Io 4K Plus

Capture, Display, Convert

Installation and Operation Guide

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Contacting AJA Support

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

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Web	https://www.aja.com
Support Email	support@aja.com
Sales Email	sales@aja.com

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Chapter 1 – Introduction

Overview

AJA Io 4K Plus offers a full set of professional video and audio connectivity with support for the latest 4K and UltraHD devices and High Frame Rate workflows. The power of Thunderbolt 3 enables Io 4K Plus to handle a wide range of formats from SD to HD, UltraHD and full 4K over both SDI and HDMI and support 4K frame rates up to 60p, plus HDR 10 and HLG support over HDMI for HDR workflows.

Io 4K Plus is the ideal companion for lightning-fast video capture, playback and editorial. Io 4K Plus connects with a single Thunderbolt cable and provides a second Thunderbolt connector for flexibility, making it perfect for on set, or in the edit suite.

Features

- Two Thunderbolt 3 ports (a pass-through daisy-chaining)
- Four bidirectional SDI BNCs configurable for up to four inputs, or four outputs, or two inputs and 2 outputs.
- Single Link I/O for 4K/UltraHD, HD and SD across 12G-SDI, 6G-SDI, 3G-SDI, and 1.5G-SDI
- Dual Link I/O for 1.5G-SDI and 3G-SDI (2 x BNC)
- Quad Link I/O for 1.5G-SDI, 3G-SDI (4 x BNC)
- Supports Quadrant or Two Sample Interleave transport
- HDMI 2.0 Input and Output
- HDR (HDR10 or HLG via HDMI, 12 Bit RGB, BT2020)
- Dedicated realtime 4K/UltraHD to HD down-conversion output (SDI Monitor out BNC)
- Eight-channel Embedded HDMI audio
- Four-channel In, Four-Channel Out analog audio (DB25 cable, Line Level)
- Front panel LED VU meters and Headphone output w/level control
- Reference In/LTC In (selectable)
- LTC Output
- RS-422 control via 9-pin
- Rugged Chassis, Small Size
- 12V DC, 4-pin XLR Power (AC adapter included)

Video Formats

For a list of supported video formats, see .

High Quality Down Conversion

The Io 4K Plus built-in down-conversion 3G monitor spigot, uses large multi-point digital interpolators, anti-alias filtering and interpolation. Because these functions are in hardware, they are available full time, all the time—with no CPU load.

Io 4K Plus Audio

Io 4K Plus provides up to 16 channels of SDI embedded audio, and up to eight channels of embedded HDMI audio. Eight channels of analog audio I/O is supported via a DB25 industry standard Tascam style audio breakout cable. The eight analog audio channels are configured as Ch1-4 input and Ch5-8 output.

AJA Software & Utilities

Io 4K Plus operates with AJA's Desktop software package, developed for powerful integrated video/audio capture, editing, and production with a variety of 3rd-party software. AJA software is distributed as a unified package which includes all the software, firmware, plugins, and utility programs for the Io 4K Plus, as well as AJA's Io, KONA, and T-TAP products.

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

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

Mac, Windows and Linux Packages

These packages include:

Drivers

AJA device drivers for tightly integrated hardware/software operation.

AJA Control Panel

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

AJA Control Room

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

AJA System Test

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

Additional with Mac and Windows Packages

3rd-Party Plugins

Plugins for popular 3rd-party Professional Video Applications from Adobe, Avid, Apple, Telestream, and others.

System Requirements

Your system should meet minimum hardware and software requirements to achieve a satisfactory level of performance. Updates to system requirements are subject to change.

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

Recommended system specifications:

- Mac OS 10.12 Sierra or later
- Win 10 or later with all updates
- Linux Redhat/CentOS 7
- Linux Ubuntu 14.04 LTS and Ubuntu 16.04 LTS
- 2.5 GHz quad core i7 minimum, for HD
- 3.5 GHz eight core minimum, faster processors and more cores recommended, for UltraHD/4K workflows, especially with high frame rate*
- 16GB RAM minimum, 32GB or more recommended, especially for UltraHD/4K or High Frame Rate applications
- A reasonably fast and powerful graphics card, with plenty of on-board memory. Examples (may be specific to application version and/or host CPU) include:
  - NvidiaK5200
  - Nvidia K4200
  - Nvidia M6000
  - Nvidia M5000
  - Nvidia M4000
  - AMD W7100
  - AMD W8100
- Media storage with adequate bandwidth to sustain the capture and playback of the material you expect to be working with.

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

What's In The Box?

As you unpack the shipping box, 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, and contact your dealer or distributor for details on how to have your Io 4K Plus repaired or replaced.

Save packing materials and the shipping box for future use should you need to transport your system or return it for service.

Inside the box you'll find the following components:

- Io 4K Plus
- 12V power adapter and power cord

In This Manual

Chapter 1 - Introduces the product briefly, listing features and system requirements.

Chapter 2 - Provides complete instructions for installing and configuring the product.

Chapter 3 - Discusses operational aspects and how to work with 3rd-party software.

Appendix A - Presents a list of technical specifications for the product.

Appendix B - Provides important Safety and Compliance information.

Chapter 2 – Installation

Installation Overview

1. If not previously installed on your Thunderbolt equipped computer, ensure that appropriate third party application software is installed as detailed in its user documentation.

2. Download and install the latest Io 4K Plus software from:

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

3. Connect the video and audio inputs and outputs.

4. Power up the unit (AC supply or battery). The Io 4K Plus will startup automatically.

5. When you run AJA Control Panel, the Io 4K Plus is auto-discovered as long as it is properly cabled and powered up.

System Test Application

AJA System Test is a utility for measuring system performance. The application includes:

• System Disk Test
• AJA Device Test
• Disk + Device Test
• System Report

The application tests Read and Write, Capture and Playback speeds tests in both Megabytes per second and Frames per second. The disk speed tests differ from standard disk I/O performance applications in that they specifically test the system under conditions typically encountered with video capture, playback, and editing.

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

Cable Connections

Figure 1. Io 4K Plus Connectors

Connector Descriptions

Thunderbolt 3

The Io 4K Plus provides the third-generation Thunderbolt 3 (USB-C) ports to support increased bandwidth between host computer and I/O device. Two ports are provided for daisy-chained network configurations.

Bi-directional SDI I/O

Four bidirectional BNC connectors can be configured in a variety of ways via the AJA Control Panel, including:

- Two HD/SD inputs (SDI 1 and SDI 2) and two outputs (SDI 3 and SDI 4)
- Two 4K/UltraHD single-link 6/12G inputs (SDI 1 and SDI 2) and two 4K/UltraHD single-link 6/12G outputs (SDI 3 and SDI 4)
- One 4K/UltraHD two-link 3G input (SDI 1 and SDI 2) and one and one two-link 3G output (SDI 3 and SDI4)
- One 4K/UltraHD four-link 1.5/3G input (SDI 1, SDI 2, SDI 3, and SDI4) input, Quadrant or 2SI.
- One 4K/UltraHD four-link 1.5/3G output (SDI 1, SDI 2, SDI 3, and SDI4) output, Quadrant or 2SI.

Dedicated SDI HD/SD Output

One BNC connector is provided for full-time, real-time output of HD/SD video. 4K video is down-converted to 2K HD and UltraHD is down-converted to HD.

HDMI Input and Output

Two HDMI connectors provide input and output of HDMI video and multi-channel embedded audio.

- HDMI 2.0 input and output, supporting UltraHD and 4K resolutions at up to 60p (4:2:2), 10-bit and 8-bit
- Supports two or eight channel HDMI audio input and output

HDMI output also supports:

- HDR 10 Support - HDR Infoframe metadata, compatible with HDMI 2.0a/CTA-861.3
- HLG Support - compatible with HDMI 2.0b/CTA-861-G

NOTE: *HDCP is not supported on either input or output. 4K HDMI output does not have HDCP, and input sources having HDCP are not supported.*

The HDMI input is designed to support long cable runs—up to 100 ft. when using 22 or 24AWG HDMI cable, or up to 50 ft. using 28 or 30AWG HDMI cable. The HDMI output supports standard HDMI cables only.

RS-422 Machine Control

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

Reference Video and LTC Input

Two BNC connectors provide reference Input and LTC output. The Reference Video input can also be used for LTC input. The selection of Reference (sync) or LTC is set using the AJA Control Panel (*"Input Select Screen" on page 23*).

Supplying a reference signal to the Reference input allows you to synchronize Io 4K Plus outputs to your house analog reference video signal (or black burst). When connecting a reference video source, the locking signal should be the same as the input format. It is possible in some circumstances to use an alternate format video signal as long as the basic frame rate is compatible.

Balanced Analog Audio Input and Output

A 25-pin connector provides 8-channel balanced analog audio, 24-bit 48kHz sample rate D/A and A/D, for use with an industry standard 8x XLR on DB-25 breakout cable (cable not included). The eight analog audio channels are configured as Ch 1-4 input and Ch 5-8 output.

12V Power Connector

A standard 4-pin XLR type connector is provided for either battery or line source power using the supplied AC power adapter.

Installing Software

NOTE: *If your computer has previously had another video capture or multimedia device installed, ensure you uninstall any related software before installing Io 4K Plus. This will prevent any hardware or software conflicts.*

Before installing the software package, ensure that your capture/editing application is installed as detailed in its user documentation. Before using Io 4K Plus with Avid Media Composer or other NLE application, it is best practice to have installed and run the software at least once on your workstation. Next, install the AJA software package.

If at a later date you add any Io 4K Plus supported applications that require drivers, you must run the AJA install program again to install them.

Chapter 3 – Io 4K Plus Operation

Audio Level Meters (8)   Power LED

Monitor Gain Control   Monitor Output Connector 1/8 in. TRS
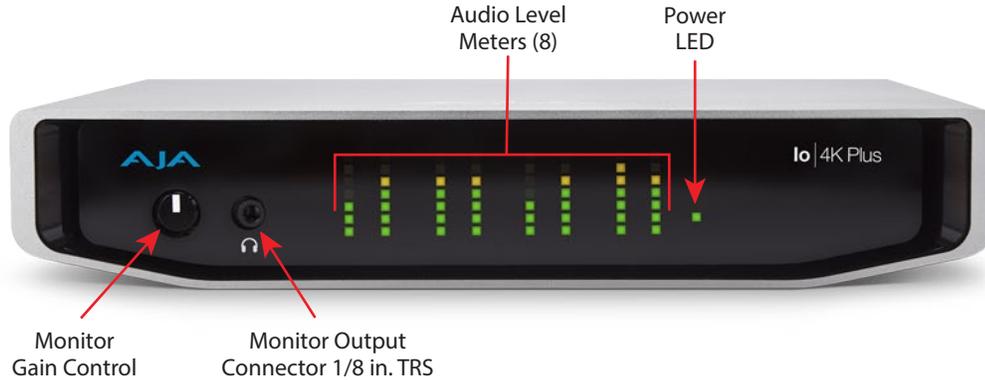
Front Panel Operation

The Io 4K Plus front panel has the following controls and indicators:

Monitor Output and Gain Control

A 1/8 inch TRS connector is available for monitoring two channels of audio, selectable in channel pairs using the Control Panel application. Typically used with a pair of headphones.

The Monitor Gain knob on the left adjusts the monitor output level. Pushing in the knob extends it (for adjustment) or recesses it (to prevent accidental changes).

Audio Level Meters

The Audio Level Meters in the center of the front panel indicate:

- During Capture - The first 8 channels of the audio source selected (SDI, HDMI, Analog).
- During Playback - The sum of whatever sources are being played out via the AJA hardware; i.e. NLE timeline and mix of host system audio output (if applicable).

The meter's LEDs are colored to indicate the amount below 0dBfs when averaged over a one millisecond time interval:

dBfs	LED Color and Location
-2 db	Red LED 1 (top)
-12 db	Yellow LED 2
-20 db	Yellow LED 1
-30 db	Green LED 4
-40 db	Green LED 3
-50 db	Green LED 2
-60 db	Green LED 1 (bottom)

NOTE: These audio level meters are for guidance only. Third-party audio metering should be employed when doing critical audio editing and mixing.

Power LED

The power LED lights up yellow when power is provided via the power supply. Once a Thunderbolt 3 connection is made, and the host is in an active state, the light turns green.

AJA Control Panel Overview

The AJA Control Panel is a software application that provides a simple visual showing how the Io 4K Plus hardware is currently configured and allows you to make changes. You can change signal input and output parameters and define the video processing that will be performed.

The AJA software installer automatically installs the Control Panel application on your computer. You'll find the AJA Control Panel application in your Applications folder.

