

KONA³



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Installation and Operation Guide

Because it matters.

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VIDEO SYSTEMS

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Chapter 1: Introduction



Overview

The AJA KONA 3 brings the highest quality to SD, HD, Dual Link HD and 2K film resolutions to Apple PCI-Express and PCI-X computers. The KONA 3 offers unsurpassed 10-bit broadcast quality serial digital video input/output, 8-channel digital AES/EBU audio input/output as well as 16-channel embedded audio, 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, DVCProHD and HDV hardware scaling support. KONA 3 is designed to be the ultimate capture and playback card. AJA provided software utilities and applications deliver leading features for broadcasters and filmmakers.

As a state-of-the-art PCI-Express card, KONA 3 plugs into a PCI-Express slot on PCI-Express slot enabled computers. A PCI-X version of the card for legacy G5 computers with a PCI-X 133Mhz slot is also offered (KONA 3X). The card comes supplied with software that allows it to work seamlessly with QuickTime-based applications to provide a professional broadcast quality editing suite, corporate/industrial video center, or high-powered desktop video setup, or anything in between. Included with the KONA 3 is a cable set that can be connected to a variety of SD, HD, Dual Link HD and 2K capable equipment. For even easier connectivity, an optional K3-Box rack mountable breakout box can also be purchased—it ships with its own multi-pin cable and is connected to the Kona 3 card with this cable and the multi-connector SDI cable provided with the card. This manual covers the installation and operation of the KONA 3, the optional K3-Box and how to use the card in conjunction with AJA Control Panel and other software applications.

Features

The KONA 3 card offers a large number of unique features for optimum quality, ease of use, and support for a wide variety of post production workflows.

Hardware

- SD-SDI, HD-SDI, Dual Link HD-SDI, and HSDL inputs
- 2K support that includes 2048x1556 and 2048x1080 formats
- x4 Lane PCI-Express Bus Interface (or PCI-X 133Mhz)
- DVCProHD hardware scaling acceleration
- HDV hardware scaling acceleration
- 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.)
- 12-bit HD component analog video and SD analog component or composite and s-video output
- 10-bit HD/SD Video+Key Output
- HD/SD Hardware Downstream Keyer
- 8-channel 24-bit, 48kHz or 96kHz digital AES/EBU audio
- 16 channels of SDI embedded digital audio
- RS-422 control via 9 pin
- Genlock input with optional looping capability via the K3- Box (terminated on the supplied breakout cable)
- Standard 2 meter length connection cables

Broadcast-Quality Conversion

KONA 3 features hardware based full 10-bit broadcast quality motion adaptive SD to HD up-conversion, HD to SD down-conversion and HD to HD cross-conversion. The quality of the conversion features found in the KONA 3 is virtually identical to AJA's award winning stand-alone converter products used throughout the post production market. The KONA 3 built-in up-converter uses a full 10-bit path, fully motion adaptive de-interlacing, and large multi-point digital interpolators. Down-conversion uses large multi-point digital interpolators, anti-alias filtering and interpolation.

Cross-conversion is high-quality hardware-based, providing capability to streamline dailies and offers true broadcast picture quality in realtime. Because these functions are in hardware on the card, they are available full time, all the time—with no CPU load. Such conversions are useful for cost effective monitoring, making standard definition dubs of an HD project, or up-converting from a standard definition project to an HD deliverable.

KONA 3 Audio

KONA 3 supports 8 channels of 24-bit 48kHz or 96kHz AES digital audio via XLR (balanced 110 ohm) connectors (using the supplied breakout cable) or XLR and BNC (unbalanced 75 ohm) connectors (when the optional K3-Box breakout box is used.) KONA 3 also supports 16 channels of embedded 24-bit 48kHz digital audio over the same SDI connection as the video. If you are using a Digital Betacam VTR, HDCam VTR, DVCPro VTR, D5 VTR or HDCam SR VTR—you'll have the proper audio connections for interfacing with the VTR.

KONA 3 support for 8 AES digital audio via XLR or BNC features AES input sample rate conversion; this feature eliminates the requirement for audio source synchronization. Sample rate converters auto-lock to any AES input, 32-96kHz, and then convert it to 24-bit 48 or 96kHz audio, perfectly locked to internal KONA 3 video. Sample rate conversion is done at very high quality (over 120db THD).

Dual Link

KONA 3 supports Dual Link HD-SDI (4:4:4). This emerging technology is found in Sony's HDCamSR product line as well as Thomson Grass Valley's Viper Filmstream camera. KONA 3 supports the ingest and output of SMPTE-372M compliant 4:4:4 RGB video at 10-bit.

2K Workflow Support

The KONA 3 2K path offers potentially significant cost and labor savings over a tape-based approach to 2K workflow. In a unique development for customers on the Apple platform, users can go straight from telecine to disk with 2K media and eliminate steps requiring the use of tape stock and then the digitizing of those tapes for the nonlinear editor. 2K telecine to KONA 3 saves time and steps in the process by directly and simultaneously creating 2K DPX files and 2K QuickTime reference movies. Material can be played out at 2K via HSDL (High Speed Data Link), offering further synergy with other 2K products, such as projectors or DDRs, currently available in the market.

Additionally, KONA 3 allows 2K files to be viewed on HD 1080PsF supported video monitors, lowering the price barrier for recording to tape and viewing 2K material. This 1080 HD payout can be down-converted to SD in real time, giving the 2K DI pipeline a powerful solution for multi-format video payout of 2K material.

By generating 2K DPX files during the digitize phase, different parts of the process, for example-delivery of full-resolution media for shots intended for visual effects-can be done much earlier.

Internal HD/SD Hardware Downstream Keyer

Available for the first time on any QuickTime capture card is a powerful hardware keyer that can place graphic files with an alpha-channel over video in, a selectable matte, or the contents of the card's framebuffer from a software application (AJA KONA TV / AJA's VTR Xchange). Key a bug or text over picture and avoid what might normally be a lengthy software render. In addition to working with these software applications, you can also key video that has an alpha channel over video input or a matte. For example, you could load a QuickTime clip that has an alpha-channel—a flying logo generated in the Animation codec—into KONA TV and then place it over live video coming into the card and then passing both on to a VTR for recording or broadcast.

Software

On a Mac

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

Supported applications include:

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

The KONA Desktop feature allows broadcast design elements to be viewed with the proper aspect ratio and color depth on a broadcast monitor via the KONA card. KONA Desktop is available on the entire range of KONA cards, supporting Adobe After Effects,

Photoshop, Apple Motion, Autodesk Smoke for Mac and more. Powerful AJA utilities, Easy Setups, and plug-ins round out the Mac environment, providing support for all popular Mac application workflows.

On a PC

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

Directly supported applications include:

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

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

Understanding Typical Workflows

KONA 3 allows more workflow flexibility than ever before in post production. Users can select a variety of formats, frame rates and codecs for capture and editorial manipulation. KONA 3 hardware has a full array of connectors for interfacing with VTRs, DDRs and other devices—with all outputs active simultaneously. Capture can range from compressed DV to uncompressed dual link HD and even 2K. Media can be stored on disk as:

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

As quality and codecs improve, the lines between offline and online are blurring. For example, with the DVCPRO HD codec editing in the codec became possible, providing very high quality results (true HD editing) at very low data rates, in some cases as low as 6 MB/sec. Compare this to 100MB/sec and higher for uncompressed HD formats, and you can immediately see the benefits.

Following are summaries of the most common workflows, listing data rates and relative quality levels. Some workflows require a RAID array and some will work using the host Apple computer's internal system drive—it's noted where this is supported in the following discussions.

PhotoJPEG

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

Quality: Good

DV is commonly input to an Apple computer via FireWire. KONA 3 can capture directly to DV compressed media from an uncompressed SDI source. For devices that may not have FireWire (IEEE1394 or i.Link) connections, this allows the user to capture to this low data rate, yet good quality codec. While DV does offer good quality, it has lower chroma resolution when compared to DV50, JPEG, or uncompressed. The KONA 3 can be used to convert DV projects to uncompressed—in real time—for monitoring and/or output even if you haven't captured the footage using the KONA 3.

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 3 can convert DV50 projects to uncompressed, in real time, for monitoring and output. KONA 3 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 3 has hardware support that allows capture from HD-SDI to the DVCPRO HD codec. KONA 3's hardware also takes a portion of the DVCPRO HD codec processing load off the CPU, allowing more computer processor time for Dynamic RT effects.

HDV

Data rate: 2+ MB/second high definition—supported by internal system drive

Quality: Very Good to Excellent

While the structure of HDV (Long GOP MPEG2) makes it nearly impossible to ingest in realtime, you can use KONA 3 to convert HDV projects to uncompressed-in real time on playback-for monitoring and/or output.

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

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

Quality: Excellent, broadcast quality

Capturing in uncompressed results in clearly defined video, at full raster size and 4:2:2 chroma sampling. Using uncompressed maintains high quality from capture all the way through effects rendering. KONA 3 supports capture of uncompressed through its SDI input. Uncompressed media can output via all of the KONA 3 outputs simultaneously.

Uncompressed 10-bit 4:2:2

Data rate: 28 MB/second standard definition, or 133-166 MB/second high definition

Quality: Excellent, broadcast quality

Offering all the benefits noted previously for 8-bit uncompressed, 10-bit additionally offers higher color specificity for compositing and color correction. With Uncompressed 10-bit 4:2:2 media, video quality is second to none-at any price point - for non-linear post production. For more information on this subject, please see the topic at the end of Chapter 4: Installation and Configuration, titled "Using 8-bit Versus 10-bit Video."

AJA Kona 10-bit Log RGB and RGB Codecs

Data rate: 200 to 300+ MB/sec - high definition and 2K

Quality: Excellent, highest quality available

Offering all the benefits noted previously for 10-bit uncompressed 4:2:2, Dual Link 4:4:4 video uses 2 HD-SDI channels to provide full color resolution as well as luminance. The term "4:4:4" refers to the ratio of sampling frequencies used to define the RGB components of a video signal. In this ratio, the red, green and blue components receive equal specificity, providing increased quality over 4:2:2 where chroma sub-sampling occurs. 4:4:4 is particularly useful for film related digital intermediate work as well as the highest level compositing and color correction.

AJA Kona 10-bit Log RGB and RGB Codecs as related to a 2K Workflow

Data rate: For 2048x1556 2K:

- When seen as a QuickTime movie at 23.98fps with a raster of 2048x1556, the data rate is 300MB/second (approximately).
- When seen as a single frame DPX file with a 2048x1556 raster, the size is roughly 12+MB/frame.
- 2K uncompressed media necessitates the use of high-performance SCSI or Fibre Channel drive arrays.

Quality: Excellent, with additional cost and labor savings over traditional 2K workflows.

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

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

Quality: Excellent, broadcast quality

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

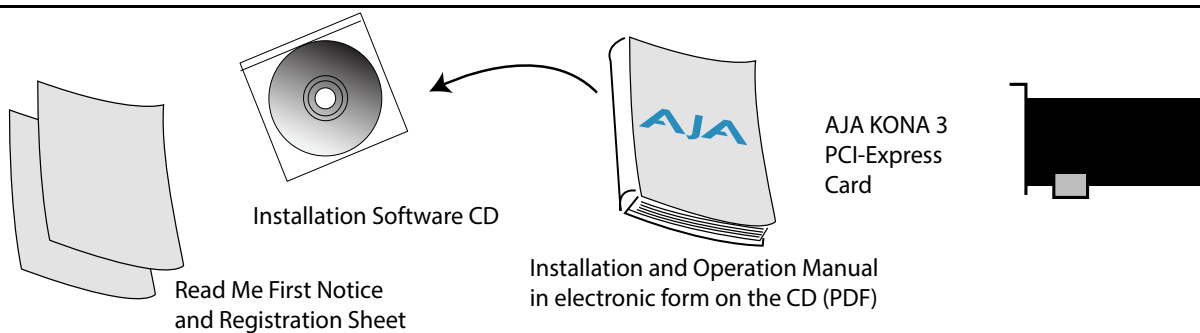
- Full-size 1920-by-1080 and 1280-by-720 HD resolutions.
- Full-size 720-by-486 and 720-by-576 SD resolutions.
- 4:2:2 chroma sampling. Provides precise compositing and blending at sharp saturated-color boundaries.
- 10-bit sample depth. Preserves subtle gradients of 10-bit sources (perfect for green-screen 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.

What's In The Box?

When you unpack your AJA KONA 3, you'll find the following components:

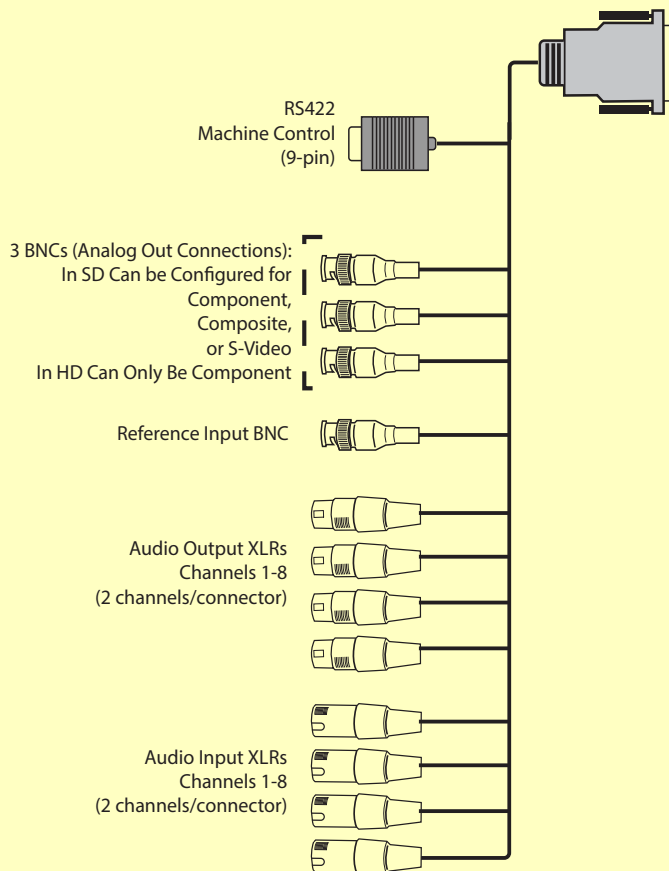
- AJA KONA 3 Software and Documentation CD-ROM—this CD contains the software installer to place KONA 3 drivers and the Control Panel on an Apple Mac Pro or Windows 7 PC. Due to the pace of innovation, it is best to install the latest driver version from the AJA website:
<http://www.aja.com/en/support/downloads/>
- Install the software as discussed in this manual in *Chapter 3: Installation and Configuration*. The CD also contains a wide variety of useful information, including this manual you're reading (PDF format).
- KONA 3 4-Lane PCI-Express card (or KONA 3X if you ordered the PCI-X version).
- Cable, KONA 3 SDI In/Out—mini-connectors on the card (technically called “1.0/2.3 connectors”) connect to full-size BNCs for ease of use and compatibility with professional equipment.
- Cable, AES XLR digital audio connectors, RS422, and Reference Input.
- Read Me First Notice, Registration sheet, and any other late-breaking news and/or errata related to KONA 3.

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

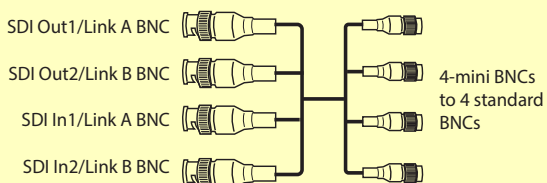


Standard Cable Set

BNC/XLR-cable



SDI cable



KONA 3 Shipping Box Contents

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 link (refer to [“Installation Overview” on page 17](#)).

Understanding Disk Storage Methods

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

For uncompressed dual link HD and 2K, AJA recommends that at a minimum, the disk storage system must be able to provide and maintain in excess of 300 MB/sec transfer rate from the Apple computer to disk (read/write). There are a variety of system configurations and peripherals that can provide this level of performance.

KONA 3 users wishing to configure a storage for a system should also be aware that raw benchmark numbers alone do not necessarily reflect the performance of a drive solution. Other factors, such as drive seek time and controller cache can also affect performance especially with regard to the bandwidth requirements of SD, HD, dual link HD and 2K files.

About RAIDs

Redundant Array of Independent Disks, or RAID, is a group of hard drives that appears to the host computer as a single high-speed storage unit. RAID systems enable you to increase storage capacity and get the performance, reliability, and data protection needed for video production, that would otherwise not be possible from a single hard drive. Drives inside the RAID array operate simultaneously, increasing overall throughput. RAID configurations can be comprised of:

- Striping data across multiple drives for storage performance (RAID 0).
- Mirroring for redundancy (RAID 1).
- Parity for data protection (such as RAID 5).

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

Striping divides a 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 Fibre Channel RAIDs. This easy to use utility can be found in *Macintosh HD/Applications/Utilities*, where “Macintosh HD” is the name of the system drive.

Storage Example: AJA KONA 3 and Xserve RAID

For an optimum disk storage configuration with the AJA KONA 3 —working with compressed media to uncompressed single-link HD media—Apple's Xserve RAID is an effective storage device when properly configured. Apple's Xserve RAID holds up to 14 drive modules (resulting terabytes of storage) in a rackmount-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). Populated with all 14 drive modules and using 512MB cache for each controller, the Xserve RAID can support the ingest and playback of all formats up to and including uncompressed single link HD. Dual Link HD and 2K formats are not supported on a single Xserve RAID.

Note: When creating and striping an Xserve RAID with the Apple Disk Utility provided with OS X, an ideal configuration is RAID 50: in other words, the internal Xserve RAID drives are set up as RAID 5 via the RAID Admin application; 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.”

