BRIDGE LIVE

Video I/O and Streaming Appliance

Installation and Operation Guide

(comprimato)

AJA
VIDEO SYSTEMS

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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:

Telephone	+1.530.271.3190
FAX	+1.530.271.3140
Web	https://www.aja.com
Support Email	support@aja.com
Sales Email	sales@aja.com

Contents

Chapter 1 – Using this Manual

Welcome

This manual is designed to enable the quickest path to productivity with BRIDGE LIVE. An outline is presented below.

Guidance on Where to Start Depending on Role

If the system has already been set up by an administrator, then we advise beginning at Chapter 2 or Chapter 3, and reading through Chapter 6.

If you are setting up the system for the first time, begin at Chapter 7 - Initial System Setup and Configuration. For general administrative functionality, see Chapter 8, Advanced System Administration.

Chapters 9 through 12 are intended only for experienced System Administrators.

How Chapters are Organized

"Chapter 1 Using this Manual". Guidance on where to start depending on role and requirements.

"Chapter 2 Introduction to BRIDGE LIVE". Providing a general overview of the product and its capabilities.

"Chapter 3 Getting Started". Accessing the system via browser or locally.

"Chapter 4 Basic Use Case: SDI to Streams Encoding". Basics of outputting streams from SDI Inputs.

"Chapter 5 Basic Use Case: Streams to SDI Decoding". Basics of outputting SDI from JPEG 2000.

"Chapter 6 BRIDGE LIVE Features and Interface Deep Dive". Covers the various parts of the UI or feature set not yet covered in detail, and contrasting various settings and options.

"Chapter 7 Initial System Setup and Configuration"; Host Name, Network Connectivity, Licensing.

"Chapter 8 Advanced System Administration"; Advanced setup configurations and software version management.

"Chapter 9 OS and Network Administration"; Console administration, web administration, manual network interface configuration, virtual interfaces.

"Chapter 10 Using REST API"

"Chapter 11 Using SNMP"

"Chapter 12 Troubleshooting"

Chapter 2 – Introduction to BRIDGE LIVE

Overview

BRIDGE LIVE is a compact, 1RU form factor, turnkey solution, created/developed for numerous professional and enterprise-level live video workflows for UltraHD and HD.

Designed for low-latency and high-quality to meet the requirements of broadcasters and content distributors, BRIDGE LIVE is built for critical streaming applications that require high-performance video encoding, decoding, transcoding, flexible video I/O, and comprehensive metadata support.

Its primary function is to take SDI to compressed formats and compressed formats to SDI. BRIDGE LIVE enables end-to-end live video production, from contribution encoding to facility decoding, up to final distribution transcoding, all supported via public Internet.

BRIDGE LIVE supports up to 4x HD, or 1x UltraHD through 1x 12G-SDI. It supports SRT, RTMP/S and MPEG-TS across JPEG 2K, H.265 (HEVC), H.264 (AVC, MPEG-4), and H.262 (MPEG-2). It includes dual 10GbE on-board NICs for network connectivity.

While the system is designed to be primarily headless and controlled through a web browser interface or REST API, a Display Port supports a local display.

BRIDGE LIVE boots up directly into a managed interface, making it easy to use.

Features

- UltraHD or up to four streams of HD with broad encode/decode options and 12G-SDI/3G-SDI I/O. Seamlessly meshes UltraHD/HD-SDI and Streaming/IP for live workflows using H.264 (AVC), H.265 (HEVC), MPEG2 and optionally JPEG 2000.
- Protocol support across SRT (implemented with encryption), RTMP, RTMPS (required for Facebook Live), and MPEG-Transport Stream. Remote workflows supported with low-latency across public Internet.
- Support for RTP over UDP (RTP/UDP), UDP
- Metadata support for the following:
    - Ad insertion markers (SCTE-35/SCTE-104)
    - CC/Subtitles embedding into H.264 SEI messages
    - Closed Captions (EIA-608/708) conversion
    - Line 21 captions
    - MPEG-2 ancillary packet support, SMPTE 2038
    - Electronic program guide (EPG) on input
- Metadata pass through
- Content Delivery through Live Streaming (YouTube/Facebook Live, Twitch), Encoding for Distribution (ABR-Ladders profiles/OTT delivery), Production Encoding (simple encode for delivery), or Video Transport/Contribution for live event feeds.
- Simple to use, robust 1RU turnkey enterprise class appliance with redundant power.
- REST API and SNMP integration allows BRIDGE LIVE to be used in existing workflows and with 3rd-party monitoring tools.

Four Primary Use Cases

BRIDGE LIVE is designed for four main use-cases, described in more detail below:

1. Live Streaming,
2. Video Transport/Contribution,
3. Encoding for Distribution, and
4. Production Encoding

Live Streaming

Encode for live streaming.

Stream live events through Internet streaming services such as YouTube Live, Facebook Live, and Twitch.

Use multiple channels, formats, bit-rates, protocols and redundancy.

Implement multicamera installations for streaming from a studio.

Transport stream to a partner.

Video Transport/Contribution

Reliably encode and transport video feed from live event, such as a sports stadium, to production facility where it is decoded for remote production. Secure and transport video feeds over public Internet. This transport method replaces satellite connections for a fraction of the cost and with better latency.

For example, an SDI (source) to SDI (destination) hand-off via H.264, 4:2:0, works well for the majority of users today, and for higher-end clients who may desire JPEG2000 or H.264 4:2:2.

- A single UltraHD channel can be transported with 1x 12G-SDI cable on any of the four SDI connectors.
- Four simultaneous HD channels (1080 60p) can be delivered with 4x 3G-SDI connectors.

Encoding for Distribution

Encode processed and produced video channel for primary distribution to partners (B2B) or for OTT (over the top) streaming. For example, you can run an H.264 or HEVC hand-off with ABR (adaptive bitrate) ladder profiles encoding, which can include pointing the ladder profile directly to a local packager or CDN.

Production Encoding

Encode SDI video for live production output, where video is delivered as the intended or intermediate format, such as H.264/H.265, 4:2:0. If a backup is needed, store locally with NAS or local HDD.

For example, Telcos, IPTV, Cable operators receive an SDI signal from a source and they need simple MPEG-TS encoded with H.264/H.265 without ABR ladders. The output could be sent for further processing, or streamed to their IPTV/Cable network directly.

Metadata

BRIDGE LIVE allows the pass through of metadata, and supports the following metadata types:

- Ad insertion markers (SCTE-35/SCTE-104) conversion
- CC/Subtitles embedding into H.264 SEI messages
- Closed Captions (EIA-608/708) conversion
- Line 21 captions
- MPEG-2 ancillary packet support, SMPTE 2038
- Electronic program guide (EPG) on input

Encoding and Decoding Protocols Supported

Encoding

BRIDGE LIVE supports encoding from SDI to Stream, and from SDI to JPEG 2K Stream (with optional license). See Table 1 and Table 2 below for encoding signal specifications.

Table 1. SDI to Stream Encoding

Encode	HD (1080p)	UltraHD	Supported Protocols
H.264 (AVC) 4:2:0, 8-bit	4 simultaneous up to 60p	1 up to 60p	SRT, RTMP/S, MPEG-TS
H.264 (AVC) 4:2:2, 10-bit (HQ)	4 simultaneous up to 30p	1 up to 30p	SRT, RTMP/S, MPEG-TS
H.264 (AVC) 4:2:2, 10-bit (HQ)	2 simultaneous up to 60p	1 up to 30p	SRT, RTMP/S, MPEG-TS
H.265 (HEVC) 4:2:0, 8/10-bit	4 simultaneous up to 60p	1 up to 60p	SRT, RTMP/S, MPEG-TS
MPEG2 4:2:0, 8-bit	4 simultaneous up to 30p/60i	N/A	SRT, RTMP/S, MPEG-TS
MPEG2 4:2:0, 8-bit (HQ)	4 simultaneous up to 30p/60i	N/A	SRT, RTMP/S, MPEG-TS

Table 2. SDI to JPEG 2K Stream Encoding (Optional License)

Encode	HD (1080p)	UltraHD	Supported Protocols
JPEG2K TR-01 2013 4:2:2, 10-bit	4 simultaneous up to 60p (80-220 Mbps)	1 up to 60p (up to 800Mbps)	SRT, MPEG-TS (note: No RTMP/S)

Decoding

BRIDGE LIVE supports decoding from Stream to SDI, and from JPEG 2K Stream to SDI (with optional license). See Table 3 and Table 4 below for decoding signal specifications.

Table 3. Stream to SDI Decoding

Decode	HD	UltraHD	Supported Protocols (Can be decoded back to SDI)
H.264 (AVC) 4:2:0, 8-bit	4 simultaneous up to 60p	1 up to 60p	SRT, RTMP/S, MPEG-TS
H.264 (AVC) 4:2:2, 10-bit (HQ)	4 simultaneous up to 30p	1 up to 30p	SRT, RTMP/S, MPEG-TS
H.264 (AVC) 4:2:2, 10-bit (HQ)	2 simultaneous up to 60p	1 up to 30p	SRT, RTMP/S, MPEG-TS
H.265 (HEVC) 4:2:0, 10-bit	4 simultaneous up to 60p	1 up to 60p	SRT, RTMP/S, MPEG-TS
MPEG2 4:2:0, 8-bit	4 simultaneous up to 30p/60i	N/A	SRT, RTMP/S, MPEG-TS
MPEG2 4:2:0, 8-bit (HQ)	4 simultaneous up to 30p/60i	N/A	SRT, RTMP/S, MPEG-TS

Table 4. JPEG 2K Stream to SDI Decoding (optional license)

Decode	HD (1080p)	UltraHD	Supported Protocols
JPEG2K TR-01 2018 4:2:2, 10-bit	4 simultaneous up to 60p (80-220 Mbps)	1 up to 60p (up to 800Mbps)	SRT, MPEG-TS (note: No RTMP/S)

Chapter 3 – Getting Started

Overview

This chapter covers the following topics:

- User types
- Accessing the system and logging in locally and remotely
- Introduction to the Dashboard interface
- System Information
- Stream Configuration

User Types

There are two user types for each BRIDGE LIVE System:

1. Admin Username ("admin") is used for local login, browser login and REST API access. This is the user type we are going to be using in the examples below.

2. Transcoder Username ("transcoder") is used for CLI/SSH (CLI stands for Command Line Interface, SSH for Secure Shell). This will be covered in *"Chapter 9 OS and Network Administration" on page 67*.

Accessing the System Locally and Remotely

There are two ways to access the UI:

1. Locally – being physically present within the server location and using kiosk mode (where there is a monitor, mouse and keyboard connected to the machine).

2. Remotely – using the assigned administration interface IP address in your web browser to remotely connect via the network.

Logging In Locally

To log in locally, you will need to supply your own USB keyboard, mouse and monitor connected through the Display Port.

Username and Password

The default username is "admin".

The password is unique for each system. Please see the QuickStart Guide that was included in the box with BRIDGE LIVE. If you have misplaced it or it is unavailable, please contact AJA Technical Support.

Forgotten Password

For forgotten default passwords, please contact AJA Technical Support.

Logging in Remotely with a Browser

IMPORTANT: To enable remote login through a browser, the admin must have previously setup the system's IP addresses. Until that has occurred, logging in remotely with a browser will not be available.

Once BRIDGE LIVE has been setup and the system's IP addresses and port numbers have been established, you can login through a browser by navigating to the login IP address and port number to access the following login prompt:

Figure 1. BRIDGE LIVE Initial Login Prompt via Browser
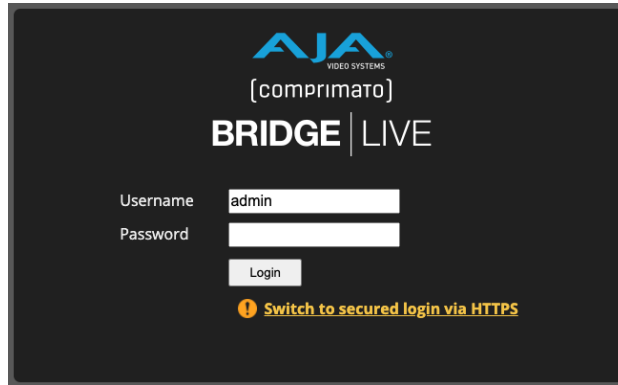
After entering a valid username and password, click Login. The Dashboard displays showing the general user interface.

Dashboard

BRIDGE LIVE is enriched with an easy-to-use browser-based user interface which can be used to set up and monitor pipeline tasks or provide access to administrative tools.

Upon logging in via browser, you will arrive at the Dashboard. Likewise if starting up BRIDGE LIVE locally, after logging in, the Dashboard will be presented. This is where the main configuration takes place and where you can access data monitoring tools.

Because BRIDGE LIVE is capable of outputting multiple stream types per input, "Pipeline" is used to describe the set of parameters dealing with the overall setup, from input source to encode, decode or transcode of output format(s).

Browsers

Generally, good performance is observed with Chrome, Chromium, Firefox and Safari.

Unsupported Browsers

Browsers change over time as new functionality is added. In some cases, if you are using an older browser, you may experience some issues when trying to administer BRIDGE LIVE through its UI. If that happens, you will be notified that you are using an old or unsupported browser, as pictured in *Figure 2*.

Figure 2. Example of an Unsupported Browser Message
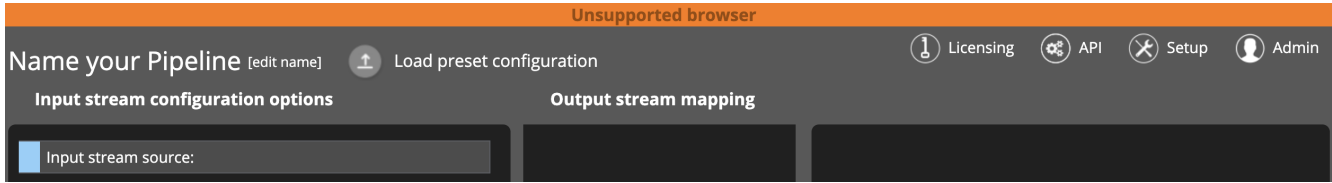
Figure 3. BRIDGE LIVE Dashboard
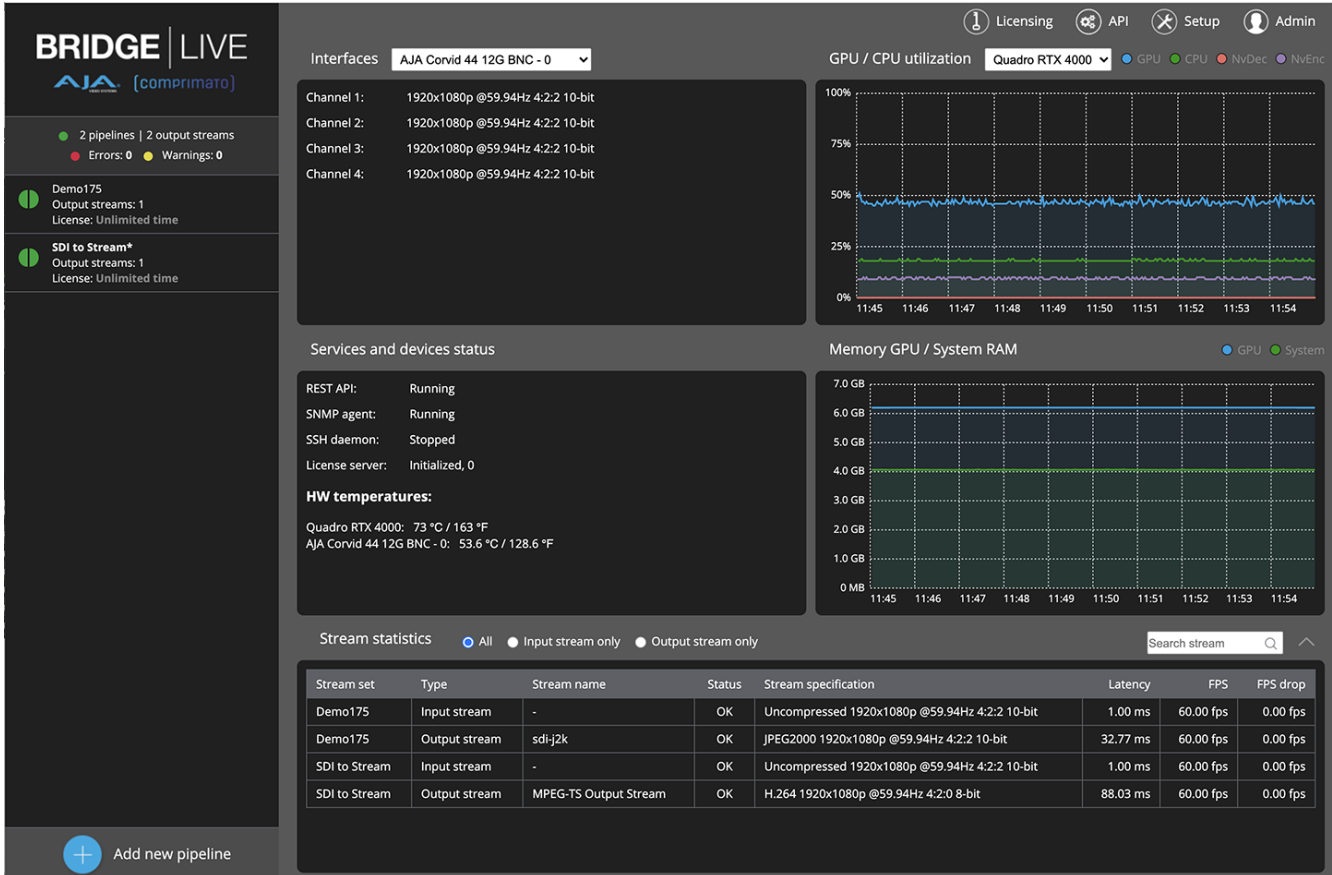
Dashboard Interface Basics

The Dashboard provides an overview of system status. It also shows an overview of performance and of the utilization of the system through the following interface elements:

Left Column - Encode, Decode and Transcode Pipelines

Upper Left Quadrant - Interfaces (SDI, 10GbE, Loopback throughput). Reports the data throughput transmitted (Tx) and received (Rx) for the selected interface. For SDI, it reports what is detected and if it is used for output streaming.

Upper Right Quadrant - GPU utilization/CPU utilization

Lower Left Quadrant - Services and devices status

Lower Right Quadrant - Memory GPU/System RAM

Lower Panel - Stream statistics including stream latency, FPS and FPS drops.

Returning to Dashboard Home View

At any time, to return to the main Dashboard home view, click the AJA/ Comprimato logos in the top left area of the Dashboard interface.

The Left Column (Pipelines)

NOTE: A "Pipeline" is the overall setup, from input source to decode, encode or transcode of output format(s).

Beneath the AJA and Comprimato logos, in the top left of the interface, is a summary of the number of running Pipelines, beneath which are flags for Errors (Red) or Warnings (Yellow).

Flags, Warnings and Errors

The Pipeline status indicators shown in *Figure 4* below show the number and types of errors, along with indicators for configured and applied Pipelines.

Hover the mouse over a half circle to see specific error messages for a Pipeline.

Figure 4. Pipeline status indicators
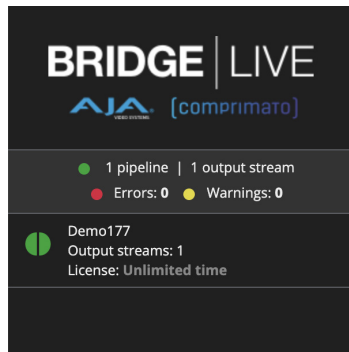
Below the errors and warning flags are the pipelines.

On the left side, each pipeline is a circular status icon. The left half of the colored circle provides feedback on the incoming part of the pipeline, while the right side indicates the status of the outgoing part of the pipeline.

Immediately to the right of the circular icon is the name of the pipeline. Further to the right, by hovering the mouse over, there is also a pipeline stop and start button.