AJA Control Panel User Interface

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

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

*Figure 2. Io 4K Plus, Block Diagram set for UltraHD Format*
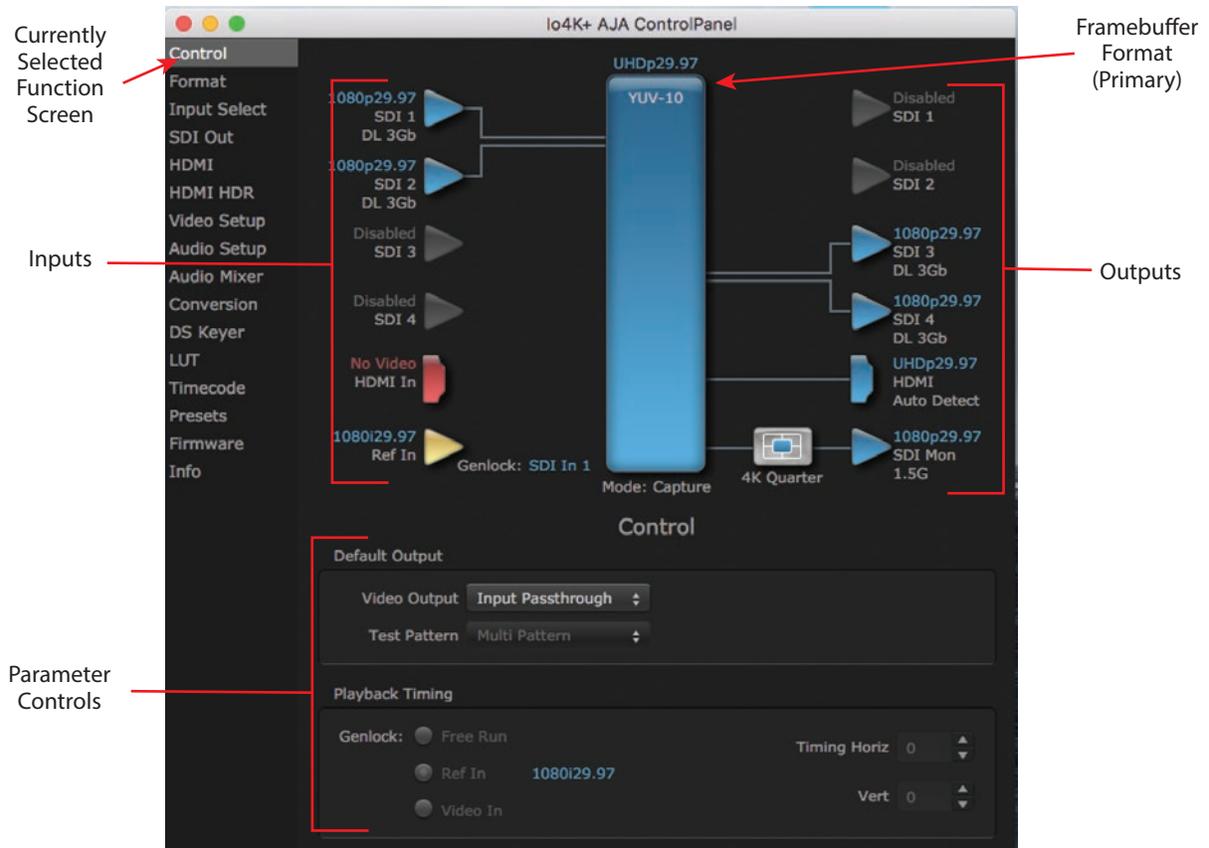
Block Diagram Area

The top block diagram area of the Control Panel screen is a visual representation of the processing, if any, that's currently occurring, including inputs/outputs, reference source, and system status. Lines between inputs, the framebuffer, and outputs, show a video path. Where there are no lines, there is no connection; this can be because an input or output isn't selected in the Input Select menu. The lines will also show whether the outputs are video or video + key.

You can click any of the function screen selection links in the left column to view its current settings or click on an icon to call up its related settings screen. You can also right-click or Control-click to see context-sensitive information and choices (*Figure 3*).

Figure 3. Context Sensitive Menu
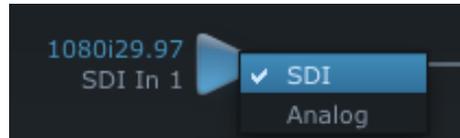
Color Meanings

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

Blue - Video is same format as the Primary Format (framebuffer)

Yellow - Reference video (black burst or other reference source)

Red - The selected operation cannot be performed

Input/Output Icons

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

Figure 4. Input/Output Icons

Framebuffer

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

Primary Format

The Primary Format is the media format written to disk and used in your project. This is the format that the framebuffer will use and is shown in the Control Panel using the color blue. It is the format that the third-party application software will either receive from the AJA hardware, or is sending to the hardware. All icons in blue are the same as the Primary Format used by the framebuffer. Also any text descriptions in the block diagram that appear in blue indicate that something is in the primary format.

Controlling Application

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

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

In the top right corner, the Control Panel displays the name of the application controlling the unit. In some cases, applications may not always properly "let go" of the I/O interface as another takes over—you'll be able to tell by looking at the Control Panel.

Presets

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

Single-User & Shared Preferences

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

- User Preferences— Preferences stored from the last Control Panel State to be used on next startup of AJA Control Panel. This occurs on next restoration of the default state (triggered by start up of host CPU, startup of AJA device, or 3rd party application releases the board).
- Shared Preferences— Preferences saved by an Administrator for use as a default start state for AJA Control Panel.

User Preferences

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

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

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

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

On Mac:

- /Users/<USER_NAME>/Library/Preferences/com.aja.devicesettings

On Windows:

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

Shared Preferences

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

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

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

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

On Mac:

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

On Windows:

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

Function Screens

Listed below are the function screens for Io 4K Plus and what they are used for.

Table 1. Io 4K Plus Function Screens

Screen	Functions
Control	Configure basic Io 4K Plus operation options and output timing.
Format	Select the framebuffer primary video format settings.
Input Select	View and edit input selections and audio mapping.
SDI Out	Select output format.
HDMI	Configure the HDMI I/O
HDMI HDR	Configure High Dynamic Range settings for HDMI output
Video Setup	Configure Video such as composite black level, progressive format and ancillary data (Closed Caption) option.
Audio Setup	Configures Audio options such as analog audio monitor level.
Audio Mixer	Select and mix audio sources for monitoring.
Conversion	Mac platform only) Select codec options such as whether paused video is full frame or single field, pulldown settings, and color space conversion.
DS Keyer	Setup and control the insertion of keyed video from the frame buffer or graphics files with alpha channel.
LUT	Load a lookup table (LUT) file to adjust the calibration of color for any source.
Timecode	Monitors SMPTE 12M-2 timecode and configure timecode window burn output.

Screen	Functions
Presets	Add or delete saved preset configurations (handy for quick and easy recall of different Io 4K Plus settings for varied workflows).
Firmware	Install firmware from your currently installed AJA software package.
Info	Display status information and the firmware version number. This information is generally intended for troubleshooting/support.

Using Io 4K Plus for UltraHD/4K

4K/UltraHD Transport Modes

The 4K and UltraHD SDI formats can use different transport modes, associated with the number of links used to transport the signal, the data rates involved, and the way the image data is organized.

Io 4K Plus supports both Quadrant and Two Sample Interleave (2SI) transport standards. Many different combinations of modes and data organization exist.

In 4K mode, single link transport is available as either 12G or 6G (which are both 2SI). Whether the video is auto-sensed as 12G vs. 6G is dependent on the data rate of the incoming or outgoing signal. For example, 4K p30 at 8bit 4:2:0 requires 6G only.

Besides single link transport, Io 4K Plus also supports the following multiple link transport modes for UltraHD and 4K:

- Quadrant 4-wire (transported on four links)
- Quadrant 2-wire (transported on two links)
- 2SI (two or four links automatically selected)

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

Quadrant Mode

In Quadrant Mode you can use four HD or 2K signals (1.5G) to input / output UltraHD or 4K at 30fps or below, or four 3G signals to enable HFR and / or deep color. Whether using four 1.5G or four 3G wires, each represents individual quadrants of the higher definition UltraHD 3840x2160 or 4K 4096x2160 4K formats. Physical connections of the quadrants will be mapped to the SDI connectors as shown. Monitoring one of these HD signals on a standard SDI monitor will display one quadrant of the picture.

Figure 6. Mapping of Quad SDI Outputs

2SI Mode

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

Figure 7. Mapping of 2SI Outputs

For 2SI UltraHD or 4K SDI video at 30 fps or less, monitoring one of these four signals on a standard SDI monitor displays the entire picture, but at a lower resolution. Above 30 fps, 3G bandwidth is required, so a 3G capable monitor is required."

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

2-Wire and 4-Wire Modes

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

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

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

Io 4K Plus Audio Monitoring

Io 4K Plus hardware can be used as your single audio monitoring solution whether you are auditioning music in a web browser, playing a movie file on the desktop, creating music, or playing a YouTube clip. As long as the output of your work or application is normally output via the host system audio, your AJA hardware can route this audio for monitoring. This cuts down on unnecessary cabling, and means you can take advantage of a consistent audio monitoring environment whatever you are currently doing with your host system.

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

Io 4K Plus lets you listen to Host System audio concurrently with your NLE audio. This is useful if you need to audition music tracks against playback of your NLE timeline, or if you need to Skype with a remote producer during an edit session, or for a myriad of other reasons.

You can also listen to Io 4K Plus Input concurrently with your NLE (with the exception of Avid Media Composer). This is useful if you need to listen out for the readiness of talent, or the presence of some other feed, whilst you continue to work.

Io 4K Plus audio monitoring is routed and mixed using the Control Panel application's Audio Mixer screen. You can select sources to be monitored, and can adjust their levels. If you are using the 1/4 inch monitor output connector, an additional overall mix gain control is conveniently available on the Io 4K Plus's front panel.

The mixed audio monitor signal is also routed to:

- SDI Audio out
- HDMI Audio Out
- Analog Audio Out (via DB25 cable)

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

Figure 8. Io 4K Plus Audio Monitoring Routing Diagram
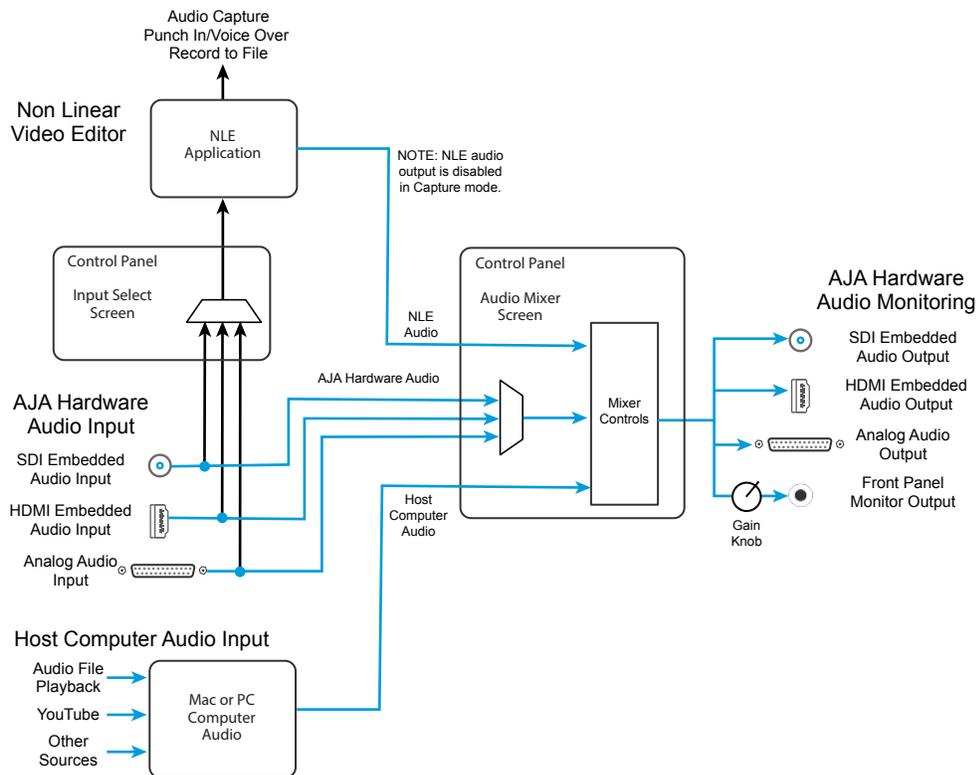
NOTE: Linux OS has not yet been tested with this functionality and as such remains unsupported until a future announcement.