When considering any high-performance disk storage system, AJA recommends working with a qualified reseller in order to configure storage appropriate for your needs.

Storage Example: AJA KONA 3 for Dual Link HD and 2K resolutions

AJA can recommend the following examples of drive configurations to support certain specified video and digital film resolutions and their associated bandwidth requirements. If a particular drive array or manufacturer is not listed, it may simply be because AJA has no experience with the company or a particular unit. This guide simply offers examples that AJA has used with success when working with the specified formats listed. With any device, actual results may vary from unit to unit and proper configuration of the drive array and any ancillary items such as host bus adapters, software drivers and cabling is assumed.

Supports 2K, Dual Link HD, Single Link HD, SD:

- G-Technology, Inc. GSPEED-XL (4Gb Fibre Channel)
Unit must be fully populated and with a minimum 512MB cache per controller.
- InforTrend EonStor A16F-G2422 (4Gb Fibre Channel)
Unit must be fully populated and with a minimum 512MB cache per controller.
- Any drive array with comparable specifications to the above examples; 16 or more SATA drives with 4Gb fibre channel connectivity to host and 512MB cache per controller.

Storage capacity

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

Note: All of the following numbers are approximations based on 2 channels of 48kHz audio. More audio channels can increase data rates. AJA also provides a freeware application called the AJA Data Rate Calculator that can be used to help determine the amount of storage space and bandwidth requirements needed for a selected format, frame rate, audio setting and compression. The AJA Data Rate Calculator is also included with

version 3.3 and higher of the Kona driver and can be found in the AJA Utilities folder which installs in the Applications folder of the Mac OS. The AJA Data Rate Calculator application can also be downloaded from the AJA website and used on any OSX computer.

| FORMAT | Data Rate in MB/sec | Storage Requirement in GB/Hour |
|--|---------------------|--------------------------------|
| SD Formats | | |
| 10-bit 4:2:2 SD (NTSC/PAL) | 28 | 101 |
| 8-bit 4:2:2 SD (NTSC/PAL) | 21 | 76 |
| DV50(NTSC/PAL) | 7 | 27 |
| DV25(NTSC/PAL) | 3.6 | 14 |
| Photo JPEG SD (NTSC/PAL) | 2.5 | 9 |
| HD Formats | | |
| 10-bit 4:2:2 1080i 59.94Hz/29.97fps | 166 | 597 |
| 8-bit 4:2:2 1080i 59.94Hz/29.97fps | 124 | 448 |
| 10-bit 4:2:2 1080i 50Hz/25fps | 138 | 498 |
| 8-bit 4:2:2 1080i 50Hz/25fps | 104 | 373 |
| 10-bit 4:2:2 1080PsF 23.98Hz/fps | 133 | 478 |
| 8-bit 4:2:2 1080PsF 23.98Hz/fps | 100 | 358 |
| 10-bit 4:2:2 720P 59.94Hz or fps | 133 | 478 |
| 8-bit 4:2:2 720P 59.94Hz or fps | 100 | 358 |
| 10-bit 4:4:4 1080PsF 23.98Hz/fps | 199 | 717 |
| 10-bit 4:4:4 1080PsF 25Hz/fps | 207 | 746 |
| 8-bit 4:2:2 1080i 59.94Hz/29.97fps | 124 | 448 |
| 8-bit 4:2:2 1080i 50Hz/25fps | 104 | 373 |
| 8-bit 4:2:2 1080PsF 23.98Hz/fps | 100 | 358 |
| 8-bit 4:2:2 720P 59.94Hz or fps | 100 | 358 |
| 2K Formats | | |
| 10-bit 4:4:4 2048x1556PsF 23.98fps | 306 | 1100 |
| 10-bit 4:4:4 2048x1080PsF 23.98fps | 212 | 764 |
| <i>MB = MegaBytes</i> <i>GB = GigaBytes</i> | | |

Cable Connections

When KONA 3 is installed in an Apple desktop computer, it connects to the outside world via either the standard cable set supplied with the board, or the optional K3-Box Breakout Box (using the cables and directions supplied with it). Use the cables or the optional Breakout Box to connect your VTR, input and output sources, and external reference video (genlock).

Using the Standard Cables

KONA 3 offers you complete I/O connectivity choices. One cable provides AES/EBU digital XLR connections and analog monitoring video connections. The other cable has 4 mini-connectors on one end, and 4 BNCs on the other, and provides SDI connections for both single link and dual-link SD/HD SDI/HSDL connections. Cable connections are marked on both the KONA 3 card endplate and on the cable connectors for easy identification.

Using The Breakout Box

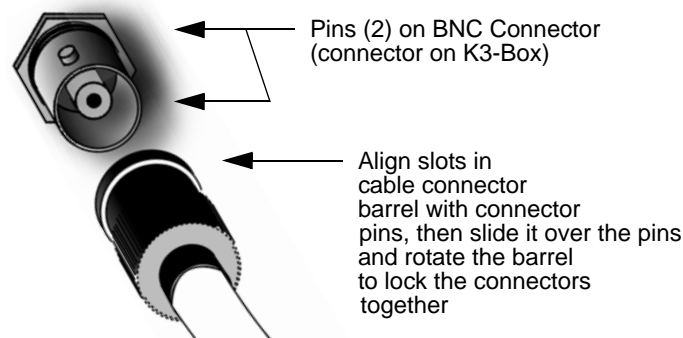
The KONA 3 Breakout Box attaches to the KONA 3 card via cables supplied with it that attach to the back of the Box.

For additional functionality, the K3-Box Breakout Box provides some features not present in the standard break-out cables: simultaneous XLR and BNC AES output, 2 channel RCA analog audio monitoring, and looping BNC Genlock reference connectors.

About BNC and Mini-Connectors

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

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

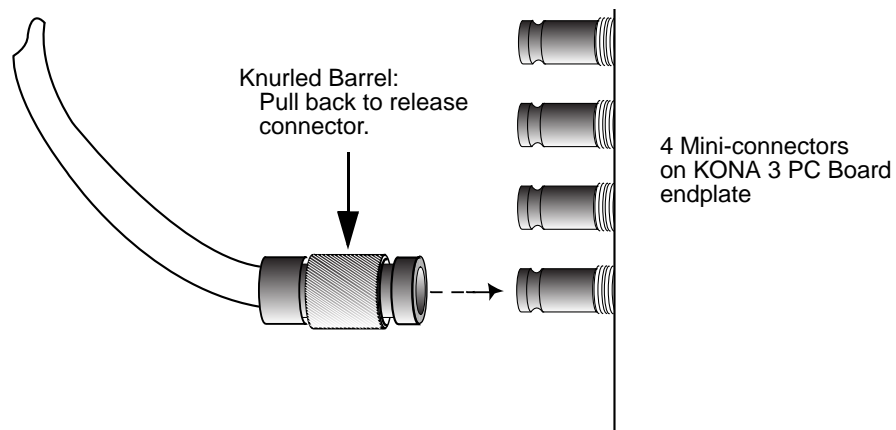


The four mini-connectors found on the KONA 3 endplate are not common to most video equipment but offer small size, ease-of-use, and high reliability. (The connectors are also called "mini-BNCs" and "1.0/2.3 Connectors".)

To make a connection with these connectors simply push the cable mini-connector onto the endplate mini-connector. It will lock in place when fully seated.

To remove a mini-connector, just grasp the knurled barrel on the connector and pull the connector off.

Note: Do not try to remove the mini-connector by pulling on the cable itself as this action will not remove the connector—but can stress the cable.



Connector Descriptions— Cables and K3-Box

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

8 Channel Digital AES/EBU Audio Inputs And Outputs

When using the standard cables, XLR connections are provided for digital AES/EBU audio input/output. Four female XLR connectors are provided for audio input and four male for audio output. Each XLR carries two channels. XLR connectors are labelled as to input/output and channels.

The optional Breakout Box provides both BNC and XLR audio connections on the front panel.

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

Analog 2 Channel Unbalanced Audio (Breakout Box only)

On the optional K3-Box are two analog output connectors, one for each channel. These connectors are RCA-style phono jacks.

RS422 Machine Control

A DB9 connector provides connection to VTRs, digital disk recorders, and other devices using RS422 device protocol. For the breakout cable the connection is male and for the breakout box the connector is female. (Connector pinout is listed in Appendix A: Specifications.)

SDI Input and Outputs

Mini-connectors are provided for two SDI inputs and two SDI outputs for single or dual-link. A cable with four Mini-connectors on one end and four BNCs on the other end is provided for connecting equipment to the SDI inputs and outputs. This cable is also used to interconnect between the KONA 3 board to the optional K3-Breakout Box.

KONA 3 has up to 4 video outputs in SD and up to 3 outputs in HD—2 SDI outputs that are used for both high-definition and standard-definition (SD/HD-SDI), and an analog video output (configuration of this three BNC cluster is discussed later with regards to component, composite and Y/C). Each of the three outputs is independently switchable between HD and SD. For example, if you are working in HD, you can have simultaneous HD-SDI, SD-SDI, and HD-component analog output.

SDI inputs and outputs support video as well as 16-channels of embedded 24-bit digital audio. Use SDI wherever possible for the best quality 10-bit uncompressed video input, capture and output. If peripheral equipment has a variety of inputs/outputs, look to see if it has SDI I/O, and use it where possible. Most high-end professional broadcast equipment supports SDI (VTRs, cameras, media storage servers, etc.).

Note: In the past manufacturers have used separate I/O connections for standard- and high-definition SDI because the circuits were different. On KONA 3 we use the same connectors for both HD and SD-SDI (both input and output) due to our dual rate chipset which supports both HD and SD.

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

KONA 3 features 12-bit component video output for both HD and SD. The analog component output can be configured in a variety of ways; as a component, composite or Y/C signal. This flexibility allows, for example, the use of an inexpensive analog input-only monitor for both HD or SD viewing. Since the three BNC connectors share component, composite and Y/C functions, output of component is exclusive while composite and Y/C can be output simultaneously. For Y/C monitoring an adapter cable from dual BNC for Y/C to S-Video mini-DIN style connector is required. For analog monitoring, a component video signal is generally regarded as higher quality for monitoring than a composite signal.

A Note About YPbPr—Component Video, or YPbPr, has been given several names over time. YUV, Y/R-Y/B-Y, and YCbCr, are just some examples. Although these various formats have some differences in levels, they are all basically the same. KONA 3 uses the modern YPbPr terminology exclusively. KONA 3 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 3 Control Panel.

A Note About RGB—Although RGB is used less in today’s video systems, KONA 3 supports it for A/V Monitor output. However, because KONA 3’s (and SMPTE SDI’s) native format is YPbPr, AJA recommends the use of YPbPr whenever possible for analog monitoring. Although component video monitors often have RGB inputs, it’s better to use YPbPr when the monitor supports it. The YPbPr format provides “headroom” for “superwhite” and “superblack”—and these video levels *will be clipped* when transcoding to RGB. Also, the RGB/YPbPr transcoding involves a level translation that results in mathematical round-off error. RGB can be configured in the KONA 3 Control Panel.

Reference Video

A single BNC connector is standard on the KONA 3 cable (self terminating). Two BNC connectors are standard on the breakout box (these provide loop through: if ref is not looped out, a 75 ohm terminator should be used for the loop out connector). Reference allows you to synchronize KONA 3 outputs to your house analog reference video signal (or black burst). If you have a sync generator or central piece of video equipment to use for synchronizing other video equipment in your studio, then connect its analog composite output to the KONA 3 reference input. When KONA 3 outputs video it uses this reference signal to lock to. When connecting a reference video source, the locking signal should be the same format in Hz (1080i29.97, 625i25, etc.) as the Primary format selected in the KONA 3 Control Panel. It is possible in some circumstances to use an alternate format video signal as long as the basic frame rate is compatible (for example, using a 525i29.97 genlock signal to lock a system running 1080i29.97)—if the Hz coincide.

In This Manual

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

Chapter 2 provides complete instructions for installing and configuring the AJA KONA 3 card. The user is guided through unpacking, installing the card into a Mac Pro or Windows PC, installing KONA 3 Mac 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 3 when used with the AJA Control Panel.

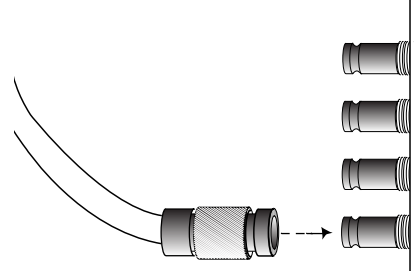
Chapter 4 discusses troubleshooting problems with your system and what to do when there's a problem you can't solve.

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

Appendix B gives a glossary of technical terms and acronyms used in the manual.

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

Chapter 2: Installation & Configuration



Installation Overview

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

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

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

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

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

4. Install AJA KONA software on your computer. While the CD supplied with your card will likely have a recent version of the driver, the fast paced nature of feature releases and updates means that visiting the AJA website for the latest driver is usually a better choice.

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

5. Cable the system audio and video sources, VTR, audio monitor, and video monitor. If you purchased the optional Breakout Box, then install it into an equipment rack or place it on a desk and connect its cables to the KONA 3 card. If you're instead using the standard cable set, then use those to connect equipment.

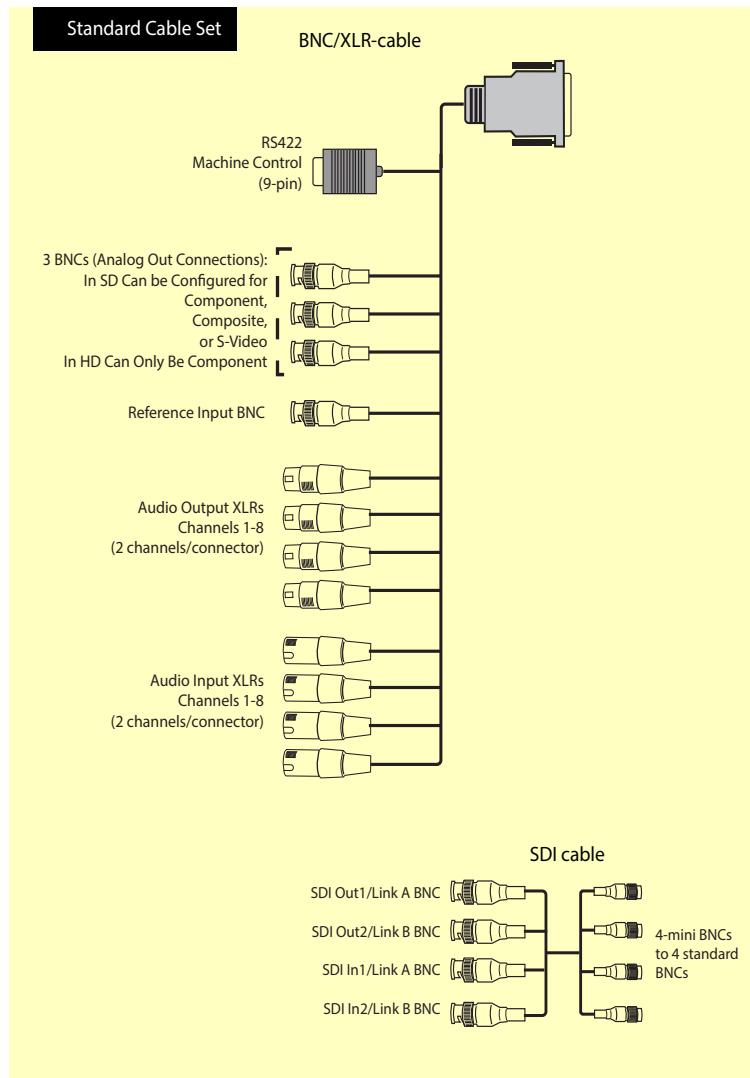
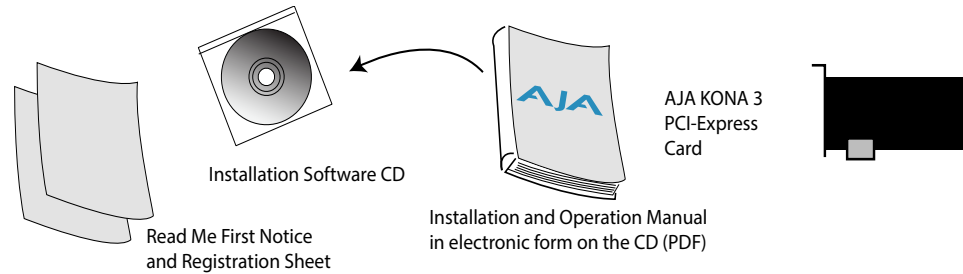
Each of these steps are explained in greater detail in the pages of this chapter.

Unpacking

Shipping Box Contents

KONA 3 is shipped with a CD containing system software for installation and a user manual (a PDF on the CD), and two cables (a multi-pin to multi-connector breakout cable and a x4 BNC to 1.0/2.3 connectors cable). If you purchased the optional K3-Box breakout box, it ships with a multi-pin to multi-pin cable for

connecting from the KONA card to the breakout box. The x4 BNC cable to 1.0/2.3 connectors cable that shipped with the card is also needed interconnect the SDI connectors out of the card to the breakout box.



