

XVC ULTRA ENCODER

XVC-ULTRA Encoder User's Guide



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Table of Contents

1	INTRODUCTION	7
1.1	Key Features	7
1.2	Testing environment	7
1.3	Additional Support	7
1.4	Definitions	8
2	GETTING STARTED	9
2.1	Unpacking the Encoder Hardware	9
2.2	Installing the XVC Management Tool	9
3	USING THE ENCODER HARDWARE	10
3.1	Buttons	11
3.2	Connectors	11
3.3	LEDs	12
4	CONFIGURING THE ENCODER	13
4.1	Getting Started	13
4.1.1	Assigning an IP Address	13
4.1.1.1	Assigning a Static IP Address	13
4.1.1.2	Assigning a DHCP-Allocated IP Address	14
4.1.2	Accessing the Encoder	15
4.1.3	Work Area	17
4.2	Video Input	18
4.3	Channel Settings	19
4.3.1	Video Bitrate Settings	22
4.3.2	Streaming Modes	23
4.3.2.1	TS-UDP/TS-RTP Streaming	23
4.3.2.2	RTP Streaming	24
4.3.2.3	RTSP Streaming	24
4.3.2.4	SRT Streaming	25
4.3.2.5	RTMP/RTMPS Streaming	27
4.4	System Settings	28
4.4.1	System Settings Main Page	29
4.4.2	Time & Date	30
4.4.3	Network Configuration	31
4.4.4	User Management	33
4.4.5	Firmware Upgrade	33
4.4.6	Licensed Features	36
4.5	System Status	37
4.6	About	37
4.6.1	XVTEC Legal Page	38
4.6.2	Open Source Software	39
4.6.3	Certifications	40
4.7	Reboot	40

5	TROUBLESHOOTING AND RECOVERY	42
5.1	Rebooting the Encoder	42
5.1.1	DHCP allocated IP Address.....	42
5.2	Overheating.....	43
5.3	Restoring System Defaults	43
5.3.1	Restore system defaults procedure.....	44
5.3.2	System Recovery.....	44
5.3.3	System recovery procedure	45
5.4	Resetting the Username and Password	47
APPENDIX A	SYSTEM SPECIFICATIONS	49

List of Figures

Figure 1: Encoder Front Panel.....	10
Figure 2: Rear Panel of Encoder.....	10
Figure 3: LED Panel.....	12
Figure 4: List of XVTEC Devices Discovered	14
Figure 5: Setting the Encoder IP Address.....	14
Figure 6: List of XVTEC Devices Discovered	15
Figure 7: Requesting Dynamic Allocation of an IP Address	15
Figure 8: Entering the IP Address in the Browser Address Bar	15
Figure 9: Enter Username and Password.....	16
Figure 10: Configuration System Page Layout	16
Figure 11: Video Input Page.....	18
Figure 12: Channel Settings Page.....	19
Figure 13: TS-UDP Streaming Fields.....	23
Figure 14: RTP Streaming Fields.....	24
Figure 15: RTSP Streaming Fields.....	24
Figure 16: System Settings Menu	28
Figure 17: Systems Settings Main Page	29
Figure 18: Time & Date Page	30
Figure 19: Network Configuration Page.....	31
Figure 20: User Management Page.....	33
Figure 21: Firmware Upgrade Page	34
Figure 22: Selecting the Image File	35
Figure 23: Upgrade Status Field.....	35
Figure 24: Upgrade LED Indicators.....	36
Figure 25: Licensed Features Page.....	36
Figure 26: Enabled Features	36
Figure 27: About Page.....	37
Figure 28: Legal Page	38
Figure 29: OSS Page	39
Figure 30: Certifications Page	40
Figure 31: Reboot Confirmation	40
Figure 32: Encoder Rebooting.....	41
Figure 33: Release SW Button to Begin Restoring Defaults.....	44
Figure 34: System Defaults Successfully Restored.....	44
Figure 35: Recovery Page.....	46
Figure 36: Selecting the Image File	46
Figure 37: Upgrade Status Field.....	47
Figure 38: Resetting the User/Password	48

List of Tables

Table 1: Contact Us	7
Table 2: Definitions	8
Table 3: Items Shipped in the Encoder Package	9
Table 4: Buttons	11
Table 5: Front Panel Connectors.....	11
Table 6: Rear Panel Connectors.....	11
Table 7: LEDs	12
Table 8: Main Menu Entries.....	17
Table 9: Control Types	17
Table 10: Video Input Field Descriptions	18
Table 11: Channel Settings Field Descriptions	20
Table 12: Valid Minimum/Maximum Bitrates HEVC.....	22
Table 13: Recommended Bitrates for HEVC	22
Table 14: TS-UDP Streaming Field Descriptions.....	23
Table 15: RTP Streaming Field Descriptions	24
Table 16: RTSP Streaming Field Descriptions.....	25
Table 17: System Settings Menu Entries.....	28
Table 18: Systems Settings Field Descriptions	29
Table 19: Time & Date Field Descriptions.....	30
Table 20: Network Configuration Field Descriptions.....	32
Table 21: User Management Field Descriptions	33
Table 22: Firmware Upgrade Field Descriptions.....	34
Table 23: Overheating Conditions	43

1 Introduction

The XVC-ULTRA Encoder is a streaming appliance enabling users to stream broadcast quality UHD video with up to 50% bandwidth savings compared to H.264.

The XVC-ULTRA Encoder provides best-in-class HEVC/H.265 and AVC/H.264 video quality of up to 4:2:2 10-bit and sets new industry standards for bit rate and latency.

1.1 Key Features

1. 3840x2160p60 encoding in AVC and HEVC formats
2. Ultra-low End-To-End latency of below 40ms in HEVC and AVC mode
3. Ultra-low encoding latency of below 10ms
4. 4:2:2, 10 bit encoding for superior image quality
5. Multiple streaming protocols including RTP/RTSP, RTMP/S, SRT, MP2TS (TS-UDP and TS-RTP)
6. Secured with HTTPS, 802.1x, Secured video streaming.
7. Compact design and low power consumption

1.2 Testing environment

It is recommended to use a strong PC to decode a 4Kp60 HEVC/AVC stream, especially when selecting a 4:2:2, 10 bits profile. A strong graphics card can reduce CPU load substantially assuming the player knows to take advantage of it.

Unsmooth video, packet losses, glitches in audio and video are some of the symptoms of a low performance PC

1.3 Additional Support

For more information and assistance please refer to www.xvtec.com or contact us at:

Table 1: Contact Us

Email
Support: support@xvtec.com

1.4 Definitions

Table 2: Definitions

Term	Definition
AAC_LC	Advanced Audio Coding – Low Complexity Profile
HEVC	High-Efficiency Video Coding, a video compression standard based on Rec. ITU-T H.265
AVC	Advanced Video Coding based on ITU-T H.264 ISO/IEC 14496-10
Pixel depth	The number of bits used to represent the color (or a color component) of a single pixel. Typical pixel depths are 8 (for 24-bit color), 10 for (30-bit color) or 12 bits (for 36-bit color)
Color space	A numerical model representation of colors, usually over 3 axes, for example, RGB or YCbCr.
Frame rate	The frequency (rate) at which consecutive images (frames) appear on a display, expressed in frames per second (fps).
GOP	Group of Pictures
GDR	Gradual Decoder Refresh. An alternative method to send I/IDR frames to avoid peaks in the network.
Bit rate	The number of bits transmitted or processed in a given period of time, expressed in bits per second (bps).
IDR	Instantaneous Decoder Refresh. An IDR frame is a specialized I-frame that clears the reference buffer so that no future frame can reference frames processed before the IDR frame.
TS-UDP	Transport Stream over UDP
TS-RTP	Transport Stream over RTP
RTP	Real Time Protocol
RTSP	Real Time Streaming Protocol
SRT	Secure Reliable Transport streaming protocol optimized for streaming across unpredictable networks, over the internet or to the cloud
RTMP	Real Time Streaming Protocol mainly used to stream live video to CDNs such as YouTube, Facebook, Wowza and more
ONVIF	Open Network Video Interface Forum. A standard widely used in surveillance and security systems to control edge devices.
MAC	Media Access Control. A MAC address is a unique identifier assigned to network interfaces that supports communications at the data link layer (Ethernet) of a network segment (LAN).
IP	Internet Protocol. An IP address is a numerical identifier assigned to a computing device or node in a TCP/IP network. The address is used to locate and identify the node in communications with other nodes on the network.
APIPA	Automatic Private IP Addressing. Used to automatically assign an IP address when no DHCP server is available.
DNS	Domain Name Server. DNS is a naming system used to translate domain names into numerical IP addresses that are used to locate and identify computer services.
Unicast	A one-to-one association between a sender and destination: each destination address uniquely identifies a single receiver endpoint.
Multicast	A one-to-many-of-many or many-to-many-of-many association; datagrams are routed simultaneously in a single transmission to many recipients. It differs from broadcast in that the destination address designates a subset, and not necessarily all, of the accessible nodes.

2 Getting started

2.1 Unpacking the Encoder Hardware

The items listed below are shipped in the encoder package. When opening the package, make sure that all the items are found. If any item is missing, please contact your XVTEC representative.

Table 3: Items Shipped in the Encoder Package

Items Shipped in the XVC-ULTRA Encoder Package
XVC-ULTRA encoder
Power supply
Quick installation guide
EULA
Warranty statement

2.2 Installing the XVC Management Tool

The XVC Management Tool is a Windows application used to perform discovery and to configure the network settings of the encoder.

To install the XVC Management Tool:

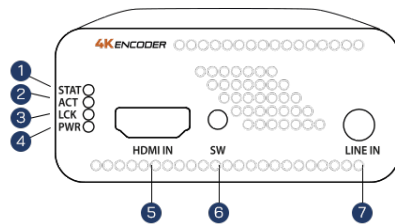
1. Download the XVC Management Tool from the XVTEC site at discovery setup tool from the Downloads page: <http://www.xvtec.com/support/downloads/>
2. Run the installation file that you just downloaded and follow the instructions as presented in the installation wizard.
3. Before executing the tool that you installed, disable Windows Firewall to enable discovery of the network.

3 Using the Encoder Hardware

This chapter contains information on the interfaces on the front and rear panels of the encoder unit:

- [Buttons](#)
- [Connectors](#)
- [LEDs](#)

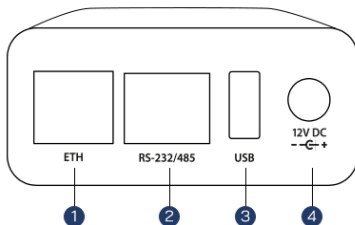
The front panel of the encoder appears as depicted in the figure below:



1. STAT – Status LED (Indicated various conditions of the unit)
2. ACT – Activity Led
3. LCK – Video lock indicator
4. PWR – Power LED indicator
5. HDMI IN – HDMI v2.0 video input
6. SW – General switch
7. LINE IN – Analog audio input genlocked to video (unbalanced)

Figure 1: Encoder Front Panel

The rear panel of the encoder appears as depicted in the figure below:



1. ETH0 – RJ-45 auto sensing 10/100/1000 Mbit
2. RS-232/485 – Serial port to control external devices
3. USB – USB port
4. 12V DC – Input voltage

Figure 2: Rear Panel of Encoder

3.1 Buttons

The table below describes the buttons on the front panel of the encoder unit, and their use.

Table 4: Buttons

Label	Connection
SW	Multi-purpose switch used in factory reset and recovery scenarios.

3.2 Connectors

Table 5 and Table 6 below list the connectors on the front and rear panels of the encoder unit, and their use.

Table 5: Front Panel Connectors

Label	Connection
USB0	USB 2.0/3.0 host port 0.
RS232/485	RS232/485 Serial port with RJ45 connector

Table 6: Rear Panel Connectors

Label	Connector
HDMI In	HDMI v2.0 video input connector
Line In	Unbalanced analog audio input genlocked to the video
Eth	Ethernet port 0 – RJ45 connector, 10/100/1000 Mbps Half/Full Duplex Auto-Negotiation
12V DC	12V input power

3.3 LEDs

The LED panel, as shown in the figure below, appears on the front panel of the encoder unit.