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

- SDI embedded
- HDMI embedded
- Analog (via DB25 cable)

Any level adjustments to Capture or Audio Punch In / Voice Over to Timeline recording operations will either need to be made upstream of the AJA input, or else via adjustments within the main NLE application (e.g. via a pass through mix tool).

AJA Control Panel Function Screens

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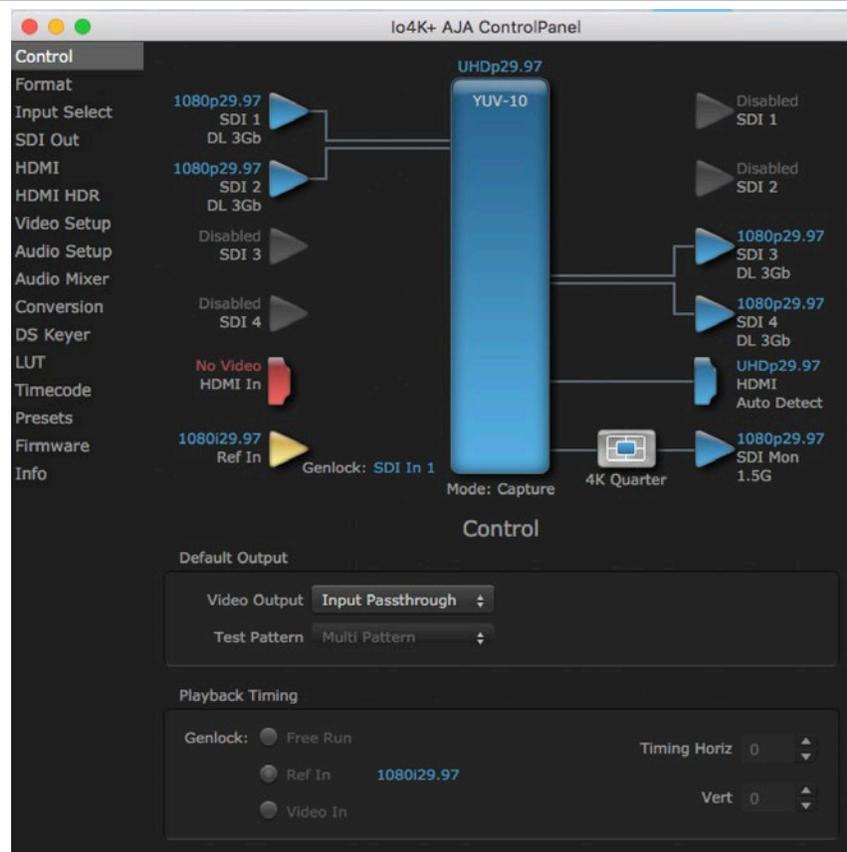
The Control Screen is where you set the Default Output, what the device outputs when no application has control of the board. This screen also has controls for setting the genlock source, and for setting the Horiz and Vert timing offsets. The top of the Control Screen shows the current state of the device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

Default Output

Many video applications can grab control of the Io 4K Plus, so its outputs can change dynamically. The Default Output settings are used to select what will be output when no third-party video application is controlling Io 4K Plus.

Video Output

- Input Passthrough - This selection directs Io 4K Plus to route video from its selected input through the card for processing and output.
- Test Pattern - This selection directs Io 4K Plus to output a preset pattern when no other application is in control. The pattern is selected from the Test Pattern dropdown list below, or a graphic file can be chosen.
- Hold Last App - This selection directs Io 4K Plus to hold and output the last frame of video from the last application to control Io 4K Plus. This can be helpful when operating in an environment where you're switching back and forth between multiple application windows.

Test Pattern

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

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

Graphic File Display

In addition to the test patterns above, a "Load File..." selection at the bottom of the Test Pattern dropdown menu allows you to load a standard RGB/RGBA graphics file (.tif,.psd, etc.) into the frame buffer for display (including alpha channel). Some graphics formats and bit depths may not be supported. Files that have been loaded are listed for quick reuse. Loaded graphic files are retained for redisplay if another test pattern is selected, and even if Io 4K Plus is power cycled.

NOTE: *A loaded graphics file will not be scaled to fit. If it's smaller than the current frame buffer format, Io 4K Plus will center it in the frame. If larger than the current frame buffer format it will be cropped.*

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

Playback Timing

Use these controls to set the Genlock source and Timing adjustment.

Genlock

Selects how Io 4K Plus will synchronize program video:

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

For video stability and proper system operation, you can genlock all equipment to house sync. However genlock is not required for Io 4K Plus due to its excellent freerun accuracy. On the Io 4K Plus house sync is connected to "LTC/Ref In".

Alternatively, Io 4K Plus can receive externally supplied Linear Time Code on that same input connector. The LTC/Ref setting on the Input Select screen (see *"LTC/ Ref" on page 24*) selects how that input signal will be used.

Timing (Horiz and Vert)

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

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

Format Screen
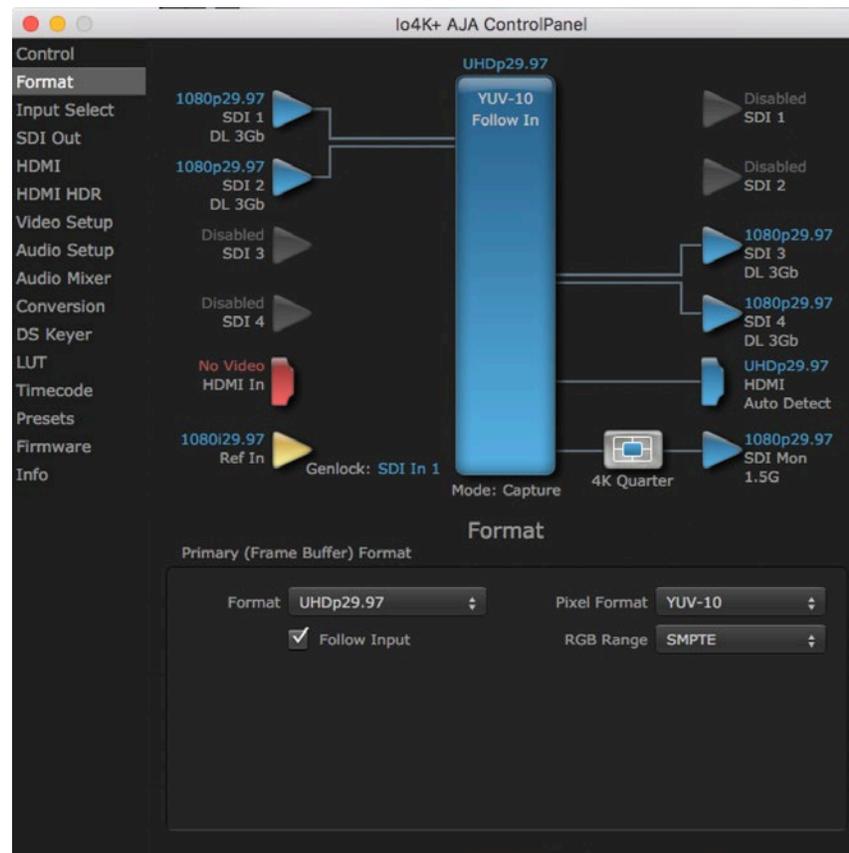
The Format Screen shows the video format currently in use by the Io 4K Plus framebuffer (called the Primary Format) and allows you to change it. All throughout the Control Panel, choices are always presented based on what Io 4K Plus can do with the signals available and the inputs/outputs selected.

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

Primary (Frame Buffer) Format

Format

This pull-down menu shows the currently selected format. When a change is made via the Video Format pull-down or by clicking an icon and selecting a new format via a contextual menu, the block diagram will change to reflect the new format.

NOTE: The Format control is not active when an application has control of the Io 4K Plus.

Follow Input

Enabling the Follow Input checkbox allows the Control Panel Buffer to auto-switch to whatever is the detected input format. This feature works if the controlling application supports input-based capture—Avid Media Composer or AJA Control Room for example. Follow Input can also be active when there is no 3rd party controlling application and the Default Output setting is Input Passthrough (see *"Video Output" on page 21*).

Pixel Format

Use this pulldown menu to choose from:
- YUV-10, YUV-8, RGB-10, ARGB-8, or RGB-12

RGB Range

The RGB Range pulldown menu allows you to select either:
- Full range (0-1023)
- SMPTE range (typically 64-940) for RGB color output.

NOTE: *RGB Range is only used when the SDI input or output is configured for RGB.*

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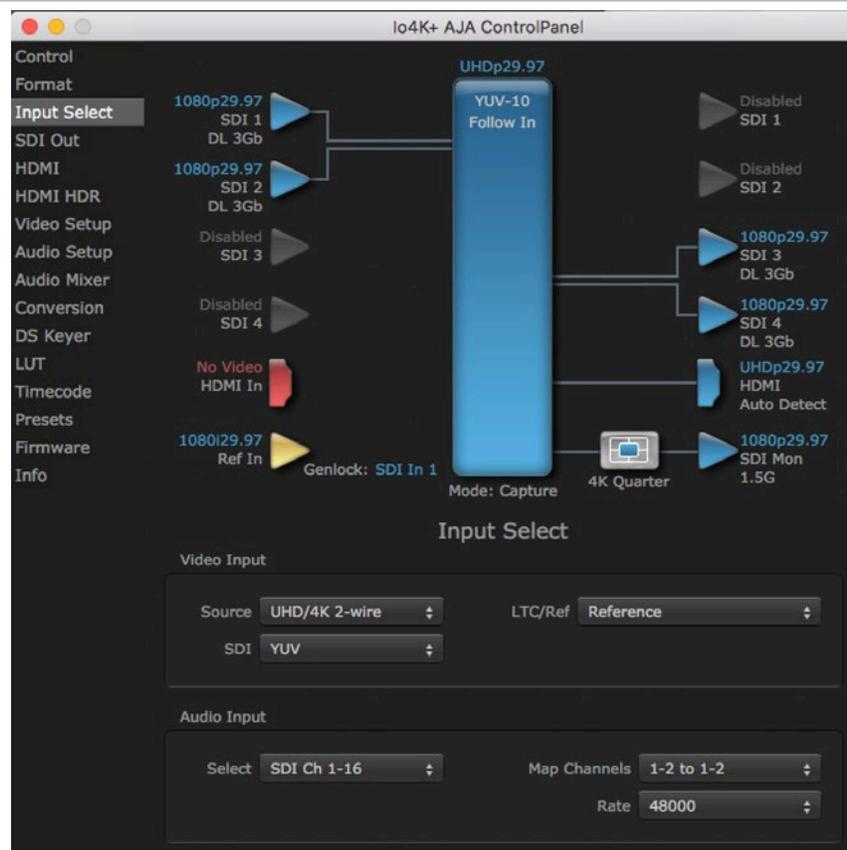
On the Input Select screen you can view or set the currently selected video and audio input sources and map audio sources to the channels supported by your editing application. Two information panes in the screen are provided: Video Input and Audio Input.

Video Input

Source

The Source pulldown menu allows you to see and change what's currently selected and shows the video format that Io 4K Plus has detected (if any). To select a different input use the pulldown to choose from:

- SDI 1, SDI 2, Dual Link, UHD/4K 2-wire, UHD/4K 4-wire, or HDMI

LTC/Ref

Use the LTC/Ref menu pulldown to identify the type of signal being received by the LTC/Ref BNC:

- Reference - BNC is used as a video reference input.
- LTC- BNC is used for linear time code (LTC) input.

Audio Input

Select

This pulldown menu allows you to pick where the audio comes from. Io 4K Plus supports up to 16 channels of embedded audio, up to 8 channels of HDMI audio, up to four analog input channels (DB-25 connector), and one analog mic/line input. Choose from:

- Analog, SDI Ch 1-16, HDMI

Map Channels

Here you can select which two audio input channels will be mapped to your editing application if only two channels (Ch 1 and Ch2) are selected in that application.

- Choose in pairs from 1-2 through 15-16.

Incoming embedded SDI audio supports the routing of all eight channel pairs. HDMI embedded audio supports routing of the first four channel pairs. Analog audio supports routing the first two channel pairs.

NOTE: This setting does not affect the embedded audio being sent to the Io 4K Plus's BNC or HDMI output connectors.

Rate

Io 4K Plus digital audio sampling is fixed at 48k.