Contents, KONA 3 Shipping Box Contents

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 3 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 3 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 card from its protective anti-static bag; place the card on top of the bag.
5. Visually locate the PCI-Express slots inside the Mac chassis (Mac Pro photo shown on the following page). The KONA card only requires a x4 lane PCI-Express slot, so any of the available slots will work correctly—(slot 3 is the preferred slot on the MacPro). You should configure the slots with the Apple Expansion Slot Utility application for the MacPro so that the KONA is at x4 or better speed.
6. Remove the card-edge access cover from the desired slot where you will be inserting the KONA card. The card edge cover is secured by a tie-down bar with two secured screws on MacPro computers; remove and set them aside for securing the KONA after installation.
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 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 3 Card

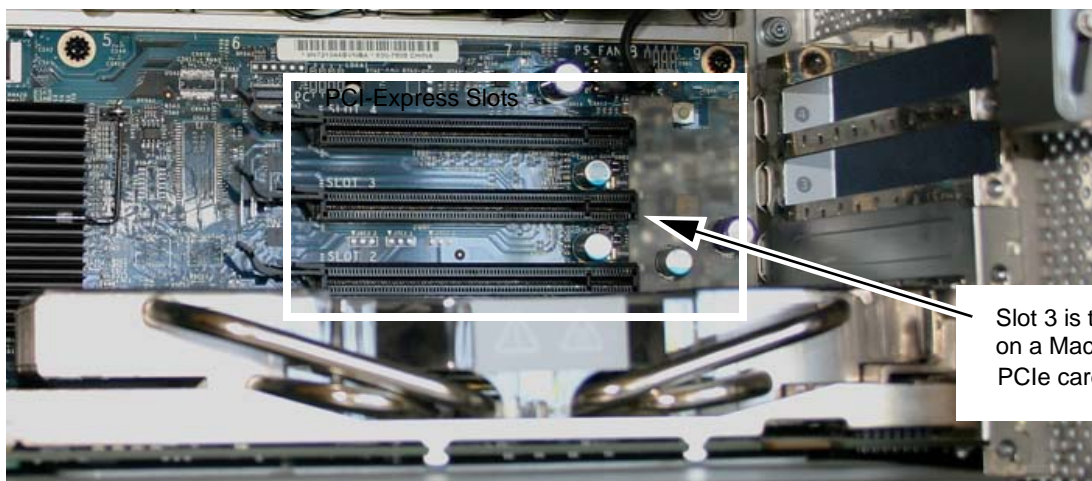


To Install:

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 3 PCIe card installation

Card Slots, PCIe Mac Pro shown here

Note: After you install the KONA 3 card, you may notice that in the MacOSX Network preferences there is a message stating “You have a new network port named KONA 3 —be sure to check the settings...”. There is no need to take any action; this occurs because MacOSX detects the RS-422 serial port on the KONA 3 card that you will use for VTR machine control.

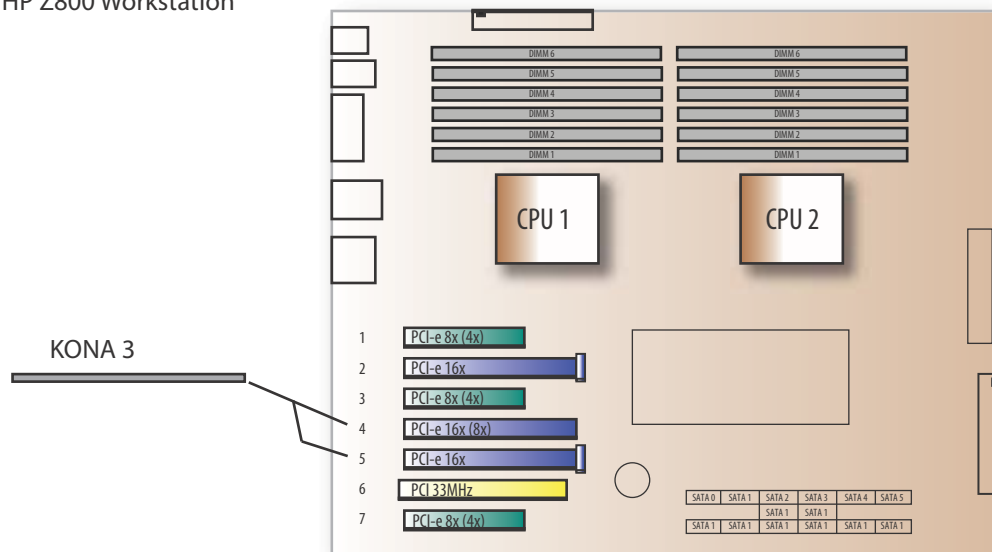
Installing the KONA Card in a Windows PC

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.

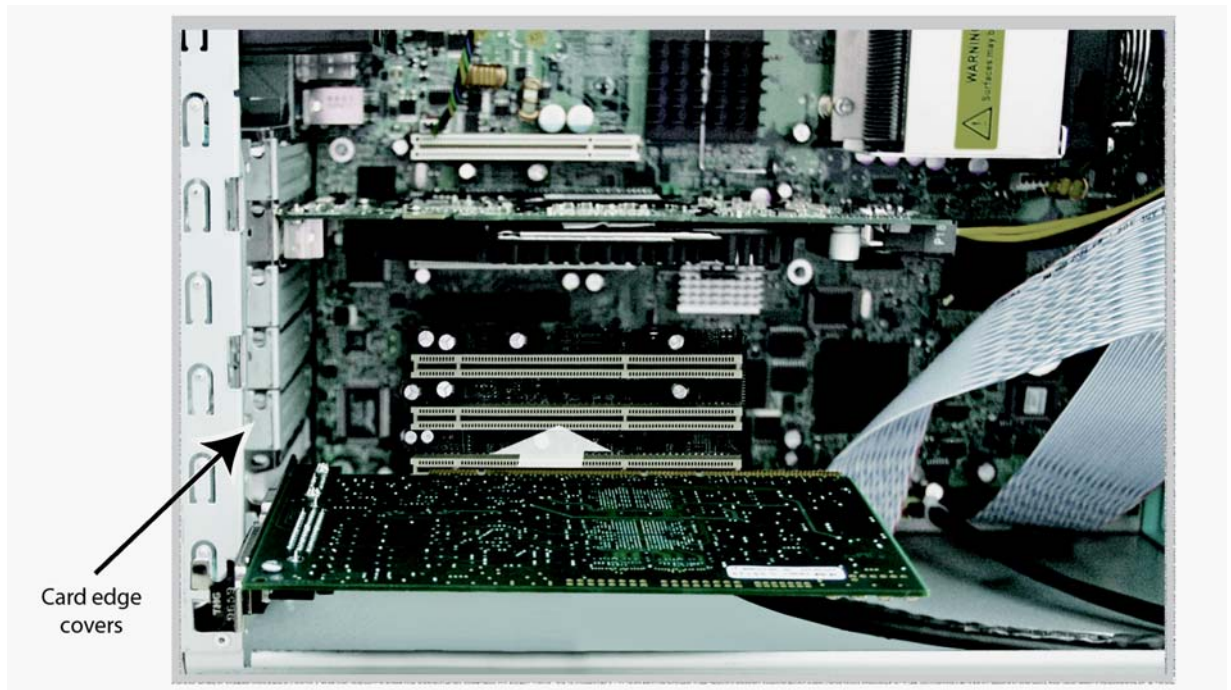
Because of hardware and software changes, AJA engineers are constantly testing and grading workstation performance. The AJA website is your best source of up-to-date approved workstation configurations.

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.

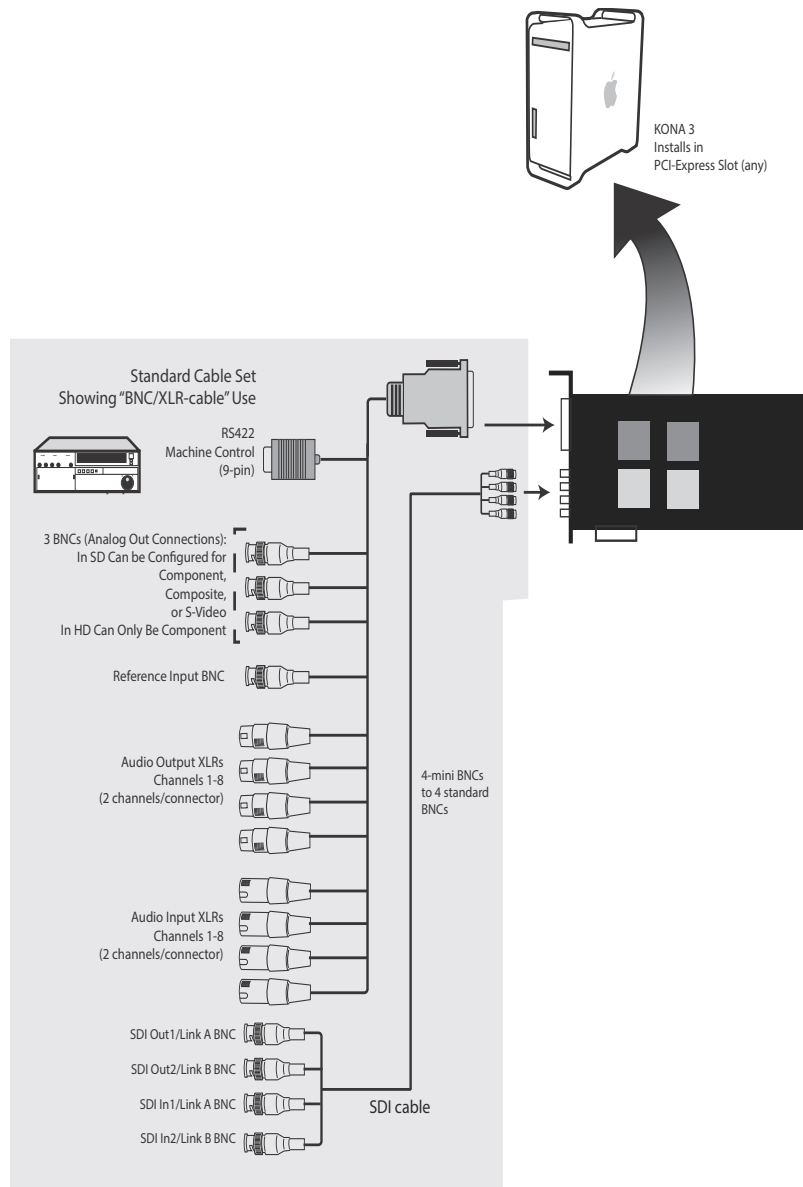


Locate the correct PCIe Slot and Insert the KONA Card (typical installation shown)

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.



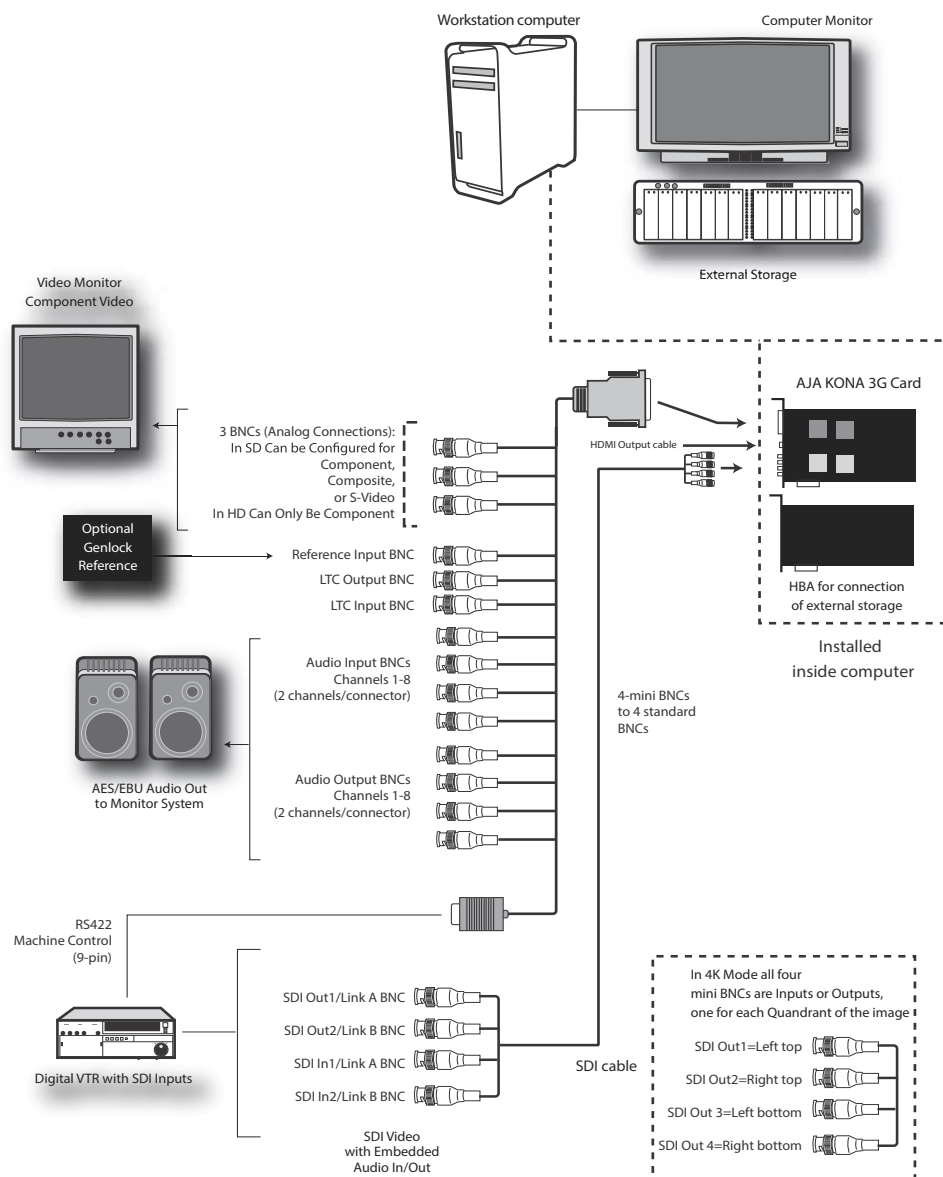
KONA 3 System Using Breakout Cable

Typical System

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

1. If desired, connect your house reference sync to the KONA 3 Ref Loop connector (BNC). On the breakout cable this is a terminated reference input. The second KONA 3 Ref Loop connector on the optional Breakout Box can be connected to your VTR. If you do not loop through the reference, the second connector should be terminated with a 75 ohm terminator.
2. Connect a Video Monitor to the KONA 3 Component Analog Video Out BNC connectors (preferred), or instead connect to a composite monitor. (If you have an SDI or HD-SDI enabled monitor, you may also connect one of the Kona SDI outputs to a monitor as well.)
3. Connect the 9-pin DB9 machine control cable on the supplied breakout cable to your VTR's RS422 control port or connect a 9 pin DB9 cable between the breakout box and the VTR's RS422 serial port.

4. Connect two SDI cables between KONA 3 and your digital VTR (Digital Betacam etc.): one from KONA 3 SDI In to the VTR SDI Out, and one from KONA 3 SDI Out (1 or 2) to the VTR SDI In. The KONA 3 SDI connections have embedded audio (16-channels) so the VTR must be configured accordingly. These connections will be made via the mini-connectors-to-BNC cable or via the optional K3-Box.
5. If you have an AES/EBU-ready audio monitoring system, then connect the eight channels of AES/EBU output from KONA 3's XLR (or BNC connectors-if using an optional K3-Box): 1/2, 3/4, 5/6, and 7/8, to the monitoring system AES/EBU inputs. If you instead have an analog audio monitoring system, you can use the two RCA-style unbalanced stereo output jacks on the optional K3-Box for output.



Typical System Connections

Installing KONA 3 Software

First ensure that your third-party editing application is installed as detailed in its user documentation. Next, install the KONA 3 driver. You cannot use KONA 3 with video editing applications until you run the KONA 3 driver and software installer.

System software updates may occasionally become available to AJA KONA 3 owners on our website (see [“Installation Overview” on page 17](#)). We recommend checking occasionally for both software updates and additional product information.

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

Mac Software Installation Procedure

For the most recent version of the KONA 3 driver, it is best to visit the AJA website, download the driver and read the details and requirements on the current driver to ensure compatibility with your system configuration. Your system should be an Apple Intel MacPro. Minimum system requirements for the host were described at the AJA websites referenced above.

Mountain Lion OS and Gatekeeper

Note: Before installing KONA 3 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 Mac OS Mountain Lion, you should go to System Preferences>Security & Privacy and choose to allow *Mac App Store and identified developers*.



Mac Security & Privacy Gatekeeper Setting

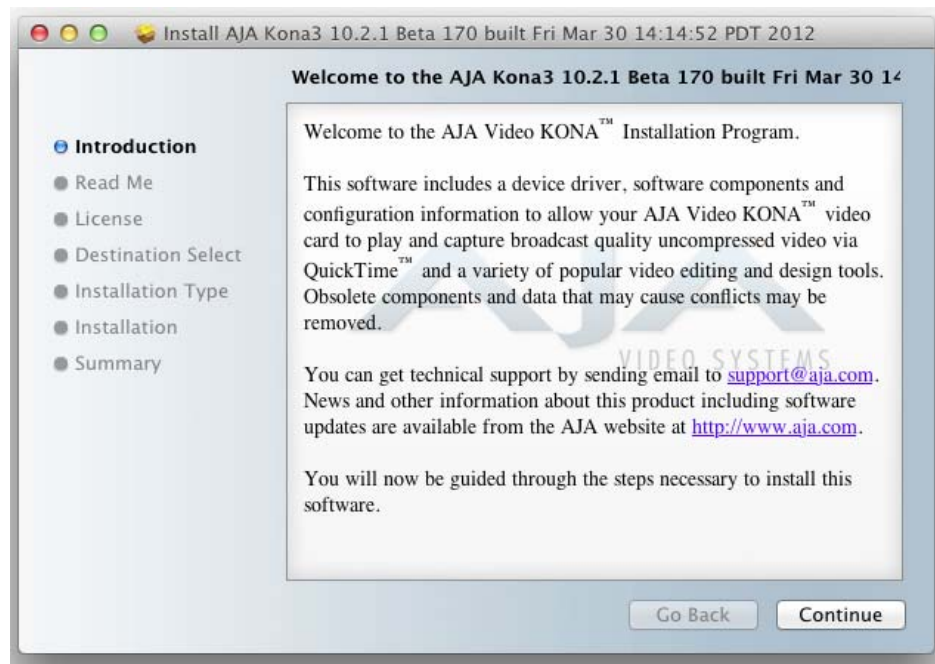
1. Visit the AJA website for the latest driver version appropriate to your configuration. Alternately, if you have no internet connection, insert the KONA 3 CD in the Mac; as noted, this driver version may not be the most current.
2. Locate the downloaded driver on the desktop or the KONA 3 CD icon on the desktop.