Figure 5. Pipeline Stop Button

Figure 6. Pipeline Play Button
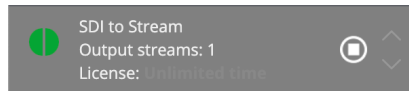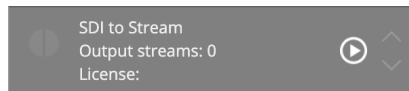

Beneath the name of the Pipeline is an indication of the number of output streams associated with the Pipeline. For every stream, there is also information on license status. Streams need to be licensed in order to run. For H.265, H.264 and H.262, BRIDGE LIVE will come with perpetual licenses.

Select a Pipeline to display the list of configured output streams for that particular input.

Meaning of Colors

Both sides Grey -
No pipeline has been created (new system or all pipelines deleted)
The Pipeline has been stopped

Right side Grey -
The output is not configured

Red - There is an error causing the Pipeline not to work correctly (left side (input), right side (output)).

Yellow - Standby mode. For example, this can occur when a Pipeline is in SRT mode and the stream does not have a subscriber. In that case, the stream is not being sunk. However, when a subscriber is actively receiving the stream, the signal will turn green.

Green - The stream is working correctly (and in the case of SRT, is being subscribed to).

Stream Licenses

If a license is granted, the status shows "Unlimited time" or the time for which the stream is allowed to produce an output, according to loaded license files (see *"Licensing" on page 62*). The status will be, for example:

- License: Unlimited time – a stream may produce an output for an unlimited period of time
- License: Till 2021-02-21 23:59:59 – a stream will produce an output until the displayed time point is passed.

NOTE: *For your convenience, the status shows the time and date according to your computer's time setting, not the BRIDGE LIVE system time, which may be different.*

For example, during installation, the automatic installer sets the time-zone to America/Los Angeles, but you may be located in a different time zone. Also, you might have offices in different time-zones and would prefer the servers to have the same system time, potentially for monitoring purposes.

If the stream is not allowed to produce an output, the license status reads "Blocked" or "Unavailable" and is shown red. BRIDGE LIVE will process the stream as usual, the only difference is that the output will not be sent to defined output sinks. This feature will help you verify your environment abilities, such as system load limits, input stream compliance, and other factors, even if you don't have enough licenses yet. For that reason, the input and output stream status indicator may be green even if the license status is not valid.

Possible invalid license statuses are:

- License: Blocked – there are licenses for the stream loaded in the system, but the count of streams exceed the licensed number (other streams have exhausted the available licenses)

- License: Unavailable – the stream needs a license which is not loaded (the stream contains a feature of newer version of BRIDGE LIVE which isn't included in any loaded license)

Upper Left Quadrant – Interfaces

The first quadrant (upper left) refers to the I/O interfaces, whether that be SDI I/O or 10GbE I/O.

Interfaces drop-down selections:

- For SDI I/O, select AJA Corvid 44 12G BNC - 0

  When we switch to the SDI I/O we can see any channels which have a live signal, and the format of that incoming signal. See *Figure 7* below.
- For streams I/O, select either:
  - Ethernet card 1 (eno1, 10 Gb/s) or
  - Ethernet card 2 (eno2, 10 Gb/s) –This displays throughput per Ethernet card; Ethernet Card 1 (eno 1), Ethernet card 2 (eno 2).
- For testing system throughput/latency, select Loopback (lo)

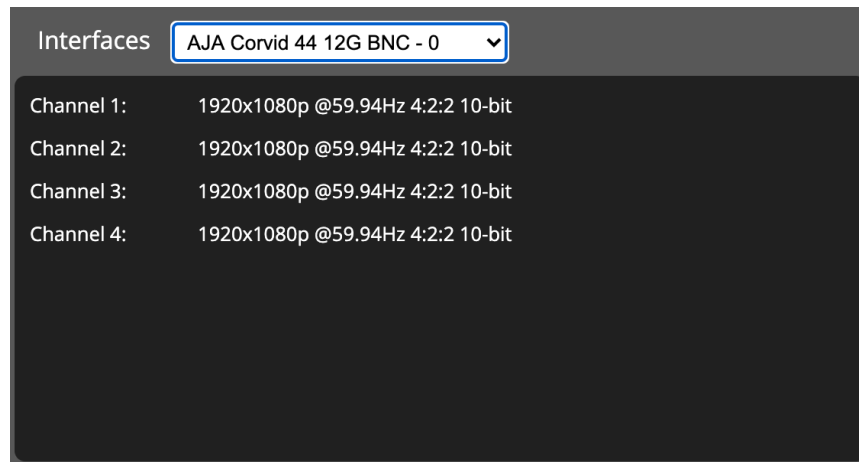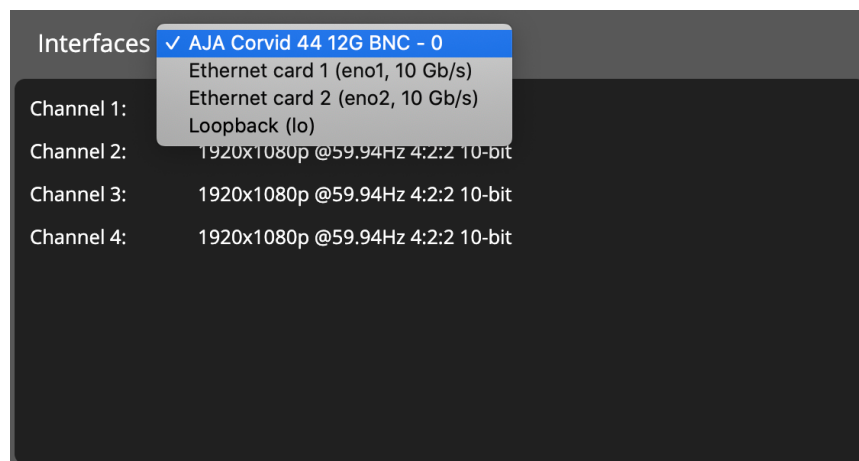*Figure 7. The Interfaces panel of Dashboard*

*Figure 8. The Interfaces panel drop-down menu*

Upper Right Quadrant – GPU Utilization/CPU Utilization

The second quadrant (upper right) shows GPU/CPU utilization hardware components. The GPU has 3 statistics. The blue line shows the level of GPU utilization. NvEnc represents the work of the NDA chip.

When working with JPEG 2000, you may see the second quadrant chart go to 100% utilization. Generally, however, the CPU is not expected to go over 65%.

Hover the mouse over the lines in Memory GPU/System RAM to see how much is being used and how much is available.

Figure 9. GPU utilization/CPU utilization panel of Dashboard
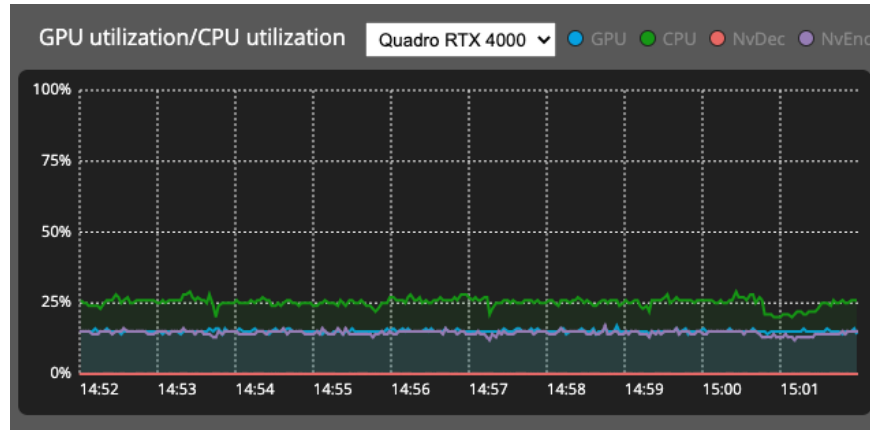
Lower Left Quadrant – Services and Devices Status

The lower left quadrant, Services and devices status, reports statistics for services that are running. It reports what is running, and it also displays the status of the License server. In the example shown below, the License server is initialized. Hardware temperatures are also reported.

Figure 10. Services and devices status panel of Dashboard
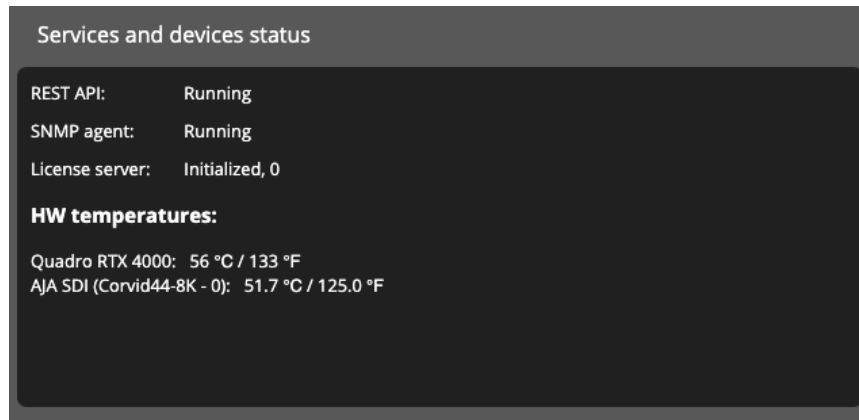
Lower Right Quadrant – Memory GPU/System RAM

The lower right quadrant, Memory GPU/System RAM, reports memory consumption.

Figure 11. Memory GPU/System RAM panel of Dashboard
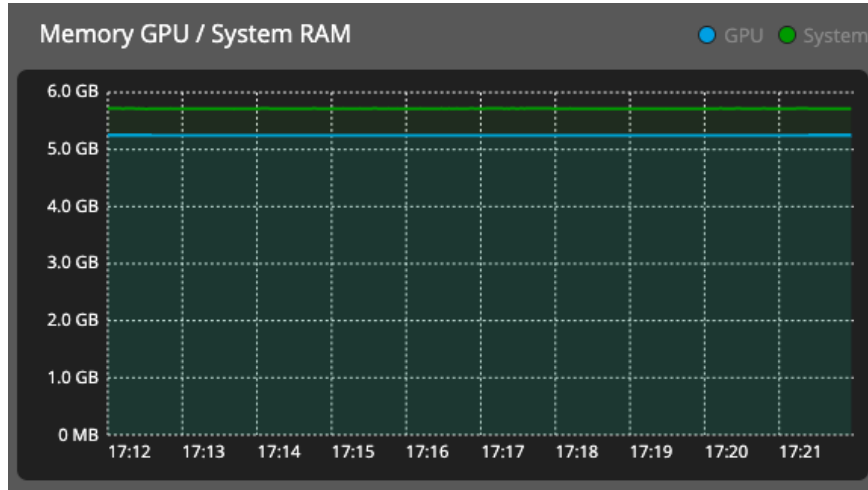
Figure 12. Memory GPU/System RAM panel of Dashboard showing mouseover
message
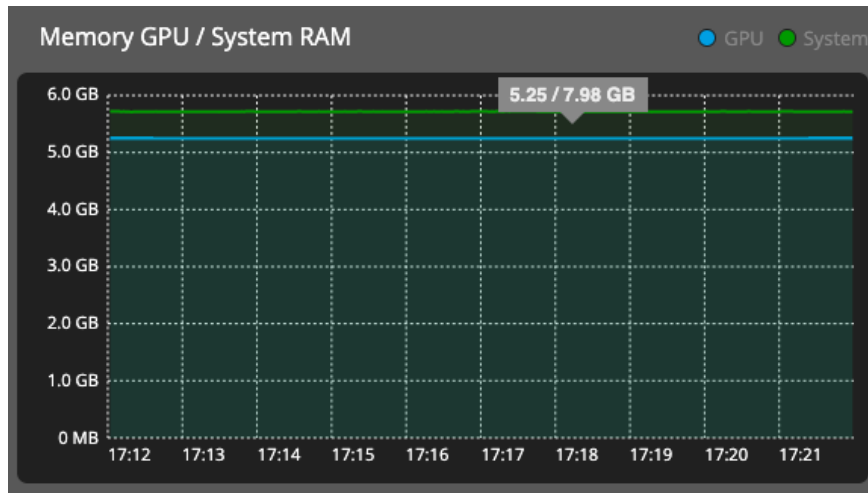
When you hover the mouse over the line in the graph, a mouseover message reports the amount of memory used followed by the amount of memory that is available.

Lower Panel

In the lower panel of Dashboard, you can see a list of all existing streams – both input and output. Use the Stream statistics radio buttons to filter by All, Input stream only, or Output stream only. You can also search for a particular stream using the search tab in the upper right section of the panel. See Figure 13 below.

NOTE: Pipelines that are still being configured and have yet to be applied will not display in the stream statistics area.

Figure 13. Dashboard Stream Statistics

Stream set	Type	Stream name	Status	Stream specification	Latency	FPS	FPS drop
Blue	Input stream	-	OK	Uncompressed 1920x1080p @29.97Hz 4:2:2 10-bit	1.03 ms	30.00 fps	0.00 fps
Blue	Output stream	Clear Blue Stream	WARNING	H.264 1280x720p @29.97Hz 4:2:2 10-bit	296.83 ms	30.00 fps	0.00 fps
Red	Input stream	-	OK	Uncompressed 1920x1080p @29.97Hz 4:2:2 10-bit	1.08 ms	30.00 fps	0.00 fps
Red	Output stream	Redstream	WARNING	H.264 1920x1080p @29.97Hz 4:2:0 8-bit	147.55 ms	30.00 fps	0.00 fps
SDI to H.264	Input stream	-	OK	Uncompressed 1920x1080p @29.97Hz 4:2:2 10-bit	1.08 ms	30.00 fps	0.00 fps
SDI to H.264	Output stream	SDI to H.264 Output	WARNING	H.264 1280x720p @29.97Hz 4:2:0 8-bit	144.28 ms	30.00 fps	0.00 fps
Green	Input stream	-	OK	Uncompressed 1920x1080p @29.97Hz 4:2:2 10-bit	1.04 ms	29.90 fps	0.00 fps
Green	Output stream	Green SRT	WARNING	H.264 1920x1080p @29.97Hz 4:2:2 10-bit	501.95 ms	30.00 fps	0.00 fps

In the event that an error occurs, the relevant line will turn red to notify you. Once you hover over a line with your cursor, the system will give you an error message as shown below in *Figure 14*.

Figure 14. BRIDGE LIVE UI - Stream Errors

Beyond the Dashboard

Besides the Dashboard, two other important areas of the interface are System Information and Stream Configuration. Other areas of the interface are covered as necessary in later chapters.

System Information

To view system information, hover your mouse over the Setup menu in the upper right corner, then click System information. System information reports various aspects of the system including software version, OS version, Installation ID, Memory statistics, drivers, hardware and network information.

Figure 15. Selecting System information from the Setup menu
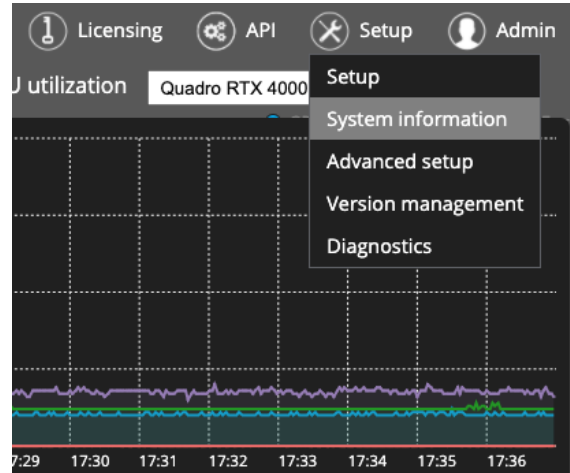
Figure 16. System Information
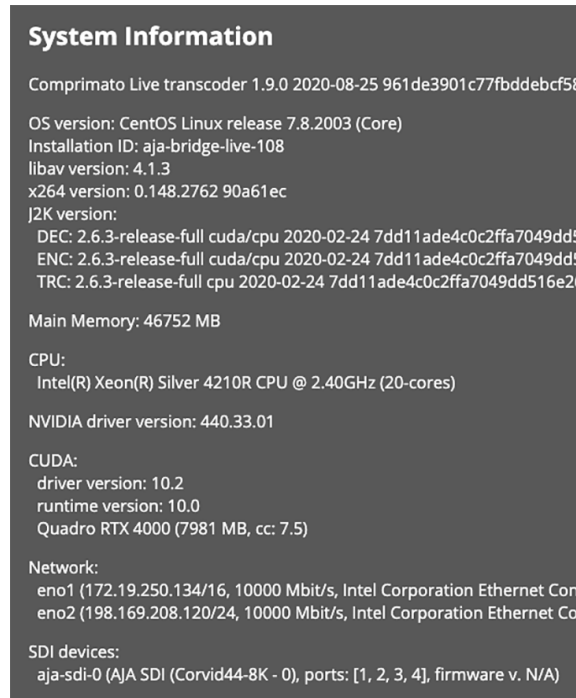
Stream Configuration

The bottom left corner of the Dashboard has an Add new pipeline button for adding a new pipeline. Selecting it directs you to the setup window. This is the same window accessed when you want to change the configuration of an existing stream. From the left column, click on a stream you want to change, and the stream settings window displays as shown in *Figure 17*.

If you need to get back to the main Dashboard view, click on the AJA/Comprimato logos in the top left of the application window.

Figure 17. BRIDGE LIVE UI - Changing Stream Configuration
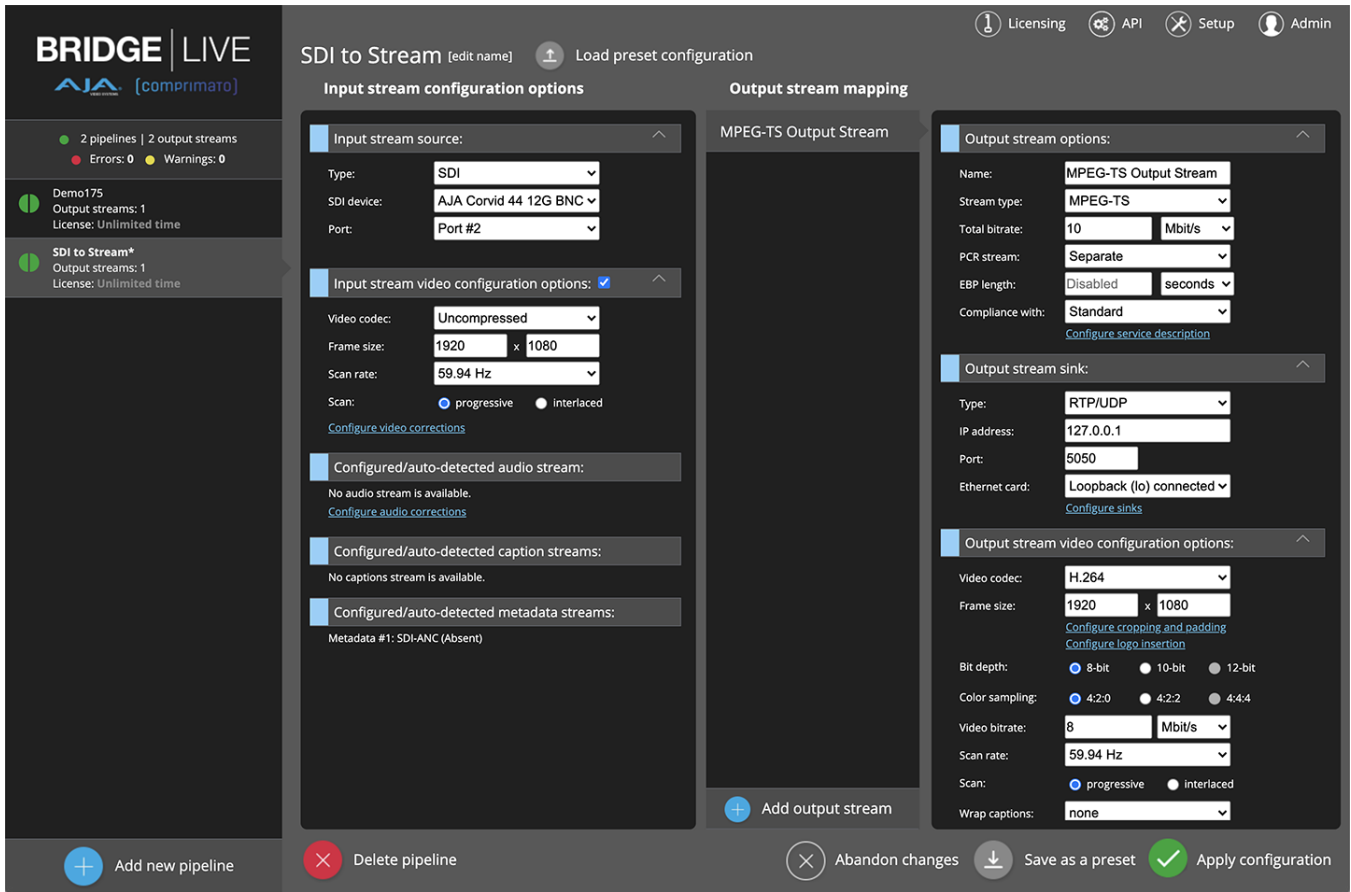
Figure 17 shows a dialogue window to select the input stream source type. You can choose the input type – SDI input, network stream, or SRT protocol. If you select the SDI input, select the SDI card (AJA Corvid 44 12G BNC) and the Port for the video input.