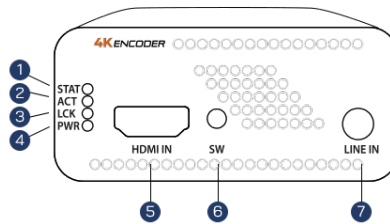


Figure 3: LED Panel

The table below describes the use of the LEDs appearing on the LED panel.

Table 7: LEDs

LED	Indication
PWR	On/Off indicator. <ul style="list-style-type: none"> Green: Unit is powered on.
STAT	Multi-purpose system status indicator. For further information, refer to the following sections: <ul style="list-style-type: none"> Boot Sequence – with static IP address Boot Sequence – with DHCP-allocated IP address Overheating Restoring System Defaults System Recovery
LCK	Video lock indicator. When the XVC-ULTRA encoder detects a supported video standard the LED will be lit as follows: <ul style="list-style-type: none"> Red: Standard definition (SD) Orange: High definition (HD, FHD) Green: 4K (UHD)
ACT	Streaming activity indicator. <ul style="list-style-type: none"> Blinking Green: Streaming is active.

NOTE

The **STAT**, **LCK**, and **ACT** LEDs are used in parallel to indicate process-specific states during the boot sequence and recovery operations.

4 Configuring the Encoder

XVTEC provides two tools for configuration of the XVC-ULTRA encoder:

- **The XVTEC Management Tool**, a Windows application used to discover and to configure the network settings of the encoder.
- **The web-based Configuration**, which is used to configure the XVC-ULTRA's settings using a standard web browser. The browsers supported are:
 - Google Chrome
 - Mozilla Firefox
 - Microsoft Edge

4.1 Getting Started

The following sections provide guidelines for your first use of the XVC-ULTRA Encoder System.

4.1.1 Assigning an IP Address

In order to communicate with the encoder, a valid IP address must be assigned to the encoder using the XVTEC Management Tool, using one of two options:

- Using a [static IP address](#)
- Using a [DHCP-allocated IP address](#)

NOTE

The initial, factory-set IP address of the XVC-ULTRA is in the APIPA range (169.254.x.x). Every encoder is assigned a different APIPA IP address, based on its MAC address.

4.1.1.1 Assigning a Static IP Address

To assign a static IP address to the encoder:

1. Execute the XVTEC Management Tool. The application discovers the XVTEC devices in your network, and displays them in a list, as shown in the figure below.

NOTE

To enable discovery of the devices, you may need to disable the Windows Firewall before executing the XVTEC Management Tool.

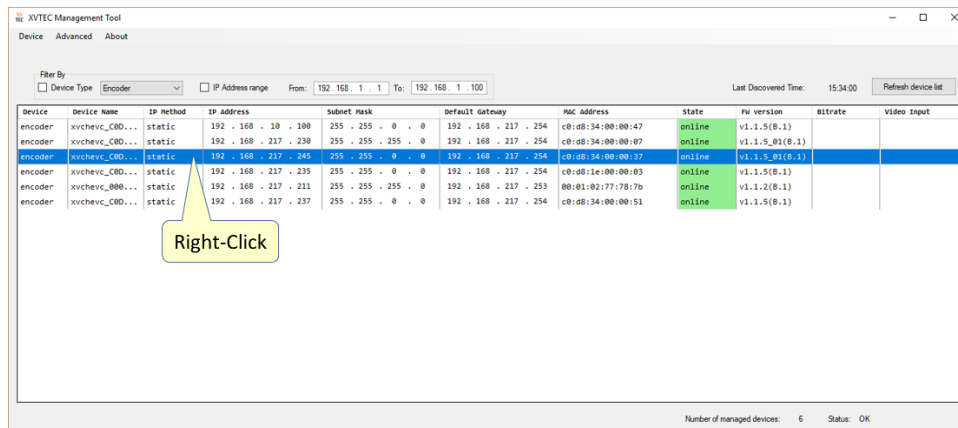


Figure 4: List of XVTEC Devices Discovered

- Find the row in the table associated with your encoder. Right-click on the row, then select **Set IP**. The Set Device IP dialog box appears, as shown in the figure below.

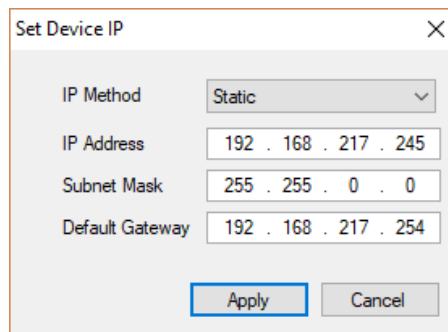


Figure 5: Setting the Encoder IP Address

- Make sure that the IP Method selected is "Static".
- Enter the encoder's **IP Address**, **Subnet Mask**, and **Default Gateway** settings. Click **Apply** to save the new settings.

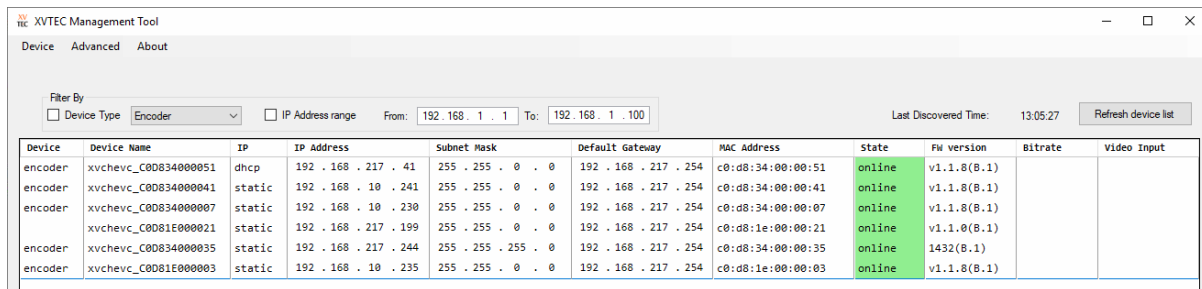
4.1.1.2 Assigning a DHCP-Allocated IP Address

To assign a DHCP-allocated IP address to the encoder:

- Execute the XVTEC Management Tool. The application discovers the XVTEC devices in your network, and displays them in a list, as shown in the figure below.

NOTE

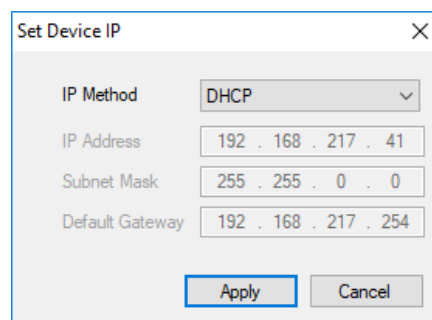
To enable discovery of the devices, you may need to disable the Windows Firewall before executing the XVTEC Management Tool.



Device	Device Name	IP	IP Address	Subnet Mask	Default Gateway	MAC Address	State	Firmware version	Bitrate	Video Input
encoder	xvchevc_C00834000051	dhcp	192 . 168 . 217 . 41	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:51	online	v1.1.8(8.1)		
encoder	xvchevc_C00834000041	static	192 . 168 . 10 . 241	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:41	online	v1.1.8(8.1)		
encoder	xvchevc_C00834000007	static	192 . 168 . 10 . 230	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:07	online	v1.1.8(8.1)		
encoder	xvchevc_C0081E000021	static	192 . 168 . 217 . 199	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:1e:00:00:21	online	v1.1.8(8.1)		
encoder	xvchevc_C00834000035	static	192 . 168 . 217 . 244	255 . 255 . 255 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:35	online	1432(8.1)		
encoder	xvchevc_C0081E000003	static	192 . 168 . 10 . 235	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:1e:00:00:03	online	v1.1.8(8.1)		

Figure 6: List of XVTEC Devices Discovered

- Find the row in the table associated with your encoder. Right-click on the row and select **Set IP**. The Set Device IP dialog box appears, as shown in the figure below.



Set Device IP

IP Method: DHCP

IP Address: 192 . 168 . 217 . 41

Subnet Mask: 255 . 255 . 0 . 0

Default Gateway: 192 . 168 . 217 . 254

Apply Cancel

Figure 7: Requesting Dynamic Allocation of an IP Address

- Select "DHCP" from the IP Method drop-down list, and click **Apply**. The encoder will attempt to retrieve network settings from a DHCP server. During the allocation process, the LEDs on the encoder front panel will respond as described in section 5.1.1. Following retrieval of network settings, the new settings will appear on the main window of the XVTEC Management Tool, as shown in Figure 6 above.

4.1.2 Accessing the Encoder

To access and configure the XVC-ULTRA using the web-based user interface, enter the IP address of the encoder unit in the address bar of the browser, as shown in the figure below:

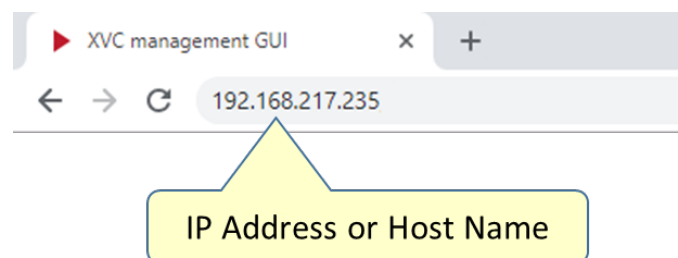
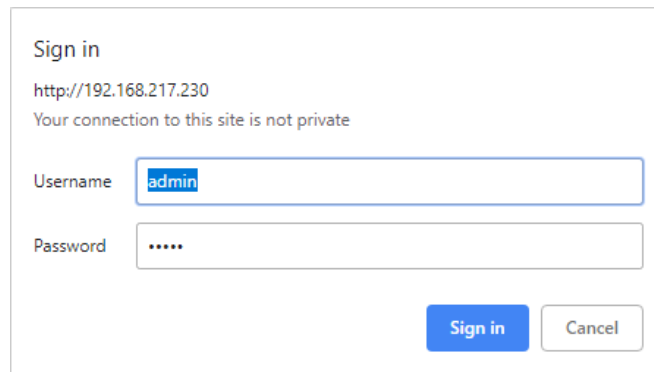


Figure 8: Entering the IP Address in the Browser Address Bar

Sign in by entering your username and password in the dialog box displayed by your browser. A sample dialog box appears in the figure below. The default credentials are:

- Username:** admin
- Password:** admin



Sign in

http://192.168.217.230

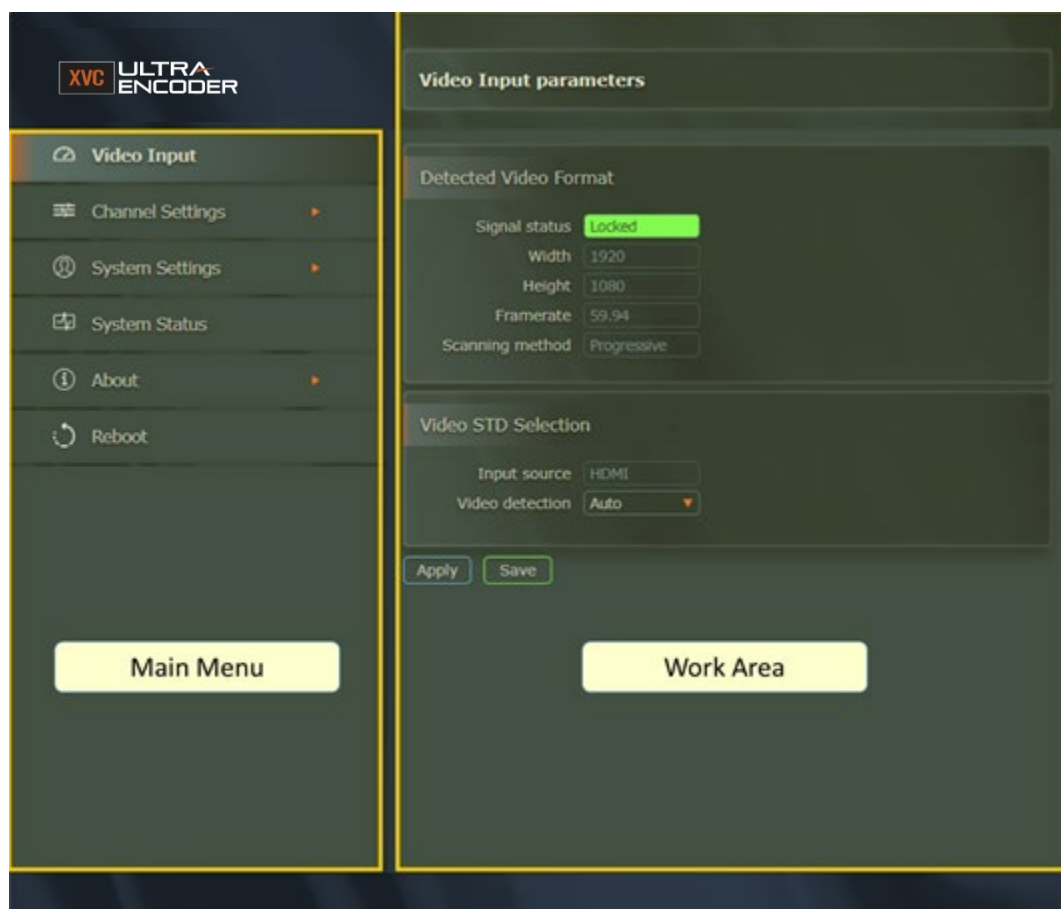
Your connection to this site is not private

Username

Password

Figure 9: Enter Username and Password

The main page of the Configuration System appears in the browser window. The page includes a main menu and a work area, as shown in the figure below:

**Figure 10: Configuration System Page Layout**

The Main Menu provides the following capabilities, which are described in detail in the following sections:





Table 8: Main Menu Entries

Entry	Description
Video Input	Provides information about the video input format and settings.
Channel Settings	Used to configure audio and video encoding parameters.
System Settings	Used to perform administrative operations and configure network settings.
System Status	Displays system-related data.
About	Provides information on technical support, licensing, and system certifications.
Reboot	Restarts the encoder.