SDI Out Screen
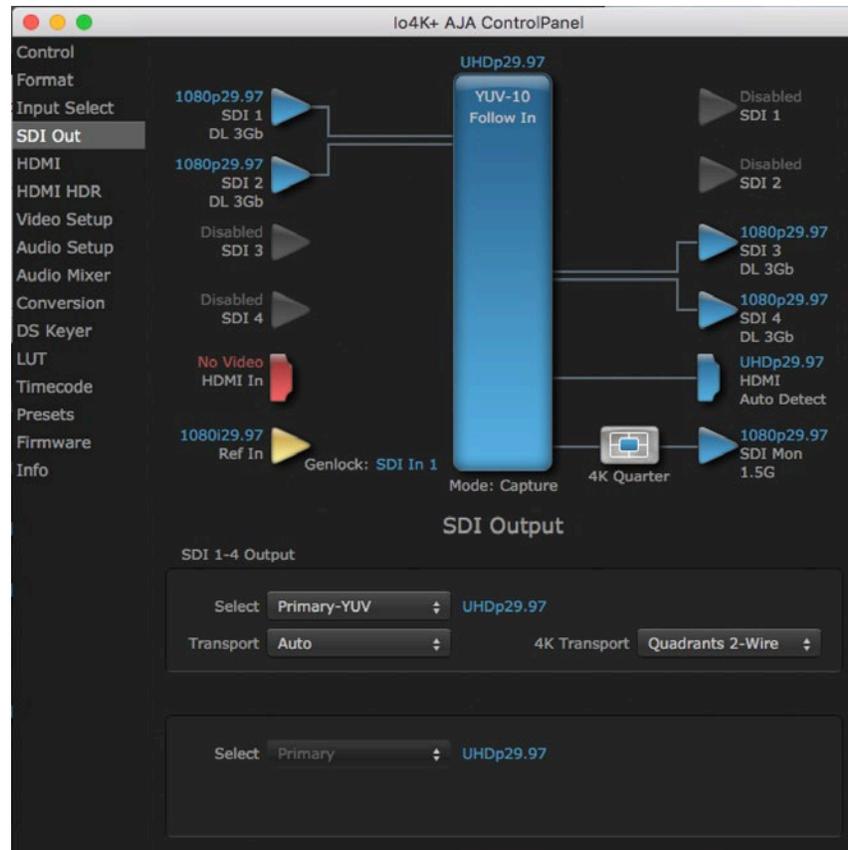
The SDI Out screen shows the current settings for the SDI outputs. The outputs can be configured independently. If an input/output has no video, it will be indicated on the block diagram ("No Video").

SDI Output

The number of SDI outputs will depend on the Video Input source format and the 4K Transport settings.

Select

Configure the SDI Outputs from:

- Primary YUV - The SDI output is set to the same format as the frame buffer with YUV color.
- RGB SMPTE - Sets the output to RGB SMPTE range video for the SDI output.
- RGB Full - Sets the output to RGB full range video for the SDI output.
- Video+Key - The SDI 1 Output video is set to the same format as the framebuffer. SDI 2 Output is set to a video key signal associated with SDI 1 (the shape to be cut out from the video - this will appear as a black and white image/matte). Using the second output as an Alpha Channel key, with the video output, may be useful for feeding production switchers, DVEs or other professional video equipment.
- Stereo - Indicates SDI 1 represents the left eye output and SDI 2 represents the right eye output of stereoscopic material, or a single link output of multiplexed Stereo 3D.

Transport

This control sets the video transport protocol for the SDI output. Select from:

- Auto - Automatically selects output transport, based on input format.
  - Up to 2K format, Auto chooses the most efficient transport (i.e. auto defaults to 1 x 3G rather than 2 x 1.5G).
  - For UltraHD/4K the Auto setting does not apply. 12G/6G 1-wire or 2SI is selected with the 4K Transport control.
- Dual Link - Forces (SMPTE 372M) output, using SDI 1 and SDI 2 in concert.
- 3Gb - Forces (SMPTE 424M) output using a single-link transport.

4K Transport

Select the UltraHD/4K output transport from:

- Quadrants 2-Wire
- Quadrants 4-Wire
- 12G/6G 1-Wire
- SMPTE 2Si
- 4K Quarter 1-Wire - Down converts 4K to 2K, and UltraHD to HD.

NOTE: The 4K Transport setting also affects the Io 4K Plus HDMI output signal, even if the SDI inputs are not being used. A 12G/6G 1-Wire or SMPTE 2Si setting is required for UltraHD/4K HDMI output. Other 4K Transport settings will downconvert HDMI output to HD or 2K.

HDMI Screen
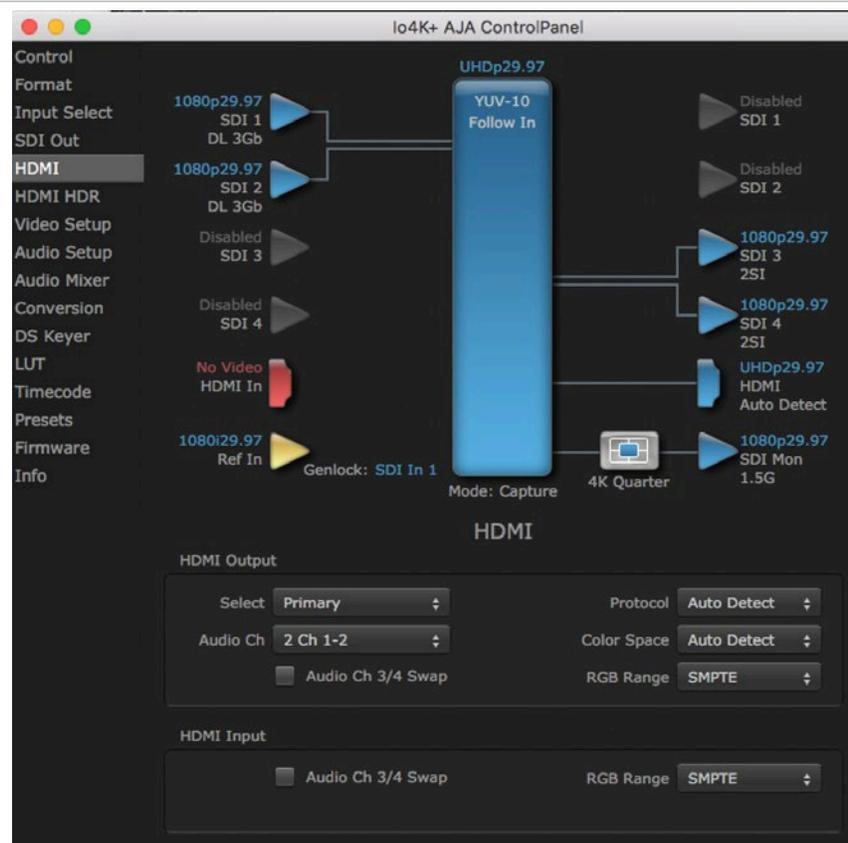
The HDMI input and output are configured with this screen.

NOTE: The 4K Transport setting on the SDI Out screen also affects the Io 4K Plus HDMI
         output signal, even if the SDI inputs are not being used. A 12G/6G 1-Wire or
         SMPTE 2Si setting is required for UltraHD/4K HDMI output. Other 4K Transport
         settings will downconvert HDMI output to HD or 2K.

HDMI Output

Select

For UltraHD/4K formats, this pulldown lets you choose:
- Primary – the full 4K or UltraHD format
- 4K Quarter - Down converts 4K to 2K, and UltraHD to HD.

Audio Ch

This pulldown allows you to select the number of embedded audio channels for
the HDMI output. Two or eight channels can be chosen. Select from:
- 2 Ch 1-2 through 15-16
- 8 Ch 1-8
- 8 Ch 9-16

Audio Ch 3/4 Swap

This checkbox controls HDMI input audio channel placement. Some multi-
channel audio decoder systems route the low frequency effects audio to channel
4, and some to channel 3. If you want to monitor or pass audio though to another
device, this control can be used to align these two channels correctly.
- Checked - (default) HDMI audio input channel 3 is moved to channel 4's
  location, and input channel 4 is moved to channel 3's location.
- Unchecked - HDMI audio input retains the original 3 and 4 channel locations.

Protocol

This pulldown allows you to choose:
- Auto Detect - Selects HDMI or DVI depending on signal.
- HDMI - Selects HDMI.
- DVI - Selects DVI. Use when outputting to a DVI monitor using an HDMI to DVI
  adapter.

RGB Range

This pulldown lets you configure video output range. Choose from:
- SMPTE
- Full

Color Space

Sets the color space bit depth. Select from:
- RGBA 8bit
- RGB 10bit

HDMI Input

The detected HDMI input video format is displayed and you're given a chance to
configure the RGB range of the HDMI input.

Audio Ch 3/4 Swap

This checkbox controls HDMI output audio channel placement. Some multi-channel audio decoder systems route the low frequency effects audio to channel 4, and some to channel 3. If you want to monitor multi-channel audio directly or pass audio though to another device, this control can be used to place these two channels correctly.
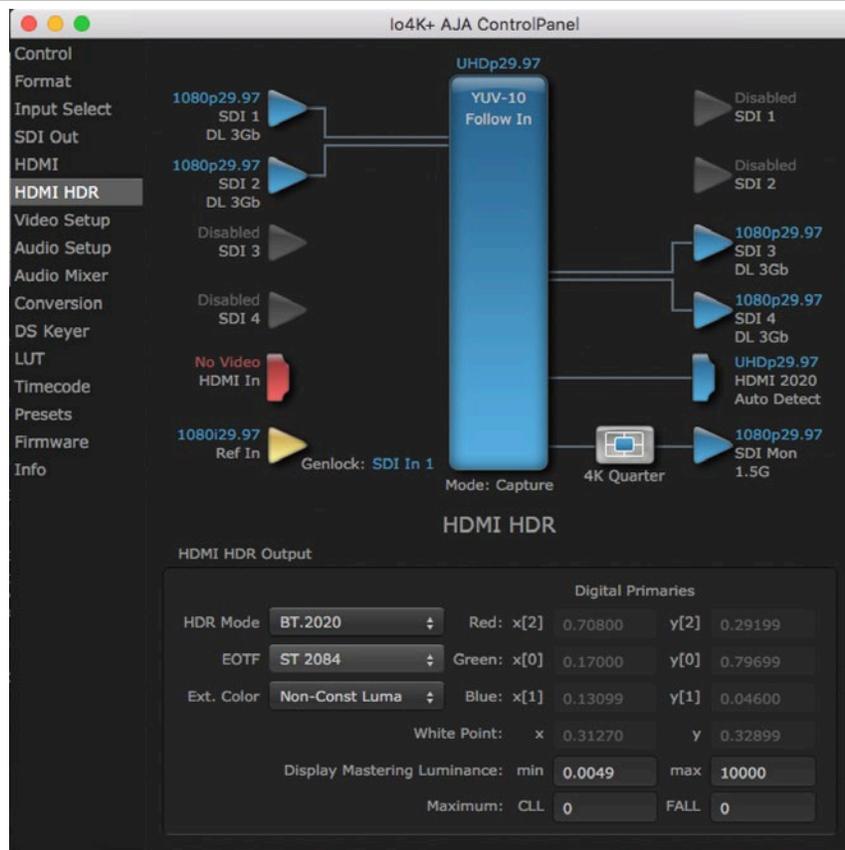
- Checked - (default) HDMI audio output channel 3 is moved to channel 4's location, and input channel 4 is moved to channel 3's location.
- Unchecked - HDMI audio output retains the original 3 and 4 channel locations.

RGB Range

Choose from:
- SMPTE
- Full

HDMI HDR Screen

The HDMI-HDR screen provides a mechanism to inform an HDMI sink device (such as a TV or monitor) that the video content is HDR. This includes generation of the Dynamic Range and Mastering Infoframe and the static metadata descriptors as defined in CTA-861.3 and HDMI v2.0a. Included are preset primaries values for BT.2020 and DCI P3 color gamuts.

HDR Mode

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

EOTF

The Electrical Optical Transfer Function metadata bit tells the HDMI display which EOTF to use. Most TV's will require this to be set to ST 2084 for their HDR modes.

- Trad Gamma SD
- Trad Gamma HD
- ST 2084 (PQ, HDR-10)
- HLG (Hybrid Log Gamma) - No metadata for Digital Primaries.

Ext. Color

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

Digital Primaries

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

Display Mastering Luminance

Represents the minimum and maximum Display Mastering Luminance.

