



XVC-ULTRA Encoder User's Guide





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1 Introduction

The XVC-ULTRA Encoder is a Ultra Low Latency 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 3840x2160p60 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 <u>www.xvtec.com</u> or contact us at:

Table 1: Contact Us

-	• •
Fma	1
LIIIG	•••

Support: support@xvtec.com

1.4 Definitions

Та	ble	2:	Defin	itions

Term	Definition
AAC_LC	Advanced Audio Coding – Low Complexity Profile
OPUS	Opus is a lossy audio coding format developed by the Xiph.Org Foundation and standardized by the Internet Engineering Task Force, designed to efficiently code speech and general audio in a single format, while remaining low-latency enough for real-time interactive communication and low-complexity enough for low-end embedded processors
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 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.
ΑΡΙΡΑ	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	

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: <u>http://www.xvtec.com/support/downloads/</u>
- 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
- <u>Connectors</u>
- <u>LEDs</u>

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. Refer to section <u>Restoring</u> <u>System Defaults</u>

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.

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

Table 5: Front Panel Connectors

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

Table 7: LEDs

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

LED	Indication
PWR	On/Off indicator.
	• Green: Unit is powered on.
STAT	Multi-purpose system status indicator. For further information, refer to the following sections:
	Boot Sequence – with static IP address
	Boot Sequence – with DHCP-allocated IP address
	Overheating
	<u>Restoring System Defaults</u>
	<u>System Recovery</u>
LCK	Video lock indicator. When the XVC-ULTRA encoder detects a supported video standard the LED will be lit as follows:
	Red: Standard definition (SD)
	• Orange: High definition (HD, FHD)
	• Green: 4K (UHD)
ACT	Streaming activity indicator.
	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 <u>static IP address</u>
- Using a <u>DHCP-allocated IP address</u>

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.



Filter B	vice Type Encoder	~	IP Address range From:	192 . 168 . 1 . 1 To: 192	. 168 . 1 . 100			Last Discovered Time:	15:34:00	Refresh device list
evice	Device Name	IP Method	IP Address	Subnet Mask	Default Gateway	MAC Address	State	FW version	Bitrate	Video Input
coder	xvchevc_C0D	static	192 . 168 . 10 . 100	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:47	online	v1.1.5(8.1)		
coder	xvchevc_C0D	static	192 . 168 . 217 . 230	255 . 255 . 255 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:07	online	v1.1.5_01(B.1)		
coder	xvchevc_C0D	static	192 . 168 . 217 . 245	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:37	online	v1.1.5_01(8.1)		
coder	xvchevc_C0D	static	192 . 168 . 217 . 235	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:1e:00:00:03	online	v1.1.5(8.1)		
coder	xvchevc_000	static	192 . 168 . 217 . 211	255 . 255 . 255 . 0	192 . 168 . 217 . 253	00:01:02:77:78:75	online	v1.1.2(8.1)		
oder	xvchevc_C0D	static /	192 . 168 . 217 . 237	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:51	online	v1.1.5(8.1)		

Figure 4: List of XVTEC Devices Discovered

2. 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.

Set Device IP	×
IP Method	Static 🗸
IP Address	192 . 168 . 217 . 245
Subnet Mask	255 . 255 . 0 . 0
Default Gateway	192 . 168 . 217 . 254
C	Apply Cancel

Figure 5: Setting the Encoder IP Address

- 3. Make sure that the IP Method selected is "Static".
- 4. 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 DCHP-allocated 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.