3. Locate the package file in the folder from the download or by double clicking on the CD; the package has an icon that looks like a box and has a ".pkg" suffix.
- Note:** Files ending in the ".pkg" suffix are OS X installer files. These launch the OS X installer and tell it where and what to install on your system.
4. Double-click the package to log on and begin software installation.
 5. The system will respond by asking you to authenticate who you are as currently defined on your OS X user profile. Enter the proper name and password at the Authenticate prompt; if you have multiple users defined, ensure that you log on as a user with administrator-level authority.



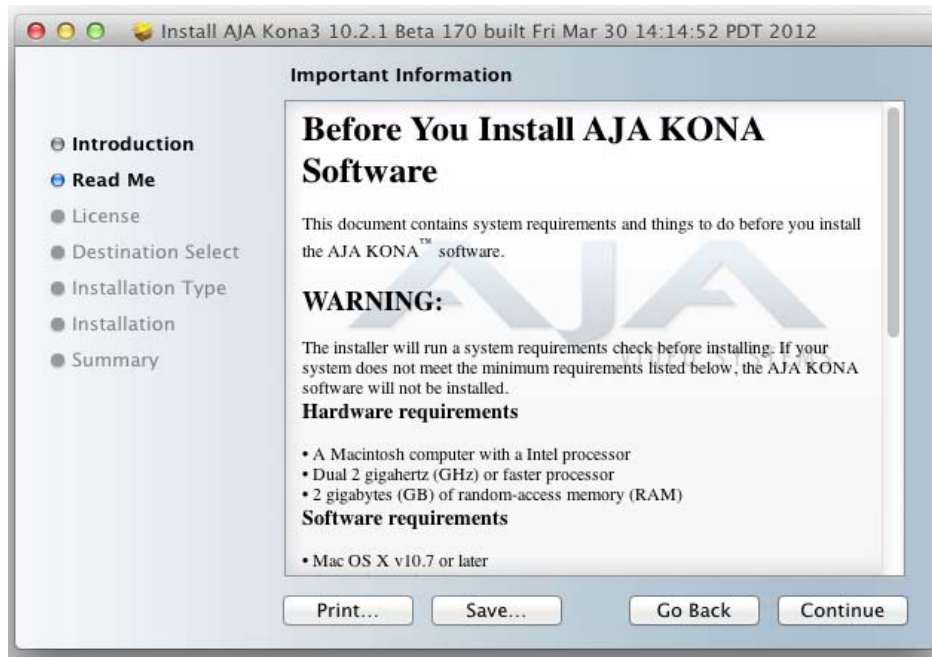
Log On Authenticate Prompt

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



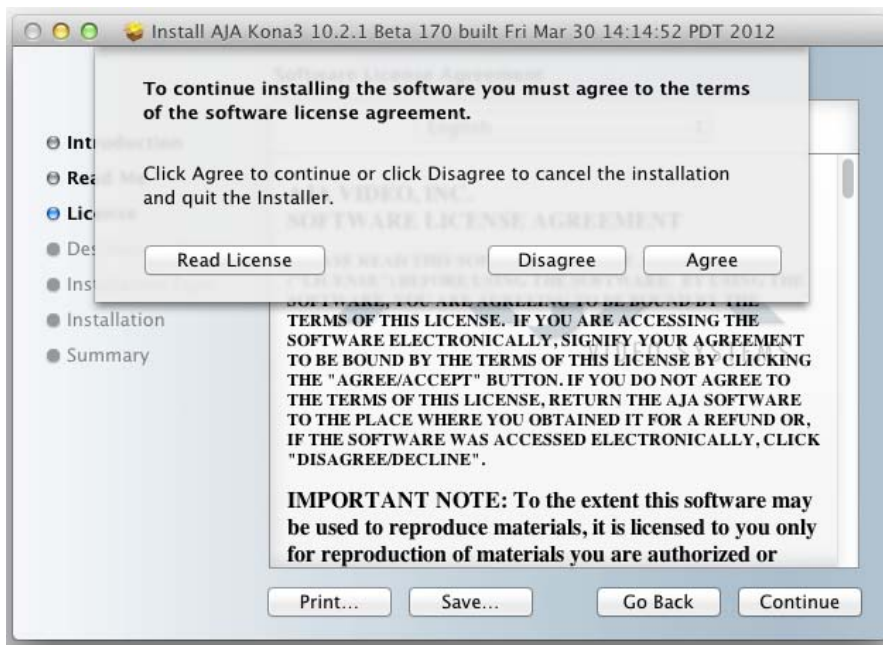
Initial Installer Screen

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



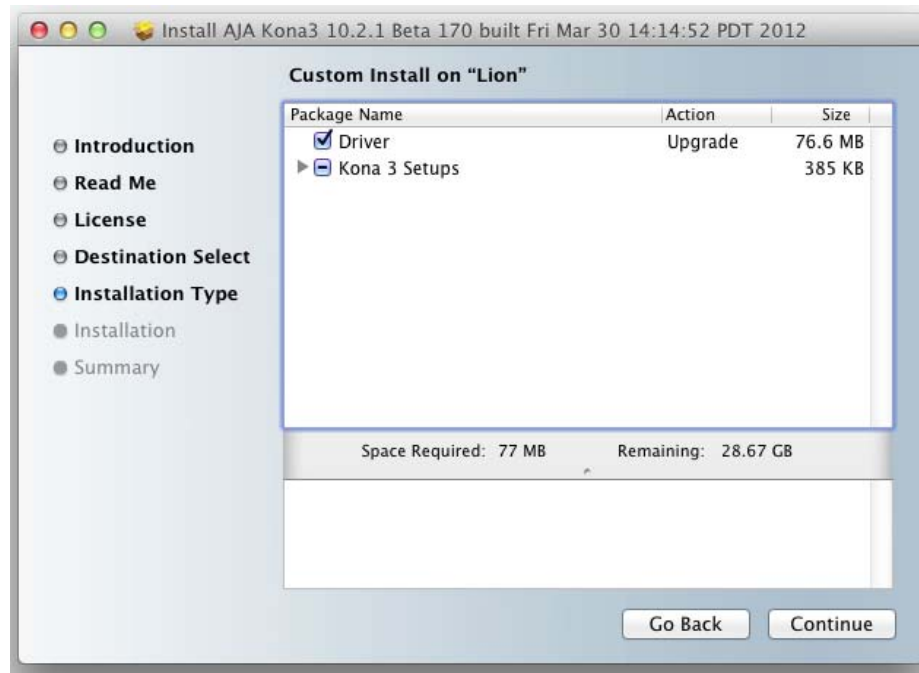
System Check Installer Screen

10. Read and agree to the Software License Agreement.



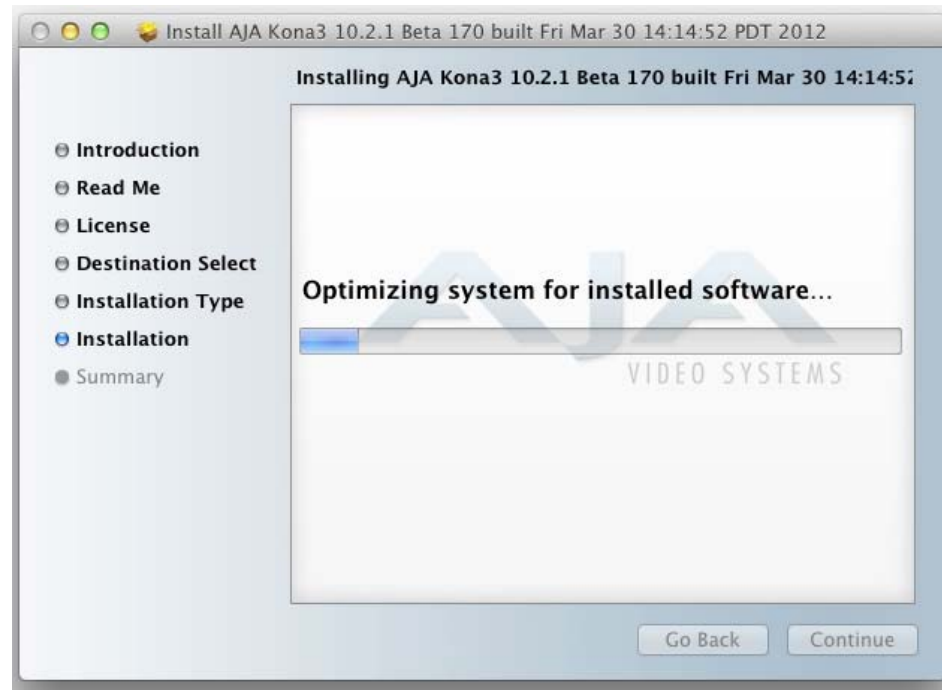
KONA 3 Software License Agreement Screen

11. At the next screen, install the suggested default package or customize your installation. Click the *Continue* button to place the software on your computer.

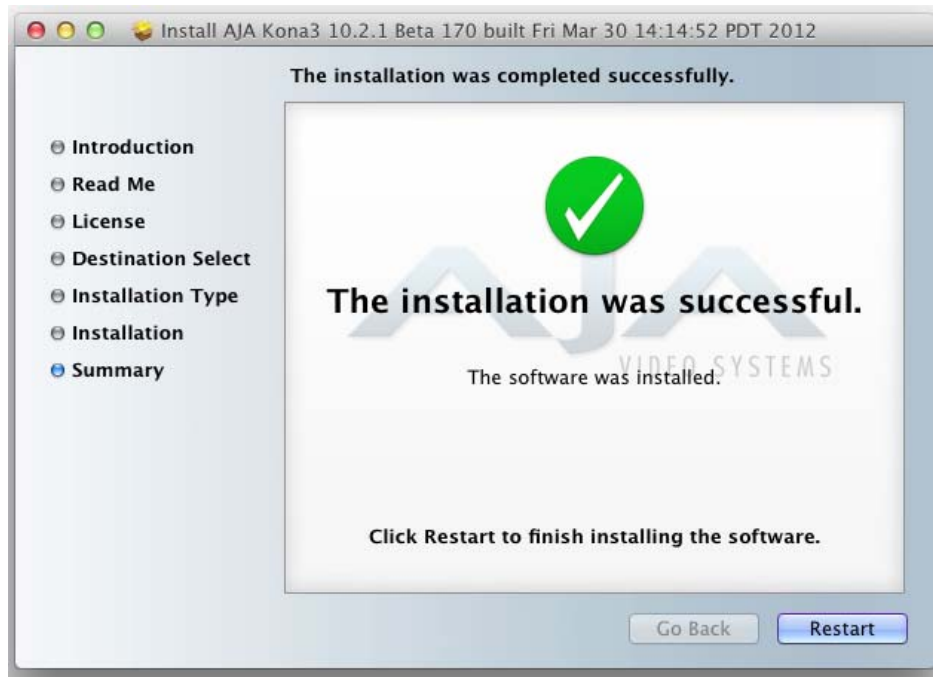


Custom or Default Installer Screen

12. The installer will run and put all the necessary KONA 3 drivers, KONA 3 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 Screen



Final Installation Screen

13. Click the Restart button to complete the installation procedure. The system will perform a software restart and be ready for use if firmware on the card is up to date.

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.

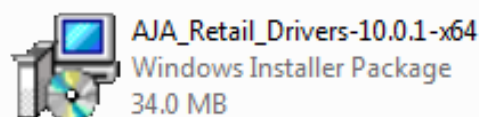
Software Installation Procedure

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

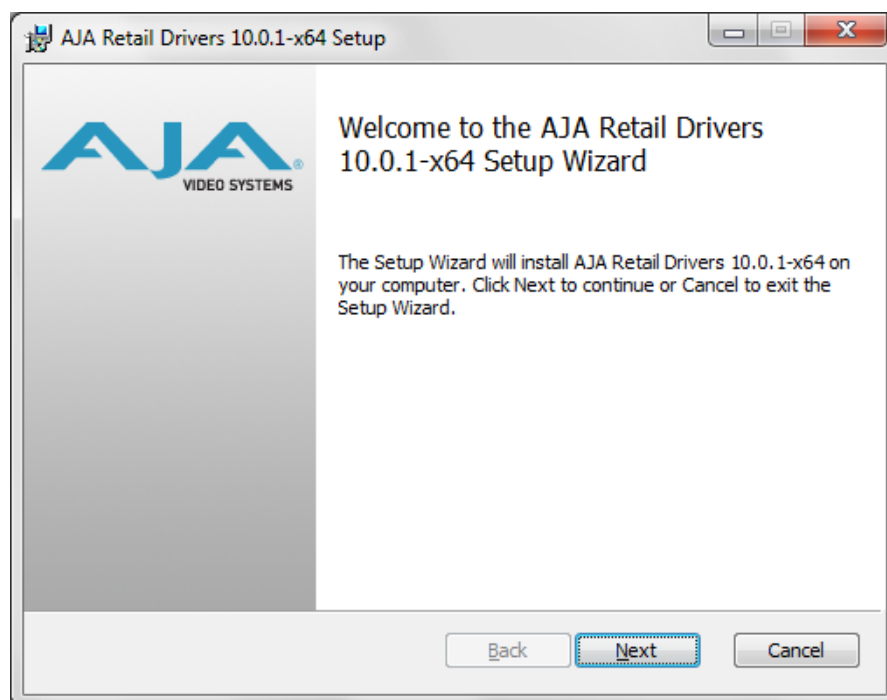
Note: Before installing KONA software, turn off any virus protection and security software that you have installed on your computer.

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.

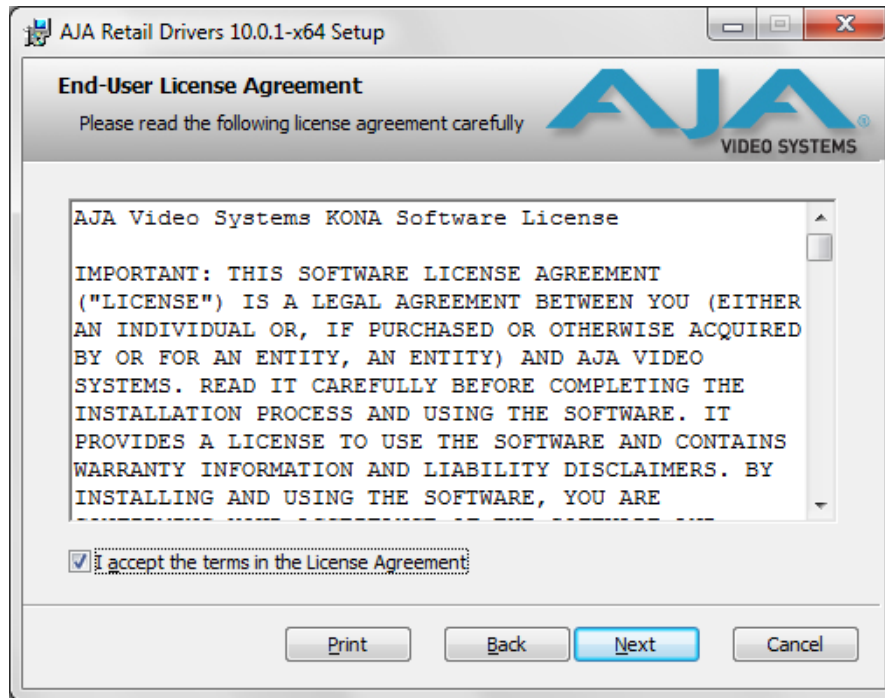
Install Wizard

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



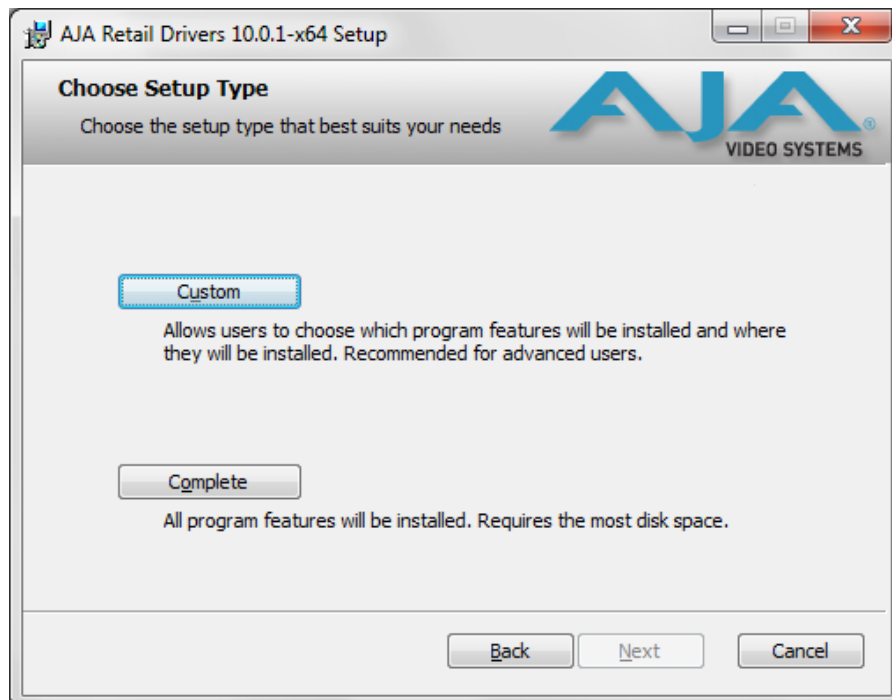
Install Wizard Welcome

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



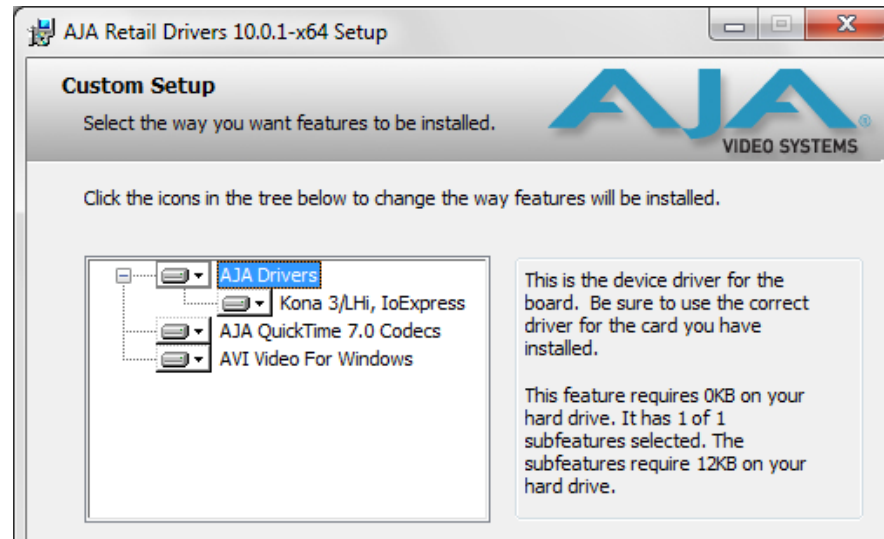
License Agreement

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.