- Minimum: Defines the floor of the SMPTE ST 2086 color volume (in the case of HDR) and is determined by the mastering environment.
  - Range: 0.00000 cd/m2 to 1.00000 cd/m2.
  - Step size: 0.00002 cd/m2.
- Maximum: Defines the ceiling of the SMPTE ST 2086 color volume (in the case of HDR) and is determined by the mastering environment.
  - Range: 1 cd/m2 to 65535 cd/m2.
  - Step size: 1 cd/m2.

Maximum Content Light Level (CLL)

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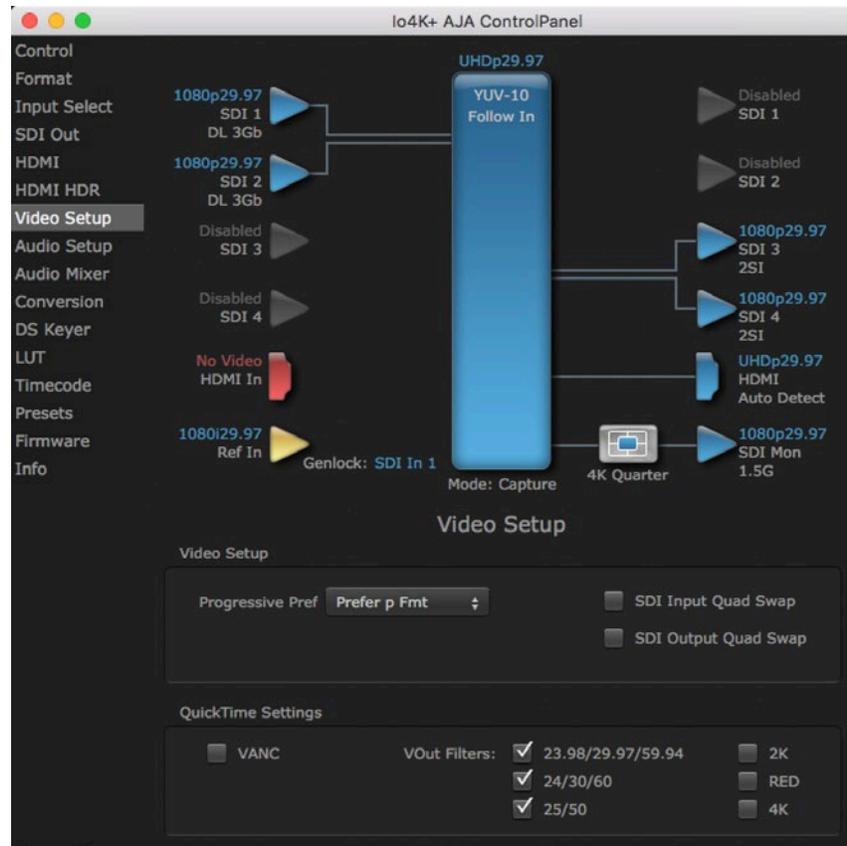
- Range: 1 cd/m2 to 65535 cd/m2.
- Step size: 1 cd/m2.

Maximum Frame Average Light Level (FALL)

Represents the maximum of frame-based average light levels taken over an entire scene, and can be determined in the post environment.

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

Video Setup Screen

The Video Setup screen shows various other settings which will affect how video inputs and outputs behave, and how Io 4K Plus interacts with some software applications.

Video Setup

Progressive Pref

This feature is used to default the hardware to use either p or PsF output over SDI when it has not been specified by the application. This setting also determines the VOut formats to be displayed (see *"VOut Filters" on page 31*). Choose between:

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

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

SDI Input Quad Swap

When checked (default setting), changes the input Quad to SDI quadrant mapping from 1 to 1 to:

Quad1	SDI3
Quad2	SDI4
Quad3	SDI1
Quad4	SDI2

SDI Output Quad Swap

Same as SDI Input Quad Swap above, but is applied to the SDI outputs.

QuickTime Settings

VANC Checkbox

When checked, the VANC checkbox tells the Io 4K Plus to capture and process any ancillary data in the SDI stream. This can include different types of metadata. Applications such as Premiere Pro and Final Cut Pro will not capture or output this data through the Io 4K Plus if this box is not checked.

NOTE: Io 4K Plus does not require enabling the VANC checkbox for Closed Captioning.

VOut Filters

These controls enable/disable output capabilities in the QuickTime VOut filter. This filter is used by older applications that are built on legacy QuickTime architecture such as FCP7, AJA TV and older versions of After Effects. Boxes that are checked will define what framerate and resolution types will appear in the list of available formats in the AJA hardware. For example, if 25/50 is unchecked, then all resolution/framerate combinations with 25 or 50 fps will not appear in the list of capabilities for the installed AJA hardware, when using QuickTime VOut filter reliant application software.

Check the following to display that format, or leave unchecked to hide that format.

- 23.98/29.97/59.94
- 24/30/60
- 25/50
- 2K
- RED
- 4K

NOTE: The 2K, RED, and 4K checkboxes need to be enabled for that format to be presented and selectable in applications like AJA TV.

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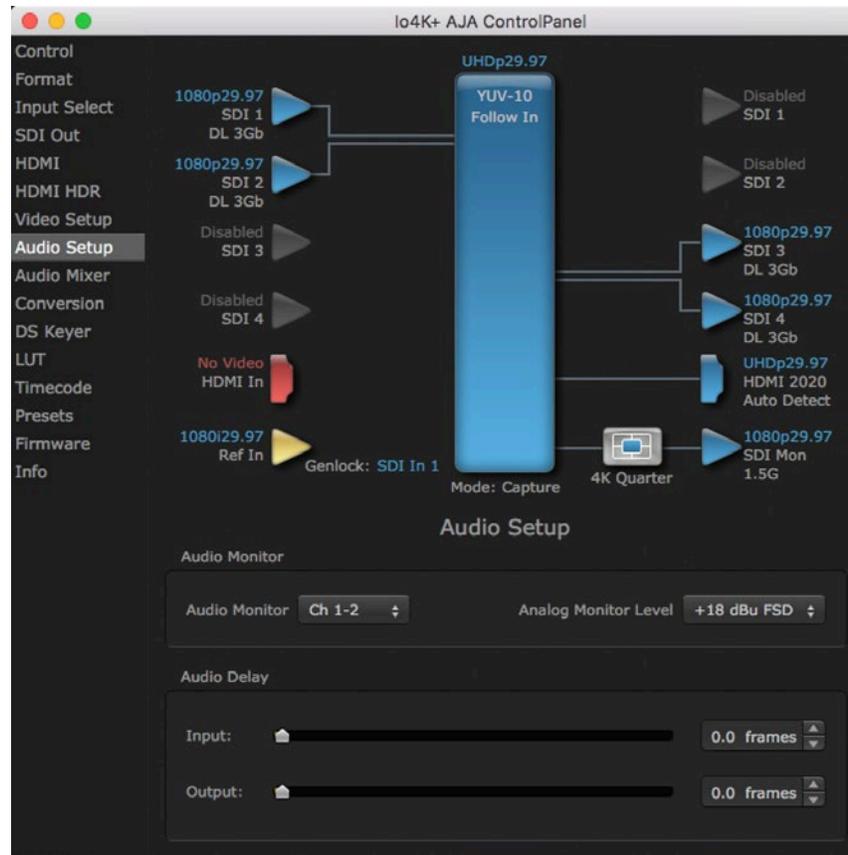
The Audio Setup screen shows the current settings for the analog audio output, allowing you to re-configure it when desired.

Audio Monitor

This control selects which pair of channels from the NLE will be monitored. For most editing scenarios this should remain as Ch 1-2, since most NLEs default to dual track / stereo monitoring as a sum of the entire timeline.

NOTE: *This setting only applies to dual channel monitoring environments (for example, the headphone jack on the front of the Io 4K Plus).*

Select from:
  • Ch 1-2 through Ch 15-16

Analog Audio Monitor Level

This selection determines the analog audio output level ("FSD" is full-scale-deflection reading as measured on a VU meter). In addition to the front panel monitor (headphone) output, this setting also effects the analog output via the DB25 cable. Select from
  • +24dBu, +18dBu, +15dBu, or +12dBu

Audio Delay

Here you can set up to 6 frames (in tenths of a frame) of delay for the AJA device's audio input and output. The AJA Control Panel delays all audio outputs—SDI, HDMI, and Analog. This feature is useful in compensating for the processing delay of a video monitor when audio is being monitored directly from the Io 4K Plus (for example, when an audio mixer is connected to the DB25 analog audio inputs).

Audio Mixer Screens

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

The selection check boxes and screen slider controls affect the following Io 4K Plus outputs:

- SDI Embedded Audio Out
- HDMI Embedded Audio Out
- Analog Audio Out (via DB25 cable)
- Front Panel Monitor Out (headphone jack) - This level can also be adjusted with the front panel gain knob, and is additive to the screen slider controls.

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

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

Figure 9. Audio Mixer Screen Example
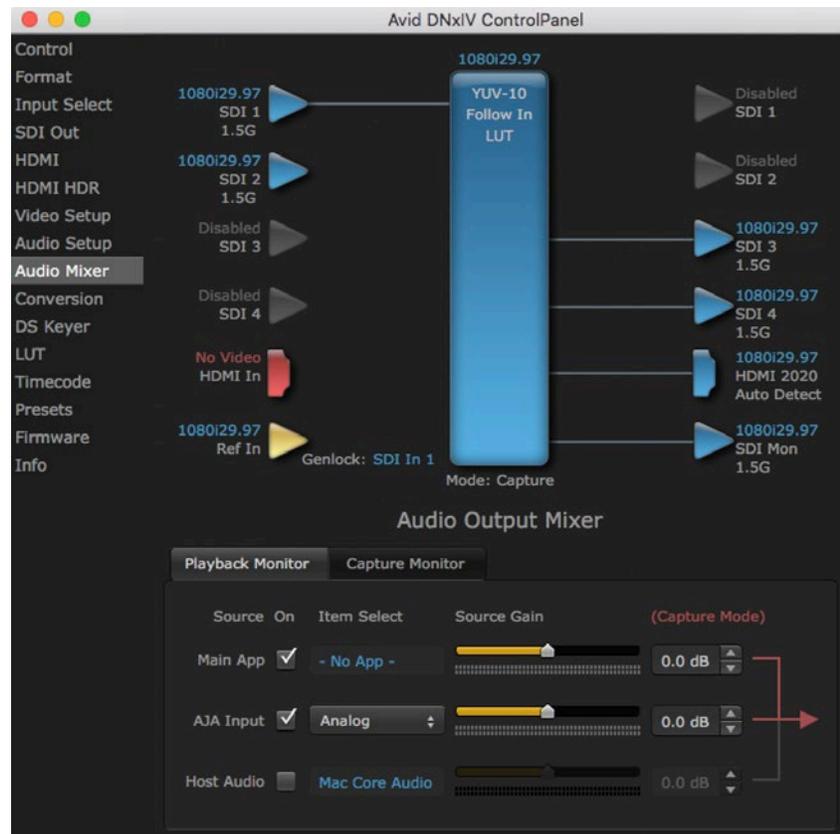
Each source has a confidence meter, which enables you to tell immediately if you have a source arriving correctly at the AJA hardware (without having to launch any other software). The level sliders allow a simple plus or minus adjustment to the Source level being monitored. This is to allow for fine-tuning of your listening environment (on occasions the host system audio can be unexpectedly loud, or an incoming feed may be very loud or very quiet).

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

Controls in each tab are only in effect when Io 4K Plus is in the correct operating mode, as determined by the controlling application or the Control Panel application's Default Output setting. When the mode doesn't match, the mode indicator on the right goes red (see *Figure 9 on page 33*). However, settings can be adjusted while in that disabled mode, and will be applied when you return to that operating mode.

