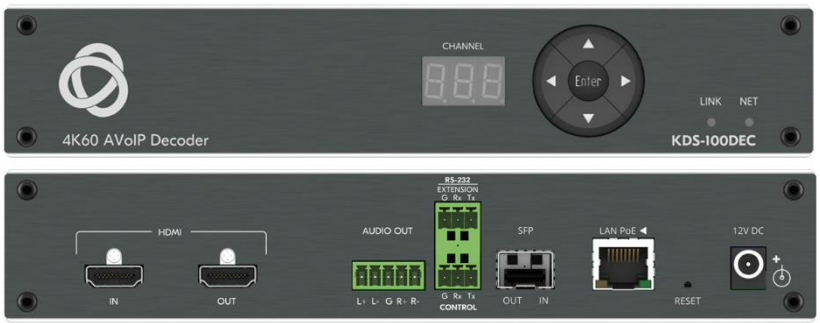
USER MANUAL

MODEL:

KDS-100EN / KDS-100DEC
4K AVoIP H.264 / H.265 Encoder / Decoder



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2 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better!

2.1 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment.
- Review the contents of this user manual.

Go to https://www.kramerav.com/downloads/kds-100en or https://www.kramerav.com/downloads/kds-100dec to check for up-to-date user manuals, application programs, and to check if firmware upgrades are available (where appropriate).

2.1.1 Achieving Best Performance

- Use only good quality connection cables (we recommend Kramer high-performance, high-resolution cables) to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables).
- Do not secure the cables in tight bundles or roll the slack into tight coils.
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality.
- Position your Kramer **KDS-100EN** / **KDS-100DEC** away from moisture, excessive sunlight and dust.

2.1.2 Safety Instructions

Caution:

- This equipment is to be used only inside a building. It may only be connected to other equipment that is installed inside a building.
- For products with relay terminals and GPI\O ports, please refer to the permitted rating for an external connection, located next to the terminal or in the User Manual.
- There are no operator serviceable parts inside the unit.

Warning:

- If not using PoE, use only the optional power cord supplied for the unit.

2.1.3 Recycling Kramer Products

The Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC aims to reduce the amount of WEEE sent for disposal to landfill or incineration by requiring it to be collected and recycled. To comply with the WEEE Directive, Kramer Electronics has made arrangements with the European Advanced Recycling Network (EARN) and will cover any costs of treatment, recycling and recovery of waste Kramer Electronics branded equipment on arrival at the EARN facility. For details of Kramer's recycling arrangements in your particular country go to our recycling pages at www.kramerav.com/quality/environment.

2.2 Overview

KDS-100 series devices deliver a complete and versatile AVoIP streaming solution for 1GE (1Gbps) networks making the most of the H.264/265 open standard. KDS-100 is ideal for any space or use-case requiring low-latency, high-quality video presentation up to 4K60 4:2:2, such as operations rooms, university auditoriums, highly secure command and control centers, and AVoIP distribution deployments.

KDS-100 series is extremely bandwidth-efficient, making it perfect for deployment over an existing IT network. KDS-100 supports up to 1000 video sources, enables simple and fast deployment, and easily scales to suit any size network AV installation.

Delivering a superior user experience, enterprise IT-grade security and advanced, yet intuitive management, KDS-100 meets all the streaming needs of enterprise, education, homeland security, military or government sites of any size. KDS-100 is part of Kramer's market-leading KDS family, the broadest range of AVoIP streaming solutions available today

Kramer **KDS-100EN** is an advanced transmitter for streaming 4K@60Hz video signals via Ethernet over copper or fiber cables. It encodes and streams over an IP network from HDMI input, and transmits RS−232 signals over the IP network.

Kramer **KDS-100DEC** decoder is an advanced receiver for streamed 4K@60Hz video signals via Ethernet over copper or fiber cables. It also decodes the RS−232 signals transmitted over IP network from the encoder.

2.2.1 Highest-Quality Video

Support for 4K60 4:2:2 video streaming ensures finely detailed images are transmitted in full quality matching the high-end capabilities of displays.

2.2.2 Exceptional Quality

- **Robust Solution for Large–Scale Installations** — The KDS-100 line provides an optimized solution for large education and enterprise campuses, and for defense and homeland security facilities, with support for numerous simultaneous video flows and built–in advanced management capabilities.
- **Built–in Resilient Security Features** — The KDS–100 line preserves the integrity, availability and confidentiality of the IT network via a highly secured and resilient AVoIP solution. KDS–100 devices comply with IT security requirements, including 802.1x and HTTPS/TLS.

- **Instant switching** - Optimized for fast switching between streams. Switching takes just 1 second or less.

2.2.3 Advanced and User-friendly Operation

- **Simple Planning and Rollout** — KDS–100 is highly bandwidth–efficient, thus enabling cost–efficient hybrid use of the existing 1GE IT network. Offering easy management, high reliability, and adjustable bandwidth control, KDS–100 is extremely cost–effective to maintain over the long term.
- **Alternative Sources/Destinations** — An HDMI loop–through port on the encoder side and an HDMI input port on the decoder, as well as embedding and de–embedding analog audio to the IP stream.

2.3 Typical Applications

KDS-100EN is ideal for the following typical applications:

- Real-time essential installations such as command and control rooms.
- Large scale AV content sharing installations using existing wires and infrastructure in corporate offices and government applications.
- AV distribution systems with one or more sources and multiple displays in schools, universities, and public venues.

2.4 Controlling your KDS-100 device

Control your KDS-100 device via:

- **The Ethernet** using built-in user-friendly web pages: See 6.2 Operating via Ethernet on page 15.
- **Protocol 3000** (API) commands: See 11 Protocol 3000 on page 59.
- Use **the channel selection button** to set the broadcast channel: See 6.1 Using the Channel Selection Buttons on page 14.

3 Defining the KDS-100

3.1 Defining KDS-100EN

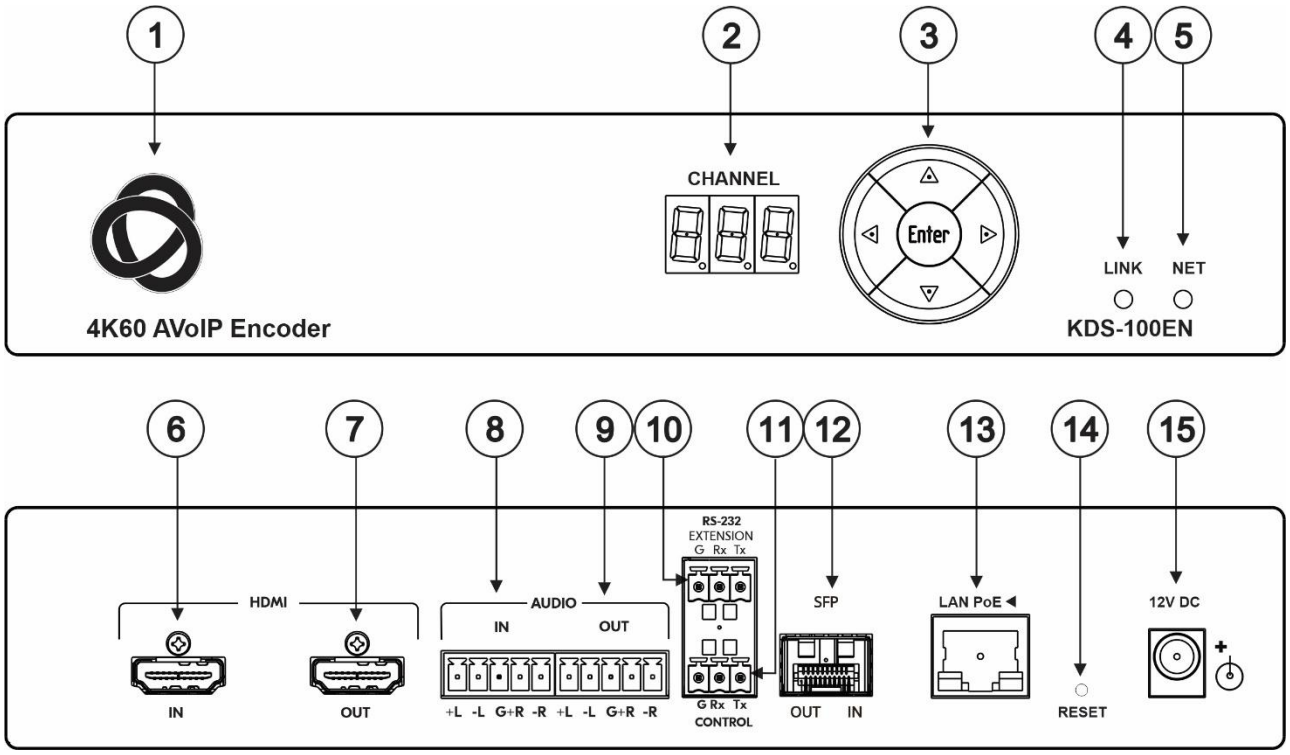


Figure 1: KDS-100EN

#	Feature		Function
1	ON LED (behind the logo)		On when power is supplied to the unit by PoE+ or by the (optional) power adapter.
2	CHANNEL 7-segment display		Use to set the stream's channel (channels must match on encoder and decoder).
3	Channel Selection Button	Up	Press to increment the channel ID number by 1.
		Down	Press to decrement the channel ID number by 1.
		Right	Press to increment the channel ID number by steps of 10.
		Left	Press to decrement the channel ID number by steps of 10.
		Enter	Press to accept the new channel ID number (within 10 seconds).
4	LINK LED	Off	No HDMI input is detected, or AV streaming mode is OFF for **KDS-100EN**.
		Lights green	**KDS-100EN** is linked to a decoder and streaming is active.
		Lights blue	**KDS-100EN** is in Dual Streaming mode, but one of the streams is not active.
		Lights red	Streaming is not active (in Dual Streaming mode, both streams are inactive).
		Flashes green	A device identification command was sent (Flag me). Flashes for 60 seconds.
5	NET LED	Off	No network connection detected.
		Lights green	A network has been detected and **KDS-100EN** has a valid IP address
		Lights red	A network has been detected but the device was not assigned a valid IP address (configure with an RS-232 interface).
		Flashes green	A device identification command was sent (Flag me). Flashes for 60 seconds.
6	HDMI IN connector		Connect to an HDMI source.
7	HDMI OUT connector		Connect to an HDMI acceptor.
8	AUDIO IN 5-pin terminal block		Connect to a balanced, stereo audio source (for example, from the server).

#	Feature	Function
9	AUDIO OUT 5-pin terminal block	Connect to a balanced, stereo audio acceptor (for example, active speakers).
10	RS-232 EXTENSION 3-pin terminal block connector	Connect to a serial data source or acceptor to extend RS-232 control from **KDS-100EN** to a **KDS-100DEC** (or vice versa)**.**
11	RS-232 CONTROL 3-pin terminal block connector	Connect to a serial controller or PC and use it to control **KDS-100EN** with **P3000** API commands.
12	SFP OUT IN transceiver connector	Insert an SFP transceiver (optical SM/MM or copper, supporting up to 1 GE) and plug in an optical / CAT-6e cable for Ethernet traffic over IP.
13	LAN PoE ◄ RJ-45 Port	Connect to the LAN (Ethernet traffic or PC controller). **KDS-100EN** is powered by PoE+ (power over ethernet) delivered through the LAN PoE port, unless the optional 12V DC power adapter is attached.
14	RESET recessed button	Press and hold for 10 seconds to restore factory default values. All LEDs flash.
15	12V DC connector	Connect to the optional power adapter (purchased separately).

3.2 Defining KDS-100DEC

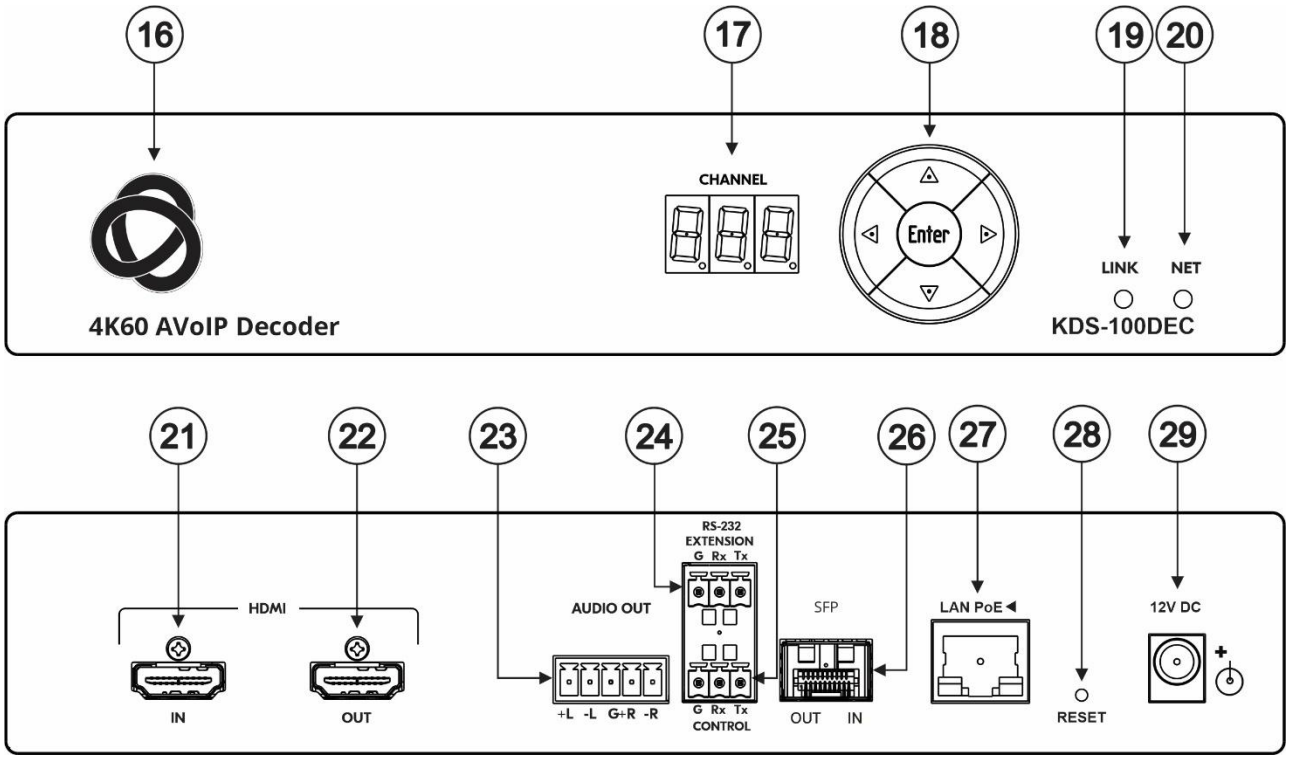


Figure 2: **KDS-100DEC** 4K60 AVoIP Decoder

#	Feature		Function
16	ON LED (behind the logo)		On when power is supplied to the unit by PoE+ or by the (optional) power adapter.
17	CHANNEL 7-segment display		Use to set the stream's channel (channels must match on encoder and decoder).
18	Channel Selection Button	Up	Scroll up through the list of automatically discovered channels.
		Down	Scroll down through the list of automatically discovered channels.
		Right	No action.
		Left	No action.
		Enter	Press to accept the new channel ID number (within 10 seconds).
19	LINK LED	Off	No network streaming detected, or AV streaming mode is OFF for **KDS-100DEC**
		Lights green	**KDS-100DEC** is receiving an input stream and decoding is successful.
		Lights red	**KDS-100DEC** is receiving an input stream but decoding has failed.
		Flashes green	A device identification command was sent (Flag me). Flashes for 60 seconds.
20	NET LED	Off	No network connection detected.
		Lights green	Network detected and the device has been assigned a valid IP address
		Lights red	A network has been detected but the device was not assigned a valid IP address (configure with an RS-232 interface).
		Flashes green	A device identification command was sent (Flag me). Flashes for 60 seconds.
21	HDMI IN connector		Connect to an HDMI source.
22	HDMI OUT connector		Connect to an HDMI acceptor.
23	AUDIO OUT 5-pin terminal block		Connect to a balanced stereo audio acceptor (for example, active speakers).
24	RS-232 EXTENSION 3-pin terminal block connector		Connect to a serial data source or acceptor to extend RS-232 control from **KDS-100DEC** to **KDS-100-EN** (or vice versa)**.**
25	RS-232 CONTROL 3-pin terminal block connector		Connect to a serial controller or PC to control **KDS-100DEC**.

#	Feature	Function
26	SFP OUT IN transceiver connector	Insert an SFP transceiver (optical SM/MM or copper, supporting up to 1 GE) and plug in an optical / CAT-5e cable for Ethernet traffic over IP.
27	LAN PoE ◄ RJ-45 Port	Connect to the LAN (Ethernet traffic or PC controller). **KDS-100DEC** is powered by PoE+ (power over ethernet) delivered through the LAN PoE+ port, unless the optional 12V DC power adapter is attached.
28	RESET recessed button	Press and hold for 10 seconds to restore factory default values. All LEDs flash.
29	12V DC connector	Connect to the power adapter (purchased separately).

4 Mounting KDS-100

This section provides instructions for mounting the devices. Before installing, verify that the environment is within the recommended range:

- Operation temperature – 0° to 40°C (32 to 104°F).
- Storage temperature – -40° to +70°C (-40 to +158°F).
- Humidity – 10% to 90%, RHL non-condensing.

Caution:

- Mount the devices before connecting any cables or power.

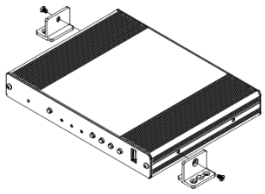
Warning:

- Ensure that the environment (e.g., maximum ambient temperature & air flow) is compatible for the device.
- Avoid uneven mechanical loading.
- Appropriate consideration of equipment nameplate ratings should be used for avoiding overloading of the circuits.
- Reliable earthing of rack-mounted equipment should be maintained.
- Maximum mounting height for the device is 2 meters.

Mounting KDS-100 devices in a rack:

- Use the recommended rack adapter (see https://www.kramerav.com/product/kds-100en#Tab_Application_Story or https://www.kramerav.com/product/kds-100dec#Tab_Application_Story).

Mount KDS-100 devices on a surface using one of the following methods:



- Attach the rubber feet and place the unit on a flat surface.
- Fasten a bracket (included) on each side of the unit and attach it to a flat surface.

5 Connecting KDS-100

By default, KDS-100 devices use PoE+ for power. An optional power adapter can be purchased separately to connect the product to the mains electricity.

Always switch off the power to a device before connecting it to your **KDS-100** device**.**

5.1 Connecting KDS-100EN to KDS-100DEC

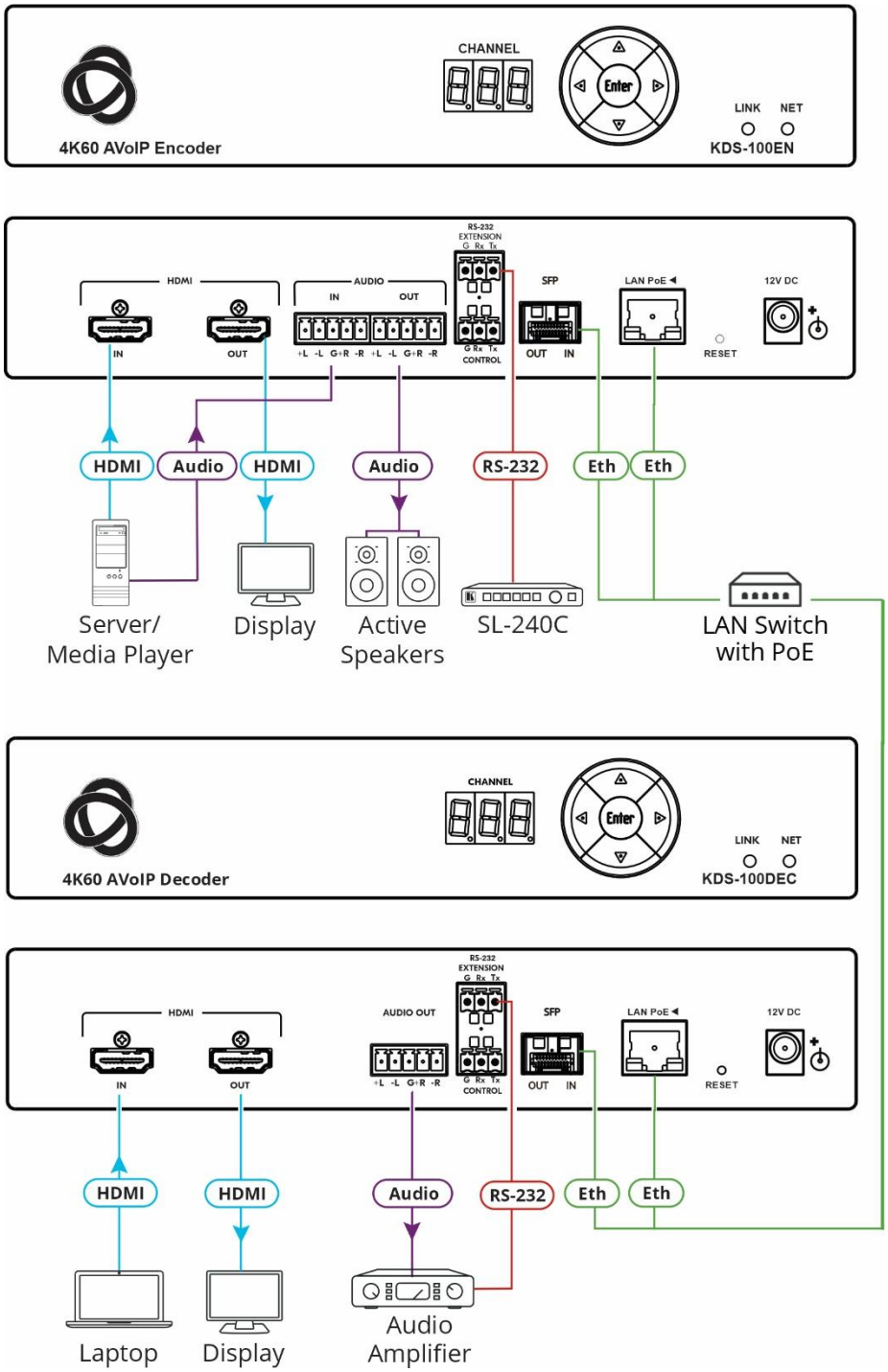


Figure 3: Connecting **KDS-100EN** to **KDS-100DEC**

To connect KDS-100EN and KDS-100DEC as illustrated in the example Figure 3:

1. Connect an HDMI source (for example, a server or a media player) to the encoder's HDMI IN connector (6) (see Defining the KDS-100 on page 6).
2. Connect a balanced stereo audio source (for example, the server audio connector) to the encoder's AUDIO IN/OUT 5-pin terminal block connector (8) (see Defining the KDS-100 on page 6).
3. Connect the LAN MEDIA 1G(PoE) RJ-45 port (13) on the encoder to a LAN switch.
4. Connect the LAN MEDIA 1G(PoE) RJ-45 port (27) on the decoder to the same LAN switch.
5. Connect the HDMI OUT connector (22) on the **KDS-100DEC** to an HDMI acceptor (for example, a display).
6. Connect the AUDIO OUT 5-pin terminal block connector (23) on the **KDS-100DEC** to a balanced stereo audio acceptor (for example, an audio amplifier).
7. Connect RS-232 3-pin terminal block connectors:

- On the **KDS-100EN**, connect the RS-232 port (10) to a control device such as the SL-240C.
- On the **KDS-100DEC**, connect RS-232 (24) to a device that can be controlled by RS-232.

RS-232 bidirectional signals can be sent between the encoder and decoder.

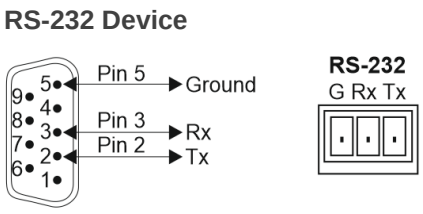
5.2 Connecting RS-232

KDS-100 devices feature an RS-232 3-pin terminal block connector (11) on their rear panel which can be used to transmit RS-232 data between the encoder and decoder and to remotely control connected devices.

Connect the RS-232 terminal block on the rear panel to a PC/controller, as follows:

From the RS-232 9-pin D-sub serial port connect:

- Pin 2 to the TX pin on the RS-232 terminal block
- Pin 3 to the RX pin on the RS-232 terminal block
- Pin 5 to the G pin on the RS-232 terminal block



There are two RS-232 ports on each KDS-100 device:

- The **Extension** port is used to transmit or receive commands from a remote KDS-100 device.
- The **Control** port is used to send commands (such as P3000 commands) directly to the local KDS-100 device.

5.3 Connecting the Audio/Input Output

The following are the pinouts for connecting the input/output to a balanced or unbalanced stereo audio acceptor:

Figure 4: Connecting to a Balanced Stereo Audio Source/Acceptor

Figure 5: Connecting to an Unbalanced Stereo Audio Acceptor

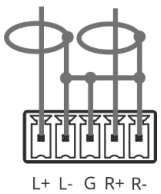


Figure 6: Connecting an Unbalanced Stereo Audio Source to the Balanced Input

5.4 Installing the SFP transceiver (optical SM/MM or copper)

KDS-100 supports the use of **Fiber modules**, either single mode or Multi mode, Max. range up to 10km. You must have a Network switch connected between the KDS-EN100 and KDS-DEC100, not a back-to –back connection.