Chapter 4 – Basic Use Case: SDI to Streams Encoding

Creating a Pipeline to Encode Incoming Uncompressed SDI to Streams

This chapter guides you through the basic steps for using BRIDGE LIVE to quickly set up a stream that encodes uncompressed SDI to H.262, H.264, H.265 or JPEG 2000. The steps below use mostly default settings. More detailed information about configuration options is included in *"Chapter 6 BRIDGE LIVE Features and Interface Deep Dive" on page 40*.

Identifying Your Encoding Requirements

As you go through the steps in this chapter, you will make choices regarding transport streams, protocols, and codecs to meet your encoding requirements. These choices dynamically impact which specific sets of configuration options become available as you go through the process of building a pipeline.

Before you begin, consider which of the following components match your requirements:

Transport Streams	Protocols	Codecs
MPEG-TS	RTP/UDP	H.262
RTMP/S*	UDP	H.264
	SRT	H.265
		JPEG 2000**

*RTMP/S works only with H.264.

**The JPEG 2000 I/O is available through an optional license that can be purchased and downloaded for installation.

Steps for Building an Encoding Pipeline

Adding New Pipeline

From the BRIDGE LIVE Dashboard, click **Add new pipeline** in the lower left corner.

Figure 18. Add new pipeline button
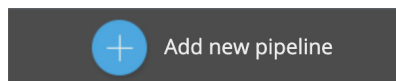
Dashboard displays a page that presents Input and Output stream configuration options.

Naming the Pipeline

From the top of the **Input stream configuration options** column, click **edit name**, found immediately to the right of the text "Name your Pipeline."

Figure 19. The edit name button
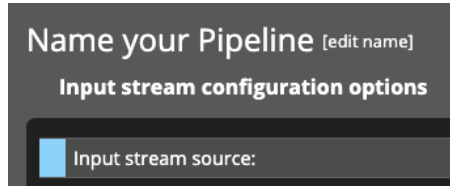
The Edit pipeline name pop-up window displays.

Figure 20. The Edit pipeline pop-up window
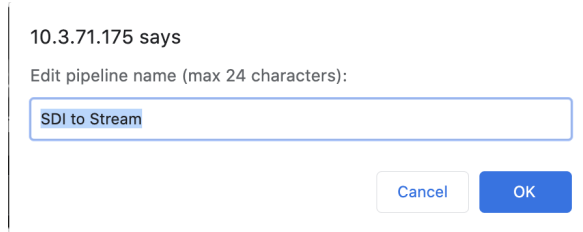
Enter a name for your new pipeline in the **Edit pipeline name** field. For this example, we are using "SDI to Stream" as the new pipeline name. Use a simple name that your users will understand.

NOTE: *There is a 24 character limit on the pipeline name. If you use more than 24 characters, an error message indicates you have exceeded the 24-character limit, and you will not be able to save the name.*

After clicking OK, the new pipeline will be shown in the left column of Dashboard. Both half circles are gray indicating that the Pipeline is not active yet.

Figure 21. The left column of Dashboard showing the newly named pipeline that you are setting up
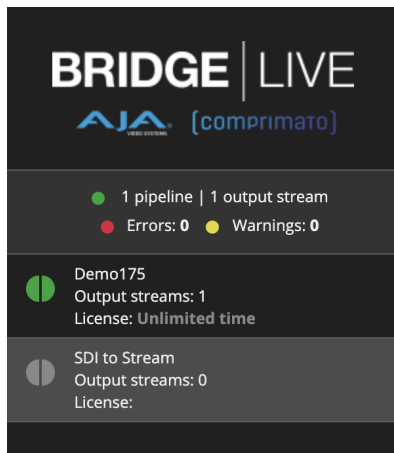
Selecting the Input Stream Source (SDI Channel)

Figure 22. Input stream source selection
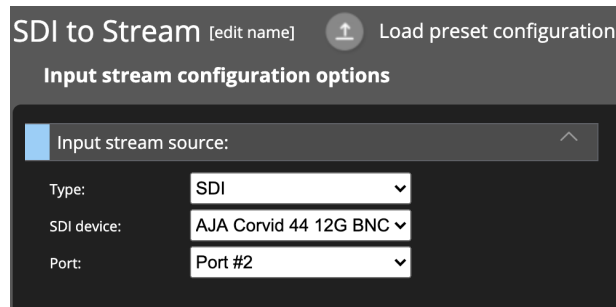
For the Input stream configuration options, make selections for Type, SDI device, and Port. In this example, the following selections were made:

- Type: SDI
- SDI device: AJA Corvid 44 12G BNC - 0
- Port: Port #2

Auto-Detecting Video Streams

In the lower-right area, click **Apply configuration**.

Figure 23. Apply configuration button
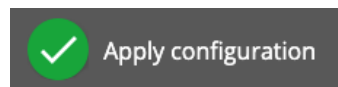
The Input stream configuration options column updates to show a new heading called "Auto-detected video streams."

Figure 24. New heading displays called "Auto-detected video streams"
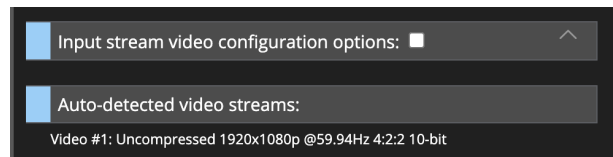
Beneath the heading, what is shown is "Video #1: Uncompressed 1920x1080p @59.94Hz 4:2:2 10-bit.

Click the signal that is listed. The Input stream video configuration options section expands and is auto-populated with the auto-detected video stream properties.

Figure 25. Input stream video configuration options and Auto-detected video streams
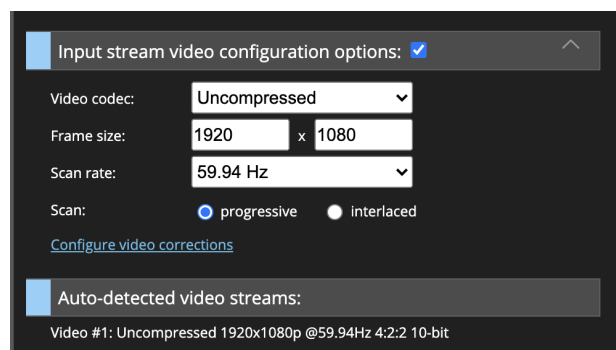
Adding the Output Stream

Next, from the lower area of the Output stream mapping column of the Dashboard, click **Add output stream**.

Figure 26. Add output stream button

New fields display in the Output stream column on the right side of Dashboard for naming and configuring your new output stream. Some of the fields of the Output stream column are auto-populated, matching the detected Input stream.

Naming the Output Stream

Under the heading Output stream options, enter a name in the Name field. For example, "SDI to H.264 Output," "SDI to H.265 Output," or whatever name will be descriptive to your users for this specific output stream.

Figure 27. Output stream options panel, example 1

Figure 28. Output stream options panel, example 2

Selecting the Output Stream Type

From the Stream type drop-down menu, select the output stream type. The default value is MPEG-TS. RTMP(S) is also available and will be discussed in *"Chapter 6 BRIDGE LIVE Features and Interface Deep Dive" on page 40*.

Figure 29. Selecting Stream Type MPEG-TS
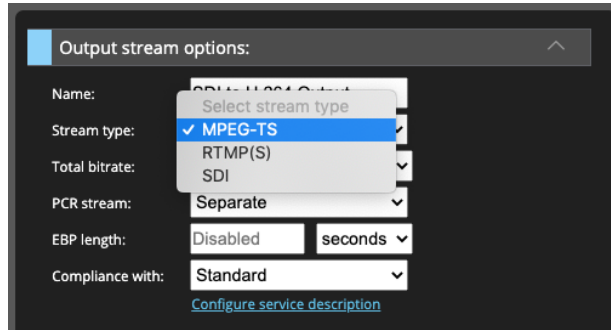
In this example, we are using MPEG-TS.

Selecting the Output Stream Sink

Under the Output stream sink heading, select the Output stream sink type. In this example, we are using RTP/UDP.

In this case, we are setting up a Loopback output stream for testing purposes. The IP address is 127.0.0.1 (for localhost), and the Port is 5050.

The Ethernet card selection is Loopback (lo) connected.

Figure 30. Output stream sink configuration
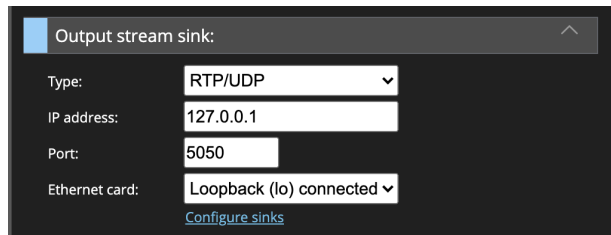
Output Stream Video Configuration Options

Next, under the heading Output stream video configuration options, for Video codec, select H.264.

Figure 31. Multiple video codec selections available
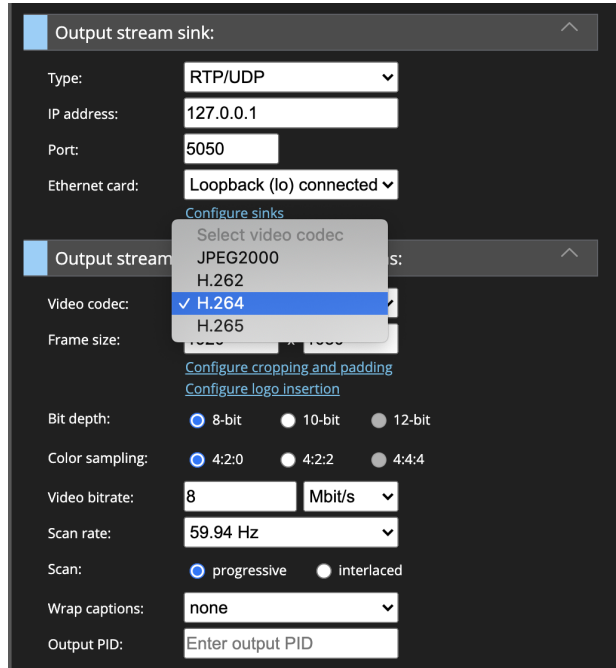
The Frame size is auto-populated to reflect the detected input signal. The Scan rate and other properties are also auto-populated.

Figure 32. Output stream video configuration options
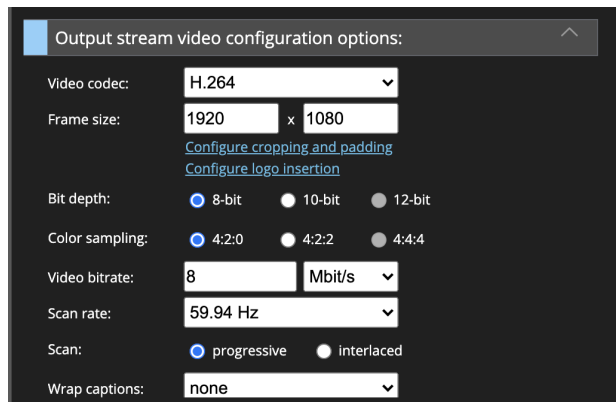
Leave the remaining fields with their default values.

Click **Apply configuration**.

Figure 33. Apply configuration button
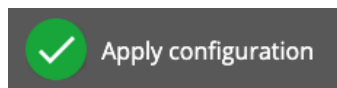
BRIDGE LIVE takes just a few moments to process the settings. Once finished, the left column updates to show your newly created Pipeline -- SDI to Stream. The two green circle halves indicate that both the input and output sides of the Pipeline are running with no errors.

Figure 34. The newly created Pipeline displaying in the left column
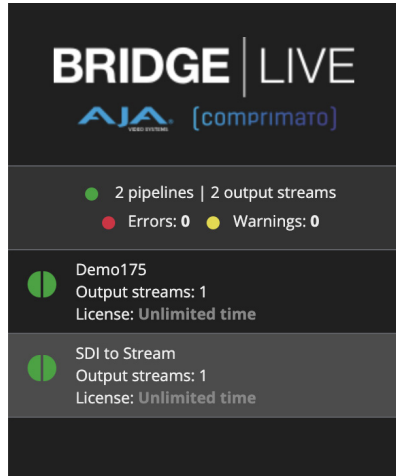
Verifying Pipeline Configurations

There are a variety of methods you can use to verify your pipeline configurations.

For an encoded stream using stream type MPEG-TS, you can use RTP/UDP, UDP, or SRT to send the stream to an output stream sink device.

For RTP/UDP or UDP, BRIDGE LIVE needs to be able to send the stream directly to the target location. If the target location is behind a router that blocks it, or if the target location is in a network behind NAT (network address translation), your target location will not be able to receive the stream.

For an encoded stream using stream type RTMP(S), the stream cannot do point-to-point. It has to bounce off of a server first.

Verifying the Configuration of Your Pipeline Remotely

With your pipeline now set up, you can verify that it is functioning correctly by accessing the stream with off-the-shelf software for monitoring. In this example, we will use VLC media player.

You can download VLC media player from the Video LAN Organization's website:

https://www.videolan.org/

Once you have downloaded, installed, and launched VLC media player on a laptop or workstation, take the following steps in BRIDGE LIVE:

Output Stream Sink Configuration for SRT

Under the Output stream sink heading, select SRT from the Type drop-down menu.

For the IP address field, enter the IP address for the computer you are using to run VLC media player.

Enter Port number 5050 into the Port field.

Select Ethernet card 2 from the Ethernet card drop-down menu.

From the lower right corner of Dashboard, click **Apply configuration**.
BRIDGE LIVE applies your configuration changes.

VLC Media Player for SRT

From VLC media player, select File > Open Network. The Open Source window displays.
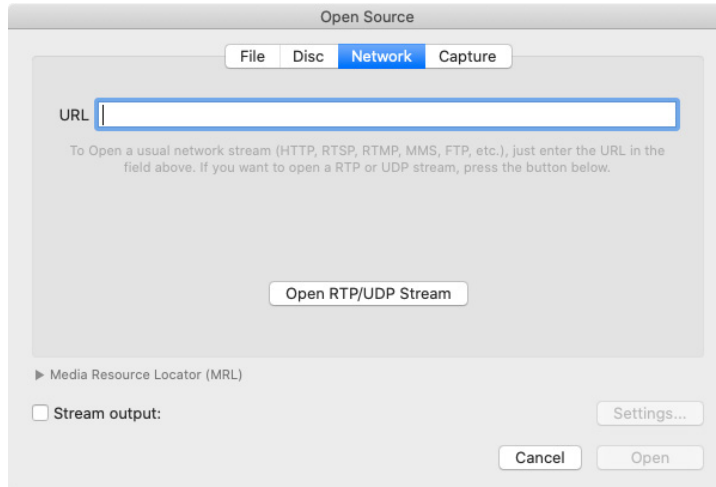
In the URL field, enter:

srt://

Followed by the IP address and port number entered earlier under the Output stream sink heading. In our example, the VLC URL field would look like this:

srt://198.169.208.120:5050
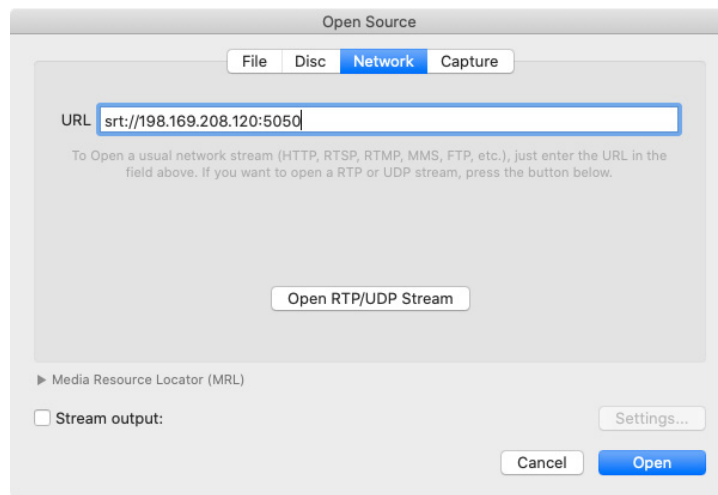
Click **Open**. VLC will open a new window displaying the live stream of the SDI source that you selected in your new BRIDGE LIVE pipeline. VLC may take a brief moment to open the new window.

Example of Streaming to YouTube

NOTE: The last steps about the stream URL and key are critical elements.

In this example, we assume that you already have a Pipeline setup that has a streaming output. We are going to add an output stream to that Pipeline for streaming to YouTube.

Adding an Output Stream for YouTube

Figure 35. Configuring a new output stream for streaming to YouTube
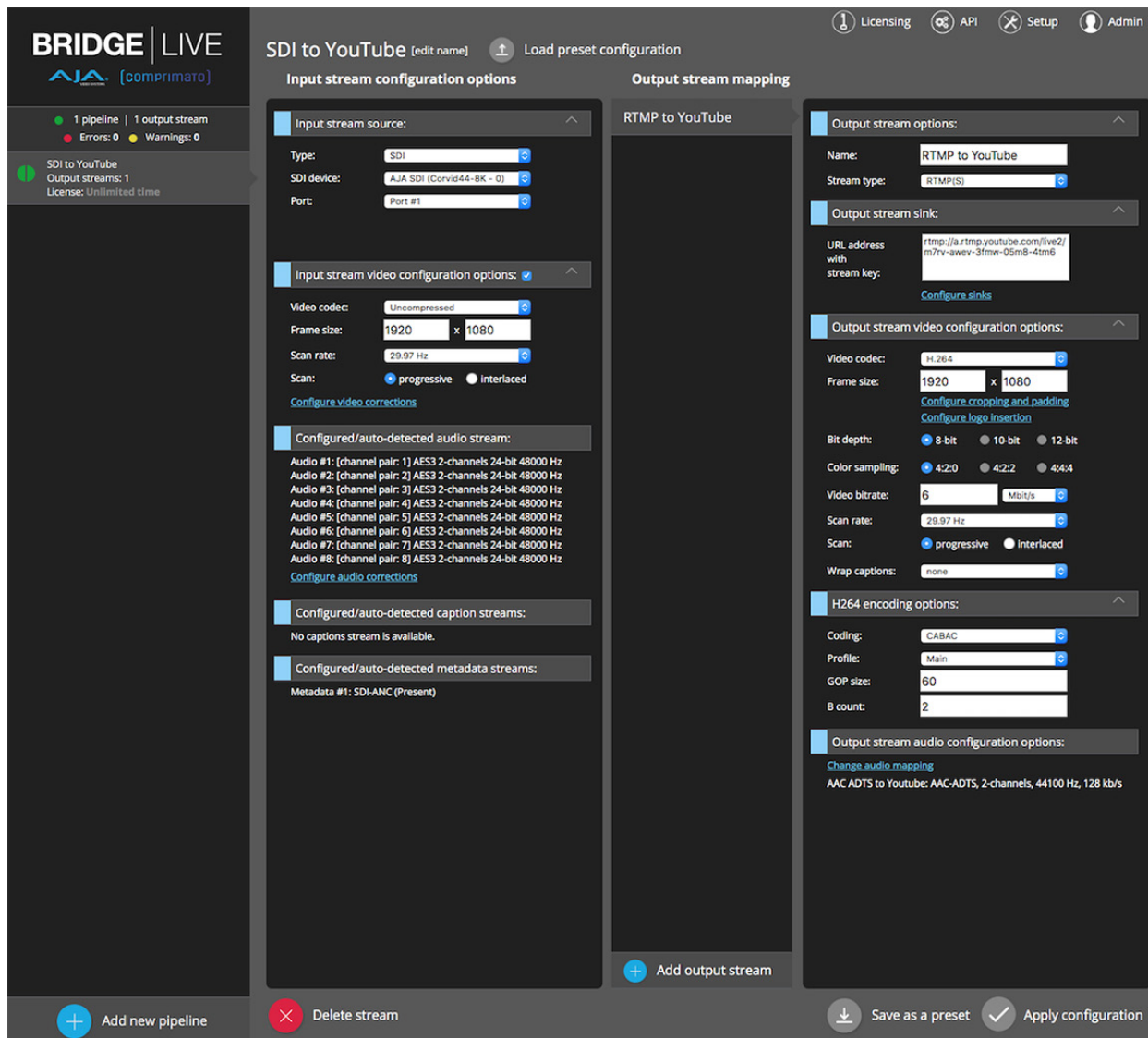
1. Click **Add output stream**.