4.1.3 Work Area

This section contains guidelines for using the controls in the work area of the Configuration System, as described in the table below.

Table 9: Control Types

Field Type	Example	Description
Field Types		
Read/Write		Fields whose values can be modified – values appear in a bright color.
Read-Only		Fields whose values <i>cannot</i> be modified – values appear in a dark color.
Check Box		Used to enable or disable a function.
List Box		Click on the field to open a list box containing alternative values.

4.2 Video Input

Select **Video Input** on the main menu to display the Video Input page, as shown in the figure below.

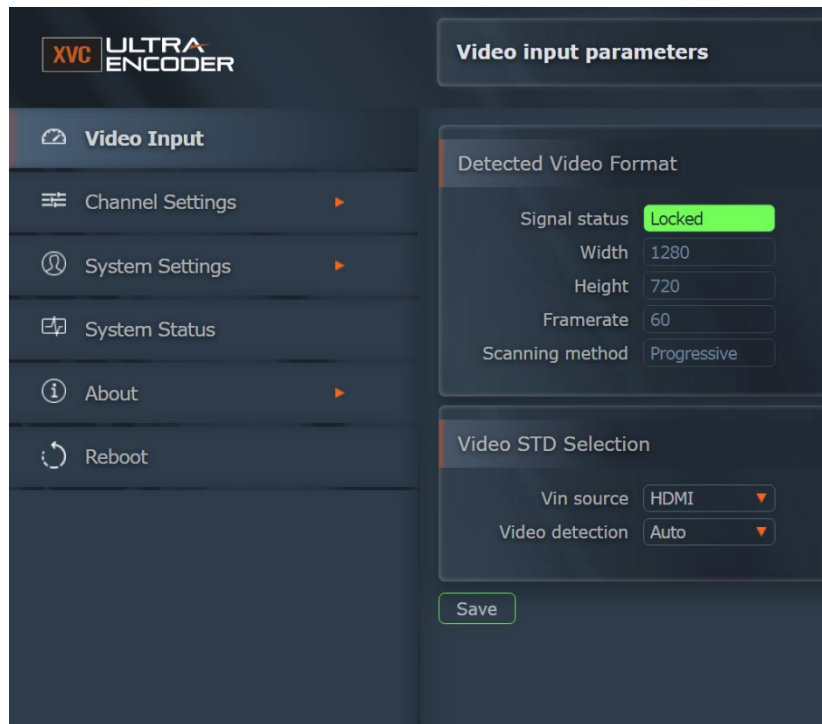


Figure 11: Video Input Page

The fields appearing on the page are described in the table below.

Table 10: Video Input Field Descriptions

Field	Description
Detected Video Format	
Signal status	Indicates if the encoder has detected a supported video standard: <ul style="list-style-type: none"> If detected, the message Locked appears on a green background If not detected, the message Not Locked appears on a red background.
Width	The width of the image in pixels.
Height	The height of the image in pixels.
Frame rate	The image frame rate, in frames per second (fps).
Scanning method	The scanning method used to display a video frame: <ul style="list-style-type: none"> Interlaced. Scanning method in which even-numbered and odd-numbered lines are captured alternately. Progressive. Scanning method in which the entire image is captured at every frame.
Video Standard Selection	
Vin source	Video input source: <ul style="list-style-type: none"> HDMI (High-Definition Multimedia Interface). Supports version 2.0 of the HDMI digital video interface.

Video Detection	The method used to detect the video input source: <ul style="list-style-type: none"> Auto. Only automatic video detection is supported.
-----------------	---

4.3 Channel Settings

The Channel Settings tab is used to configure the following parameters:

- Video encoding parameters
- Audio encoding parameters
- Streaming parameters

Select **Channel Settings** and the relevant channel number on the main menu to display the Channel Settings page, as shown in the figure below.

The screenshot displays the 'Channel Settings' interface for 'Channel 1'. The left sidebar contains navigation options: Video Input, Channel Settings (selected), Channel 1, System Settings, System Status, About, and Reboot. The main content area is divided into three sections:

- Video Encoder Settings:**
 - Compression: H.264/AVC
 - Resolution: Scale input
 - Scaled width: 1280
 - Scaled Height: 720
 - Frame rate: 1/4
 - Pixel depth: 8 Bit/pixel
 - Color format: 4:2:0
 - Encoding latency: Normal
 - Rate control: Low Latency CBR
 - Bitrate: 1000 (Kb)
 - Intra refresh mode: Full frame
 - Intra period: 60
 - GOP structure: IPPP
- Audio Encoder Settings:**
 - Audio source: Line-in
 - Audio enable: ☒
 - Detected sample rate: 48000 (Hz)
 - Bit rate: 320000 (bps)
 - Compression: AAC LC
- Streaming Settings:**
 - Stream enable: ☒
 - Streaming mode: RTSP
 - RTSP port: 900
 - RTSP stream name: live
 - RTSP stream URL: rtsp://192.168.10.130:900/live
 - Copy button

At the bottom of the settings area are 'Save' and 'Refresh' buttons.

Figure 12: Channel Settings Page

The fields appearing on the page are described in the table below.

Table 11: Channel Settings Field Descriptions

Field	Description
Video Encoder Settings	
Compression	Video compression scheme, AVC(H264) or HEVC(H.265).
Resolution	The resolution of the encoded video: <ul style="list-style-type: none"> • Follow input - Encoding resolution will be the same as the video source. • Scale input – Encoding resolution will be a scaled (up/down) version of the input resolution. <ul style="list-style-type: none"> ○ In 'scale input' mode, the width and height of the scaled resolution should be set.
Pixel depth	The number of bits used to specify each color component (Y, Cb, Cr) of a pixel: <ul style="list-style-type: none"> • 8 Bit/pixel – Each component is represented using 8 bits. • 10 Bit/pixel – Each component is represented using 10 bits.
Color format	The chroma subsampling scheme used to compress video transmissions. <ul style="list-style-type: none"> • 4:2:0 – The video is compressed using 4:2:0 color space (normal quality). • 4:2:2 – The video is compressed using 4:2:2 color space (high quality).
Encoding latency	Encoding latency selection in AVC and HEVC mode. <ul style="list-style-type: none"> • NORMAL – Video will be encoded in normal latency. Latency may reach up to 1 sec due to rate control decisions and GOP structure. • ULTRA LOW – Video will be encoded in Ultra Low latency. Encoding latency will be approximately 1/4 of the frame duration (e.g., at 60fps, frame duration is 16.67ms, encoding latency can reach 4-5ms). In this mode, B frames are disabled and 'Low Latency CBR' is enabled.
Rate control	The algorithm used by the encoder to maintain the target encoder bit rate. <ul style="list-style-type: none"> • CBR (Constant Bit Rate). In CBR, the encoder encodes the video at a constant bit rate. • Low Latency CBR. Like CBR but rate control decisions are done in real time, it tries to maintain an equal amount of frame sizes for all pictures.
Bitrate	Average video output bitrate. A higher bitrate yields a better-quality video. Click to view a list of valid video bitrates.
Frame rate	The ratio of the target (output) frame rate to the input frame rate: <ul style="list-style-type: none"> • Full (All frames are encoded) • 1/2 (Every second frame is encoded) • 1/4 (Every 4th frame is encoded) <p>Note:</p> <ul style="list-style-type: none"> • For interlaced video standards (such as 1080i50/60), only the "Full" frame rate is supported.
Intra refresh mode	<ul style="list-style-type: none"> • If 'Full frame' is selected, when ever the I/IDR period is reached, a complete frame is encoded as an I/IDR frame (This will create a relatively big frame size). • If 'GDR..' is selected, frames are continuously refreshed with stripes (Horizontal or Vertical) of Intra blocks. Selecting this mode will suppress high peaks of encoded frames.
Intra period/GDR period	<ul style="list-style-type: none"> • For 'Full frame', sets the interval (in number of frames) upon which the encoder will produce an I/IDR (Intra/Instantaneous Decodable Refresh) Frame, e.g., setting this field to 30 will generate an I/IDR frame every 30 frames. • For 'GDR..', sets the period of Intra block refresh. For example, in case of 'GDR-vertical' the values should be set to at least 135 (2160/16).

	<p>Note:</p> <p>The interval selected depends on the application and network conditions. For low bitrate transmissions, the interval value should be high – allowing the encoder to reduce traffic volume by sending more P (Predictive) frames.</p> <ul style="list-style-type: none"> • Minimum value: 1 frame • Maximum value: 1000 frames • Recommended values: 30-120
GOP structure	<p>The Group of Pictures (GOP) structure used:</p> <ul style="list-style-type: none"> • IPPP - Only P frame is used. • IBP, IBBP, IBBBBP, IBBBBP - B and P frames are used. <p>The structure determines whether an I-frame is followed by P-frames (Predictive coded picture) or B-frames (Bi-predictive coded picture).</p>
Audio Encoder Settings	
Audio source	<p>The interface used to input audio signals into the encoder:</p> <ul style="list-style-type: none"> • HDMI Audio for encoding is taken from HDMI (Embedded audio). • LINE IN Audio for encoding is taken from LINE-IN, gen-locked to video.
Audio enable	If checked, encoded stream will include audio
Detected sample rate	<p>The detected audio sampling rate used.</p> <p>Note: Only 48 KHz, 44.1Khz and 32Khz are supported for HDMI audio, and 48Kh for Line-in.</p>
Bit rate	<p>The bit rate of the encoded audio . Valid values are between 64,000 and 256,000 bps. Default is 80,000 bps.</p> <p>In LPCM16, the audio bitrate is fixed to $F_s \times 16 \times 2$, e.g., for $F_s = 48\text{Khz}$, the audio bitrate will be 1.536Mbit/sec</p>
Coding	<p>The audio compression method:</p> <ul style="list-style-type: none"> • AAC-LC, LPCM16 and OPUS. <p>Note: For Low latency encoding, LPCM16 and OPUS is supported.</p>
Streaming Settings	
Streaming mode	<p>The streaming mode selected. The following modes are supported:</p> <ul style="list-style-type: none"> • TS-UDP - Transport Stream over UDP. • TS-RTP – TS over RTP/UDP. • RTP - Real-Time Protocol over UDP. • RTSP - Real-Time Streaming Protocol. • SRT - Secure Reliable Transport streaming protocol • RTMP – Real Time Messaging Protocol <p>Details on configuring the individual streaming modes are found in the following section.</p>

4.3.1 Video Bitrate Settings

Table 12 below summarizes the minimum and maximum bitrates supported by the XVC-ULTRA Encoder for major video standards.

