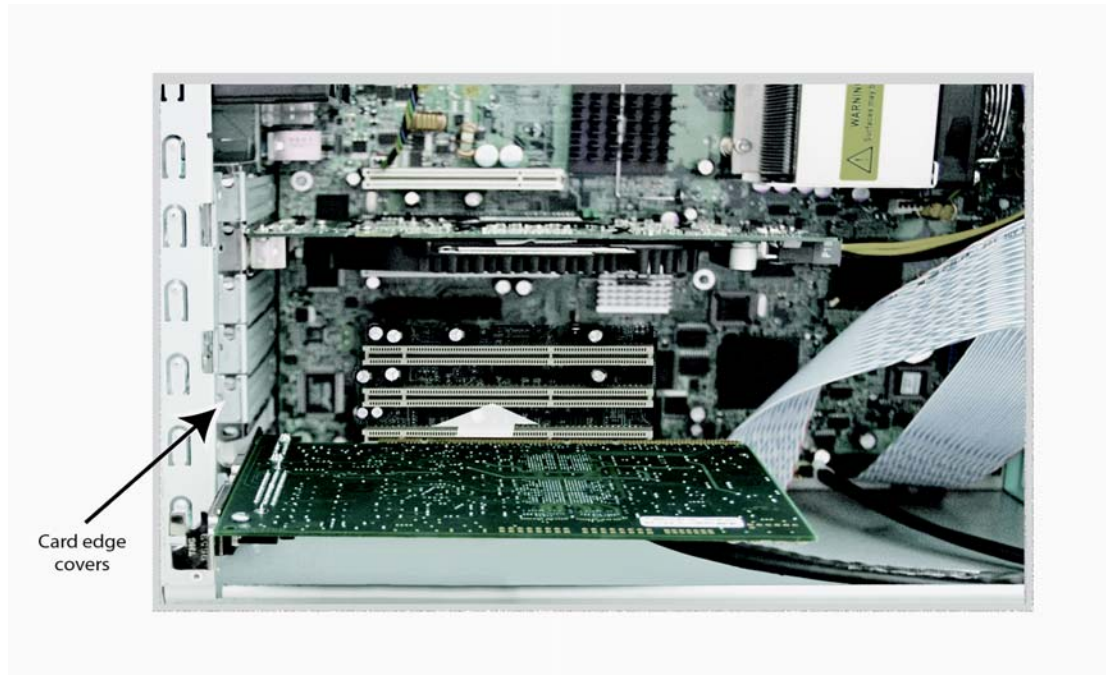
Note: Always put the RAID controller and KONA on separate PCI busses. This improves performance by reducing bus contention.

HP Z800 Workstation



KONA Card placement in HP Z800 Motherboard

6. Open the card retainer bar on the left side of the chassis cardcage. Remove the card edge access cover from the desired slot where you will be inserting the KONA card.
7. Holding the KONA card by the card edge plate and an outside edge, carefully insert the KONA card by rocking it slowly into the slot. Ensure the card edge aligns properly with the PC's opening (where the card edge cover was just removed) and that it is fully seated in the slot.
8. Secure the card in the slot replacing the card retainer bar.
9. Replace the PC's panel/door removed in step 3.



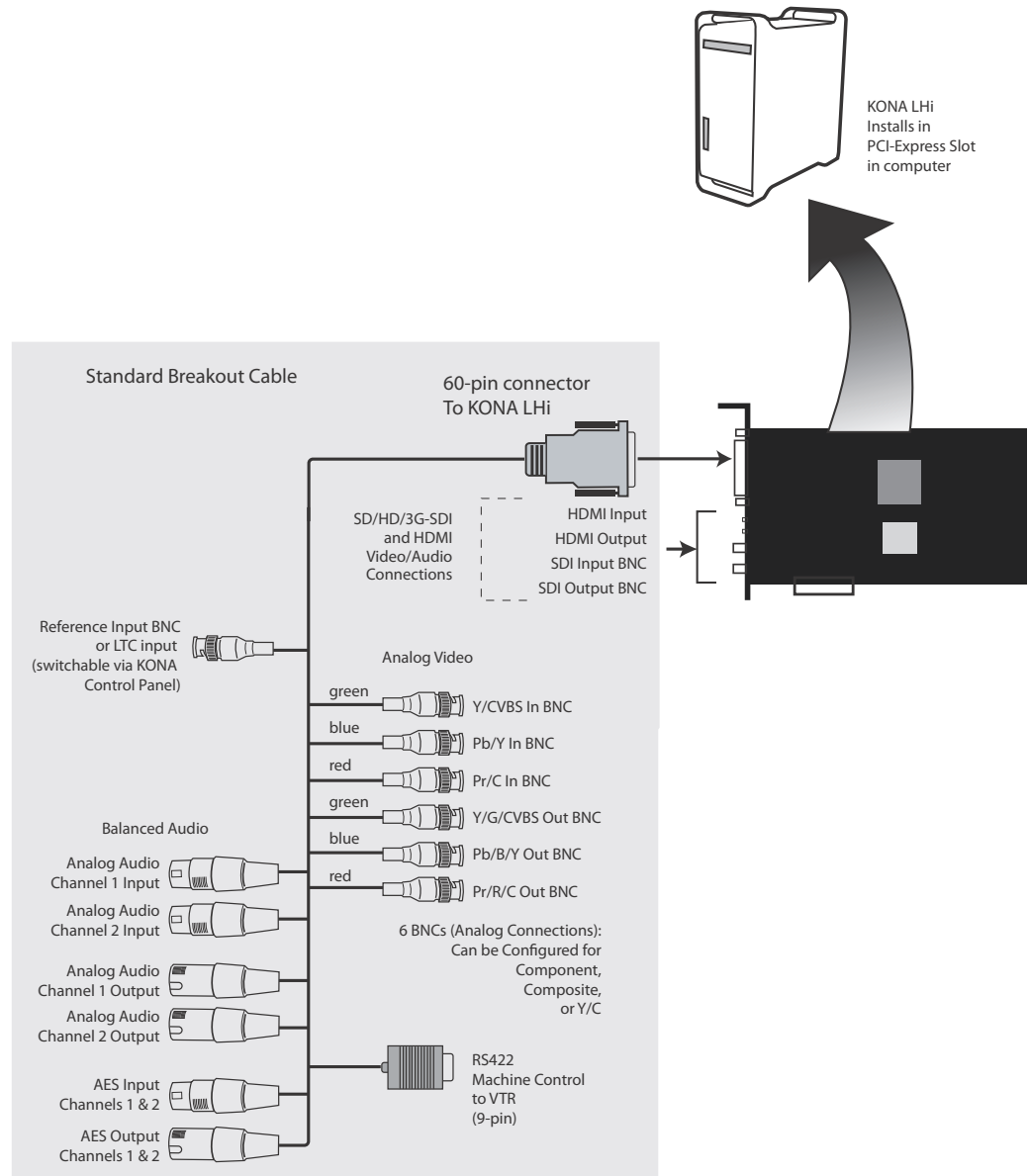
Locate the correct PCIe Slot and Insert the KONA Card (typical installation shown)

Cabling the System

System Video/Audio Cable Connections

When installing your system, you'll make video and audio input/output connections. These connectors are explained individually in chapter 2. Here, system interconnection is shown and described.

System Cabling When Using The Breakout Cable

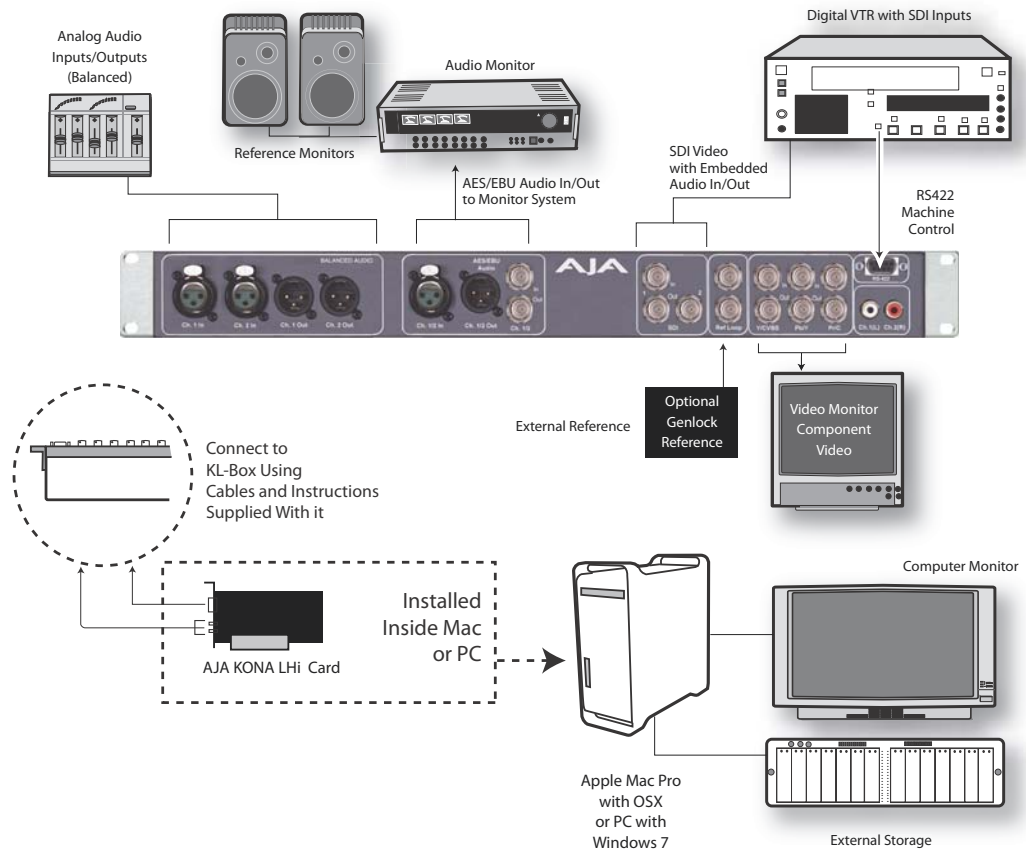


KONA LHi System Using The Breakout Cable

Typical System

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

1. If desired, connect your house reference sync to the KONA LHi *Ref Loop* connector (BNC). The second KONA LHi Ref Loop connector on the KLHi-box (if used) can be connected to the VTR or terminated with a 75-ohm terminator. If instead using LTC timecode input, connect to the Ref Loop input.
2. Connect an HDMI Video Monitor to the KONA LHi HDMI Out connector. *Or instead, use the Component Analog Video Out* BNC connectors to go to an analog monitor.
3. Connect a 9-pin DB9 machine control cable between your VTR's RS422 control port and the breakout cable's RS-422 machine control connector.
4. Connect two SDI cables between KONA LHi (BNCs are on the card endplate) and your digital VTR (Digital Betacam etc.): one from KONA LHi *SDI In* to the VTR SDI Out, and one from KONA LHi *SDI Out* to the VTR SDI In. The KONA LHi SDI connections have embedded audio so the VTR must be configured accordingly.
5. If you have an AES/EBU-ready audio monitoring system, then connect the two channels of AES/EBU output from KONA LHi's XLR connectors (channels 1 and 2) to the monitoring system AES/EBU inputs. If you instead have an analog audio monitoring system, you can use either the XLR balanced audio connectors or the two RCA-style unbalanced stereo output jacks on the Optional KLHi-Box for output.