THE XVTEC M	anagement Tool									-		×
Device Ad	dvanced About											
Filter By	Filter By Device Type Encoder IP Address range From: 192. 168. 1 . 1 To: 192. 168. 1 . 100 Last Discovered Time: 13.05.27 Refresh device list											
Device	Device Name	IP	IP Address	Subnet Mask	Default Gateway	MAC Address	State	FW version	Bitrate	Vide	o Input	
encoder	xvchevc_C0D834000051	dhcp	192 . 168 . 217 . 41	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:51	online	v1.1.8(B.1)				
encoder	xvchevc_C0D834000041	static	192 . 168 . 10 . 241	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:41	online	v1.1.8(B.1)				
encoder	xvchevc_C0D834000007	static	192 . 168 . 10 . 230	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:07	online	v1.1.8(B.1)				
	xvchevc_C0D81E000021	static	192 . 168 . 217 . 199	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:1e:00:00:21	online	v1.1.0(B.1)				
encoder	xvchevc_C0D834000035	static	192 . 168 . 217 . 244	255 . 255 . 255 . 0	192 . 168 . 217 . 254	c0:d8:34:00:00:35	online	1432(B.1)				
encoder	xvchevc_C0D81E000003	static	192 . 168 . 10 . 235	255 . 255 . 0 . 0	192 . 168 . 217 . 254	c0:d8:1e:00:00:03	online	v1.1.8(B.1)				
]						

Figure 6: List of XVTEC Devices Discovered

2. 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

3. 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 connect	ion to this site is not private							
Username	admin							
Password								
	Sign in Cancel							

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:

	Video Input parameters
🙆 Video Input	Detected Video Format
華 Channel Settings ・ ① System Settings ・ 団 System Status	Signal status <mark>(Locked)</mark> Width 1920 Height 1080 Framerate 59.94
(1) About	Scanning method Progressive
Reboot Main Menu	Video STD Selection Input source HDML Video detection Auto • Apply Save Work Area

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	Table	8:	Main	Menu	Entries
----------------------------	-------	----	------	------	---------

Entry	Description
<u>Video Input</u>	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.

Field Type	Example	Description
Field Types		
Read/Write	80000	Fields whose values can be modified – values appear in a bright color.
Read-Only	48000	Fields whose values <i>cannot</i> be modified – values appear in a dark color.
Check Box	\checkmark	Used to enable or disable a function.
List Box		Click on the field to open a list box containing alternative values.

Table 9: Control Types

4.2 Video Input

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

XVC ULTRA ENCODER	Video input para	neters
🛆 Video Input	Detected Video For	mat
≇ Channel Settings	Signal status	Locked
O System Settings O	Width	1280
System Settings	Height	720
🖾 System Status	Framerate	
	Scanning method	Progressive
(i) About		
C Reboot	Video STD Selectio	n
	Vin source	HDMI 🔻
	Video detection	Auto 🔻
	Save	

Figure 11: Video Input Page

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

Field	Description
Detected Video Format	
Signal status	Indicates if the encoder has detected a supported video standard:
	 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:
	• Progressive . Scanning method in which the entire image is captured at every frame.
Video Standard Selection	n
Vin source	Video input source:
	• 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:



• 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.

🕰 Video Input	Video Encoder Setti	nas				
	and the second second	ae				
	Compression H.265	/Hevc 🔻	Encoding latency	Normal	•	
Channel 1	Resolution Follow	input 🔻	Rate control	CBR	•	
	Frame rate Full		Bitrate	10000		(Kb)
(7) System Settings	Pixel depth 8 Bit/	oixel 🔻	Intra refresh mode	Full frame	V	
	Color format 4:2:0		Intra period	60		
P Time & Date			GOP structure	Іррр	•	
	Advanced Encoder	Settings				
🗢 Network Configuration	C08 1000					
	CPB 1000	(ms)				
🖃 User Management	Min-Q 2					
	Max-Q 51					
() Firmware Upgrade	Max Pic Size 200	(Kbit)				
🖆 Licensed Features	Load defaults					
🖾 System Status	Audio Encoder Setti	ngs				
🛈 About 🛛 📭	Audio s	ource HDMI	/SDI			
	Audio e	nable 🗸				
() Reboot	Detect	ad FS 48000) (Hz)			
	Bi	t rate 80000) (bps)			
	Compre	ssion Opus(Low Latency) 🔻			
	Streaming Settings	nable 🗸				
	Streaming	mode RTP				
	Video RTP destination	port 29000	ř.			
	Audio RTP destination	port 29008				
	RTP destinat	on IP 239.2	40.240.250			
		MTU 1500				
			Download S	SDP File		
	Save Refr	≥sh				

Figure 12: Channel Settings Page

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

Field	Description
Video Encoder Settings	
Compression	Video compression scheme, AVC(H264) or HEVC(H.265).
Resolution	 The resolution of the encoded video: 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. 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: 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. 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. 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. 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. <u>Click to view a list</u> of valid video bitrates.
Frame rate	 The ratio of the target (output) frame rate to the input frame rate: Full (All frames are encoded) 1/2 (Every second frame is encoded) 1/4 (Every 4th frame is encoded)
Intra refresh mode	 If 'Full frame' is selected, whenever the I/IDR period is reached, a complete frame is encoded as an I/IDR frame (This will create a relatively big frame is 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	 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).