2. Under Output stream options, provide a name for your new output stream.

3. Set Stream type to RTMP(S).

4. Under Output stream video configuration options, set Video codec to H.264.

5. Set Frame size to your desired YouTube resolution, for example, 1920x1080.

6. Set Bit depth to 8-bit.

7. Set Color sampling to 4:2:0.

8. Set Video bitrate to the YouTube recommended rate of 3 to 6 Mbit for 1080p23.98 to 1080p30.

9. Set Scan rate to match the video input scan rate (can be half for high frame rate inputs if desired).

10. Set Scan to progressive (YouTube prefers progressive video).

11. Under H.264 encoding options, set Coding to CABAC.

12. Set Profile to Main.

13. Set GOP size to 2x the frame rate. For example, 1080p29.97 = GOP of 60).

Audio Settings

1. Under Output stream audio configuration options, click Change audio mapping.

Figure 36. Audio Mapping RTMP to YouTube

2. Name your Output Audio settings.

3. Select AAC-ADTS under Audio codec.

4. Set Rate to 44100 Hz.

5. Set Audio bitrate to 128 kbit/s.

6. Click **Save setup**.

YouTube Studio Live Streaming Page

1. Go to your YouTube Studio live streaming page.

Figure 37. YouTube Studio Live Streaming Page
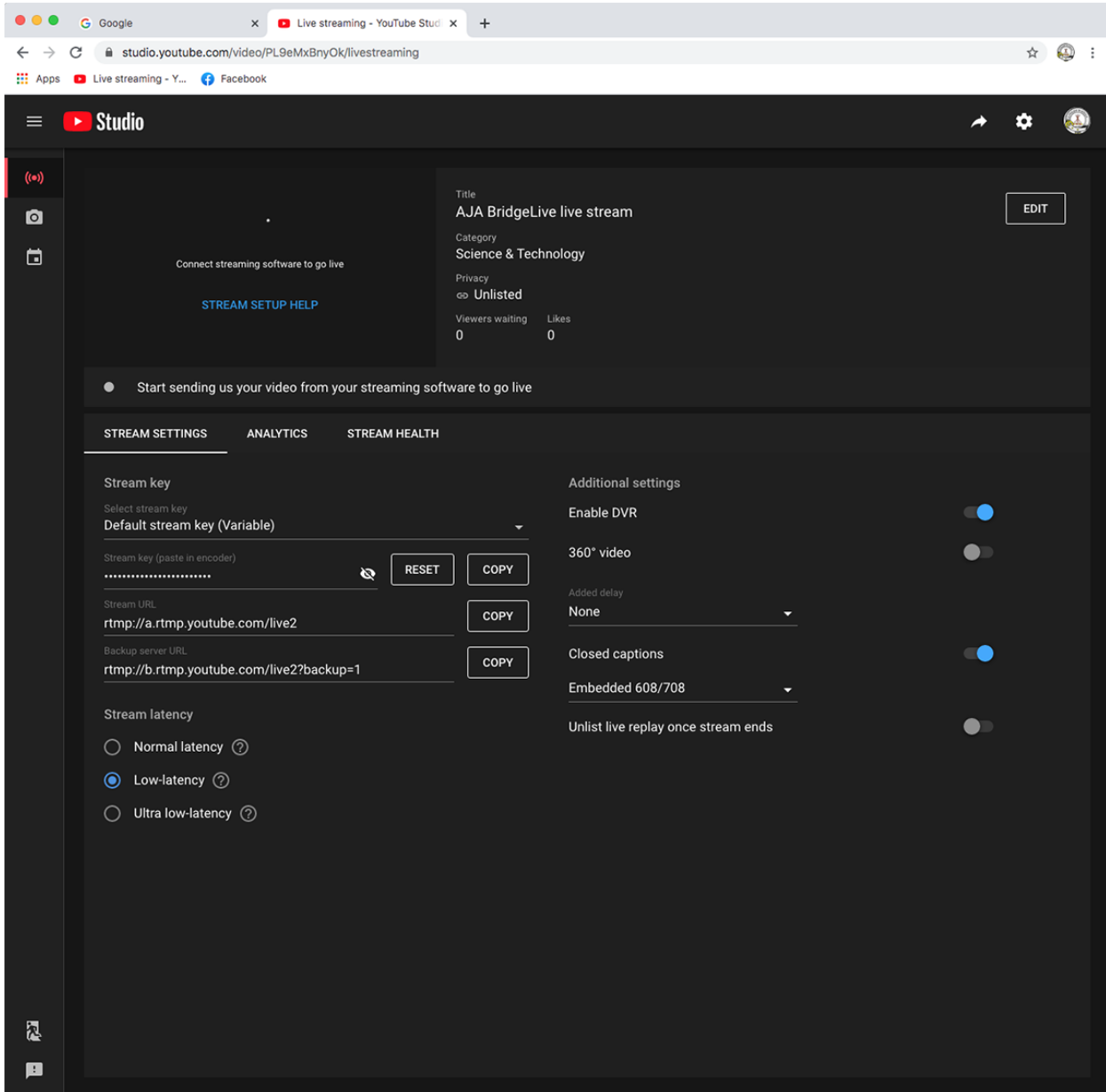
2. Copy the Stream URL.

3. Paste the stream URL into **URL address with stream key** field under Output stream sink of pipeline Output stream mapping.

4. Go back to the YouTube Studio live streaming page.

5. Copy the Stream key.

6. Go back to the RTMP **URL address with stream key** field.

7. Add a "/" to end of the pasted URL address, then paste in the copied stream key.

8. Apply configuration.

Figure 38. YouTube Studio Live Stream Page Now Streaming

Chapter 5 – Basic Use Case: Streams to SDI Decoding

Creating a Pipeline to Decode Incoming JPEG 2000 to Uncompressed SDI

This chapter guides you through the basic steps for quickly setting up a stream that decodes JPEG 2000 into uncompressed SDI. The steps below use default settings. More detailed information is included in *"Chapter 6 BRIDGE LIVE Features and Interface Deep Dive" on page 40*.

Identifying Your Decoding Requirements

As you go through the steps in this chapter, you will make choices regarding transport streams, protocols, and codecs to meet your decoding requirements. These choices dynamically impact which specific sets of configuration options become available as you go through the process of building a pipeline.

Before you begin, consider which of the following components match your requirements:

Transport Streams	Protocols	Codecs
MPEG-TS	RTP/UDP	H.262
RTMP/S*	UDP	H.264
	SRT	H.265
		JPEG 2000**

*RTMP/S works only with H.264.

**The JPEG 2000 I/O is available through an optional license that can be purchased and downloaded for installation.

Steps for Building a Decoding Pipeline

Adding New Stream

From the BRIDGE LIVE Dashboard, click **Add new stream** in the lower left corner.

Figure 39. Add new stream button
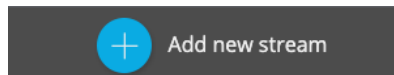
Dashboard displays a page that presents Input and Output stream configuration options.

Naming the Pipeline

From the top of the **Input stream configuration options** column, click **edit name**, found immediately to the right of the text "Name your Pipeline."

Figure 40. The edit name button
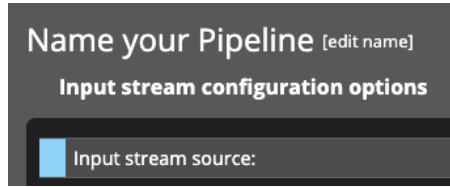
The Edit pipeline name pop-up window displays.

Figure 41. The Edit pipeline pop-up window
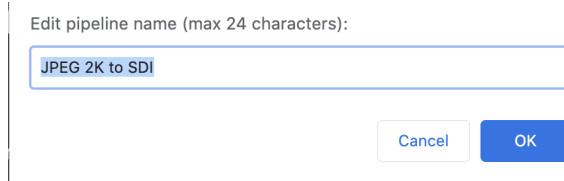
Enter a name for your new pipeline in the Edit pipeline name field. For this example, we are using "JPEG 2K to SDI" as the new pipeline name.

NOTE: *There is a 24 character limit on the pipeline name.*

After clicking OK, the new pipeline will be shown in the left column of Dashboard.

Figure 42. The left column of Dashboard showing the newly named pipeline that you are setting up
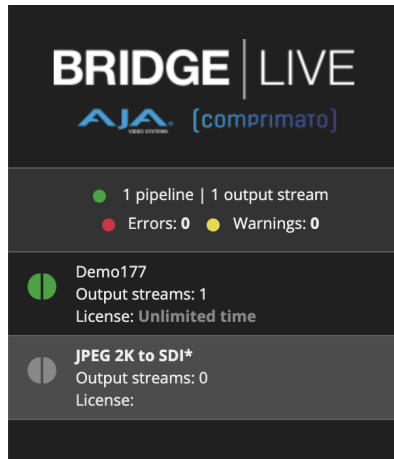
Selecting the Input Stream Source (JPEG 2000 Channel)

Figure 43. Input stream source selection
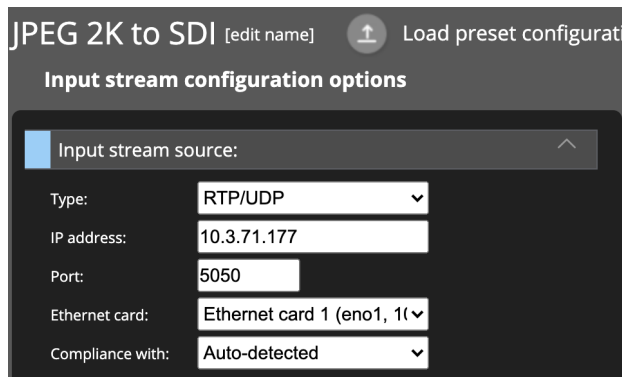
For the Input stream configuration options, make selections for Type, IP address, Port, Ethernet card. In this example, the following selections were made:

- Type: RTP/UDP
- IP address: enter the IP address for the Ethernet card that is receiving the JPEG 2000 signal. Or set it to 0.0.0.0 (default). BRIDGE LIVE will interpret 0.0.0.0 as being equivalent to entering the IP address of the Ethernet card.
- Port: 5050
- Ethernet card: Ethernet card 1
- Compliance with: Auto-detected

Auto-Detecting Video Streams

In the lower-right area, click **Apply configuration**.

Figure 44. Apply configuration button
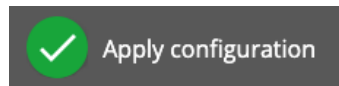
The Input stream configuration options column updates to show a new heading called "Auto-detected video streams."

Figure 45. New heading displays called "Auto-detected video streams"
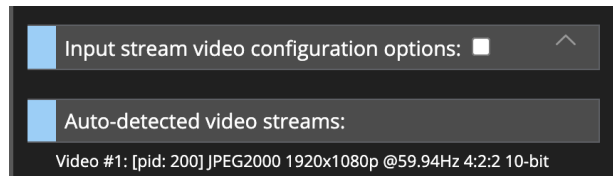
Beneath the heading, what is shown is "Video #1: JPEG2000 1920x1080p @59.94Hz 4:2:2 10-bit.

Click the signal that is listed. The Input stream video configuration options section expands and is auto-populated with the auto-detected video stream properties.

Figure 46. Input stream video configuration options Auto-populated and Auto-detected JPEG2000 video streams
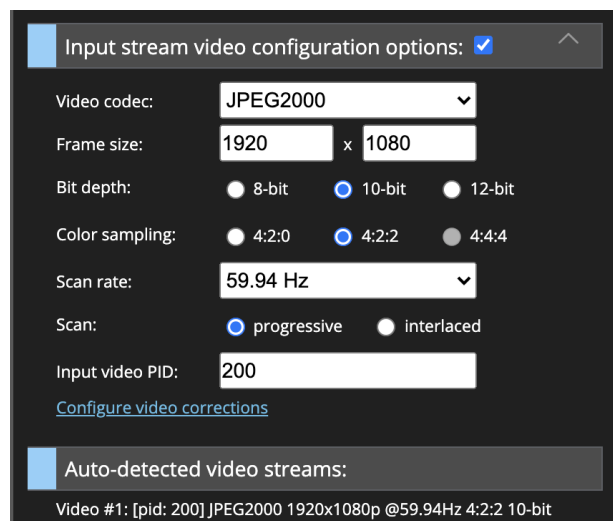
Adding the Output Stream

Next, from the lower area of the Output stream mapping column of the Dashboard, click Add output stream.

Figure 47. Add output stream button

New fields display for naming and configuring your new output stream.

Naming the Output Stream

Under the heading Output stream options, enter a name in the Name field.

For Stream type, select SDI.

Figure 48. Output stream options panel
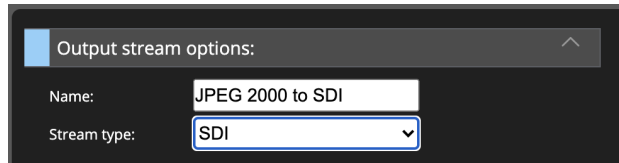
Selecting the Output Stream Sink Type

Under the heading Output stream sink, select AJA Corvid 44 12G BNC - 0 from the SDI device drop-down menu.

In this example, we have selected Port #1 to output the SDI signal.

Figure 49. Output stream sink panel
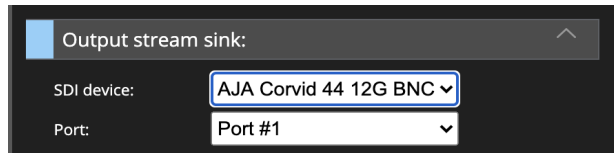
Output Stream Video Configuration Options

The Output stream video configuration options are pre-selected based on the auto-detection on the input side. Uncompressed is already selected from the Video codec drop-down menu.

Likewise, the frame size, bit depth, color sampling, scan rate, and scan (progressive or interlaced) are pre-populated.

Figure 50. Output stream video configuration options pre-populated
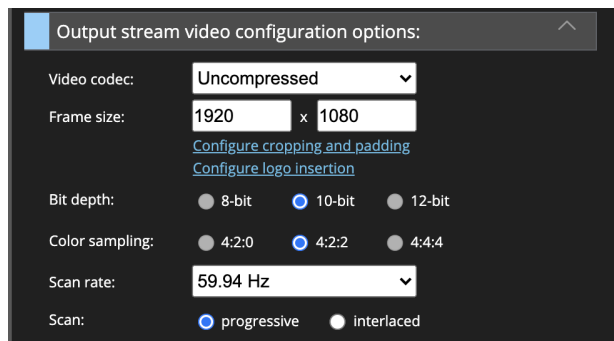
Applying Configuration Settings

From the lower right corner of Dashboard, click **Apply configuration**.
BRIDGE LIVE applies all your configuration settings and initiates the new pipeline.

Figure 51. Apply configuration button
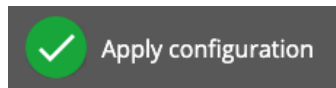
After BRIDGE LIVE accepts your configuration settings, the left column will update to show the new pipeline. When both circle halves are green, the pipeline is running correctly.

If you see error messages, look for error messages in red text in the Pipeline configuration window to see where errors are occurring.

See also: *"Chapter 12 Troubleshooting" on page 74.*

Figure 52. Newly created JPEG 2K to SDI Pipeline
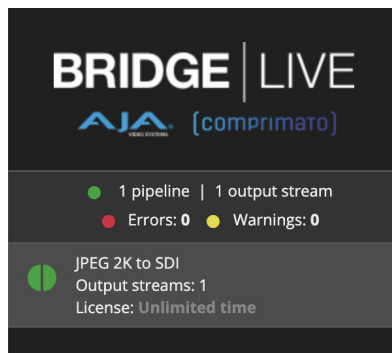
Chapter 6 – BRIDGE LIVE Features and Interface Deep Dive

Encoding Incoming Uncompressed SDI to Various Stream Types

BRIDGE LIVE provides four channels of HD or a single channel of UltraHD for SDI input or output.

When it comes to deriving streams from incoming uncompressed SDI sources, each SDI input can be output to multiple formats and/or destinations using H.264 (AVC), H.265 (HEVC), MPEG2 and optionally JPEG 2000.

Regarding Containers and Protocols, BRIDGE LIVE supports SRT (plus encryption), RTMP, RTMPS (required for Facebook Live), RTP, UDP, MPEG-TS and VSF-TR01.

Input SDI

All four SDI ports can be used simultaneously for 3G-SDI I/O. The SDI ports can be used as all inputs, all outputs, or a mixture.

Alternatively, any of the four SDI ports can be used for 12G-SDI I/O, but doing so will block the remaining ports until the 12G-SDI signal is disconnected from the port.

Incoming SDI can look like any of the following:

1. 12G-SDI
2. 3G-SDI
3. HD-SDI
4. SD-SDI

Output Stream

Supported Output Data for Single Program Transport Stream

BRIDGE LIVE supports the following types of output data in a single program transport stream:

1. Video
   - H.262 – 4:2:0, 8bit, up to 3840x2160p60/i60
   - H.264 CPU – 4:2:2/4:2:0, 8bit/10bit, baseline/main/high profile, up to 3840x2160p60/i60
   - H.264 GPU – 4:2:0, 8bit, main/high profile, up to 3840x2160p60/i60
   - H.265 GPU – 4:2:0, 8/10bit, main/main10 profile, up to 3840x2160p60
   - JPEG2000 GPU – 4:2:0/4:2:2, 8bit/10bit, up to 3840x2160p60/i60
     - Encapsulation – standard TR01 only
   - SDI Uncompressed – 4:2:2, 10bit, up to 2048×1080p60/i60

2. Audio
   - AAC (ADTS, LATM)
   - AC3 up to 6 channels

- AES3
- MPEG 2

3. Closed Captions – H264 insertion

4. Metadata – LTC insertion, SCTE 35/104 conversion

Output Stream Options

Clearly Naming Multiple Output Streams

Figure 53 depicts the dialogue window for output streams settings. It also shows the situation where there are multiple output streams already configured. When adding an output stream, it is important to name it clearly to eliminate any potential confusion as to what it is.

Besides the mandatory options to direct the output to a specific network interface and a remote node, these settings have more attributes that impact the quality of the resulting stream.

Figure 53. Output Streams Configuration

Stream Type

MPEG-TS

BRIDGE LIVE supports data transmission using MPEG-TS (MPEG Transport Stream) container format. The transport stream is used in broadcast systems and is designed to be used in terrestrial or satellite broadcast, for example. It can carry multiple programs. Each program contains packets of video stream, audio stream and metadata (if present).

BRIDGE LIVE supports receiving and processing the MPEG-TS streams, detects all programs, and allows its users to choose them easily.

