VITEC
VIDEO INNOVATIONS

MGW Diamond

Multi-Channel HEVC and H.264 Portable Encoder

User Manual

Version 1.6

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Contents

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Product Safety and Compliance Information

For product safety and compliance information, please consult VITEC Support Portal at https://www.vitec.com/support/.

CHAPTER 1

About This Manual

In This Chapter

General

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Manual Structure and Use

This manual is structured in a modular format, containing the following sections:

- **MGW Diamond Encoder Overview** (on page 7)

  Describes the MGW Diamond Encoder product, its system requirements, and I/O specifications.
- **Getting Started** (on page 13)

  Describes how to connect to the appliance for the first time.
- **Setup and Operations** (on page 20)

  Describes how to set and configure MGW Diamond Encoder appliance.
- **Firmware Upgrade** (on page 59)

  Describes how to upgrade MGW Diamond Encoder firmware.
- **Decoding MGW Diamond Encoder Video Streams** (on page 63)

  Describes how to set up players to view MGW Diamond Encoder channels playback.
- **Decoding Zixi™ and Pro-MPEG Streams (HEVC and H.264)** (on page 73)

  Describes how to set up players to view Zixi™ protected channels playback.

CHAPTER 2

MGW Diamond Encoder Overview

In This Chapter

The Product

MGW Diamond is a small, power-efficient quad channel HEVC and H.264 HD/SD video encoder ideal for field-based applications. MGW Diamond features a powerful encoding engine with the abilty to output up to eight streams simultaneously. MGW Diamond is ideally suited to any multichannel application where stringent size, weight and power (SWaP) characteristics are demanded.

In addition to providing H.264 encoding, the MGW Diamond delivers advanced HEVC compression allowing users to stream HD/SD video (up to 1080p60) with up to 50% bandwidth savings compared to current H.264 standards.

The MGW Diamond supports simultaneous encoding and streaming of analog and SDI sources, KLV / STANAG metadata ingest from various sources (SDI/IP or Serial), real-time video scaling, reliable stream transport (Zixi), and JITC compliant output streams.

The MGW Diamond Encoder system package includes:

- The MGW Diamond Encoder appliance
  - MGW Diamond 4 channels - P/N 17338
  - MGW Diamond 2 channels - P/N 17245
- International AC/DC Power Supply – P/N 16957
- 1x Breakout cable for analog audio inputs (x4), Talkback audio output and Serials (x4) – P/N 17239
- 4x HD-BNC to BNC cable
- A quick start guide to connect to MGW Diamond web interface.

System Requirement

Operating System:

- Microsoft ® Windows 2003 ®
- Microsoft ® Windows 2008 ®
- Microsoft ® Windows 2012 ®
- Microsoft ® Windows 7 ®
- Microsoft ® Windows 8.0 / 8.1 ®
- Microsoft ® Windows 10.0 ®
- Apple ® MAC OS ® 10.8 or higher.

Internet Browser:

- Edge 38 ® or higher
- Internet Explorer 11 ® or higher
- FireFox 36.0 ® or higher (Windows and Mac)
- Safari 9.0 ® or higher (Mac)
- Google Chrome™ 49.0 or higher.

I/O Specifications

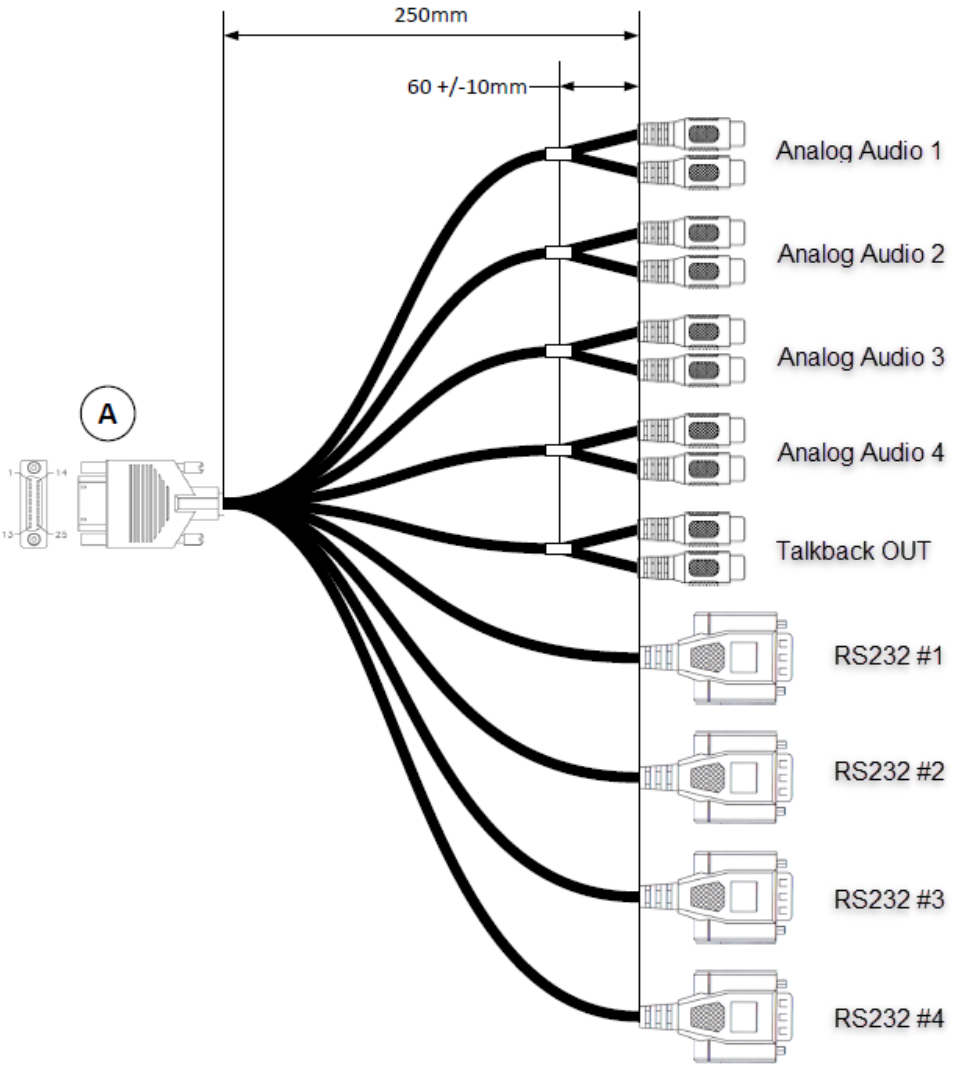
MGW Diamond Encoder Front Panel

LED/ Port	LED Status	Description
Power LED	• Off • Green • Blinking green (once per second) • Blinking green (twice per second)	• The appliance is off • The appliance is up and ready • The appliance is starting • The appliance is being upgraded.
Stream LED	• Off • Green	• No stream • Streaming
Video In LED	• Off • Green	• No video input • Video input is detected on one or more interfaces.
Error LED	• Off • Blinking red (once per second)	• All services are up and running • An error has been detected.
USB Port		USB connection for retrieving network parameters.
Reset		A short press will restart the appliance. A long press (6 seconds) will return the unit to factory settings (erasing all user-stored channel and network settings). Pressing for 2-3 seconds while powering the appliance will re-load the last known good firmware.