1. Remove the currently installed transceiver: Pull down the bale clasp, insert the dust plug and pull out. Store in a safe place.
2. Make sure the bale clasp of the new transceiver is pushed up, in the closed position.
3. Insert the new transceiver (maximum bandwidth up to 1 GE) into the SFP port and push it in until it clicks.
4. Remove the dust plug and store it in a safe place for future use.

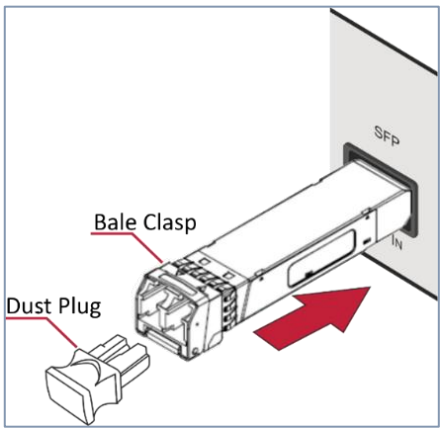


Figure 7: Inserting the SFP transceiver

Warning:

- Connecting the SFP transceiver to an LC(APC) fiber connector may cause poor performance and damage the connector!

Warning: Class 1 Laser Product

- Invisible laser radiation present.
- Avoid long-term viewing of laser.
- Avoid the use of magnifying viewing aids or instruments (such as binoculars, telescopes, microscopes, and magnifying lenses, but not spectacles or contact lenses).
- Avoid placing optical devices in the emitted beam that could cause the concentration of the laser radiation to be increased.

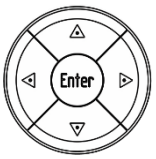
6 Operating and Controlling KDS-100 Devices

This section describes the following actions:

- 6.1 Using the Channel Selection Buttons on page 14.
- 6.2 Operating via Ethernet on page 15.
- 6.3 The streaming protocols and how to configure them on page 16.
- 6.4 Configuring the Network Switch on page 19.
- 6.5 Connecting KDS-100EN to a 3rd party decoder on page 20.

6.1 Using the Channel Selection Buttons

Each encoder requires a unique channel number. Decoders connected to the encoder must be tuned to the same channel as the encoder. By default, the channel selection is automatic on both the encoder and the decoder, but it can be set manually.



Setting the channel number with the channel selection button:

1. For the **KDS-100EN**:
   a) Use the UP/DOWN arrows to increment/decrement the channel number by 1 and the RIGHT/LEFT buttons to increment/decrement by 10. Channel selections that collide with an existing channel will not be accepted.
   b) Press **ENTER** (while the CHANNEL display flashes) to accept the changes.
      - Channel selections that collide with an existing channel will not be accepted.
      - The CHANNEL display flashes for 10 seconds and the new channel ID is displayed.
      - If ENTER is not pressed within the 10-second flashing period, or if an error occurs, the channel ID is not changed.
2. On each connected **KDS-100DEC:**
   - Set the same channel number defined on the **KDS-100EN**: Use the UP/DOWN arrows to scroll up or down through the list of automatically detected channels.
   - If **Dual Stream** mode is activated on **KDS-100EN**, both output streams have the same Channel ID.
   - The CHANNEL display flashes for 10 seconds, press Enter while it flashes to confirm the selection.

6.2 Operating via Ethernet

6.2.1 Accessing the embedded web pages

Each KDS-100 device contains an embedded HTML menu which provides extensive device controls. The embedded web pages are accessed by entering the IP of the KDS-100 device in a browser within the same network or on a computer directly connected to the KDS-100 device.

To access the embedded web pages, perform the following:

1. Connect the LAN port of the KDS-100 device to a local area network.
2. By default, DHCP sets the IP of your KDS-100 device and you may need to ask your network administrator to identify its IP address.
   If no DHCP server is available, for example if the device is connected directly to a PC, it will use the default IP addresses (192.168.1.39 for the encoder and 192.168.1.40 for the decoder).
3. Connect your PC to the same network as the encoder / decoder.
4. Input the encoder or decoder's IP address in the browser and press Enter, if Security is enabled (default), the Login window pops up.

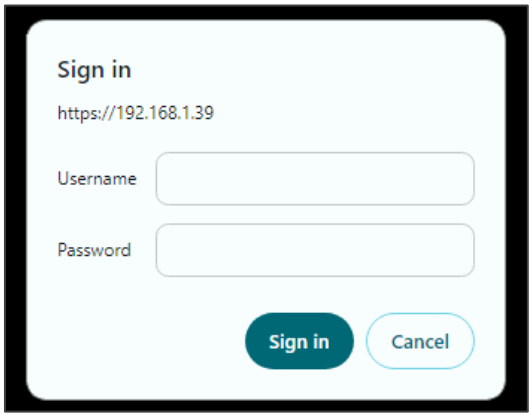


Figure 8: Login Window

4. Input the username and password (default username / password: Admin / Admin) and click **Sign In** to enter the main page of embedded web pages.

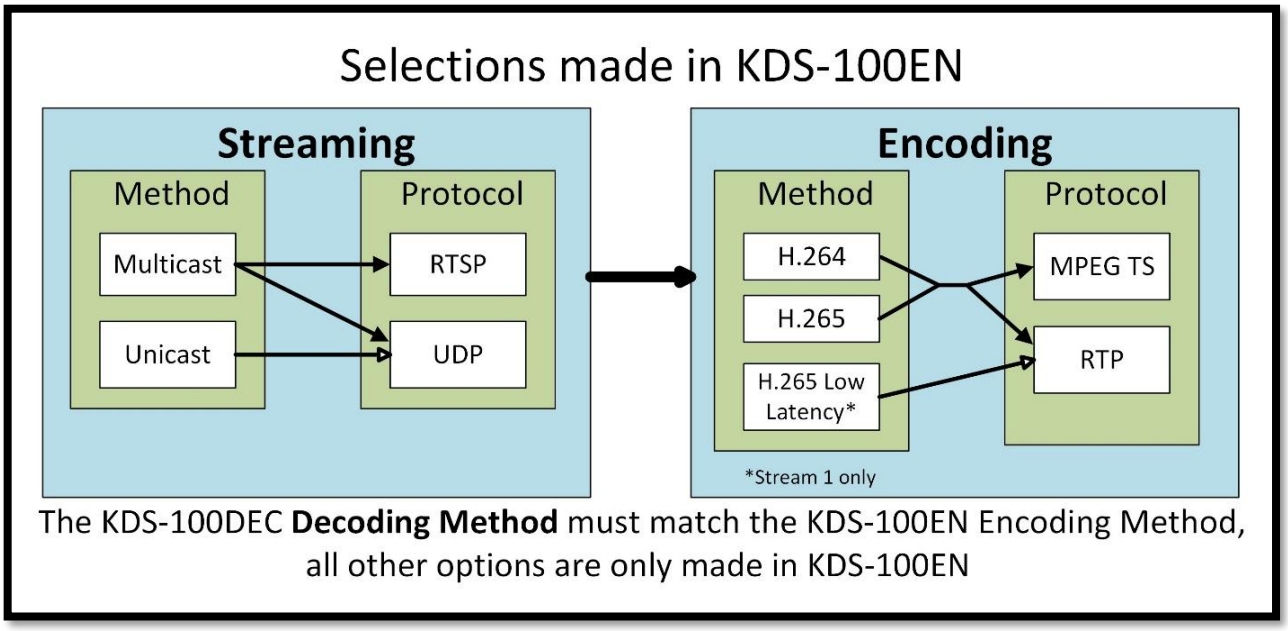
You have accessed the embedded web pages.

6.3 The streaming protocols and how to configure them

The stages of defining a KDS-100 stream are as follows:

1. Select the Streaming Method (Unicast or Multicast).
2. Select the Streaming Protocol (UDP or RTSP).
3. Select the Encoding Method (H.264, H.265 or H.265 Low Latency).
   Note that the identical Decoding Method must be set in KDS-100DEC.
4. Select the Encoding Protocol (RTP or MPEG TS).

The relationship between the different selections are illustrated below:



It is advisable to work with the default settings unless you have specific requirements.

- **Streaming Selections** define how the encoder will interface with the network:
  What type of stream will be generated (the method) and how the transmitter and receiver will communicate (the protocol).
- **Encoding Selections** manage how the AV is compressed (the method) and how data that is sent over the network will be packaged (the protocol).

6.3.1 Streaming Selections

6.3.1.1 Method

The streaming method can be **Multicast** or **Unicast**. Multicast transmits data to multiple receivers and may be nonspecific, unicast is used for one-to-one communication. Multicast requires network configuration, see 6.4 Configuring the Network Switch on page 19.

In unicast streaming the switch directs packets to the MAC address of the destination device and there is no need for special network configuration.

6.3.1.2 Protocol

KDS-100EN supports two Streaming Protocols: UDP and RTSP:

- **UDP (User Datagram Protocol)** manages streaming over layer 4 (the Transport layer) of the OSI model. It is best for live video broadcasts where low latency is a priority and end-user stream control is not a priority.

- **RTSP (Real Time Streaming Protocol)** manages streaming over layer 7 (the Application layer) of the OSI model. Because it's more application-based it provides better control of the stream and allows end-users to communicate with the transmitter (to pause, change or play the AV or to control a video camera). It is more efficient when large numbers of end-users are involved but may come at a latency cost as it is more complex.

6.3.2 Encoding Selections

AVoIP (Audio Video over Internet Protocol) encoding compresses and formats audio-video data for transmission through the internet.

6.3.2.1 Method

KDS-100 uses two encoding methods: H.264 (MPEG-4 AVC) and H.265 (HEVC).
Each method has two names because two different standard authorities collaborated in their development (ITU and ISO/IEC).

- **H.264** – H.264 is an older standard and was designed for1080P or below. It is usually more efficient than H.265 when used at resolutions lower than 4K (it uses less computational power and may have lower latency).
- **H.265** – H.265 is designed for use with 4K and above. When streaming high-resolution video, H.265 uses much lower bitrates, requiring less bandwidth then competing methods. Its improved computational methods allow it to maintain higher quality images and to adapt streaming rates to ensure smooth playback on slower networks.
- **H.265 Low Latency** - This version of H.265 has been specially tuned to use higher bandwidth and use much larger buffers, to maximize speed of transmission.

6.3.2.2 Protocol

KDS-100 uses two encoding protocols: MPEG-TS (transport stream) and RTP (real-time protocol):

- **MPEG-TS** is more suitable for delivering pre-recorded videos and environments where there is greater likelihood of network error. MPEG-TS cannot be used with H.265 low-latency.
- **RTP** is better for low-latency streams, especially live broadcasting, VOIP and video calls.

6.3.3 Using Low Latency

Latency is the time delay from when AV reaches the encoder to when the decoder sends the AV to the output device. Low latency is critical for real-time applications like video conferencing, live streaming (sports events, gaming), and VoIP (Voice over IP).

High latency can cause buffering, poor synchronization between audio and video, or pauses during playback.

KDS-100EN and KDS-100DEC support HEVC (High Efficiency Video Coding), also known as H.265. H.265 is a video encoding method, designed for 4K video, that uses special techniques to reduce the delays caused by video encoding and decoding.

KDS-100EN supports two versions of the H.265 encoding method:

- **HEVC (H.265)** – Standard H.265 compression.
- **HEVC (H.265) Low Latency** – This version uses higher bandwidth and does less buffering, to maximize speed of transmission. HEVC Low latency streaming is not available on Stream 2 (if dual streaming is active). Stream 2 should be used to broadcast a lower bandwidth, better compressed version of the same video for decoders that do not have a latency issue. Unlike Stream 1, Stream 2 is not configured to transmit at 4K, transmitting at 1090p.

H.265 is enabled in the **Encoding** pane of KDS-100EN (set the **Encoding Method**).

6.4 Configuring the Network Switch

KDS-100 supports the use of **Fiber modules**, either single mode or Multi mode, Max. range up to 10km. You must have a Network switch connected between the KDS-EN100 and KDS-DEC100, not a back-to –back connection.

Network switch configuration depends on your streaming method, which can be **Multicast** or **Unicast**. Multicast transmits data to multiple receivers and may be nonspecific, unicast is used for one-to-one communication.

In unicast streaming the switch directs packets to the MAC address of the destination device and there is no need for special network configuration.

Make sure that your AV over IP network switch meets the following requirements:

1. Activate **IGMP Snooping -** This causes the network switch to “listen” for multicast traffic requests.

2. Activate **IGMP Immediate/Fast Leave -** This saves bandwidth by enabling decoders to notify the network switch that they are leaving the multicast group and to stop sending them the multicast group’s traffic.

3. Activate **Unregistered Multicast Filtering** – This saves bandwidth by telling the network switch to discard multicast traffic that is not requested by any devices on the network (devices must request to receive the stream).

4. Activate **PoE+** - Both KDS-100EN and KDS-100DEC are powered by PoE+ (power supplied by the switch), unless the optional power supply unit has been purchased and attached.

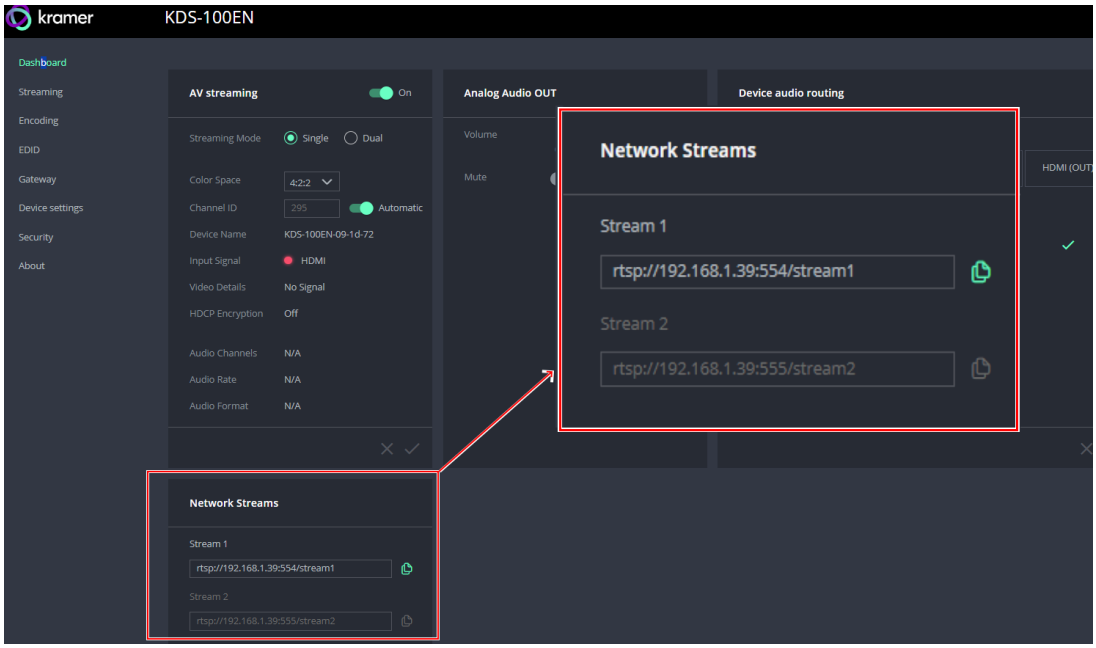
VLAN Configuration

Networks can be divided into VLAN (virtual local area network) segments, so that network traffic can be filtered and the network streams can be limited to certain segments.

KDS-100 devices support the use of VLANs and can be configured to attach VLAN tags to stream packets, along with VLAN CoS (local network class of service) priorities and DSCP (WAN differentiated services code point) priorities.

6.5 Connecting KDS-100EN to a 3rd party decoder

The KDS-100EN **Dashboard** has a **Network Streams** field group that displays a URL or an SDP file that can be entered in a third-party decoder to connect to the stream:



The KDS-100EN streaming method and protocol and its encoding protocol, all affect the details of this link, so finish defining the stream before you use the data in the Network Streams.

Restart the device (in Device Settings) before trying to use the link generated in Network Streams.

The following table illustrates how protocols and methods affect the link:

Encoding Method	Encoding Protocol	Streaming Method	Streaming Protocol	Network Streams Output
H.264 or H.265	MPEG TS	Multicast	UDP	**RTP://<IP>:<port>**
		Unicast or Multicast	RTSP	**RTSP://<IP>:<port>/stream#**
	RTP	Multicast	UDP	**RTP://<IP>:<port>**
		Unicast or Multicast	RTSP	**RTSP://<IP>:<port>/stream#**
H.265 Low Latency	RTP	Multicast	UDP	**SDP file to download**
		Unicast or Multicast	RTSP	**RTSP://<IP>:<port>/stream#**

VLC player is recommended for playing the links. Note that not all media players support URLs or SDP files.

- **RTSP (Real Time Streaming Protocol)** – Enter the URL in a media player/decoder to play or save the stream.
- **RTP (Real Time Protocol)** - Enter the URL in a media player/decoder to play or save the stream.

- **SDP (Session Description Protocol)** – Upload the file to a media player/decoder to play the stream.

7 KDS-100EN: Using the Embedded Web Pages

KDS-100EN enables you to configure settings using the built-in, user-friendly, Ethernet web pages. The web pages are accessed using a web browser and an Ethernet connection.

For the decoder web pages, see KDS-100DEC: Using the Embedded Web Pages on page 38.

KDS-100EN can also be configured by Protocol 3000 commands (see Protocol 3000 Commands on page 60).

For instructions on how to connect to the encoder and load the web pages, see 6.2 Operating via Ethernet on page 15.

If a web page does not update correctly, clear the browser cache.

Some features may not be supported by mobile device operating systems.

To Browse the KDS-100EN Web Pages:

1. Open your Internet browser.
2. Type the IP address of the device in the address bar of your browser. For example, the default IP address:

If Security is enabled in the Security page, then the Login window appears.

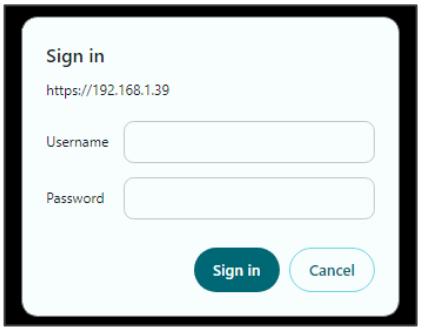


Figure 9: Login Window

3. Enter the Username and Password (default Admin / Admin).

The **KDS-100EN** page appears.

4. Click the tabs on the left to select a relevant web page.

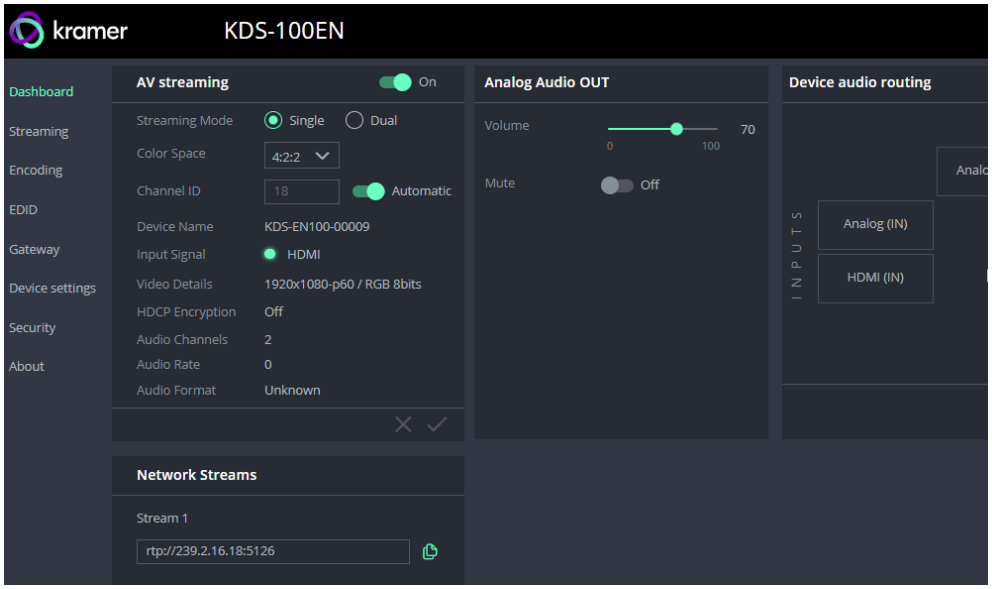
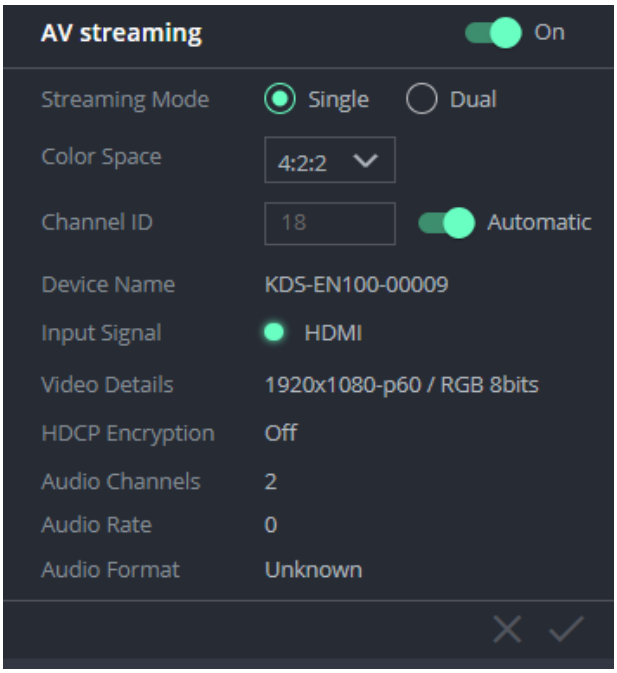


Figure 10: Dashboard Window

7.1 Dashboard: *Set channel and audio, view input signal*

The **KDS-100EN** Dashboard shows an overview of AV streaming and audio information. Use the dashboard to set the streaming channel, mode and audio parameters.

Note: Images have been edited to save space and improve visibility.

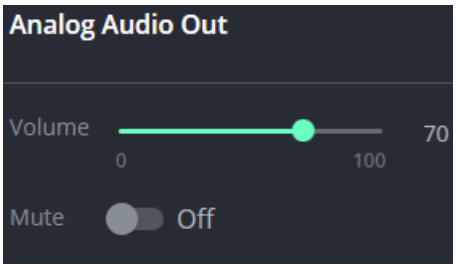


7.1.1 AV streaming

1. In the **Dashboard** pane, activate AV Streaming.
2. Define the following settings:
   - **Streaming Mode: Dual** outputs the stream twice, with the second stream at a lower bandwidth and higher latency. Additional options are set in the **Streaming** pane and the **Encoding** pane.
   - **Color Space:** Select the chroma subsampling ratio. Lower values reduce bandwidth and latency.
   - **Channel ID**: Enter a channel number in **Manual** mode or move the slider to **Automatic** and the device will select the first unused channel. The channel ID (1 to 899) must be identical on encoder and decoder.

   Display fields provide additional non-editable information about the input AV.
3. Click the green check to confirm your changes.

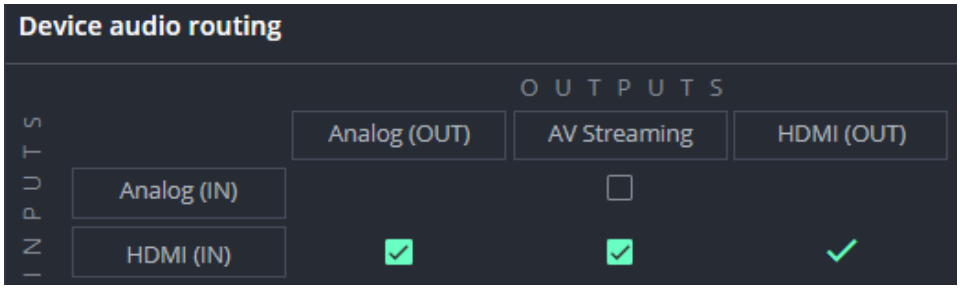
7.1.2 Analog Audio OUT



- **Volume**: Use the slider to adjust the analog audio output volume (0 to 100%).
  Default is 70%. 100% is 12dB and 0% is mute.
- **Mute**: Mute/unmute all audio outputs (HDMI OUT, AUDIO OUT, and MEDIA ports).

7.1.3 Device audio routing

- In the **INPUTS** check the box for the audio input source (HDMI or Analog) and match it to the **OUTPUTS** (KDS-100EN output ports: Analog, AV Streaming or HDMI). Analog output is only available with HDMI input. The KDS-100EN HDMI OUT port only outputs the HDMI input's audio.



7.1.4 Network Streams

The network streams fields generate an RTSP URL, an RTP URL or an SDP file that you can copy to a third-party device compatible with these encoding methods, so it can access the stream.

The output type depends on the Method selected in the **Streaming** pane (unicast or multicast) and the protocols selected in the **Streaming** and **Encoding** panes.

Stream 2 is only displayed if **Streaming Mode** is set to Dual.

Output:

- **RTSP** (Real Time Streaming Protocol) – Enter the URL in a media player/decoder to play or save the stream.
- **RTP** (Real Time Protocol) - Enter the URL in a media player/decoder to play or save the stream.
- **SDP** (Session Description Protocol) – Upload the file to a media player/decoder to play the stream.