Typical System Connections—Shown with Optional KLHi-Box

Installing KONA LHi Software

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

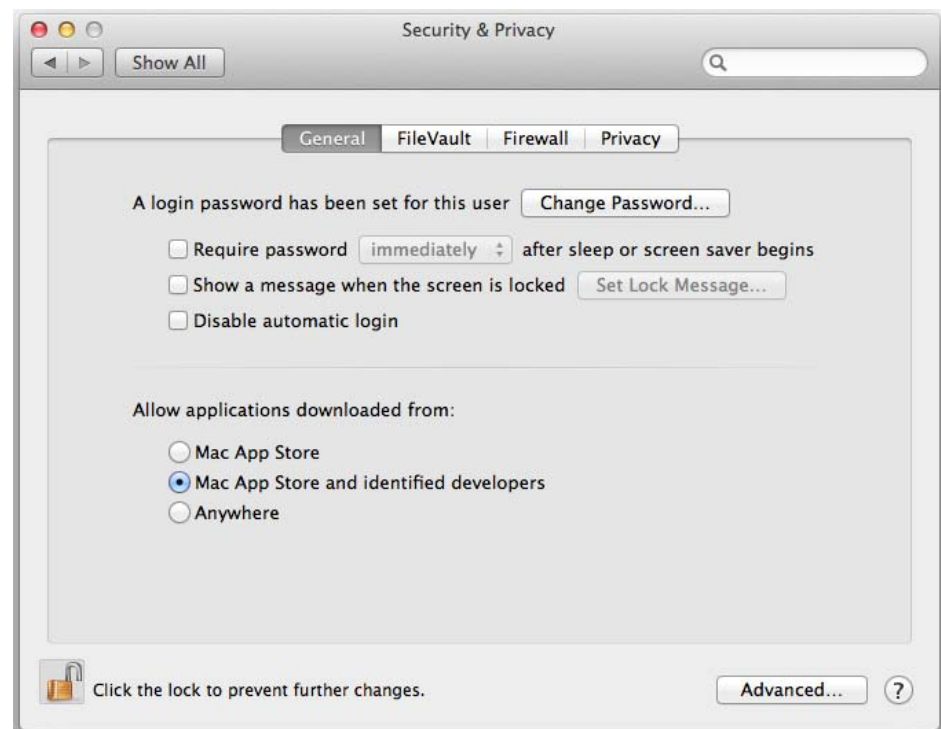
System software updates may occasionally become available to AJA KONA LHi owners on our website (<http://www.aja.com>). We recommend checking occasionally for both software updates and additional product information. For link to AJA KONA LHi software see "[Installation Overview](#)" on page 13.

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

Installing KONA Software for Mac

Visit the AJA website for the latest driver version appropriate to your configuration. Alternately, if you have no internet connection, insert the KONA LHi CD in the Mac; as noted, this driver version may not be the most current. After securing the most recent KONA LHi driver package, read the details and requirements on the to ensure compatibility with your system configuration.

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



Note: *Mac Security & Privacy Gatekeeper Setting*

Installation Procedure

1. Locate the downloaded driver on the desktop or the KONA LHi CD icon on the desktop.
2. Locate the package file in the folder from the download or by double clicking on the CD; the package has an icon that looks like a box and has a “.pkg” suffix.

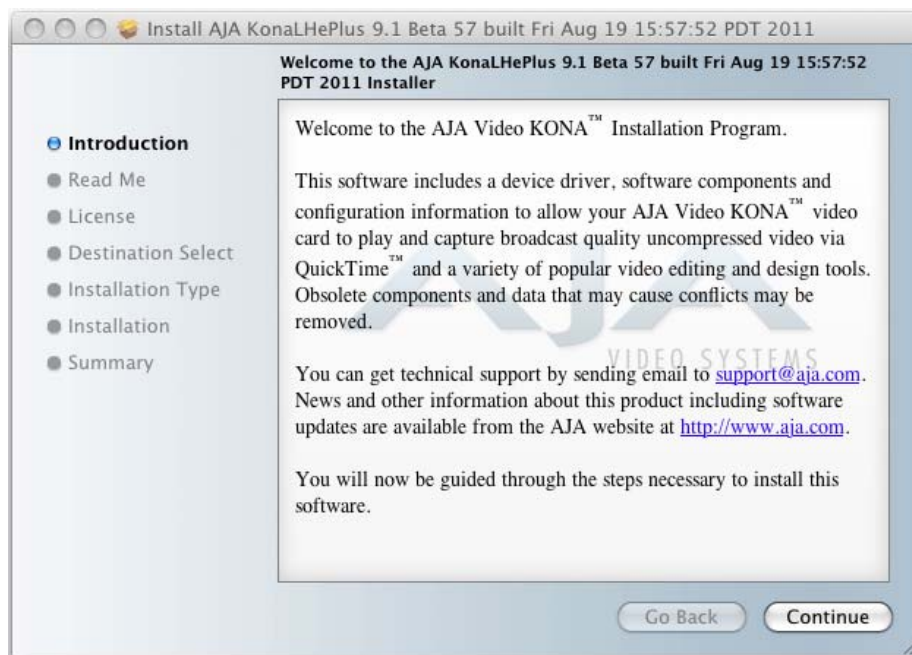
Note: Files ending in the “.pkg” suffix are OS X installer files. These launch the OS X installer and tell it where and what to install on your system.

3. Double-click the package to log on and begin software installation.
4. The system will respond by asking you to authenticate who you are as currently defined on your OS X user profile. Enter the proper name and password at the Authenticate prompt; if you have multiple users defined, ensure that you log on as a user with administrator-level authority.