Audio Mixer Playback Monitor Mode Screen

Figure 10. Audio Mixer Screen, Playback Monitor Mode
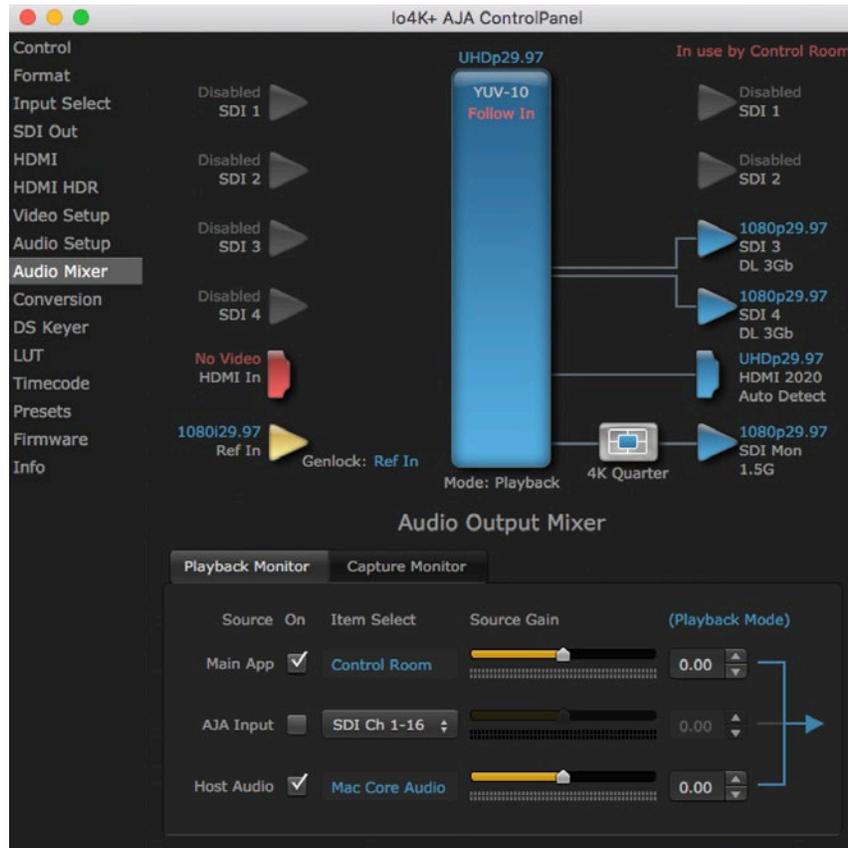
Playback Source Selection

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

Main App

If an external application is controlling the Io 4K Plus, it will be displayed in the **Item Select** column and its audio can be selected for playback with the checkbox.

AJA Input

Selects for monitoring the audio being input to Io 4K Plus.

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

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

- Analog - The Analog Audio being received on the Io 4K Plus, DB-25 connector.
- HDMI - The embedded audio being received on the Io 4K Plus HDMI In connector.
- SDI Ch 1-16 - The embedded audio being received on the Io 4K Plus SDI In connectors.

Host Audio

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

Source Gain

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

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

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

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

Audio Mixer Capture Monitor Mode Screen

*Figure 11. Audio Mixer Screen, Capture Monitor Mode*
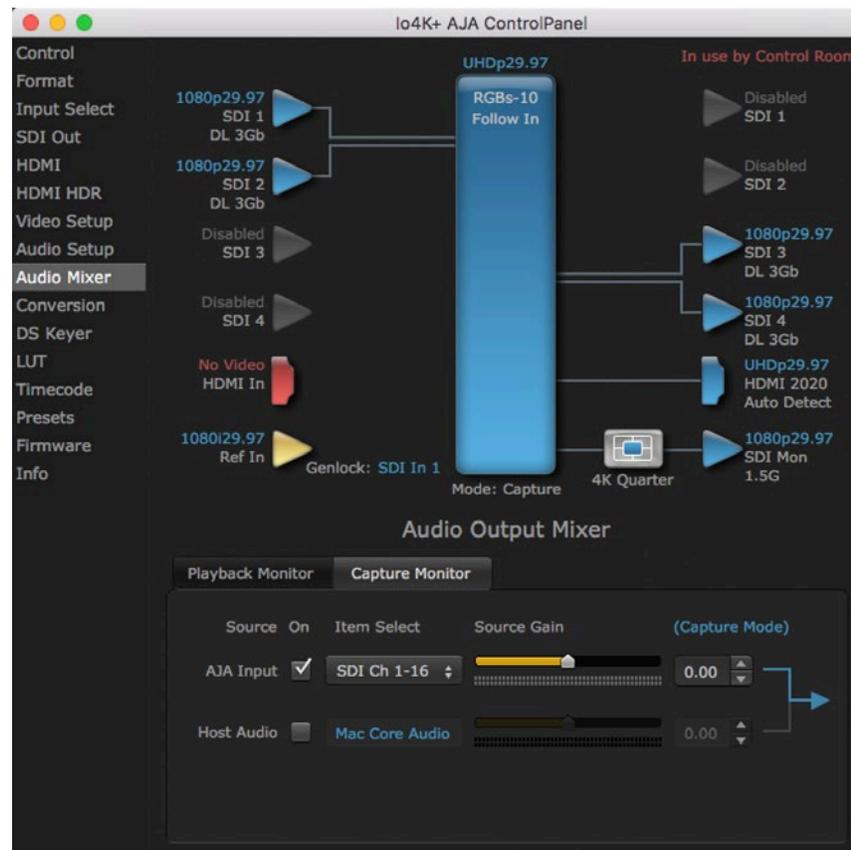
The Capture Monitor Mode screen is used to select and mix audio to be monitored during capture operations.

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

The controls on this screen are similar to those on the Playback Monitor Mode screen, except the Main App is not available for selection (you cannot capture from the application that is capturing). See *"Audio Mixer Playback Monitor Mode Screen" on page 34* for more information.

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

Conversion Screen
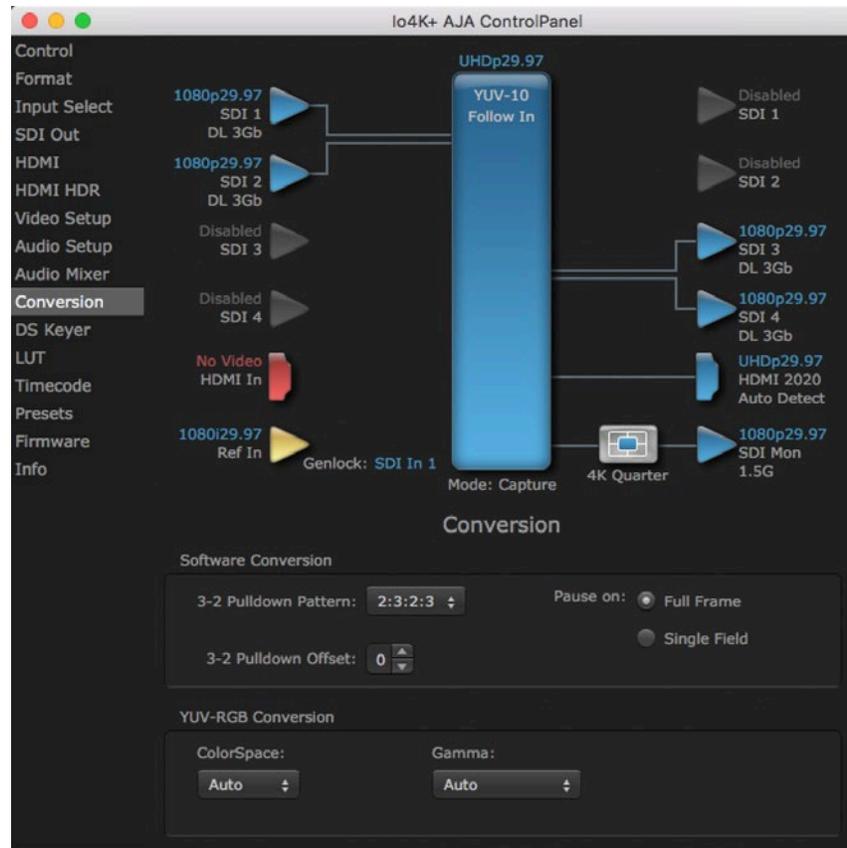
The Conversion Screen offers controls that determine how the card behaves with 3rd-party applications.

NOTE: *This screen is present in the Mac version of AJA Control Panel only and not all applications support these functions.*

Software Conversion

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

3:2 Pulldown Pattern

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

- 2:3:2:3
- 2:3:3:2
- 2:2:2:4

3:2 Pulldown Offset

The 3-2 Pulldown offset is used if the 3-2 pulldown feature is removing the wrong frames. This setting lets you adjust when the pulldown begins in a sequence of frames. Select from 0 to 4 frames.

Figure 12. Conversion Screen Frame-padding Pattern Choices
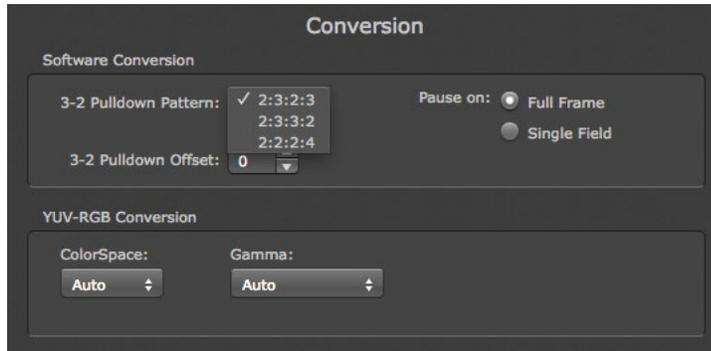
Pause On

These two choices determine what happens when the editing application is paused in stop mode:

- Full Frame: both fields are displayed resulting in some jitter while paused.
- Single Field: a single field is displayed, showing no flicker (useful when color correcting or whenever the flickering would be a distraction).

YUV-RGB Conversion

These pulldowns select industry standard color space and gamma transfer functions for the YUV-RGB conversion, or allow you to direct Io 4K Plus to automatically determine it for you.

Colorspace

- Auto
- Rec 601
- Rec 709

Gamma

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

DS Keyer Screen
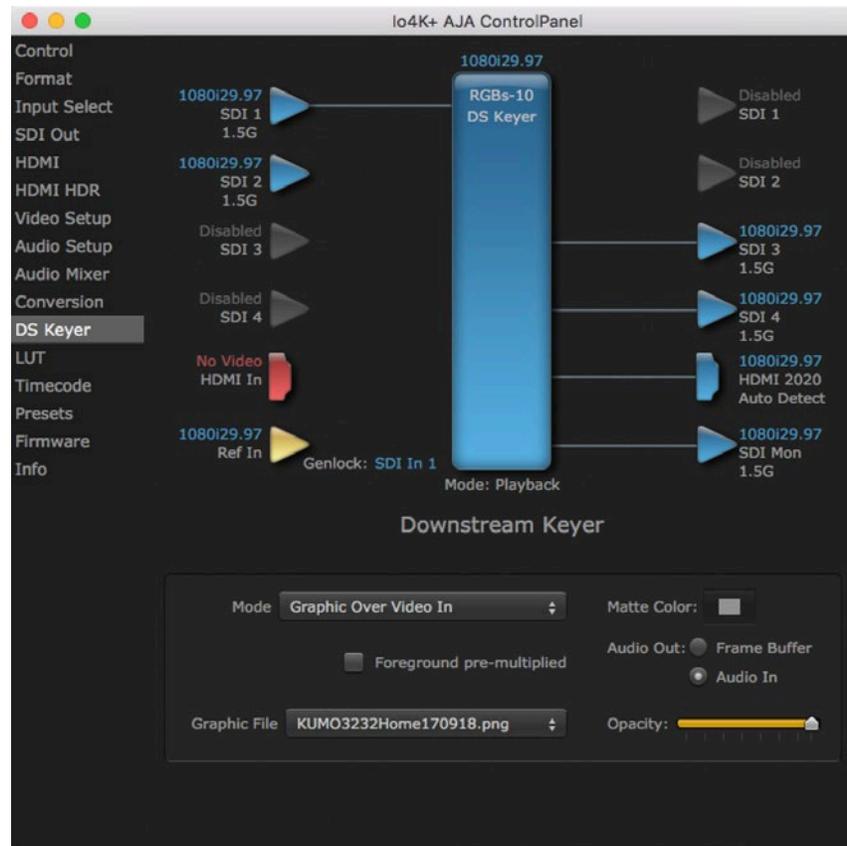
The Io 4K Plus has a hardware-based downstream keyer that is ideal for putting logos, "bugs" or other video material with an alpha channel on top of video being played out or printed to tape.

NOTE: The Io 4K Plus does not support Downstream Keying in UltraHD and 4K formats.

A typical application would be putting a television station's call letters or channel over program video content. Keyed video can be from the Io 4K Plus internal Frame Buffer (from storage, video In, etc.) or from a graphics file that has an alpha channel (Photoshop etc.).

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

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 Io 4K Plus
  Frame Buffer (which might be from storage, video In, etc.).

Matte Color

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

Foreground pre-multiplied (checkbox)

Use to avoid "matte lines" and improve the appearance of the foreground (key)
being composited over the background.

Audio Out

- Frame Buffer - Select audio out to be routed from the Frame Buffer.
- Audio In - Select audio out to be routed from the Io 4K Plus's selected input(s).