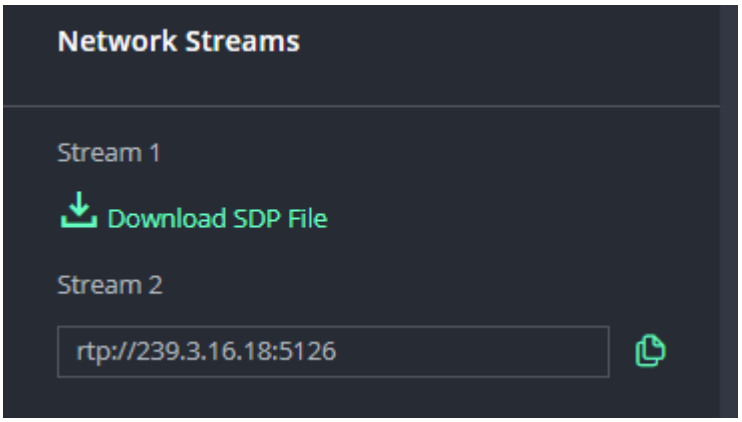


Figure 11: Network Streams output example showing SDP file and RTP URL

Encoding Method	Encoding Protocol	Streaming Method	Streaming Protocol	Network Streams Output
H.264 or H.265	MPEG TS	Multicast	UDP	**RTP://<IP>:<port>**
		Unicast or Multicast	RTSP	**RTSP://<IP>:<port>/stream#**
	RTP	**Multicast**	**UDP**	**RTP://<IP>:<port>**
		Unicast or Multicast	**RTSP**	**RTSP://<IP>:<port>/stream#**
H.265 Low Latency	RTP	**Multicast**	**UDP**	**SDP file to download**
		Unicast or Multicast	RTSP	**RTSP://<IP>:<port>/stream#**

7.2 Streaming: *Multicast settings and time to live*

Streaming selections define how the encoder will interface with the network:
What type of stream will be generated (the method) and how the transmitter and receiver will communicate (the protocol). For more information see The streaming protocols and how to configure them on page 16:

KDS-100EN supports two streaming methods, **Multicast** and **Unicast**. Multicast transmits data to multiple receivers and may be nonspecific, unicast is used for one-to-one communication.

KDS-100EN supports two Streaming Protocols: **UDP** and **RTSP**.

Note: STREAM 2 is only active if you select Dual streaming in the Dashboard pane.

Figure 12: The Streaming pane: Image has been edited for readability.

- **Method** – Multicast or Unicast. Multicast transmits data to multiple receivers and may be non-specific, unicast is used for one-to-one communication.

  Network configurations need to be properly set up to enable multicast communication.

- **Protocol -** Unicast streams are always RTSP. Multicast streams can be UDP or RTSP. UDP has lower latency and is more suitable for sessions where all users receive the stream at once over a reliable network, RTSP has higher latency but gives more control over the stream's destinations, allows for user control and is more reliable.
- **Bandwidth** is the maximum amount of multicast bandwidth that a single multicast stream can use. It is set in **Encoding > Advanced preferences.**
- **Multicast Prefix** – Select a prefix for the multicast stream's IP between 224 and 239 and click Save (prefix as in **224**.x.x.x). Routers identify multicast streams by the IP address to which the stream is directed. IP prefixes can be used to identify the stream's packets as data which is not directed to a specific recipient, but a general stream addressed to the entire network.
- **Multicast Address** – The address of the multicast group to which video recipients must subscribe.

- **Multicast ports** (video / audio) – Use these ports to make it easier for routers, servers and clients to separate and handle the stream data.
- **Time To Live** (TTL) restricts the number of times a packet/data can be forwarded by network routers before it is discarded. It stops the stream data from circulating endlessly in the network. Select a value between 1 and 255.

Click Save after making changes.

7.3 Encoding: *Method, protocol, scaling, bitrate and more*

Encoding selections manage how the AV is compressed (the method) and how data that is sent over the network will be packaged (the protocol).

KDS-100 supports two encoding methods: H.264 (MPEG-4 AVC) and H.265 (HEVC).
Each method has two names because two different standard authorities collaborated in their development (ITU and ISO/IEC):

- **For an explanation of Encoding methods, see Encoding Selections on page 17.**

STREAM 2 is only available if you activate **Dual** streaming in the **Dashboard** pane.
Stream 2 is intended for a lower bandwidth version of Stream 1 and has more limited options.

Figure 13: Encoding panel: Image has been edited for readability.

To define the encoding method, protocol and scaling:

1. In the **Encoding** pane, select the **Encoding method** from **H.264, HEVC (H.265)** and **HEVC (H.265) Low Latency**.

   Impact of the encoding method on the advanced preferences:

Parameters	Normal Mode (H264, HEVC[H265])		Low Latency Mode (HEVC [H.265])	
	Stream 1	Stream 2	Stream 1	Stream 2
Bitrate	15000kb	5000kb	15000kb	5000kb
GOP size	10	10	50	10
B frames	0	0	0	0
Slices per frame	4	4	8	4
IDR frequency	240	240	3600	240

2. Select the **Protocol** used to transfer the video over the network.

Encoding Method (KDS-100)	Protocol (KDS-100)	Supported Yes / No		
		KDS-100 Encoder		KDS-100 Decoder
		Stream 1	Stream 2	
H.264 or HEVC (H.265)	RTP	**Yes**	**Yes**	No
	MPEG-TS	**Yes**	**Yes**	**Yes**
	RTSP	**Yes**	**Yes**	**Yes**
HEVC (H.265) Low Latency	RTP	**Yes**	N/A	**Yes**
	MPEG-TS	No	N/A	No
	RTSP	No	N/A	No

3. Select the **Scaling** from **Passthrough, 3840x2160-p30** and **1920x1080-p60**. P30 / P60 = frames per second, 3840 x 2160 = 4K resolution, 1920x1080 = 1080p. Higher resolution images require appropriate cables.
4. If necessary, make changes to the advanced settings (field descriptions below).
5. Click **Save.**

Advanced preferences:

It is advisable to work with the default settings unless you have specific requirements.

- **Bitrate** – From 1 to 60Mbps. Higher bitrates produce higher quality images but require more data and bandwidth.
- **GOP size** – Sizes are from 1 to 1,000. GOP (group of pictures) encoded streams group pictures together and then transmit the differences. The GOP size is the gap between every transmitted full picture.

- **B frames** – From 0 to 4. Bidirectional predicted pictures save space by using differences between the current frame and both the preceding and following frames to build pictures.
- **Slices per frame** – From 1 to 32. To speed up video encoding each frame can be divided into sections (slices) which are encoded in parallel.
- **IDR frequency** – Minimum (-1). IDR (instantaneous decoder refresh) frames are frames that clear all saved reference frames. -1 disables IDR.

7.4 EDID: *Set display metadata*

Extended Display Identification Data (EDID) contains metadata describing HDMI display device formatting and capabilities so that the output can be adjusted to match the display's requirements. EDIDs can be retrieved from the display, or a preset EDID can be used.

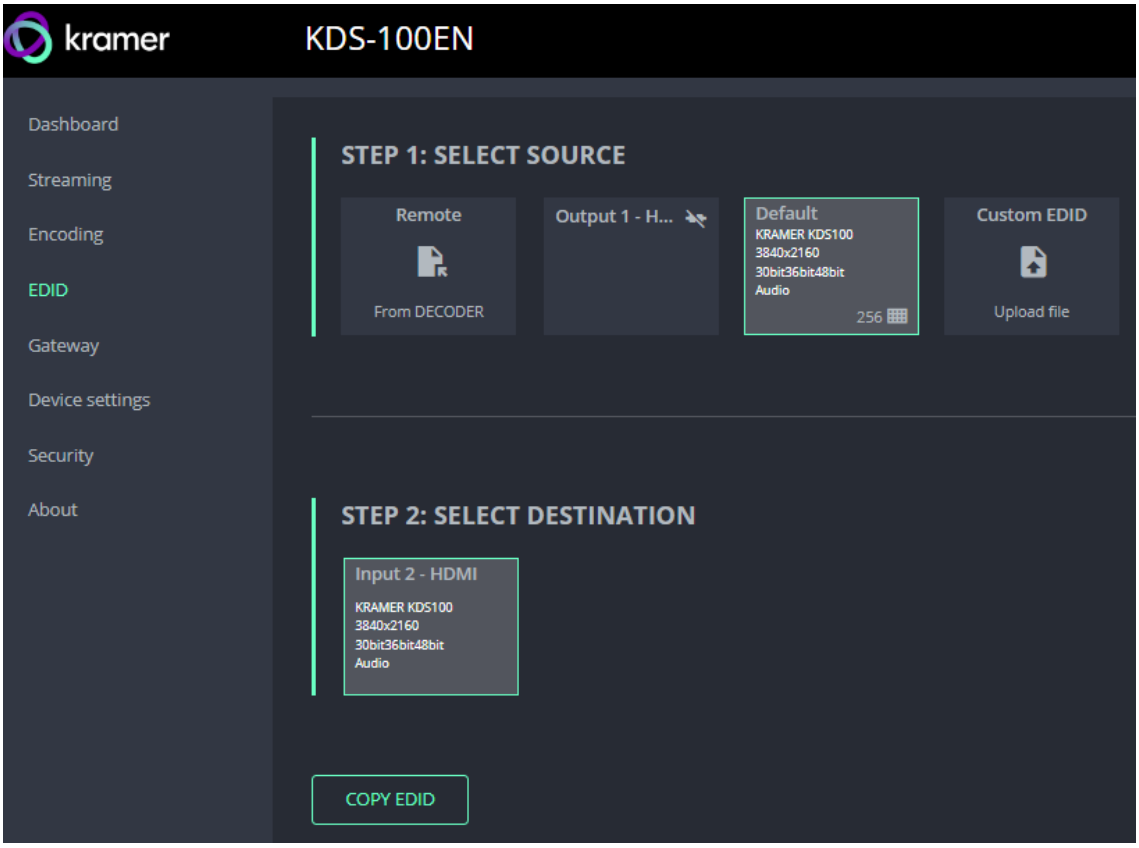


Figure 14: EDID pane

7.4.1.1 Step 1: Select Source.

To select the EDID, click on a **Select Source** square and then click **COPY EDID** at the bottom; The selected EDID will be copied to **Select Destination**.

Select Source options:

- **Remote, from decoder** – Click this option to open a pop-up for entry of the desired decoder's IP address. The EDID of the screen connected to the HDMI Out port of the selected decoder will be returned to the device.
- **Output 1 -** Shows the last/current EDID used by the encoder. Select the **Output 1** square to use this EDID. Click the bottom right corner 256 to view the EDID bitmap.
- **Default –** A default EDID is supplied with the **KDS-100EN**. Click the bottom right corner 256 to view the EDID bitmap.
- **Custom EDID -** Upload a stored EDID file from your computer.

7.4.1.2 Step 2: Select Destination

Click **COPY EDID** and your selected EDID will be loaded into the destination square.

EDID is managed.

7.5 Gateway: *RS-232 settings*

Use the RS-232 **Extension** port to transmit RS-232 commands from a device connected to the encoder to a device connected to the KDS-100DEC or vice versa. For example, one could transmit a 'turn on' command to a monitor or projector connected to the decoder.

Use the RS-232 **Control** port to control the (local) KDS-100EN with RS-232 commands, including transmission of PK3000 commands.

To set the RS-232 Gateway:

1. In the **Gateway** pane, move the **RS-232 Gateway** slider to the right.
2. Enter the **Baud Rate** 50 to 115,200 (default is 9,600).
3. Enter the **Data Bits**: 5, 6, 7 or 8 (default).
4. Enter **Parity**: None (default), Odd, Even, Mark or Space.
5. Enter **Stop Bits**: 1 (default) or 2.
6. Click **SAVE**.

RS-232 Gateway is configured.

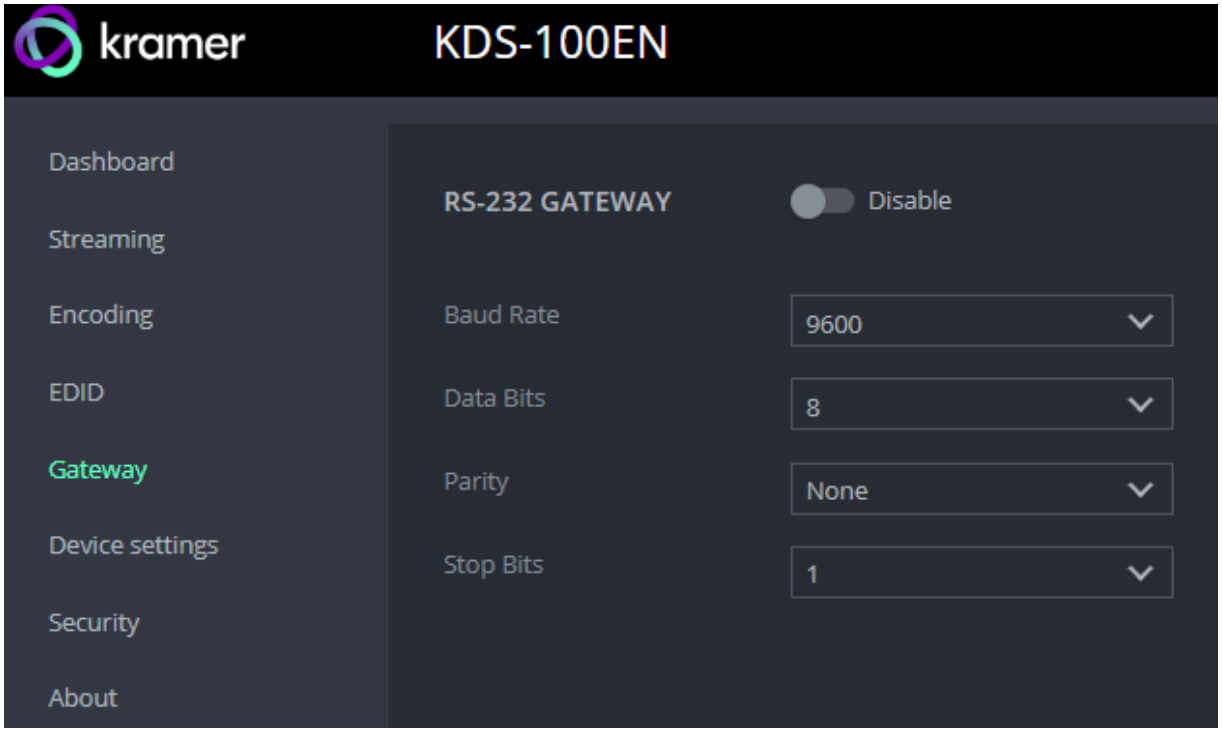


Figure 15: Gateway pane

7.6 Device: *General device, network and time settings*

The **KDS-100EN** **Device** pane has three tabs:

- **General** – Set the channel name, update firmware and reset or locate the device.
- **Network** – Set the LAN and port parameters for the device.
- **Date & Time** – Define an NTP (network time protocol) server or set the time. An NTP server is advisable, as it coordinates the time between all the connected devices.

7.6.1 General tab

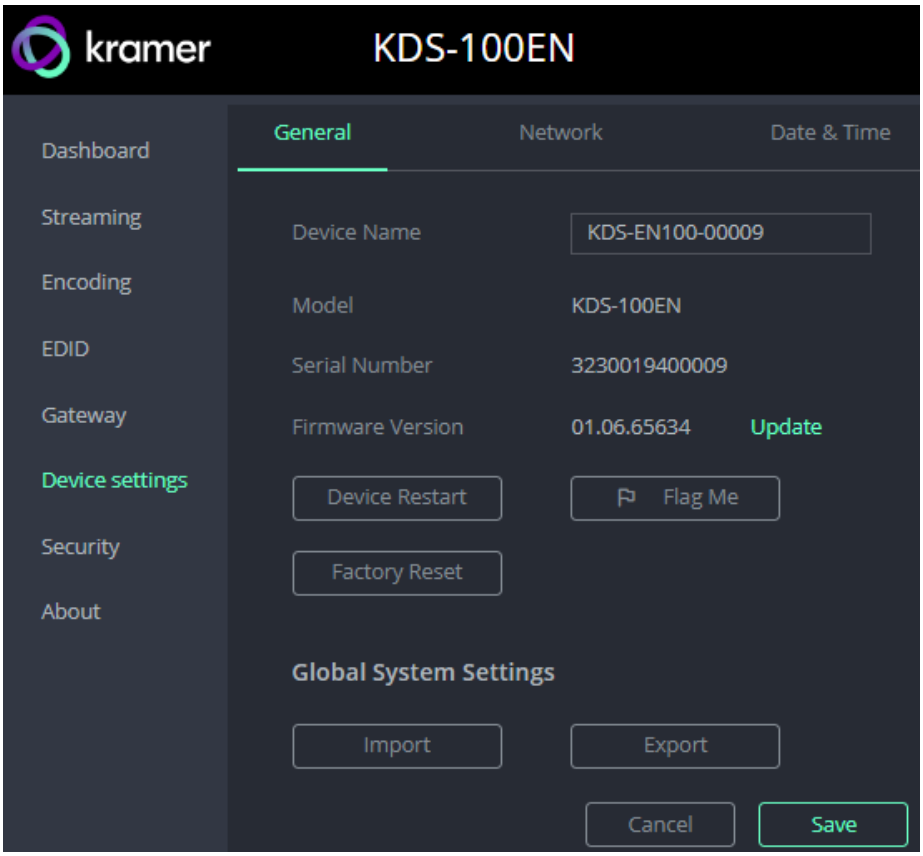


Figure 16: Device pane – General tab: Image has been edited for readability

- **Device name –** Edit or view the device's Host name. Click **Save** after changing.
- **Model and Serial Number** of the encoder.
- **Firmware Version –** To update the encoder firmware, download the latest version from https://www.kramerav.com/downloads/kds-100en to a local network location and then click **Update** to select and upload it.
- **Device Restart –** Click to restart **KDS-100EN** (confirmation will be requested).
- **Factory Reset -** Click to reset the device's operation mode and restart the device (confirmation is requested).
- **Flag Me –** The LEDs will flash fast for 10 seconds to identify the device.
- **Global System Settings –** Import or Export a configuration file (.bin format) to copy the settings to/from other devices.

7.6.2 Network tab

Use the **KDS-100EN** **Device** pane's Network tab to enable DHCP or, if you prefer, to define a static IP address for the **KDS-100EN**.

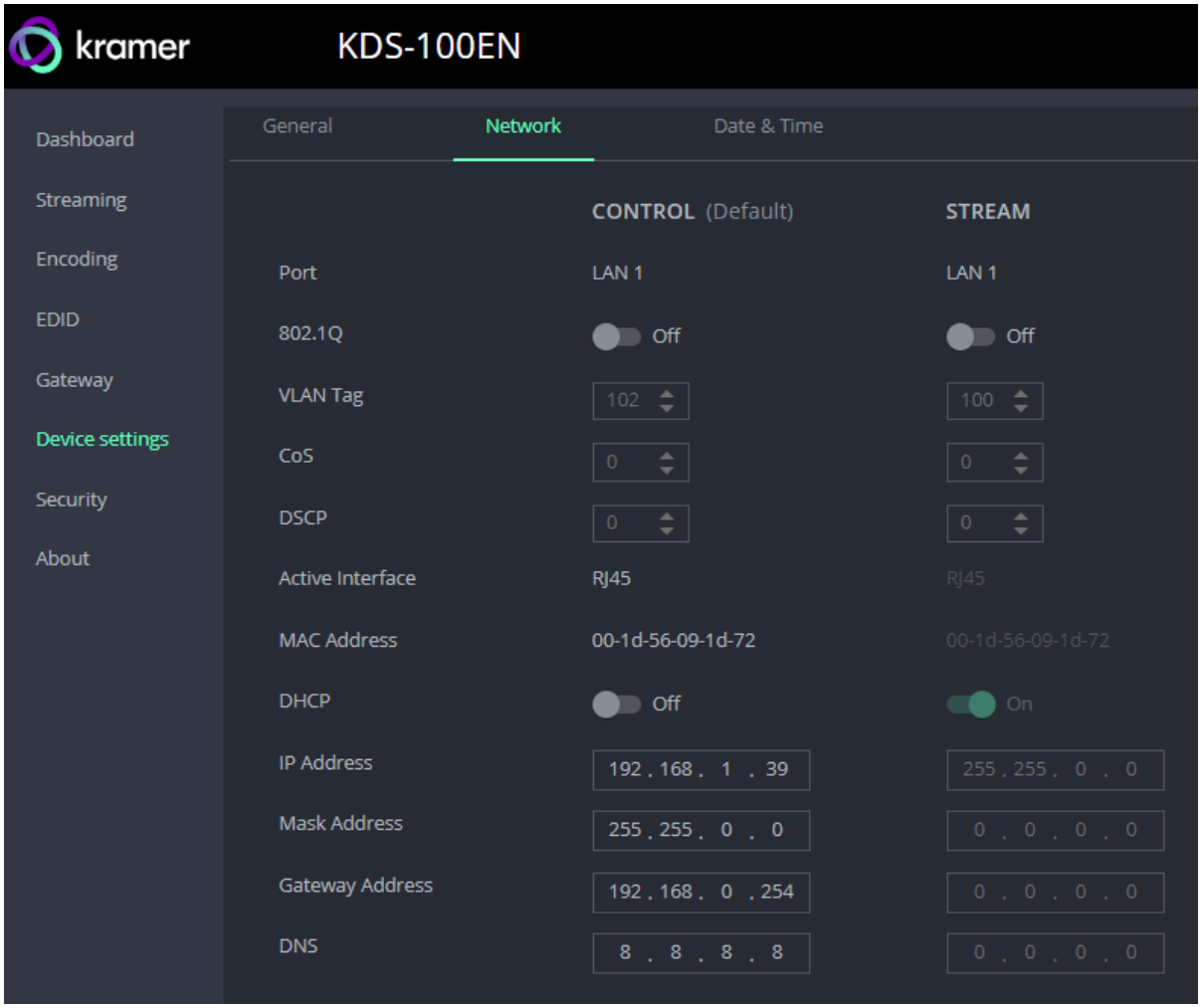


Figure 17: Device pane – Network tab

Control is for PK3000 commands and RS-232 data.
Stream is for the AV stream

- **Port –** The ethernet port used for the control and AV streams.
- **802.1Q –** If set to On (off by default), the data transmission uses VLAN tags:
    - **VLAN Tag –** VLAN (virtual local area network) tags (range 2 – 4000) are used to separate the network into smaller virtual networks.
    - **CoS –** Class of Service, requires a unique VLAN tag. CoS sets the priority (0-7) of each of the VLAN options within the local network (layer 2 of the OSI model). Higher priority traffic is prioritized and provides a more reliable service.
    - **DSCP -** The DSCP (Differentiated Services Code Point) value is used to mark the priority (0-63) of packets in a WAN network layer (layer 3 of the OSI model). It is used for large-scale networks (or across the Internet) and increases the quality of service.
- **Active Interface** – The output port.
- **MAC Address** – MAC of the **KDS-100EN**.

- **DHCP** – Set the slider to On, to have your DHCP server automatically define an IP address.
- **IP Address**, **Mask Address** and **Gateway Address -** Static IP definition fields: Not relevant if DHCP is enabled.
- **DNS** – Address of the domain name server. By default, the system is set to use the Google DNS.

Click **Save** after changing.

7.6.3 Date & Time tab

An NTP (Network Time Protocol) server should be used for KDS-100 series deployments. The NTP is essential for encoder and decoder synchronization, time stamping, and reliability in applications where coordination is critical. It helps prevent drift, jitter, out-of-sync data and contributes to reliable and efficient system operation.

Note: If no NTP server is available, it is possible to enter the address of a KDS-100 device (encoder or decoder), and the device will synchronize time to that device.

To sync device time and date from a network time server:

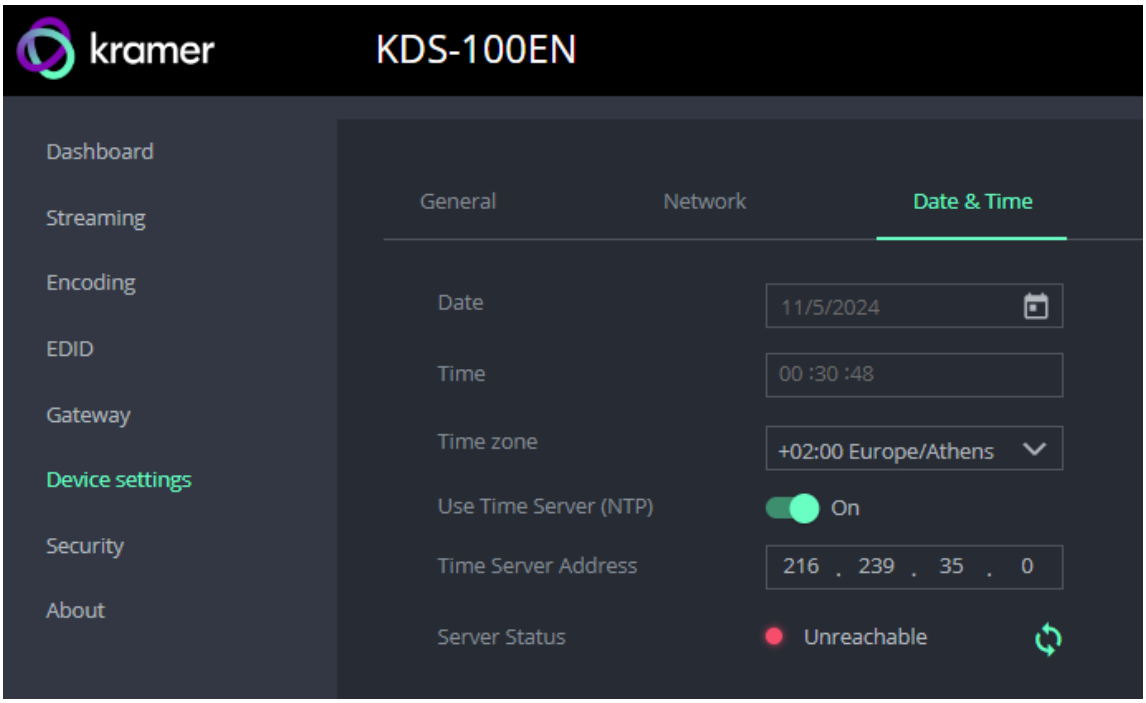


Figure 18: Device Pane – Date & Time tab

1. In the **Device** pane, select the **Date & Time** tab.
2. Set the **Time zone**.
3. Set **Use Time Server (NTP),** to On.
4. Enter the **Time Server Address** IP (or the IP of a KDS-100 Series device that you are using as an alternative to a Time Server).
5. Click **SAVE**.