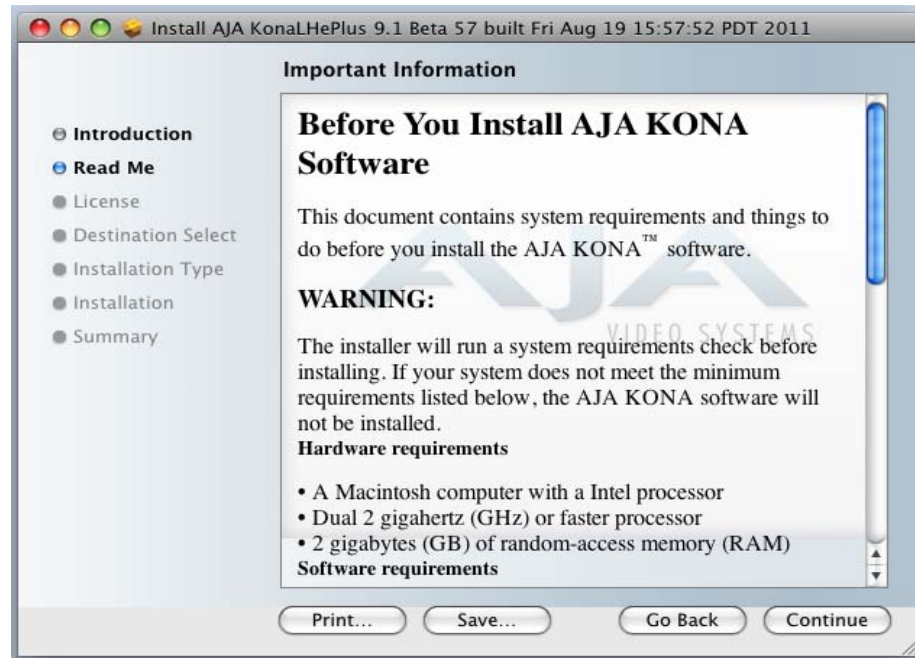
Log On Authenticate Prompt

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



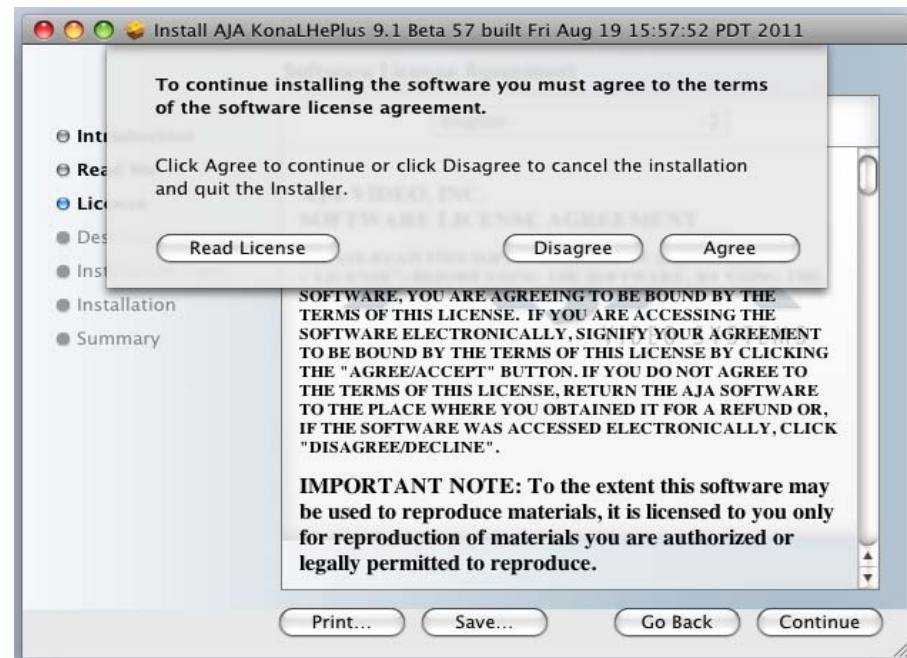
Initial Installer Screen

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



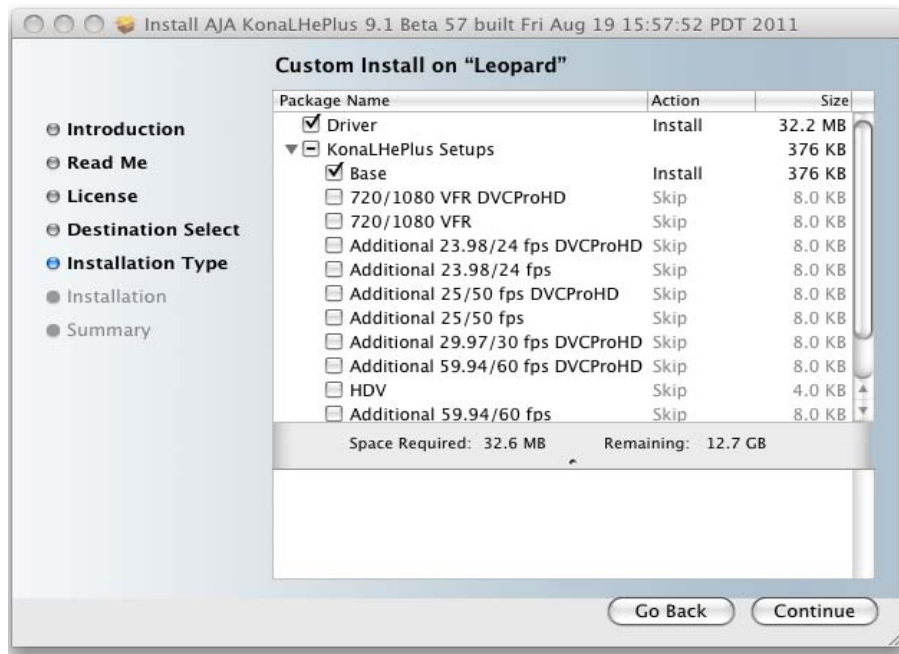
System Check Installer Screen

9. Read and agree to the Software License Agreement.



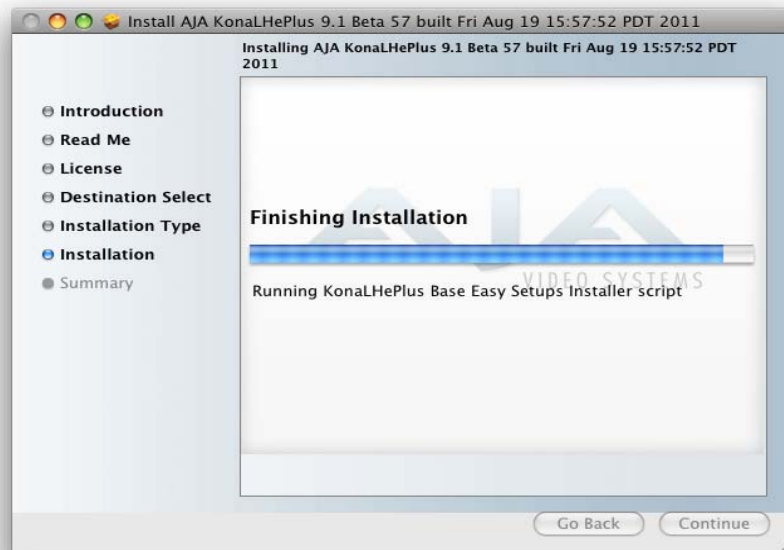
KONA LHi Software License Agreement Screen

10. At the next screen, click the *Install* button to place the software on your computer.



Easy Install, Installer Screen

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



Installation Progress Bar



Final Installation Screen

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

Note: You may be required to update the KONA card's firmware if installing a new version. See ["Updating KONA Firmware" on page 32.](#)

Installing KONA Software for Windows

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

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

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

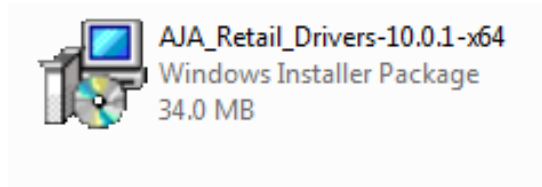
Software Installation Procedure

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

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

- Retail Drivers and Control Panel applications
- Plugins for the various third-party applications supported.

The AJA Retail Software package must be installed first. Next, install the plugin package for your desired Application Software.



KONA for PC Retail Drivers Installer Package

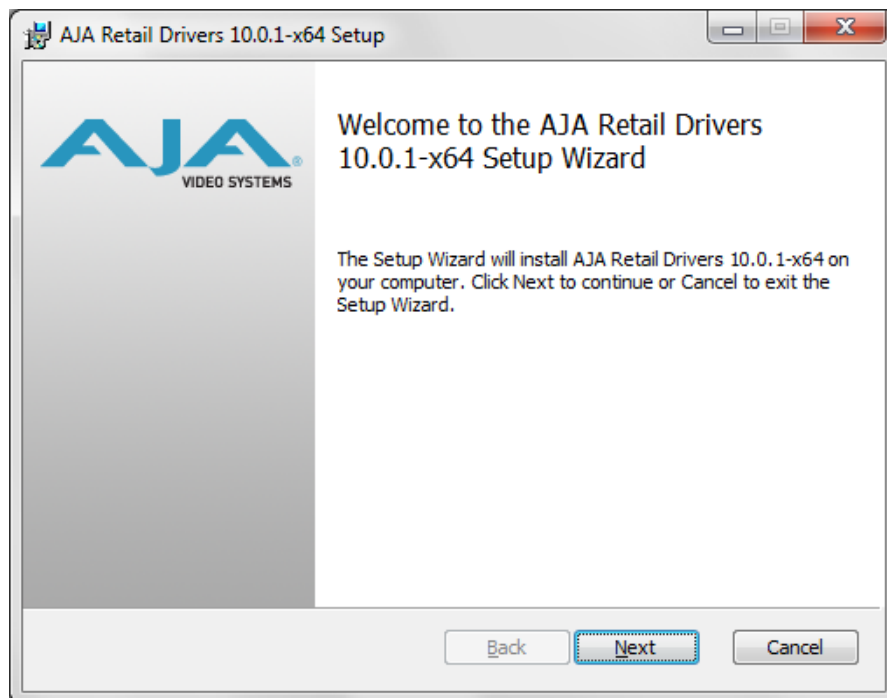
Note: Before installing KONA software, turn off any virus protection and security software that you have installed on your computer.