MGW Diamond Encoder Rear Panel

Label	Connectors	Description
SDI/CVBS 1	BNC	SDI input (3G/HD/SD) or Composite input. 3G-SDI is compliant with SMPTE 425-A
SDI/CVBS 2	BNC	SDI input (3G/HD/SD) or Composite input. 3G-SDI is compliant with SMPTE 425-A
SDI/CVBS 3	BNC	SDI input (3G/HD/SD) or Composite input. 3G-SDI is compliant with SMPTE 425-A
SDI/CVBS 4	BNC	SDI input (3G/HD/SD) or Composite input. 3G-SDI is compliant with SMPTE 425-A
12G-SDI (Not enabled)	BNC	SDI input (12G/3G/HD/SD) input. 12G-SDI is compliant with SMPTE 2082
Ethernet 1	RJ-45	Gigabit Ethernet for streaming and management.
Ethernet 2	SFP Cage	Gigabit Ethernet port for either RJ45 or Fiber connectivity over SFP. Contact VITEC technical support or your sales representative for a list of compatible SFP adaptor.
Serial/Audio (not enabled)	Multi-pin connector	Breakout cable for unbalanced audio inputs (x4 stereo), KLV/STANAG serial data ingest (x4 RS232), and Talkback audio.

MGW Diamond Breakout Cable



Connector Label	Connectors	Description
Analog Audio [1..4]	RCA Female	Unbalanced Stereo Analog Audio inputs (line level)
Talkback OUT	RCA Female	Unbalanced Stereo Analog Audio output for Talkback (line level)
RS232 #[1..4]	DB9	Serial for KLV/STANAG data ingest

CHAPTER 3

Getting Started

In This Chapter

Logging on

The MGW Diamond Encoder web interface requires a password to log on.

To log on to MGW Diamond Web Interface:

2. Connect to the MGW Diamond Encoder web interface by entering in your browser's URL field either the default appliance's IP address or the new one you have set, by typing **https://<IP address>.** By default, MGW Diamond Encoder's Ethernet **Port #1** is set to IP address **192.168.1.1** and Ethernet **Port #2** is provided by the DHCP server. The login window appears:

NOTE:

Entering a non-secure "HTTP" prefix will automatically be redirected to the HTTPS URL.

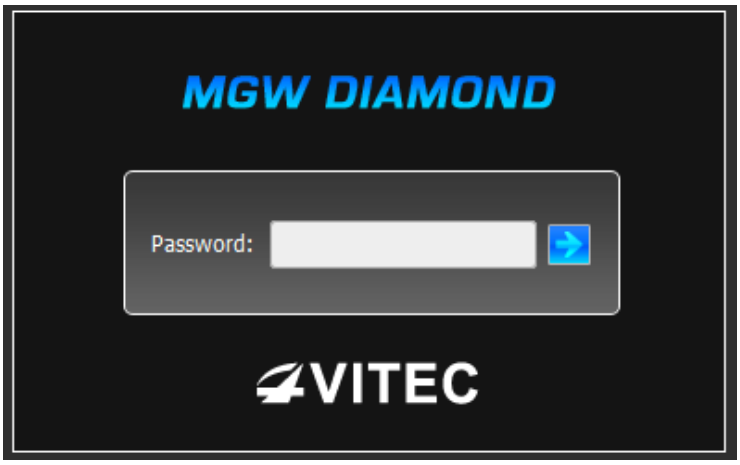


Figure 3-1: MGW Diamond Login window

3. Type the password (the default password is **"1qaz!QAZ"**) and click the blue arrow. The MGW Diamond web interface is loaded.

Initial Connection and IP Setup

The MGW Diamond Encoder is configured, by default, to use a fixed static IP address for its Ethernet Port 1 Use the default **192.168.1.1** IP address to perform initial login from a computer connected directly to the platform.

Ethernet Port 2 is by default configured in DHCP mode.

To configure the appliance's network settings for the first time from a web browser:

1. Connect a power source to the rear power input port.
2. Connect the network port labeled "Ethernet 1" to a computer in the **192.168.1.x** range with subnet **255.255.255.0** and ensure you can ping the default IP address of the unit to **192.168.1.1.**
3. Either use an Internet browser or open an SSH terminal.

To configure the appliance's network settings for the first time through the browser:

1. Type the appliance's IP address in the URL field. The login window appears.

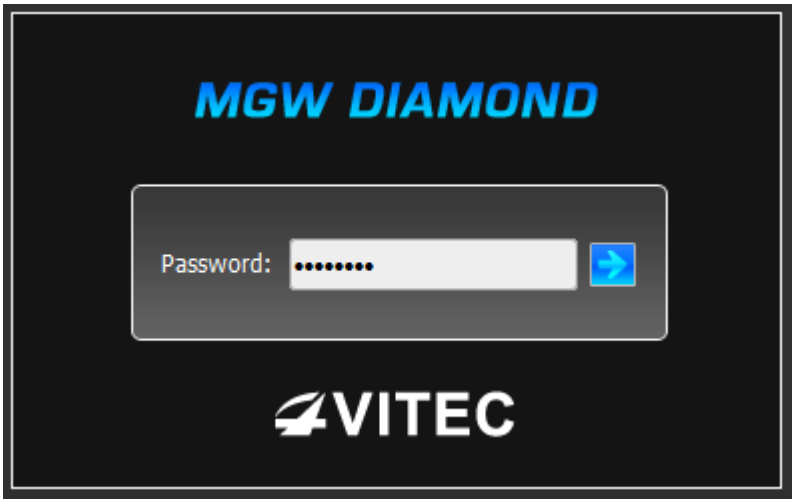


Figure 3-2: MGW Diamond Login window

2. Type the password (the default password is **"1qaz!QAZ"**) and click the blue arrow. The MGW Diamond web interface is loaded.