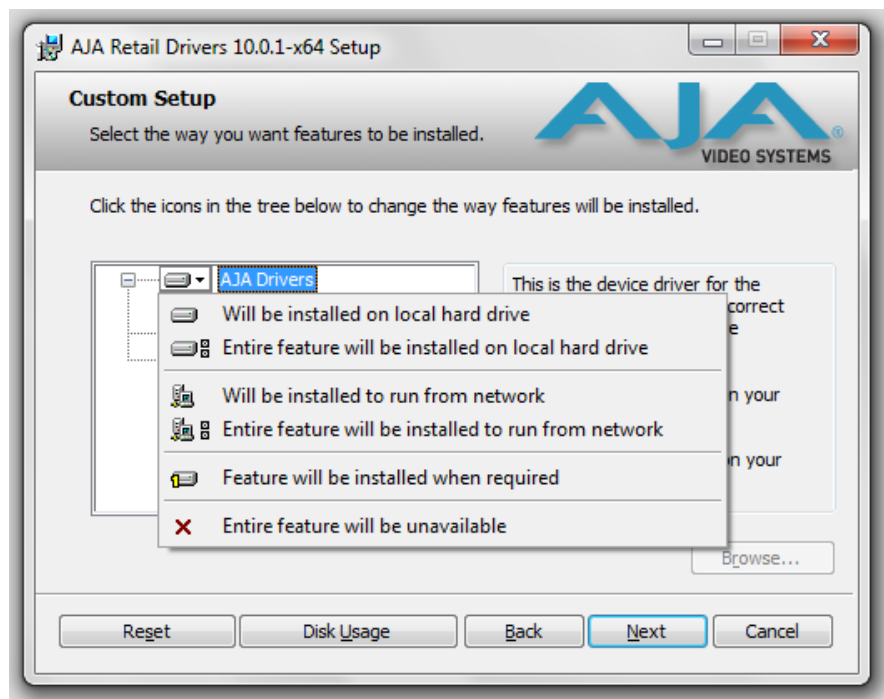
Installation Type

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.



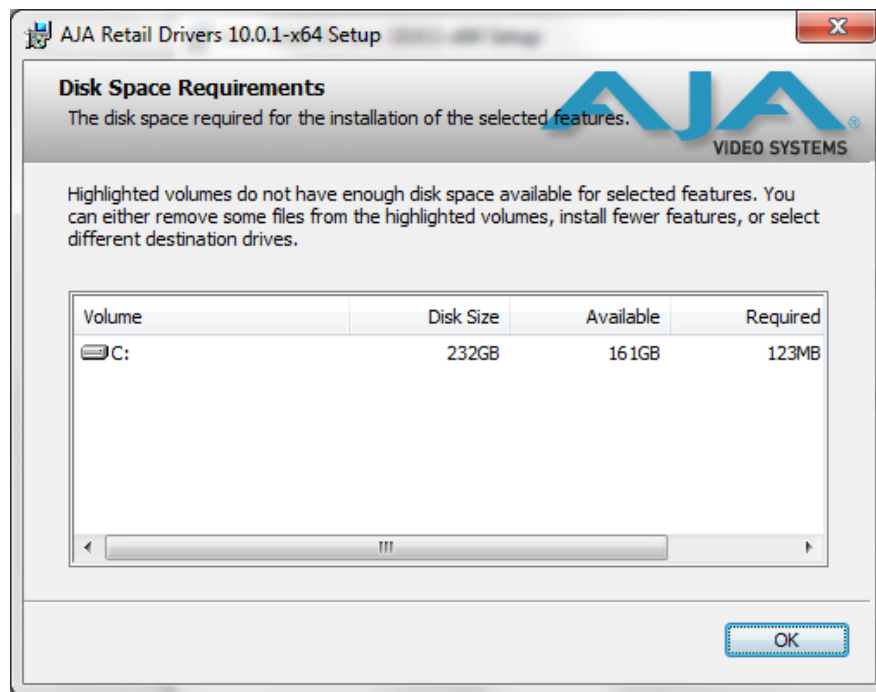
Custom Installation Menu

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



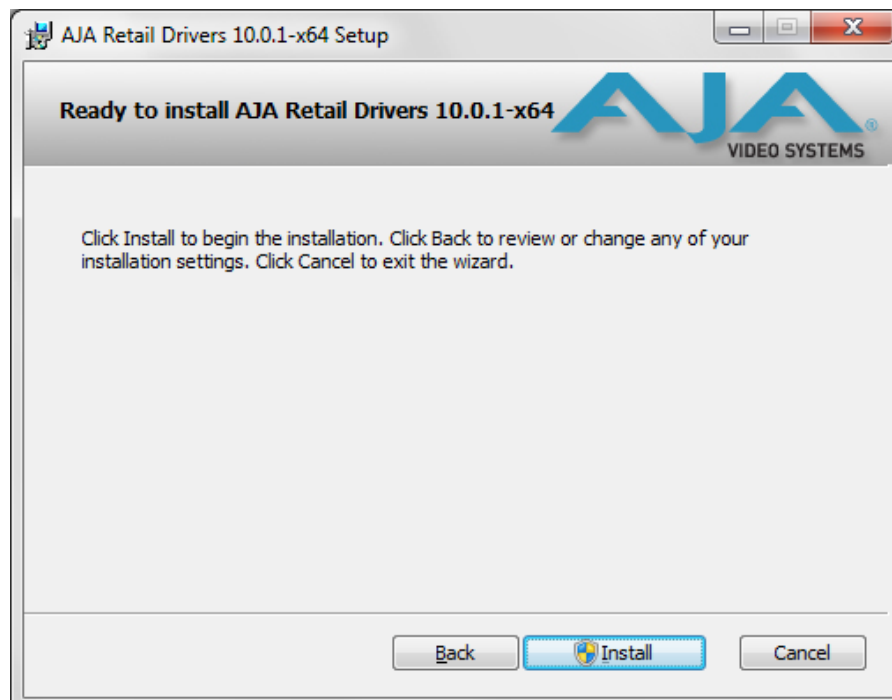
Custom Selections Pulldown Menu

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

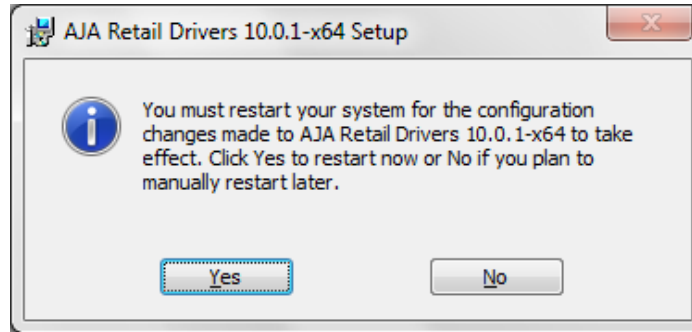
To return to the installation click OK. Click Next to begin the installation. screen.



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.



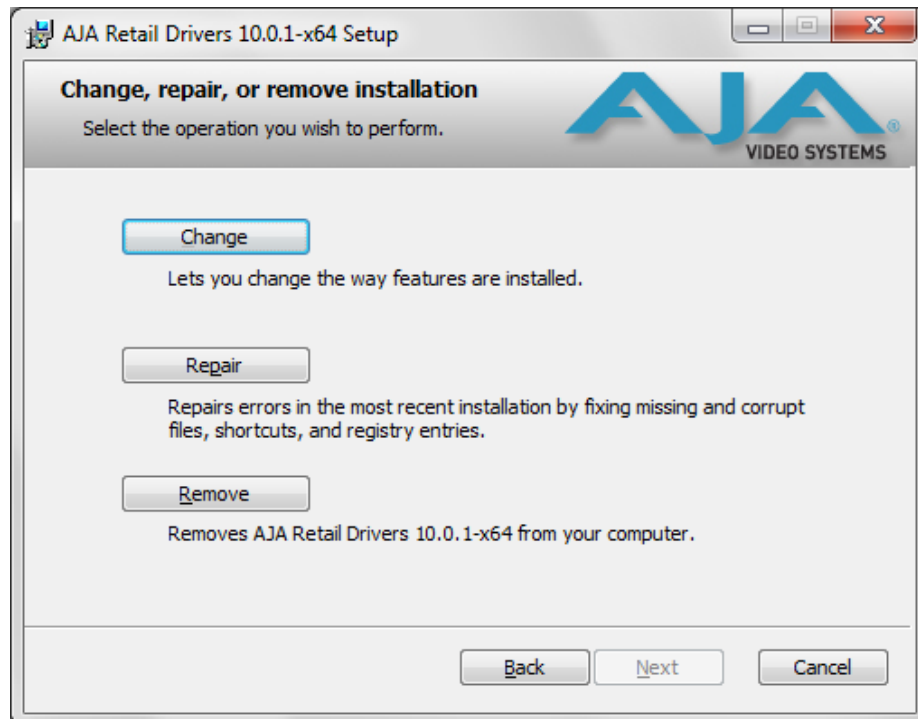
Restart Screen

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 plugins, you can relaunch the install package and access the following window.

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



Change, Repair, or Remove Installation Menu

Updating KONA 3 Firmware

When you update your KONA 3 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 3.

Follow these instructions when a firmware update is required:

1. First install the new version of KONA 3 software.
2. After successfully installing the new KONA software, the AJA KONA Updater will automatically launch. (The updater application is located in the *AJA Utilities* folder.)



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



Firmware Update Welcome Screen

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



Firmware Update Warning Screen

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



Firmware Update Power-down Screen

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

Genlock and Your System

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

Chapter 3: Operation

Using KONA 3G with Professional Video /Audio Software

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

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

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

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

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

Using The KONA 3 Control Panel

The KONA 3 control panel is a software application that provides a simple visual way to see how the KONA 3 card is currently configured and then make changes as desired. Settings—both what you changed and didn't—can be saved as a preset 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 constantly resetting card 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 card is set. The current status of the up-converters/down-converters, the input and output settings, and many other details can be viewed as a color-coded block diagram in the control panel. You can even access the Kona Control Panel application without exiting the application by first holding down the command key (Apple key) before mouse clicking on the Kona Control Panel application on the desktop.

For this reason, it is useful to leave the Kona Control Panel application on the desktop while you work in applications and simply command click into it to access it if you are unsure of a setting or wish to make a change.

Control Panel Basics

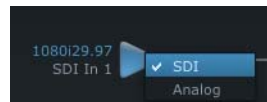
Although the KONA 3 card auto-detects the input format depending on the input that it is presented, and the Control Panel intuitively shows at a glance much about what the card is doing—there is even more information presented that may not be obvious. To ensure you make the most of the software, run the KONA 3 Control Panel application and look at its display. Then refer to the “Basics” described here to better understand what you're seeing and learn how to view and change the KONA 3 system configuration.

Note: The KONA Control Panel also works with all KONA models. However, the actual features and screens displayed differ slightly since the board feature sets differ.

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 3?*” later in this chapter for more advanced information on how applications interact with the KONA 3 board.

Block Diagram Screen—the top area of the KONA 3 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 or dual-link (where two channels are used to carry the bandwidth of HD-SDI 4:4:4 video), and whether output is 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

Currently Selected
Screen



Framebuffer
Format
(Primary Format)

Outputs:
SDI, HDMI
and analog

Inputs

Screen Choices – Click One to Edit/View a Topic

KONA 3 Control Panel, Block Diagram

Framebuffer—the framebuffer is the “engine” in the KONA 3 card where active video operations take place. The framebuffer has a format (called the “Primary Format” and color space that it follows, as defined in the AJA Control Panel screens or via external application software.



It is important to realize that inside the computer workstation many applications can use the KONA 3 card (as you switch from window to window) and it may not always be obvious which is currently controlling it. The KONA 3 Control Panel displays the name of the application controlling the card in red text at the top of the control panel block diagram. If an application does not properly “let go” of the card 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 3. 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, green for example, then you know that KONA 3 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 Icons

Conversion Icons—when an input or output is a different standard than the framebuffer then the KONA 3 may be up-converting, down-converting or cross-converting the signal to the proper 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. In the case of cross-conversion, the type of cross-convert will be shown under the icon (in the example that follows, it’s “1080 to 720”).



Down, Up, and Cross Conversion Icons

Color Meanings—all items in the KONA 3 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 KONA 3 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 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:

Screens available 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 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).

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

Control Screen

The KONA 3 can be controlled by various software applications running on a host computer as well as be used as a Macintosh Desktop extension. The Control screen is where you select how the KONA 3 directs video and is used by application software. This screen also provides control for configuring output timing with regard to external reference video and horizontal/vertical delay.

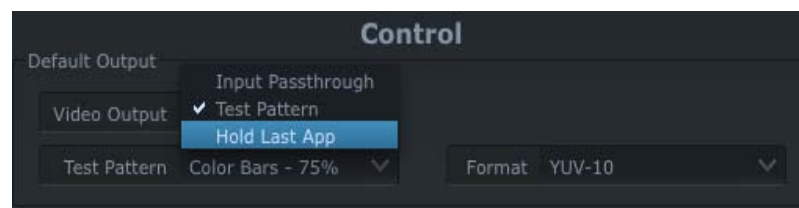
At the top of the Control screen it will show the current Default Output and the application currently controlling the KONA 3 card (if there is one).



KONA 3 Control Panel, Control Screen

Control Screen Settings

Default Kona Output—this is where you select what KONA 3 will output as a default when no application has control of the board, such as when the Finder is active. Since KONA 3 can be controlled by software applications as well as its own control panel, the output can change dynamically. When you select many video applications, they will grab control of the KONA 3 card inputs/outputs. These settings determine what happens when an application that doesn't grab the KONA 3 inputs/outputs is active.



KONA 3 Control Panel, Control Screen, Default Kona Output Pulldown Menu

Default KONA Output Choices and their meanings:

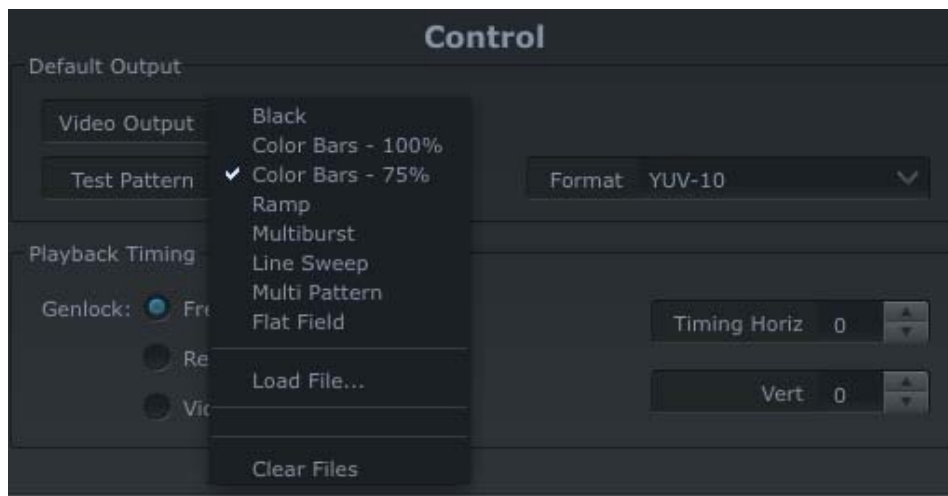
Input Pass through: this selection directs KONA 3 to route video from its selected input through the card for processing and output. When this selection is in effect, all Primary/Secondary Format selections are available for selection in controlling the output. This in effect makes the KONA 3 a converter when used in conjunction with the AJA Control Panel application.