Table 11: Channel Settings Field Descriptions



	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.
	Minimum value: 1 frame
	Maximum value: 1000 frames
	Recommended values: 30-120
GOP structure	The Group of Pictures (GOP) structure used:
	IPPP - Only P frame is used.
	IBP, IBBP, IBBBP, IBBBBP - B and P frames are used.
	The structure determines whether an I-frame is followed by P-frames (Predictive coded picture) or B-frames (Bi-predictive coded picture).
Advanced Encoder Setti	ngs
СРВ	Specifies the coded picture buffer (CPB) as specified in the HRD model in milliseconds.
	Note that the Buffering latency in the Decoder side should correspond to the CPB size.
	Larger values of CPB will produce higher picture quality at the expense of increased latency.
	Internally, the initial delay will automatically be set to CPB/2.
Qmin, Qmax	The Min/Max values of Q. Q is used in the encoding process the quantize the DCT/DST coefficients. Q varies between Qmin and Qmax to adjust continuously the current bitrate.
	Higher values for Qmin will degrade picture quality.
	Lower values of Qmax will increase picture quality.
	Both values directly affect the bitrate of the encoded stream.
	Recommended values are:
	Qmin: 2-5
	Qmax: 40-51
Max Pic Size	In CBR mode only, limits the maximum frame size thus allowing to curtail the size of each encoded frame. Valid values are between 2-5000. 0 disables the max_pic_size algorithm.
	Recommended values:
	Max_pic_size = (Bitrate[Kbit]/Fps) * Overhead
	Overhead = $[1.1 - 6]$
	Example:
	Bitrate = 10,000Kbit
	Fps = 60
	Overhead = 1.5
	Max_pic_size = (10000/60) * 1.5 = 250Kbit (Per frame)
Default	Presets to configure advanced encoder settings.
Weak Limit	In all presets the target bit rate will be honored.
Hard Limit	Default – No hard limit on encoded frame size.
	Weak Limit – Encoded frame size will be slightly limited.
	Hard Limit – Encoded frame size will be strictly limited.
Audio Encoder Settings	
Audio source	The interface used to input audio signals into the encoder:
	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
Audio Encoder Settings Audio source Audio enable	 Weak Limit – Encoded frame size will be slightly limited. Hard Limit – Encoded frame size will be strictly limited. The interface used to input audio signals into the encoder: HDMI Audio for encoding is taken from HDMI (Embedded audio). LINE IN Audio for encoding is taken from LINE-IN, gen-locked to video. If checked, encoded stream will include audio



Detected sample rate	The detected audio sampling rate used. Note: Only 48 KHz,44.1Khz and 32Khz are supported for HDMI audio, and 48Kh for Line-in.
Bit rate	The bit rate of the encoded audio . Valid values are between 64,000 and 256,000 bps. Default is 80,000 bps. In LPCM16, the audio bitrate is fixed to Fs*16*2, e.g., for Fs = 48Khz, the audio bitrate will be
	1.536Mbit/sec
Coding	The audio compression method:
	• AAC-LC, LPCM16 and OPUS.
	Note: For Low latency encoding, LPCM16 and OPUS is supported.
Streaming Settings	
Streaming mode	The streaming mode selected. The following modes are supported:
	• <u>TS-UDP</u> - Transport Stream over UDP.
	• <u>TS-RTP</u> – TS over RTP/UDP.
	<u>RTP</u> - Real-Time Protocol over UDP.
	<u>RTSP</u> - Real-Time Streaming Protocol.
	<u>SRT</u> - Secure Reliable Transport streaming protocol
	<u>RTMP</u> – Real Time Messaging Protocol
	Details on configuring the individual streaming modes are found in the following section.