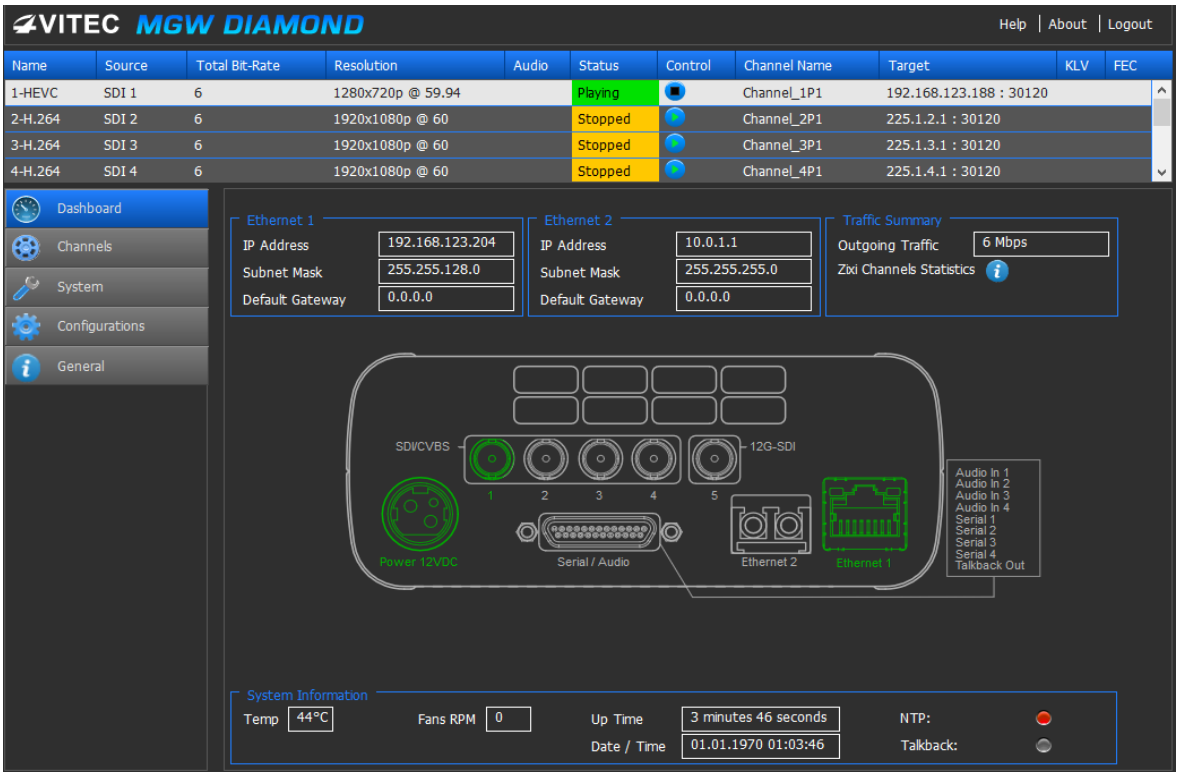


Figure 3-3: The Dashboard page

3. From the main menu, select **System.** The system page opens.

Figure 3-4: The System page

Set the following parameters and click **Apply.**

CAUTION:

When you change the unit's IP address to use a different subnet you may need to reconfigure your computer network settings to re-connect to the appliance.

Parameter	Description
IP Address	Enter a static IP/Prefix address.
Subnet Mask	Enter the subnet mask address.
Default Gateway	Enter the gateway/v6 address
IPv6 Address auto/ Prefix	A static IP/Prefix address is retrieved automatically from a DHCP server.
IPv6 Address manual/Prefix	Enter a static IP/Prefix address.

To configure the appliance's network settings for the first time using an SSH client:

1. Open an SSH terminal window (PuTTY is the recommended tool).
2. Connect to the MGW Diamond IP address.
3. At the login prompt, type "**user**", and at the password prompt type the password (the default is "**1qaz!QAZ**").
4. To set up network parameters, type "**network**" to configure the applicable settings.
5. To display the available commands using SSH, type "**help**". See the figure below for the available commands:

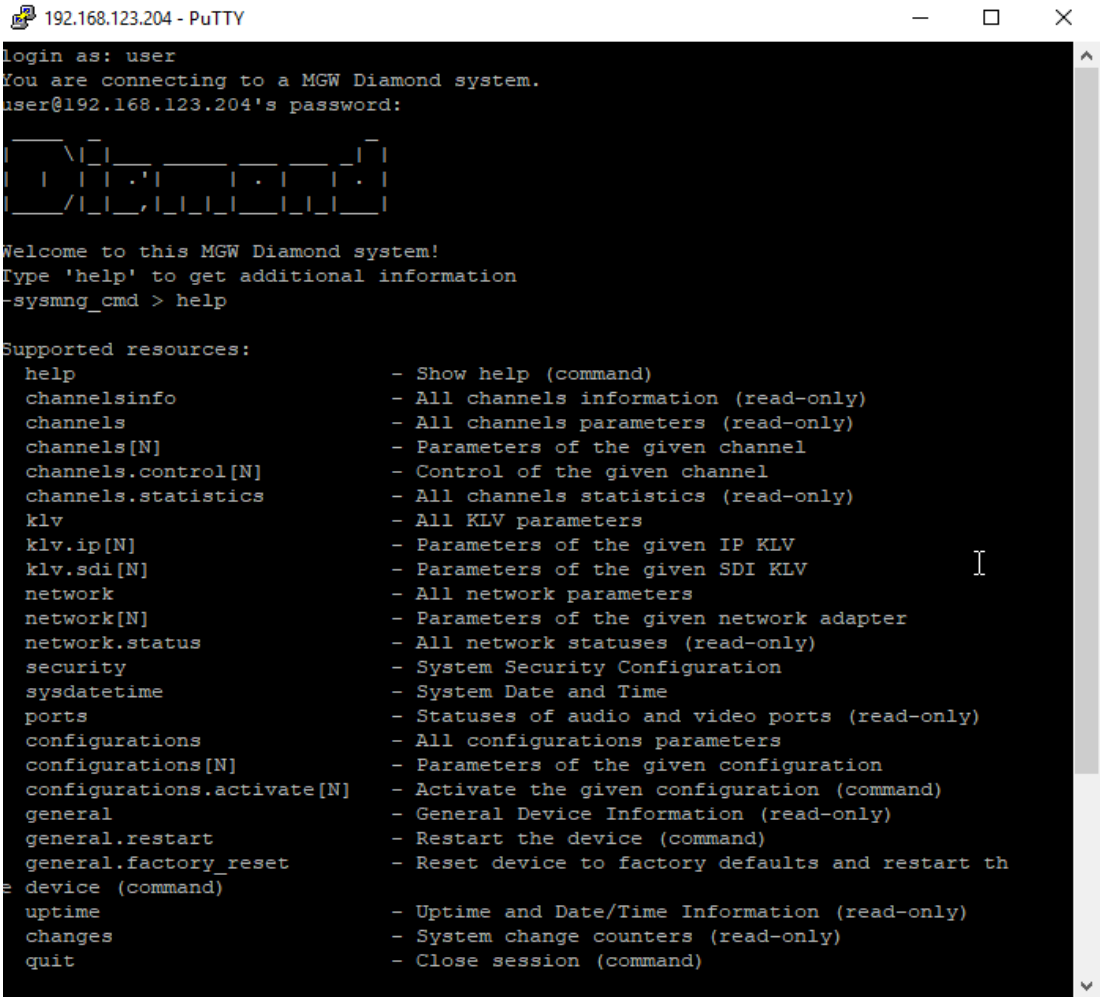


Figure 3-5: Help Commands for SSH

NOTE:

The SSH API documentation is available at this location: **https://IP_Adress/clidoc.pdf**.

Retrieving or Setting Network Parameters through a USB Thumb Drive

To Retrieve Your Network Parameters through a USB Thumb Drive (When MGW Diamond Encoder IP Address is Unknown):

6. Turn MGW Diamond Encoder OFF.
7. Allocate a USB thumb drive, ensure it is empty of any other files and insert it to MGW Diamond Encoder USB port.

NOTE:

USB thumb drive with FAT32 file system must be used.

8. Connect the network cable to MGW Diamond Encoder Ethernet port.
9. Turn MGW Diamond Encoder ON. The network setup file **"EncoderNetworkSettings.txt"** is being copied from the appliance to the thumb drive. Wait for complete boot of the system.
10. Remove the USB Thumb drive from the appliance, and insert it to a PC.
11. Open the **"EncoderNetworkSettings.txt"** file in the USB thumb drive using any text editor program.
12. Read the IP address from the file.
13. Enter the read IP address in the Internet browser URL field. The Log on window appears.
14. Log in.

To Set Network Parameters through a USB Thumb Drive:

15. Either obtain the **"EncoderNetworkSettings.txt"** from VITEC Online Support Portal. This file contains the default IP address of **192.168.1.1,** and open it using any text editor program.

    - or -

    Retrieve the IP address from MGW Diamond Encoder by repeating steps 1 through 9 as described in the section above.
16. Modify any of the listed network parameters, as required, and save the changes.
17. Eject the USB thumb drive properly from the PC and insert it to the MGW Diamond Encoder USB port.
18. Turn MGW Diamond Encoder *ON.* When the boot process is completed, MGW Diamond Encoder will be set to the new IP addresses.

19. Enter the IP you have set to the Internet browser URL field. The Log on window appears.
20. Log in.
21. Save the file (either on a USB thumb drive or any other place of your choice for future reference. In case MGW Diamond Encoder IP address becomes unknown and needs to be retrieved, this file will be used.

CHAPTER 4

Setup and Operations

In This Chapter

Using the MGW Diamond Interface

MGW Diamond Functions

The followings are available at all times (regardless which menu item is selected):

- **Dashboard Frame** - top of page from which channels are controlled and monitored. Rows represent the H.264 or HEVC channels. Up to 4x 1080p60 channel instances can be each configured with its own input, encoding standard (H.264 or HEVC), bitrate, resolution, frame rate. Those 4x1080p60 channels can be split in a Primary and Secondary stream for a total of eight stream output (each stream can be configured with its own encoding standard - H.264 or HEVC - bitrate, resolution, frame rate).
- **Menus** – Provide a centralized access to monitor, configure and control the MGW Diamond Encoder.
- **Help** – An inline help manual.
- **Logout** - Allows you to log out of the application.

The Main Menu

The MGW Diamond Encoder main menu includes the following items:

- **Dashboard** - view high level channels summary, platform information, network traffic and Zixi™ statistics.
- **Channels** - view and set compression and streaming parameters: source, processing and target.
- **System** - view and set appliance's parameters such as date and time, network, KLV inputs, login information.
- **Configurations** - allows saving and loading of channel configurations.
- **General** - view system information such as software and hardware versions, serial numbers, and the ability to upgrade firmware and license.

Dashboard Frame

In the dashboard frame section, you can view the current source type, data rate and the compression format selected for each stream, as well as start/stop streams.

MGW Diamond features up to 4x1080p60 channels, each one can be split in a primary and a secondary stream for a total of 8 streams output.

CH	Description
1-H.264 Or 1-HEVC	HEVC or H.264 Primary channel – Supports 4:2:0/4:2:2 encoding up to 1920x1080p60 using various resolutions, frame rates and other compression settings. Streaming protocols include UDP, RTP, ProMPEG FEC, and Zixi™ stream protection.
1S-H264 Or 1S-HEVC	HEVC or H.264 Secondary channel. Resolution, frame rate, and compression settings of this channel depend on the selections made in channel 1. If the same compression standard (1-H.264/HEVC) is used, then total pixel count processed between both channels cannot exceed 1920x1080x60 FPS. Available options for channel 2 are automatically presented after channel 1 settings are applied.

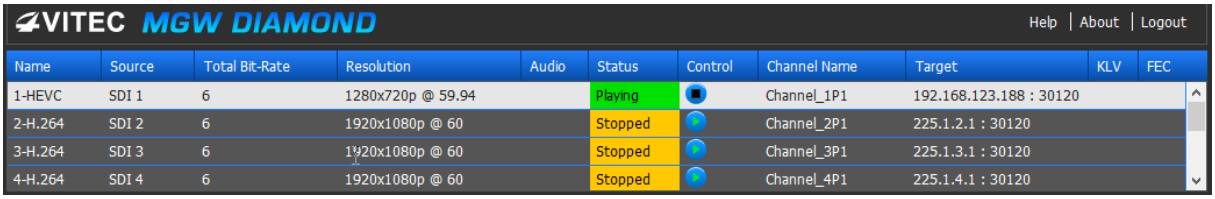


Figure 4-1: The Dashboard Frame

Parameter	Display	Description
CH	1-H.264…4S-H.264	Displays the channel number and the compression format
Source	3G/HD/SD-SDI or Composite	Displays the source type assigned to the channel.
Total Bit-Rate	Bit-rate in Mbps	Display the total bit-rate of the channel (Video+Audio+KLV Metadata+streaming protocol overhead). This value doesn't include additional overhead required when using ProMPEG Forward Error Correction or Zixi™ protection.
Audio		Indicates if audio is being inserted into the stream.
Status	• Playing • Stopped • Error	• **Stopped** – **Orange**. The settings for this channel are configured, but the channel has not been activated by the user. • **Playing** – **Green.** The channel is being streamed without any known errors. • **Error** – **Red**. The channel has encountered an error.
Control	 Play/Stop	**Play/Stop** - allows to start or stop a channel. Displays the channel status, allow you to change it, as well as preview the channel and view its related events.
Channel Name		Displays the channel name as set by the user.
Target	• Multicast or • Unicast IP	Displays the target IP address.
KLV		Indicates if KLV metadata is being inserted into the stream (enabled or disabled).
FEC	• Zixi • Pro-MPEG	Displays the selected error correction technology. Applicable only when either Zixi™ or Pro-MPEG are selected. Will be left blank when other streaming protocols are used.