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 KONA 3, configured for up-conversion in the Control Panel and then passed through to the HD VTR for recording.

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

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



KONA 3 Control Panel, Test Pattern Choices

Genlock (*Freerun, Ref In, Input 1, or Input 2*)—selects how KONA 3 will synchronize program video:

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

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

Video: Directs KONA 3 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 3 framebuffer (called the *Primary Format*) and allows you to change it. All throughout the Control Panel, choices are always presented based on what KONA 3 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 up/down/cross conversion is employed.



KONA 3 Control Panel, Formats Screen



KONA 3 Control Panel, Formats Screen, Showing Primary Formats Pulldown Menu

Format Screen Settings

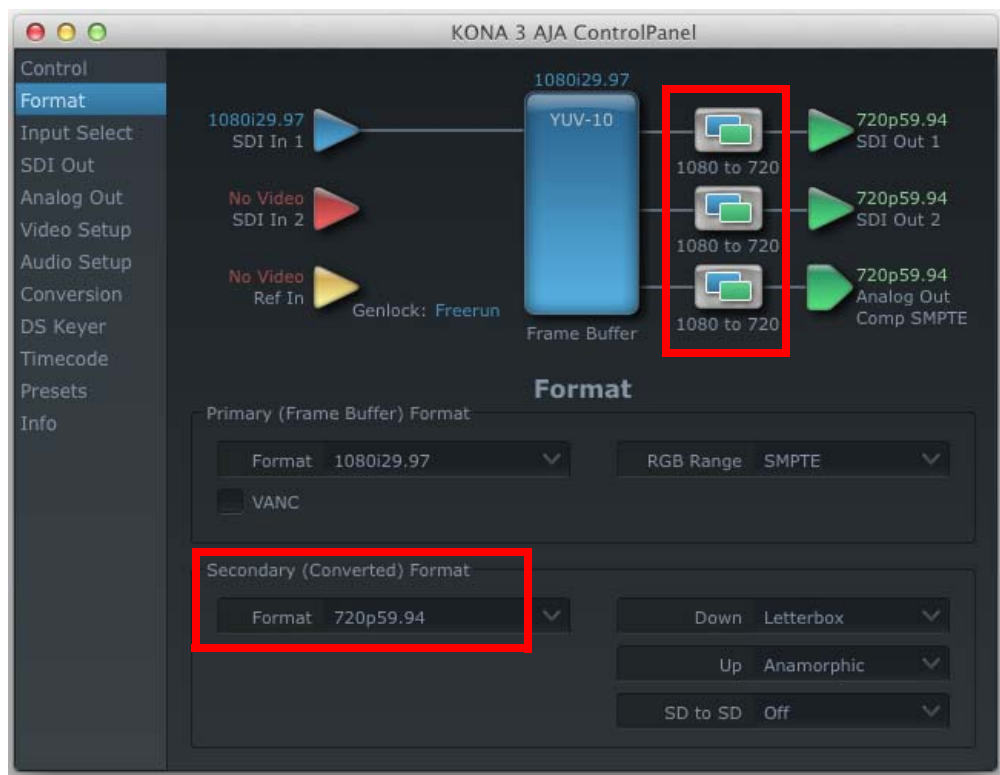
Video Format—this pull-down menu shows the currently selected format. This pull-down appears in both the Primary Format area of the Formats screen as well as the Secondary Format area (if present). If you select an alternate value in the Primary Format using the pull-down, it will change the format used by KONA 3's framebuffer. When a change is made via the Video Format pull-down or by clicking an icon (widget) and selecting a new format via a contextual menu, the block diagram will change to reflect the new format. In the case of a Secondary Format, the formats available can vary based on what the Primary Format is and the input signal (frame rates of input sources limits the to/from conversion choices). The "Secondary Video Format" pull-down menu lists all compatible formats 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.

KONA 3 Formats include:

| | |
|--------------|---------------|
| | 1080p23.98 |
| 525i 23.98 | 1080p24 |
| 525i 29.97 | 1080p25 |
| | 1080p29.97 |
| 625i 25 | 1080p30 |
| | 1080p50b |
| 720p 23.98 | 1080p59.94b |
| 720p50 | 1080p60b |
| 720p 59.94 | |
| 720p 60 | 2K1080p23.98 |
| | 2K1080p24 |
| | 2K1080p25 |
| 1080i 25 | |
| 1080i 29.97 | |
| 1080i 30 | 2K1080sf23.98 |
| | 2K1080sf24 |
| | 2K1080sf25 |
| 1080sf 23.98 | 2K1556sf14.98 |
| 1080sf 24 | 2K1556sf15 |
| 1080sf 25 | 2K1556sf23.98 |
| 1080sf 29.97 | 2K1556sf24 |
| 1080sf 30 | 2K1556sf25 |

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 Kona Control Panel) as compared to progressive frame formats which will show only "p."

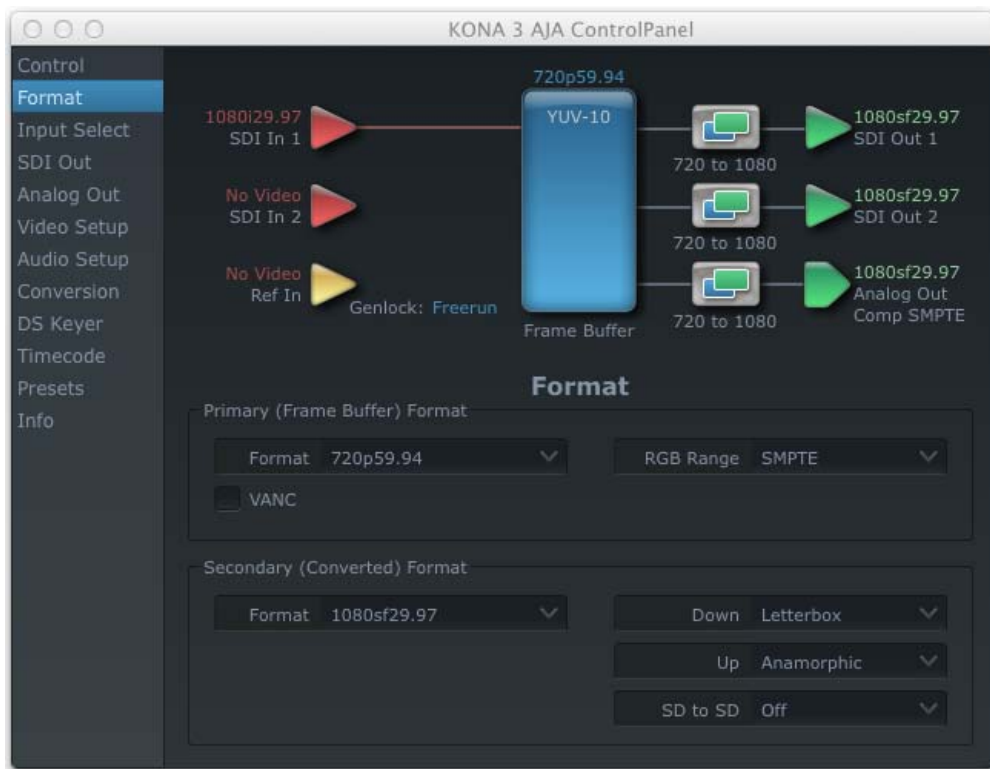
cross-conversion: if you have an HD format as your primary and then select a secondary HD format with a different frame size, the KONA 3 card will perform a cross-conversion where necessary (input or output) for "like Hz" formats. By *like Hz* this means that 720P 59.94 may be converted to 1080i 29.97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



KONA 3 Control Panel, Formats Screen Showing Cross-conversion, 1080i to 720p



KONA 3 Control Panel, Formats Screen Showing Cross-conversion, 720p to 1080i



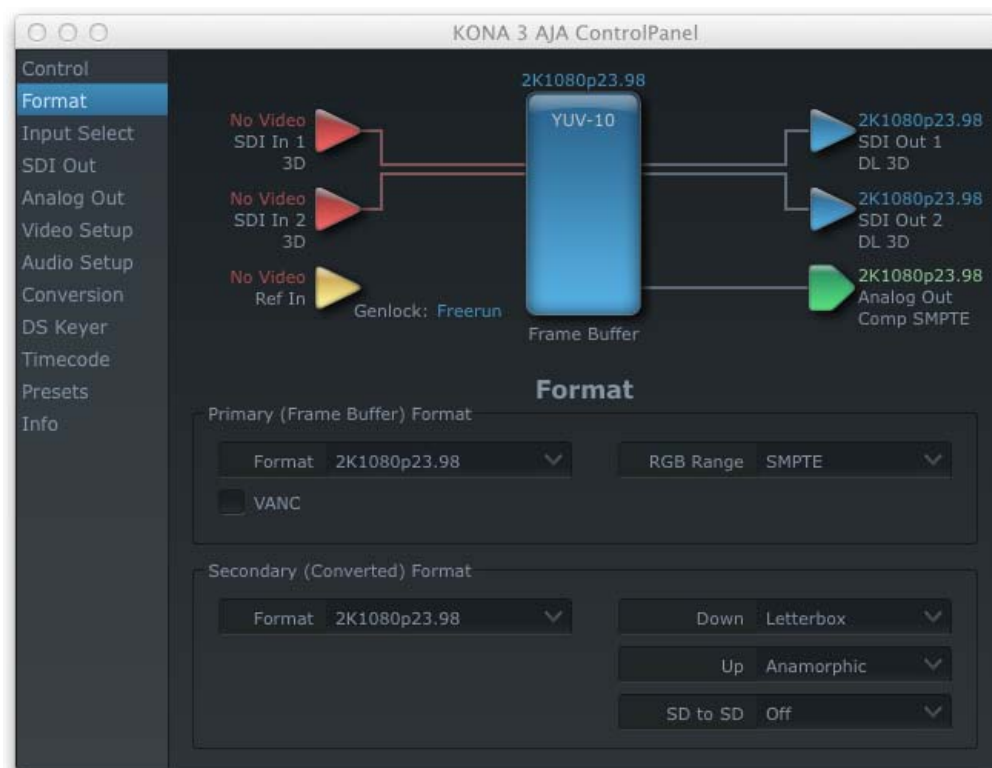
KONA 3 Control Panel, Formats Screen Showing Cross-conversion, 720p to 1080PsF



KONA 3 Control Panel, Formats Screen Showing 1080i to 525i Down-convert



KONA 3 Control Panel, Formats Screen Showing SD to 720p Up-convert



KONA 3 Control Panel, Formats Screen Showing Dual-link In/Out (no conversion)

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

For up-conversion the following choices are available:

- Anamorphic*: full-screen “stretched” image
- Pillar box 4:3*: results in a 4:3 image in center of screen with black sidebars
- Zoom 14:9*: results in a 4:3 image zoomed slightly to fill a 14:9 image with black sidebars
- Zoom Letterbox*: results in image zoomed to fill full screen
- Zoom Wide*: results in a combination of zoom and horizontal stretch to fill a 16:9 screen; this setting can introduce a small aspect ratio change

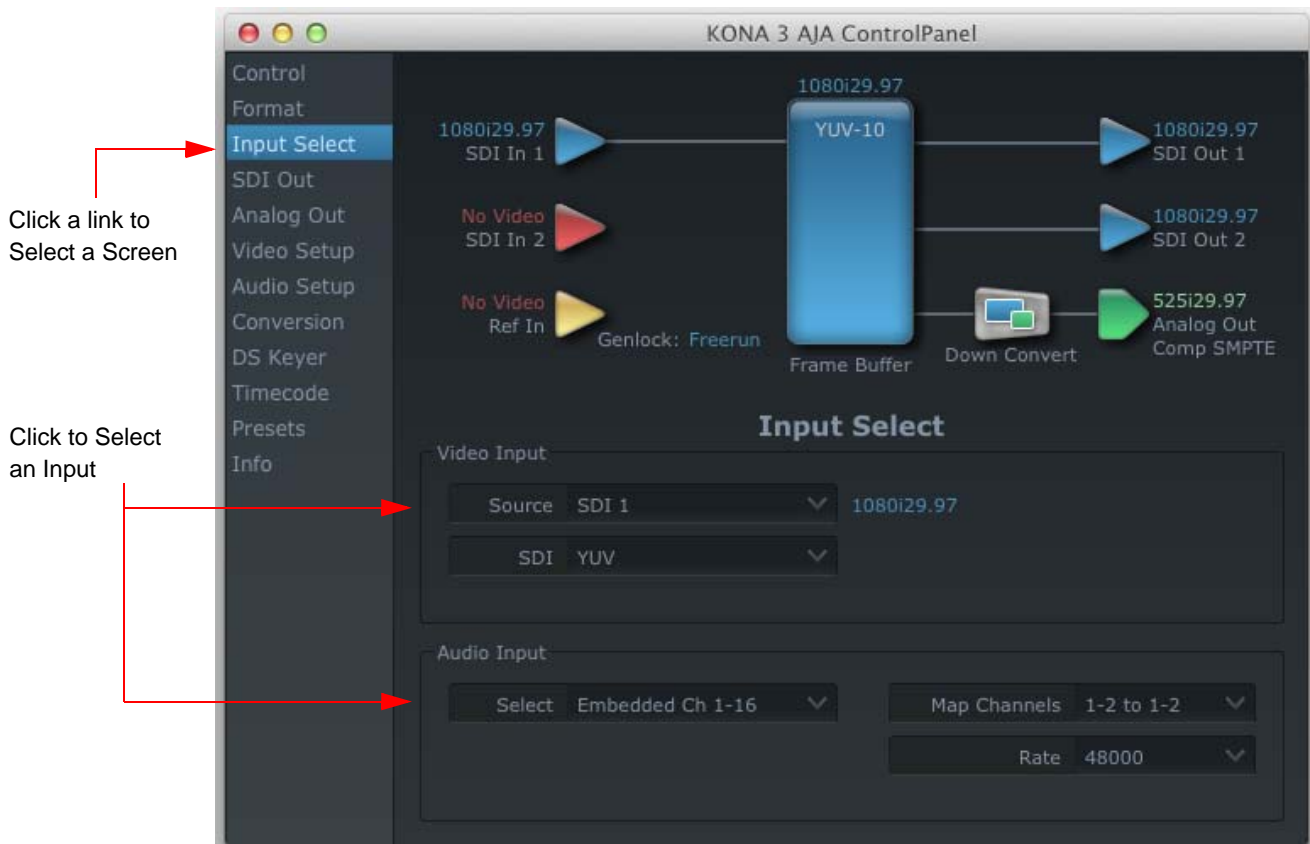
Down (Conversion)—for down-conversion the following choices are available:

- 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

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

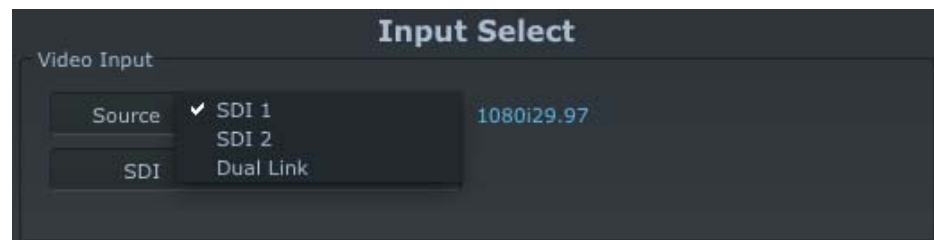


KONA 3 Control Panel, Inputs Screen

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 third-party editing application. Two information panes in the screen are provided: Video Input and Audio Input.

Input Select Screen Settings

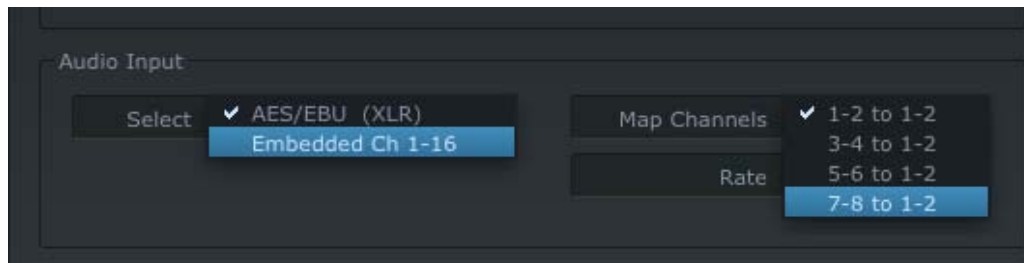
Video Input—the pulldown menu allows you to see and change what's currently selected and the video format that KONA 3 has detected (if any). In the example shown previously, it shows that video is selected at the SDI 1 input and the format is 1080i with a frame rate of 29.97. Since this text is shown in blue, you can tell that it does match the framebuffer's primary format you've set in the "Formats" screen. By looking at the input source, you can determine how the primary format should likely be set (unless you want to perform a conversion on input.) If you wish to select a different input you can do so by selecting a different menu item or you may want to select Dual Link if your source is 4:4:4 RGB.



Audio Input—This pulldown menu allows you to pick where the audio comes from. KONA 3 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.