- The *minimum bitrate* value depends on the video input standard. In addition, the minimum bit rate scales proportionally with the frame rate selected. For example, if the minimum bitrate for 2160p60 is 2812 Kbps, then the minimum bitrate for 2160p30 (a 50% reduction in frame rate) will be 1406 Kbps (a 50% reduction in bitrate).
- The *maximum bitrate* is always 60,000 Kbps.
- For **AVC** add approximately 30-40% to each column.

Table 12: Valid Minimum/Maximum Bitrates HEVC

Video Standard	Rec. Minimum Bitrate (Kbps)	Maximum Bitrate (Kbps)
480i29.97 (NTSC)	500	60000
576i25 (PAL)	500	60000
480p60	500	60000
576p50	500	60000
720p60	800	60000
1080i60	800	60000
1080p60	1000	60000
2160p60	2812	60000
4K(DCI)p60	3000	60000

Table 13 below list recommended video bitrate values for different video standards.

Table 13: Recommended Bitrates for HEVC

Video Resolution	Video Quality (kbps)		
	High	Medium	Low
3840x2160@60p	40,000	16,000	8,000
1920x1080@60p	10,000	4,000	2,000
720x480@60p	4000	1,600	800

4.3.2 Streaming Modes

The XVC-ULTRA Encoder supports the following streaming modes:

- [TS-UDP/TS-RTP](#) - Transport Stream over UDP.
- [RTP](#) - Real-Time Protocol over UDP.
- [RTSP](#) - Real-Time Streaming Protocol.
- [SRT](#) - Secure Reliable Transport streaming protocol.
- [RTMP](#) – Real Time Messaging Protocol.

4.3.2.1 TS-UDP/TS-RTP Streaming

The following fields appear in the Streaming Settings section when you choose TS-UDP streaming.

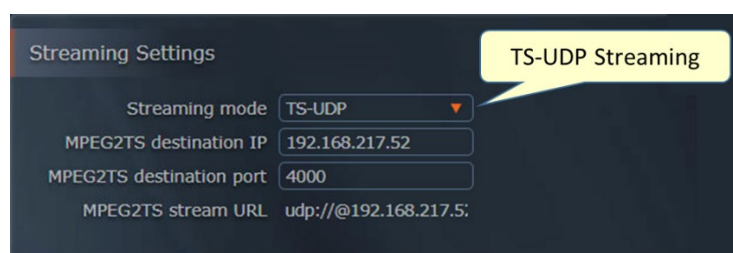


Figure 13: TS-UDP Streaming Fields

The fields appearing on the page are described in the table below.

Table 14: TS-UDP Streaming Field Descriptions

Field	Description
TS-UDP Streaming Settings	
TS-UDP/RTP destination IP	The destination IP address of the TS-UDP stream. Note: TS-UDP supports unicast and multicast transmissions. In order to perform a multicast transmission, use a multicast-dedicated IP address.
TS-UDP/RTP destination port	The destination port number of the TS-UDP stream.
TS-UDP/RTP stream URL	This address is generated automatically by the encoder and should be copied to the video decoder / player.

NOTE

The IPv4 multicast IP address range is between 224.0.0.0 and 239.255.255.255. Contact your system administrator for the specific address to use.

4.3.2.2 RTP Streaming

The following fields appear in the Streaming Settings section when you choose RTP streaming.

Figure 14: RTP Streaming Fields

The fields appearing on the page are described in the table below.

Table 15: RTP Streaming Field Descriptions

Field	Description
RTP Streaming Settings	
Video RTP destination port	The destination video UDP port of the RTP stream.
Audio RTP destination port	The destination audio UDP port of the RTP stream.
RTP destination IP	The destination IP address of the RTP stream. Note: RTP supports unicast and multicast transmission. To perform a multicast transmission, use a multicast-dedicated IP address.
RTP SDP	The SDP (Session Description Protocol) file is generated automatically by the encoder and contains information about the streaming parameters. The player should open this file to display the stream.

NOTE

The RTP specification recommends selecting an even RTP port number, and the next higher odd number for associated RTCP port. Note that XVC-ULTRA supports RTCP packets. Example RTP port selections:

- * Video RTP destination port: 10000 (associated RTCP port number would be 10001 and 10002)
- * Audio RTP destination port: 10004 (associated RTCP port number would be 10005,10006)

4.3.2.3 RTSP Streaming

RTSP supports streaming to a single client in unicast only. When a RTSP session is active, session requests from other clients will be refused. The following fields appear in the Streaming Settings section when you choose RTSP streaming.

Figure 15: RTSP Streaming Fields

The fields appearing on the page are described in the table below.

Table 16: RTSP Streaming Field Descriptions

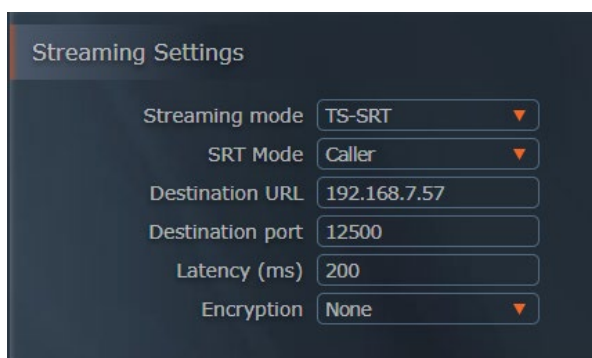
Field	Description
RTSP Streaming Settings	
RTSP port	The TCP port number of the RTSP session.
RTSP stream name	The name of the RTSP stream.
RTSP stream URL	The URL address is generated automatically by the encoder, and it should be copied to the video decoder / player.

4.3.2.4 SRT Streaming

Secure Reliable Transport is an open-source video transport protocol developed originally by Haivision. SRT optimizes streaming performance across unpredictable networks, such as the Internet, by dynamically adapting to the real-time network conditions between transport endpoints. This helps minimize effects of jitter and bandwidth changes, while error-correction mechanisms help minimize packet loss. SRT supports end-to-end encryption with AES. When performing retransmissions, SRT only attempts to retransmit packets for a limited amount of time based on the latency as configured by the application.

Caller mode

Field	Description
SRT Streaming Settings	
Mode	Caller
Destination URL	Destination IP
Destination port	Destination port
Latency	20-2000ms, should be set to 3xRTT (Round Trip Time)
Encryption	None, AES128, AES192, AES256
Passphrase	If encryption is selected, enter a Passphrase



The screenshot shows a 'Streaming Settings' window with the following fields and values:

- Streaming mode: TS-SRT
- SRT Mode: Caller
- Destination URL: 192.168.7.57
- Destination port: 12500
- Latency (ms): 200
- Encryption: None

Listener mode

Field	Description
SRT Streaming Settings	
Mode	Listener
Listener port	The port that SRT will listen on
Latency	20-2000ms, should be set to 3xRTT (Round Trip Time)
Max Overhead Bandwidth	Valid range (5 – 100)% default 5%. Limits the overhead BW required for packet loss recovery
Encryption	None/AES128/AES192/AES256
Passphrase	If encryption is selected, enter a Passphrase
TS-SRT stream URL	Generated URL of final stream

The screenshot shows a 'Streaming Settings' window with the following fields and values:

- Streaming mode: TS-SRT
- SRT Mode: Listener
- Listener port: 8118
- Latency (ms): 20
- Max Overhead B/W (%): 20
- Encryption: AES-256
- Passphrase: (masked with dots)
- TS-SRT stream URL: srt://@192.168.10.235:8118
- A 'Copy' button is located next to the stream URL.

Notes:

1. In **Listener** mode, the XVC-ULTRA will wait for an incoming connection on the specified 'Listener port'.
2. In **Caller** mode, the XVC-ULTRA will try to connect to the 'Destination URL'

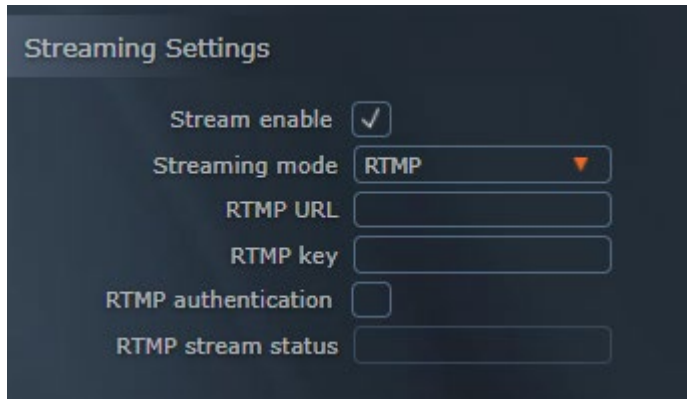
For more information refer to: <https://github.com/Haivision/srt>

4.3.2.5 RTMP/RTMPS Streaming

RTMP protocol is mainly used to stream live video to CDNs such as YouTube, Facebook, Twitch, Wowza, Boxcast, and other Content Delivery Networks.

Some CDNs require secured RTMP named RTMPS. When selecting RTMPS, the Audio/Video will be delivered to the CDN in a secured/encrypted manner.

XVC-ULTRA support RTMP and RTMPS (Secured RTMP)



Field	Description
RTMP Streaming Settings	
RTMP URL	URL provided by the CDN.
RTMP Key	RTMP key provide by the CDN

Note: Consult the service provider (YouTube, Facebook,..) for the exact audio and video encoding parameters.

4.4 System Settings

Select **System Settings** on the main menu to open the System Settings Menu, as shown in the figure below:

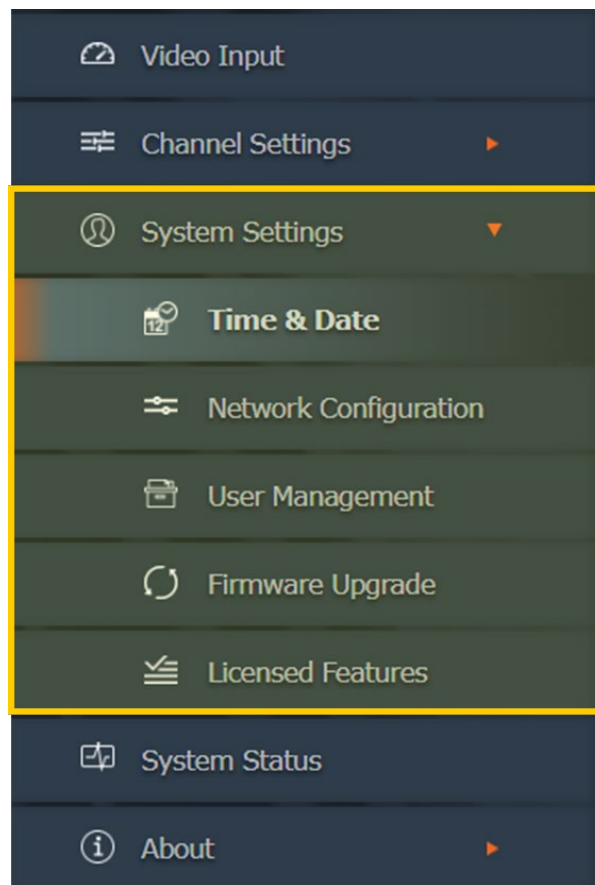


Figure 16: System Settings Menu

The Systems Settings menu provides the following capabilities, which are described in detail in the following sections:

Table 17: System Settings Menu Entries

Entry	Description
System Settings	Displays firmware version information.
Time & Date	Used to set the system time and date.
Network Configuration	Used to set the encoder's network parameters.
User Management	Used to authorize users to manage the encoder using the web interface.
Firmware Upgrade	Used to perform firmware upgrades.
Licensed1 Features	Displays a list of features that have been enabled for use with the encoder.

4.4.1 System Settings Main Page

The System Settings main page displays firmware version information. To access the page from the main menu, select **System Settings**. The System Settings main page appears as depicted in the figure below.