The Dashboard Page

The **Dashboard** page is the main page displaying the appliance's view and displays network information for both network interfaces as well as an overall traffic summary.

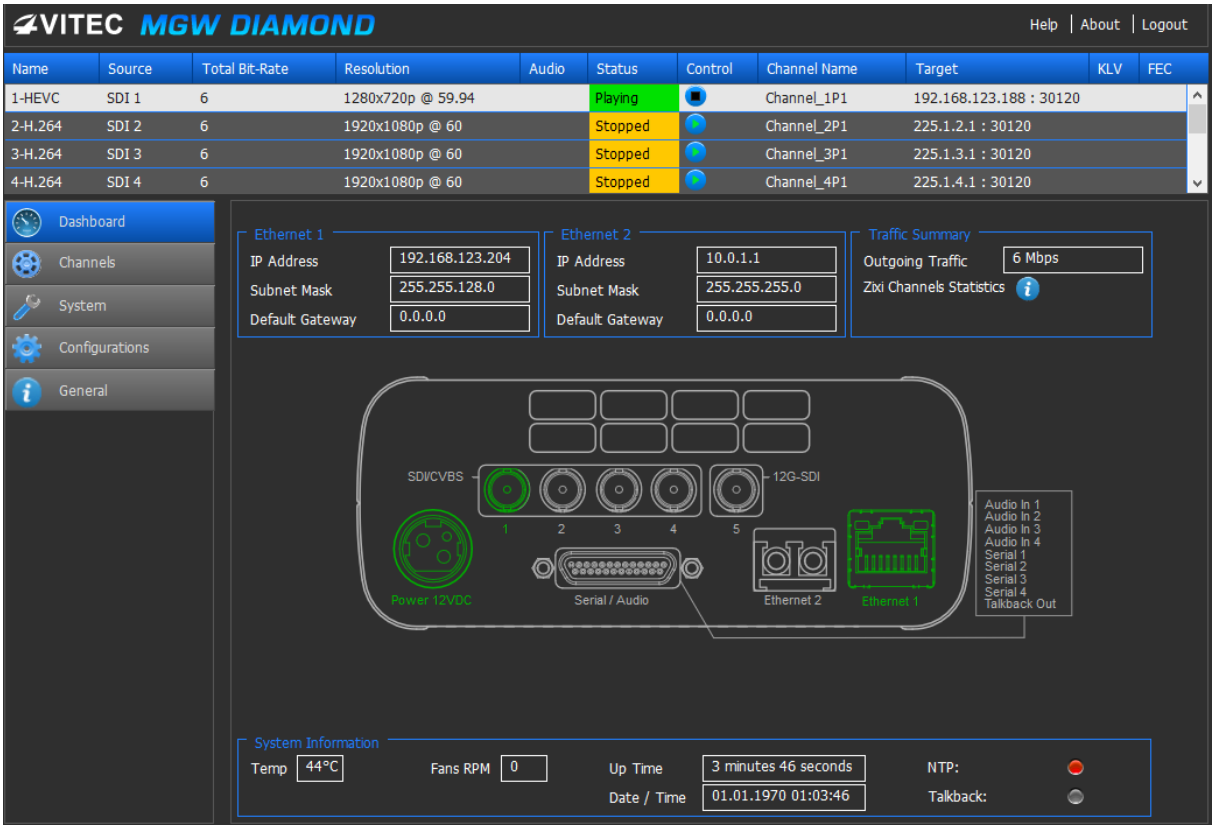


Figure 4-2: The Dashboard page

Active interfaces appear in green. Idle or disconnected interfaces appear gray (see figure above).

To view the dashboard parameters:

1. From the main menu, select **Dashboard.** The following parameters are displayed:

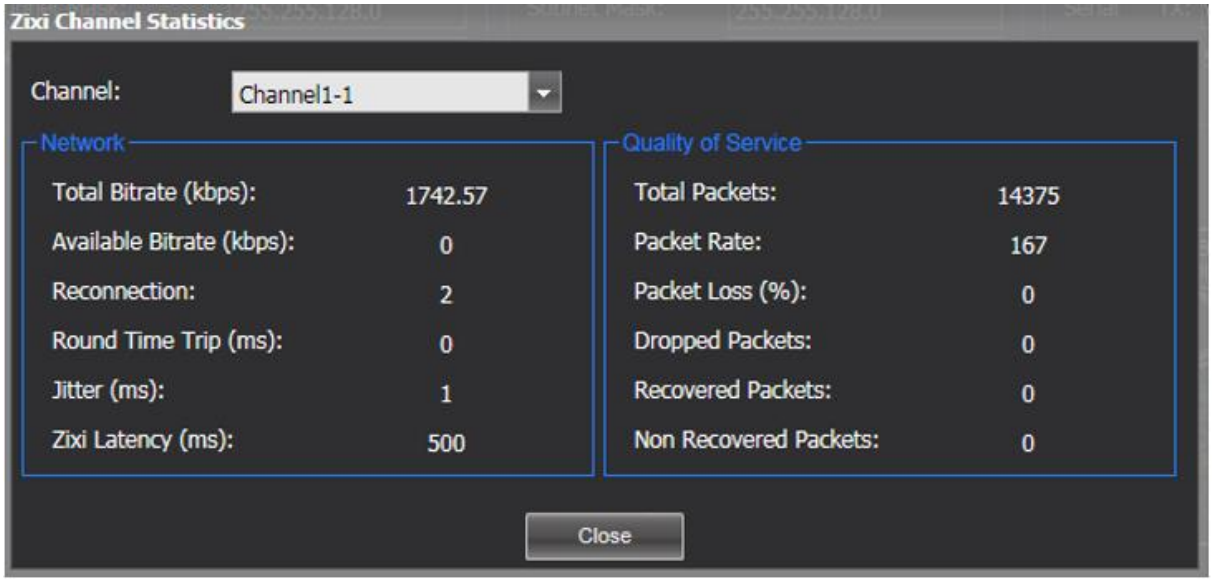
NOTE:

The Dashboard page automatically polls the appliance hardware for the latest status of channels, streams and sources every 30 seconds. You may also manually refresh the Dashboard page (by either pressing the "F5" key on your keyboard or re-clicking **Dashboard**), to obtain instantly the current state of the system whenever you configure any of the following parameters: streaming/ management interfaces, traffic, or rear panel connections.