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

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

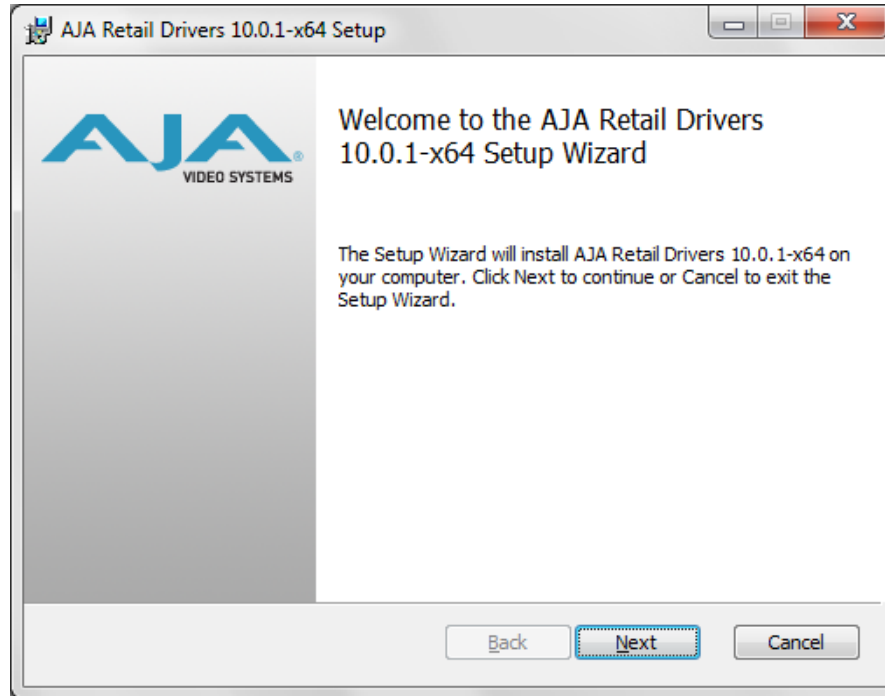
Install Wizard

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



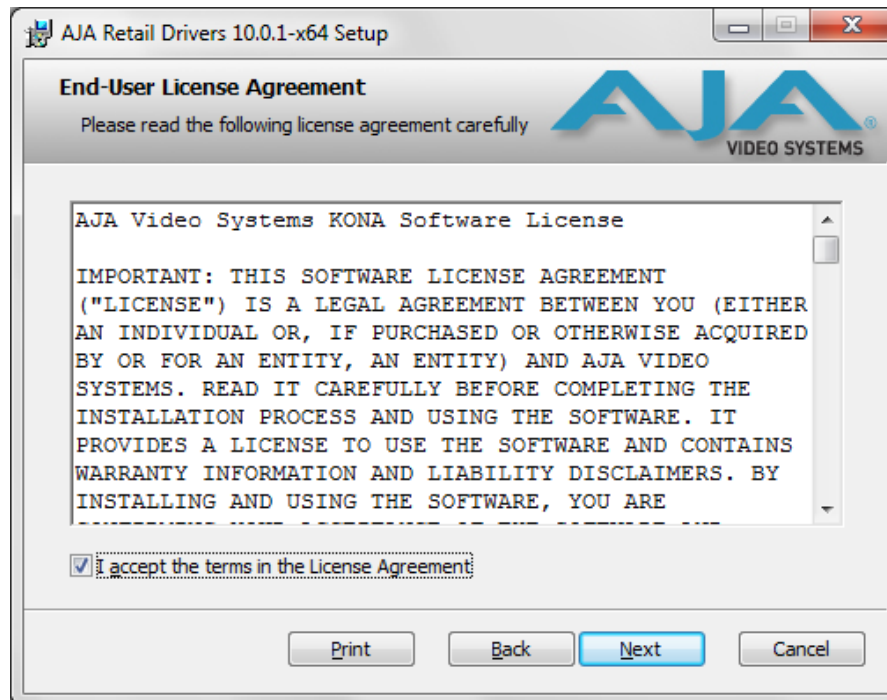
Install Wizard Welcome

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



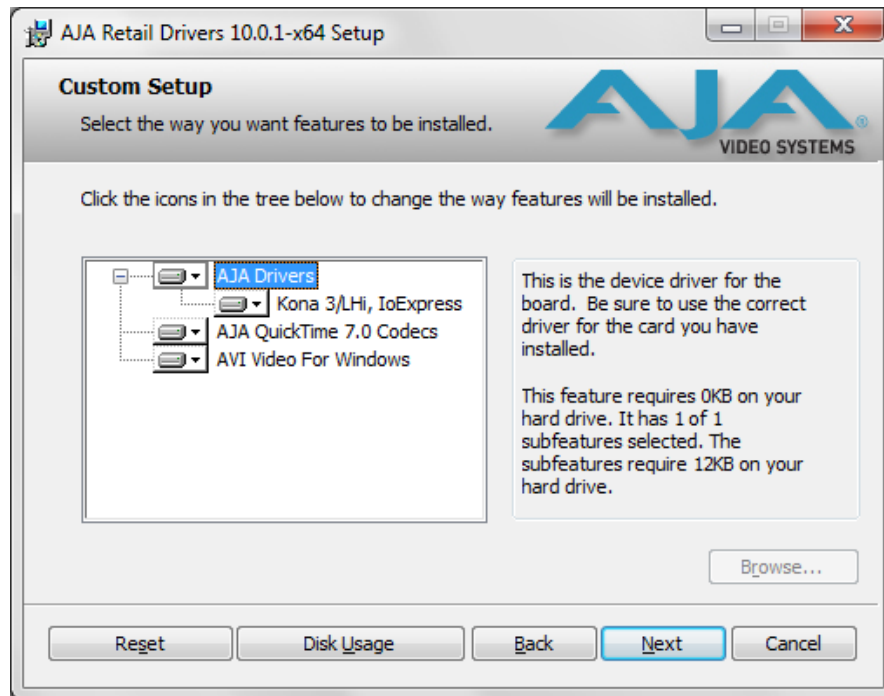
License Agreement

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



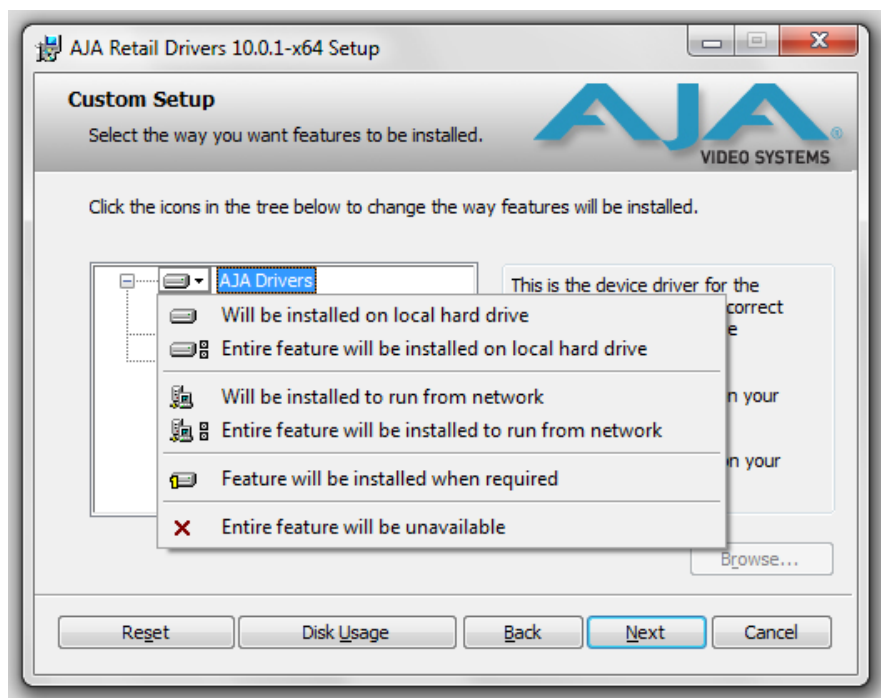
Installation Type

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



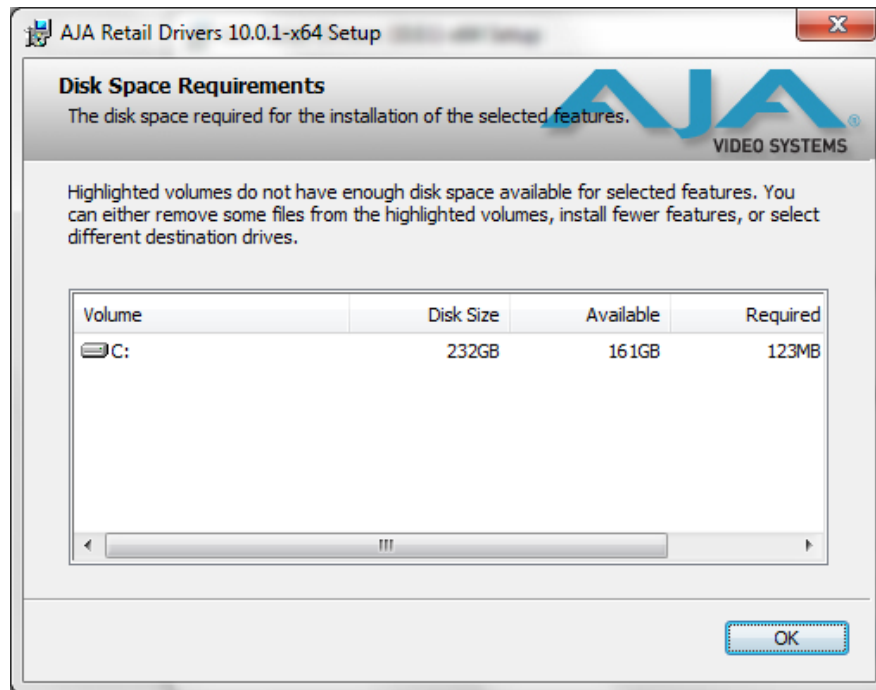
Custom Installation Menu

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



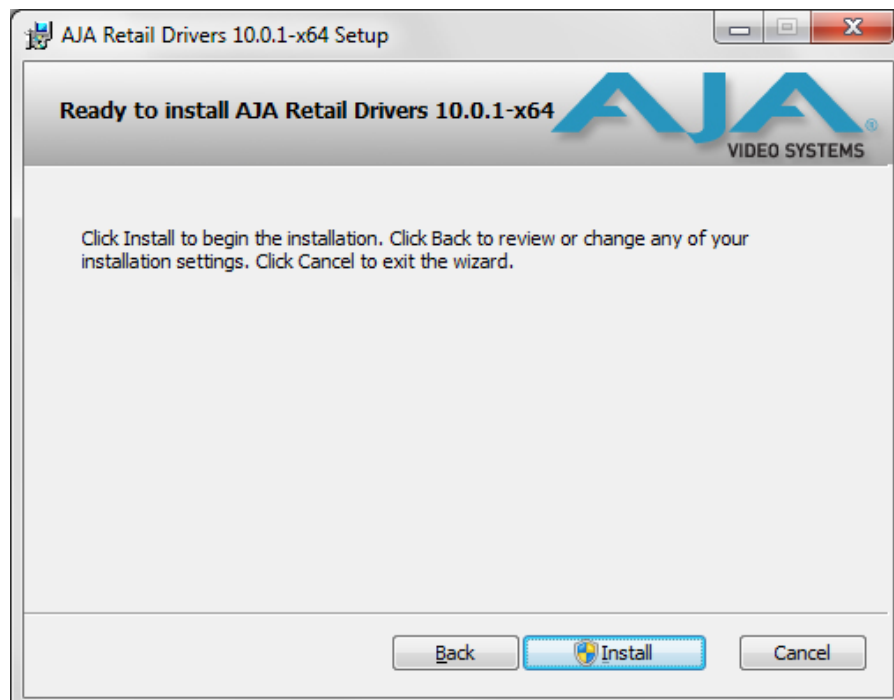
Custom Selections Pulldown Menu

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



Workstation Disk Usage Display

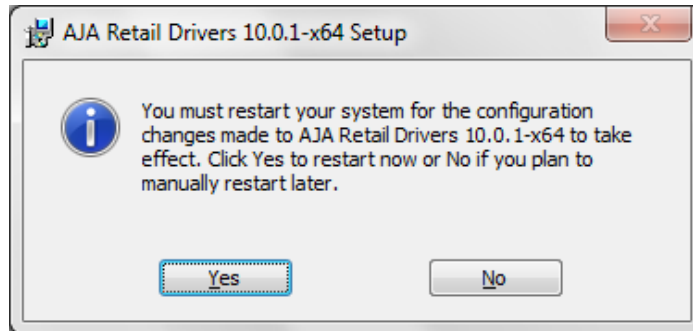
To return to the installation click OK. Click Next to begin the installation. screen.



Begin Driver and Plugin Installation

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

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



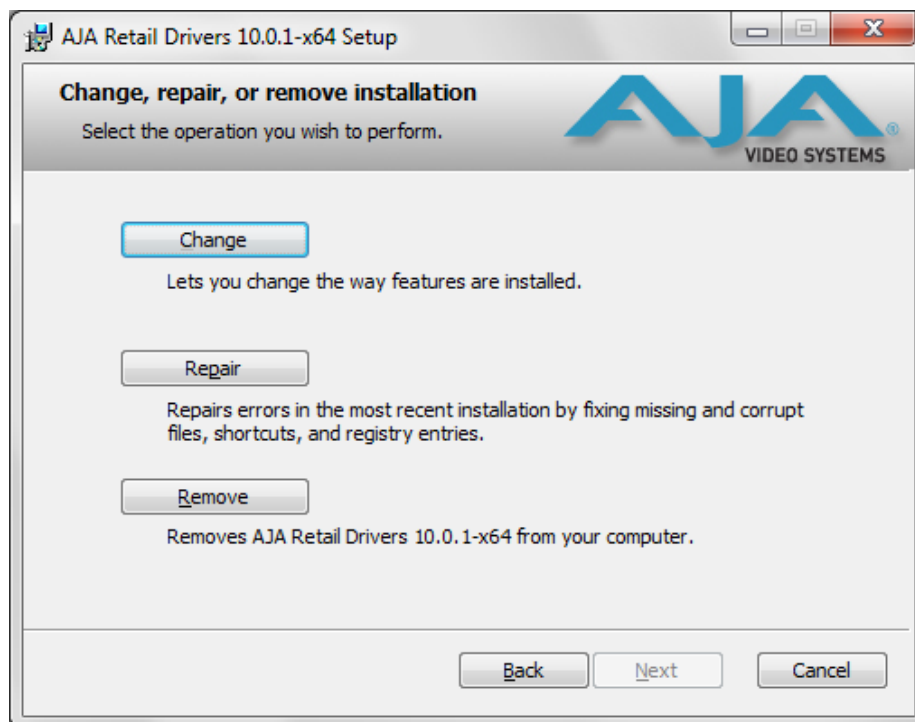
Restart Screen

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

Re-Installation & Repair

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

Note: Note: Always uninstall KONA software before running a newer version software installation package.



Change, Repair, or Remove Installation Menu

Updating KONA Firmware

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

Follow these instructions when a firmware update is required:

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



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



Firmware Update Welcome Screen

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



Firmware Update Warning Screen

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



Firmware Update Warning Screen

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

Genlock and Your System

For video stability and proper system operation, you can genlock all equipment to house sync, however genlock is not required for KONA LHi due to excellent freerun accuracy. To connect genlock, use a black burst generator output looped through the system. On the KONA LHi cables and optional KLHi-Box breakout box, house sync is connected to "Ref Loop".