4.3.1 Advanced Video Settings

During the encoding process many internal state variables are updated to achieve the target bitrate.

The user can prioritize picture quality at the expense of higher instantaneous bitrates or strict bitrate at the expense of lower picture quality.

The parameter exposed to the user are:

- 1. **Qmin**,**Qmax** the range within Q can vary. Q is used to quantize the coefficient of the DCT/DST. Lower values of Q will produce a more accurate representation of the coefficients but will consumes more bits per coefficient.
- 2. **Maximum picture size** The maximum size of a compressed frame. Used to curtail the frame size in applications where strict bitrate is important. Setting it **0** will disable the maximum picture mechanism.
- **3. CPB** Coded Picture Buffer in milliseconds. Larger values will enable more flexibility to the RC (Rate Control) algorithm to produce higher video quality while honoring the target bitrate at the expense of higher encoding latency.

4.3.2 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, scaling setting. For example, if the minimum bitrate for 2160p60 is 4000 Kbps, then the minimum bitrate for 2160p30 (a 50% reduction in frame rate) will be 2000 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)
480p59.94	500	60000
576p50	500	60000
480p60	500	60000
576p50	500	60000
720p60	800	60000
1080p60	1000	60000
2160p60	4000	60000

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

Table 13: Recommended Bitrates for HEVC

Video Decelution	Video Quality (kbps)		
video Resolution	High	Medium	Low
3840x2160@60p	40,000-60,000	16,000-8,000	8,000-4000
1920x1080@60p	10,000-15,000	4,000-2000	2,000-1000
720x480@60p	4,000-6,000	1,600-800	800-400

4.3.3 Streaming Modes

The XVC-ULTRA Encoder supports the following streaming modes:

- <u>TS-UDP/TS-RTP</u> Transport Stream over UDP.
- <u>RTP</u> Real-Time Protocol over UDP (Only RTP supports Ultra Low Latency streaming).
- <u>RTSP</u> Real-Time Streaming Protocol.
- <u>SRT</u> Secure Reliable Transport streaming protocol.
- <u>RTMP</u> Real Time Messaging Protocol.

4.3.3.1 TS-UDP/TS-RTP Streaming

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

Streaming Settings		TS-UDP Streaming
Streaming mode	TS-UDP 🔻	
MPEG2TS destination IP	192.168.217.52	
MPEG2TS destination port	4000	
MPEG2TS stream URL	udp://@192.168.217.5;	
MPEG2TS stream URL	udp://@192.168.217.5;	

Figure 13: TS-UDP Streaming Fields

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

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.		

Table 14: TS-UDP Streaming Field Descriptions

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.

4.3.3.2 RTP Streaming

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

Streaming Settings		RTP Streaming
Stream enable		
Streaming mode	RTP	T
Video RTP destination port	29000	
Audio RTP destination port	29008	
RTP destination IP	239.240.240.250	
MTU	1500	
	Download :	SDP File

Figure 14: RTP Streaming Fields

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

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.	
MTU	Set MTU (Maximum transmission unit) size. Maximum size is 1500.	
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.	

Table 15: RTP Streaming Field Descriptions

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)

4.3.3.3 RTSP Streaming

RTSP supports streaming to a single client in unicast, or to multiple clients in multicast. When a RTSP session is **active** in unicast mode (e.g. a player is receiving a steam from the encoder), other requests to join, will be refused.

In RTSP Multicast, many clients can join the same session. The total bitrate produced by the encoder is equal to the bitrate set regardless of the amount of clients receiving the sream.

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



Stream enable		RTSP Streaming
Streaming mode	RTSP	
RTSP port	2000	
RTSP stream name	hhju	
Multicast streaming		
RTSP stream URL	rtsp://192.168.10.117:2000/hhju (Сору

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.
Multicast Streaming	If checked, the encoder will send a multicast RTP stream. This will enable multiple players to join the same session without having the encoder to duplicate the stream. Note, if multicast steaming is disabled, the encoder will send a unicast stream to a single destination. A maximum of two unicast destinations is supported. (Up to two players can join the session)
RTSP stream URL	The URL address is generated automatically by the encoder, and it should be copied to the video decoder / player.