When a KONA 3 has a Breakout Box attached, there are two ways to connect AES/EBU

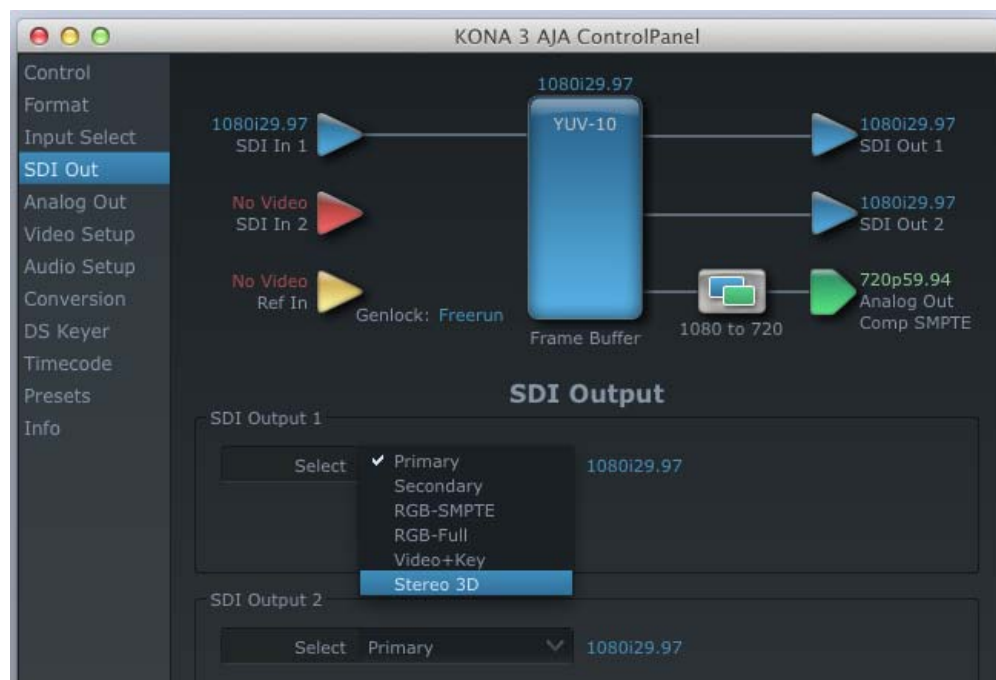
inputs: XLR or BNC connectors. The Audio Input pulldown allows you to select which of the two connector groups will be used. If you digitize footage and find that there is no audio present on the captured footage, it may simply be because the audio selection in the Kona Control Panel is set to AES/EBU (BNC) when in fact you are connected via AES/EBU (XLR).



Audio Input Select Choices

SDI Output Screen

The SDI Output screen shows the current settings for both of the SDI outputs. Because the outputs can be configured independently, one output may be the Primary format and the other output may be the Secondary format. If an input/output has no video, it will be indicated on the block diagram ("No Video").



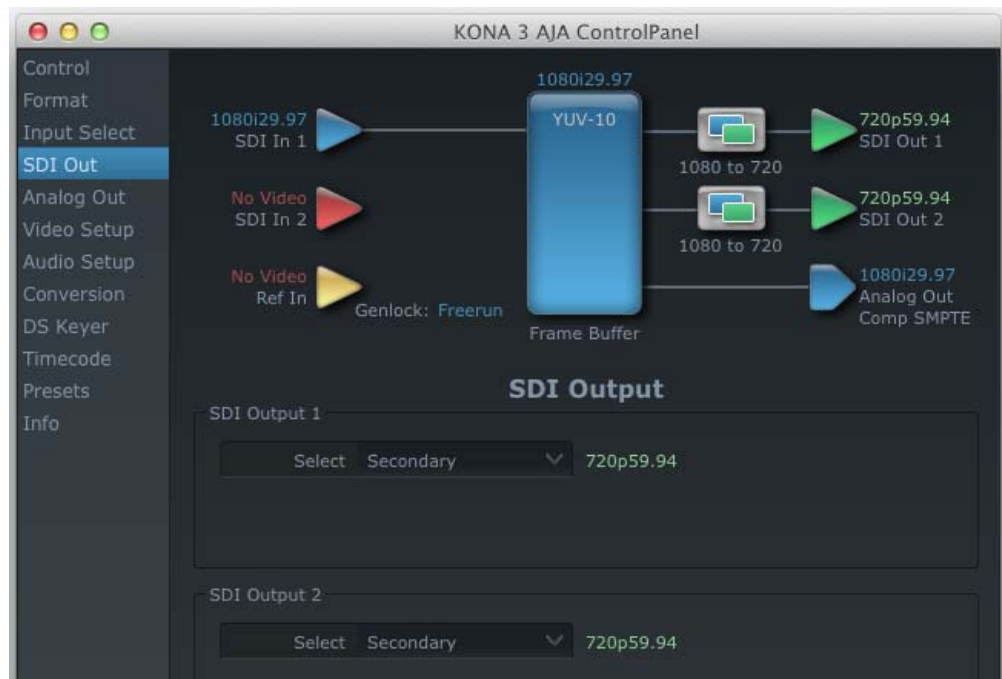
KONA 3 Control Panel, SDI Output Screen

SDI Output Screen Settings

Separate information panes will be listed (as applicable) for SDI Outputs 1 and 2. Information that can appear includes the following items. You can view the current setting or use the pulldown menu to change to it:

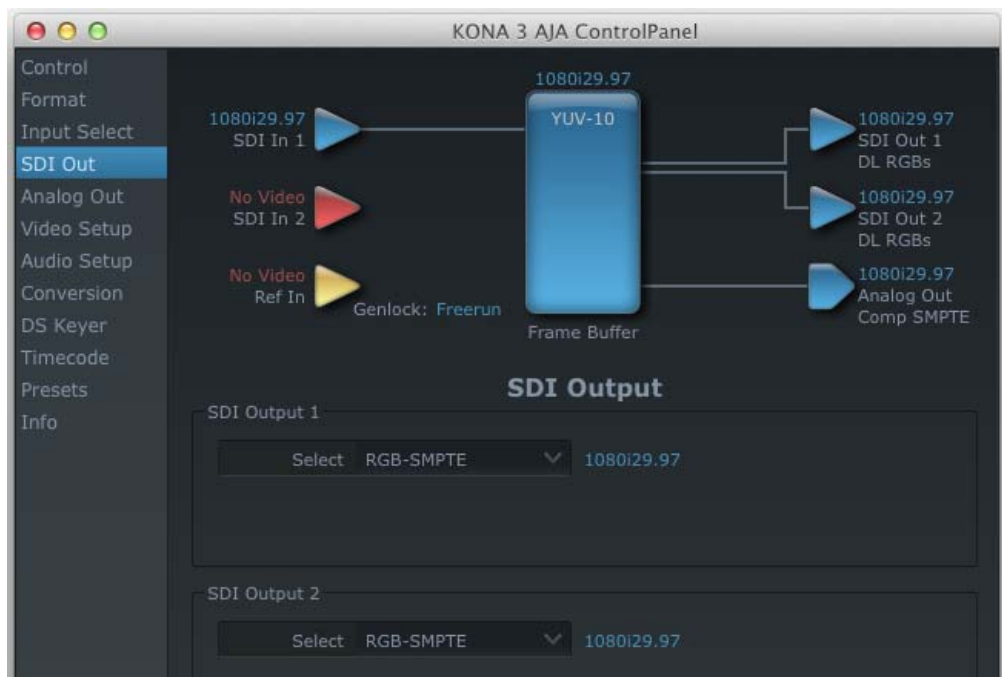
Primary—when selected, this indicates that the SDI output is set to the same format as the framebuffer. That value will be listed in blue.

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 even up/down-conversion).



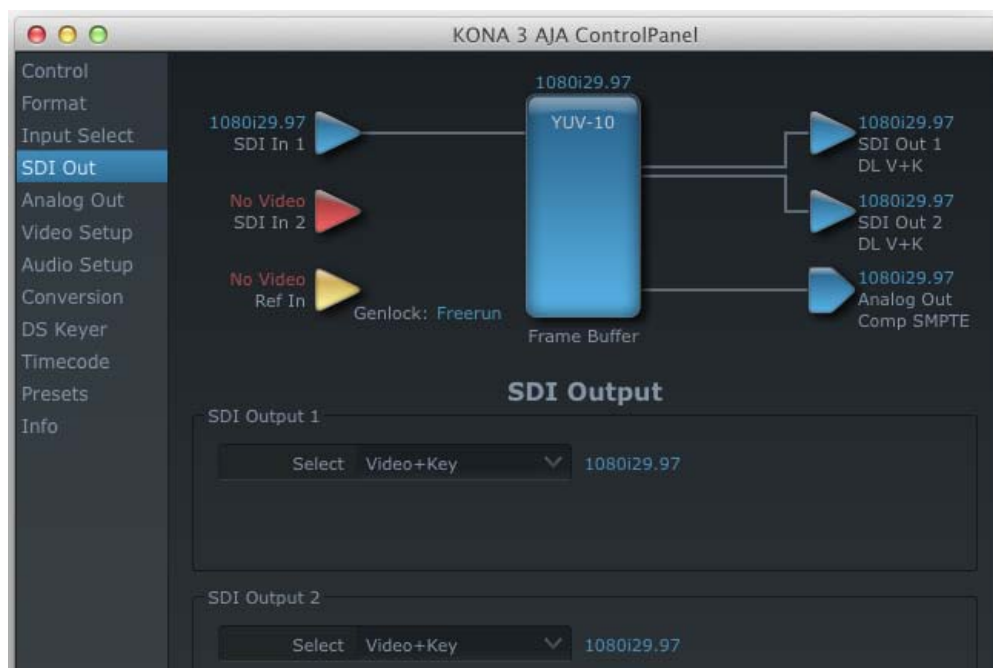
KONA 3 Control Panel, SDI Output Screen, Secondary

RGB (SMPTE or Full levels)—when selected, this indicates that both SDI outputs are being used together to output a 4:4:4 dual-link signal from the KONA 3 card. The RGB Range pulldown menu allows you to select either Full range (0-1023) or SMPTE range (typically 64-940) for RGB color output.



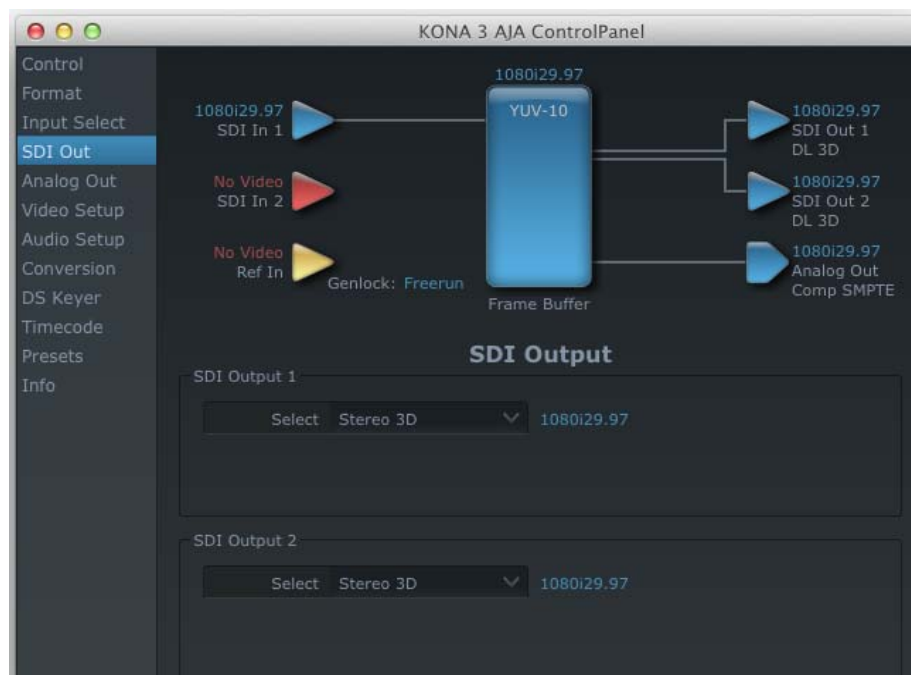
KONA 3 Control Panel, SDI Output Screen, RGB 3GB

Video+Key—when selected, this indicates that the SDI output 1 video is set to the same format as the framebuffer. SDI output 2 is set to a video key signal associated with output 1 (the shape to be cut out from the video - this will appear as a black and white image/matte). Using the second KONA output as an Alpha Channel key, with the video output, may be useful for feeding production switchers, DVEs or other professional video equipment. If Video+Key has been selected as an output, the block diagram will indicate the SDI outputs with video in blue and the key in red.



KONA 3 Control Panel, SDI Output Screen, Video + Key

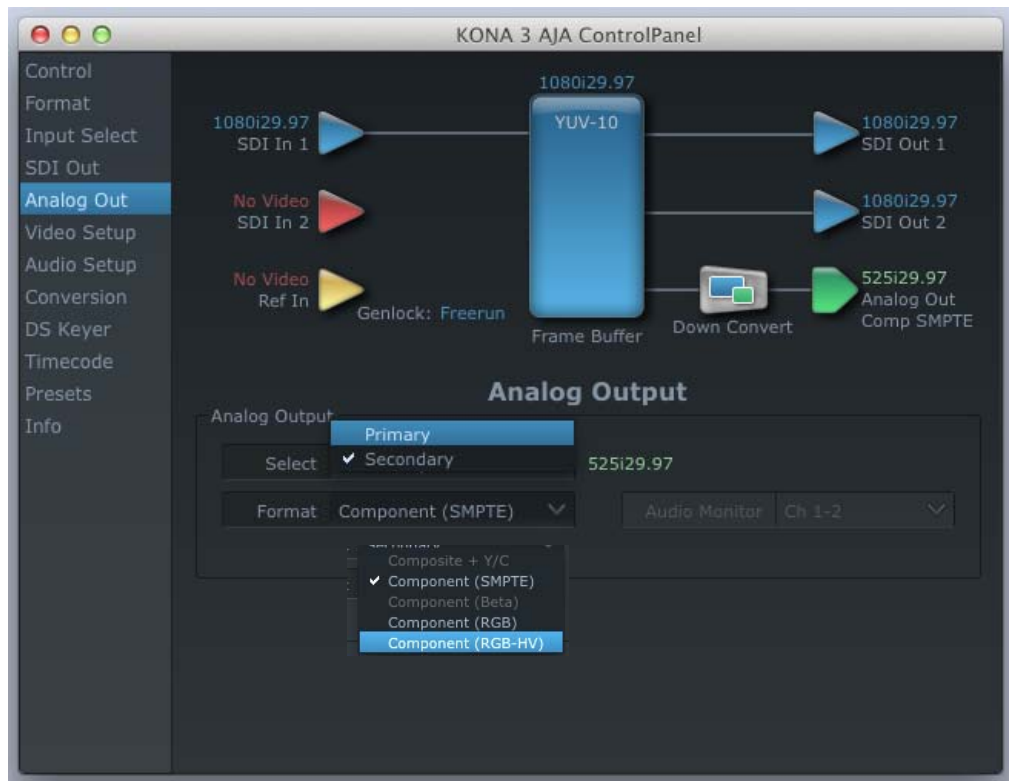
Stereo 3D—when selected, this indicates that SDI 1 represents the left eye output and SDI 2 represents the right eye output of stereoscopic material.



KONA 3 Control Panel, SDI Output Screen, Stereo 3D Dual Link

Analog Out Screen

KONA 3 provides a high-quality analog component or composite + Y/C output, generally used for monitoring. This screen shows the current settings for that analog output, and allows you to re-configure it when desired (format and black-level).



KONA 3 Control Panel, Analog Out Screen

Analog Out Screen Settings

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

Audio Monitor—here you can select which two channels will be mapped to the analog audio output (K3-Box only).

Video Setup Screen

KONA 3 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.



KONA 3 Control Panel, Setup Screen

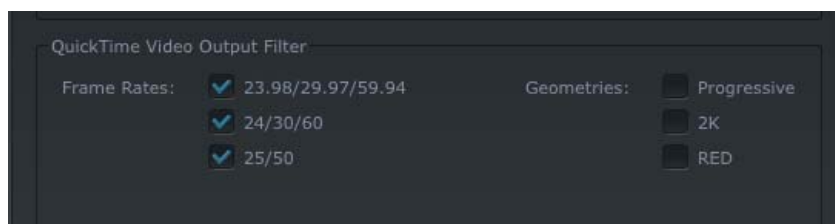
Video Setup Screen Settings

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:

- 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.



QuickTime Video Output Display Options

Note: The *RED* checkbox is designed to enable video output support for the unique geometries associated with RED proxy files or media transcoded from RED source R3D files. Without this checkbox enabled, playback of RED footage, be it proxy or transcoded files, will require your editing application to handle the scaling of the video to a standard video output size, such as 1920x1080.

Audio Setup Screen

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



KONA 3 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).

Enable DBL Audio Capture—When used with properly equipped Sony HDCAM SR VTRs (such as the Sony SRW-5800), the KONA 3G can be configured to ingest material at double normal speed or "DBL" speed.

Conversion Screen

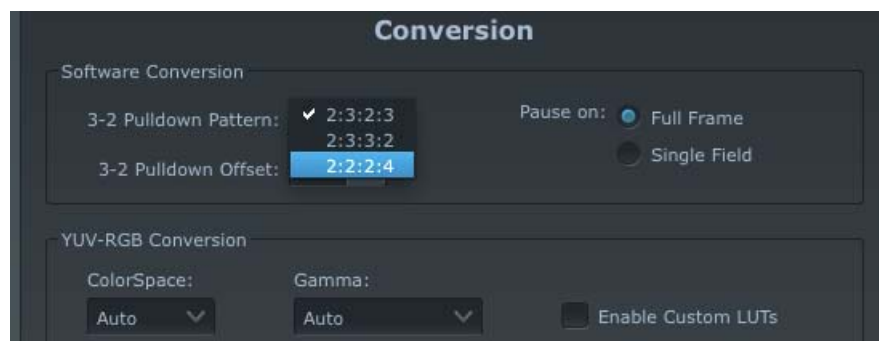
This screen offers a variety of controls that determine how the card behaves under the editing application.