Chapter 3: Operation

Using KONA LHi with Professional Video /Audio Software

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

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

<http://www.aja.com/en/support/kona/mac/kona-lhi/>

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

Using The AJA Control Panel

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

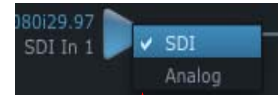
One thing you'll notice instantly about the Control Panel is that it represents a visual block diagram of how the unit is configured. The current status, input and output settings, and many other details can be viewed as a color-coded block diagram in the Control Panel.

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

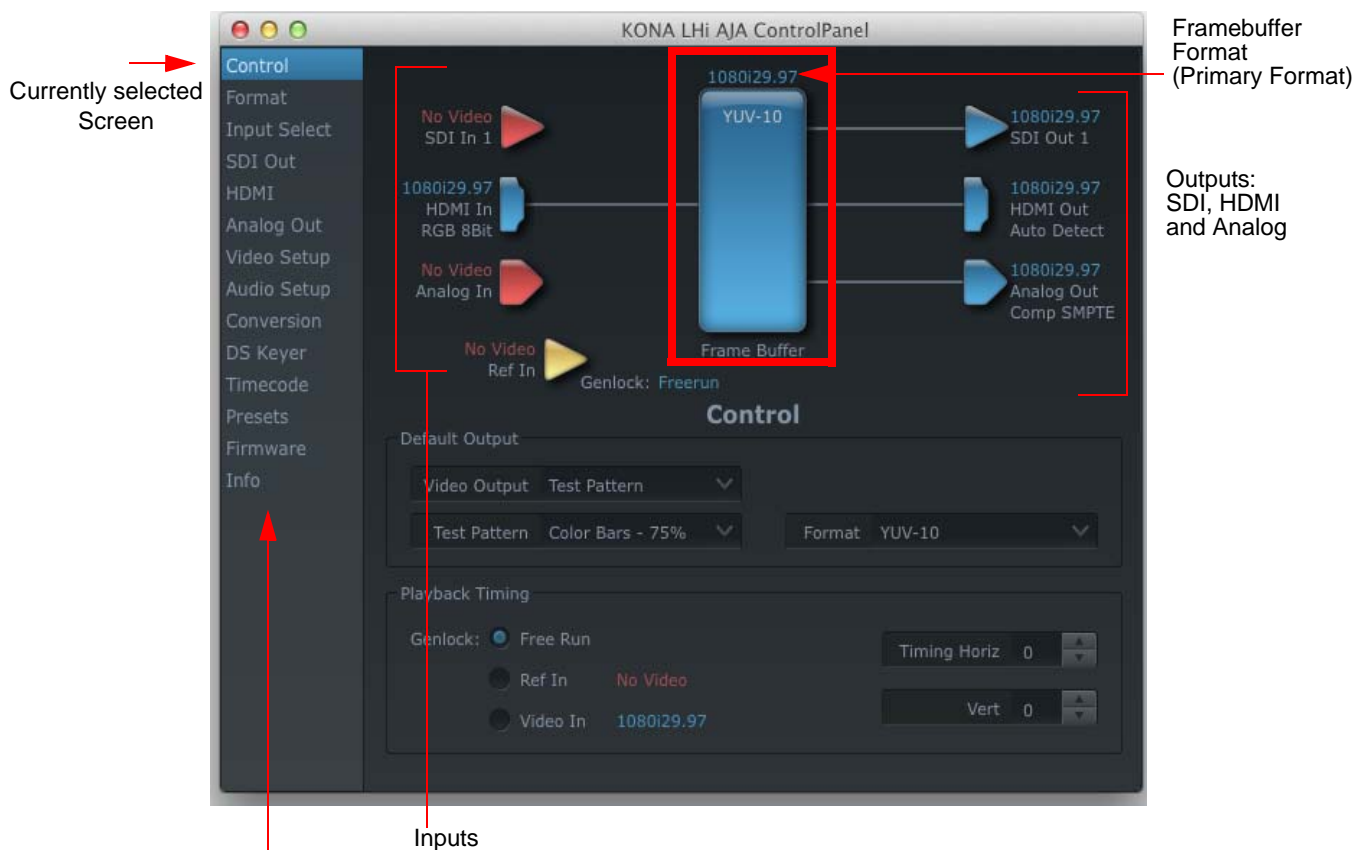
Before we go into too much detail, here are some basic definitions you should know (please refer to the figure that follows for reference). After studying the basics, read "[Who is Controlling KONA?](#)" on page 55 for more advanced information on how applications interact with KONA LHi.

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

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



Control-Clicking an Icon Produces a Context-sensitive Menu



Screen Choices – Click One to Edit/View a Topic

AJA Control Panel, Block Diagram

Framebuffer—The framebuffer is the “engine” in KONA LHi where active video operations take place using 3rd-party applications, or even KONA LHi itself. The framebuffer has a format (called the “Primary Format” and color space that it follows, as defined in the topic screens or via external application software (such as the “Easy Setups”). It is important to realize that inside the host computer, many applications can use the KONA LHi (as you switch from window to window) and it may not always be obvious which currently controls it.

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

Primary Format—The video format currently assigned to KONA LHi. This is the format that the framebuffer will use and is shown in the Control Panel using the color blue. All

icons in blue are the same as the Primary Format used by the framebuffer. Also any text descriptions in the block diagram that appear in blue also indicate that something is in the primary format. So, for example, if you see that the input and output icons are blue, then you know that the same format is used throughout the video path and that no format conversion is being performed. If a different color is displayed on the input or output, say green for example, then you know that KONA LHi is performing a format conversion in the video path.

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

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



Input/Output Icon

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



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

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

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

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

Format: select the framebuffer primary video format, any secondary formats, and parameters of conversion for input/output.

Input Select: view and edit input selections and how they are mapped.

SDI Output: assign outputs to either Primary or Secondary formats.

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

Video Setup: configures Video LHi options such as composite black level.

Audio Setup: configures analog audio monitor level and delay.

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

DS Keyer: select downstream keyer mode, specify a graphic file or matte.

Timecode: monitor RP-188 timecode and configure timecode window burn output (**Note:** SMPTE 12M-2 is the updated name and specification for what was RP-188)

Presets: add or delete saved preset configurations (handy for setting up the KONA LHe for certain workflows and then saving it as a canned configuration for easy later recall)

Firmware: enables installation of AJA card firmware.

Info: displays status information about the KONA. This information is generally intended for troubleshooting and support.

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

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

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

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

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

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

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

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

Control Screen

The KONA LHi can be controlled by various software applications running on a host Mac as well as be used as a Macintosh Desktop extension. The Control Screen is where you select how the card directs video and is used by application software. This screen also provides control for configuring output timing with regard to external reference video and horizontal/vertical delay.

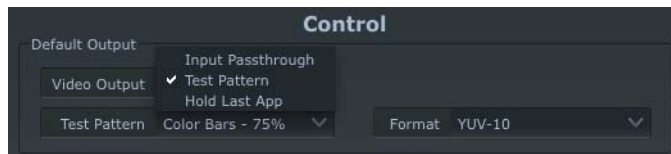
At the top of the Control screen it will show the current Default Output and the application currently controlling it (if there is one). For example, in the screen shown here, the default output is a Test Pattern.



AJA Control Panel, Control Screen

Control Screen Settings

Default Video Output—this is where you select what the KONA LHi will output as a default when no application has control of it, such as when the Finder is active. Since it can be controlled by software applications as well as its own control panel, the output can change dynamically. Some video applications will grab control of the KONA LHi inputs/outputs. These settings determine what happens when an application is active that *does not* grab the KONA LHi inputs/outputs.



AJA Control Panel, Control Screen, Default Output Pulldown Menu

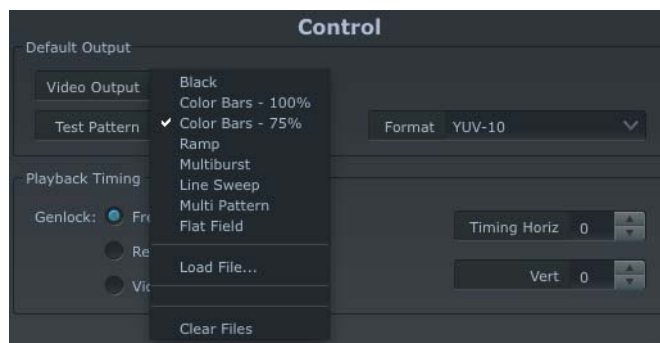
Default Output Choices and their meanings:

Input Pass through: this selection directs KONA LHi to route video from its selected input through the card for processing and output. When this selection is in effect, all Primary/Secondary Format selections are available for selection in controlling the output. This in effect makes the LHi a converter when used in conjunction with the AJA Control Panel application and a Mac.

No applications other than the AJA Control Panel need to be open to convert audio and video from one format to another. For example, if an SD source tape needs to be dubbed to an HD tape, the signal might be routed from the SD VTR to the LHi, configured for upconversion in the Control Panel and then passed through to the HD VTR for recording.

Test Pattern: this selection directs KONA LHi to output a choice of preset pattern when no other application is using the card. In addition to the provided test pattern choices, a “Load File...” selection at the bottom of the menu allows you to load any standard Mac RGB graphics file (.tif, .psd, etc.) into the frame buffer for display.

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



AJA Control Panel, Test Pattern Choices

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

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

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

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

Video In: Directs KONA LHi to use whichever video input source has been selected in the Inputs screen for sync.

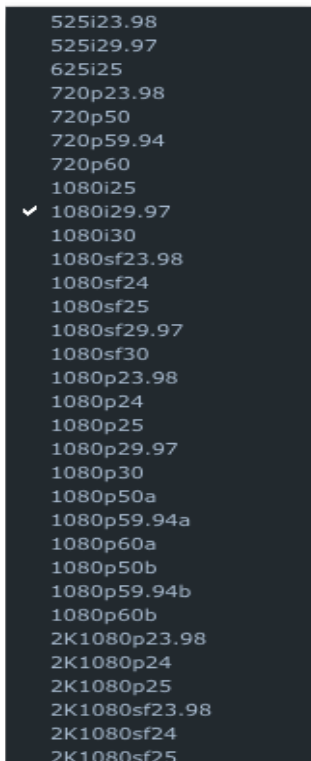
Timing (*Horiz and Vert*)—these two pull-downs allow output timing adjustment with reference to the Ref Video source selected. The Horizontal reference can be adjusted by selecting a number of pixels (clocks) to offset. Vertical can be adjusted by specifying a number of lines to offset.

Formats Screen

The Formats screen shows the video format currently in use by the KONA LHi framebuffer (called the *Primary Format*) and allows you to change it. All throughout the Control Panel, choices are always presented based on what KONA LHi can do with the signals available and the inputs/ outputs selected. For example, on the Formats screen, if the output or inputs are a different format than the primary, then you'll see an additional information pane that allows you to view and edit the secondary format—including control over whether down conversion is employed.