The devices date and time are synchronized to the server address entered.

7.7 Security: *Passwords, HTTPS and 802.1X*

Password protection is only active when the **Security Status** is On (default).

The default password is (username) Admin, (password) Admin.

The **KDS-100EN** Security tab has three tabs:

- **Security –** Enable/disable security and change the device password.
- **HTTPS –** Use the device's internal certificate or upload a local certificate.
- **802.1X-** Enable and setup IEEE 802.1X authentication.

7.7.1 Security tab

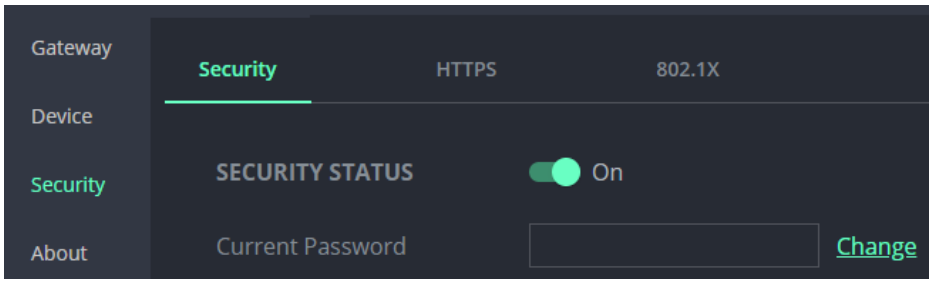


Figure 19: Security pane – Security tab

7.7.1.1 To change Security Status

Move the slider to enable/disable security. To disable security you must enter the device's current password in a pop-up.

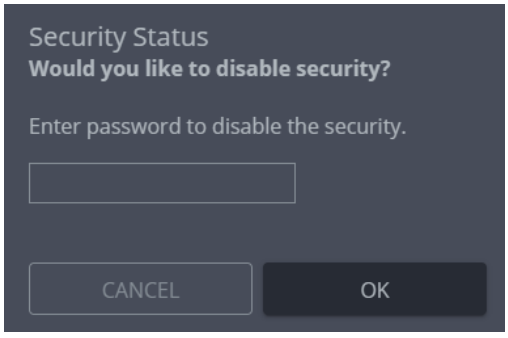


Figure 20: Security pane – pop-up

7.7.1.2 To change the password

Password protection is only available if the **Security Status** is On. To change the password, enter the **Current Password** and then click **Change**.

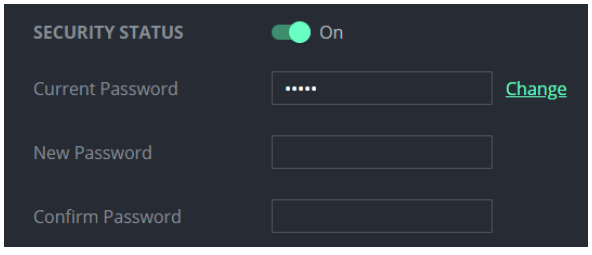


Figure 21: Security pane – Change password

7.7.2 HTTPS tab

To configure HTTPS:

1. In the **Security** pane's **Security** tab, **Security Status** must be enabled.
2. Select the **HTTPS** tab.
3. Select one of the following authentication methods:

- **Internal Certificate** – Use the factory default certificate for authentication.
- **Server Certificate** – Submit a certificate from the server for authentication (assigned by your network administrator). Click to upload the certificate. Enter the private key password and click **APPLY & REBOOT**.

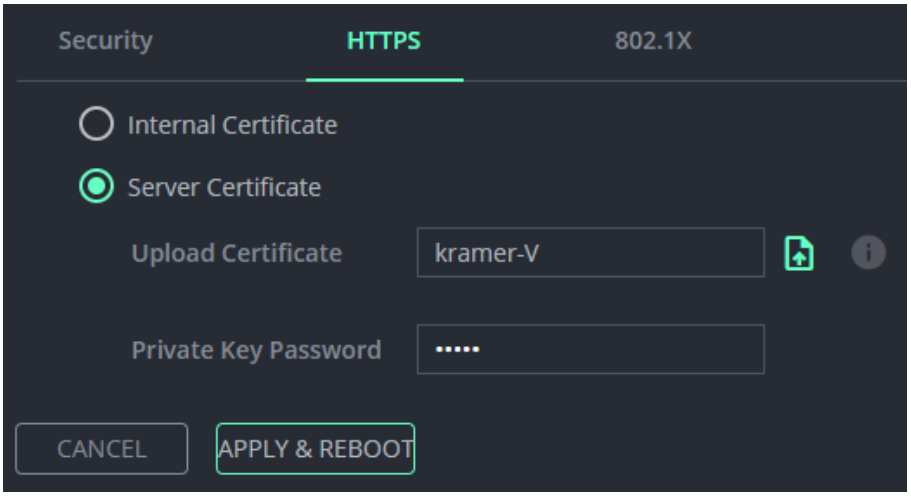


Figure 22: Security Tab – Server Certificate

4. Click **APPLY & REBOOT**.

HTTPS is configured.

7.7.3 802.1X tab

To configure IEEE 802.1X Authentication:

1. In the **Security** pane, select the **802.1X** tab.
2. Set 802.1x authentication **ON**.
3. Check one of the following settings:

- **EAP-MSCHAP V2** – To use this authentication method, enter the **KDS-100EN** username and password.
- **EAP-TLS** – Submit a certificate from your network authentication server. To do so, enter the **KDS-100EN** Username (default Admin / Admin), click to upload the certificates and keys, and enter the private key password (assigned by your network administrator).
  Set **Server Certificate** to **On**.

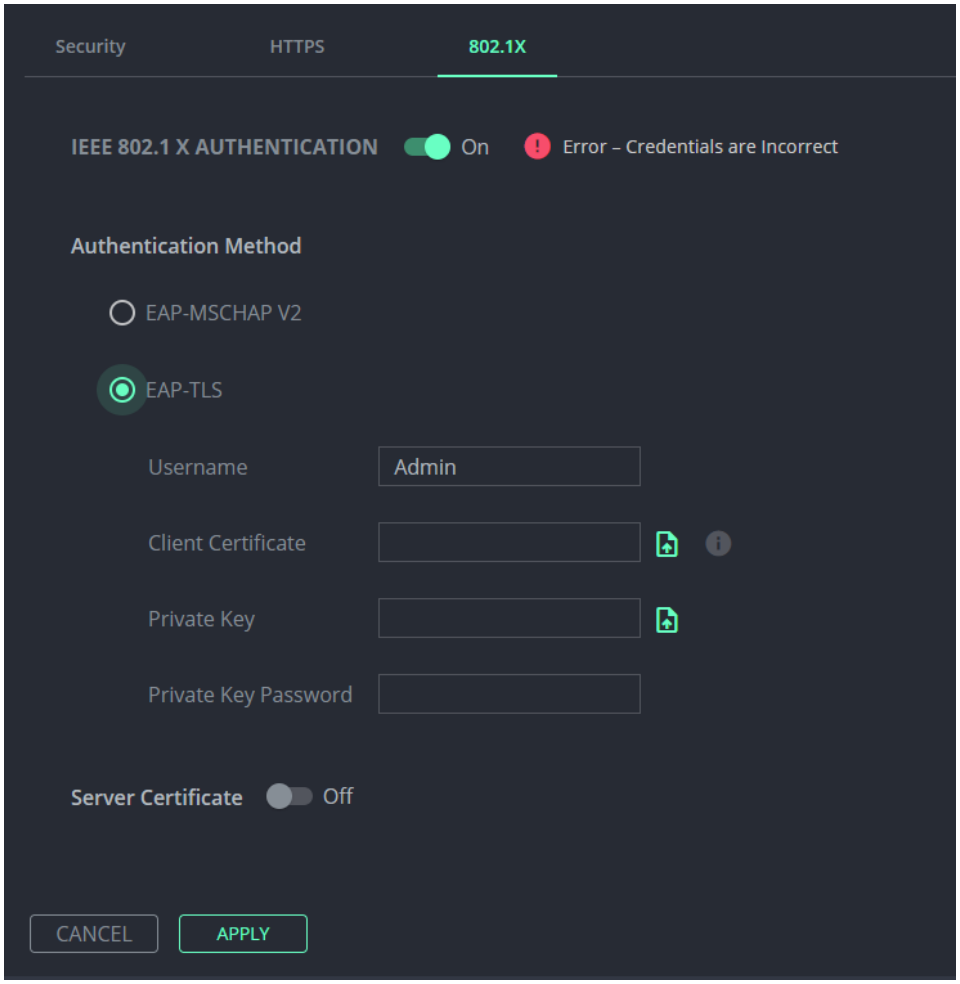


Figure 23: EAP-TLS – Certificates and Password

4. Click **APPLY**.

Security is configured.

7.8 About: *Web version and contact details*

View the web page release version and Kramer Electronics Ltd details.

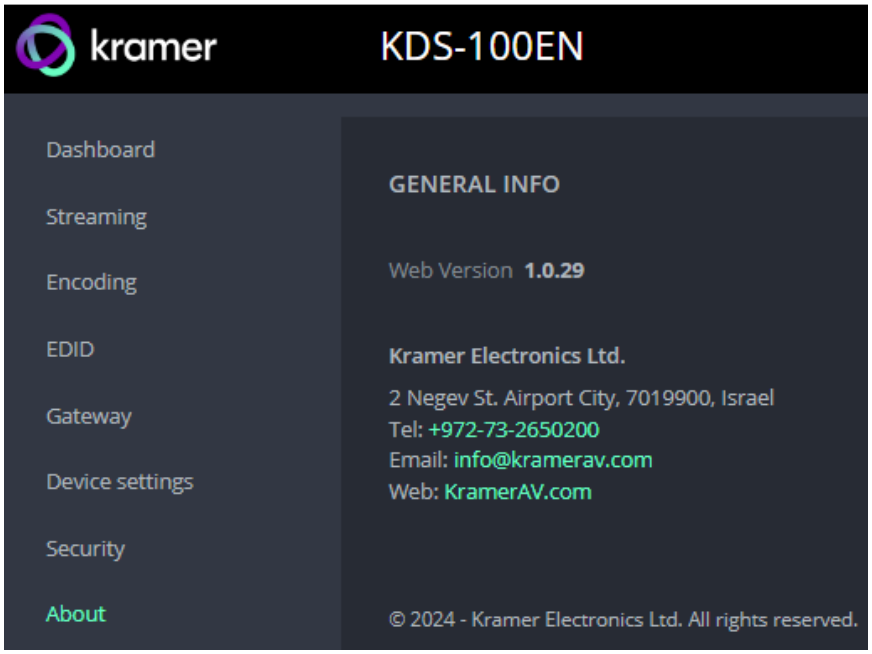


Figure 24: About Page

8 KDS-100DEC: Using the Embedded Web Pages

KDS-100DEC enables you to configure settings via Ethernet using built-in, user-friendly web pages. The Web pages are accessed using a Web browser and an Ethernet connection.

You can also configure **KDS-100DEC** via Protocol 3000 commands (see Protocol 3000 Commands on page 60).

For instructions on how to connect to the decoder and load the web pages, see

Operating via Ethernet on page 15.

If a web page does not update correctly, clear your Web browser's cache.

Some features may not be supported by mobile device operating systems.

8.1 To Browse the KDS-100DEC Web Pages:

1. Open your Internet browser.
2. Type the IP address of the device in the Address bar of your browser. For example, the default IP address: 192.168.1.40.

   If **Security** is enabled in the Security pane, then the Login window appears.

3. Enter the Username and Password (default Admin / Admin).

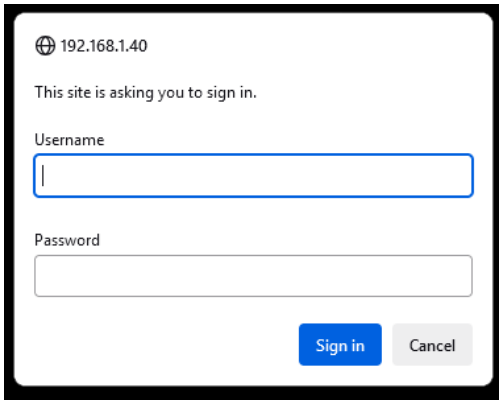


Figure 25: Login Window

The **KDS-100DEC** page appears.

4. Click the tabs on the left to select a relevant web page.

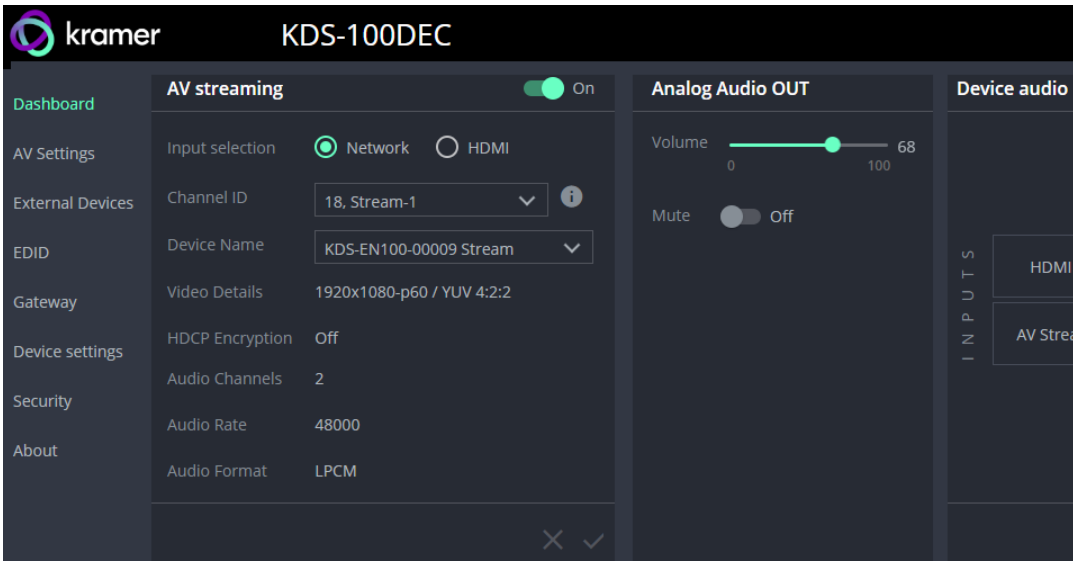


Figure 26: Dashboard Window (image has been edited to fit page)

8.2 Dashboard: *Set channel and audio, view input signal*

The **KDS-100DEC** Dashboard shows an overview of AV streaming and Audio information. Use the dashboard to set the input source: Network stream or connected HDMI device.

- The decoding channel must match the encoding channel used by the Encoder.
- Streaming must be enabled on both encoder and decoder.

8.2.1 AV Streaming (define the AV source)

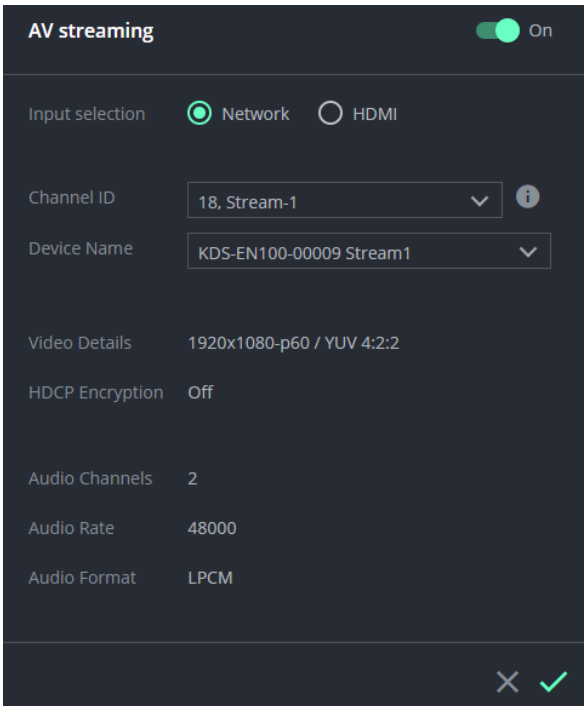


Figure 27: Dashboard Window, AV streaming fields

1. In the **Dashboard** pane, activate AV Streaming. AV Streaming is not required for HDMI input.
2. Define the following settings:
   - **Input selection:** Network (Ethernet port) or HDMI (HDMI IN port).
   - **Channel ID**: If the encoder is set to Automatic, the channel will be set automatically. The encoder channel list only shows channels that can be decoded according to the decoding method defined in the **AV Settings > Video** tab (see AV Settings: Decoding, resolution and overlays on page 42).
     - Channel IDs in the range 1-899 are encoder channels. Select the channel used by the encoder.
     - Channel IDs in the range 900-999 are virtual channels allocated to external devices such as IP cameras (see External Devices on page 44).
   - **Device Name**: The host name of the encoder or the name defined on devices tab for external devices.
3. Click the green check to approve any changes.

Video Details, **HDCP Encryption**, **Audio channels**, **Audio rate** and **Audio format** are set by the data source.

8.2.2 Analog Audio OUT

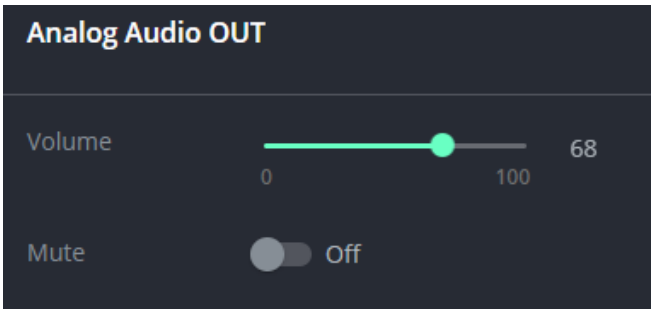


Figure 28: Dashboard Window, Analog audio output

- **Volume:** Use the slider to adjust the analog audio output volume (0 to 100%). Default is 68%, 100% is 12dB and 0 is mute.
- **Mute:** Mute/unmute all audio outputs.

8.2.3 Device audio routing

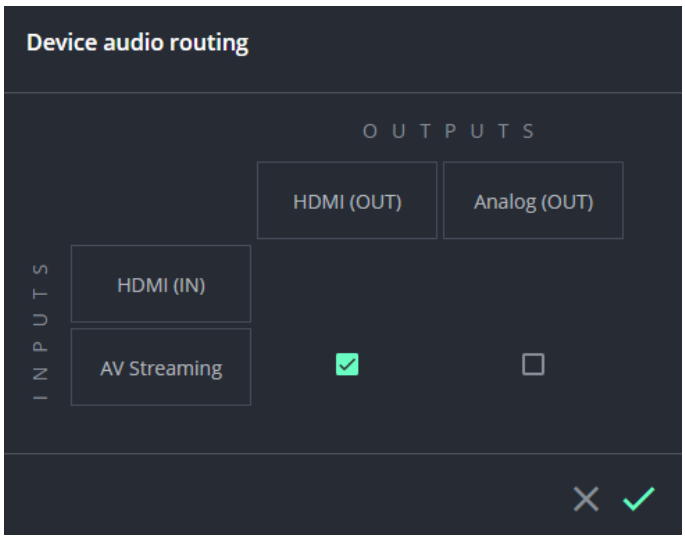


Figure 29: Dashboard Window, Device audio routing

In the **INPUTS** row, check the box for the source of the audio input (HDMI or AV Streaming) and match it to the **OUTPUTS** column (HDMI or Analog).

8.3 AV Settings: *Decoding, resolution and overlays*

- The decoding method must match the encoding method used by the Encoder.

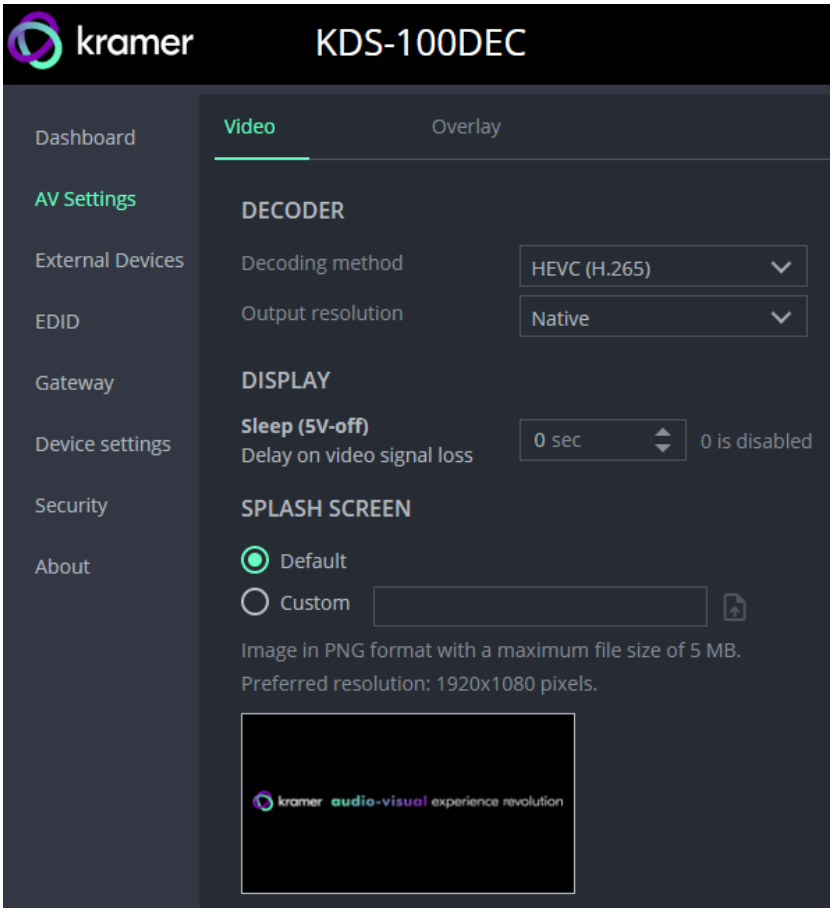


Figure 30: AV Settings, Video tab

8.3.1 Video tab

8.3.1.1 Decoder

- **Decoding method** – The decoding method must match the encoding method used by the encoder. Select from **H.264, HEVC (H.265)** or **HEVC (H.265) Low Latency**.
- **Output resolution – Native** resolution will match the resolution to the output **screen.** For best results the output screen should support 1080 or 4K.

8.3.1.2 Display

- **Sleep (5v-off) –** Switches off the video output, if no input signal is detected for the length of time entered here. Entering a value protects the output device from the potential harm caused by a constant unchanging video signal.

8.3.1.3 Splash Screen

- **Set the splash screen –** Use overlay to display an images on the screen at the start of a stream. Use the default image or upload your own image. A preview of the image is shown at the bottom of the Video tab.

8.3.2 Overlay tab

An overlay text can be displayed on the output device, either for a limited time period or permanently. Choose from:

- **Custom Text** – Enter the text you want to display in the “Text” box.
- **Resolution Info** – Displays the resolution information on the screen. Set the text size, alignment (position on the screen) and choose text color and transparency.
- **Device Info** – Displays the device’s IP address and resolution information.
- **None** – No overlay is displayed.