Section	Description
Ethernet 1	IP Address – Displays the Network Interface #1 IP address. Subnet Mask – Displays the Network Interface #1 subnet mask address. Default Gateway – Displays the Network Interface #1 Default Gateway address.
Ethernet 2	IP Address – Displays the Network Interface #2 IP address. Subnet Mask – Displays the Network Interface #2 subnet mask address. Default Gateway – Displays the Network Interface #2 Default Gateway address.
Traffic Summary	Outgoing Streams – Actual stream Bandwidth from both Network ports. Zixi Channels Statistics - When a Zixi channel is started, the info button provides detailed Zixi statistics information (see **Zixi Statistics Information** section below)
Rear Panel Connectors	Displays the source inputs of the platform. The following is the indications of the source current connection state: Green – connected Gray – not connected.
System Information	• **Temperature** – Displays the platform's internal temperature in Celsius. The value turns to red when out-of range. • **Fan (%) – Displays fan speed in percentage** • **Up Time** – Displays up-time since the last system boot. • **Date/Time** – Display the platform date and time. • **NTP – NTP** – An indication LED for status of network time server. **Green** - Synchronizing with NTP server. **Red** - Not synchronizing with NTP server or the NTP server is unreachable. • **Talkback** (not enabled)

Zixi™ Statistics Information

1. When a Zixi™ channel starts playing, click the info button. The Zixi™ Channel Statistics window opens:



Parameter	Description
Total Bitrate (kbps)	Current bitrate of the outgoing channel.
Available bitrate (kbps)	• This value is available only when "Enable ABR (Adaptive Bitrate)" is enabled (Error correction setting). • Current available bitrate between MGW Ace Encoder and a Zixi™ broadcaster or VITEC Decoder (MGW Ace Decoder or D265).
Reconnection	Displays the number of reconnection attempts. If this number keeps increasing then the network link is unstable and should be checked.
Round Time Trip (ms)	Two-way delay between the encoder and decoder (RTT).
Jitter (ms)	Network jitter.
Latency (ms)	Stream Latency configured on the encoder side. If the latency set is less than 3 times the Round Trip Time (RTT) value, then Latency value turns red to indicate non-sufficient error recovery buffer size (refer to the note below)
Total Packets	Total number of packets already transmitted
Packet Rate	Current number of packets per second transmitted

Packet Loss	The current percentage of dropped packets between the encoder and decoder (the packet loss is introduced by the network link). Zixi™ allows to recover up to 30% packet loss.
Dropped Packets	Total number of packets dropped between the encoder and the decoder due to the network link. The dropped packets are recovered by Zixi™ technology (see below parameters).
Recovered Packets	The total number of dropped packets that have been recovered on the decoder side since the beginning of the streaming.
Non-recovered Packets	Total number of non-recovered packets since the beginning of the streaming. If the packet loss is lower than 30%, this number should remain to zero, meaning no interruption or decoding artifacts were experienced by the viewer.

Table 4-1: The Zixi™ Channel Statistics

NOTE:

For getting sufficient error-recovery, it is recommended to set the Zixi™ Latency (in Channel / Error Correction) at least 3 times larger than the RTT (i.e Latency >= 3* RTT).

The Channels Page

The Channel section provides a one-page view dedicated to channel configuration. The configuration is designed in three main categories:

- **Source** - select the input video and audio sources to be used for the channel.
- **Processing** - set the encoding video and audio parameters for the channel as required by the application.
- **Target** - Define the transport characteristics of the output stream.
- Each main channel (one to four) can be split into a primary and a secondary channel. The maximal encoding resolution of the primary and secondary channel is 1080p60.

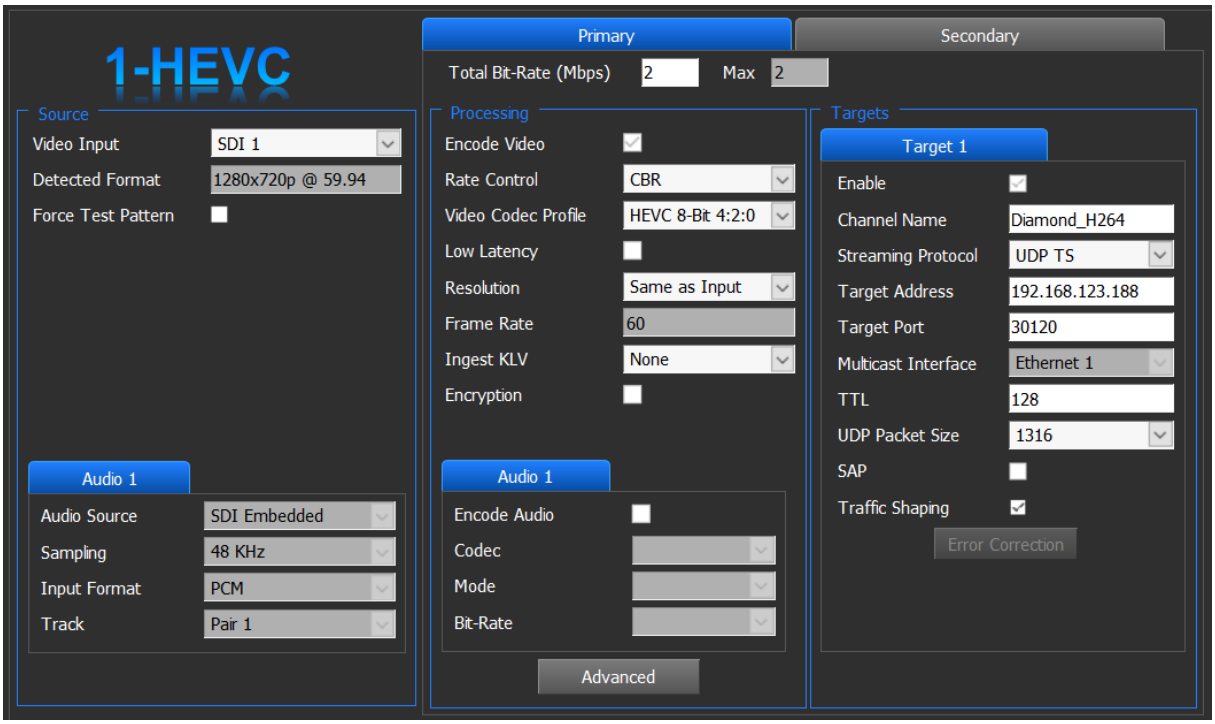


Figure 4-3: The Channels page

To set the channel parameters:

1. From the main menu, select **Channels**.
2. Set the following parameters as required in each section and click **Apply**.