RTMP(S)

BRIDGE LIVE supports RTMP streaming. RTMP output in BRIDGE LIVE supports both streams with and without authentication. The protocol is used for video, audio and data streaming over the Internet and serves as a bridge between Flash player and a server.

BRIDGE LIVE supports the RTMP output only in the H.264 video codec and the AAC audio codec. Some services, such as YouTube, do not accept RTMP streams without audio.

Configuring RTMP Output

To set up an RTMP output stream, select Output stream options, Stream type as RTMP and just beneath it, fill out the URL address. An example URL of a stream with authentication is the following:

    rtmp://user:pass@IPADDRESS/application/stream-key

If you have provided a valid URL, BRIDGE LIVE will produce an output stream upon starting the configured pipeline using RTMP.

You can see how the UI looks without a configured URL address in *Figure 54*.

Figure 54. Configuring RTMP
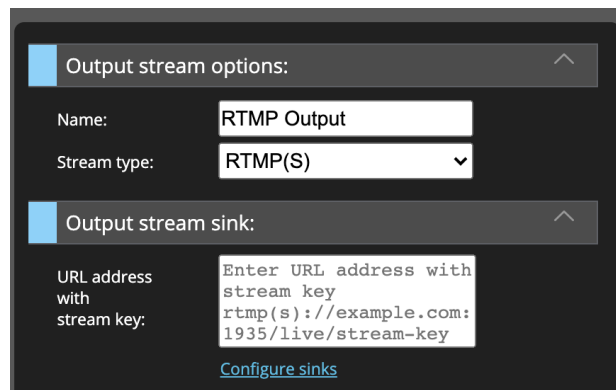
If you want to use a hostname instead of an IP address in the URL, you need to set an appropriate DNS server. If it is in the external network, the set Default route needs to have access to the Internet. Both can be done in the Setup. For more information, see *"System Setup" on page 58.*

Total Bitrate

Total Bitrate and Data Quality

The overall amount of data that is transmitted is controlled by the total allowed bitrate. This attribute combines the sum of video, audio and remaining bitrates.

Distinction between Total Bitrate and Video Bitrate

Total bitrate is the whole bitrate of the transport stream. Total bitrate contains video, audio and metadata, plus possible padding.

Video bitrate, on the other hand, is the bitrate of the video only. This attribute has a direct impact on the resulting quality – the lower the allowed video bitrate, the less the quality of transmitted data.

You can limit the total video bitrate which will define which part of the total bitrate is dedicated to video data. In some scenarios, it may be necessary to adjust the total bitrate overhead over the video bitrate.

PCR Stream

Some receivers require PCR to be stand-alone and not to be in the video stream. This control allows you to select whether the PCR stream should be included in the video stream or be a stand-alone stream included in the total bitrate, under its own PID.

EBP Length (Encoder Boundary Point)

Use the EBP setting to define the parameter for Encoder Boundary Point insertion, which is often used in ABR streaming. This field is typically left empty.

Compliance With

This refers to the transport stream encapsulation standards, and it is relevant to all stream types. If you are using an Evertz device, select the Evertz standard. Otherwise, select Standard.

Configure service description

To access this functionality, you need to be subscribed to a service.

This is for timing and synchronization for specific end point services for streaming. Certain service providers may have some specialized version of streaming that would require this level of setup, but this is not frequently used.

Output Stream Sink

Configure Sinks

You can have multiple output stream sinks for each Pipeline.

Type

- RTP/UDP
- UDP
- SRT

SRT Protocol for Reliable Data Transmission

BRIDGE LIVE supports data transmission using SRT (Secure Reliable Transport) protocol. SRT is a video transport protocol that is intended to be used over unreliable networks such as public Internet. It adjusts the packet loss, jitter and fluctuating bandwidth in order to maintain the high quality of the transported video stream. It has end-to-end security mechanisms to protect the transmitted data, and it is easy to configure to work with network firewalls. If you wish to learn more about the protocol, please visit the official SRT Alliance website:

https://www.srtalliance.org
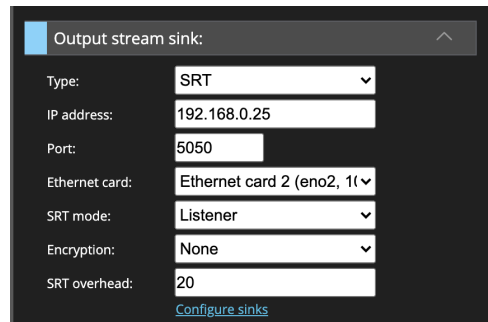
BRIDGE LIVE supports 2 SRT modes of operation – Listener, and Caller. In other words, this is simply the client–server model. The Listener unit is configured to connect to its own local IP address that will be receiving data from the (external) Caller unit. Therefore, the Caller machine is configured with the IP address of an external (to it) unit where the data will be listened to.

NOTE: SRT is a connection-oriented communication and therefore cannot use multicast IP delivery.

Configuring Output Side of SRT Transmission

When creating the pipeline's output side, you can choose to send the traffic via SRT in order to make the connection more reliable and prevent image loss during transmission. In the Output stream sink section, you can select Type – SRT which will add the SRT configuration options. See *Figure 55*. Similarly, as for Input configuration, you can choose between 2 modes – Caller, and Listener.

Figure 55. Configuring SRT Output

SRT Mode
- Listener – IP:port of the local machine where an external Caller unit will request a connection
- Caller – IP:port of the remote machine where the external unit is waiting to receive data

SRT Overhead

In addition, you should define the SRT overhead parameter – a percentage amount over Total Bitrate that can be surpassed in order to achieve the lost data recovery. As a result, the maximum used connection bitrate is equal to the configured Total Bitrate + SRT overhead. In general, this is the upper limit and the connection does not require it for normal operation.

IP Address

The IP Address to which you want to send the stream. While using SRT in Caller mode, it is the address which is being called (sending to) and for the Listener mode, it is the address which is being called (receiving a request from said address to which the stream will be sent).

In this case, the IP Address of the local machine where an external Caller unit will request a connection is Ethernet Card 2 (eno 2).

Port

Port 5050, 5051, 5052 and 5053 are all viable to enable easy traversing of firewalls and other potential obstacles. It usually does not matter which port is used, it just needs to match on both ends.

Ethernet Card

Ethernet card 1

Ethernet card 2

Loopback (lo)

This list of selections can vary based on the configuration done during UI Setup. Users might be able to select only one Ethernet card and Loopback based on how BRIDGE LIVE is configured.

Output Stream Video Configuration Options

Video Codec

When selecting which codec to use, one aspect to consider is the type of equipment being used by the receivers. If their equipment does not support the higher demands of the codec, that could present challenges, especially if the receivers would be required to purchase new equipment in order to be able to receive the signal.

Choose from settings for the chosen video codec that define quality vs. speed difference.

JPEG 2000

JPEG 2000 is an image coding system that uses state-of-the-art compression techniques based on wavelet technology and offers an extremely high level of scalability and accessibility. Content can be coded once at any quality, up to lossless, but accessed and decoded at a potentially very large number of other qualities and resolutions and/or by region of interest, with no significant penalty in coding efficiency.

Two methods used to transport JPEG 2000 are VSF TR-01:2103 and VSF TR-01:2018.

H262 Encoding Options

H.262 is the official name for MPEG-2. Since it is the oldest of the codecs and it has been around for a long time, many people are familiar with it and know how to work with it. It is known to be reliable.

- Profile: High, Main, Simple
  - The Simple profile allows you to use only I and P frames, while Main or High profiles support even B frames. All H.262 profiles are 4:2:0. The High profile also supports Spatial and SNR scalability modes. For bit rates and profiles, you may decide to use an older profile because of compatibility with older devices (especially older phones).
- GOP size – distance between two I-frames
- B count – number of B-frames between two P-frames

H264 Encoding Options

H.264 is newer than H.262, and it has better image quality and is more efficient.

- Coding – CABAC, CAVLC
  - CAVLC is typically used for compatibility with old devices. CAVLC is an older coding option and is easier to decode. However, for the same bitrate, it produces lower video quality.
  - CABAC is a newer coding option and is a bit harder to decode. It provides the same quality of video as CAVLC while using 5% to 15% smaller of a bitrate.
- Profile – Baseline, Main, High
  - Similar to H.262 profiles, the higher the profile, the more capabilities it has. The Main profile and higher allows B frames and CABAC. The High profile supports 4:2:2 sampling and 10-bit depth.
- GOP size – distance between two I-frames
- B count – number of B-frames between two P-frames

H265 Encoding Options

H.265 supports UltraHD. It is newer and even more efficient than H.264. Its efficiency is in decoding. (Encoding requires more computing power up front.)

- Profile: Main, Main10
  - Main uses 8-bit encoding/decoding. Main 10 uses 10-bit encoding/decoding. On a system level, 10-bit I/O is more resource intensive.
- GOP size – distance between two I-frames
- B count – number of B-frames between two P-frames

Video Bitrate

Enter a bitrate to define how much of the total bitrate is dedicated to video data. You can specify the units in terms of Mbit/s, kbit/s or bit/s.

Scan Rate

BRIDGE LIVE can either keep original frame rates or convert frame rates as required.

Supported Frame Rate Conversions

BRIDGE LIVE supports frame rate 50% down-conversion capabilities, for example:

- 60p to 30p,
- 59.94 to 29.97,
- 50p to 25p

BRIDGE LIVE also supports frame rate 50% up-conversion, such as:

- 50i to 50p

Frame Rate Conversions Not Supported

However, BRIDGE LIVE does NOT currently support these frame rate conversions:

- 25 to 30,
- 50 to 60,
- 23.976 to 24.00,
- 59.94i to 60p

NOTE: *You can choose from only two different frame rate (fps) options on the output - either (i) same as the source, or (ii) halved in rate.*

Wrap Captions

The H.264 video codec supports wrapping closed captions. These are available to be selected and wrapped to output in the video elementary stream only if they are detected in the source SDI metadata stream as CEA 608 or CEA 708.

Output PID

In general, each elementary stream or table in MPEG-TS is identified by a packet Identifier. You can specify the PID for your output MPEG-TS. Otherwise it defaults to the source's PID.

Output Stream Audio Configuration Options

While configuring the output stream, you can also choose which transmitted audio or metadata channels you wish to include. The configurator is shown in Figure 56.

Figure 56. Audio Mapping
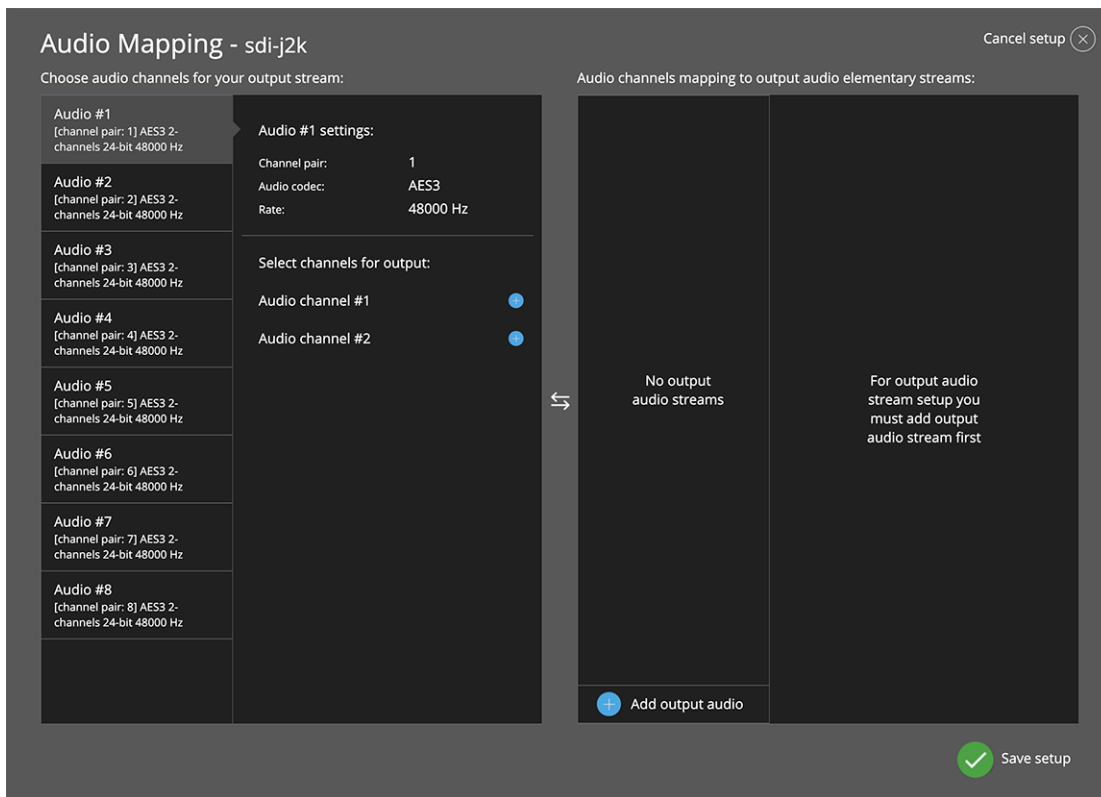
Output Stream Metadata Configuration Options

Displays and manages all metadata conversions or pass-through, such as SDI ancillary data to SMPTE-2038.

Decoding Incoming Streams and Outputting Uncompressed SDI

Input Stream

Input streams can be one of the following:

1. JPEG 2000

2. H.265

3. H.264

4. H.262

Configuring Input Streams

RTP/UDP, UDP, SRT Input Stream Sources

When configuring input streams of type RTP/UDP, UDP, or SRT, you will need to configure network settings.

There are only two circumstances in which you will need to fill out the IP address and Port:

1. When the input stream has a multicast address;

2. When the input stream is of type SRT and BRIDGE LIVE is set as the caller.

Enter the IP address and port number that corresponds to where the input stream is being sent.

For example, when BRIDGE LIVE is using the IP address 172.23.26.29, it would receive a unicast transport stream at that IP address and port 5000. So the valid input combination in BRIDGE LIVE would be an IP address of 172.23.26.29 (or just 0.0.0.0) and port number 5000.

NOTE: Entering the IP address of 0.0.0.0 for the input stream tells BRIDGE LIVE to use the IP address of its selected Ethernet port where the signal is being received.
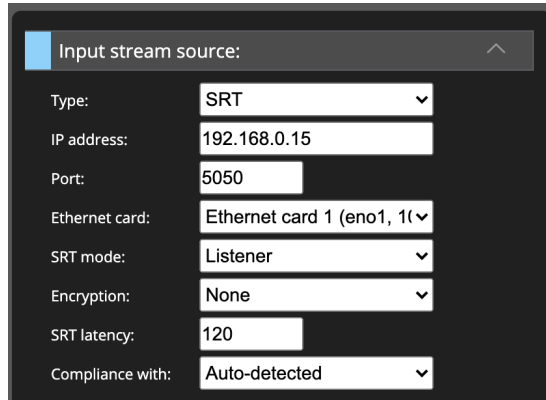
For SRT configuration, see *"SRT Protocol for Reliable Data Transmission" on page 44*.

MPEG-TS and RTMP are found in Input Stream configuration. This means that if you have one transport stream being sent to one particular IP address and Port combination, it can contain various programs. With MPEG-TS and RTMP, you can differentiate whether it is just one program or if there are multiple programs. If it is MPEG-TS, there are more video streams, and you choose between the program number that you want to decode and process. If it is single stream, then you work with only one.

Configuring Input Side of SRT Transmission

When you wish to configure SRT for use, select the Input Stream Type item called SRT, as you can see in Figure 57. Before configuring the IP address and IP port, select whether you intend to use Caller/Listener mode. This directly impacts what IP you need to provide.

Figure 57. Configuring SRT Input Source

When you select SRT mode:
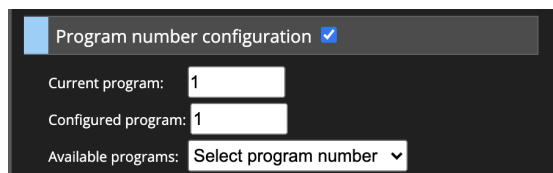
- Listener – IP:port of the same machine where the data is being received (listened to) from an external source
- Caller – IP:port of the remote machine from where the data will be sent

It is necessary to define the SRT latency variable in milliseconds (ms). The parameter is the time of intended delay of network packets (a buffer) that is allowed for the connection to slow down the data in transmission in order to provide a time slot to re-send lost UDP packets if they occur. This is what allows SRT protocol to establish a reliable connection with the focus on removing video disruptions.

Choosing the Program Number

When you wish to choose which program to use, you need to enable the Program number configuration in Input stream configuration options. Once allowed, you can select the program number from a drop-down menu. Current program informs about the current configuration, while Configured program has to be applied first in order to take effect. If you do not set up anything, the first program in the list is selected. If a Configured program number is not present in the stream, BRIDGE LIVE reports an error. Once you change the program number and apply the configuration, video with another PID is detected (if present).

Figure 58. Configuring MPTS

Output SDI

You can send an output stream from BRIDGE LIVE using uncompressed SDI.

To configure the SDI output, set the Stream type to SDI first, then select the correct SDI device and Port that you want to use.

Figure 59. SDI Output Example

Output Stream Cropping and Padding

In order to address how you want BRIDGE LIVE to handle resolution change, use the Cropping/Padding configuration window to adjust settings for the input video and output video. Click **Configure cropping and padding** in the Output stream video configuration options area to access the configuration window.

Figure 60. The Cropping/Padding configuration window

For the input video, you can adjust frame size, left/top cropping and right/bottom cropping.

For the output video, you can adjust the output frame size and resize method.

Resize Method

From the Resize method pull-down menu, available selections are:

- Scale: Resizes the configured input frame to the configured output frame and changes the aspect ratio when it differs.
- Crop: Resizes the configured input frame to the configured output frame, but keeps the input frame aspect ratio. The input will be automatically cropped horizontally or vertically.
- Pad: Resizes the configured input frame to the configured output frame, but keeps the input frame aspect ratio. The input will be automatically expanded with horizontal or vertical black bars.

Logo Insertion

You can insert a logo into the stream. You can configure it in the "Output stream video configuration options" section by clicking the "Output stream video configuration options" button, which can be seen in Figure 61.

Figure 61. Logo Insertion Button
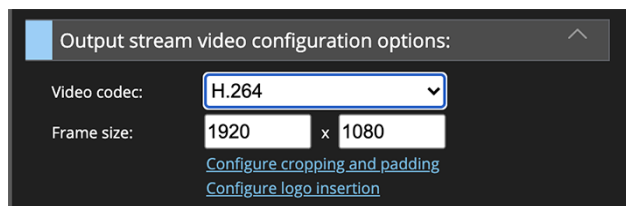
Upon clicking it, we are presented with another pop-up window, in which the user can set up, as seen in Figure 62.

Figure 62. Logo Insertion Configuration
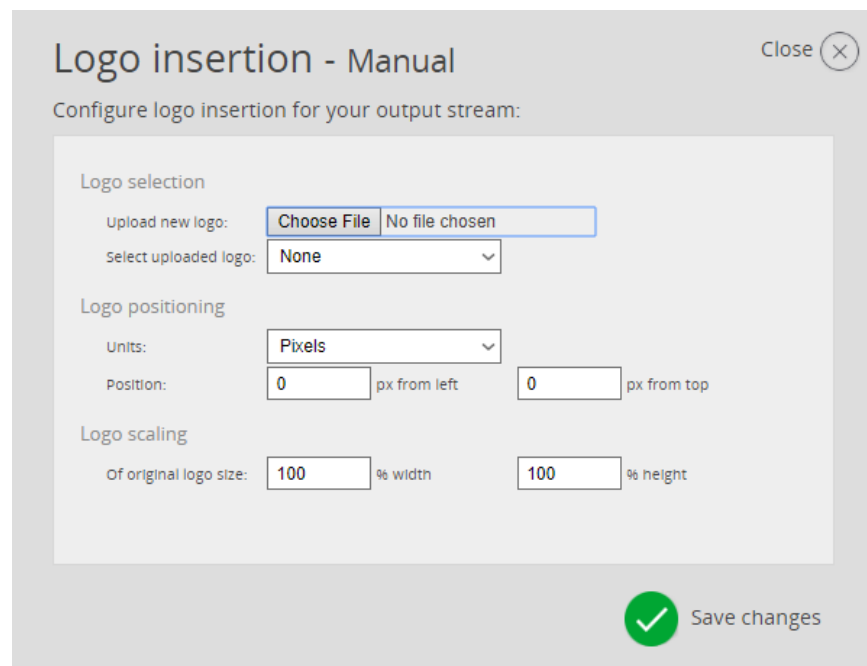
First, a logo file in the .png format must be uploaded and selected. After that, the user can choose to position the logo either in pixels, or set its positions using percent. If for some reason a logo has to have adjusted scale, it's possible to do it using the Logo scaling option.