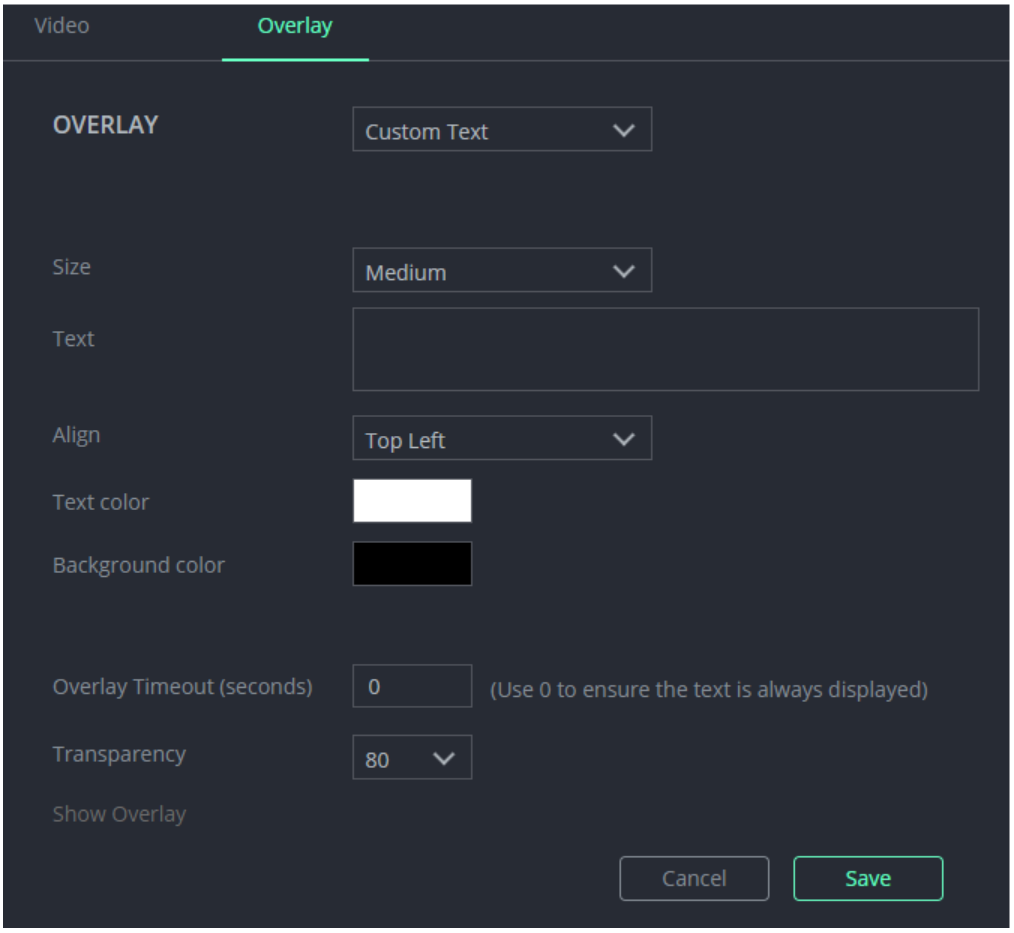


Figure 31: AV Settings, Video tab

For all options, set the text size, align (location on the screen), text color and background color.

- **Overlay Timeout** – Set the amount of time to display the overlay or enter 0 to display it constantly.
- **Transparency** - Set a transparency level (100 = No transparency, 0 = Full transparency).
- **Show Overlay** – After saving your changes, click Show Overlay to view it on the display.

8.4 External Devices

Use the **External Devices** tab to connect **KDS-100DEC** to external streaming devices using the RTSP protocol, such as IP (live streaming) cameras.

8.4.1 Adding a Device

To add a stream to the Device List:

1. In the External Devices pane, click **ADD DEVICE**.

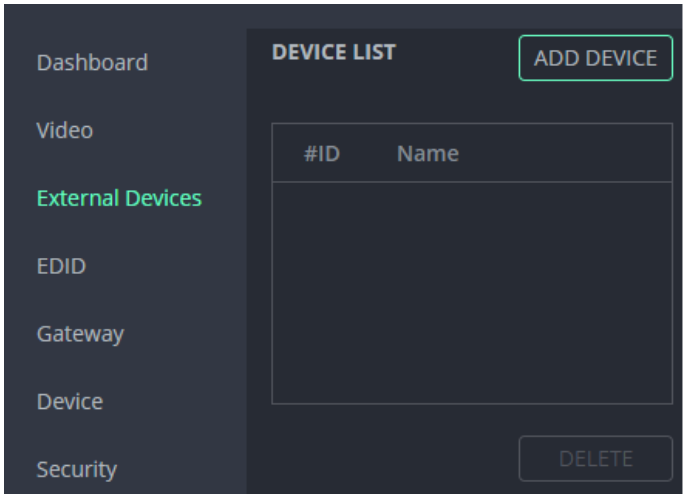


Figure 32: External Devices - Device List

2. In the **Device Properties** (see image below), enter the Device Name and URI stream in the format “rtsp://<ip address of the stream>:<port #>”. See also the KDS-100EN Dashboard’s Network Streams field on page 24.
3. If the stream requires a password, activate **Security Mode** and enter the login and password.
4. Click **Save.**

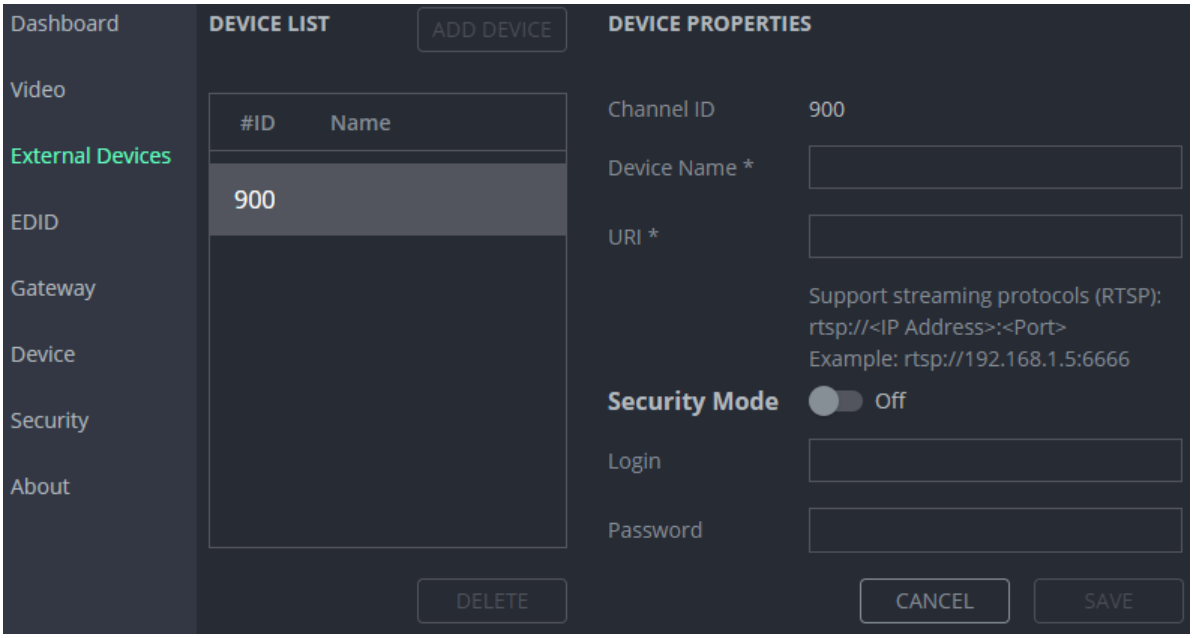


Figure 33: External Devices - Device Properties

6. Third Party Devices (900-999) will be displayed in the Dashboard screen's Channel ID drop-down list (see Dashboard: Set channel and audio, view input signal on page 39).

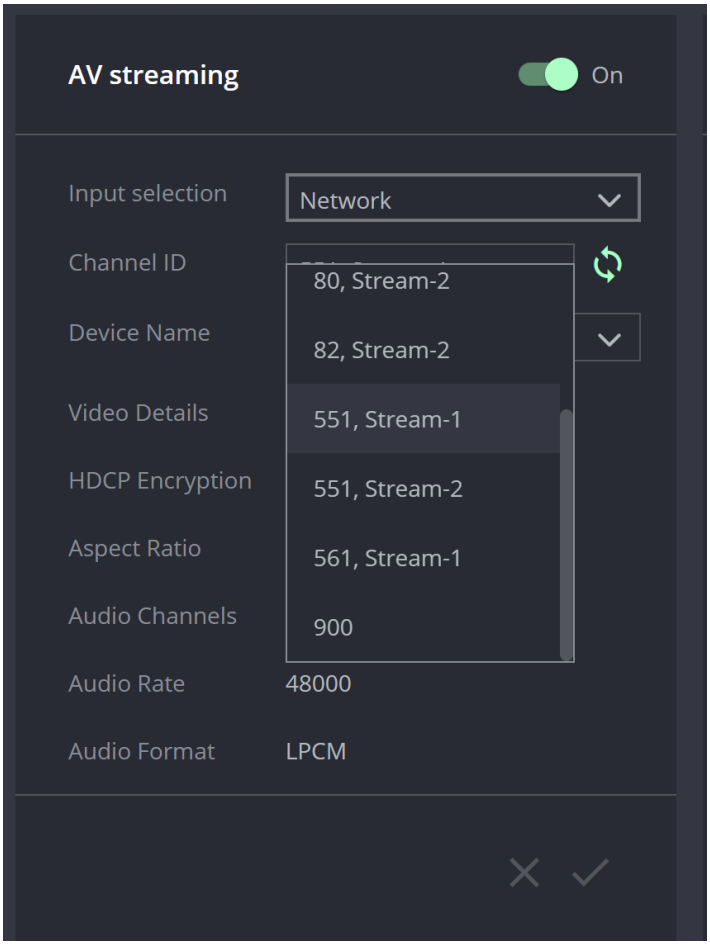


Figure 34: Dashboard – Channel ID dropdown list

8.5 EDID: *Set display metadata*

EDIDs (Extended Display Identification Data) contain metadata describing HDMI display device formatting and capabilities so that the output can be adjusted to match the display's requirements. EDIDs can be retrieved from the display, or a preset EDID can be used.

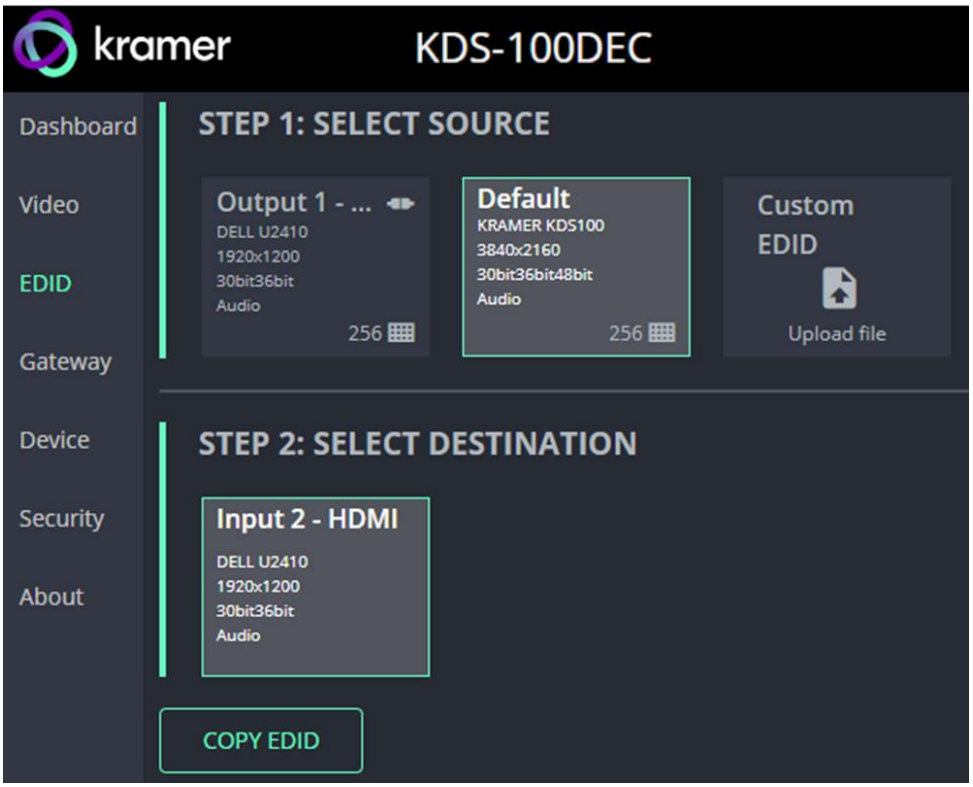


Figure 35: EDID pane

8.5.1.1 Step 1: Select Source.

To select an EDID, click a **Select Source** square (additional actions may be requested) and then click **COPY EDID** at the bottom; The selected EDID will then be copied to **Select Destination**.

Select Source options:

- **Output 1 -** The EDID of the last used/current HDMI Out screen (click refresh to view a newly connected screen). Select the **Output 1** square to use this EDID. Click the bottom right corner 256 to view the EDID bitmap.
- **Default –** A default EDID is supplied with the **KDS-100DEC**. Click the bottom right corner 256 to view the EDID bitmap.
- **Custom EDID -** Upload a stored EDID file from your computer.

8.5.1.2 Step 2: Select Destination

Click **COPY EDID** and your selected EDID will be loaded into the destination square.

EDID is managed.

8.6 Gateway: *RS-232 settings*

Use the RS-232 **Extension** port to transmit RS-232 commands from a device connected to the KDS-100EN to a device connected to the decoder or vice versa. For example one could transmit a 'turn on' command to a monitor or projector connected to KDS-100DEC.

Use the RS-232 **Control** port to control the locally connected KDS-100 device with RS-232 commands, including transmission of PK3000 commands.

To set the RS-232 Gateway:

1. Enable RS-232 (move the **RS-232 Gateway** slider to the right).
2. Choose between **Gateway** and **Remote Tunneling**. Use Gateway for a connected controller and Remote Tunneling if you are connecting an RS-232 extension delivering commands from a distance.
3. In **Gateway** mode, define the RS-232 gateway port (5001, by default).

   In **Remote Tunnelling** mode, **Remote Encoder ID** is the **KDS-100EN** channel number.
4. The following settings must match on the remote **KDS-100EN** encoder:
   - Enter the **Baud Rate** 50 to 115,200 (default is 9,600).
   - Enter the **Data Bits**: 5, 6, 7 or 8 (default).
   - Enter **Parity**: None (default), Odd, Even, Mark or Space.
   - Enter **Stop Bits**: 1 (default) or 2.
5. Click SAVE.

RS-232 Gateway is configured.

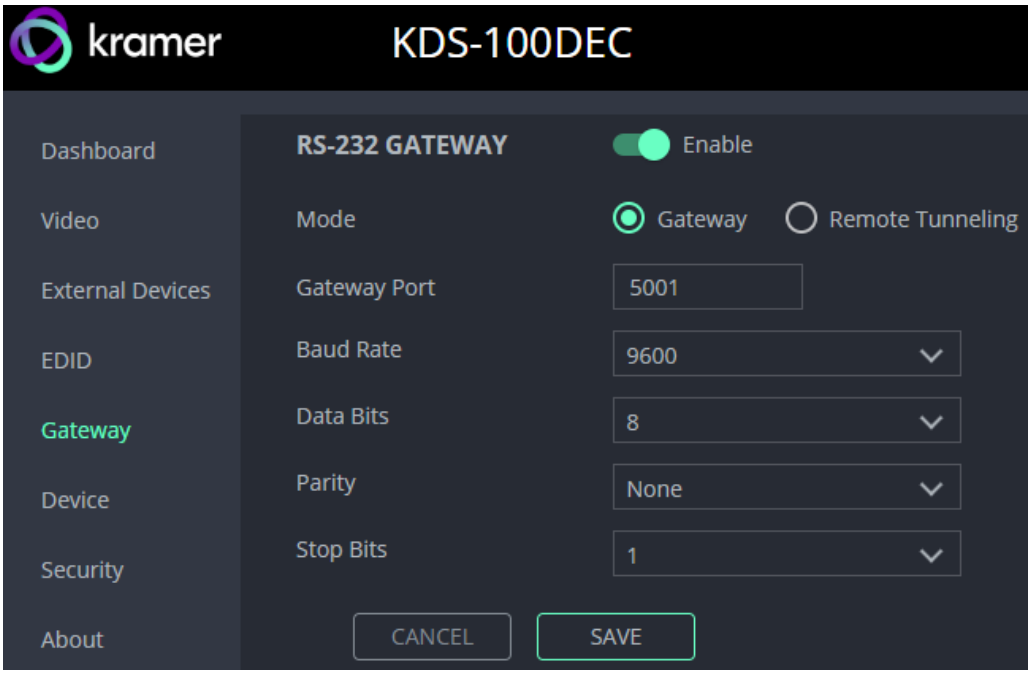


Figure 36: Gateway pane

8.7 Device Settings: *General device, network and time settings*

The **Device Settings, Security** and **About** page's are the same in both **KDS-100EN** and **KDS-100DEC**.

The **Device Settings** pane has three tabs:

- **General** – Sets the channel name, update firmware and reset or locate the device.
- **Network** – Set LAN and port parameters for the device.
- **Date & Time** – Define an NTP (network time protocol) server or set the time. An NTP server is recommended, as it coordinates the time between all the connected devices.

8.7.1 General tab

Figure 37: Device pane – General tab

- **Device name** – Edit or view the device's Host name.
- **Model and Serial Number**
- **Firmware Version –** To update the firmware download the latest version from https://www.kramerav.com/downloads/kds-100en to a local network location and then click **Update** to select and upload it.
- **Device Restart –** Click to restart the decoder (confirmation will be requested).
- **Factory Reset -** Click to reset the device's operation mode and restart the device (confirmation

is requested).

- **Flag Me –** The LEDs will flash fast for 10 seconds to identify the device.

When an HDMI OUT screen is connected without an input, the screen will show the device's IP address.

- **Global System Settings –** Import or Export a configuration file (.bin format) to copy the settings to/from other devices.

8.7.2 Network tab

Use the **KDS-100DEC Device Settings > Network** tab to enable DHCP or, if you prefer, to define a static IP address for the **KDS-100DEC**.

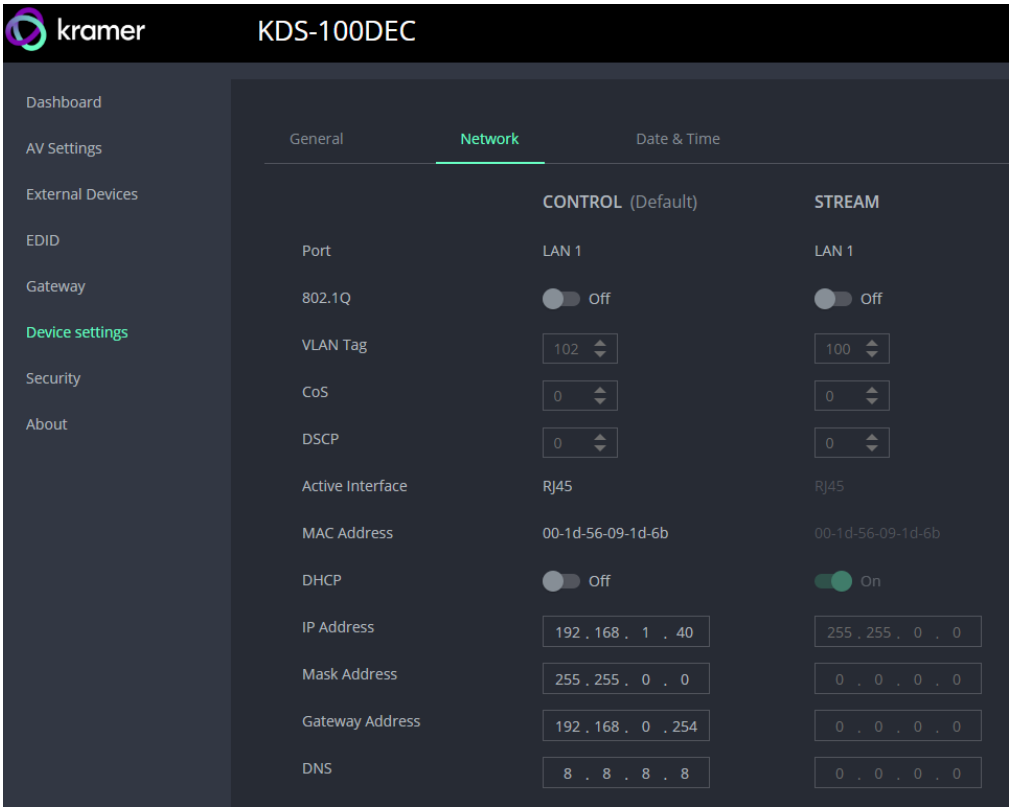


Figure 38: Device pane – Network tab

Control is for PK3000 commands and RS-232.
Stream is for the AV stream

- **Port –** The ethernet port used for the control and AV streams.
- **802.1Q –** If set to On (off by default), the data transmission uses VLAN tags:
    - **VLAN Tag –** VLAN (virtual local area network) tags (range 2 – 4000) are used to separate the network into smaller virtual networks.
    - **CoS –** Class of Service, requires a unique VLAN tag. CoS sets the priority (0-7) of each of the VLAN options within the local network (layer 2 of the OSI model). Higher priority traffic is prioritized and provides a more reliable service.
    - **DSCP -** The DSCP (Differentiated Services Code Point) value is used to mark the

priority (0-63) of packets in a WAN network layer (layer 3 of the OSI model). It is used for large-scale networks (or across the Internet) and increases the quality of service.

- **Active Interface** – The output port.
- **MAC Address** – MAC of this device (the **KDS-100DEC**).
- **DHCP** – Set the slider to On, to have your DHCP server automatically define an IP address.
- **IP Address**, **Mask Address** and **Gateway Address -** Static IP definition fields: Not relevant if DHCP is enabled.
- **DNS** – Address of the domain name server. By default, the system is set to use the Google DNS.

Click **Save** after changing.

8.7.3 Date & Time tab

An NTP (Network Time Protocol) server should be used for KDS-100 series deployments. The NTP is essential for encoder and decoder synchronization, time stamping, and reliability in applications where coordination is critical. It helps prevent drift, jitter, out-of-sync data and contributes to reliable and efficient system operation.

Note: If no NTP server is available, it is possible to enter the address of a KDS-100 device (encoder or decoder), and the device will synchronize time to that device.

To sync device time and date from a network time server:

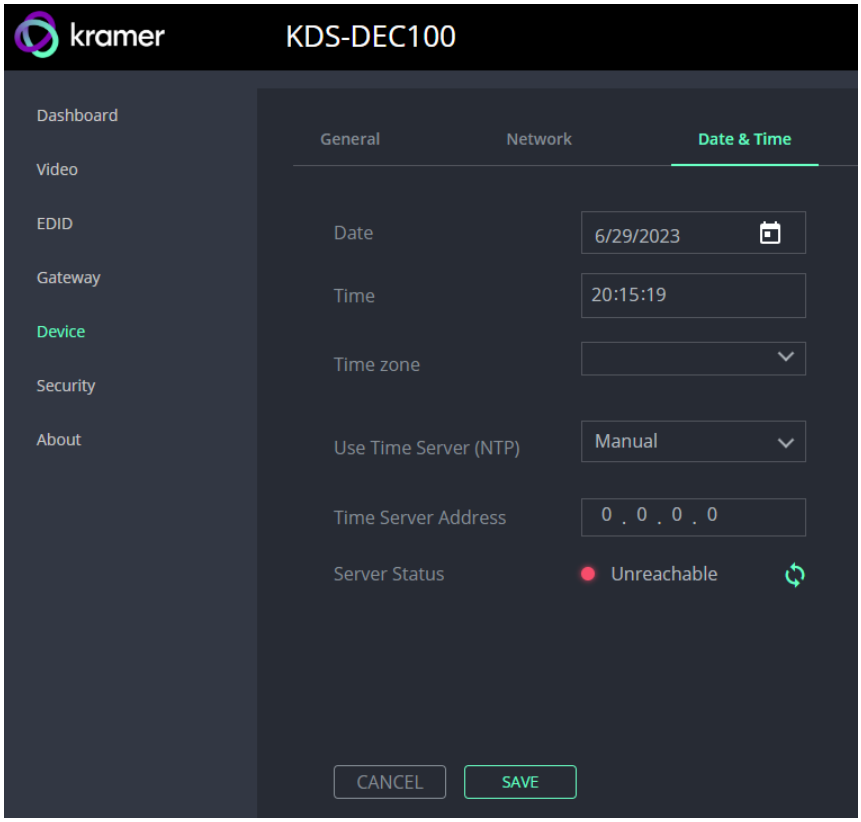


Figure 39: Device Pane – Date & Time tab

1. In the **Device** pane, select the **Date & Time** tab.
2. Set the **Time zone**.
3. Set **Use Time Server (NTP),** to **On**.
4. Enter the **Time Server Address** IP (or the IP of a KDS-100 Series device that you are using as an alternative to a Time Server).
5. Click **SAVE**.

The devices date and time are synchronized to the server address entered.

8.8 Security: *Passwords, HTTPS and 802.1X*

Password protection is only active when the **Security Status** is On (default).

The default password is (username) Admin, (password) Admin.

The **KDS-100DEC** Security tab has three tabs:

- **Security –** Enable/disable security and change the device password.
- **HTTPS –** Use the device's internal certificate or upload a local certificate.
- **802.1X-** Enable and setup IEEE 802.1X authentication.

8.8.1 Security tab

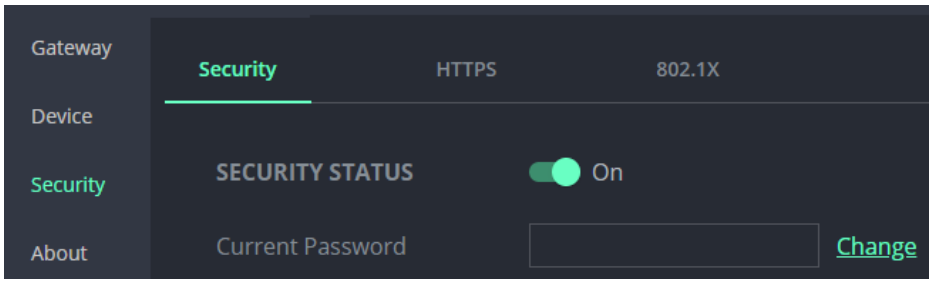


Figure 40: Security pane – Security tab

8.8.1.1 To change Security Status

Move the slider to enable/disable security. To disable security, enter the device's current password in the pop-up.