Graphic File

This pulldown allows you to choose from any recently accessed file or select a
new file ("Load File..."), which then brings up a file dialogue. You can load any
standard RGB graphics file (.tif,.psd, etc.) into the frame buffer for display, but
some graphics formats and bit depths may not be supported.

The file raster (pixel x pixel count) should match the primary format in the frame
buffer or the secondary format if up-converting. For example, you wish to key a
logo on top of a 1920x1080 footage, the still image with alpha channel that you
load should be 1920x1080.

Loaded graphic files are retained for redisplay if another file is chosen, and even if
the Io 4K Plus is power cycled.

NOTE: *A loaded graphics file will not be scaled to fit. If it's smaller than the current frame
buffer format,Io 4K Plus will center it in the frame. If larger than the current frame
buffer format it will be cropped.*

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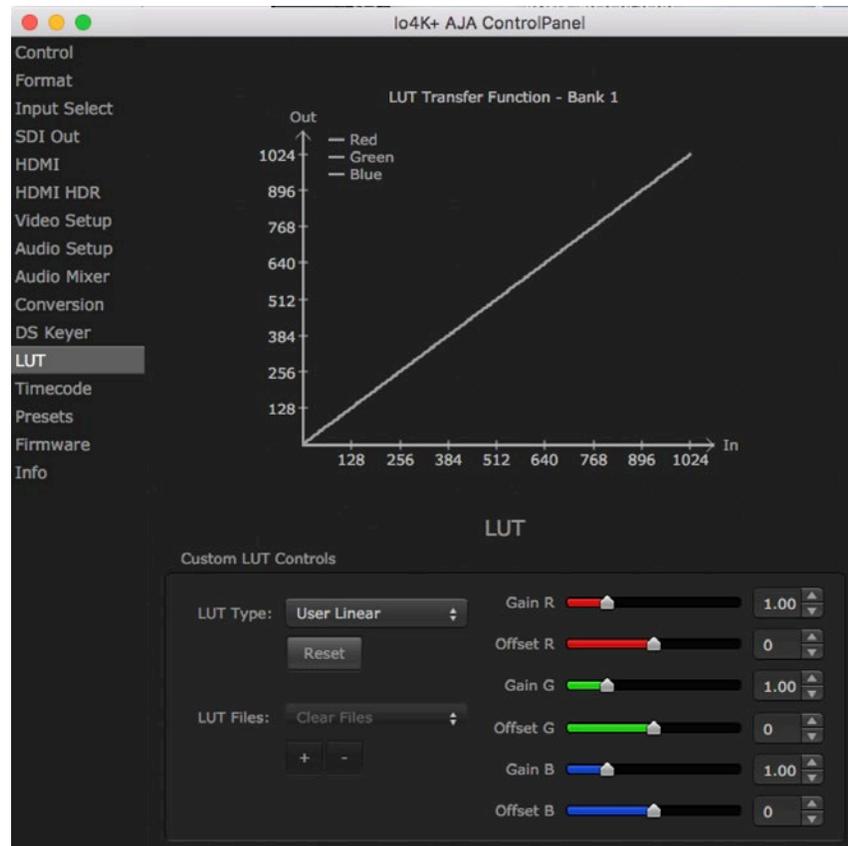
The LUT screen controls allow you to create a custom color look up table (LUT) on the output, for matching a production "look" on a specific display.

Users can also specify their own custom LUTs by creating a LUT file and uploading it to an AJA Video Device using the LUT (lookup table) screen in the Control Panel.

Custom LUT Controls

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

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

LUT Type

Selects the type of LUT. Choose from

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

Figure 13. Example LUT Transfer Function Curves
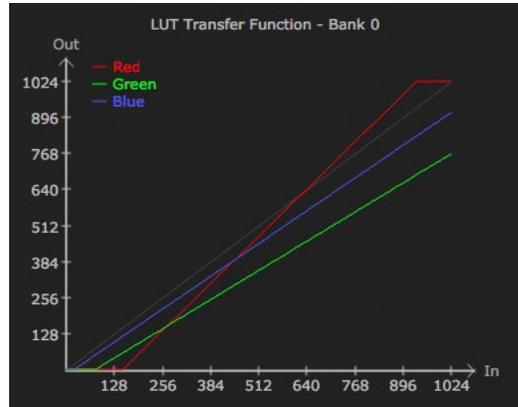
- User Film Stream - Activates the Gain and Offset controls with a default curve matching Grass Valley FilmStream cameras, and also allowing manual creation of a custom LUT.
- User LUT File - See *"LUT Files"* below.

Gain and Offset Controls

When activated, the controls on the right allow adjustment of Gain and Offset for Red, Blue and Green.

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

Reset

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

LUT Files

The User LUT File setting above activates the LUT Files dropdown, allowing the selection of a previously saved LUT file. You can create a custom LUT file using most text editors or spread sheets, provided the data is arranged according to the LUT File Format Specification that follows (see *"LUT File Format Specification" on page 43*).

Uploading Custom User LUT file

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

1. Before loading a LUT, make sure you are using an RGB/RGBA frame buffer format, and that you have a AJA Video Device that supports LUTs.

2. Open AJA Control Panel and select the "LUT" pane.

3. Click the "LUT Type" popup and choose "User LUT File" menu item. Note "LUT Files" options become enabled.

4. Click the "+" button and use the navigation dialog to choose a custom LUT file. The LUT is now loaded.

## LUT File Format Specification

LUT files are normal text files that contain 1025 lines (numbered 0 - 1024). Each line contains 3 integer values in the range 0 - 1023, representing 10 bit R, G, B component output values. Component values may be separated by one or more commas, spaces, or tabs. The example below show LUT File contents for Line 0, Line 1, Line 2, and Line 1024, with several valid ways to separate the numbers in a line.

- 16, 17, 17
- 17 18 18
- 19 19 21
- …
- 1000, 1022, 1023

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

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

Timecode Screen
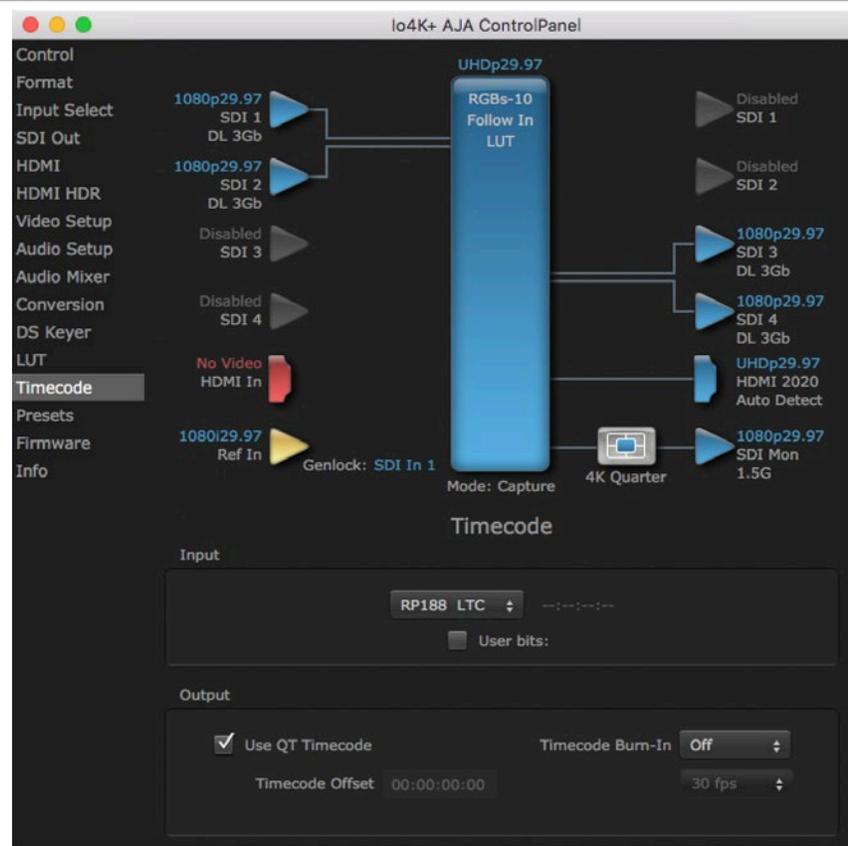
The Timecode screen is used to select the timecode stream read for applications that use it (for example, in AJA Control Room when the Timecode Source preference is set to "Control Panel Setting" that application will read the selected stream). This screen is also used for monitoring the RP-188 timecode embedded in the digital data stream, for selecting a timecode offset (if required), and setting timecode outputs.

Timecode Input Settings

RP-188 Timecode <n>

In RP-188 timecode (SMPTE 12M-gg2) there can be multiple timecode types in the data stream. Use this pull-down to select the one you wish to monitor:

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

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

User Bits

For monitoring a variable framerate (VFR) timecode (such as Varicam), you may wish to check the User-bits box. If you set this checkbox, Io 4K Plus will detect and interpret the user-bits and display them next to the checkbox. You will see the original framerate (30 fps in the figure below) followed by the adjusted frame padding (two digits reporting discarded and retained frame padding).

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

Figure 14. AJA Control Panel, Timecode Screen
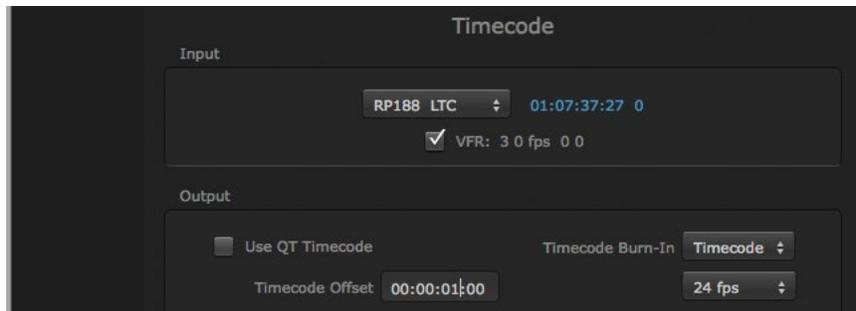
Timecode Output Settings

Use QuickTime Timecode (Mac OS Only)

This feature is for Final Cut Pro 7 (or earlier), VTR Exchange, and AJA TV only. When checked, it directs Io 4K Plus to output timecode from the QuickTime timecode track.

Timecode Burn-in

This pulldown selects whether the timecode value is displayed in a "burned-in" window in video output. If set to "OFF", timecode will not be keyed over the video. If set to "Timecode", then the timecode value will be keyed over the output video for all of the Io 4K Plus outputs. This can be useful for synchronizing, choosing edit points, dailies, and many other purposes.

Timecode Offset

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

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

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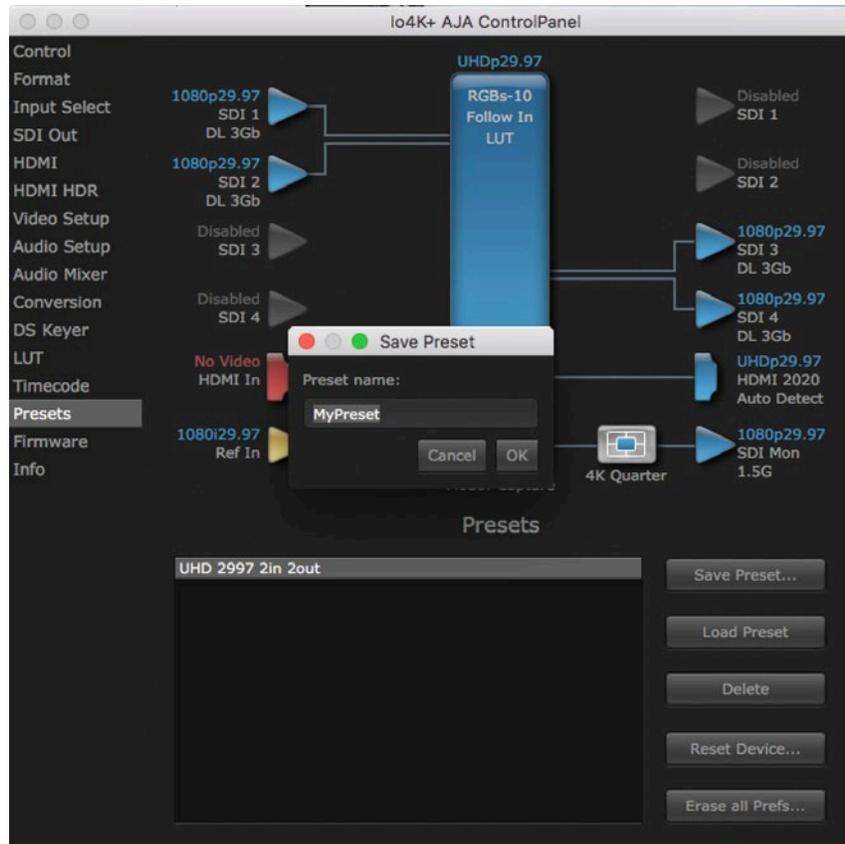
After configuring the AJA Control Panel screens, you can then save all your settings as a snapshot for later recall—called a preset. In this way, you can organize presets for all your typical tasks, eliminating time-robbing manual reconfiguration each time. To save a preset, simply go to the Presets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