NOTE:

- When switching from HEVC to H.264 (or from H.264 to HEVC), click apply before you adjust any of the **Advanced Settings** fields.
- Fields and optional settings in each one of the sections are automatically adjusted when you switch from HEVC to H.264 channels to display only the settings and the parameters that are applicable to the selected channel.
- A green frame appears when entered value is valid (see figure below).
- A red frame appears when the entered value is not valid.
- To apply changes to one or more fields you must click the Apply button on the bottom right. When exiting the settings screen or starting a channel without applying the settings, the previous settings will apply.

Source Section

Video Parameters	Description
Video Input	Select the active source interface.
Detected Format	Displays the detected video/ audio format.
Force Test Pattern	Select the box to force test pattern (color bar) for testing purposes.
Audio Source	Select the audio source (Embedded or external Analog Audio).
Audio Sampling	Select the audio sampling rate (Analog Audio only).
Audio Tracks	Select the embedded audio pair (SDI Embedded Audio only).

Processing Section

Video Parameters	Description
Total Bit-Rate (Mbps)	Enter the **Total** bitrate value in Mbps Total Bit-Rate and Max in Mbps must be filled out for Capped VBR. Refer to **Rate Control** below for information about each mode. Allocation within the stream for video/ audio bitrate, metadata and transport overhead is automatically calculated by the encoder to match your specific Total Bitrate. The algorithm will maximize allocation for video payload after accommodating for the specified audio bit rate and metadata bandwidth set in the System page. **On-the-fly bit rate change:** MGW Diamond is able to apply changes to the desired stream bit-rate while live streaming is in progress, without stopping the video service. When required, enter the new value in the Total field. Click Apply - the bitrate is adjusted on-the-fly. Note that not all IPTV decoders can handle on-the-fly bit-rate changes and may require stopping and starting the decoding process to recover the video stream after applying the change.
Encode Video	Select the box to enable video encoding.
Rate Control	Select either CBR (Constant Bitrate - which is the default) or Capped VBR (Variable Bitrate) • **CBR** – constant bit rate. The specified value is used as the total. Audio bit rate, streaming protocol overhead and Metadata bandwidth are deducted from the specified value and the remaining bandwidth is allocated towards the compressed video data. • **Capped VBR** – variable bit rate with a cap. The Max value is used to set a ceiling not to be exceeded by the stream. Bandwidth utilization below the Max is dynamically managed by the encoder based on the complexity of the content, amount of motion and range of colors detected during the session.  Within LAN environment, Capped VBR can be used for best end to end latency. Ensure to set a high Max bitrate value and to turn off **Traffic Shaping.**

Video Codec Profile	Select the video codec profile between: H.264: Baseline, Main, High, High 10 (10-bit), High 4:2:2 (10-bit) HEVC: 8-bit 4:2:0; 8-bit 4:2:2; 10-bit 4:2:0; 10-bit 4:2:2.  It is recommended to use 10-bit encoding in any application for best video quality results. 8-bit encoding is provided to ensure compatibility with 8-Bit only decoders.  **WARNING**: Available resolutions and bitrates options vary according to the selected profile.
Low Latency	Select this parameter to ensure optimized the encoding latency. To obtain the best glass-to-glass latency, it is recommended to use a VITEC decoder, such as MGW Ace Decoder, or EZTV. Low latency mode is not available when B frames are used.
Resolution	Select the video encoding resolution. When "**Same as Input**" is selected, the encoder will automatically configure the encoded resolution and frame rate to match the input source resolution and frame rate. If the input source changes while streaming, the MGW Diamond Encoder will automatically stop the channel, re-configure its settings, and re-start the channel using either the newly detected resolution and frame rate (if supported), or if the input resolution is not supported as an output resolution, it will use the closest match to the newly detected source.
Frame Rate	Select the frame rate value.
Ingest KLV	• Select the type of the KLV input to ingest and embed as metadata (based on the KLV input parameters that were set in the **KLV Input** in **System** page). Options are: **None, SDI, IP1, IP2, IP3, IP4, IP1S, IP2S, IP3S, IP4S.**  If you change the Ingest KLV, ensure that the relevant KLV Input is configured in the System page.
Encryption	• Select the box to activate AES Encryption (128 or 256-bit).

Audio Parameters	Description
Encode Audio	Select the box to activate audio encoding.
Audio Codec	Select the audio codec.
Audio Mode	Select the box to enable audio encoding (Stereo, Mono Right or Mono Left).
Audio Bit-Rate	Select the audio encoding bitrate.
Advanced	Select to access the Advanced settings parameters.