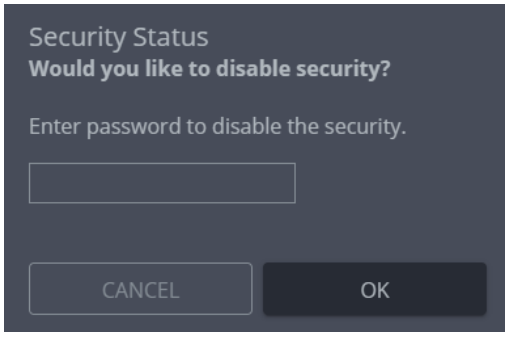


Figure 41: Security pane – pop-up

8.8.1.2 To change the password

Password protection is only available if the **Security Status** is On. To change the password, enter the **Current Password** and then click **Change**.

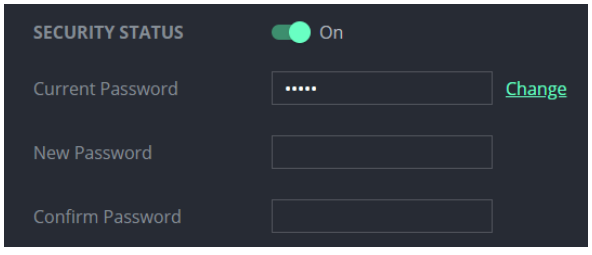


Figure 42: Security pane – Change password

8.8.2 HTTPS tab

To configure HTTPS:

1. In the **Security** pane's **Security** tab, **Security Status** must be enabled.
2. Select the **HTTPS** tab.
3. Select one of the following authentication methods:

- **Internal Certificate** – Use the factory default certificate for authentication.
- **Server Certificate** – Submit a certificate from the server for authentication (assigned by your network administrator). Click to upload the certificate. Enter the private key password and click **APPLY & REBOOT**.

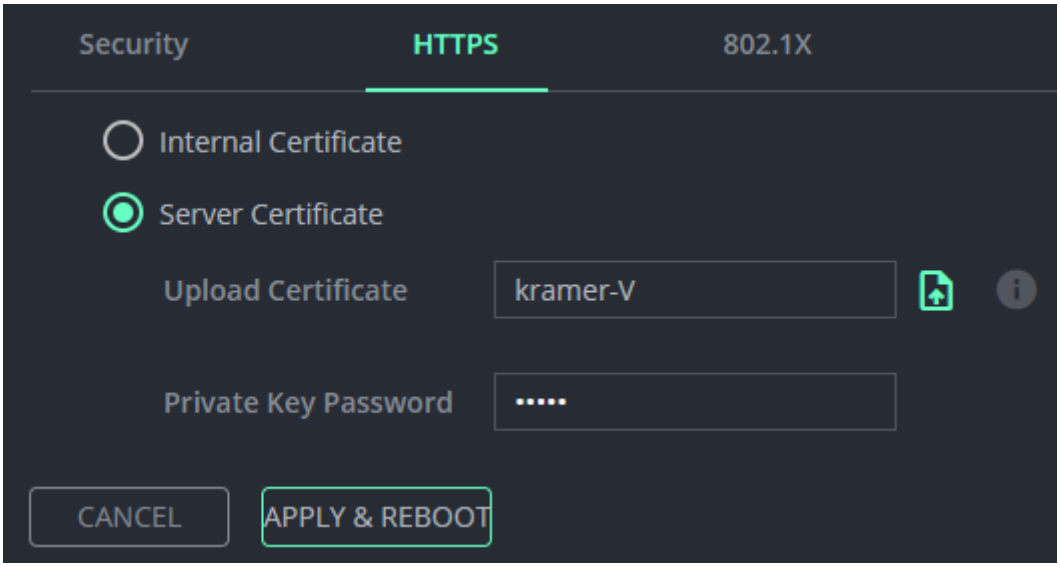


Figure 43: Security Tab – Server Certificate

4. Click **APPLY & REBOOT**.

HTTPS is configured.

8.8.3 802.1X tab

To configure IEEE 802.1X Authentication:

1. In the Security pane, select the 802.1X tab.
2. Set 802.1x authentication **ON**.
3. When set to ON check one of the following settings:

- **EAP-MSCHAP V2** – This authentication method requires that you enter the **KDS-100DEC** username and password.
- **EAP-TLS** – Submit a certificate from your network authentication server. To do so, enter the **KDS-100EN** Username (default Admin / Admin), click to upload the certificates and keys, and enter the private key password (assigned by your network administrator).
  Set **Server Certificate** to **On**.

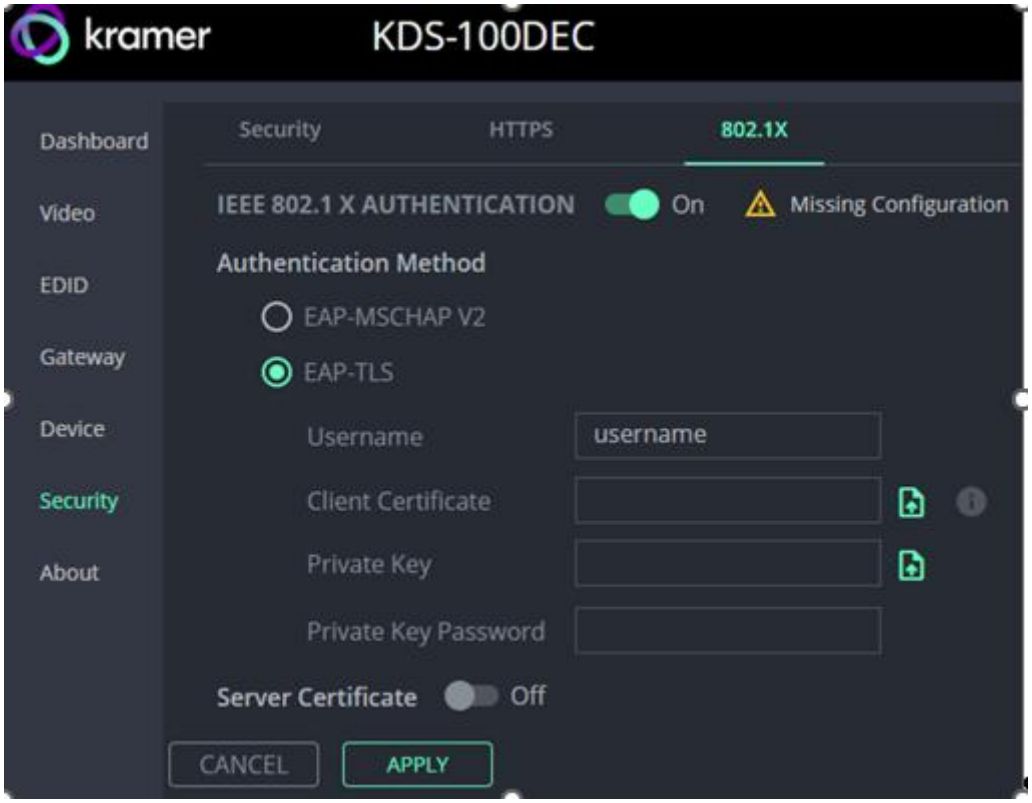


Figure 44: EAP-TLS – Certificates and Password

4. Click **APPLY**.

Security is configured.

8.9 About: *Web version and contact details*

View the web page release version and Kramer Electronics Ltd details.

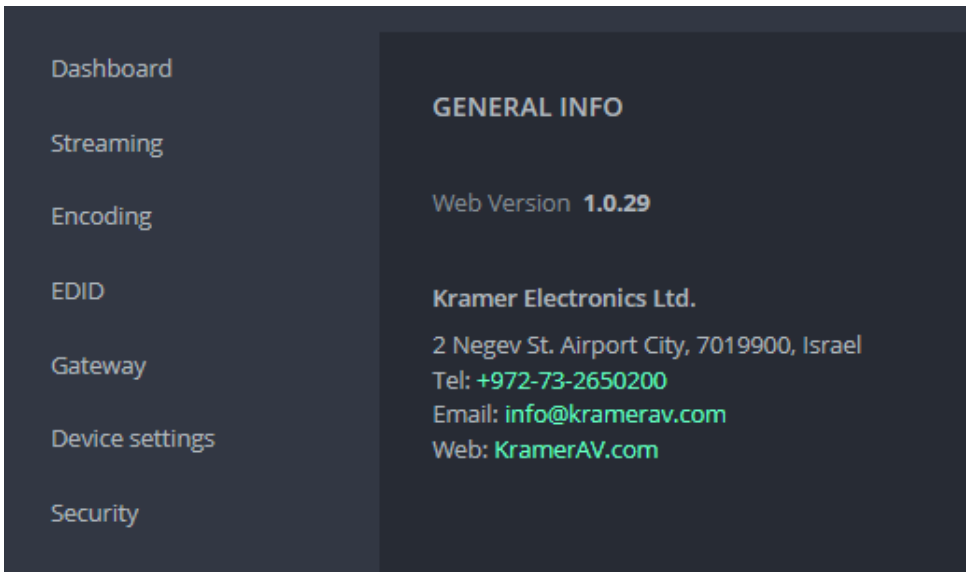


Figure 45: About Page

9 Upgrading Firmware

Upgrade the firmware, view the date of the last upgrade, or rollback to the previous firmware revision in case of a problem.

For support, contact the Kramer tech support team at support@kramerav.com.

9.1.1 To upgrade the firmware:

1. Download the latest firmware from the Kramer website at:

- **KDS-100EN** - https://www.kramerav.com/downloads/kds-100en
- **KDS-100DEC** - https://www.kramerav.com/downloads/kds-100dec

Firmware can also be downloaded from the **Resources** tab of the relevant product pages at www.kramerav.com/product/KDS-100EN#Tab_Resources.

2. In the embedded web pages, select the **Device** page. It will open on the **General** tab. This page is the same in both **KDS-100EN** and **KDS-100DEC**.

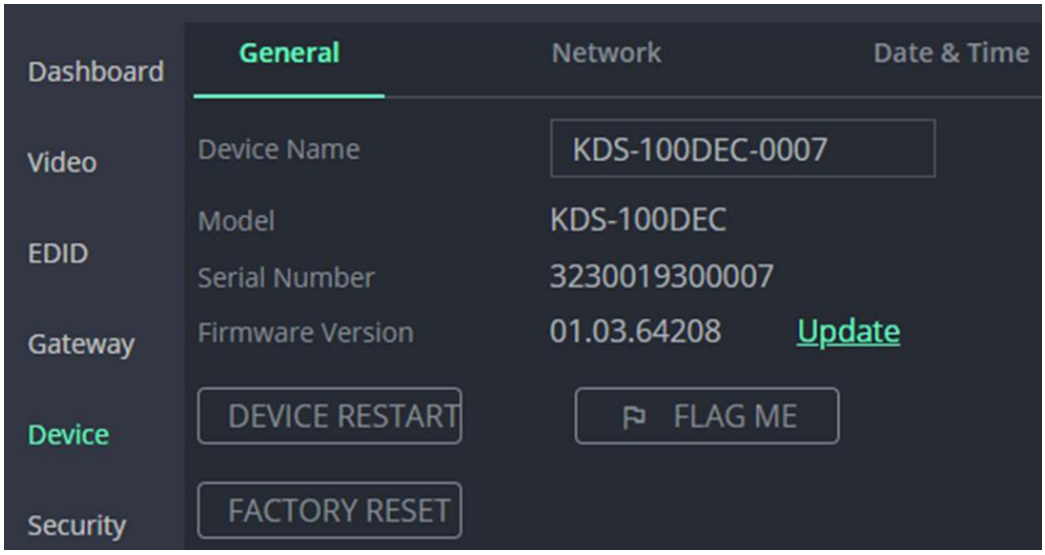


Figure 46: General Tab – Upgrading the Firmware

3. Next to **Firmware Version**, click **Update**.
4. Select the Firmware file and click **Open**. The Firmware upgrade pop-up opens. Wait for upgrade completion.
5. Once completed, refresh the web page and log-in.

Firmware upgrade is complete.

10Technical Specifications

10.1 KDS-100EN Specifications

Inputs	1 HDMI	On a female HDMI connector
	1 Balanced Audio	On a 5-pin terminal block connector
Outputs	1 HDMI	On a female HDMI connector
	1 Balanced Audio	On a 5-pin terminal block connector
Ports	1 Media/Control LAN PoE	On an RJ-45 female connector
	1 RS-232	On a 3-pin terminal block connector for control
	1 RS-232	On a 3-pin terminal block connector for extension
	1 Fiber on an LC Connector	Standard: 1000BASE-SX, 1000BASE-LX
Network	1 GE	
	IPv4	
	Multicast	IGMPv2
	RTP/RTCP	Over UDP
	MPEG-TS	
	RTSP	
Video	Max In/Out Resolution	3840x21604K@60Hz 4:4:4
Video Streaming	Compression	H.264 / HEVC (H.265)
	Max Streaming Resolution	3840x21604K@60Hz 4:2:2
	Bit Rate Range	1-60Mbps
	Latency	Low latency: About 40msec
	Dual streaming support	Primary: Up to 3840x2160@30Hz 4:2:2 Secondary: Up to 1920x 1080@60Hz 4:2:2
Security	HTTPS, 802.1x, OWASP-10	
User Interface	Indicators	LINK, NET and ON LEDs, front panel channel number display
	Rear Panel	Factory reset button
	Controls	Embedded web pages, P3K API commands via Ethernet, front panel channel selection buttons
Power	PoE+	IEEE 802.3at
	Optional Power Supply	12V DC, 5A. Unit must be supplied by a power supply specified as a Limited Power Source (LPS) or PS2 source of supply.
	Consumption	13.6W
Environmental Conditions	Operating Temperature	0° to +45°C (32° to 113°F)
	Storage Temperature	-20° to +70°C (-4° to 158°F)
	Humidity	10% to 90%, RHL non-condensing
Regulatory Compliance	Safety	CE, FCC
	Environmental	RoHs, WEEE
Dimensions	Net Dimensions (W, D, H)	21.5cm x 16.3cm x 4.4cm (8.5" x 6.4" x 1.72")
	Shipping Dimensions (W, D, H)	34.5cm x 16.5cm x 5.2cm (13.6" x 6.5" x 2.05")
Weight	Net Weight	0.9kg (2lbs) approx.
	Shipping Weight	1.4kg (3.1lbs) approx.
Specifications are subject to change without notice at www.kramerav.com		

10.2 KDS-100DEC Specifications

Inputs	1 HDMI	On a female HDMI connector
Outputs	1 HDMI	On a female HDMI connector
	1 Balanced Audio	On a 5-pin terminal block connector
Ports	1 Ethernet	On an RJ-45 female connector
	1 RS-232	On a 3-pin terminal block connector for control
	1 RS-232	On a 3-pin terminal block connector for data
	1 Fiber on an LC Connector	Standard: 1000BASE-SX, 1000BASE-LX
Network	1 GE	
	IPv4	
	Multicast	IGMPv2
	RTP/RTCP	Over UDP
	MPEG-TS	
	RTSP	
Video	Max In/Out Resolution	3840x21604K@60Hz 4:4:4
Video Streaming	Compression	H.264 / H.265
	Streaming Resolution	3840x21604K@60Hz 4:2:2
	Bit Rate Range	1-60Mbps
	Latency	Low latency About 40msec
	Scaler	Yes
Security	HTTPS, 802.1x, OWASP-10	
User Interface	Indicators	LINK, NET and ON LEDs, front panel channel number display
	Rear Panel	Factory reset button
	Controls	Embedded web pages, P3K API commands via Ethernet, front panel channel selection buttons
Power	PoE+	IEEE 802.3at
	Optional Power Adapter	12V DC, 5A. Unit must be supplied by a power supply specified as a Limited Power Source (LPS) or PS2 source of supply.
	Consumption	13.6W
Environmental Conditions	Operating Temperature	0° to +45°C (32° to 113°F)
	Storage Temperature	-20° to +70°C (-4° to 158°F)
	Humidity	10% to 90%, RHL non-condensing
Regulatory Compliance	Safety	CE, FCC
	Environmental	RoHs, WEEE
Dimensions	Net Dimensions (W, D, H)	21.5cm x 16.3cm x 4.4cm (8.5" x 6.4" x 1.72")
	Shipping Dimensions (W, D, H)	34.5cm x 16.5cm x 5.2cm (13.6" x 6.5" x 2.05")
Weight	Net Weight	0.9kg (2lbs) approx.
	Shipping Weight	1.4kg (3.1lbs) approx.
Specifications are subject to change without notice at www.kramerav.com		

11 Protocol 3000

Kramer devices can be operated using Kramer Protocol 3000 commands sent via serial or Ethernet ports.

11.1 Understanding Protocol 3000

Protocol 3000 commands are a sequence of ASCII letters, structured according to the following.

- **Command format**:

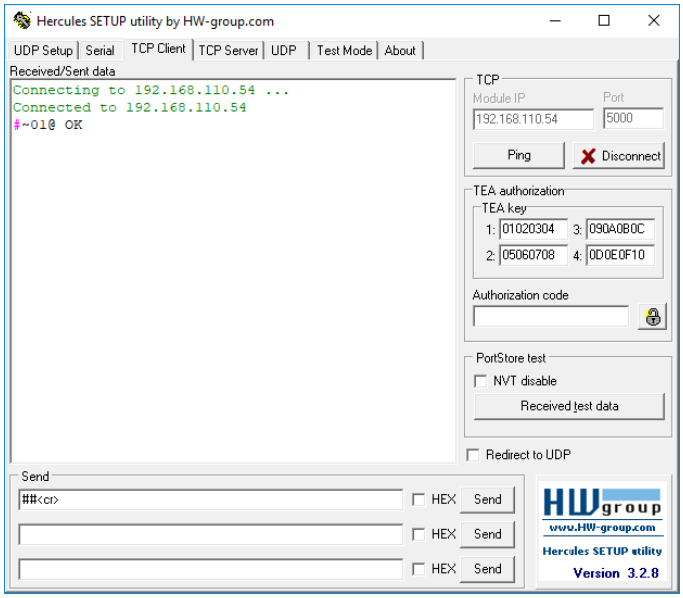
Prefix	Command Name	Constant (Space)	Parameter(s)	Suffix
#	Command	␣	Parameter	<CR>

- **Feedback format**:

Prefix	Device ID	Constant	Command Name	Parameter(s)	Suffix
~	nn	@	Command	Parameter	<CR><LF>

- **Command parameters** – Multiple parameters must be separated by a comma (,). In addition, multiple parameters can be grouped as a single parameter using brackets ([and]).
- **Parameters attributes** – Parameters may contain multiple attributes. Attributes are indicated with pointy brackets (<…>) and must be separated by a period (.).

The command framing varies according to how you interface with **KDS-100EN**. The following figure displays how the # command is framed using terminal communication software (such as Hercules):



11.2 Protocol 3000 Commands

Function	Description	Syntax	Response	Parameters/Attributes	Example
#	Protocol handshaking. Validates the Protocol 3000 connection and gets the machine number. Step-in master products use this command to identify the availability of a device.	#<CR>	~nn@_ok<CR><LF>		#<CR>
AUTH-802-1X-ENABLE	Set Authentication 802.1X feature for the device per specific interface.	#AUTH-802-1X-ENABLE Interface ID,state<CR>	~nn@AUTH-802-1X-ENABLE Interface ID,state<CR><LF>	**Interface ID:** – 0 **State**: 0,1 – Enable/Disable	Enable 802 Security of interface 0 #AUTH-802-1X-ENABLE 0,1<CR>
AUTH-802-1X-ENABLE?	Get Authentication 802.1X feature for the device per specific interface.	#AUTH-802-1X-ENABLE? Interface ID<CR>	~nn@AUTH-802-1X-ENABLE Interface ID,state<CR><LF>	**Interface ID:** – 0 **State**: 0,1 – Enable/Disable	Get 802 security status of interface 0 #AUTH-802-1X-ENABLE? 0<CR>
AUTH-802-1X-OP-STAT?	Get Authentication 802.1X operational status	#AUTH-802-1X-OP-STAT? Interface ID<CR>	~nn@AUTH-802-1X-OP-STAT Interface ID ,state<CR><LF>	**Interface ID:** – 0 **State**: 0 - 3 – Enable/Disable	802 authentication is running #AUTH-802-1X-OP-STAT? 0<CR>
AV-SW-TIMEOUT	Set auto switching timeout.	#AV-SW-TIMEOUT action,time_out<CR>	~nn@AV-SW-TIMEOUT action,time_out<CR><LF>	action – video / audio switching actions 0 – Video signal lost 1 – New video signal detected 2 – Audio signal lost 3 – Audio signal detected 4 – Disable 5V on video output if no input signal detected 5 – Video cable unplugged 6 – Audio cable unplugged 7 – Video signal lost for signal routed as a result of a manual override action time_out - timeout in seconds, for different action it has different valid range: Action Range Default 0 5 - 90 5 1 0 - 90 0 2 5 - 90 5 3 0 - 90 0 4 0 - 90 0 5 0 - 90 0 6 0 - 90 0 7 0 - 90 5	Set auto switching "Disable 5V on video output if no input signal detected" to 5 seconds: #AV-SW-TIMEOUT 4,5<CR>
AV-SW-TIMEOUT?	Get auto switching timeout.	#AV-SW-TIMEOUT? action<CR>	~nn@AV-SW-TIMEOUT action,time_out<CR><LF>	action – video / audio switching actions 0 – Video signal lost 1 – New video signal detected 2 – Audio signal lost 3 – Audio signal detected 4 – Disable 5V on video output if no input signal detected 5 – Video cable unplugged 6 – Audio cable unplugged 7 – Video signal lost for signal routed as a result of a manual override action time_out - timeout in seconds, for different action it has different valid range: Action Range Default 0 5 - 90 5 1 0 - 90 0 2 5 - 90 5 3 0 - 90 0 4 0 - 90 0 5 0 - 90 0 6 0 - 90 0 7 0 - 90 5	Get auto switching "Disable 5V on video output if no input signal detected" value: #AV-SW-TIMEOUT? 4<CR>
BUILD-DATE?	Get device build date.	#BUILD-DATE?<CR>	~nn@BUILD-DATE date,time<CR><LF>	**date** – Format: YYYY/MM/DD **time** – Format: hh:mm:ss	Get the device build date: #BUILD-DATE?<CR>
CHANNEL-ID	Set channel or channel mode.	#CHANNEL-ID channel_mode, channel_id<CR>	~nn@CHANNEL-ID channel_mode, channel_id<CR><LF>	**channel_mode** – auto=0, man=1 **channel_id** - <channel number>	Set the channel to 18 #CHANNEL-ID 1,18<CR>
CHANNEL-ID?	Get channel or channel mode.	#CHANNEL-ID?<CR>	~nn@CHANNEL-ID? channel_mode, channel_id<CR><LF>	**channel_mode – auto=0, man=1** **channel_id** - <channel number>	Get the channel mode and number. #CHANNEL-ID?<CR>
COM-ROUTE	This command sets tunneling port routing. Every com port can send or receive data from the ETH port.	#COM-ROUTE com_id,port_type,port_id,eth_rep_en,ping_val<CR>	~nn@COM-ROUTE com_id,port_type,port_id,eth_rep_en,ping_val<CR><LF>	**com_id** – Machine dependent **port_type** – TCP/UDP 2 – TCP 1 – UDP **port_id** – TCP/UDP port number **eth_rep_en** – Ethernet Reply 0 – COM port does not send replies to new clients 1 – COM port sends replies to new clients. **Ping_val** – every x seconds the device sends an empty string to TCP client ("/0") (0 to 3600)	Set tunneling for TCP port 5000; where the COM port sends replies to new clients and the keep alive time is 1: #COM-ROUTE 1,tcp,5000,1,1<CR>
COM-ROUTE?	Get tunneling port routing.	#COM-ROUTE?_com_id<CR>	~nn@COM-ROUTE com_id,port_type,port_id,eth_rep_en,ping_val<CR><LF>	**com_id** – Machine dependent port_type – TCP/UDP 2 – TCP 1 – UDP **port_id** – TCP/UDP port number **eth_rep_en** – Ethernet Reply 0 – COM port does not send replies to new clients 1 – COM port sends replies to new clients. **Ping_val** – Every x seconds the device sends an empty string to TCP client ("/0") (0 to 3600)	Get tunneling port routing for all route tunnels: #COM-ROUTE?_*<CR>