If you save a pipeline that uses the Logo insertion function and has some logo uploaded as a preset, it will be saved with the logo file, too.

Muxing

BRIDGE LIVE is capable of muxing multiple streams such as audio inputs, captions and metadata streams into a single output stream. The list of supported input data is as follows:

Video

- 3G SDI
    - Uncompressed 4:2:2; 8bit/10bit, up to 1080i60/720p30; 4:2:2; 8bit/10bit, up to UltraHDp60 – AJA Corvid 44 12G BNC
- Generic single program MPEG transport stream
    - Encapsulation – standard TR01, Evertz TR01, MediaLinks TR01, legacy NetInsight TR01
    - High-bitrate JPEG2000 – 4:2:2, 10bit/12bit, up to 3840x2160p60/i60
    - H.262 – 4:2:0, 8bit, up to 3840x2160p60/i60
    - H.264 – 4:2:2/4:2:0, 8bit/10bit, up to 3840x2160p60/i60
    - H.265 – 4:2:0, 8bit/10bit, up to 3840x2160p60

Audio

- AES3 uncompressed (SMPTE 302M)
- MPEG2 audio
- AAC (ADTS, LATM)
- AC3
- E-AC3

Closed Captions

- SMPTE 2038 (608/708)
- EIA-708 or EIA-608 (in SDI)

Metadata

- LTC timestamps
- MPEG TS PCR
- Ad-markers – SCTE104 (in SDI)
- Pass-through capabilities

Creating and Loading Preset Configurations for Streams

Presets

In order to avoid manually configuring Pipelines, you can save configuration settings to a file. You can then load the saved configuration settings from the file and instantly populate all the settings, saving time and potential configuration errors.

Presets can also serve as a way to backup, clone or restore Pipeline configuration settings.

These configuration files are stored in the .json structured file format.

To save as a preset

1. From the left column of Dashboard, click on the configured stream that you want to save as a preset. The window opens showing the Input stream configuration options and the Output stream mapping.

2. In the lower right area of Dashboard, click **Save as a preset**, located below the Output stream configuration column.

3. A JSON file downloads to your computer that contains all of the configuration settings. This is the Preset file. You can view it (or edit it) using a text editor.

To load a preset configuration

1. From Dashboard, click **Add new stream** from the lower left area. The Pipeline configuration panels display.

2. Click **Load preset configuration** above the Input stream configuration options column. An open file dialog window opens.

3. Navigate to your saved preset JSON file. Select it, then click Open. Dashboard refreshes to display the Pipeline populated with all the configuration settings that were stored in the JSON preset configuration file.

Alternative Methods for Verifying Pipeline Configuration

Using RTMP Server for Mac

A free application, Local RTMP Server for macOS, is available through Github. You can use it to stream straight to a Mac host, reading it back with VLC and verifying it locally to make sure RTMP is working. The application can be found through the following link:

https://github.com/sallar/mac-local-rtmp-server

Capturing Outgoing Packets and Creating Transport Stream

Another method for verifying the Pipeline configuration is to capture the outgoing packets from the BRIDGE LIVE server, directly on BRIDGE LIVE. Then download the PCAP file, and create a transport stream out of that data for inspection.

Probes or Other Tools

Some large organizations may have probes or other various tools that can be used to verify the streams, and therefore may not need to visually see what the stream looks like.

Chapter 7 – Initial System Setup and Configuration

Overview

The first boot will guide you through a short setup, which is largely a verification of selected options. Important items to select are the network interface where the video data will flow in and out.

See these chapters for more information:

regarding configuration of a DNS server, if needed.

You will also be prompted to select which network interface's default gateway will be used as a default route (likewise for every interface). shows the Dashboard view, which is the homepage of the UI.

What's In the Box?

- BRIDGE LIVE Quick Start Guide
- BRIDGE LIVE appliance, including:
  - pre-installed rack-ears
  - rack rails
  - two power cables

As you unpack the shipping box, carefully examine the contents. Make sure 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 description of the damage. AJA will repair or replace damaged items.

If you find shipping damage, contact your AJA dealer or distributor for details on how to have your BRIDGE LIVE repaired or replaced.

NOTE: *Save packing materials and the shipping box. If your BRIDGE LIVE ever requires service or you move your system, use the packaging materials and box for safe shipment.*

Chassis Front

Figure 63. BRIDGE LIVE Chassis Front View

Power Status

Chassis Power Button

The main power switch is used to apply or remove power from the power supply to the system. Turning off system power with this button removes the main power but keeps standby power supplied to the system. Therefore, you must unplug all system power cords before servicing.

Chassis Rear

Figure 64. BRIDGE LIVE Chassis Rear View

USB 3.0 Ports (4)

Unused

Redundant Power Supplies   Unused   Unused   Display Port

SDI Ch 4   SDI Ch 2

Dual 10Gig Ethernet   Reference   SDI Ch 3   SDI Ch 1
Streaming Video I/O   **Baseband Video I/O**
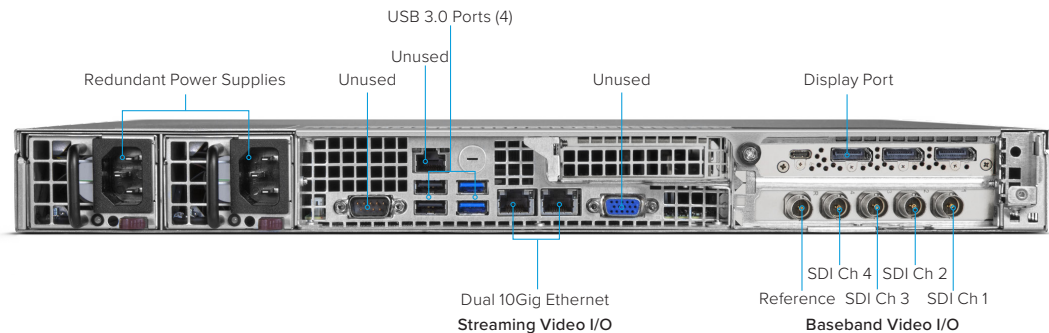
Rear Panel Power Supply LEDs

On the rear of each power supply module an LED indicates its status as follows.

*   Solid Green: When illuminated, indicates that the power supply is on.
*   Solid Amber: When illuminated, indicates the power supply is plugged in and turned off, or the system is off but in an abnormal state.
*   Blinking Amber: When blinking, this system power supply temperature has reached 63°C. The system will automatically power-down when the power supply temperature reaches 70°C and restarts when the power supply temperature goes below 60°C.

Installation Summary

1. Unpack the shipping box, removing the BRIDGE LIVE Quick Start Guide, the BRIDGE LIVE device, pre-installed rack-ears, rack rails, and two power cords.

2. Mount the physical chassis as desired, using the provided sliding rails. Cooling airflow enters the chassis from the front, and exits from the rear and top panels. Do not obstruct these air vents.

3. Install the BRIDGE LIVE chassis into a standard 19-inch wide equipment rack, allowing space for cooling airflow. The chassis occupies only one vertical rack unit.

4. Two rack rail assemblies are included in the rack mounting kit. Each assembly consists of two sections: an inner fixed chassis rail that secures directly to the server chassis and an outer fixed rack rail that secures directly to the rack itself.

5. The rail assemblies are shipped with rack adapters installed for use with IT (square hole) style rack frames. For IT racks, simply slide the unit into place, as the rails will lock automatically. For use with a standard round hole rack frame, you will need to remove the adapters using a small Phillips head screwdriver.

6. Connect the two BRIDGE LIVE power cords to AC mains. For redundancy, use both power supplies and connect them to separate branch circuits so that the BRIDGE LIVE will continue to operate even if a circuit breaker opens on one branch.

7. Connect a computer monitor (user supplied) to one of the rear DisplayPort ports.

8. Connect a keyboard and mouse (user supplied) to available rear USB 3.0 connectors.

9. Power up the chassis. The system will boot up to the BRIDGE LIVE application.

Initial System Setup via Local Interface

For initial setup, BRIDGE LIVE will need to be accessed locally via customer supplied keyboard, mouse and monitor (via Display Port).

Once BRIDGE LIVE has been unpacked and safely racked-mounted, cables and peripherals can be added; 10GbE cables for network connectivity, SDI cables for baseband audio/video I/O, USB keyboard, USB mouse, monitor (via Display Port), and dual power cables for redundant power supplies.

Cabling Guide

This section covers callouts for the connections, including which port to use for media/control.

- 10GbE Ports 01 and 02:
- Left Port from rear is #01 – use this for media connectivity
- Right Port from rear is #02 – use this port for control/monitoring

Figure 65. BRIDGE LIVE Rear Connectors
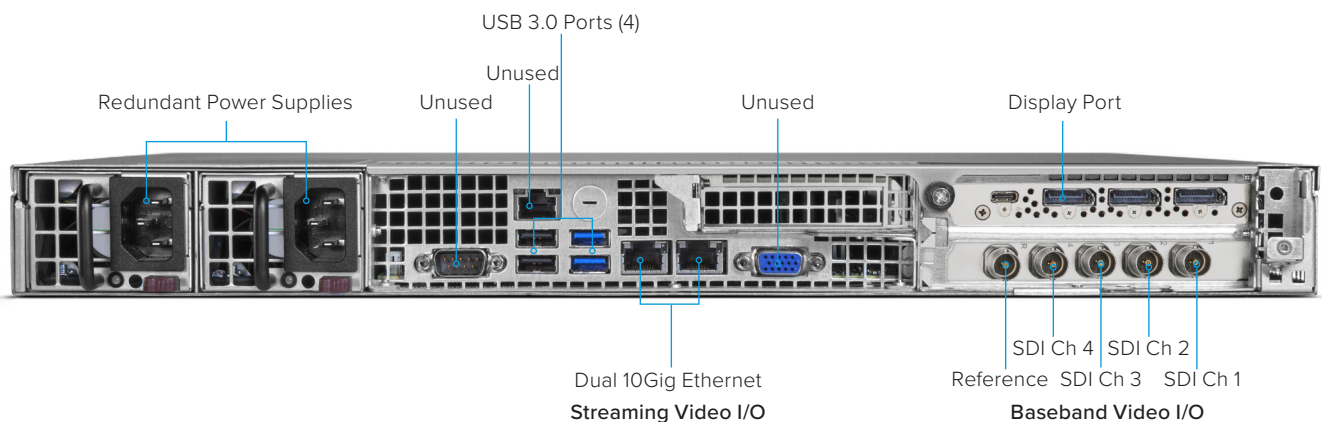
Power Up and Log In

Power on BRIDGE LIVE (front right button). At the login screen, enter the system's specific Admin credentials as shown below:

- Model: BRIDGE LIVE
- Serial Number: C5140A127A60026 - Example Chassis SN (15 Characters). See QuickStart Guide for actual SN for unit.

- Username: admin
- Password: See QuickStart Guide for unique Password per unit

After logging in you will need to accept license agreements presented, and after doing so you will arrive at the AJA BRIDGE LIVE interface.

EULA

When you login to the BRIDGE LIVE UI for the first time, you will be prompted to read and accept the EULA. If you change the BRIDGE LIVE version using the Version manager, found in *"Updates" on page 63,* you will be required to accept it again.

Figure 66. EULA
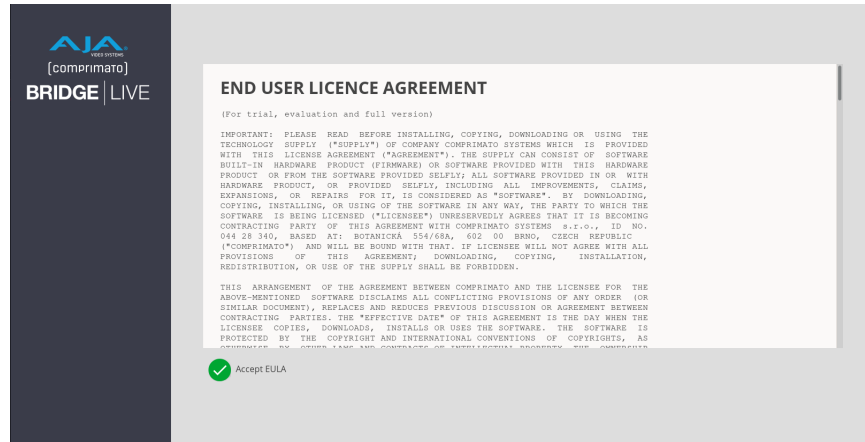
System Setup

To begin the system setup process, select Setup from the Setup drop-down menu in the upper right area of Dashboard.

Figure 67. Accessing the Setup menu
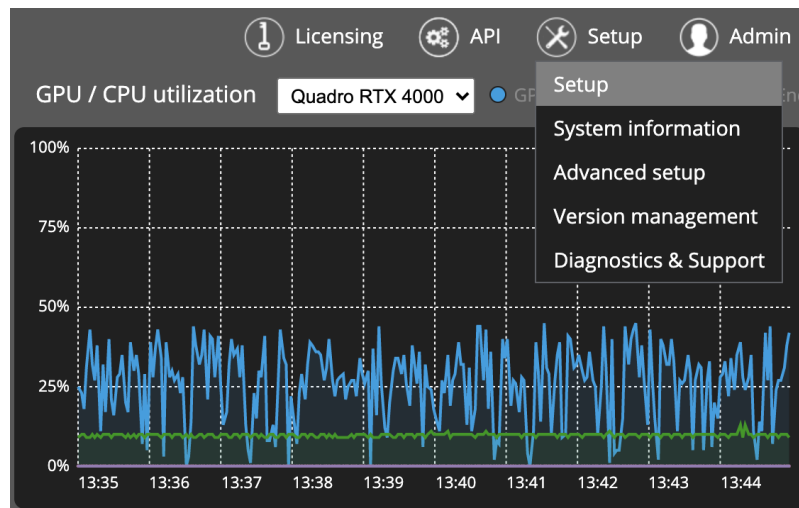
Host Name

Set the System Hostname by entering a name in the Hostname field, then click **Next step**.

Figure 68. Setting the System Hostname
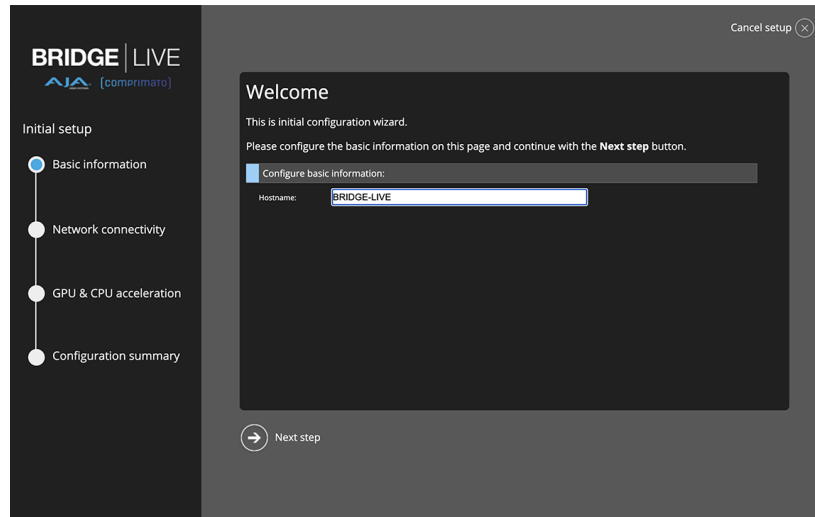
Configuration of Network Connectivity

Configure each of the two 10GbE interfaces.

Figure 69. Configuring network connectivity
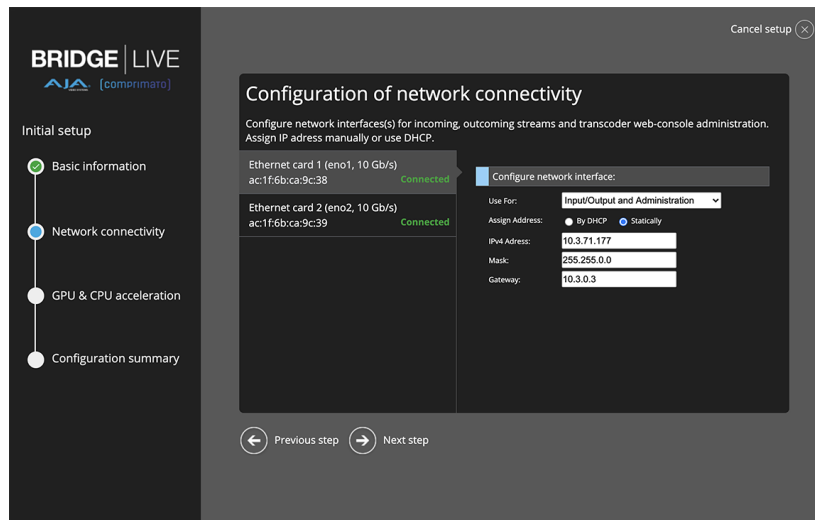
Use For

Select one of the following from the pull-down menu:

- Don't Use
- Administration
- Input/Output
- Input/Output and Administration

NOTE: *Typically Administration is applied to only one port. If applied to more than one port, you will see a warning message (but not an error).*

NOTE: *With a dual NIC setup, you cannot have both NICs connected to the same network.*

Assign Address

Select one of the following:

- DHCP
- Static
  - IPv4 Address
  - Mask
  - Default gateway
- Mask
- Gateway

Click **Next step**.

Configuration of GPU and CPU Acceleration

This section is informational only. It reports detected GPUs and CPUs for acceleration of video frame decoding and encoding.

Figure 70. Informational only – Configuration of GPU & CPU acceleration
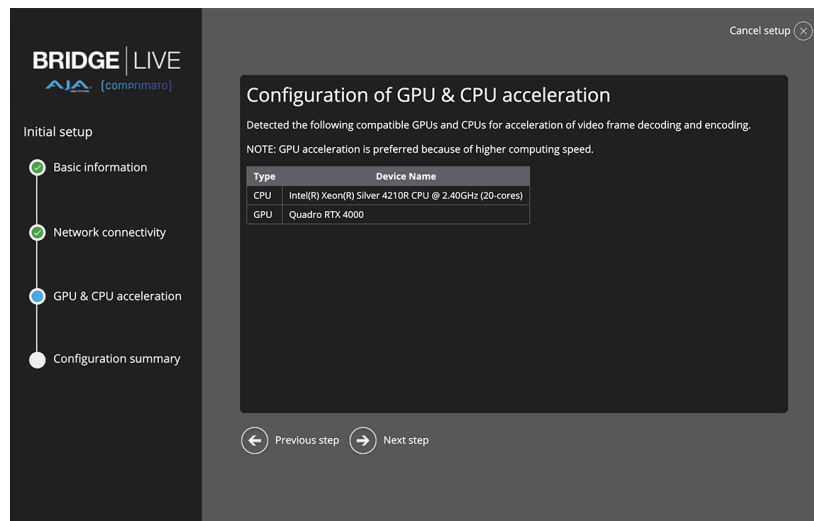
Click **Next step**.

Configuration Summary

A summary of the final configuration settings of your device, including hostname, network connectivity, CPU and GPU acceleration, and DNS settings.