Loading and Saving Presets

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

Transferring Saved Presets

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

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

Reset to Default

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

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

Erase all Prefs

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

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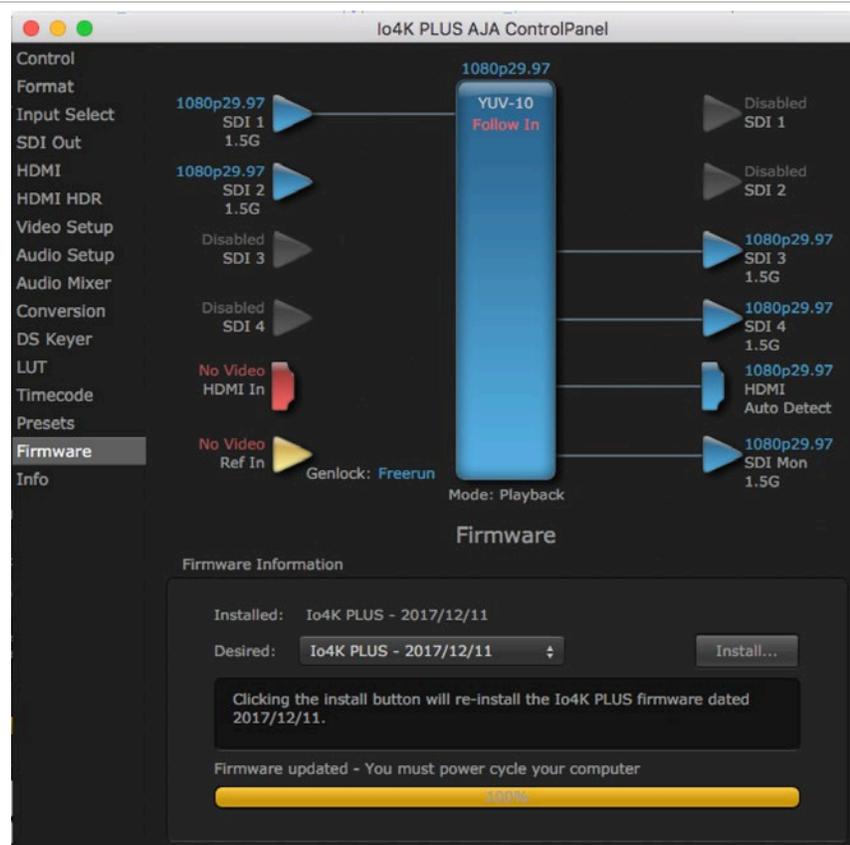
Use the Firmware screen to access the firmware install screen. Click install to erase current firmware and load the firmware version contained in your current driver installation. Note the Installation message shown below.

Figure 15. Update Completed
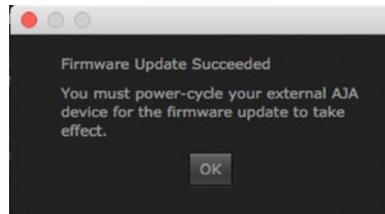
You will be required to power-cycle your Io 4K Plus and computer to finish the update.

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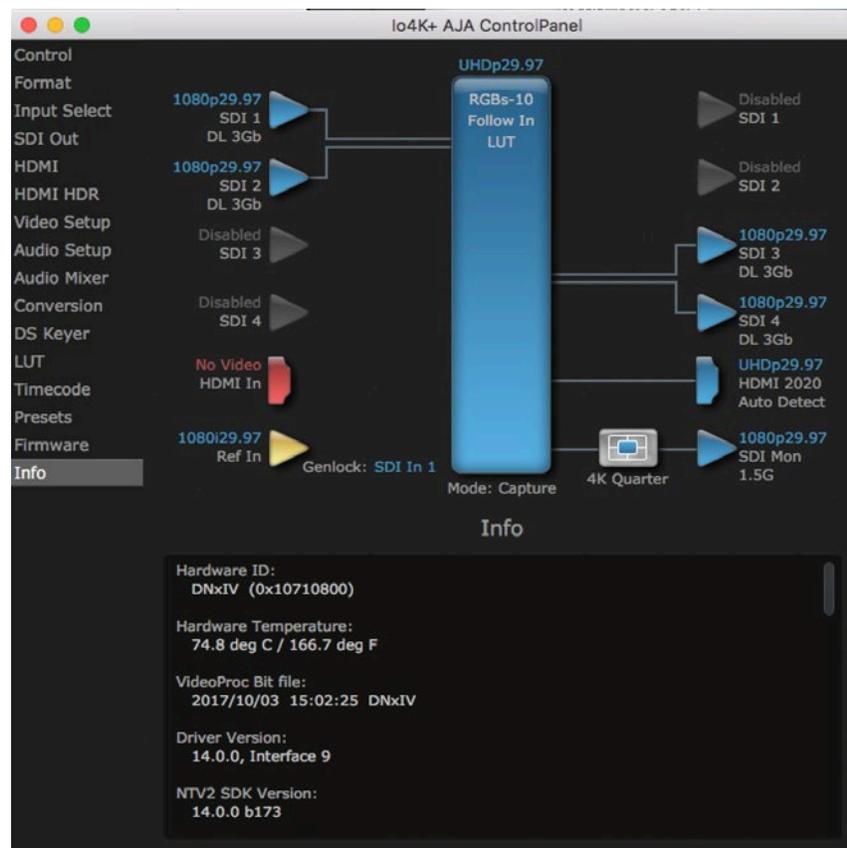
The Info Screen shows the software files that have been installed on your system. This information may be needed if you talk to an AJA Customer Service representative to determine if files are missing or need updating.

Appendix A – Specifications

Io 4K Plus Tech Specs

Video Formats

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

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

Video Inputs

- 12G-SDI, SMPTE-2082, 12-bit*, 10-bit and 8-bit
- 6G-SDI, SMPTE-2081, 10-bit and 8-bit
- 3G-SDI, SMPTE-259/292/296/424/425, 12-bit*, 10-bit and 8-bit
  - 4K/UltraHD 4:4:4 (4 x BNC)
- 1.5G-SDI, SMPTE 372M, Dual Link HD 4:4:4 (2 x BNC), 12-bit*, 10-bit and 8-bit
- 1.5G-SDI, SMPTE 292M, Single Link 4:2:2 (1 x BNC), 10-bit and 8-bit
- HDMI v2.0
  - 30/36 bits/pixel, RGB or YUV, 6 Gbps per color component
  - 4K, UltraHD, 2K, HD and SD with HFR support up to 60p (4:2:2), 10-bit and 8-bit

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

Note: 12G-SDI, 6G-SDI configured outputs support UltraHD / 4K only

Video Outputs

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

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

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

Note: 12G-SDI, 6G-SDI configured outputs support UltraHD / 4K only

Audio Inputs Digital

- 16-Channel, 24- and 16-bit SDI embedded audio, 48 kHz sample rate, synchronous
- 8-Channel, 24- and 16-bit HDMI embedded audio, 48 kHz sample rate, synchronous

Audio Inputs Analog

- 4-Channel, 24 and 16-bit D/A analog audio, 48 kHz sample rate, balanced, using industry standard 8x XLR on DB-25 breakout cable (cable not included)
- +24 dBu full scale digital (0dBFS)
- +/- 0.2 dB 20 to 20 kHz frequency response
- Input is supported across Ch. 1-4

Audio Outputs Digital

- 16-Channel, 24-bit SDI embedded audio, 48 kHz sample rate, synchronous
- 8-Channel, 24-bit HDMI embedded audio, 48 kHz sample rate, synchronous

Audio Outputs Analog

- 4-Channel, 24-bit D/A analog audio, 48 kHz sample rate, balanced, using industry standard 8 x XLR on DB-25 breakout cable (cable not included)
- +24 dBu full scale digital (0dBFS)
- +/- 0.2 dB 20 to 20 kHz frequency response
- Output is supported across Ch. 5-8

Downstream Keyer

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

Down-Conversion 4K/UltraHD

- Real time, dedicated 4K down-conversion output (1 x BNC)
- 4K to 2K down-conversion
- UltraHD to HD down-conversion

Reference and LTC I/O

- 1 x BNC LTC output
- 1 x BNC assignable to Reference video or LTC input

Reference

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

Electrical Interface

- Thunderbolt 3 (2 x)

Machine Control

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

Shell GND

  1 GND

  2 RX-

  3 TX+

  4 GND

  5 No Connection

  6 GND

  7 RX+

  8 TX-

  9 GND

Shell GND

Size (w x d x h)

- 8.74" x 8.11" x 1.65" (222mm x 206mm x 42mm)

Weight

- 3.4 lbs (1.5 kg)

Power (device only)

- 10-20V, 30W typical, 36W max, 70W max with USB-C power delivery to external devices

Environment

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

Appendix B – Safety and Compliance

Federal Communications Commission (FCC) Compliance Notices

Class A Interference Statement

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

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

FCC Caution

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

Canadian ICES Statement

Canadian Department of Communications Radio Interference Regulations

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

Règlement sur le brouillage radioélectrique du ministère des Communications

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

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

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

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

Declaration of Conformity

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

CE This equipment meets the following conformance standards:

This equipment meets the following conformance standards:

Safety

EN 60065: 2014 (T-Mark License),

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

Additional licenses issued for specific countries available on request.

Emissions

EN 55032: 2012, CISPR 32: 2015

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

Immunity

EN 55103-2: 2009

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

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

EN 61000-4-6: 2009, EN 61000-4-11: 2004

Environments: E2, E3 and E4

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

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

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

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

Recycling Notice

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

Korea KCC Compliance Statement

A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
Class A (Broadcasting Communication Equipment for Office Use)	As an electromagnetic wave equipment for office use (Class A), this equipment is intended to use in other than home area. Sellers or users need to take note of this.

Taiwan Compliance Statement

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

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

Japan Compliance Statement

この装置は、クラスＡ情報技術装置です。この装置を家庭環境で使用す
ると電波妨害を引き起こすことがあります。この場合には使用者が適切な
対策を講ずるよう要求されることがあります。　　　　ＶＣＣＩ－Ａ

This is a Class A product based on the standard of the VCCI Council (VCCI 32: 2016).
If this equipment is used in a domestic environment, radio interference may
occur, in which case, the user may be required to take corrective actions.

Translated Warning and Caution Messages

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

 Warning Symbol   Caution Symbol

Before Operation Please Read These Instructions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Warning! Do not open the chassis. There are no user-serviceable parts inside. Opening the chassis will void the warranty unless performed by an AJA service center or licensed facility.

Avertissement! Ne pas ouvrir le châssis. Aucun élément à l'intérieur du châssis ne peut être réparé par l'utilisateur. La garantie sera annulée si le châssis est ouvert par toute autre personne qu'un technicien d'un centre de service ou d'un établissement agréé AJA.

Warnung! Öffnen Sie das Gehäuse nicht. Keine der Geräteteile können vom Benutzer gewartet werden. Durch das Öffnen des Gehäuses wird die Garantie hinfällig, es sei denn, solche Wartungsarbeiten werden in einem AJA-Service-Center oder einem lizenzierten Betrieb vorgenommen.

¡Advertencia! No abra el chasis. El interior no contiene piezas reparables por el usuario. El abrir el chasis anulará la garantía a menos que se lo haga en un centro de servicio AJA o en un local autorizado.

Advertência! Não abra o chassi. Não há internamente nenhuma peça que permita manutenção pelo usuário. Abrir o chassi anula a garantia, a menos que a abertura seja realizada por uma central de serviços da AJA ou por um local autorizado.

Avvertenza! Non aprire lo chassis. All'interno non ci sono parti riparabili dall'utente. L'apertura dello chassis invaliderà la garanzia se non viene effettuata da un centro ufficiale o autorizzato AJA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Warranty and Liability Information

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Limited Warranty on Hardware

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

If a hardware product or storage module (hereafter, a "product") proves to be defective during the applicable warranty period, AJA Video, at its option, will either repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

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

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