4.3.3.4 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

Sectings		
Streaming mode	TS-SRT	V
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	

Streaming Settings		والترجيح الالت
Streaming mode	TS-SRT	
SRT Mode	Listener	
Listener port	8118	
Latency (ms)	20	
Max Overhead B/W (%)	20	
Encryption	AES-256	·
Passphrase	•••••	
TS-SRT stream URL	srt://@192.168.10.235	Copy

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



4.3.3.5 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)

Streaming Settings		
Stream enable	V	
Streaming mode	RTMP	*
RTMP URL		
RTMP key		
RTMP authentication		
RTMP stream status		

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:

Entry	Description		
System Settings Displays firmware version information.			
Time & Date	Used to set the system time and date.		
<u>Network</u> <u>Configuration</u>	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.		

Table	17:	System	Settings	Menu	Entries
			0000000		

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.

🛆 Video Input	Firmware Version		
幸 Channel Settings	Appl rtsp_121		
Channel 1	Kernel 5.4.0-xilinx-v2020.1 U-Boot 2018.01.XH.1.05-00075- <u>c</u>		
③ System Settings	FPGA UE0-01.01.03		
🖾 System Status			
(i) About	Detect Unit		
🖒 Reboot	Status LED Toggle Blink State		
	Refresh		

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.

2	Video Input	Time
華	Channel Settings	System Uptime 1 day
0	System Settings	System Time 08/04/2023 03:03 NTP √
	😰 Time & Date	NTP server pool.ntp.org Time Zone (GMT 00:00)
	* Network Configuration	Daylight saving time
	🖻 User Management 🛛	Save
	🗘 Firmware Upgrade	

Figure 18: Time & Date Page

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

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.

Table 19: Time	& Date Field	Descriptions
----------------	--------------	--------------

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.

	Network Configuration
🕰 Video Input	IP Address 192.168.10.117 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:d8:34:00:01:31 Ignore ICMP Echo
 Time & Date Network Configuration User Management 	802.1X Configuration Enable User test Password •••••••
 ✓ Firmware Upgrade ≦ Licensed Features ☑ System Status 	SSDP Configuration
About	Save Refresh Network Diagnostics Destination IP/Domain Ping results Clear

Figure 19: Network Configuration Page



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

Table 20: Network Configuration Field Descrip	tions
--	-------

Field	Description	
Device Network Configu	ration	
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:	
	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 <u>IP address</u> 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 (<u>router</u>) 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.	
802.1x Configuration		
Enable	If checked, 802.1x is enabled	
User	Username for 802.1x	
Password	Password for 802.1x	
SSDP		
Enable	If checked, SSDP (Simple Service Discovery Protocol) is enabled. The unit will be discovered by ssdp clients such as windows (File Explorer->Network)	
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 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.

മ	Video Input	Web Interface User
뷖	Channel Settings	Use HTTP Authentication 🗸
Ø	System Settings	User name admin Letters, numbers, and underscores. 5-15 characters.
	📅 Time & Date	Password Only letters and numbers, 7-15 characters.
	➡ Network Configuration	
	💼 🛛 User Management	Save
	≦ Licensed Features	

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.

🛆 Video Input	Current Software Version
😅 Channel Settings 🛛 🔻	Application rtsp_121
Channel 1	Kernel 5.4.0-xilinx-v2020.1 U-Boot 2018.01.XH.1.05-00075-ç
③ System Settings	FPGA UE0-01.01.03
😰 Time & Date	Firmware Version Upgrade
* Network Configuration	Select firmware image file Choose File No file chosen
💼 User Management	
🗘 Firmware Upgrade	
Licensed Features	

Figure 21: Firmware Upgrade Page

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

Field	Description					
Current Software Version	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.					

Table 22: Firmware Upgrade Field Descriptions

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.