Figure 71. Configuration summary
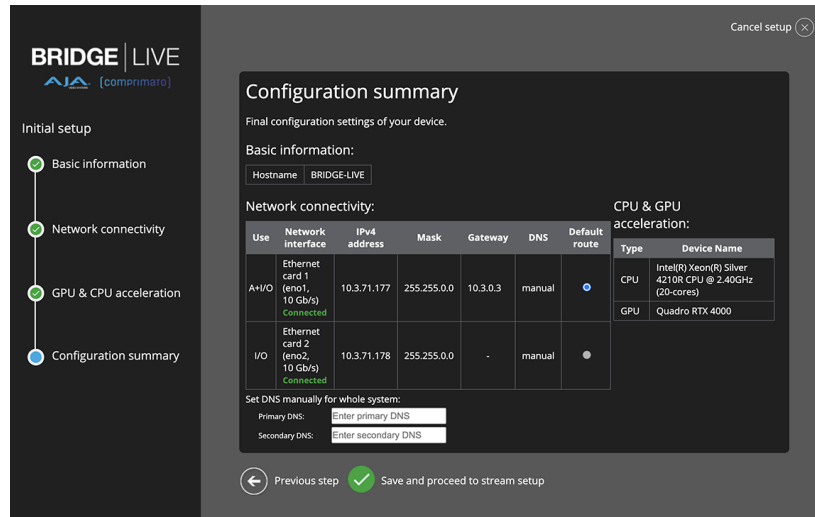
Default Route

This is used for setting up the BRIDGE LIVE system so that it communicates correctly within your network. The default route determines which interface is used by BRIDGE LIVE for outbound communication.

The Default route is also used for internal communication. It is typically the address of another router, which treats the packet the same way: if a route matches, the packet is forwarded accordingly, otherwise the packet is forwarded to the default route of that router.

Set DNS Manually for Whole System

You can manually set which DNS server should be used for your BRIDGE LIVE system.

The BRIDGE LIVE server will send DNS requests to either the primary or secondary DNS server.

DNS is a protocol which allows you to translate domain names (www. domainname.com) into IP addresses.

Password Administration

Changing passwords for the two user types is done through the Password management page, accessed through the Admin > Security menu.

Figure 72. Accessing password management
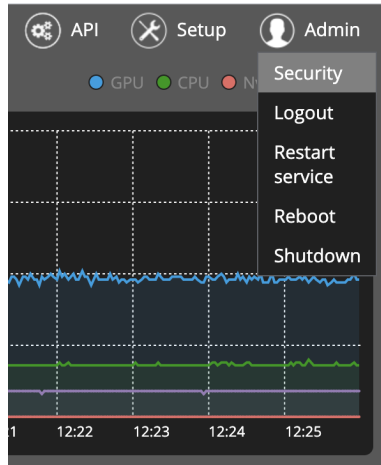
Setting Remote Shell Access

From the Password management page, you can enable or disable SSH access to BRIDGE LIVE altogether by clicking the Enable button (if currently disabled) or the Disable button (if currently enabled) underneath the Secure Shell (SSH) heading.

Remote secure shell (SSH) access is intended only for the transcoder user (console user).

Password Management

Manage passwords for the admin user (web application user) and the transcoder user (console user) by entering the current password, then setting the new password.

Licensing

Licenses that are ordered at the time of purchasing the BRIDGE LIVE unit will be pre-installed prior to shipment.

At a later date, if you want to order an additional license, you will need to get the unique Installation ID number, found on the System Information page, and contact AJA Support.

To access the System Information page, select **System Information** from the Setup menu in the upper right area of Dashboard. The System Information page displays.

Figure 73. Accessing the System Information page from the Setup menu
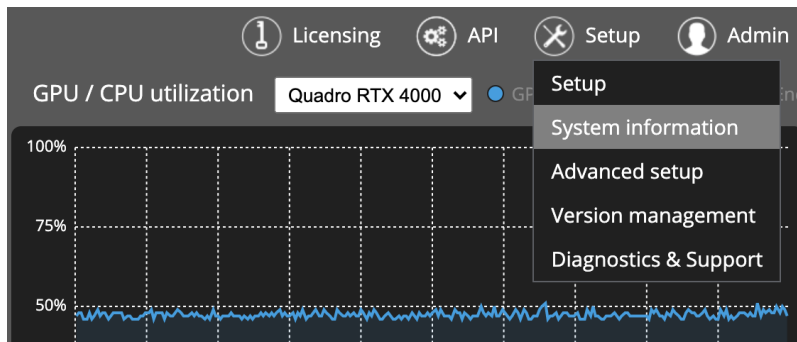
From the System Information page, the Installation ID is found a few lines below the top of the page.

Contacting AJA Technical Support

Email: support@aja.com

Phone: +1-530-271-3190

Fax: +1-530-274-9442

Web: https://www.aja.com/support/contact

Shipping: 180 Litton Dr. Grass Valley, CA 95945 USA

With the Installation ID in hand, contact AJA Support. AJA Support will assist you with placing your order for an additional license. You will receive the license through an email attachment or download link. Download the license file to a place that is accessible to you through the BRIDGE LIVE web UI.

Next, navigate to the License page by clicking **Licensing** in the upper right area of Dashboard.

Figure 74. Accessing the Licenses page
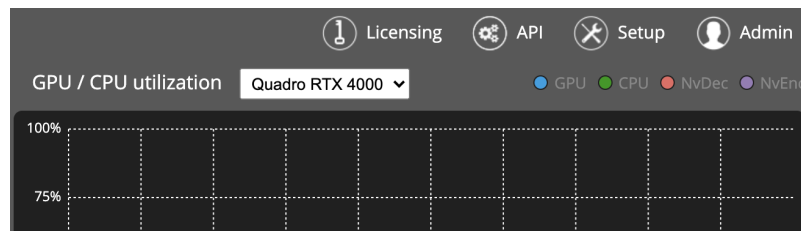
From the Licenses page, select **Load license file**. Navigate to the license file, select it, then click **Upload**. Upon completion of the license upload, the license will immediately be available for use.

Updates

To check for updates for AJA BRIDGE software, go to the AJA website and view/download the package for your particular BRIDGE model:

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

Unzip the download and then stage the unzipped package via either USB key or network share. Then, from within BRIDGE LIVE, Setup > Version management choose to "Upload upgrade file" and browse to the downloaded and unzipped package – then "Perform Upgrade".

Chapter 8 – Advanced System Administration

Advanced BRIDGE LIVE Configuration

You can change configuration settings (used for fine-tuning to a particular use case) and change the version of BRIDGE LIVE. You can access both configuration settings by hovering with mouse over the Setup icon in the UI, as you can see in *Figure 75*.

Figure 75. Setup Mouseover
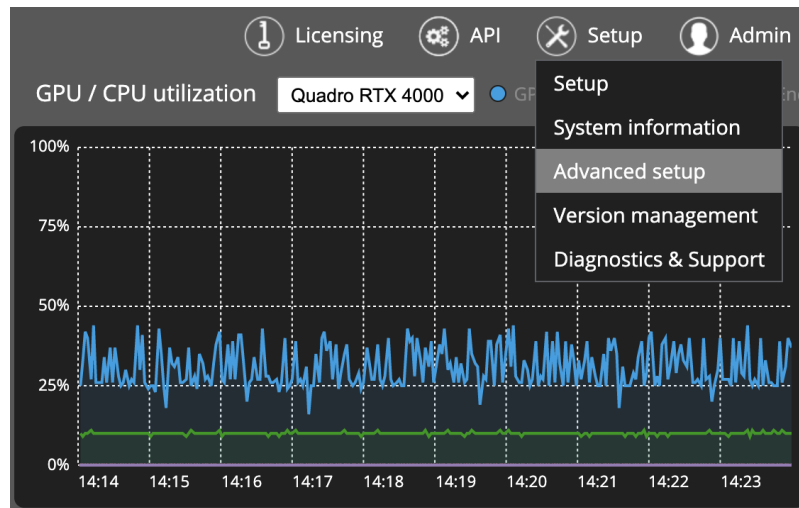
Advanced Setup

Access Advanced setup by clicking the Advanced setup option under the Setup mouseover. You can select between saved configuration under Available settings drop-down menu, download them, upload new ones and delete custom configuration files. Click the Apply button in order to set the chosen settings configuration. After that, you will be prompted to restart the BRIDGE LIVE service in order to apply changes. This configuration allows you to edit parameters, which adjust the transcoding process, such as GPU memory distribution, encoding presets, and other settings.

The suffix "preset" means that the file is the pre-configured one, which in general should work best with a particular use case. The suffix "custom" points out the fact that this settings file was uploaded to BRIDGE LIVE by the end user.

It is advised to consult the configuration adjustments with your support team.

Figure 76. Advanced Settings Management
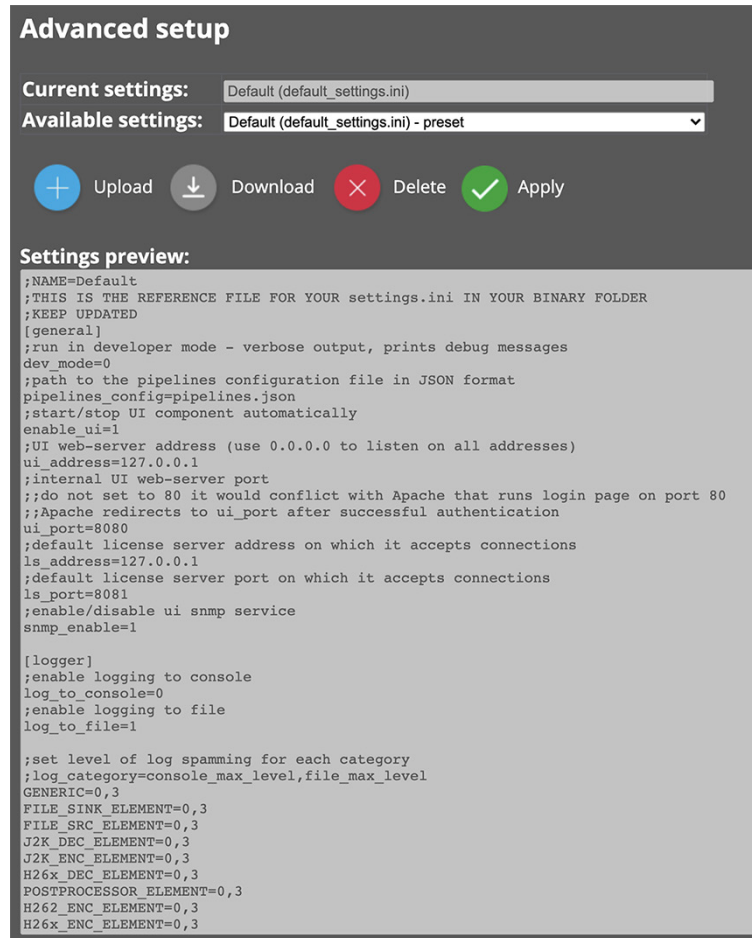
Version Management

Version management can be accessed by clicking the Version management option under Setup mouseover. You can select from uploaded upgrade files, which you need to obtain from your supplier first. Select the particular version you are interested in and click the Perform upgrade button. After that, you will be asked whether you want to restart the server right away or do it later.

Figure 77. Version Management
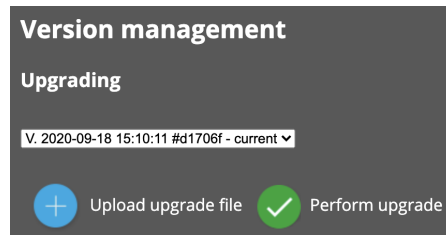
Factory Reset

> **WARNING:** Before performing a factory reset, be sure to backup your Pipeline configurations. See *"Creating and Loading Preset Configurations for Streams" on page 53* for more information.

Performing a factory reset will restore BRIDGE LIVE to its factory settings. All pipelines and settings, including network setup and passwords, will revert to default factory settings. Only your current licenses will be preserved. Once changes are applied, the server will restart itself and boot into the factory state. The process takes approximately one minute.

Factory Reset through a Warm Reboot

If you want to perform a Factory Reset to BRIDGE LIVE from a system that is up and running, take the following steps:

Figure 78. Accessing the Version Management page
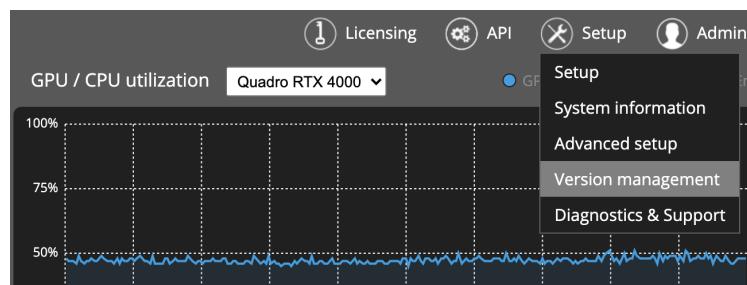
1. From the Setup menu in the upper right area, select Version management. The Version management page displays.

2. Under the Factory reset heading, click **Perform factory reset**.

3. You will need the original Admin credentials indicated in the Quick Start Guide.

Chapter 9 – OS and Network Administration

Console Administration

The default user environment is the aforementioned web-based console. However, for advanced administrative tasks, it is possible to switch to the system console. The background OS is CentOS 7 where the standard shortcut Ctrl+Alt+F1 will forward you to the console environment.

Default Accounts

Admin User

Admin Username: admin
- Used for local login, browser login and REST API

Admin Password:
- See the Quick Start Guide that was originally delivered with your unit for your factory-provided unique password.

Transcoder User

Transcoder Username: transcoder
- Used for CLI/SSH

Transcoder Password:
- See the Quick Start Guide that was originally delivered with your unit for your factory-provided unique password.

NOTE: Due to security reasons, it is not possible to connect using SSH as a root user.

BRIDGE LIVE Files Location

Most of the important files are located in /opt/transcoder/ folder including the binaries or configuration files as well.

System Services

All BRIDGE LIVE components run as a system service. You can use the standard OS's interface systemctl to manage those services.

transcoder-base

Starts the BRIDGE LIVE and the web server with web UI at system start.

transcoder-x

Starts graphical window system with lightweight desktop manager OpenBox.

transcoder-browser

Starts chromium browser in kiosk mode and restarts it in case it detects that chromium stops running.

transcoder license

Starts the license server with its web UI at system start.

Web Administration

The security of the system is provided by a built-in firewall. The setup is available in the UI's setup wizard.

Each network interface needs to be marked with an attribute whether its intent is to be used for:

- Administration – SSH, HTTP(S), SNMP protocols ports allowed
- Incoming/outgoing streams – 1024-65535 ports allowed
- Both
- Unused

All of the remaining ports are blocked.

In a situation when an interface is marked either Administration or Unused, it will not show in the stream configuration dialogue; therefore, it cannot be selected there.

Manual Network Interface Configuration

BRIDGE LIVE UI offers a somewhat limited set of possibilities to configure the network interface. In the event that you need to set it more precisely, CentOS 7 has three main options for how to configure network interfaces.

1. ifcfg files – It uses ifcfg network configuration script files placed in '/etc/sysconfig/network-scripts'. It is used internally in BRIDGE LIVE. You can manually adjust some parameters when needed. Preferred and the only supported way of manual network setup in BRIDGE LIVE OS.

2. NetworkManager – NM uses its nm* commands to configure network interfaces; however, it conflicts with BRIDGE LIVE setting up the network in its own way. Therefore, BRIDGE LIVE setup interfaces are not to be managed by NM. Please do not use it.

3. ip command – some changes made by ip command are only temporal and are not guaranteed to survive system restart. We recommend exercising caution in making use of this functionality.

Virtual Interfaces

BRIDGE LIVE currently doesn't support creating new virtual interfaces in web UI. These interfaces need to be added using system console using ifcfg scripts. Currently BRIDGE LIVE recognizes bond, bridge and vlan interfaces.

Adding New Virtual Interface

For example, to add vlan 100 to existing Ethernet interface enp4s0:

With sudo add new file ifcfg-enp4s0.100 to directory /etc/sysconfig/network-scripts/ (for example with nano or vim) cd /etc/sysconfig/network-scripts/ sudo vim ifcfg-enp4s0.100

DEVICE=enp4s0.100

TYPE=Vlan

VLAN=yes

VLAN_ID=100

ONBOOT=yes

BOOTPROTO=none

NM_CONTROLLED=no

IPV6INIT=no

ZONE=trc-admin-data

Next start the interface

sudo ifdown ifcfg-enp4s0.100

sudo ifup ifcfg-enp4s0.100

Restart BRIDGE LIVE service

sudo systemctl restart transcoder-base

Wait until BRIDGE LIVE starts and in BRIDGE LIVE Dashboard run Setup where you can find your new vlan interface. Configure usage and complete setup.

Chapter 10 – Using REST API

The REST API is accessed with standard methods, including through the browser URL field and through Curl commands.

Can use other methods too. Can use through web browser. For automation, would use something like Curl. But it is a typical REST API in terms of how someone would access and use it.

Accessing the API Documentation

BRIDGE LIVE is REST API ready. You can access the complete API documentation by selecting the API button in the top right corner of Dashboard.

Figure 79. The API button
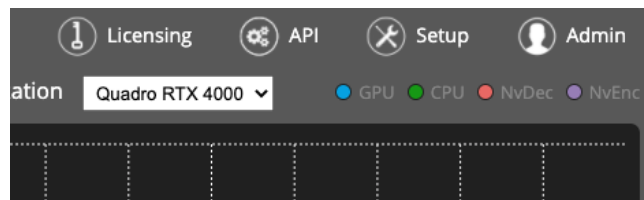
Featured Curl commands

The API documentation is extensive. However, the following list of certain Curl commands may be especially useful as you get started:

list network interfaces

- $ curl 'http://localhost:8080/api/system/network-interfaces' -i -H 'Accept: application/json'

list all available pipelines

- $ curl 'http://localhost:8080/api/pipelines' -i -H 'Accept: application/json'

add simple pipeline with input stream data

- $ curl 'http://localhost:8080/api/pipeline' -i -X POST -H 'Content-Type: application/json' \ -d '{ "name" : "Pipeline 3", "source" : "udp://127.0.0.1:5000:lo", "complianceWith" : "TR_01", "video" : { "format" : "J2K", "width" : 1920, "height" : 1080, "sampling" : "4:2:2", "depth" : 10, "framerate" : "24", "fieldOrder" : "PROGRESSIVE" } }

get the state of pipeline with ID 0

- $ curl 'http://localhost:8080/api/pipeline/0/state' -i -H 'Accept: application/json'

Chapter 11 – Using SNMP

Example of SNMP Commands

It is possible to automate system monitoring with the SNMP protocol. Below is the list of commands that you may use.

NOTE: The monitoring only works while the BRIDGE LIVE is actually transcoding. You will not see a correct response if the system is idle.

CPU utilization

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.2021.11.9

GPU utilization

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.1.4.1.3

Available GPUs

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.1.4.1.2

Inbound streams

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.2.2.1

Outbound streams

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.2.3.1

Dropped frames

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.2.3.1.8

Overall status

snmpwalk -v2c -cpublic <IP> .1.3.6.1.4.1.50087.1.1.3.1

Network received data

snmpwalk -v2c -cpublic <IP> .1.3.6.1.2.1.2.2.1.10

Network transmitted data

snmpwalk -v2c -cpublic <IP> .1.3.6.1.2.1.2.2.1.16

Network interfaces

snmpwalk -v2c -cpublic <IP> .1.3.6.1.2.1.2.2.1.2

Obtaining name of an object in a tree – outputs COMPRIMATO-SYSTEMS-MIB:cmpto

snmptranslate .1.3.6.1.4.1.50087

Obtaining location of a certain object from MIB – outputs .1.3.6.1.4.1.50087.1.1.3

snmptranslate –On COMPRIMATO-SYSTEMS-MIB:trcOutputStreamTable

SNMP Traps

BRIDGE LIVE uses standard SNMP traps. SNMP traps are used to send event messages. An event has a start and an end which are conveyed by event messages. Below is an example of events we use:

- user launched a pipeline
- user stopped a pipeline
- a pipeline crashed
- the device is receiving no input
- the device is producing no output
- some frames are being dropped by the transcoder
- invalid data on input

Each event has assigned a severity, which can be:

- info(0)
- warning(1)
- error(2)
- clear(3)

Events get cleared by a trap containing an event message with severity clear(3). Event messages regarding the same event are linked together by the same trcEventKey.

trcEvent structure:

- trcEventIndex
- trcEventKey
- trcEventObject
- trcEventObjectName
- trcEventSeverity
- trcEventText
- trcEventCreatedTime

The event message contains all necessary information about the event:

- eventObject – OID of the alarming object within the node having the alarm
- eventObjectName – human-friendly name of the alarming object
- severity – the severity of the event (CLEAR - add)
- text – an event text providing more information about the issue
- createTime – time when the event was raised/cleared

There are also two related tables – lastEventsTable and activeEventsTable. lastEventsTable contains the 10 most recent event messages (one row for each sent trap). activeEventsTable contains all raised events which have not been cleared yet, alongside the four most recently cleared ones.