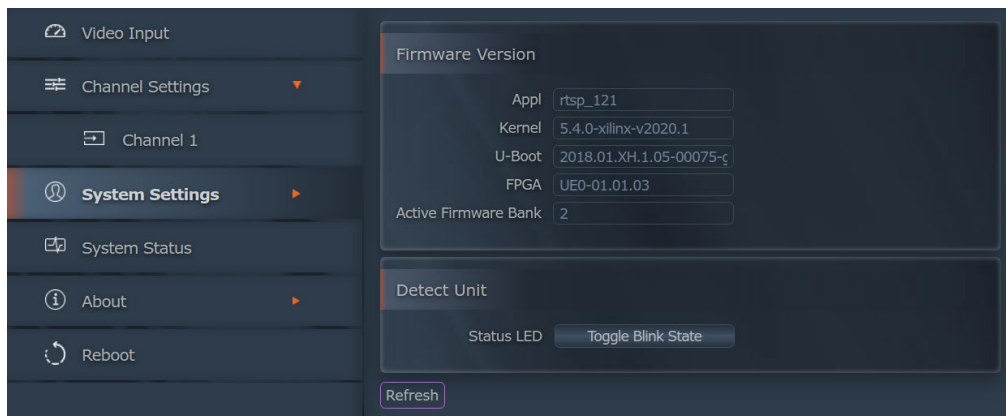


Figure 17: Systems Settings Main Page

The fields appearing on the page are described in the table below.

Table 18: Systems Settings Field Descriptions

Field	Description
Firmware Version	
Appl	The global firmware version.
Kernel	Linux kernel version.
U-Boot	U-boot version.
FPGA	FPGA hardware version.
Active Firmware Bank	The number of the active bank (an area in the FLASH memory) from where all the software/firmware components are loaded.
Detect Unit	
Status LED	Click on the button to toggle the STAT LED between <i>blinking</i> and <i>not blinking</i> . You can use this function to identify the encoder currently being managed.

4.4.2 Time & Date

The Time & Date page is used to set the system time and date – either manually, or automatically by an NTP server. To access the page from the main menu, select **System Settings >> Time & Date**. The Time & Date page appears as depicted in the figure below.

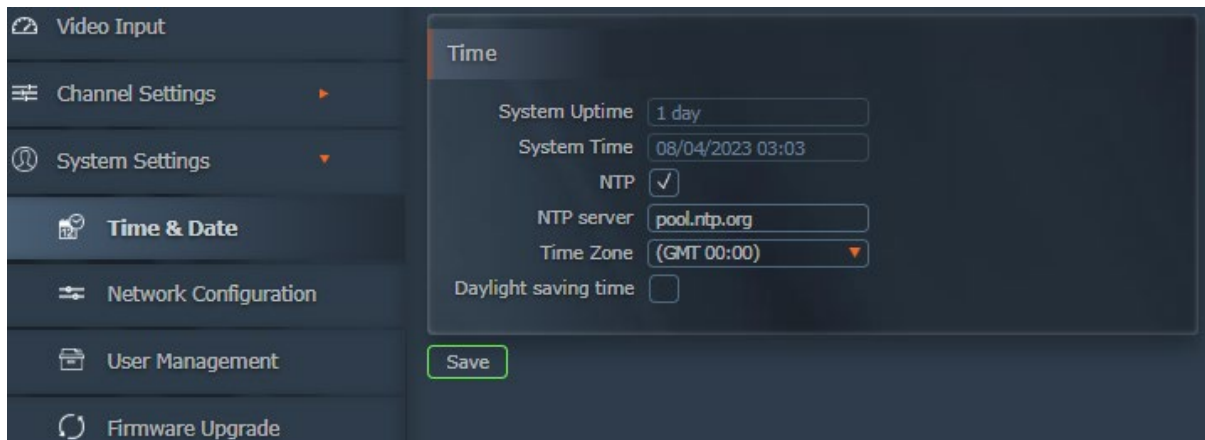


Figure 18: Time & Date Page

The fields appearing on the page are described in the table below.

Table 19: Time & Date Field Descriptions

Field	Description
Time	
System Uptime	The time elapsed since the last encoder reboot, in hh:mm format.
System Time	The current system date and time.
NTP	If checked, the system date and time are synchronized with an NTP server.
NTP Server	The URL of the NTP server used.
Time Zone	The time zone in which the encoder operates. Select the appropriate time zone using the list box.
Daylight Saving Time	If checked, the system date and time are adjusted for daylight savings.

4.4.3 Network Configuration

The Network Configuration page is used to set the encoder's network parameters. To access the page from the main menu, select **System Settings >> Network Configuration**. The Network Configuration page appears as depicted in the figure below.

The screenshot displays the Network Configuration page of the XVC-ULTRA Encoder. The left sidebar contains a menu with the following items: Video Input, Channel Settings, System Settings, Time & Date, **Network Configuration** (selected), User Management, Firmware Upgrade, Licensed Features, System Status, About, Legal Info, XVTec Legal, OSS, Certifications, and Reboot. The main content area is divided into two sections. The top section, titled 'Device Network Configuration', contains the following fields: Device Name (xvchevc_C0D834000077), IP Method (Static), IP Address (192.168.10.235), Netmask (255.255.0.0), Default Gateway (192.168.217.254), DNS Server 1 (192.168.217.1), DNS Server 2 (8.8.8.8), MAC Address (c0:d8:34:00:00:77), and an Ignore ICMP Echo checkbox. Below these fields are 'Save' and 'Refresh' buttons. The bottom section, titled 'Network Diagnostics', contains a 'Destination IP/Domain' input field, a 'Send ICMP Ping' button, a 'Ping results' area, and a 'Clear' button.

Figure 19: Network Configuration Page

The fields appearing on the page are described in the table below.

Table 20: Network Configuration Field Descriptions

Field	Description
Device Network Configuration	
Device Name	The encoder device name. The factory-supplied device name is generated by concatenating the prefix "xvchevc_" with the MAC address of the encoder.
IP Method	The method used to allocate an IP address for the encoder: <ul style="list-style-type: none"> • Static. The IP address is set manually. • DHCP. The IP address is allocated automatically using the DHCP (Dynamic Host Configuration Protocol). • Note: If a DHCP server is not running, the encoder will fail to receive network configurations. In this case, the encoder will attempt several times to send a DHCP request to the server. If no response is received, the encoder's IP address defaults to an APIPA address (169.x.x.x). The IP address of the encoder can be discovered using the XVC Management Tool.
IP Address	The IP address of the encoder.
Netmask	The subnetwork mask used by the network segment in which the encoder operates.
Default Gateway	The IP address of the default gateway that serves as the forwarding host (router) to other networks when no other route specification matches the destination IP Address.
DNS Server 1	The IP address or host name of the main DNS server accessed by the encoder.
DNS Server 2	The IP address or host name of the secondary DNS server accessed by the encoder.
MAC Address	The MAC address of the encoder.
Ignore ICMP Echo	If checked, the encoder ignores ICMP Echo (ping) requests. This feature can help prevent Denial of Service (DoS) attacks.
Network Diagnostics	
Destination IP/Domain	The IP address or domain name of the ping request destination. Click Send ICMP Ping to initiate the request.
Ping Results	Displays the results of the ping responses. Click Clear to erase the results.

4.4.4 User Management

The User Management page is used to authorize users to manage the encoder using the web interface. To access the page from the main menu, select **System Settings >> User Management**. The User Management page appears as depicted in the figure below.

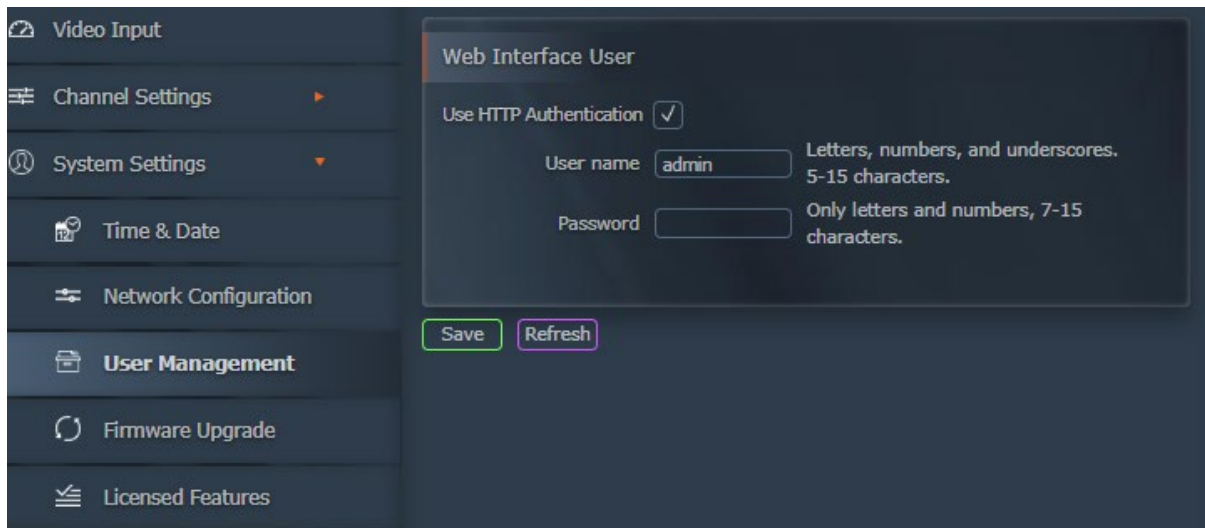


Figure 20: User Management Page

The fields appearing on the page are described in the table below.

Table 21: User Management Field Descriptions

Field	Description
Web Interface User	
Use HTTP Authentication	If checked, an HTTP Authorization request is required in order to authenticate the credentials of web-based client users.
Username	Web-based client username.
Password	Web-based client user's password.

NOTE

To [reset the user name and password](#), use the XVC Management Tool.

4.4.5 Firmware Upgrade

The Firmware Upgrade page is used to manage the firmware upgrade process. To access the page from the main menu, select **System Settings >> Firmware Upgrade**. The Firmware Upgrade page appears as depicted in the figure below.

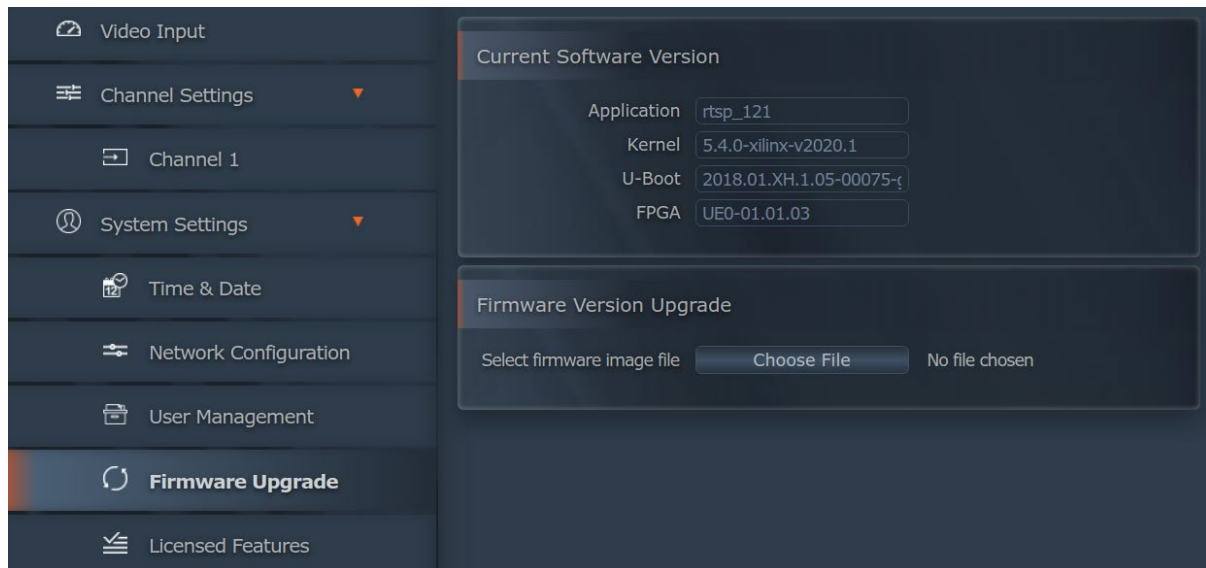


Figure 21: Firmware Upgrade Page

The fields appearing on the page are described in the table below.

Table 22: Firmware Upgrade Field Descriptions

Field	Description
Current Software Version	
Application	The global firmware version
Kernel	Linux kernel version
U-Boot	U-boot version
FPGA	FPGA hardware version
Firmware Version Upgrade	
Select Firmware Image File	The image file to be uploaded into Flash memory. Click Choose File to select an image file for upload.

In order to upgrade the encoder firmware, upload the firmware image file supplied by XVTEC.