Dpen 🛛						×
← → × 📙 > Thi	is PC > Documents > Hevc version > v1.1	.5		✓ ♂ Search v1.1.	5	م
Organize 👻 New folde	r					•
Quick access Desktop Downloads Documents Pictures Test report HW v1.1.5 version 1.1.2 XVTEC OneDrive This PC 30 Objects Desktop Desktop	Name xvc-hevc_reL_XVTEC_v1.1.1.img xvc-hevc_reL_XVTEC_v1.1.2.img xvc-hevc_reL_XVTEC_v1.1.5.img	Date modified 12/24/2018 3:47 PM 12/24/2018 3:47 PM 12/24/2018 3:47 PM	Type Disc Image File Disc Image File Disc Image File	Size 46,968 KB 46,968 KB 46,968 KB		
File <u>n</u> a	ame:			 All Files 		~
				<u>O</u> pen	▼ Can	cel

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.
- 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.



🛆 Video Input	Features
幸 Channel Settings ▼	AVC Enabled
Channel 1	HEVC Enabled UHD Enabled
③ System Settings	ULL Enabled 420/8bit Enabled
🛱 Time & Date	422/10bit Enabled
🗯 Network Configuration	Unload License File
🖻 User Management	Choose File No File Chosen
${\cal O}$ Firmware Upgrade	Upload
🕍 Licensed Features	
D System Status	Refresh

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.

Ω	Video Input		\sim	\sim		
茎	Channel Settings		(\mathcal{O})	(X)		
0	System Settings		Website xvtec.com	Customer Support		
	😭 Time & Date					
	🗢 Network Configuratio	n				
	🖶 User Management					
	🗘 Firmware Upgrade					
	설 Licensed Features					
Þ	System Status					
(1)	About					
	à Legal Info					
0	Reboot					

Figure 27: About Page

The About page provides access to the following resources:

- The XVTEC website at xvtec.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.

Ø	Video Input					
			Package	Ver	License	URL
-	Channel Settings		Kernel	4.14	GNU GPLv2	https://www.kernel.org
0	System Settings		U-Boot	2018.01	GNU GPLv2+	https://www.denx.de/wiki/U-Boot/
	🔊 Time & Date		ffmpeg	2.5.11	GNU LGPLv2.1+	https://www.ffmpeg.org
	🗢 Network Configuratio	n			GNU GPLV2	
	🖻 User Management		Alsa-lib	1.1.5	GNU LGPLv2.1	https://www.alsa-project.org/main/index.php/
	C) Firmware Upgrade		libconfig	1.4.9	GNU LGPLv2.1	https://hyperrealm.github.io/libconfig/
			thttpd	2.25b	Proprietary	http://www.acme.com/software/thttpd/
	Licensed Features				(2 clauses BSD like)- Free	
Þ	System Status		Bootstrap	4.1.3	MIT	https://getbootstrap.com/
Ì	About		qdecoder	12.0.4	Proprietary (2 clauses BSD like) - Free	http://www.qdecoder.org http://wolkykim.github.io/qdecoder/
	🚵 Legal Info		busybox	1.24.1	GNU GPLv2	https://busybox.net/
	TVTEC Legal		tcpdump	4.9.2	BSD	http://www.tcpdump.org/
	@ 055		libpcap	1.8.1	BSD	http://www.tcpdump.org/
	Certifications		monit	5.25.2	GNU AGPLv3	https://mmonit.com/monit/
			libcurl	7.60.0	MIT/X	https://curl.haxx.se/
0	Reboot		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 <u>Reboot</u> 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 <u>DHCP-allocated IP address</u>

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*.

Status	STAT LED Behavior	Encoder Behavior					
Normal temperature	Green	Normal					
Fan failure	Red	 Fan failures: 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. Repowering is required.					