KONA 3 Control Panel, Conversion Screen

Conversion Screen Settings

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



KONA 3 Control Panel, Conversion Screen, Frame-padding Pattern Choices

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).

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

Colorspace—choose from:

Rec 601
Rec 709
Auto

Gamma—choose from the following:

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

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

DS Keyer Screen

The KONA 3 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.).



KONA 3 Control Panel, Downstream Keyer Screen

Settings in the DS Keyer screen provide control over how the keyer operates and whether it's turned on or off. Controls and their meanings in the screens are as follows:

Downstream Keyer Mode:

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

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

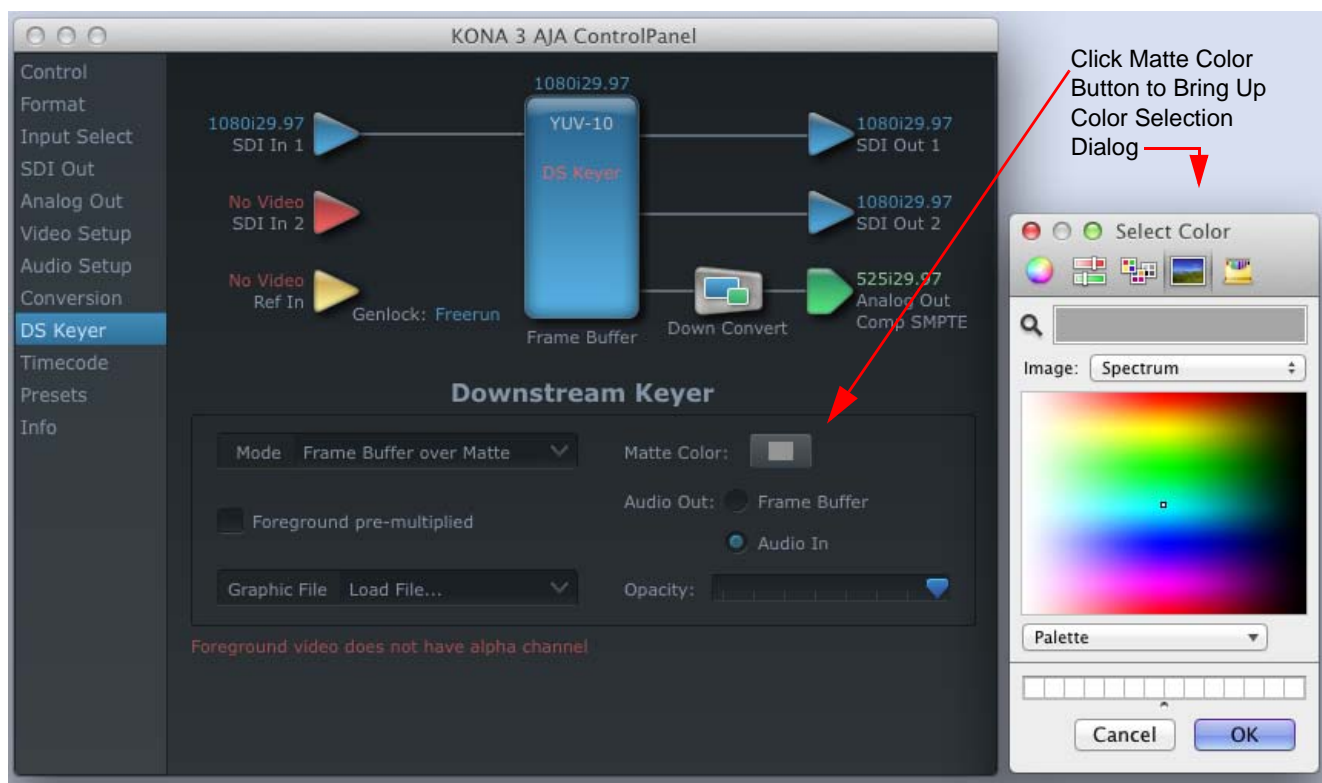
Frame Buffer over Video In—places the keyed video currently in the Frame Buffer over the video input for playout or print-to-tape.

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

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

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

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



KONA 3 Control Panel, DS Keyer Screen, Matte Color Selection

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

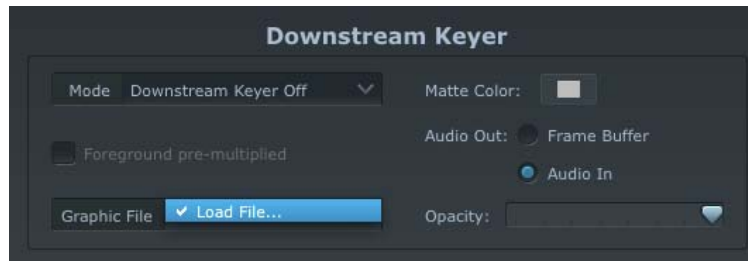
Audio Out:

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: click this field to choose from any recently accessed file from the menu 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 up-converting. 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.



KONA 3 Control Panel, DS Keyer Screen, Loading a Graphic File to Place Over a Matte

Timecode Screen

The timecode screen is used for both monitoring the RP-188 timecode embedded in the digital data stream and for selecting a timecode offset on output (if desired). Settings for the output section of the screen can be used to create window burn superimposed timecode outputs.

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



KONA 3 Control Panel, Timecode Screen

Timecode Screen Settings

Input

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

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

Output

Use QuickTime Timecode—when checked, this directs KONA to output timecode from the QuickTime timecode track. When not checked, KONA uses the Output Timecode Offset value plus the number of frames into the movie.

Note: not all QuickTime applications use or support timecode tracks, so sometimes the QuickTime timecode is missing or not meaningful.

Output Timecode Offset (entry field and FPS pull-down)—this text entry field allows you to specify a timecode offset for use with your 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 3. If set to “OFF”, timecode will not be keyed over the video. If set to “timecode”, then the timecode value will be keyed over the output video. This can be useful for synchronizing, choosing edit points, dailies, and many other purposes.



Note: SMPTE RP 188/SMPTE 12M-2 defines a standard for the transmission of time code and control code in the ancillary data space of a digital television data stream. Time code information is transmitted in the ancillary data space as defined in ANSI/SMPTE 291M. Multiple codes can be transmitted within a single digital video data stream. Other time information, such as real time clock, DTTR tape timer information, and other user-defined information, may also be carried in the ancillary time code packet instead of time code. The actual information transmitted through the interface is identified by the coding of a distributed binary bit. Equipment manufacturers can use the meta data for different purposes.

Info Screen

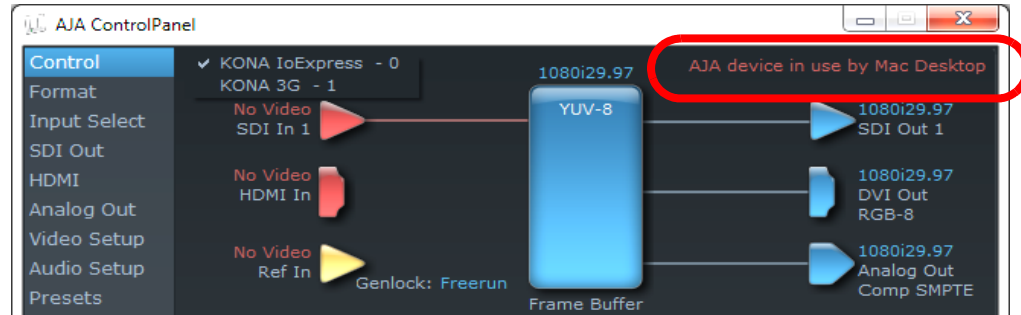
This screen shows the KONA 3 software files that have been installed on your system. This information may be needed if you talk to an AJA Customer Service representative to determine if files are missing or need updating.



KONA 3 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

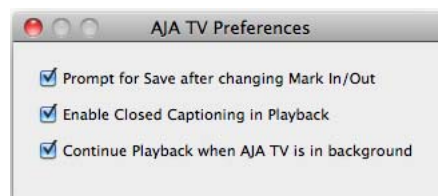
Starting with the v7.5 drivers, more than one AJA product can be used with your host computer. Using the AJA Control Panel application, you can choose which installed product an application uses for input/output. In the upper left corner of the AJA Control Panel application, you will see a board name, such as Kona3-0, 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). 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.



AJA Control Panel with Multiple AJA Devices Available

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 3 as the targeted product in the AJA Control Panel application. Launch your editing application (eg. Premiere Pro). The application is now using the KONA 3 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 3 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 make 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

Warning: Check on the AJA Video website for software updates:

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

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 Final Cut 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 Apple or 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 Final Cut Pro operational issue, Power Mac system issue, or Xserve RAID issue, then call Apple Customer Support for help.

If the problem is an AJA Video KONA 3 issue, then contact AJA Video Customer Support using one of the methods listed below:

Contacting by Mail Address:

180 Litton Drive, Grass Valley, CA. 95945 USA
Telephone: 1.800.251.4224 or 1.530.274.2048
Fax: 1.530.274.9442

Web: <http://www.aja.com>
Support Email: support@aja.com

Appendix A: Specifications

Video Input

Dual-rate (SD or HD)
SD and HD-SDI, SMPTE-259/292/296
Single Link 4:2:2
Dual-link HD 4:4:4
2K HSDL (High Speed Data Link) 4:4:4

Video Formats

525i 23.98 (intermediate format only)
525i 29.97
625i 25
720P 23.98 (intermediate format only)
720P 50
720P 59.94
720P 60
1080i 25
1080i 29.97
1080i 30
1080PsF 23.98
1080PsF 24
1080P 24
1080P 25
1080P 29.97
1080P 30
1080P 50
1080P 59.94
1080P 60
2048 x 1080P 23.98
2048 x 1080P 24
2048 x 1080PsF 23.98
2048 x 1080PsF 24
2048 x 1556PsF 14.98 (HSDL data rate)
2048 x 1556PsF 15 (HSDL data rate)
2048 x 1556psf 23.98 (playback rate)
2048 x 1556PsF 24 (playback rate)

Video Output

Digital:
SD-SDI, SMPTE, 259M, 10-bits, BNC
HD-SDI SMPTE, 292/296, 10-bits, BNC
Dual-link HD 4:4:4 and 2K HSDL 4:4:4
Analog SD and HD Output, 12-bits, BNC:
HSD and HD Output, 12-bits, BNC
HD: YPbPr, RGB
SD: YPbPr, RGB (component mode) or
Composite + Y/C (composite mode with
simultaneous Y/C)

Downstream Keyer: can output graphics with alpha channel over video,
matte or framebuffer or framebuffer content over video or matte

Audio

24-bit SDI embedded audio, 16 channel, 48kHz
 24-bit AES audio, 8 channel, 96kHz or 48kHz, 16-bit capable

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

Down-Conversion

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 K3-Box, terminated on supplied breakout cable

Machine Control

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

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

Appendix B: Glossary

Reference Terms

| | |
|----------------------|---|
| 3:2 Pull Down | 3:2 pull down is a process where six frames are added to a film's original 24-frames-per-second format so that it can work within the 30 fps NTSC standard. |
| 24P | A term for 24 full frames per second digital video progressively captured. It generally refers to the HD format of 1920x1080, although it is also used with 1280x720 images as well. |
| 1080i | Refers to a picture resolution of 1920 vertical pixels by 1080 horizontal pixels. The "i" stands for interlaced scanning. Interlaced scanning is based on the principle that the screen shows every odd line at one scan of the screen and then all the even lines in a second scan. |
| 1080p | Refers to a picture resolution of 1,920 vertical pixels by 1,080 horizontal pixels. The "p" stands for progressive scanning. This format works on the same principle as 720p; the only difference is that in this type there are more pixels and the resolution is better. |
| 1080psf | 1080psf differs from 1080p defined previously; PSF is an acronym for "Progressive Segmented Frame". Like 1080p, psf is progressive, but it differs in that the data is written as two separate "fields" (but without inter-field motion as interlaced video carries). This provides psf with the temporal motion characteristics of progressive video, but with the data transport ease of interlaced video. There should be no visual difference between the display of a progressive frame communicated as 1080p, and the same frame communicated as 1080psf. |
| 16:9 | Refers to the aspect ratio of movie screen and widescreen DTV formats used in all HDTV (High Definition TV) and some SDTV (Standard Definition TV). The ratio is 16 arbitrary units of width for every 9 arbitrary units of height. |
| 4:3 | The aspect ratio of traditional National Television Systems Committee (NTSC) TV screens. The ratio refers to four units of width for every three units of height. |

| | |
|--|--|
| 720p | Refers to a picture that is 1,280 vertical pixels by 720 horizontal pixels. The “p” stands for progressive scanning. Progressive scanning offers a smoother picture as 720 horizontal lines are scanned progressively or in succession in a vertical frame repeated 30 times a second. |
| Anamorphic video | Refers to video images that are “squeezed” or “stretched” (depending on whether the video is being upconverted or downconverted) to fit a video frame. When 16:9 anamorphic video is displayed on a 4:3 screen size (downconvert), the images will appear unnaturally tall and narrow. |
| Aspect ratio | A ratio of screen width to height. It may be traditional 4:3 or 16:9 widescreen. |
| ATSC | An acronym for Advanced Television Systems Committee, which is responsible for developing and establishing Digital-HDTV Standards. It is also the name of the DTV system used by broadcasters in the U.S. |
| Barn Doors | When a 4:3 image is viewed on a 16:9 screen, the viewer sees black bars on the sides of the screen, sometimes referred to as “barn doors.” |
| Codec | A short term used for both “Compressor-decompressor” and “Coder-decoder.” In terms of most editing and graphics applications, codec generally means “Compressor-decompressor”, which, whether hardware or software, converts video and audio signals to and from a compressed digital format. (“Coder-decoder” is generally a device that converts analog video and audio signals into a digital format for transmission, and also converts digital signals back into an analog format; depending on the application, it can also have alternate meanings.) |
| Decoder | See “codec.” A device or program that translates encoded data into its original format (i.e., it decodes the data.). |
| Deinterlacing | The process of converting an interlaced-scan video signal (where each frame is split into two sequential fields) to a progressive-scan signal (where each frame remains whole). Advanced de-interlacers include a feature called 3-2 pulldown processing. Sometimes de-interlacing is referred to as “line-doubling.” |
| Downconvert | Refers to format conversion from a higher resolution input standard to a lower one. For example, converting a 1080 input to a 525 display (HD to SD). |
| DTV (Digital Television) | DTV stands for Digital Television. It refers to all digital television formats and standards established by the Advanced Television Systems Committee (ATSC). Two basic DTV standards are HDTV (high-definition television) and SDTV (standard-definition television) |
| Frame rate | The rate at which frames are displayed per second. Frame rates are used in synchronizing audio and pictures for video and film. In motion pictures and television, the frame rates are standardized by SMPTE (Society of Motion Picture and Television Editors). SMPTE frame rates of 24, 25 and 30 frames per second are very common, with a great number of others also used. Frame rates have different applications and uses in different workflows. For motion pictures 24 frames per second is common, while in standard definition television 30 frames per second is common in the US (NTSC). Higher frame rates produce smoother motion but also create larger file storage requirements. |
| HDTV (High-Definition Television) | High Definition Television refers to the highest-resolution formats of the DTV formats. Offering twice the vertical and horizontal picture resolution of standard definition, an HD picture is much sharper. HDTV has a widescreen aspect ratio of 16:9. HD formats 1080i and 720p both offer reduced motion artifacts like ghosting and dot crawl. |

| | |
|--|--|
| HD-SDI | Refers to a high definition signal provided on a serial digital connection. |
| High Definition | A video format consisting of either 720 active lines of progressive video or 1080 active lines, using either progressive or interlaced scanning. |
| Interlaced Scanning | A scanning method based on the visible screen showing every odd line at one scan of the screen and the even lines in a second scan. |
| Letterbox | Letterbox refers to the image of a wide-screen picture on a standard 4:3 aspect ratio screen. Usually black bars are shown above and below the picture to fill the unused space. Letter-boxing maintains the original aspect ratio of the source (often a film source of 16:9 aspect ratio or wider). |
| Luminance | The brightness or black-and-white component of a color video signal. Luminance determines the level of picture detail. |
| Progressive Scanning | Progressive scanning provides a picture made up of 720 or 1080 horizontal lines scanned progressively in succession, within a vertical frame. The frame repeats 30 times a second. |
| Resolution | Resolution usually refers to the density of lines, and dots per line, that represent an image. It is measured by the number of pixels displayed. A higher number of lines and dots provides sharper and more detailed picture content. Analog television pictures have over 200,000 color pixels while HDTV—at 1080 vertical pixels by 1920 horizontal pixels—offer greater than 2 million pixels per picture. |
| Sampling | A digital process by which analog information is measured in intervals to convert analog to digital. |
| SDTV (Standard-Definition Television) | Standard Definition Television pictures are higher quality than NTSC, however, they do not reach the quality and resolution of HD. SDTV is based on 480 lines of vertical resolution, available with both interlaced and progressively scanned formats. |
| SD-SDI | Refers to a standard definition signal provided on a serial digital connection. |
| Upconverting | Process by which a standard definition picture is changed to a simulated high-definition picture. |
| Widescreen | Widescreen TV is a picture with a 16:9 aspect ratio. 16:9 is the aspect ratio of movie screen and widescreen DTV formats used in all HDTV (High Definition TV) and some SDTV (Standard Definition TV); it stands for 16 units of width for every 9 units of height. |

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