To upgrade the encoder firmware:

1. Click on the **Choose File** button. An Open dialog box appears, as shown in the figure below.

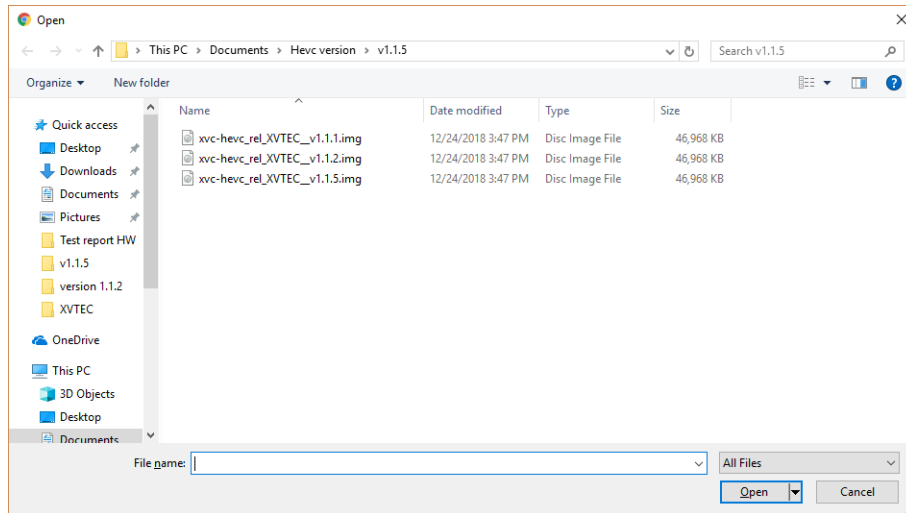


Figure 22: Selecting the Image File

2. Navigate the system and select the image file to be uploaded. Click **Open**. The name of the license file selected appears next to the **Choose File** button.
3. Click **Upload** to upload the image file to the encoder. A series of progress messages will appear in a new field – **Update Status** – that appears on the page, as shown in Figure 23 below:
 - “Loading”
 - “Saving”
 - “Validation”
 - “Rebooting” At this point, there will be a loss of connectivity with the encoder. Connectivity will be restored following the successful completion of the boot process.

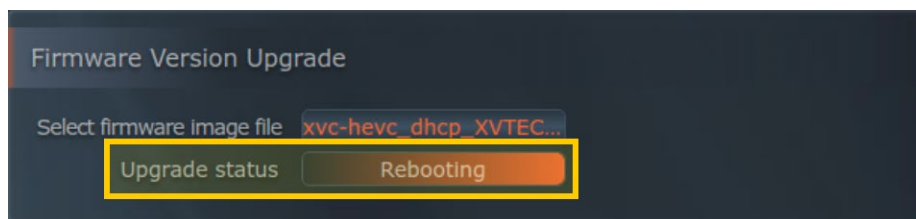


Figure 23: Upgrade Status Field

During the F/W upgrade process the **STAT** LED (LED 1), appears in blinking green, as shown in the figure below:

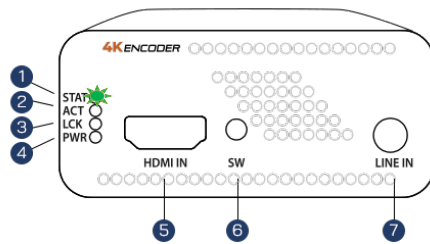


Figure 24: Upgrade LED Indicators

4.4.6 Licensed Features

The Licensed Features page displays a list of features that have been enabled for use with the encoder. To access the page from the main menu, select **System Settings >> Licensed Features**. The Licensed Features page appears as depicted in the figure below.

NOTE

In a future release, you will be able to use this page to enable additional features.

Figure 25: Licensed Features Page

The Enabled Features section displays a list of features that have been enabled for use with the encoder.

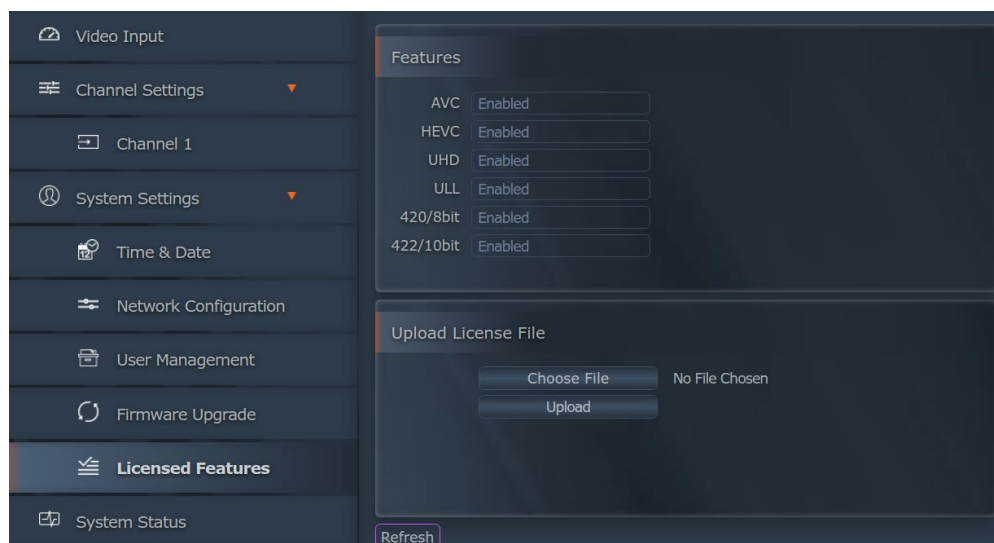


Figure 26: Enabled Features

4.5 System Status

Select **System Status** display the temperature of the system.

4.6 About

Select **About** on the main menu to display the About page, as shown in the figure below.

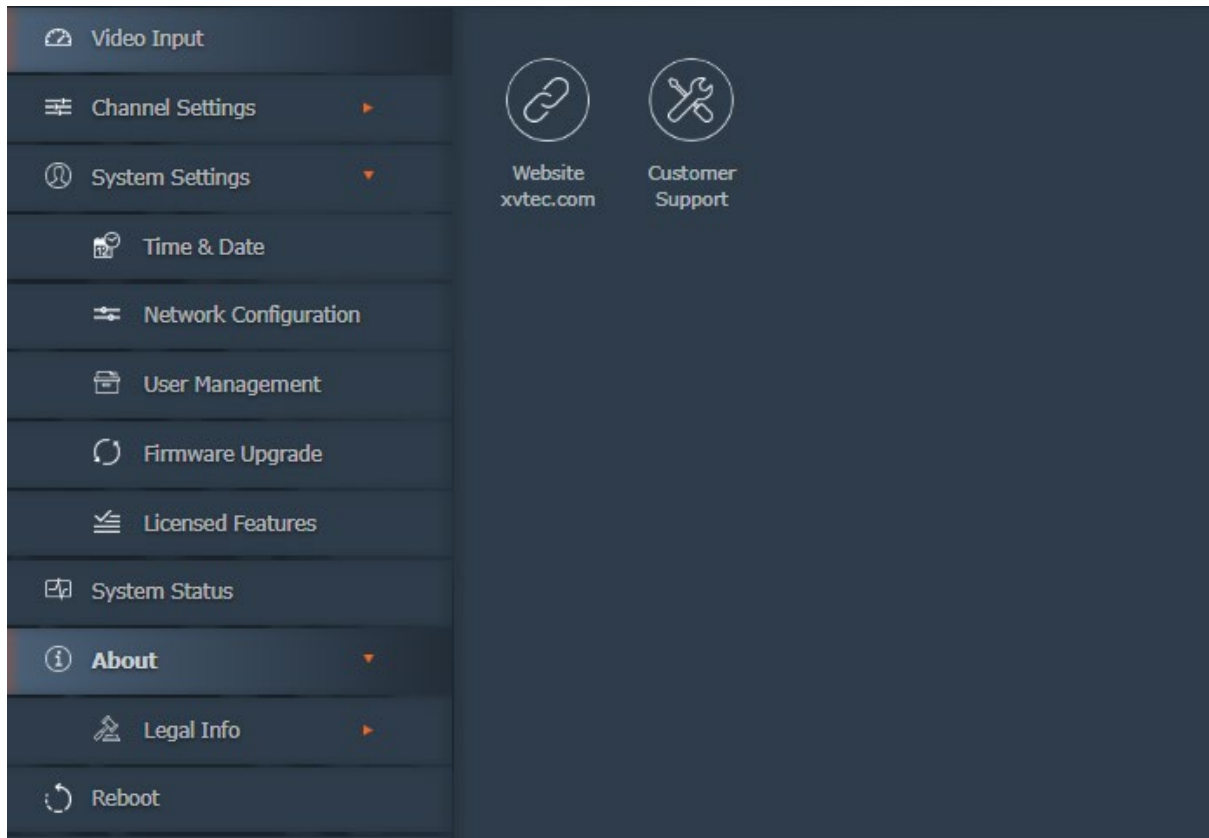


Figure 27: About Page

The About page provides access to the following resources:

- The XVTEC website at xvttec.com.
- Customer support – the XVTEC website Downloads page.

4.6.1 XVTEC Legal Page

The XVTEC Legal page presents the End User License Agreement and warranty information. To access the page from the main menu, select **About >> Legal Info >> XVTEC Legal**. The page appears as depicted in the figure below.

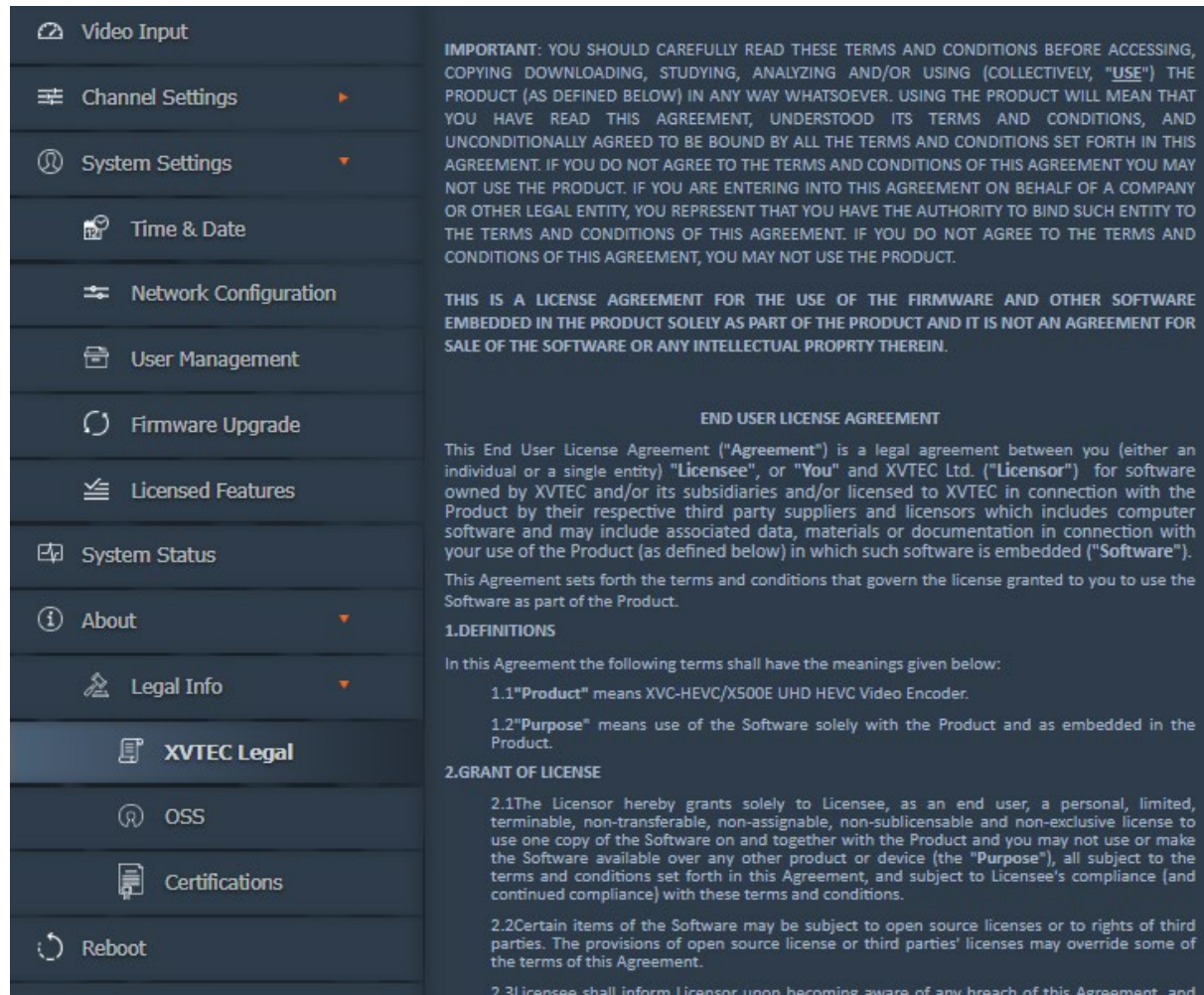


Figure 28: Legal Page

4.6.2 Open Source Software

The OSS (Open Source Software) page provides access to a list of OSS packages integrated into the encoder system, together with licensing information. To access the page from the main menu, select **About >> Legal Info >> OSS**. The page appears as depicted in the figure below.