Table 23: Overheating Conditions



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 connecter 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. <u>Enter the IP address of the encoder unit in the address bar</u> of your browser to display the Recovery page, as shown in the figure below:

Red	covery page
Recovery Version	
Recovery version	
Device Network Configuratio	n
Device Name	xvchevc_C0D834000007
IP Method	Static
IP Address	192.168.217.230
Netmask	255.255.255.0
Default Gateway	192.168.217.254
DNS Server 1	
DNS Server 2	
MAC Address:	
Save	
Firmware Version Upgrade	
Select firmware image file	Choose File No file chosen
() Reboot	

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.

his	PC > Documents > Hevc version > v1.1	1.5		V Ö Search v	1.1.5	۶
er					8:: •	(
	Name	Date modified	Туре	Size		
	xvc-hevc_rel_XVTEC_v1.1.1.img	12/24/2018 3:47 PM	Disc Image File	46,968 KB		
	xvc-hevc_rel_XVTEC_v1.1.2.img	12/24/2018 3:47 PM	Disc Image File	46,968 KB		
	xvc-hevc rel XVTEC_v1.1.5.img	12/24/2018 3:47 PM	Disc Image File	46,958 KB		
	me:			~ All Files		,

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.
- 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 1 to 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.

TTC XVTEC N	Aanagement Tool									- 0	×
Device A	Advanced Abou By svice Type Encod	ut Jer v	 IP Address range 	From: 192.168.1.	1 To: 192.168.1.10	0	Last Di	scovered Time:	12:14:24	Refresh device li	st
Device	Device Name	IP Method	IP Address	Subnet Mask	Default Gateway	MAC Address	State	FW version	Bitrate	Video Input	_
decoder	xvc100	static	169 . 254 . 17 . 16	255 . 255 . 0 . 0	169.254.1.1	84:7e:40:f8:11:10	online	FW DEC V2			
decoder	xvc100	static	10 . 0 . 0 . 181	255 . 255 . 255 . 0	10.0.0.138	84:7e:40:f7:b3:84	online	FW_DEC_AK			
encoder	xvc100	static	10 0 . 0 . 222	255 . 255 . 0 . 0	10.0.0.1	84:7e:40:ef:0b:b0	online	FW_ENC_V6	9500 9500	e HDMI1 🛢 H	DMI2
encoder	xvc1003zz5	static	10 0 . 0 . 180	255 . 255 <u>255</u> Q	10 0 0 138	e4:7e:40:eb:77:d4	online	FW_ENC_V5	1000 1000	e HDMI1 💿 H	DMI2
encoder	xvc100	static	10 0 . 0 . 220	255 . 255 Launch	web browser	4:7e:40:ed:49:d0	online	FW_ENC_V6	4000 2000	• SDI1 • 5	SDI2
encoder	xvc100	static	10 . 0 . 111	255 . 255 Set web	interface User/Password	0:39:72:68:c7:44	online	FW_ENC_V6	1500 750	• HDMI1 • H	DMI2
encoder	xvc100	static	10 . 0 . 212	255 . 255 Set IP		9:72:68:c7:10	online	FW_ENC_V6	2000 2000) • HDMI1 • H	DMI2
			Right-Click	Locate - Reboot Remove	toggle blink LED	Select to F	Reset l	<mark>Jser/Pas</mark>	sword		
						Numb	er of managed d	levices: 7	Status: OK		

Figure 38: Resetting the User/Password

- 2. Find the row in the table associated with your encoder. Right-click on the row, then select **Set web interface User/Password**.
- 3. 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] HzFHD:1920x1080p [23.97, 24, 25, 29.97, 30, 50, 59.94, 60] Hz
	HD: 1280x720p[50, 59.94, 60] Hz,
	SD: 720x576p50 Hz, 720x480p59.94 Hz
	VESA: From VGA to QSXGA
	No interlace support
Scaler	Passthrough (follow input resolution) or Scale to any arbitrary resolution
Output Streams	Up to UHDp60 HEVC or AVC over IP
Video Compression	 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 coding
	Rate control: CBR, Low latency CBR
	Bitrates: from 500 Kbps to 60 Mbps
	Op 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	 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	• 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	1
Ethernet	Eth: RJ45, Ethernet 10/100/1000 Base-T, auto-neg, auto-sense, half/full duplex
Streaming Protocols	TS-UDP: Transport Stream over UDP (Unicast/Multicast)
	TS-RTP: Transport Stream over RTP/UDP (Unicast/Multicast)
	RTP: Real-Time Protocol over UDP (Unicast/Multicast)



	RTSP: Real-Time Streaming Protocol (Unicast single client and Multicast)
	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, SSDP, IPv4, TCP, UDP
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
	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

END OF DOCUMENT