Function	Description	Syntax	Response	Parameters/Attributes	Example
COM-ROUTE-ENABLE	Enable/Disable RS-232 Gateway	#COM-ROUTE-ENABLE Connector ID,Mode<CR>	~nn@COM-ROUTE-ENABLE Connector ID,Mode<CR><LF>	**Connector ID** 1 **Mode** ON/OFF 0-1	Get RS-232 gateway status #COM-ROUTE-ENABLE 1,1<CR>
COM-ROUTE-ENABLE?	Get RS-232 gateway status	#COM-ROUTE-ENABLE? Connector ID<CR>	~nn@COM-ROUTE-ENABLE Connector ID,Mode<CR><LF>	**Connector ID** 1 **Mode** ON/OFF 0-1	Enable RS-232 Gateway #COM-ROUTE-ENABLE 1,1<CR>
CPEDID	Copy EDID data from the output to the input EEPROM	#CPEDID edid_io, src_id, dest_bitmap<CR>	~nn@CPEDID edid_io,src_id,dest_bitmap,safe_mode<CR><LF>	**edid_io**: EDID source type (usually output) 0 – Input / 1 – Output / 2 – Default EDID / 3 – Custom EDID **src_id:** Number of chosen source stage 0..N **dest_bitmap:** Bitmap representing destination IDs. Format: XXXX…X, where X is hex digit. The binary form of every hex digit represents corresponding destinations 0 – EDID data is not copied to this destination / 1 – EDID data is copied to this destination. **safe_mode:** Safe mode 0 – device accepts the EDID as is without trying to adjust 1 – device tries to adjust the EDID (default value if no parameter is sent).	Copy the EDID data from Output 1 (EDID source) to the Input: #CPEDID 1,1,0<CR>
CPEDID-REMOTE	Load EDID from remote device.	#CPEDID-REMOTE Decoder output number,Decoder ID,Encoder Input,Destination ID,Decoder IP Address<CR>	~nn@CPEDID-REMOTE Decoder output number,Decoder ID,Encoder Input,Destination ID,Decoder IP Address<CR><LF>	**Decoder output number** - 1 **Decoder ID** -1 **Encoder Input number** - 2 **Destination ID** - 2 **Decoder IP Address** - Valid IP Address	Copy EDID from Decoder output to Encoder input #CPEDID-REMOTE 1,1,2,2,192.168.58.3<CR>
DISPLAY?	Get the output's HPD (hot plug display) status	#DISPLAY? out_index<CR>	~nn@DISPLAY out_index,status<CR><LF>	**out_index:** Number that indicates the specific output. 1-N (N= the total number of outputs) **status:** HPD status according to signal validation. 0 – Signal or sink is not valid 1 – Signal or sink is valid 2 – Sink and EDID is valid.	Get the output HPD status of Output 1: #DISPLAY? 1<CR>
ETH-ACTIVE-PHY?	Get the status of the currently active connector – SFP/RJ-45	#ETH-ACTIVE-PHY? 1,mod,1<CR>	~nn@ETH-ACTIVE-PHY <CR><LF>	1,mod,1- parameters that indicates which interface is connected 1-2.	The SFP connector is active #ETH-ACTIVE-PHY? 1,2,1<CR>
ETH-PORT	Set Ethernet port protocol. If the port number you enter is already in use, an error is returned. The port number must be within the following range: 0-(2^16-1).	#ETH-PORT port_type,port_id<CR>	~nn@ETH-PORT port_type,port_id<CR><LF>	**port_type** – TCP/UDP **port_id** – when port_type = TCP: 5000~5099 when port_type = UDP: 50000~50999	Set the Ethernet port protocol for TCP to port 12457: #ETH-PORT TCP,5000<CR>
ETH-PORT?	Get Ethernet port protocol.	#ETH-PORT?_port_type<CR>	~nn@ETH-PORT port_type,port_id<CR><LF>	**port_type** – TCP/UDP **port_id** – when port_type = TCP: 5000~5099 when port_type = UDP: 50000~50999	
ETH-TUNNEL?	Get open tunnels parameters.	#ETH-TUNNEL? tunnel_id<CR>	~nn@ETH-TUNNEL tunnel_id,cmd_name,port_type,port_id,eth_ip,remote_port_id,eth_rep_en,connection_type <CR><LF>	**tunnel_id:** Tunnel ID number * (get all open tunnels) **cmd_name:** UART number **port_type:** TCP/UDP 0 – TCP 1 – UDP **port_id:** TCP/UDP port number **eth_ip:** Client IP address **remote_port_id:** Remote port number **eth_rep_en:** Ethernet Reply 0 – COM port does not send replies to new clients 1 – COM port sends replies to new clients **Connection_type** 0 – not wired connection 1 – wired connection	Get Tunnel id 1 details #ETH-TUNNEL? 1<CR>
FACTORY	Reset device to factory default configuration. This command deletes all user data from the device. The deletion can take some time. Your device may require powering off and powering on for the changes to take effect.	#FACTORY<CR>	~nn@FACTORY_ok<CR><LF>		Reset the device to factory default configuration: #FACTORY<CR>
GEDID	Get EDID data on certain input/output.	#GEDID io_mode,in_index<CR>	~nn@GEDID io_mode,in_index,size,Binary DATA<CR><LF>	**io_mode:** Input/Output 0 – Input, 1 – Output, 2 – Default EDID, 3 – Custom EDID **in_index:** Number that indicates the specific input 1-N (N= the total number of inputs) size: Size of data to be sent from device 0 means no EDID support **Binary DATA:** EDID Binary data in binary format.	Get EDID data for input #1: #GEDID? 0,1<CR>

Function	Description	Syntax	Response	Parameters/Attributes	Example
HDCP-MOD	Set HDCP mode. NOTE: Set HDCP working mode on the device input.	#**HDCP-MOD** in_index,mode<CR>	~nn@**HDCP-MOD** in_index,mode<CR><LF>	in_index – Number that indicates the specific input: 1-N (N= the total number of inputs) mode – HDCP mode: 0 – HDCP Off 1 – HDCP On	Set the input HDCP-MODE of IN 1 to Off: #HDCP-MOD 1,0<CR>
HDCP-MOD?	Get HDCP mode. **NOTE:** Set HDCP working mode on the device input.	#**HDCP-MOD?** in_index<CR>	~nn@**HDCP-MOD** in_index,mode<CR><LF>	in_index – Number that indicates the specific input: 1-N (N= the total number of inputs) mode – HDCP mode: 0 – HDCP Off 1 – HDCP On	Get the input HDCP-MODE of IN 1 HDMI: #HDCP-MOD <CR>
HDCP-STAT?	Get HDCP signal status. **NOTE:** io_mode =1 – get the HDCP signal status of the sink device connected to the specified output. io_mode =0 – get the HDCP signal status of the source device connected to the specified input.	#**HDCP-STAT?** io_mode,in_index<CR>	~nn@**HDCP-STAT** io_mode,in_index,status<CR><LF>	io_mode – Input/Output 0 – Input 1 – Output io_index – Number that indicates the specific number of inputs or outputs (based on io_mode): 1-N (N=total number of inputs or outputs) status – Signal encryption status - valid values On/Off 0 – HDCP Off 1 – HDCP On (1.4) 2 – HDCP On (2.3)	Get the output HDCP-STATUS of IN 1: #HDCP-STAT? 0,1<CR>
HELP	Get command list or help for specific command.	#HELP<CR> #HELP cmd_name<CR>	1. Multi-line: ~nn@Device cmd_name, cmd_name<CR><LF> To get help for command use: HELP (COMMAND_NAME)<CR><LF> ~nn@HELP cmd_name:<CR><LF> description<CR><LF> USAGE:usage<CR><LF>	**cmd_name** – Name of a specific command	Get the command list: #HELP<CR> To get help for AV-SW-TIMEOUT: HELP av-sw-timeout<CR>
IDV	Set visual indication from device. Using this command, some devices can light a sequence of buttons or LEDs to allow identification of a specific device from similar devices.	#IDV<CR>	~nn@IDV ok<CR><LF>		#IDV<CR>
KDS-ACTION	Set action to perform by encoder/decoder.	#KDS-ACTION kds_mode<CR>	~nn@KDS-ACTION kds_mode<CR><LF>	**kds_mode** – Action (state) for encoder/decoder 0 – Stop 1 – Play 2 – Save config	Stop the encoder/decoder: #KDS-ACTION 0<CR>
KDS-ACTION?	Get last action (state) performed by encoder/decoder.	#KDS-ACTION?<CR>	~nn@KDS-ACTION kds_mode<CR><LF>	**kds_mode** – Action (state) for encoder/decoder 0 – Stop 1 – Play 2 – Save config	Get the last action performed by the encoder/decoder: #KDS-ACTION?<CR>
KDS-APPLY	Save configuration for all inputs	#KDS-APPLY * <CR>	~nn@KDS-APPLY all<CR><LF>	**all:** Save all inputs configuration *	Save configuration for all inputs #KDS-APPLY *<CR>
KDS-B-FRAMES	Set current streaming b-frames	#KDS-B-FRAMES input,B-Frames<CR>	~nn@KDS-B-FRAMES input,B-Frames<CR><LF>	**input:** 1-2 (stream 1 or stream 2). **B-Frames:** Value 0-4.	Set B-Frames of input 1 to 0 #KDS-B-FRAMESV1,0<CR>
KDS-B-FRAMES?	Get current streaming b-frames	#KDS-B-FRAMES? input<CR>	~nn@KDS-B-FRAMES input,B-Frames<CR><LF>	**input:** 1-2 (stream 1 or stream 2). **B-Frames:** Value 0-4.	Get B-Frames of input 1 #KDS-B-FRAMES? 1<CR>
KDS-BR	Set bitrate.	#KDS-BR bitrate <CR>	~nn@KDS-BR bitrate<CR><LF>	**Bitrate** – 1-60 in Mbps	set bit rate to 15 mbps: #KDS-BR? 15<CR>
KDS-BR?	Get bitrate.	#KDS-BR? <CR>	~nn@KDS-BR bitrate<CR><LF>	Bitrate in Mbps	Get bit rate: #KDS-BR?<CR>
KDS-CS?	Get color space of the source	#KDS-CS? Input<CR>	~nn@KDS-CS Input,Color Space<CR><LF>	**Input:** Input ID 1	Get Input 1 color space information #KDS-CS? 1<CR>
KDS-EN	Set encoding method to encoder/decoder.	#KDS-EN method<CR>	~nn@KDS-EN method<CR><LF>	**Method** 0-encoder, 1-decoder	Set encoding method to decoder: #KDS-EN 1<CR>
KDS-EN?	Get encoding method.	#KDS-EN?<CR>	~nn@KDS-EN method<CR><LF>	**Method** 0-encoder, 1-decoder	Get encoding method: #KDS-EN 1<CR>
KDS-FR?	Get frame rate.	#KDS-FR?<CR>	~nn@KDS-FR value<CR><LF>	**value:** Frame rate in frames per second.	Get frame rate: #KDS-FR?<CR>
KDS-GOP	Set GOP (group of pictures) size.	#KDS-GOP? Input, gop_value<CR>	~nn@KDS-GOP input,gop_value<CR><LF>	**Input:** **Value:** GOP size (1 – 1000). Number of frames between every keyframe.	
KDS-GOP?	Get GOP (group of pictures) size.	#KDS-GOP?<CR>	~nn@KDS-GOP value<CR><LF>	**Input:** 1,2 (stream 1 or stream 2). **Value:** GOP size. Number of frames between every keyframe.	Get GOP size: #KDS-GOP?<CR>
KDS-IDR	Set Encoder IDR (Instantaneous Decoder Refresh) Frequency.	#KDS-IDR Input,IDR Frequency<CR>	~nn@KDS-IDR Input,IDR Frequency<CR><LF>	**Input:** Input 1-2 (stream 1 or stream 2). **IDR Frequency:** -1 – infinite.	Set Input 1 IDR frequency of 60 #KDS-IDR 1,60<CR>
KDS-IDR?	Get Encoder IDR Frequency.	#KDS-IDR? Input<CR>	~nn@KDS-IDR Input,IDR Frequency<CR><LF>	**Input:** Input 1-2 (stream 1 or stream 2). **IDR Frequency:** -1 – infinite.	Get IDR Frequency of input 1 #KDS-IDR? 1<CR>
KDS-LATENCY	Set Encoder IDR (Instantaneous Decoder Refresh) Frequency.	#KDS-IDR Input,IDR Frequency<CR>	~nn@KDS-IDR Input,IDR Frequency<CR><LF>	Input: Input 1-2 (stream 1 or stream 2). IDR Frequency: -1 – infinite.	Set Input 1 IDR frequency of 60 #KDS-IDR 1,60<CR>

Function	Description	Syntax	Response	Parameters/Attributes	Example
KDS-LATENCY?	Get Encoder IDR Frequency.	#KDS-IDR? Input<CR>	~nn@KDS-IDR Input,IDR Frequency<CR><LF>	**Input:** Input 1-2 (stream 1 or stream 2). **IDR Frequency:** -1 – infinite.	Get IDR Frequency of input 1 #KDS-IDR? 1<CR>
KDS-LATENCY-MODE	Set current streaming latency mode	#KDS-LATENCY-MODE input,l_mode<CR><LR>	~nn@KDS-LATENCY-MODE input,l_mode<CR><LR>	**Input:** Input 1-2 (stream 1 or stream 2). **L_mode:** 0=Default,1=Normal,2=LowLatency	Set Input 1 to low latency #KDS-LATENCY-MODE 1,2<CR>
KDS-LATENCY-MODE?	Get current streaming latency mode	#KDS-LATENCY-MODE? input<CR><LR>	~nn@KDS-LATENCY-MODE input,l_mode<CR><LR>	**Input:** Input 1-2 (stream 1 or stream 2). **L_mode:** 0=Default,1=Normal,2=LowLatency	Get the latency level of Input 1: #-KDS-LATENCY-MODE 1,2<CR>
KDS-METHOD	Set unicast / multicast streaming method. Available only when RTP Streaming Protocol is configured (see KDS-PROT command).	#KDS-METHOD input,method<CR>	~nn@KDS-METHOD input,method<CR><LF>	**Input -** Input 1-2 (stream 1 or stream 2). **method** – Streaming method 1 – Unicast 2 – Multicast	Get current streaming method of encoder/decoder: #KDS-METHOD<CR>
KDS-METHOD?	Get unicast / multicast streaming method. Available only when RTP Streaming Protocol is configured (see KDS-PROT command).	#KDS-METHOD? input<CR>	~nn@KDS-METHOD input,method<CR><LF>	**Input –** Input 1 – 2 (stream 1 or stream 2). **method** – Streaming method 1 – Unicast 2 – Multicast	Set the current streaming method of input 1 to Unicast on the encoder/decoder : #KDS-METHOD 1,1 <CR>
KDS-MOD?	Get device current working mode.	#KDS-MOD?<CR>	~nn@KDS-MOD mode<CR><LF>	**mode:** Device working mode 3 – HIGH_QUALITY.	Get device current working mode: #KDS-MOD?<CR>
KDS-MULTICAST	Set multicast group address and TTL value (encoder mode only). Multicast groups are identified by special IP addresses between the range of 224.0.0.0 and 239.255.255.255. Addresses within the 224.0.0.0 range are commonly reserved for local subnet communications. TTL is the time to live of the datagram to avoid it being looped forever due to routing errors.	#KDS-MULTICAST group_ip,ttl<CR>	~nn@KDS-MULTICAST group_ip,ttl<CR><LF>	**group-ip** - Multicast group IP used for streaming packets in Multicast Streaming Method. **ttl** - Time to Live of the streamed packets.	Set multicast group address and TTL value #KDS-MULTICAST 225.225.0.10,1<CR>
KDS-MULTICAST?	Get multicast group address and TTL value.	#KDS-MULTICAST?<CR>	~nn@KDS-MULTICAST group_ip,ttl<CR><LF>	**group-ip** - Multicast group IP used for streaming packets in multicast streaming method. **ttl** - Time to Live of the streamed packets.	Set multicast group address and TTL value #KDS-MULTICAST 225.225.0.10,1<CR>
KDS-MULTICAST-PREFIX	Set multicast group address value.	#KDS-MULTICAST-PREFIX Input,Octet 1,Octet 2,Octet 3,Octet 4<CR>	~nn@KDS-MULTICAST-PREFIX Input,Octet 1,Octet 2,Octet 3,Octet 4<CR><LF>	**Input:** 1-2 (stream 1 or stream 2). **Octet 1:** 224-239 **Octet 2:** 0-255 **Octet 3:** 0 **Octet 4:** 0	Set Multicast Prefix of input 2 to 230.3.0.0 #KDS-MULTICAST-PREFIX 2,230,3,0,0<CR>
KDS-MULTICAST-PREFIX?	Get multicast group address value.	#KDS-MULTICAST-PREFIX Input<CR>	~nn@KDS-MULTICAST-PREFIX Input,Octet 1,Octet 2,Octet 3,Octet 4<CR><LF>	**Input:** 1-2 **Octet 1:** 224-239 **Octet 2**: 0-255 **Octet 3:** 0 **Octet 4:** 0	Set Multicast Prefix of input 2 to 230.3.0.0 #KDS-MULTICAST-PREFIX 2,230,3,0,0<CR>
KDS-NUM-SLICES	Set current streaming number of slices produced for each frame.	#KDS-NUM-SLICES Input,Slices<CR>	~nn@KDS-NUM-SLICES Input,Slices<CR><LF>	**Input:** Input 1-2 (stream 1 or stream 2). **Slices:** Slice Value 4-32	Set 8 slices per frame to input 1. #KDS-NUM-SLICES 1,8 <CR>
KDS-NUM-SLICES?	Get current streaming number of slices produced for each frame.	#KDS-NUM-SLICES? Input<CR>	~nn@KDS-NUM-SLICES Input,Slices<CR><LF>	**Input:** Input 1-2 (stream 1 or stream 2). **Slices:** Slice Value 4-32	Get Slice value of input 1 #KDS-NUM-SLICES? 1<CR>
KDS-OP-STAT?	Get streaming operational status.	#KDS-OP-STAT?<CR>	~nn@KDS-OP-STAT value<CR><LF>	**value:** Streaming operational status 0 – running 1 – Not_running/stop 2 – error.	Get streaming operational status: #KDS-OP-STAT?<CR>
KDS-PROT?	Get current streaming protocol of encoder/decoder.	#KDS-PROT? stream<CR>	~nn@KDS-PROT protocol<CR><LF>	**Stream:** 1 encoder, 2 decoder. **protocol:** Encoder/decoder streaming protocol 0 – RTP, 1 - RTSP	Get current streaming protocol of encoder/decoder: #KDS-PROT? 1/2<CR>

Function	Description	Syntax	Response	Parameters/Attributes	Example
KDS-RESOL?	Get actual AV stream resolution.	#KDS-RESOL? io_mode,io_index,is_native<CR>	~nn@KDS-RESOL? io_mode,io_index,is_native,resolution<CR><LF>	**io_mode:** Input/Output 0 – Input 1 – Output **io_index:** Number that indicates the specific input or output port. 1-N (N= the total number of input or output ports) **is_native:** Native resolution flag 0 – Off 1 – On **resolution:** Resolution index 0=No Signal (for input) / Native – EDID (for output) 31=1920x1080p@50Hz 34=1920x1080p@29.97Hz/30Hz 74=3840x2160p@30Hz 76=3840x2160p@60Hz	
KDS-SCALE	Set scaling mode. Encoder only, requires a reboot to activate. Scaling is only supported from resolutions: up-scaled 720p to 1080p, and down-scaled 1080p to 720p.	#KDS-SCALE value<CR>	~nn@KDS-SCALE value,res_type<CR><LF>	**value** – Streamer Decoder Scaling Mode 0 – Pass Thru 1 – Scaling **res_type** – The resolution mode on the display, for example "S:1920x1080p-60"	Set scaling mode: #KDS-SCALE 1<CR>
KDS-SCALE?	Get scaling mode.	#KDS-SCALE? <CR>	~nn@KDS-SCALE value,res_type<CR><LF>	**value** – Streamer Decoder Scaling Mode 0 – Pass Thru 1 – Scaling **res_type** – The resolution mode on the display, for example "S:1920x1080p-60"	Get scaling mode #KDS-SCALE?<CR>
KDS-SCALE-CS	Set KDS Scale Color Space.	#KDS-SCALE-CS stream_id,scaling_color_space<CR>	~nn@KDS-SCALE-CS<CR><LF>	**stream id** number 1 – 2 (stream 1 or stream 2). **scaling_color_space**: 0 - ScalingColorSpace_NV12_4_2_0, 1 - ScalingColorSpace_NV16_4_2_2, (0 – 1)	Set Scaling Color Space Stream 1 to NV12_4_2_0 #KDS-SCALE-CS 1,0<CR>
KDS-SCALE-CS?	Get KDS Scale Color Space.	#KDS-SCALE-CS? stream_id <CR>	~nn@KDS-SCALE-CS<CR><LF>	**stream_id:** 1 – 2 (stream 1 or stream 2).	Get Scaling Color Space Stream 1 #KDS-SCALE-CS? 1<CR>
KDS-SCALE-LIST?	Return list of supported video resolutions.	#KDS-SCALE-LIST? stream_id <CR>	~nn@KDS-SCALE-LIST<CR><LF>	**stream_id:** 1 – 2 (stream 1 or stream 2).	Get decoder scaling list from stream_id 1 #KDS-SCALE-LIST? 1<CR>
KDS-START-OVERLAY	Set KVM Master Name.	#KVM-MASTER Name<CR>	~nn@KVM-MASTER Name<CR><LF>	**Name:** IP address boundary to ip address	Set KVM ip address of 192.168.30.3 #KVM-MASTER 192.168.30.3<CR>
KVM-MASTER?	Get KVM Master Name.	#KVM-MASTER?<CR>	~nn@KVM-MASTER Name<CR><LF>	**Name:** IP address boundary to ip address	Get KVM ip address #KVM-MASTER?<CR>
KVM-MODE?	Get KVM Mode.	#KVM-MODE?<CR>	~nn@KVM-MODE Mode<CR><LF>	**Mode:** Mode ON/OFF	Get KVM status #KVM-MODE?<CR>
LDEDID	Write EDID data from external application to device. When the unit receives the LDEDID command it replies with READY and enters the special EDID packet wait mode. In this mode the unit can receive only packets and not regular protocol commands. If the unit does not receive correct packets for 30 seconds or is interrupted for more than 30 seconds before receiving all packets, it sends a timeout error ~nn@LDEDID err01<CR><LF> and returns to the regular protocol mode. If the unit received data that is not a correct packet, it sends the corresponding error and returns to the regular protocol mode.	#LDEDID edid_io,dest_bitmask,edid_size, safe_mode<CR>	~nn@LDEDID edid_io,dest_bitmask,edid_size, safe_mode,ready<CR><LF>	**edid_io:** EDID destination type (usually input) 0 – Input,1 – Output, 2 – Default EDID 3 – Custom EDID **dest_bitmask:** Bitmap representing destination IDs. Format: 0x********, where * is ASCII presentation of hex digit. The binary presentation of this number is a bit mask for destinations. Setting '1' means EDID data has to be copied to this destination. **edid_size:** EDID data size. **safe_mode:** Safe mode. 0 – Device accepts the EDID as is without trying to adjust, 1 – Device tries to adjust the EDID. ready: Data in protocol packets Using the Packet Protocol Send a command: LDRV, LOAD, IROUT, LDEDID Receive Ready or ERR### If **ready:** a. Send a packet, b. Receive OK on the last packet, c. Receive OK for the command packet structure: Packet ID (1, 2, 3…) (2 bytes in length) Length (data length + 2 for CRC) – (2 bytes in length) Data (data length -2 bytes) CRC – 2 bytes 01 02 03 04 05 Packet ID Length Data CRC 5. In response: ~nnnn ok (Where NNNN is the received packet ID in ASCII hex digits).	
MANAGER-ID?	Get Manager ID	#MANAGER-ID token<CR>	~nn@MANAGER-ID token	token - the encrypted token	Set the device be provisioned with one AVoIP Manager #MANAGER-ID VALIDTOKEN<CR>
MODEL?	Get device model.	#MODEL?<CR>	~nn@MODEL model_name<CR><LF>	**model_name:** String of up to 19 printable ASCII chars.	Get the device model: #MODEL? <CR>
NAME	Set the device's DNS name. Requires DNS feature is on. Sets a DNS identifier, not the model name.	#NAME machine_name<CR>	~nn@NAME machine_name<CR><LF>	**machine_name:** String of up to 15 alpha-numeric chars (can include hyphen, not at the beginning or end).	Set the DNS name of the device to room-442: #NAME room-442<CR>
NAME?	Get the device's DNS name.	#NAME?<CR>	~nn@NAME machine_name<CR><LF>	**machine_name:** String of up to 15 alpha-numeric chars (can include hyphen, not at the beginning or end).	Get the DNS name of the device: #NAME?<CR>