Video Input	
Channel Settings	
System Settings	
Time & Date	
Network Configuration	
User Management	
Firmware Upgrade	
Licensed Features	
System Status	
About	
Legal Info	
XVTEC Legal	
OSS	
Certifications	
Reboot	

Package	Ver	License	URL
Kernel	4.14	GNU GPLv2	https://www.kernel.org
U-Boot	2018.01	GNU GPLv2+	https://www.denx.de/wiki/U-Boot/
ffmpeg	2.5.11	GNU LGPLv2.1+ GNU GPLv2	https://www.ffmpeg.org
Alsa-lib	1.1.5	GNU LGPLv2.1	https://www.alsa-project.org/main/index.php/...
libconfig	1.4.9	GNU LGPLv2.1	https://hyperrealm.github.io/libconfig/
thttpd	2.25b	Proprietary (2 clauses BSD like) - Free	http://www.acme.com/software/thttpd/
Bootstrap	4.1.3	MIT	https://getbootstrap.com/
qdecoder	12.0.4	Proprietary (2 clauses BSD like) - Free	http://www.qdecoder.org http://wolkymkim.github.io/qdecoder/
busybox	1.24.1	GNU GPLv2	https://busybox.net/
tcpdump	4.9.2	BSD	http://www.tcpdump.org/
libpcap	1.8.1	BSD	http://www.tcpdump.org/
monit	5.25.2	GNU AGPLv3	https://mmonit.com/monit/
libcurl	7.60.0	MIT/X	https://curl.haxx.se/
parted	3.2	GNU LGPLv3+	https://www.gnu.org/software/parted/

Figure 29: OSS Page

4.6.3 Certifications

The Certifications page displays a series of symbols representing certifications granted to the encoder system. To access the page from the main menu, select **About >> Legal Info >> Certifications**. The page appears as depicted in the figure below.

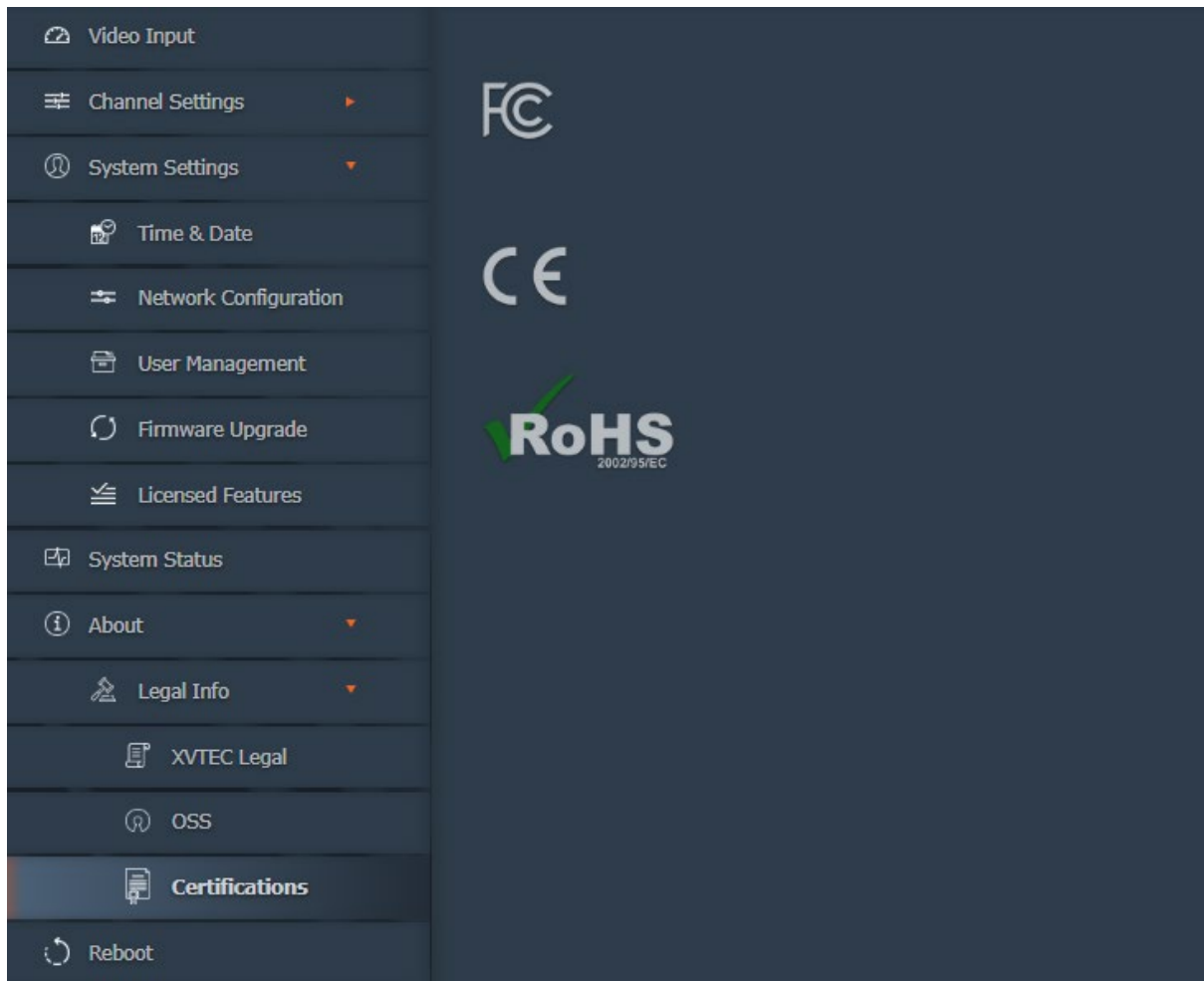


Figure 30: Certifications Page

4.7 Reboot

Select **Reboot** on the main menu to shut down and restart the encoder. The following decision box appears, requesting that you confirm the Reboot command.

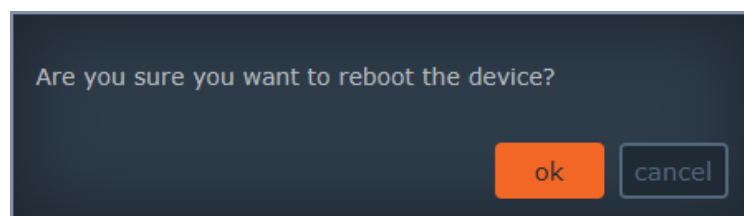


Figure 31: Reboot Confirmation

Click **OK** to confirm the reboot. The following message box appears, informing you that the reboot process has begun.

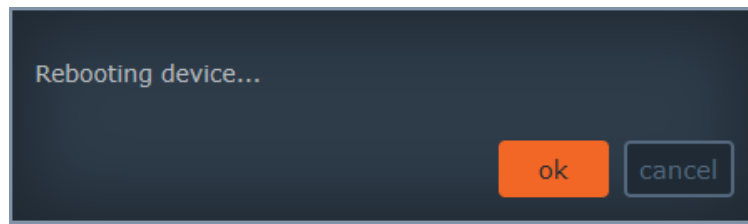


Figure 32: Encoder Rebooting

For more information on the reboot process, see the [Boot Sequence](#) section.

5 Troubleshooting and Recovery

This chapter provides details on reboot, troubleshooting and recovery operations.

5.1 Rebooting the Encoder

To re-boot the encoder system, perform one of the following operations:

- Select **Reboot** on the main menu (see the [Reboot](#) section).
- Disconnect and then reconnect the input power connector.
- Reboot the unit from the management system

During the booting process the LEDs on the front panel of the encoder are lit or blink in according to the current system state. The following sections describe the LED behavior when booting in Static and DHCP mode:

- Booting with a [static IP address](#)
- Booting with a [DHCP-allocated IP address](#)

5.1.1 DHCP allocated IP Address

1. If a DHCP server/service is running, the XVC-ULTRA will receive a DHCP IP address.
2. If a DHCP server is **not** running, the encoder will fail to receive the network configurations. In this case, the STAT LED will blink in **orange** for 60 sec, during this period the encoder will attempt several times to send a DHCP request to the server. If no response is received, the encoder's IP address defaults to an APIPA address (169.x.x.x), and the STAT LED will turn SOLID **orange**. At any stage, if a DHCP sever becomes available the XVC-ULTRA will get an IP address the, and the STAT LED will turn solid **green**.
3. The IP address of the encoder can be discovered using the **XVC Management Tool**.

5.2 Overheating

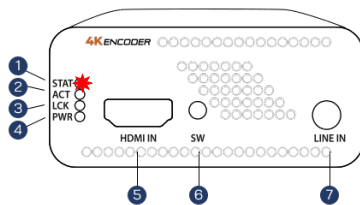
The **STAT** LED serves as an indicator of system overheating. The following table provides guidelines for handling the system in an overheating scenario.

NOTE

The STAT LED is used for multiple types of indications in a variety of processes. Note that *overheating and fan malfunction alarms have the highest priority, and always override all other indications.*

Table 23: Overheating Conditions

Status	STAT LED Behavior	Encoder Behavior
Normal temperature	Green	Normal
Fan failure	Red	Fan failures: <ul style="list-style-type: none"> Fan not detected by the software Fan operate under the minimum required speed: 500 RPM.
Critical temperature	Red, slow blink	The unit resets after 60 seconds. Upon reset, only basic infrastructure and functionality are enabled – CPU, memories, peripherals, and communications. Full operation resumes upon return to Normal status.
Emergency	Red, fast blink	System is powered off after 30 seconds. Re-powering is required.



5.3 Restoring System Defaults

Perform the following operations if you need to restore the factory system defaults.

NOTE

During factory defaults the IP address of the encoder will be set to 169.x.x.x. The x.x.x is derived from the MAC address. Encoder parameters are set default, streaming mode is set to TS-UDP. The actual IP address can be discovered using the **XVC management tool**.

5.3.1 Restore system defaults procedure

1. Disconnect the input power connector to power down the unit.
2. While pressing and holding down the **SW** button (long press), reconnect the input power. Continue pressing and pay attention to the behavior of the **STAT** LED:
3. After approximately 10 seconds, All LEDs blink in orange, as shown in Figure 33 below. At this point, release the **SW** button. System defaults will be restored.

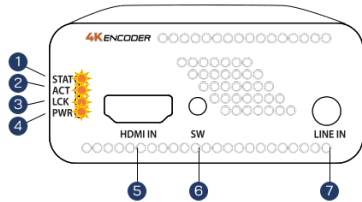


Figure 33: Release SW Button to Begin Restoring Defaults

4. At the end of the process, the **STAT** and the **PWR** LED should appear in solid green, as shown in Figure 34 below.

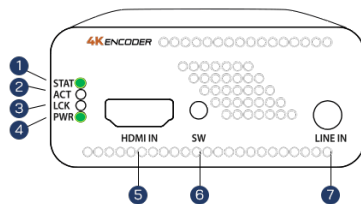


Figure 34: System Defaults Successfully Restored

5.3.2 System Recovery

In the event of firmware malfunction (Unit is not responding or no access to the unit), perform a **system recovery** to restore normal operation.