OIDs of relevant tables:

- lastEventsTable .1.3.6.1.4.1.50087.1.1.2.1

- activeEventsTable .1.3.6.1.4.1.50087.1.1.3.1

Configuration of SNMP Manager

You can find the MIB file in BRIDGE LIVE here:

/usr/share/snmp/mibs/COMPRIMATO-SYSTEMS-MIB.txt

Setup to configure the SNMP agent:
- open "/etc/snmp/snmpd.conf" for editing as sudo,
- find the line that reads "trap2sink localhost public",
- replace "localhost" with the IP address of the SNMP manager. The line should then look like this:

"trap2sink 172.12.5.123 public",
- save the file,
- restart SNMP services: "sudo systemctl restart snmpd" and "sudo systemctl restart snmptrapd".

Chapter 12 – Troubleshooting

What if BRIDGE LIVE fails?

Chromium has an ability to restart itself. However, we restricted this for BRIDGE LIVE because there is a possibility to get into an infinite loop due to a bad config file. Instead, you should use system tools to (re)start the BRIDGE LIVE using the command:

> sudo systemctl stop transcoder-base

in order to turn off the service. Use the following command to investigate service logs; alternatively you can also edit config .json files (located /opt/transcoder/).

> sudo journalctl –u transcoder-base

and start the service again

> sudo systemctl start transcoder-base

In case this procedure fails to reinitiate the correct operation of BRIDGE LIVE, please try to also reboot the whole machine. If the problem is still not gone, contact Support.

How do I access the system administration environment?

You can access the system administration environment only through the local interface. It is not available through remote browser.

Use the CentOS standard shortcut Ctrl + Alt + F1 in order to switch the view. Here you can use Unix commands to operate the system. Using Ctrl + Alt + F2 will bring you back to the web UI.

How can I collect BRIDGE LIVE log files?

You can see logs in the folder:

> /opt/transcoder/transcoder/logs/

If you need to send logs to Support, please copy the contents of the folder, archive them and share.

Alternatively, you can download them from the Diagnostics and Support page. To access the page, select **Diagnostics & Support** from the Setup menu in the upper right area of Dashboard.

Figure 80. Accessing Diagnostics and Support page from the Setup menu
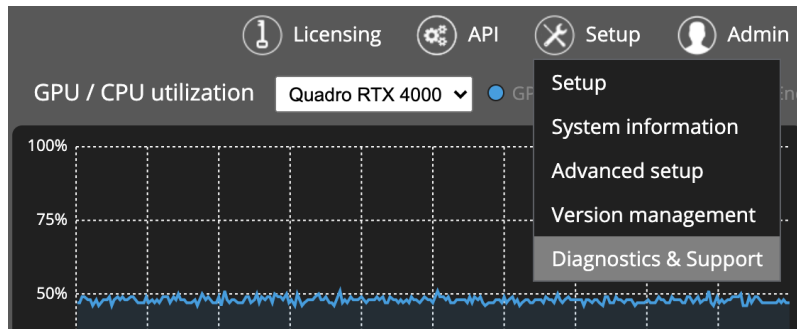
From the Diagnostics and Support page, click **Create and download diagnostic report**. The diagnostic report will download to your computer. The report contains system information, pipeline configuration information, and system logs. Please send the diagnostic report to AJA Support (support@aja.com).

How can I change the default system password?

See also: *"Password Administration" on page 61*.

BRIDGE LIVE installation runs on CentOS 7, and you can use standard system commands. If you need to change the password for user "myuser" then use the command:

    sudo passwd myuser

in the system terminal. You can access the terminal window with the keyboard shortcut Ctrl + Alt + F1 while browsing the BRIDGE LIVE UI.

How can I change the admin password?

See also: *"Password Administration" on page 61*.

We have a script ready that can change the admin password. Switch to the system console environment (described above) and navigate to /opt/transcoder/ where there is a script set_ui_password.sh that will accomplish the task. Run the script with sudo permissions.

The UI shows that streams are working but I cannot receive any data on the output.

It is highly probable that there is an issue on the network and the data are being lost in transmission. Please verify that the network route is accessible between devices (source, BRIDGE LIVE, receiver) including firewall settings, which may be configured to block BRIDGE LIVE-related traffic (e.g., ports). You can use Wireshark to verify whether your target machine is receiving network data, or VLC to visualize the content.

I see frame drops in the UI. What can be the cause?

There are two possible causes – flaws in the input, or performance bottlenecks. The rule of thumb is to investigate whether drops occur when the machine is not fully utilized. If so, the problem may be in the input itself when some frames can be corrupted by losses during network transmission or compatibility issues.

The other case is that high workload is responsible for frame drops; for example, high utilization of HW resources (CPU, GPU, NI). Try to lower the performance drain by stopping some streams and observe the situation further.

Another possibility is to configure the Pipeline to have higher Total bitrate overhead over Video bitrate. Sometimes, the video bitrate fluctuation is higher, which causes the video stream to not be able to fit into the overall data limit, resulting in dropped frames.

What information is needed for troubleshooting by Support?

In order to provide troubleshooting we need:
- Your description of the issue
- Any error messages you are seeing
- Parameters of input stream(s) – standard compliance, resolution, framerate, audio channels, the number of configured input streams
- Parameters of output stream(s) – bitrates, resolution, framerate, encoding option, the number of configured output streams
- Identification of successive devices that receive BRIDGE LIVE's output stream

- Network configuration (for example, do devices see each other on the network?)

Bear in mind that providing an extensive and detailed description of your issue will help us work more efficiently and deliver the solution faster.

A list of possible error messages in UI:

{stream} is not producing any data to sink – no video output is produced, rather, the stream is filled with NULL packets.

This message is normal during the stream initialization. Otherwise, there may be a problem.

Some video frames are being dropped.

A frame that cannot be processed by the pipeline due to flawed images, high latency, etc., in a specified time slot, is dropped.

{stream} wasn't detected in source stream.

The provided stream parameters (width, height, frame rate or standard compliance) during configuration in the UI do not match the auto-detected parameters from the input Transport stream.

Video is being encoded at a lower frame rate {xxx} than required {yyy}.

The video encoder is busy encoding too many streams. Try reducing the number of encoding streams.

Video is being decoded at lower frame rate {xxx} than required {yyy}.

The video decoder is busy decoding too many frames. Try reducing the number of input streams.

{stream} is in unexpected state: {status}

Contact Support.

{stream} is not receiving any PCR from source.

BRIDGE LIVE cannot detect any input data or all PCR packets are dropped.

Appendix A – Specifications

BRIDGE LIVE Tech Specs

Video Formats

- (UltraHD) 3840x2160p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (2K) 2048x1080p 23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60
- (HD) 1080i 50, 59.94, 60
- (HD) 1080p 23.98, 24, 25, 29.97, 30, 50, 59.94, 60
- (HD) 720p 50, 59.94, 60
- (SD) 625i 50
- (SD) 525i 59.94
- YCbCr, 4:2:2, 10-bit

Video Codec Color Component Sampling

- 4:2:2, 10-bit/8-bit
- 4:2:0, 10-bit/8-bit

Video Codecs

- H.264 (AVC, MPEG-4)
- H.265 (HEVC)
- JPEG 2000 (VSF TR 01)
- MPEG-2

Audio Streams/Codecs

- AAC
- AC3
- MPEG-2 Audio
- Uncompressed PCM (multichannel), SMPTE 302M-2007

Metadata

- Closed Captioning (EIA-608/708)
- Line 21 Captions
- Metadata pass-through
- MPEG-2 ancillary packet support, SMPTE 2038
- SCTE-35, SCTE-104 (plus conversion)
- Subtitles embedded within H.264 SEI messages
- Electronic program guide (EPG) on input

Containers and Protocols

- MPEG-TS
- MPTS (input only)
- RTMP/RTMPS
- RTP, UDP
- SRT (including encryption)
- VSF-TR01

Video Processing

- Auto Color Component Sampling based on I/O settings
- Cropping / Padding
- Color adjustments
- Deinterlacing
- Frame rate 50% down-conversion (60p->30p, 59.94->29.97, 50p->25p)
- Frame rate up-conversion (50i->50p)
- Logo insertion
- Resizing

Audio Processing

- Channel Remapping
- Gain
- Sample Rate conversion

Synchronization

- Input PCR
  - Global configuration (in separate transport stream)
  - Local configuration (in each transport stream)
- Output PTS
  - Pass-through
  - Add offset to input PTS

Performance

- Stream startup time maximum 5 seconds after configuration applied
- Latency 200-700ms input to output (based on codec and other parameters)
- Up to 4 simultaneous primary HD streams, plus additional output variations per stream*
- Up to 1 primary UHD stream, plus additional output variations of that stream*

*Final additional stream count per output is dependent on configuration

Video Input Digital

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

*UltraHD 30p supported, no HD 120p support at this time

Video Output Digital

- 12G-SDI, SMPTE-2082, 10-bit
- 6G-SDI, SMPTE-2081, 10-bit
- 3G-SDI, SMPTE-259/292/296/424, 10-bit
- 1.5G-SDI, SMPTE 292M, Single Link 4:2:2 (1x BNC), 10-bit

Audio Input Digital

- 16-channel, 16 and 24-bit SDI embedded audio, 48 kHz sample rate, synchronous per SDI connection

Audio Output Digital

- 16-channel, 16 and 24-bit SDI embedded audio, 48 kHz sample rate, synchronous per SDI connection

Configuration & Monitoring

- Local "Kiosk" interface (keyboard, mouse and monitor)
- Remote access via Browser
- REST API
- SNMP

Form Factor

- 1RU turnkey system
- 4x full size BNC (12G/6G/3G/1.5G-SDI compatible)
- 2x 10GigE
- Local interface via Display Port and USB
- OS custom image
- Updates and licenses via download

Size (w x d x h)

- 17.2" x 16.9" x 1.7" (436.88 x 429.26 x 43.18 mm)

Weight

- 28 lb. (12.7kg) in box
- 18 lb. (8.2kg) server only

Power

- 100-240 VAC 50/60 Hz (Dual, redundant power supplies)
- 190W typical, 245W Maximum

Environment

- Safe Operating Temperature: 5 to 35 C (41 to 95 F)
- Safe Storage Temperature (Power OFF): -40 to 60 C (-40 to 140 F)
- Operating Relative Humidity: 8-90% noncondensing
- Nonoperating Relative Humidity: 5-95% noncondensing

BRIDGE LIVE SDI Video I/O Formats

UltraHD I/O Supported

1x 12Gb SDI:

Format	Frame Rate	Color Space	Sampling	Bit Depth
• 3840x2160p	23.98, 24, 25, 29.97, 30, 50, 59.94, 60	YCbCr	4:2:2	10

1x 6Gb SDI:

Format	Frame Rate	Color Space	Sampling	Bit Depth
• 3840x2160p	23.98, 24, 25, 29.97, 30	YCbCr	4:2:2	10

2K/HD I/O Supported

1x 3Gb SDI:

Format	Frame Rate	Level A/B	Color Space	Sampling	Bit Depth
• 2048x1080p	23.98, 24, 25, 29.97, 30, 47.95, 48, 50, 59.94, 60	A	YCbCr	4:2:2	10
• 1920x1080p	23.98, 24, 25, 29.97, 30, 50, 59.94, 60	A	YCbCr	4:2:2	10
• 1920x1080i	50, 59.94, 60	A	YCbCr	4:2:2	10
• 1280x720p	50, 59.94, 60	A	YCbCr	4:2:2	10

1x 1.5Gb SDI:

Format	Frame Rate	Color Space	Sampling	Bit Depth
• 2048x1080p	23.98, 24, 25, 29.97, 30	YCbCr	4:2:2	10
• 1920x1080p	23.98, 24, 25, 29.97, 30	YCbCr	4:2:2	10
• 1920x1080i	50, 59.94, 60	YCbCr	4:2:2	10
• 1280x720p	50, 59.94, 60	YCbCr	4:2:2	10

SD Inputs Supported

1x 270Mb SDI:

Format	Frame Rate	Color Space	Sampling	Bit Depth
• 525i	59.94	YCbCr	4:2:2	10
• 625i	50	YCbCr	4:2:2	10

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:

EN 60065: 2014 (T-Mark License),

IEC 60065: 2014 (CB Scheme Report/Certificate)

Additional licenses issued for specific countries available on request.

Emissions

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

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

Immunity

EN 55103-2: 2009, EN 61000-4-2:2009, EN 61000-4-3: 2006 + A1:2008 + A2:2010,

EN 61000-4-4: 2004 + A1:2010, EN 61000-4-5:2006, EN 61000-4-6:2009,

EN 61000-4-11:2004

Environments: E2, E3 and E4

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

> **Warning!** This is a Class 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

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

Taiwan Compliance Statement

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Warning! 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! 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

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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! 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! 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.

Hazard! High Voltage. This situation or condition can cause injury due to electric shock.

Avertissement! Tension élevée. Cette situation ou condition peut causer des blessures dues à un choc électrique.

Warnung! Hochspannung. Diese Situation oder Bedingung kann zu Verletzungen durch Stromschlag führen.

¡Advertencia! Alto voltaje . Esta situación o condición puede causar lesiones debidas a una descarga eléctrica.

Aviso! Alta Tensão . Esta situação ou condição pode causar danos devido a choques elétricos.

Avviso! Alta tensione. Questa situazione o condizione può causare lesioni a causa di scosse elettriche.

Warning! Dual Power Cord Notice—please read this. To reduce the risk of electrical shock,disconnect both power cords before servicing equipment.

Avertissement! Avis concernant la double alimentation électrique — à lire soigneusement. Pour éviter tout risque d'électrocution, débranchez les deux câbles électriques avant d'intervenir sur l'équipement.

Achtung! Hinweis auf Doppel-Netzkabel—bitte lesen. Um das Risiko eines Elektroschocks zu verringern, müssen beide Netzkabel ausgestöpselt werden, bevor die Vorrichtung gewartet wird.

Avvertenza. Avviso concernente il cavo di alimentazione doppio – leggere attentamente. Per ridurre il rischio di elettrocuzione, scollegare entrambi i cavi di alimentazione prima di eseguire la manutenzione o riparazioni di questo apparecchio.

Aviso! Aviso de Cabo Elétrico Duplo - por favor, leia isto. Para reduzir o risco de choque elétrico, desconecte ambos os cabos elétricos antes de fazer manutenção ao equipamento.

¡Advertencia! Aviso del doble cable de alimentación - leer esto por favor. Para reducir el riesgo de descarga eléctrica, desconecte ambos cables de alimentación antes de dar servicio al equipo.

Caution! To meet safety regulations for leakage current, connect the dual power supplies to separate branch circuits.

¡Advertencia! Para cumplir con las normas de seguridad para la corriente de fuga, conecte las dos fuentes de alimentación para circuitos derivados diferentes.

Attention! Pour répondre aux mesures de sécurité concernant le courant de fuite, raccorder les sources d'alimentation doubles à des circuits de dérivation distincts.

Warnung! Zur Erfüllung der Sicherheitsbestimmungen bezüglich Reststrom schließen Sie bitte die zwei Netzteile an unterschiedlichen Abzweigleitungen an.

Cuidado! Para atender aos regulamentos de segurança para correntes de fuga, conecte as fontes duplas a circuitos elétricos separados.

Attenzione! Per soddisfare le norme di sicurezza sulla corrente di perdita, collegare i doppi alimentatori a circuiti derivati separati.

Warning! Hazardous Voltages! The safe operation of this product requires that a protective earth connection be provided. This protective earth is provided by the grounding conductor in the equipment's supply cord. To reduce the risk of electrical shock to operator and service personnel, this ground conductor must be connected to an earthed ground.

Avertissement : tensions dangereuses — Pour utiliser ce produit en toute sécurité, il faut un raccordement à la terre. Ce raccordement s'effectue par l'intermédiaire du connecteur de terre dans le cordon d'alimentation de l'équipement. Pour réduire le risque d'électrocution de l'opérateur ou du personnel de maintenance, ce cordon avec conducteur de terre doit être branché sur une prise reliée à la terre.

Achtung! Gefährliche Spannungen — Sichere Bedienung dieses Geräts erfordert, dass ein Schutzleiteranschluss vorgesehen wird. Dieser Schutzleiteranschluss wird mittels der Erdungsleitung im Netzkabel der Vorrichtung vorgesehen. Um die Gefahr eines Elektroschocks für Bedien- und Wartungspersonal zu verringern, muss diese Erdungsleitung mit einer geerdeten Masse verbunden werden.

Avvertenza – Alte tensioni – Il funzionamento in sicurezza di questo prodotto richiede una presa di terra, che viene fornita dal conduttore di messa a terra presente nel cavo di alimentazione dell'apparecchio. Per ridurre il rischio di elettrocuzione per l'operatore e il personale di manutenzione, tale conduttore deve essere collegato a un punto al potenziale di terra.

Advertencia de voltajes peligrosos — El funcionamiento seguro de este producto require que se proporcione una conexión terrestre protegida. Esta protección terrestre es proporcionada por el conductor de conexión en la tierra del cable de alimentación del equipo. Para reducir el riesgo de descarga eléctrica al operador y el personal de servicio, este conductor de conexión de la tierra debe ser conectado a la misma tierra.

Warranty and Liability Information

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 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 the Customer brings a valid claim under this limited warranty for a hardware product or storage module (hereafter, a "product") during the applicable warranty period, AJA Video will, at its sole option and as the Customer's sole remedy for breach of the above warranty, provide one of the following remedies:

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

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 https://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. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES OR LIMITATIONS ON APPLICABLE STATUTORY RIGHTS OF A CONSUMER, SO SOME OR ALL OF THE TERMS OF THIS PARAGRAPH MAY NOT APPLY TO YOU.

Limitation of Liability

Under no circumstances shall AJA video BE LIABLE IN ANY WAY FOR ANY LOST, CORRUPTED OR DESTROYED DATA, FOOTAGE OR WORK, OR FOR ANY OTHER INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOST PROFITS, OR FOR ANY THIRD PARTY CLAIM, IN CONNECTION WITH THE PRODUCT, WHETHER RESULTING FROM DEFECTS IN THE PRODUCT, SOFTWARE OR HARDWARE FAILURE, OR ANY OTHER CAUSE WHATSOEVER, EVEN IF AJA VIDEO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. AJA VIDEO'S LIABILITY IN CONNECTION WITH THE PRODUCT SHALL UNDER NO CIRCUMSTANCES EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCT. The foregoing limitations apply even if any remedy set forth in this LIMITED WARRANTY fails of its essential purpose. SOME JURISDICTIONS DO NOT ALLOW THE LIMITATION OF LIABILITY FOR PERSONAL INJURY, OR OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO SOME OR ALL OF THE TERMS OF THIS PARAGRAPH MAY NOT APPLY TO YOU.

Governing Law and Language; Your Rights

This limited warranty is the only warranty provided by AJA Video on the hardware product. It supersedes all prior or contemporaneous understandings regarding such subject matter. No amendment to or modification of this warranty will be binding unless in writing and signed by AJA Video. The laws of the State of California, USA will govern this warranty and any dispute arising from it. Any translation of this

Agreement is intended for convenience and to meet local requirements and in the event of a dispute between the English and any non-English versions, the English version of this warranty will govern. This limited warranty gives you specific legal rights and you may have other rights that vary from jurisdiction to jurisdiction, some of which are noted above.

Index