AJA Control Panel, Formats Screen



AJA Control Panel, Formats Screen, Showing Primary Formats Pulldown Menu

Format Screen Settings

Primary (Framebuffer) Format—this pull-down menu shows the currently selected format. This pull-down appears in both the Primary Format area of the Formats screen as well as the Secondary Format area (if present). If you select an alternate value in the Primary Format using the pull-down, it will change the format used by the KONA LHi framebuffer. When a change is made via the Video Format pull-down or by clicking an icon (widget) and selecting a new format via a contextual menu, the block diagram will change to reflect the new format.

For a complete list of supported Video Formats, see [“Video Formats” on page 61](#).

VANC—enables or disables VANC data capture and playback.

Secondary (Converted) Format—the formats available can vary based on what the Primary Format is and the input signal (frame rates of input sources limits the to/from conversion choices). The “Secondary Video Format” pull-down menu lists all compatible formats in black (incompatible formats are shown in gray and cannot be selected). This allows you to see what you've chosen, and also see those formats that are compatible with the selected Primary format.

Note: The AJA Control Panel software uses the abbreviation “sf” instead of “Psf” when referring to “progressive segmented frame” formats. In the manual and in other literature you may see either of these acronyms used interchangeably. Visually it is easier to discern at a glance if you are working with progressively segmented frame formats (sf in the AJA Control Panel) as compared to progressive frame formats which will show only “p.”

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

Down (Conversion)—for downconversion the following choices are available:

Anamorphic: full-screen “stretched” image

Letterbox: image is reduced with black top and bottom added to image area with the aspect ratio preserved

Crop: image is cropped to fit new screen size

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

For Upconversion the following choices are available:

Anamorphic: full-screen “stretched” image

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

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

Zoom Letterbox: results in image zoomed to fill full screen

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

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

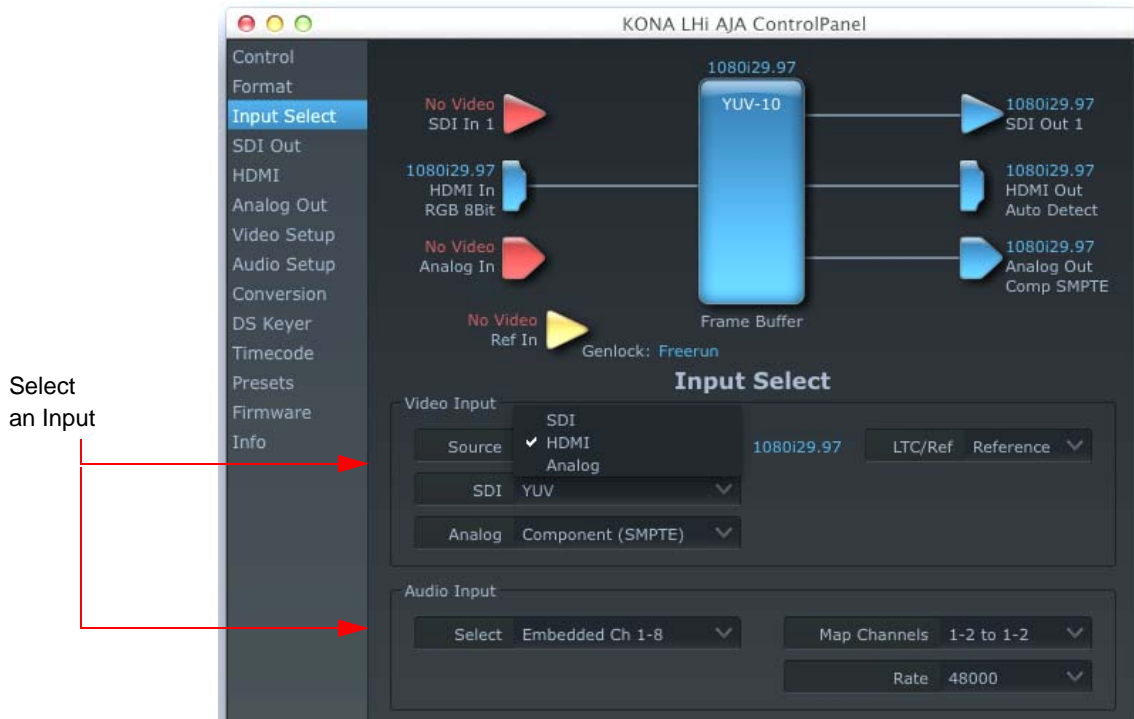
Letterbox: this transforms SD anamorphic material to a letterboxed image.

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



AJA Control Panel, Input Select Screen

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

Input Screen Settings

Video Input—These pulldown menus allow you to see and change what's currently selected for the video (SDI, HDMI or Analog) and the audio input. A second pulldown allows you to specify how the LTC/Reference input is used: choose LTC for LTC timecode input or Reference to use the input as a house reference. If Analog is selected, then you also need to select the type of Analog input via a pulldown menu. Choices are:

- Composite
- Y/C
- Component (SMPTE/EBU N10)
- Component (Beta)

Audio Input—This pulldown menu allows you to pick where the audio comes from. KONA LHi supports up to 8 channels of embedded digital audio, so you can choose out of the 16 channels that can be embedded in SDI, and pick which to bring in (from the group 1-8 or 9-16). Another pulldown allows you to select a sample rate 48000 or 96000 for analog audio.



SDI Output Screen

The SDI Out screen shows the current settings for the SDI output. If an input/output has no video, it will be indicated on the block diagram (“No Video”).



AJA Control Panel, SDI Out Screen

SDI Output Screen Settings

Information that can appear includes the following items. You can view the current setting or click on another to change to it:

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

HDMI Screen

The KONA LHi's HDMI input and output are shown and configured at this screen. The HDMI input pane shows if an HDMI input source has been detected and locked on, showing the format found.



AJA Control Panel, HDMI Screen

HDMI Screen Settings

HDMI Output—one pulldown allows you to select either the primary video format (framebuffer) or a secondary one (up/down/cross-conversion). Pulldowns are provided for configuring the video output range, color space and number of embedded audio channels (2 or 8) for the HDMI output. A Protocol pulldown allows you to choose either “HDMI” or “DVI” protocol—use DVI if you’re outputting to a DVI monitor using an HDMI to DVI adapter.

HDMI Input—while there are two different ranges of colorspace values that SDI can use (RGB and YCbCr) the HDMI input on the KONA LHi will automatically negotiate between the two. A pulldown allows you to select the video input RGB range (SMPTE or Full).

Analog Out Screen

KONA LHi provides a high-quality analog component or composite output, generally used for monitoring. This screen shows the current settings for that analog output, and allows you to re-configure it when desired.



AJA Control Panel, Analog Out Screen

Analog Out Screen Settings

Select—Primary or Secondary (conversion)

Analog Format—choices in the Analog Format pulldown menu vary depending upon the Analog Output video standard. For example, the “Composite + Y/C” selection is only available when an SD (525i29.97 or 625i25) format is in use. Analog formats can include:

- Composite +Y/C
- Component (SMPTE/EBU N10)
- Component (Beta)
- Component (RGB)
- Component (RGB -HV)

Monitor Audio—select which two channels will be routed to the stereo pair of unbalanced consumer audio outputs on the KLHI-Box (option).

Video Setup Screen

The KONA LHi's Analog Black level and QuickTime Video Output Display Filter are configured here.



AJA Control Panel, Video Setup Screen

Setup Screen Settings

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

QuickTime Video Output Display Filter—these controls help manage the comprehensive list of video outputs and geometries that may be available to applications.

By selecting the checkbox next to specified parameters, the video outputs related to these specified parameters are enabled as possible video outputs for applications. As an example, if the checkbox next to 25/50 is unchecked, 50Hz video outputs are deselected and would not be available to the user in the *A/V Devices*. To avoid confusion when working in a particular editorial environment, users might elect to leave 50Hz unchecked if they work solely in a 60Hz editorial environment.

Audio Setup Screen

The KONA LHi's audio settings are configured here.



AJA Control Panel, Audio Setup Screen

Audio Setup Screen Settings

Lock Audio Gain To Unity—When set, the KONA card will ignore the third-party application's gain setting and set the audio gain at unity. When not set, this checkbox tells the KONA card to get the audio gain setting application (if supported).

Analog Audio Monitor Level—when a KLHi-Box is connected to KONA LHi, the button selected determines the audio level that will appear at the Analog Audio Output RCA connector pair ("FSD" is *full-scale-deflection* reading as measured on a VU meter). Select +18 for Europe or +24 for USA.

Conversion Screen

This screen is used to set conversion options.



AJA Control Panel, ConversionScreen

Conversion Screen Settings

Pause On—these two choices determine what happens when your editing application is paused in stop mode:

Full Frame: both fields are displayed resulting in some jitter while paused.

Single Field: a single field is displayed, showing no flicker (useful when color correcting or whenever the flickering would be a distraction).

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

3-2 Pulldown Offset—select a frame offset value from 0 to 4.

RGB-YUV Conversion: These pulldowns select industry standard color space and gamma transfer functions for the YUV-RGB conversion, or allow you to direct the KONA card to automatically determine it for you.

Colorspace—choose from:

Rec 601
Rec 709
Auto

Gamma—choose from the following:

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

Enable Custom LUTs—this checkbox enables a custom color lookup table (LUT).

DS Keyer Screen

The KONA LHi has a hardware-based downstream keyer that is ideal for putting logos, “bugs” or other video material with an alpha channel on top of video being played out or printed to tape. A typical application would be putting a television station's call letters or channel over program video content. Keyed video can be from the KONA's internal Frame Buffer (from storage, video In, KONA TV, etc.) or from a graphics file that has an alpha channel (PhotoShop etc.).



AJA Control Panel, DS Keyer Screen

DS Keyer Screen Settings

Downstream Keyer Mode:

Downstream Keyer Off — when this pulldown menu item is selected the downstream keyer will be turned off

Frame Buffer over Matte— places the keyed video with alpha channel currently in the Frame Buffer over a fixed color matte determined by the “Matte Color” setting set separately.

Frame Buffer over Video In—places the keyed video currently in the Frame Buffer over the video input for playout or print-to-tape.

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

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

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

Matte Color: only available when the pulldown “Frame Buffer over Matte” or “Graphic over Matte” are selected—pressing this button brings up a color selection dialog. The dialog provides a variety of ways to select a matte color including a color wheel, color picker (choose from a location anywhere on the computer screen), numeric sliders, swatches, “crayons”, and spectrums. The matte chosen will be used as a video background under the keyed video.

Foreground pre-multiplied (checkbox): use to avoid “matte lines” and improve the appearance of the foreground (key) being composited over the background.