5.3.3 System recovery procedure

1. Disconnect the input power connector to power down the unit.
2. Reconnect the input power while pressing and holding down the SW button for approximately 20 seconds. Pay attention to the behavior of the LEDs:
 - After approximately 10 seconds, all LEDs appears in blinking **orange**.
 - After approximately 20 seconds, all LEDs appears in solid **orange** (no blinking). At this point, **release** the **SW** button to start the system recovery.
 - Once the XVC-ULTRA has loaded in recovery mode, the STAT LED will turn on solid **green** and the rest of the LEDs will be solid **orange**.

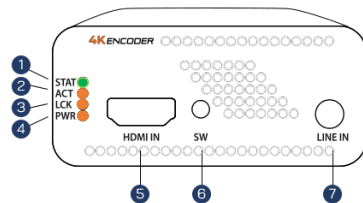


Figure 40: System Defaults Successfully Restored

The recovery process automatically configures the encoder's network settings as follows:

- IP address: 192.168.1.100
- Subnet mask: 255.255.255.0

The system boots using the new network settings.

NOTE

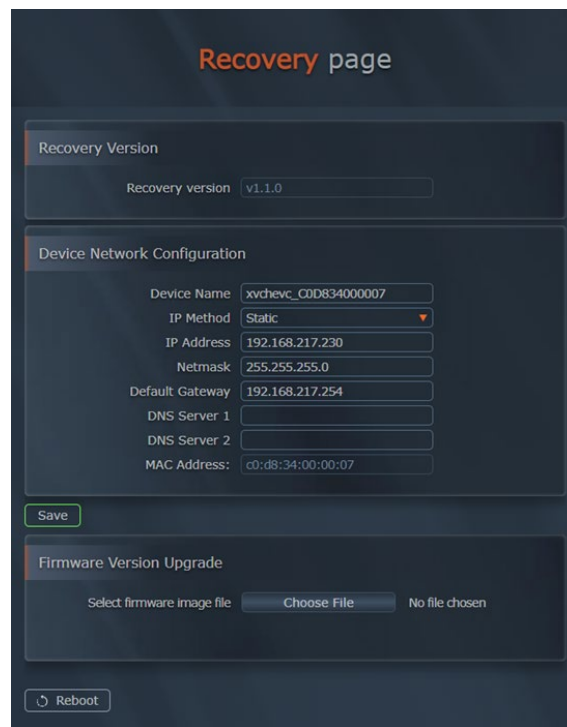
System recovery mode should be entered only when:

1. The unit stops functioning correctly
 2. The web interface is stuck, or the unit can't not be reached with the XVC management tool.
-

NOTE

The host's (your PC's) IP address must be set to the same IP domain as the encoder to access the encoder. For example, you can set the PC's IP address to: 192.168.1.101

3. Enter the IP address of the encoder unit in the address bar of your browser to display the Recovery page, as shown in the figure below:



The screenshot shows a web interface titled "Recovery page". It contains two main sections: "Recovery Version" and "Device Network Configuration".

Recovery Version: A text field labeled "Recovery version" with the value "v1.1.0".

Device Network Configuration: A form with the following fields:

- Device Name: xvchevc_C0D834000007
- IP Method: Static (dropdown menu)
- IP Address: 192.168.217.230
- Netmask: 255.255.255.0
- Default Gateway: 192.168.217.254
- DNS Server 1: (empty)
- DNS Server 2: (empty)
- MAC Address: c0:d8:34:00:00:07

Below the network configuration is a "Save" button. Further down is a "Firmware Version Upgrade" section with a "Select firmware image file" label, a "Choose File" button, and the text "No file chosen". At the bottom is a "Reboot" button.

Figure 35: Recovery Page

4. Set the **IP Address** and **Netmask** as required (optional).
5. Click on the **Choose File** button. An Open dialog box appears, as shown in the figure below.

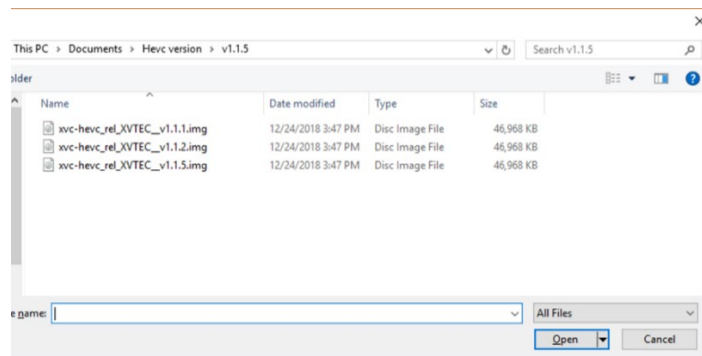


Figure 36: Selecting the Image File

6. Navigate the system and select the image file to be uploaded. Click **Open**. The name of the license file selected appears next to the **Choose File** button.
7. Click **Upload** to upload the image file to the encoder. A series of progress messages will appear in a new field – **Update Status** – that appears on the page, as shown in Figure 37 below:
 - “Loading”
 - “Saving”
 - “Validation”
 - “Rebooting” At this point, there will be a loss of connectivity with the encoder. Connectivity will be restored following the successful completion of the boot process. The rest of the process is similar 1to F/W upgrade (refer to section [4.4.5](#))

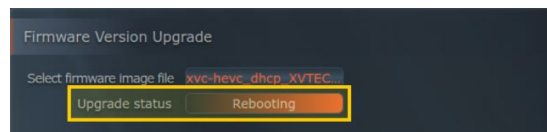


Figure 37: Upgrade Status Field

8. [Access the encoder from your browser](#) using the newly configured IP address.

NOTE

You may need to clear cookies and site data from you browser before executing this step.

5.4 Resetting the Username and Password

To reset the username and password of web-based interface use the XVC Management Tool.

To assign a static IP address to the encoder:

1. Execute the XVTEC Management Tool. The application discovers the XVTEC devices in your network, and displays them in a list, as shown in the figure below.

NOTE

To enable discovery of the devices, you may need to disable the Windows Firewall before executing the XVTEC Management Tool.

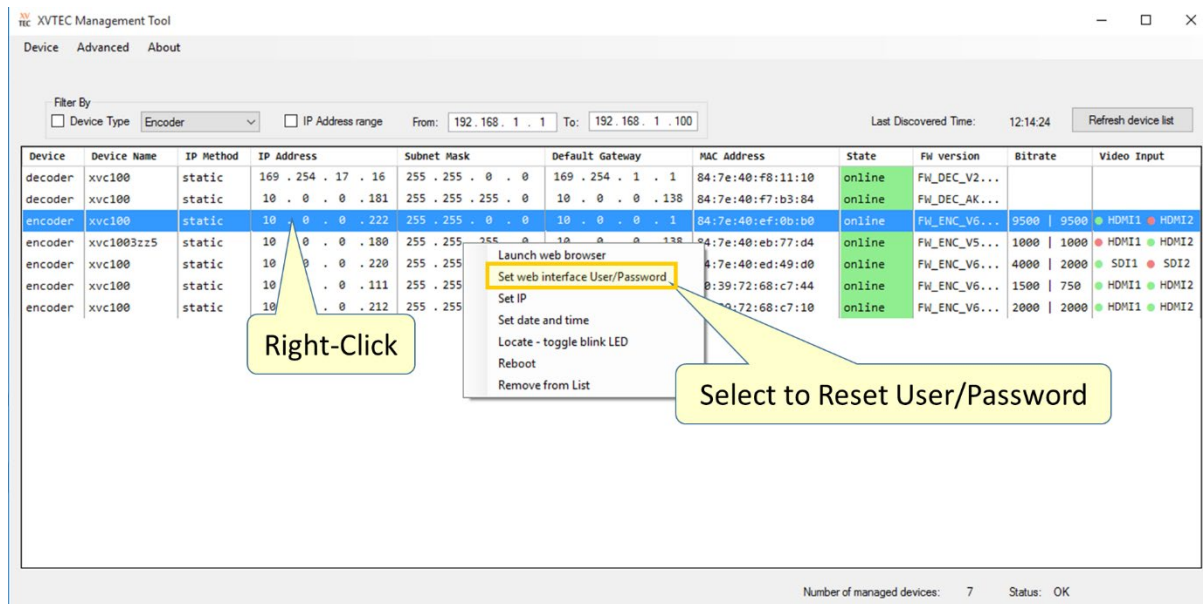


Figure 38: Resetting the User/Password

- Find the row in the table associated with your encoder. Right-click on the row, then select **Set web interface User/Password**.
- In the dialog box that appears, enter a new Username and password, and click **Apply**.

Appendix A System Specifications

Video	
Video Input	HDMI Type A connector, HDMI v2.0a (Non HDCP)
Input Resolution	UHD: 3840x2160p [23.97, 24, 25, 29.97, 30, 50, 59.94, 60] Hz FHD: 1920x1080p [23.97, 24, 25, 29.97, 30, 50, 59.94, 60] Hz HD: 1280x720p [50, 59.94, 60] Hz, 1920x1080i [25, 29.97, 30] Hz SD: 720x576p50* Hz, 720x576i25 Hz, 720x480p59.94 Hz, 720x480i29.97 Hz VESA: From VGA to QSXGA Interlace supported only in HEVC compression scheme
Scaler	Passthrough (follow input resolution) or Scale to any arbitrary resolution
Output Streams	Up to UHDp60 HEVC or AVC over IP
Video Compression	<ul style="list-style-type: none"> ISO MPEG-4 Part 10: Advanced Video Coding (AVC)/ITU H.264 AVC: Baseline, Main, High, High10, High4:2:2, High10, Intra, High 4:2:2 Intra up to Level 5.2 ISO MPEG-H Part 2: High Efficiency Video Coding (HEVC)/ITU H.265 HEVC: Main, Main Intra, Main10, Main10 Intra, Main 4:2:2 10, Main 4:2:2 10 Intra up to Level 5.1 High Tier
Codec features	Configurable GOP size, FPS, BPS I/P/B frames support 4:2:0 and 4:2:2 color space 10/8-pixel depth Supports progressive and field based interlaced coding Rate control: CBR, Low latency CBR Bitrates: from 500 Kbps to 60 Mbps Frame rate: full, half, quarter of the input framerate
Encoding Performance	Up to 4Kp60 4:2:2 10 bit HEVC/AVC stream
Audio	
Audio Input	HDMI embedded audio OR Analog audio unbalanced gen-locked to video (PL stereo connector)
Audio Sample Format	<ul style="list-style-type: none"> HDMI audio: Single stereo channel audio at Fs = 32Khz/44,1Khz, 48KHz, 16bit per/sample. Line-in audio: Fs=48Khz sampling rate, 16bit per/sample.
Audio Compression	<ul style="list-style-type: none"> MPEG-2 AAC-LC (ISO/IEC 13818-7), configurable bitrate 64-256Kbps LPCM16 – 16 bit linear PCM single stereo channel OPUS – OPUS audio encoding 64-320Kbps.
Latency	
Latency Modes	Low latency mode: < 8ms (Encoding latency at 4Kp60 20 Mbps with 1GbE I/F) Normal mode latency: up to 1000ms depending on GOP structure End-To-End latency with XVC-ULTRA Decoder < 40ms
Interfaces	
Ethernet	Eth: RJ45, Ethernet 10/100/1000 Base-T, auto-neg, auto-sense, half/full duplex
Streaming Protocols	<ul style="list-style-type: none"> TS-UDP: Transport Stream over UDP (Unicast/Multicast) TS-RTP: Transport Stream over RTP/UDP (Unicast/Multicast)

	<ul style="list-style-type: none"> • RTP: Real-Time Protocol over UDP (Unicast/Multicast) • RTSP: Real-Time Streaming Protocol (Unicast, single client) • SRT: Caller/Listener mode • RTMP/S: Real Time Messaging Protocol (Only for H.264/AVC)
Other Protocols	HTTPS, 802.1X, IGMP V1/V2, DHCP client
Other Interfaces	1 x USB 2.0/3.0 host ports RS-232/485 LED indicators (Power on, Status, Video lock, Streaming) Tactile switches
Encoder Management	Web-based Interface via browser REST API ONVIF Remote firmware upgrade via browser or REST API Hardware button for resetting factory defaults
Physical/Environmental	
Dimensions (LxWxH)	125 x 72 x 32 mm
Weight	400 grams
Operational Temperature	0°C to 50°C
Operational Humidity	Up to 90%, non-condensing
Input Voltage	12V DC
Power Consumption	Typical: 11W (varies according to use case)
Regulatory Compliance*	FCC part 15 class A, CE HDMI sink certification, test specification

END OF DOCUMENT