Function	Description	Syntax	Response	Parameters/Attributes	Example
NAME-RST	Reset device's DNS name to factory default. Factory default DNS name is "KRAMER_" + 4 last digits of device serial number.	#NAME-RST<CR>	~nn@NAME-RST ok<CR><LF>		Reset the machine name (S/N last digits are 0102): #NAME-RST kramer_0102<CR>
NET-DHCP	Set DHCP mode. Only 1 is relevant for the mode value. To disable DHCP, the user must configure a static IP address for the device. Connecting Ethernet to devices with DHCP may take time in some networks. To connect with a randomly assigned DHCP IP, specify the device DNS name (if available) using the NAME command. You can also get an assigned IP by direct connection to USB or RS-232 protocol port, if available. For proper settings consult your network administrator. For Backward compatibility, the id parameter can be omitted. In this case, the Network ID, by default, is 0, which is the Ethernet control port.	#NET-DHCP netw_id,dhcp_state<CR>	~nn@NET-DHCP netw_id,dhcp_state<CR><LF>	**netw_id** – Network ID–the device network interface (if there are more than one). Counting is 0 based, meaning the control port is '0', additional ports are 1,2,3…. **dhcp_state** – 1 – Try to use DHCP. (If unavailable, use the IP address set by the factory or the net-ip command).	Enable DHCP mode for port 1, if available: #NET-DHCP 1,1<CR>
NET-DHCP?	Get DHCP mode. For Backward compatibility, the network ID can be omitted (it will be assigned the default value of 0, which is the Ethernet control port).	#NET-DHCP? netw_id<CR>	~nn@NET-DHCP netw_id,dhcp_state<CR><LF>	**netw_id** – Network ID–the device network interface (if there are more than one). Counting is 0 based, meaning the control port is '0', additional ports are 1,2,3…. **dhcp_state** – 1 – Try to use DHCP. (If unavailable, use the IP address set by the factory or the net-ip command).	Get DHCP mode for port 1, if available: #NET-DHCP? 1<CR>
NET-DNS	Set the ID and IP of the DNS name server. If dns_id is out of the defined DNS range, Error Code #3 (ERR_PARAMETER_OUT_OF_RANGE) is returned.	#NET-DNS dns_id,dns_ip<CR>	~nn@NET-DNS dns_id,dns_ip<CR><LF>	**dns_id:** ID of the DNS name server to retrieve, indexing starts at "0" **dns_ip:** IP address of the DNS server.	Set the DNS name server's ID and IP. #NET-DNS DNS,192.168.34.23 <CR>
NET-DNS?	Get the ID and IP pf the DNS name server. If dns_id is out of the defined DNS range, Error Code #3 (ERR_PARAMETER_OUT_OF_RANGE) is returned.	#NET-DNS? dns_id<CR>	~nn@NET-DNS dns_id,dns_ip<CR><LF>	**dns_id:** ID of the DNS name server to retrieve, indexing starts at "0" **dns_ip:** IP address of the DNS server.	Get DNS name server: #NET-DNS? <CR>
NET-MAC?	Get MAC address. For backward compatibility, the id parameter can be omitted. In this case, the Network ID, by default, is 0, which is the Ethernet control port.	#NET-MAC? id<CR>	~nn@NET-MAC id,mac_address<CR><LF>	**id** – Network ID–the device network interface (if there are more than one). Counting is 0 based, meaning the control port is '0', additional ports are 1,2,3…. **mac_address** – Unique MAC address. Format: XX-XX-XX-XX-XX-XX where X is a hex digit	#NET-MAC? id<CR>
NET-SERVICE	Maps applicational service to specific network interface	#NET-SERVICE service_id,netw_id<CR>	~nn@NET-SERVICE service_id,port<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 – Dante port – 0,1…. physical interface	Set Dante service to LAN-2(eth1) #NET-SERVICE 2,1<CR>
NET-SERVICE?	Get applicational service to specific network interface mapping	#NET-SERVICE? service_id<CR>	~nn@NET-SERVICE service_id,port<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 – Dante port – 0,1…. physical interface	Get Dante service LAN port #NET-SERVICE? 2<CR>
NET-SRV-802-1Q	Set a network service 802.1Q configuration.	#NET-SRV-802-1Q service_id,mode,vlan_id,cos<CR>	~nn@NET-SRV-802-1Q service_id,mode,vlan_id,cos<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 – Dante mode – enable 802.1Q 0 – off (When mode is Off, vlan id and cos will be ignored) 1 – on vlan id – 2~4000 (Optional, when mode is 1, must be provided) cos – 0~7 (Optional, when mode is 1, must be provided)	Set Control service 802.1Q enable with VLAN ID 10, Cos 6 #NET-SRV-802-1Q 0,1,10,6 <CR> Set Stream service 802.1Q Off #NET-SRV-802-1Q 0,0 <CR>
NET-SRV-802-1Q?	Get a network service 802.1Q configuration.	#NET-SRV-802-1Q? service_id<CR>	~nn@NET-SRV-802-1Q service_id,mode,vlan_id,cos<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 – Dante mode – enable 802.1Q 0 – Off 1 – On vlan_id – 2~4000 cos – 0~7	Get Control service 802.1Q #NET-SRV-802-1Q? 0 <CR>
NET-SRV-APPLY	Apply the vlan configuration defined in NET-SRV-CONFIG..	#NET-SRV-APPLY <CR>	~nn@NET-SRV-APPLY <CR><LF>		Apply the VLAN configuration #NET-SRV-APPLY<CR>

Function	Description	Syntax	Response	Parameters/Attributes	Example
NET-SRV-CONFIG	Set a network configuration for application services. NOTE: If the gateway address is not compliant to the subnet mask used for the host IP, the command will return an error. Subnet and gateway compliancy specified by RFC950. NOTE: This set the device to DHCP OFF automatically.	#NET-SRV-CONFIG service_id,net_ip,net_mask,gateway,dns<CR>	~nn@NET-SRV-CONFIG service_id,net_ip,net_mask,gateway,dns<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 – Dante net_ip – Network IP net_mask – Network mask gateway – Network gateway dns - DNS address	Set the device control service network to IP address 192.168.113.10, net mask 255.255.0.0, and gateway 192.168.0.1: #NET-SRV-CONFIG 0,192.168.113.10,255.255.0.0, 192.168.0.1<CR>
NET-SRV-CONFIG?	Get a network configuration for application services.	#NET-SRV-CONFIG? service_id<CR>	~nn@NET-SRV-CONFIG service_id,net_ip,net_mask,gateway,dns<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 – Dante net_ip – Network IP net_mask – Network mask gateway – Network gateway dns - DNS address	Get network configuration for control service: #NET-SRV-CONFIG? 0<CR>
NET-SRV-DHCP	Set DHCP mode on application services. NOTE: To disable DHCP, the user must configure a static IP address for the device. Connecting Ethernet to devices with DHCP may take more time in some networks.	#NET-SRV-DHCP service_id,dhcp_state<CR>	~nn@NET-SRV-DHCP service_id,dhcp_state<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 – Dante dhcp_state – 1 – Try to use DHCP. (If unavailable, use the IP address set by the factory or the net-ip command).	Enable DHCP mode for port 0, if available: #NET-SRV-DHCP 0,1<CR>
NET-SRV-DHCP?	Get DHCP mode on application services.	#NET-SRV-DHCP? service_id<CR>	~nn@NET-SRV-DHCP service_id,dhcp_state<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 – Dante dhcp_state – 1 – Try to use DHCP. (If unavailable, use the IP address set by the factory or the net-ip command).	Get DHCP mode for control service: #NET-SRV-DHCP? 0<CR>
NET-SRV-DSCP	Set a network service DSCP configuration.	#NET-SRV-DSCP service_id,dscp<CR>	~nn@NET-SRV-DSCP service_id,dscp<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 - Dante (Can't be changed) dscp – 0~63	Set Control service DSCP as 63 #NET-SRV-DSCP 0,63<CR>
NET-SRV-DSCP?	Get a network service DSCP configuration.	#NET-SRV-DSCP? service_id<CR>	~nn@NET-SRV-DSCP service_id,dscp<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 - Dante dscp – 0~63	Get Control service DSCP #NET-SRV-DSCP? 0<CR>
PORTS-LIST?	Get the port list of this machine. The response is returned in one line and terminates with<CR><LF>. The response format lists port IDs separated by commas.	#NET-SRV-DSCP service_id,dscp<CR>	~nn@NET-SRV-DSCP service_id,dscp<CR><LF>	service_id – ID of the service: 0 – Control 1 – Stream 2 - Dante (Can't be changed) dscp – 0~63	Set Control service DSCP as 63 #NET-SRV-DSCP 0,63<CR>
PROT-VER?	Get device protocol version.	#PROT-VER? <CR>	~nn@PROT-VER 3000:,version<CR><LF>	**3000::** Prefix **version:** XX.XX where X is a decimal digit	Get the device protocol version: #PROT-VER? <CR>
RESET	Reset device. To avoid locking the port due to a USB bug in Windows, disconnect USB connections immediately after running this command. If the port was locked, disconnect and reconnect the cable to reopen the port.	#RESET<CR>	~nn@RESET ok<CR><LF>		Reset the device: #RESET<CR>
SIGNAL?	Get input signal status.	#SIGNAL? in_index<CR>	~nn@SIGNAL in_index,status<CR><LF>	**in_index**: Number that indicates the specific input 1-N (N= the total number of inputs) **status**: Signal status according to signal validation 0 – Off 1 – On	Get the input signal lock status of IN 1: #SIGNAL? 1<CR>

Function	Description	Syntax	Response	Parameters/Attributes	Example
SIGNALS-LIST?	Get signal ID list of this device. The response format lists signal IDs separated by commas. This is an Extended Protocol 3000 command.	#SIGNALS-LIST? <CR><LF>	~nn@SIGNALS-LIST [direction_type.port_format.port_label.signal_type.index,]<CR><LF>	The following attributes comprise the signal ID: **direction_type** – Direction of the port: IN – Input OUT – Output BOTH – Bi-directional (e.g. for RS-232) **port_format** – Type of signal on the port: HDMI HDBT ANALOG_AUDIO AMPLIFIED_AUDIO TOS SPDIF MIC RS-232 IR USB_A USB_B **port_label** – The port number as printed on the front or rear panel VIDEO AUDIO ARC RS232 IR USB **signal_type** – Signal ID attribute. **index** – Indicates a specific channel number when there are multiple channels of the same type	Get signal ID list: #SIGNALS-LIST?<CR>
SN?	Get device serial number.	#SN? <CR>	~nn@SN serial_num<CR><LF>	**serial_num** – 14 decimal digits, factory assigned	Get the device serial number: #SN? <CR>
TIME	Set device time and date. The year must be 4 digits. The device does not validate the day of week from the date. Time format - 24 hours. Date format - Day, Month, Year.	#TIME day_of_week,date,data<CR>	~nn@TIME day_of_week,date,data<CR><LF>	**day_of_week** – One of {SUN,MON,TUE,WED,THU,FRI,SAT} **date** – Format: DD-MM-YYYY. **data** – Format: hh:mm:ss	Set device time and date to December 5, 2018 at 2:30pm: #TIME mon 05-12-2018,14:30:00<CR>
TIME?	Get device time and date. The year must be 4 digits. Time format - 24 hours. Date format - Day, Month, Year.	#TIME? <CR>	~nn@TIME day_of_week,date,data<CR><LF>	**day_of_week** – One of {SUN,MON,TUE,WED,THU,FRI,SAT} **date** – Format: DD-MM-YYYY. **data** – Format: hh:mm:ss	Get device time and date: #TIME? <CR>
TIME-SRV	Set (NTP) time server. This command is needed for setting the UDP timeout for the current client list.	#TIME-SRV mode,time_server_ip,sync_hour <CR>	~nn@TIME-SRV mode,time_server_ip,sync_hour, server_status<CR><LF>	**mode** – On/Off 0 – Off 1 – On **time_server_ip** – Time server IP address **sync_hour** – Hour in day for time server sync **server_status** – On/Off	Set time server with IP address of 128.138.140.44 to ON: #TIME-SRV 1,128.138.140.44,0,1<CR>
TIME-SRV?	Get time server. This command is needed for setting UDP timeout for the current client list.	#TIME-SRV?<CR>	~nn@TIME-SRV mode,time_server_ip,sync_hour, server_status<CR><LF>	**mode** – On/Off 0 – Off 1 – On **time_server_ip** – Time server IP address **sync_hour** – Hour in day for time server sync **server_status** – On/Off	Get time server: #TIME-SRV? <CR>
TIME-ZONE	Set the device's time zone.	#TIME-ZONE timezone_str<CR>	~nn@TIME-ZONE timezone_str <CR><LF>	**timezone_str:** A string that identifies the relevant time zone. Available time zone strings can be listed using the TIME-ZONE-LIST? command.	Set time zone to London, England: #TIME-ZONE europe/london<CR>
TIME-ZONE?	Get the device's time zone.	#TIME-ZONE? <CR>	~nn@TIME-ZONE timezone_str<CR><LF>	**timezone_str:** A string that identifies the relevant time zone. Available time zone strings can be listed using the TIME-ZONE-LIST? command.	Get the device time zone: #TIME-ZONE? <CR>
TIME-ZONE-LIST?	Get a list of time zones. Entries from the list can be set as the device time zone with the TIME-ZONE command.	#TIME-ZONE-LIST? <CR>	~nn@TIME-ZONE-LIST list<CR><LF>	**list:** List of available time zones, one per line	Get a list of available time zones: #TIME-ZONE-LIST? <CR>
TUNNELING-MODE	Set decoder tunneling mode enable / disable.	#TUNNELING-MODE enable/disable<CR>	~nn@TUNNELING-MODE <CR><LF>	**enable/disable:** decoder enable tunneling mode 1-0	set decoder tunneling mode enable #TUNNELING-MODE 1<CR>
TUNNELING-MODE?	Get decoder tunneling mode status.	#TUNNELING-MODE? <CR>	~nn@TUNNELING-MODE <CR><LF>	**enable/disable:** decoder enable tunneling mode 1-0	Get decoder tunneling mode #TUNNELING-MODE? <CR>
UART	Set com port configuration.	#UART com_id,baudrate,databits,parity, stopbits<CR>	~nn@UART com_id,baudrate,databits,parity, stopbits <CR><LF>	com_id – 1 to n (machine dependent) baudrate – 1200 - 115200 databits – 5-8 parity – Parity Type 0 – No 1 – Odd 2 – Even stopbits – 1/2	Set baudrate to 9600, 8 databits, parity to none and stopbit to 1: #UART 1,9600,8,0,1<CR>

Function	Description	Syntax	Response	Parameters/Attributes	Example
UART?	Get com port configuration. The command is backward compatible, meaning that if the extra parameters do not exist, FW goes to RS-232. Stop_bits 1.5 is only relevant for 5 data_bits.	#UART?com_id<CR>	~nn@UART com_id,baud_rate,data_bits,parity,stop_bits_mode,serial_type,485_term<CR><LF>	**com_id** – 1 to n (machine dependent) **baud_rate** – 9600 - 115200 **data_bits** – 5-8 **parity** – Parity Type 0 – No 1 – Odd 2 – Even 3 – Mark 4 - Space **stop_bits_mode** – 1/1.5/2 **serial_type** – 232/485 0 – 232 1 – 485 **485_term** – 485 termination state 0 – disable 1 – enable (optional - this exists only when serial_type is 485)	Set baud rate to 9600, 8 data bits, parity to none and stop bit to 1: #UART 1,9600,8,node,1<CR>
VERSION?	Get firmware version number.	#VERSION? <CR>	~nn@VERSION firmware_version<CR><LF>	firmware_version – XX.XX.XXXX where the digit groups are: major.minor.build version	Get the device firmware version number: #VERSION?<CR>
X-AUD-DESC?	Get audio signal info. This is an Extended Protocol 3000 command.	#X-AUD-DESC? <direction_type>.<port_format>.<port_index><CR>	~nn@X-AUD-DESC? <direction_type>.<port_format>.<port_label>.<signal_type>.<index>,ch_tot,samp_rate,aud_format<CR><LF>	The following attributes comprise the signal ID: **direction_type** – Direction of the port: IN – Input OUT – Output BOTH – Bi-directional (e.g. for RS-232) **port_format** – Type of signal on the port: HDMI HDBT ANALOG_AUDIO AMPLIFIED_AUDIO TOS SPDIF MIC RS-232 IR USB_A USB_B **port_index** – The port number as printed on the front or rear panel. **Port_label** **Signal_type -** Signal ID attribute: VIDEO AUDIO ARC RS232 IR USB **Index** - Indicates a specific channel number when there are multiple channels of the same type. **ch_tot** – Total number of channels **samp_rate** – Sample rate **aud_format** – audio format.	Get the audio signal info: #X-AUD-DESC? out.hdmi.1<CR>
X-AUD-LVL	Set audio level of a specific signal. This is an Extended Protocol 3000 command.	#X-AUD-LVL <direction_type>.<port_format>.<port_index>.<signal_type>.<index>,audio_level<CR>	~nn@X-AUD-LVL <direction_type>.<port_format>.<port_index>.<signal_type>.<index>,audio_level<CR><LF>	The following attributes comprise the signal ID: <**direction_type**> – Direction of the port: IN – Input OUT – Output BOTH – Bi-directional (e.g. for RS-232) <**port_format**> – Type of signal on the port: HDMI HDBT ANALOG_AUDIO AMPLIFIED_AUDIO TOS SPDIF MIC RS-232 IR USB_A USB_B <**port_index**> – The port number as printed on the front or rear panel <**signal_type**> – Signal ID attribute: VIDEO AUDIO ARC RS232 IR USB <**index**> – Indicates a specific channel number when there are multiple channels of the same type **audio_level** – Audio level in dB (range between -60 to +30) depending of the ability of the product	Set the audio level of a specific signal to 10: #X-AUD-LVL in.analog_audio.5.audio.1,10<CR>

Function	Description	Syntax	Response	Parameters/Attributes	Example
X-AUD-LVL?	Get the audio level of a specific signal.	#X-AUD-LVL? <direction_type>.<port_format>.<port_index>.<signal_type>.<index><CR>	~nn@X-AUD-LVL <direction_type>.<port_format>.<port_index>.<signal_type>.<index>,audio_level<CR><LF>	The following attributes comprise the signal ID: **<direction_type>** – Direction of the port: IN – Input OUT – Output BOTH – Bi-directional (e.g. for RS-232) **<port_format>** – Type of signal on the port: HDMI HDBT ANALOG_AUDIO AMPLIFIED_AUDIO TOS SPDIF MIC RS-232 IR USB_A USB_B **<port_index>** – The port number as printed on the front or rear panel **<signal_type>** – Signal ID attribute: VIDEO AUDIO ARC RS232 IR USB **<index>** – Indicates a specific channel number when there are multiple channels of the same type **audio_level** – Audio level in dB (range between -60 to +30) depending of the ability of the product	Get the audio level of a specific signal: #X-AUD-LVL? out.analog_audio.1.audio.1<CR>
X-MUTE	Set mute ON/OFF on a specific signal. This command is designed to Mute a Signal. This means that it could be applicable on any type of signal. Could be audio, video and maybe IR, USB or data if this capability is supported by the product.	#X-MUTE <direction_type>.<port_format>.<port_index>.<signal_type>.<index>,state<CR>	~nn@ X-MUTE <direction_type>.<port_format>.<port_index>.<signal_type>.<index>,state<CR><LF>	<direction_type> – Direction of the port: { IN – Input ; OUT – Output; BOTH – Bi-directional } <port_format> – Type of signal on the port: { HDMI,USB_C,ANALOG_AUDIO } <port_index> – The port number as printed on the front or rear panel <signal_type> – Signal ID attribute: { VIDEO, AUDIO} <index> – Indicates a specific channel number when there are multiple channels of the same type state – OFF/ON (not case sensitive)	Mute the video on HDMI OUT 1: #X-MUTE_out.hdmi.1.video.1,on<CR>
X-MUTE?	Get mute ON/OFF on a specific signal.	#X-MUTE? <direction_type>.<port_format>.<port_index>.<signal_type>.<index><CR>	~nn@ X-MUTE <direction_type>.<port_format>.<port_index>.<signal_type>.<index>,state<CR><LF>	<direction_type> – Direction of the port: { IN – Input ; OUT – Output; BOTH – Bi-directional } <port_format> – Type of signal on the port: { HDMI,USB_C,ANALOG_AUDIO } <port_index> – The port number as printed on the front or rear panel <signal_type> – Signal ID attribute: { VIDEO, AUDIO} <index> – Indicates a specific channel number when there are multiple channels of the same type state – OFF/ON (not case sensitive)	Get the mute the video on HDMI OUT 1: #X-MUTE?_out.hdmi.1.video.1<CR>
X-ROUTE	Send routing command. It is recommended to use the command #SIGNALS-LIST to get the list of all the signal IDs which can be used in this command. Video 1 is the default port in this command and is implied even if not written: #X-ROUTE out.sdi.5,in.sdi.1<CR> is interpreted as: #X-ROUTE out.sdi.5.video.1,in.sdi.1.video.1<CR> This is an Extended Protocol 3000 command. Brackets '[' and ']' are reserved Protocol 3000 characters that define a list of parameters as in [a,b,c,d].	#X-ROUTE [<direction_type1>.<port_type1>.<port_index1>.<signal_type1>.<index1>,...],<direction_type2>.<port_type2>.<port_index2>.<signal_type2>.<index2><CR>	~nn@X-ROUTE [<direction_type1>.<port_type1>.<port_index1>.<signal_type1>.<index1>,…],<direction_type2>.<port_type2>.<port_index2>.<signal_type2>.<index2><CR><LF>	The following attributes comprise the signal ID: **<direction_type>** – Direction of the port: IN – Input OUT – Output BOTH – Bi-directional (e.g. for RS-232) **<port_type>** – Type of signal on the port: HDMI HDBT ANALOG_AUDIO AMPLIFIED_AUDIO TOS SPDIF MIC RS-232 IR USB_A USB_B STREAM DANTE **<port_index>** – The port number as printed on the front or rear panel **<signal_type>** – Signal ID attribute: VIDEO AUDIO ARC RS232 IR USB **<index>** – Indicates a specific channel number when there are multiple channels of the same type.	Route HDMI IN 2 to HDMI OUT 3: #X-ROUTE out.hdmi.3.video.1,in.hdmi.2.video.1<CR> Route an ARC audio signal to HDBT input #1 from HDMI output #1: #X-ROUTE in.hdbt.1.arc.1,out.hdmi.1.arc.1<CR> Route audio of hdmi.1.audio.1 signal to hdmi output, analog,and dante: #X-ROUTE [out.hdmi.1.audio.1,out.analog_audio.1.audio.1,out.dante.1.audio.1],in.hdmi.1.audio.1<CR>

Function	Description	Syntax	Response	Parameters/Attributes	Example
X-ROUTE?	Get routing status. It is recommended to use the command #SIGNALS-LIST to get the list of all signal IDs available in the system and which can be used in this command. VIDEO.1 are the default <signal_type> and <index> in this command and are implied even if not written: #X-ROUTE out.sdi.5,in.sdi.1<CR> is interpreted as: #X-ROUTE out.sdi.5.video.1,in.sdi.1.video.1<CR> This is an Extended Protocol 3000 command.	#X-ROUTE? <direction_type1>.<port_type1>.<port_index1>.<signal_type1>.<index1><CR>	~nn@X-ROUTE <direction_type1>.<port_type1>.<port_index1>.<signal_type1>.<index1>,<direction_type2>.<port_type2>.<port_index2>.<signal_type2>.<index2><CR><LF>	The following attributes comprise the signal ID: **<direction_type>** – Direction of the port: IN – Input OUT – Output BOTH – Bi-directional (e.g. for RS-232) **<port_format>** – Type of signal on the port: HDMI HDBT ANALOG_AUDIO AMPLIFIED_AUDIO TOS SPDIF MIC RS-232 IR USB_A USB_B USB_C **<port_index>** – The port number as printed on the front or rear panel **<signal_type>** – Signal ID attribute: VIDEO AUDIO ARC RS232 IR USB AV_TEST_PATTERN **<index>** – Indicates a specific channel number when there are multiple channels of the same type.	Get the routing status: #X-ROUTE? out.hdmi.5.video.1<CR>

11.3 Result and Error Codes

11.3.1 Syntax

In case of an error, the device responds with an error message. The error message syntax:

- **~NN@ERR XXX<CR><LF>** – when general error, no specific command
- **~NN@CMD ERR XXX<CR><LF>** – for specific command
- **NN** – machine number of device, default = 01
- **XXX** – error code

11.3.2 Error Codes

Error Name	Error Code	Description
P3K_NO_ERROR	0	No error
ERR_PROTOCOL_SYNTAX	1	Protocol syntax
ERR_COMMAND_NOT_AVAILABLE	2	Command not available
ERR_PARAMETER_OUT_OF_RANGE	3	Parameter out of range
ERR_UNAUTHORIZED_ACCESS	4	Unauthorized access
ERR_INTERNAL_FW_ERROR	5	Internal FW error
ERR_BUSY	6	Protocol busy
ERR_WRONG_CRC	7	Wrong CRC
ERR_TIMEDOUT	8	Timeout
ERR_RESERVED	9	(Reserved)
ERR_FW_NOT_ENOUGH_SPACE	10	Not enough space for data (firmware, FPGA…)
ERR_FS_NOT_ENOUGH_SPACE	11	Not enough space – file system
ERR_FS_FILE_NOT_EXISTS	12	File does not exist
ERR_FS_FILE_CANT_CREATED	13	File can’t be created
ERR_FS_FILE_CANT_OPEN	14	File can’t open
ERR_FEATURE_NOT_SUPPORTED	15	Feature is not supported
ERR_RESERVED_2	16	(Reserved)
ERR_RESERVED_3	17	(Reserved)
ERR_RESERVED_4	18	(Reserved)
ERR_RESERVED_5	19	(Reserved)
ERR_RESERVED_6	20	(Reserved)
ERR_PACKET_CRC	21	Packet CRC error
ERR_PACKET_MISSED	22	Packet number isn't expected (missing packet)
ERR_PACKET_SIZE	23	Packet size is wrong
ERR_RESERVED_7	24	(Reserved)
ERR_RESERVED_8	25	(Reserved)
ERR_RESERVED_9	26	(Reserved)
ERR_RESERVED_10	27	(Reserved)
ERR_RESERVED_11	28	(Reserved)
ERR_RESERVED_12	29	(Reserved)
ERR_EDID_CORRUPTED	30	EDID corrupted
ERR_NON_LISTED	31	Device specific errors
ERR_SAME_CRC	32	File has the same CRC – not changed
ERR_WRONG_MODE	33	Wrong operation mode
ERR_NOT_CONFIGURED	34	Device/chip was not initialized

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SAFETY WARNING

Disconnect the unit from the power supply before opening and servicing

For the latest information on our products and a list of Kramer distributors, visit our website where updates to this user manual may be found.

We welcome your questions, comments, and feedback.

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