Audio Out:

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

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

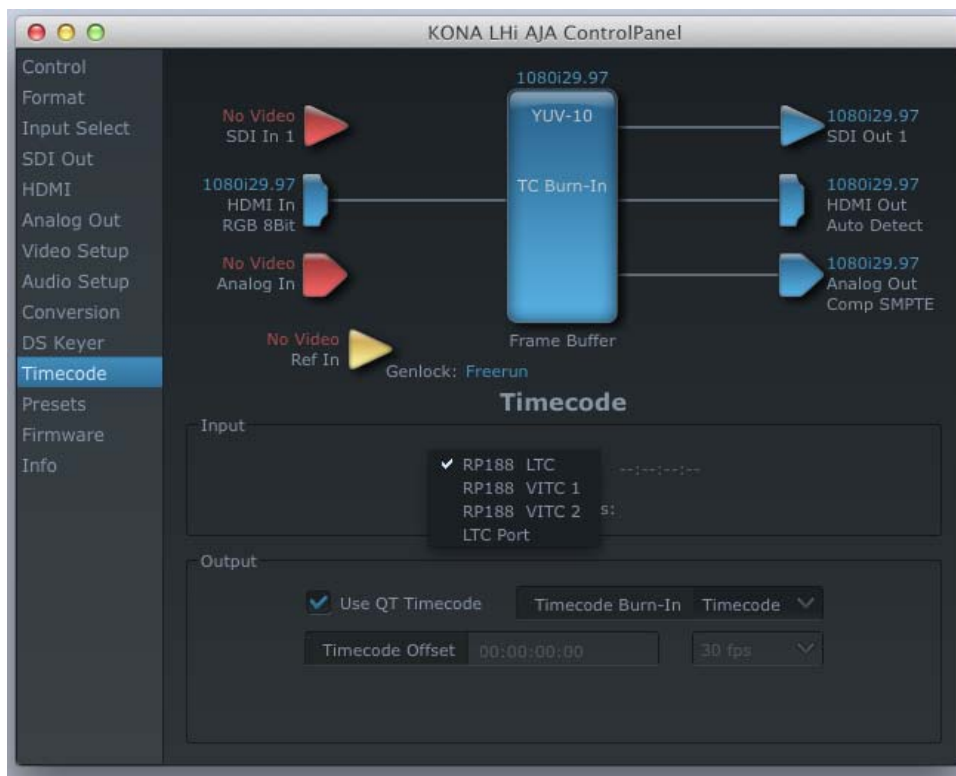
Opacity: this slider controls the transparency of the keyed video (over the background) from translucent to completely opaque.

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

Timecode Screen

The timecode is used for both monitoring the RP-188 timecode embedded in the digital data stream and for selecting a timecode offset (if required) for the attached VTR (connected to KONA LHi's RS-422 port)—and sent during assemble-edit mode.

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



AJA Control Panel, Timecode Screen

Timecode Screen Settings

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

User Bits—For monitoring variable framerate (VFR) timecode (such as Varicam), you may wish to monitor the user bits embedded in the timecode. If you set this checkbox, KONA LHi will detect and interpret the user bits and display them next to the checkbox.

Use QuickTime Timecode—when checked, this directs KONA to output timecode from the QuickTime timecode track. When not checked, KONA uses the *Output Timecode Offset* value plus the number of frames into the movie. Note: not all QuickTime applications use or support timecode tracks—so sometimes the QuickTime timecode is missing or not meaningful.

Output Timecode Offset (entry field and FPS pull-down)—this text entry field allows you to specify a timecode offset for use with your video editing application that has timecode offsets that are user-controlled. Use that same value here as the “Output Timecode Offset” to ensure the timecode is synchronized.

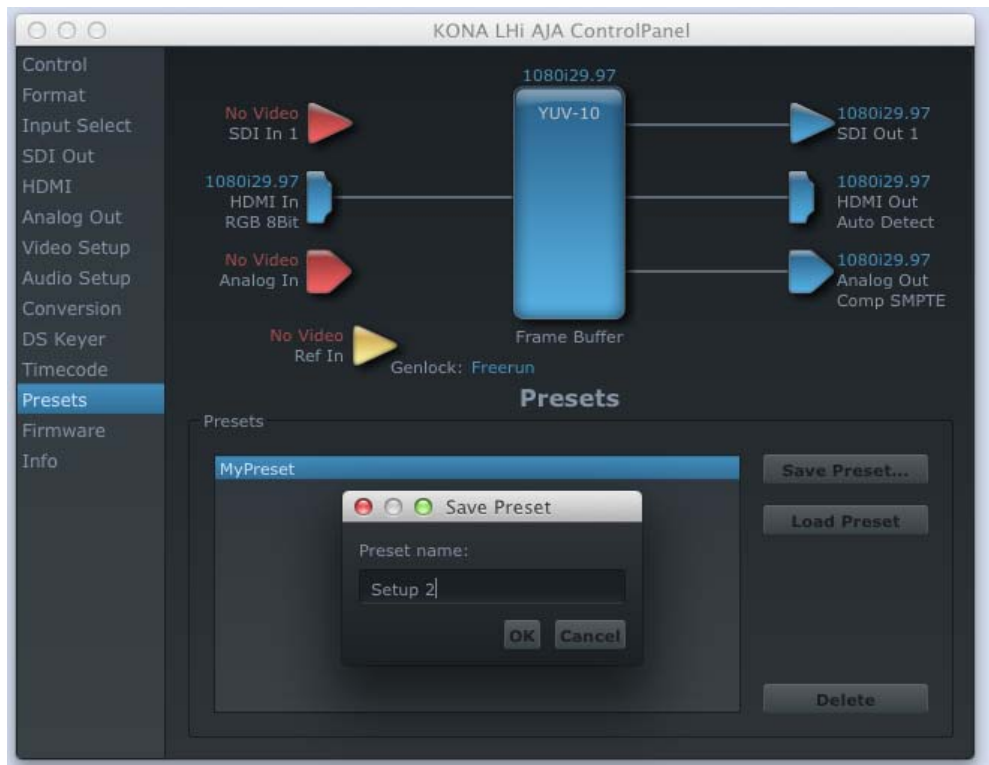
Timecode Burn-in—this pulldown selects whether the timecode value is “burned-in” on video output from KONA LHi. If set to “OFF”, timecode will not be keyed over the video. If set to “timecode”, then the timecode value will be keyed over the output video. This can be useful for synchronizing, choosing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

Note: SMPTE RP 188 defines a standard for the transmission of time code and control code in the ancillary data space of a digital television data stream. Time code information is

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

Presets Screen

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

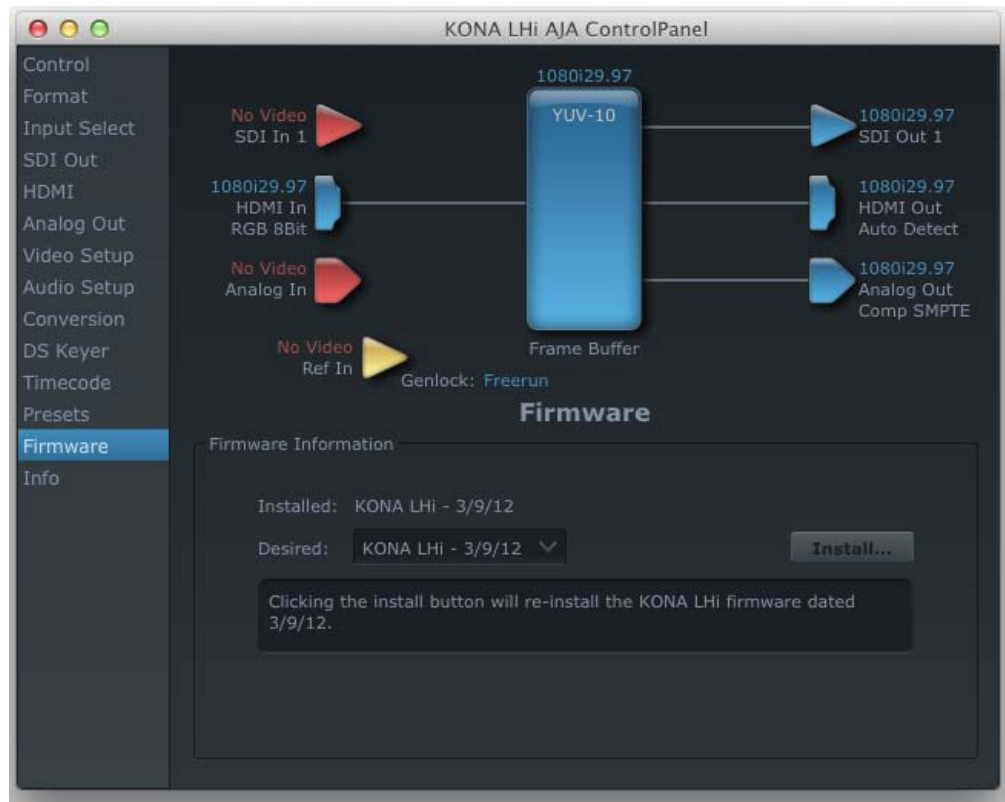


Presets Screen

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

Firmware Screen

Use the Firmware screen to access the firmware install screen. Click install to erase current firmware and load the firmware version contained in your current driver installation. Note the Installation message shown below.



Firmware Update

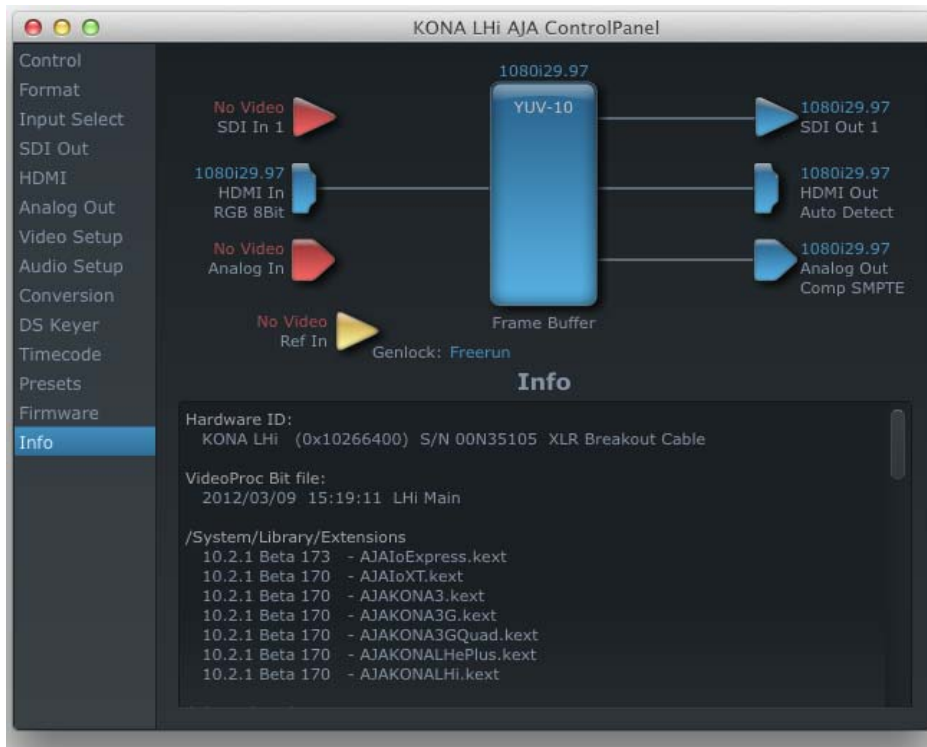
You will be required to power-cycle your computer to finish the update.



Update Completed

Info Screen

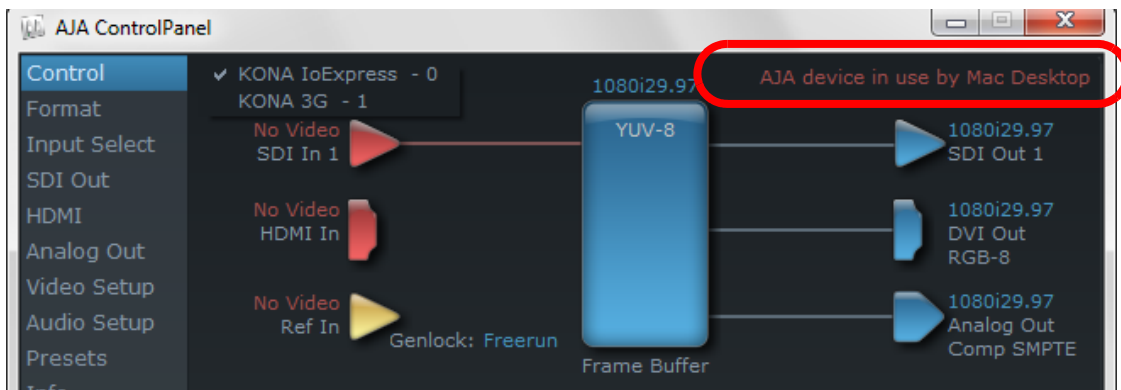
This screen shows the KONA LHi software files that have been installed on your system. This information may be needed if you talk to an AJA Customer Service representative to determine if files are missing or need updating.



AJA Control Panel, Info Screen

Who is Controlling KONA?

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



AJAControl Panel Control Message

The AJA Control Panel in-use message will tell you the "active" application that has control of KONA (see in-use message above) and what the format selections are. If you click on another

supported application that is running such as Adobe Premiere Pro or AJA TV, the AJA Control Panel in-use message will report the change by displaying the new application in control. If no in-use message is displayed, the AJA Control Panel is in control of KONA. If no QuickTime applications are running, the board's state is determined by the AJA Control Panel application's settings.

QuickTime Application Format Selection

If a running QuickTime application uses KONA for capture or output, it controls the Primary format via its own menus and settings. These format selections are reported in the AJA Control Panel block diagram.

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

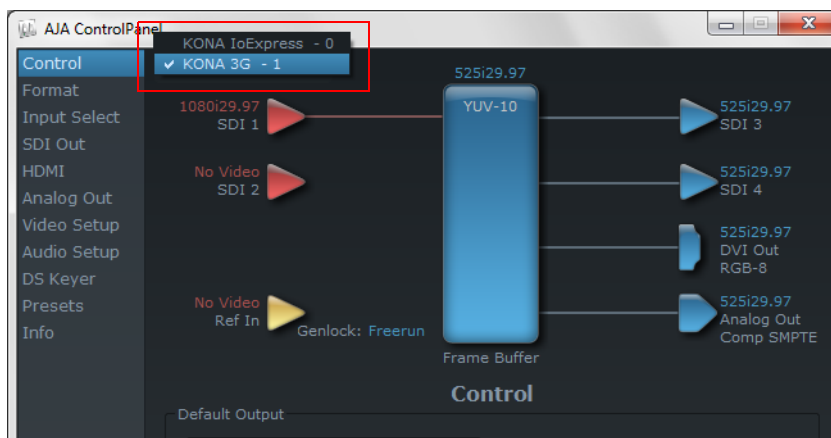
Note: Some third-party applications do not release the board if it is in capture mode. The AJA Control Panel “in-use” message will still indicate the application still has control even if the front application changes.

Control Recommendations

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

Using Multiple AJA Products

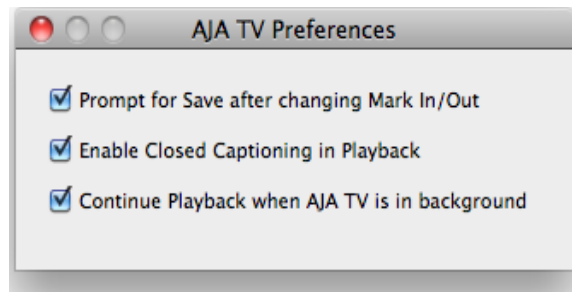
Starting with the v7.5 drivers, more than one AJA product can be used with your host computer. Using the AJA Control Panel application, you can choose which installed product an application uses for input/output. In the upper left corner of the AJA Control Panel application, you will see a board name,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



When you launch an application such as Adobe Premiere Pro, or AJA TV, that application will use the product that is currently selected in the AJA Control Panel application for its input/output. Once an application is running, you can change the “targeted” product selection in the AJA Control Panel and select a different product. The running application will retain its connection to the product. If you change the “targeted” product and launch a different

application, that application will use the new product for its input/ output, while the first application you launched will continue to use the other AJA product.

Example: select a KONA LHi as the targeted product in the AJA Control Panel application. Launch your editing application (eg. Premiere Pro). The application is now using the KONA LHi for its input/output. Go back to the AJA Control Panel application and select an Io Express as the “targeted” product. Launch the AJA TV application. AJA TV would now use the Io Express for its output. If you switch back to Premiere Pro, you would note that it is still using the KONA LHi for its input/output. Note that some applications, like AJA TV, have a provision for playing in the background, so playback on one product could even continue when switching the targeted device for use with another application. You can even feed the output from one AJA product to another AJA product on the same system in such cases.



AJA TV Preferences, Continue Playback when AJA TV is in background

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

Notes on using multiple AJA Products:

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

Using 8-bit Versus 10-bit Video

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

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

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

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

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

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

Chapter 4: Troubleshooting

If You Run Into Problems

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

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

Symptom	Check
Disk RAID cannot keep up (dropped frames etc.).	Ensure the disk system is providing at least 50 MB/second sustained transfer rate
Dropped frames during playback.	1. Virus checking software running in the background (disable it). 2. Scratch drive not set to the RAID.
Dropped frames during record.	1. RAID cannot sustain the data rate of the capture preset codec. 2. Virus checking software running in the background (disable it). 3. Scratch drive not set to the RAID.
Media is not being captured from desired external device.	Check the settings in the <i>Input</i> tab of the Io XT Control Panel application. Also check equipment cables.
Dropped frames during playback	Look for scroll bars in the viewer or canvas as a warning sign that the zoom setting exceeds the fit-t-window.
Video stutter during playback.	RAID cannot sustain data rate.
Render bar occurs when placing a clip on a sequence.	The sequence setting does not match the clip setting.

Updating Software

Check on the AJA Video website for software updates:

<http://www.aja.com/en/support/kona/mac/kona-lhi/>

If any are available, download the file and read any associated instructions prior to installing the software.

Support

When calling for support, first check over your system configuration and ensure everything is connected properly and that current presets and Easy Setups match what you are trying to do. Even if you cannot find the cause of the problem, having this information at hand will help when you call AJA Customer Support for help.

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

If the problem is a Mac Pro system issue, or Xserve RAID issue, then call Apple Customer Support for help.

If the problem is an AJA Video KONA LHi issue, refer to *“Contacting Support” on page ii* and contact AJA Video Customer Support.

Appendix A: Specifications

KONA LHi

PCIe 4-lane compatible

Video Input

3G SD and HD-SDI, SMPTE-259/292/296/424, 10-bits HDMI v1.3

Composite/S-Video (Y/C):

NTSC, NTSCJ, PAL 12-bit A/D, 2x oversampling

3 line adaptive comb filter decoding

SMPTE/EBU N10, Betacam 525 line,

Betacam 525J, RGB

12-bit A/D, 2x oversampling

YPbPr

12-bit A/D

1D LUT Support (PC)

Video Formats

525i 29.97

625i 25

720p 23.98 *, 24 *, 25 *, 29.97 *, 30 *, 50, 59.94, 60

1080i 25, 29.97, 30

1080PsF 23.98, 24, 25, 29.97, 30

1080P 23.98, 24, 25, 29.97, 30, 50, 59.94, 60

* Formats marked with an asterisk are non "over-the-wire" VFR formats

Video Output Digital

3Gb SD and HD-SDI, SMPTE-259/292/296/424

HDMI v1.3, 30/36 bits/pixel, RGB or YUV, 2.25Gbps, SD,HD, 1080p50/60

Video Output Analog

Composite/S-Video (Y/C):

NTSC, NTSCJ, PAL

12-bit D/A, 8x oversampling

SD Component:

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

12-bit D/A, 8x oversampling

HD Component:

YPbPr, RGB

12-bit D/A, 2x oversampling

Audio

Digital:

24-bit SDI embedded audio, 8 channel, 48kHz

24-bit AES audio, 2 channel, 48kHz

16-bit capable

Analog:

24-bit A/D and D/A, 2 channel balanced

XLR, 48kHz

+24dbu Full Scale Digital

+/- 0.2db 20 to 20kHz frequency response

Up-Conversion

Hardware 10-bit

Anamorphic: full-screen

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

Zoom 14:9: Results in a 4:3 image zoomed slightly to fill a 14:9 image with black side bars

Zoom Letterbox: Results in image zoomed to fill full screen

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

Down-Conversion

Hardware 10-bit

Anamorphic: Full-screen

Letterbox: Image is reduced with black top and bottom added to image area with the aspect ratio preserved

Crop: Image is cropped to fit new screen size

Cross-Conversion

Hardware 10-bit

1080i to 720P

720P to 1080i

720P to 1080PsF

SD to SD Aspect Ratio Conversion

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

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

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

V Crop: Will transform SD letterbox material to an anamorphic image.

Reference Input

Analog Color Black (1V) or Composite Sync (2 or 4V) Non terminating, Looping, 75 ohm on KLHi-Box, terminated on supplied breakout cable, BNC assignable as LTC input or Reference Input

Machine Control

RS-422, Sony 9-pin protocol

The 9-pin DE-9 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

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