Advanced Settings – H.264

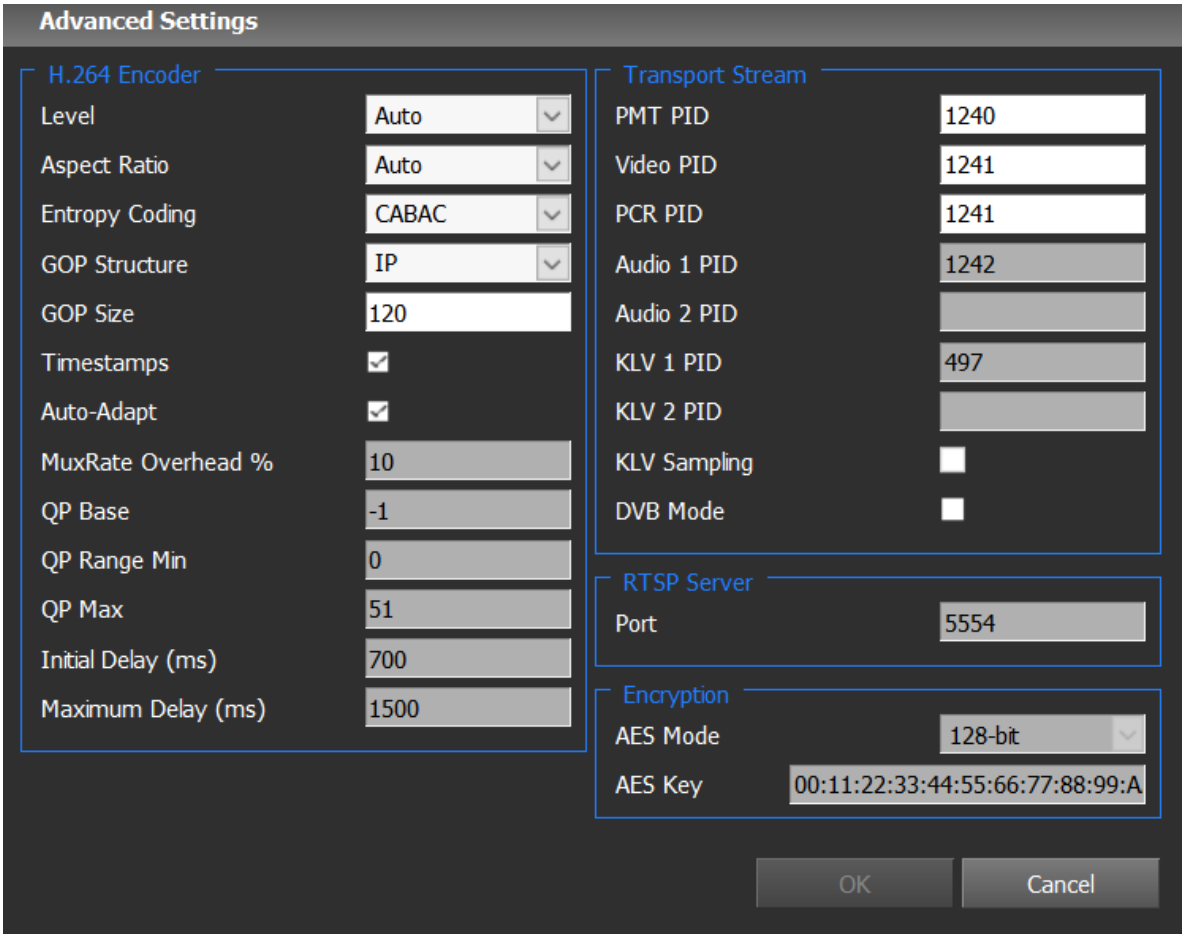


Figure 4-4: Advanced Settings - H.264

1. Click **Advanced Settings** to set advanced processing parameters as follows:

By default, many of the advanced parameters are determined automatically by the system's internal algorithm and are based on the selected resolution, compression format and bit-rate. For certain applications and for unique scenarios you may be able to optimize video quality, latency, and overall behavior of the codec, by manually modifying some of the advanced settings fields. Modifying these advanced settings may also lead to degraded video quality and/or performance in case selected values are not ideal for the selected resolution and bit rate.

We recommend consulting with VITEC Support Team, before switching to manual mode.

- **Level** - The encoding level of the H.264 codec. Choices are 1.0 to 5.1 depending on the Video Codec profile selected.

NOTE:

By decreasing the Level setting, you can improve the end-to-end latency as the decoder takes less time to process H.264 video with smaller Level value.

Note that a lower Level value may impact video encoding quality.

- **Aspect Ratio** – The proportional relationship between the video width and its height. Choices are: Auto, 4:3 or 16:9.
- **Entropy Coding** – The Variable Length Coding is a code that maps source symbols to a variable number of bits. Variable-length codes can allow sources to be compressed and decompressed with zero error (lossless data compression) and still be read back symbol by symbol. Choices are: CABAC (context-based adaptive binary arithmetic coding), or CAVLC (Context-adaptive variable-length coding).
- **GOP Structure** - Specifies the order in which I, P, and B frames are arranged in the video stream. GOP (Group of Pictures) choices are: IP (default), I, IBP, I(2B)P…I(7B)P.

NOTE:

Compression settings may impact video latency. Using B-Frames will improve the quality of the compression, achieving better quality at a given bitrate. However, usage of B-frame will increase latency. To achieve the lowest end-to-end latency, disable B-Frames and use GOP structures with 'I' and 'P' frames only. When B-Frames are not in use, you may decrease the buffer size of your decoder (when configurable in the video decoder settings), to benefit from lower latency without impacting the viewing quality.

- **GOP Size** – The intervals between I-Frames. Range is 1-1000 (default is 30).
- **Timestamps**– The video stream contains time information. If KLV over SDI is used, the precision timestamp from KLV metadata is also inserted in the Video Elementary stream. Select the box to enable time-stamping GOPs.
- **Auto-Adapt** - Select the box to allow the encoder to automatically optimize advanced compression and streaming parameters to the bit-rate you defined for the channel.

NOTE:

Use the manual settings option cautiously. Incompatible combination of parameters that were manually set, may result in a video and audio quality degradation. Consult VITEC Support Team for recommendation on specific settings if you wish to optimize the compression and streaming settings for a specific application.

- **MuxRate Overhead %** - The average amount of null packets relative to the video bitrate while streaming CBR. The default value is designed for reaching the best video quality in typical content. However, this parameter can be changed to achieve the best quality in some other contents. Enter the allocated percentage of the stream for the multiplexer. Range is 1-500.

- **QP Base** - The initial quantization (compression) level value used (range is 1-51). An automatic Qp is used when -1 value is set
- **QP Range Min** - Minimum quantization (compression) value (range is 1-51). When a minimum value is set, the encoder will not use a lower value than specified. This setting is mainly relevant for content with minimal movement where bit rate allocation can be reduced.
- **QP Max** - Maximum quantization (compression) value (range is 1-51). When a maximum value is set, the encoder will not use a higher value than specified. This setting is specifically relevant in motion-intensive scenes where higher bit rate allocation is needed.
- **Initial Delay** (**ms**) - The delay for incoming PTS/DTS relative to PCR (range is 0-5000). This setting enables the control of buffering within the receiver / decoder.

NOTE:

To minimize the end-to-end latency, the initial delay can be reduced to lower values. Such change may impact video quality or encoder bitrate regulation. It is then recommended to allow either a higher bitrate or a higher MuxRate Overhead.

- **Maximum Delay (ms)** - Maximum duration threshold before Access Units (AU's) are multiplexed together. This setting minimizes high bitrate variations (range is 1-1000).
- **Latency Monitoring** – Enable to allow end-to-end latency monitoring when decoding the stream with MGW Ace Decoder. Latency can be monitored within MGW Ace Decoder web interface or via HTTP command.

  If enabled, Timecode input is not captured from SDI input anymore.

- To ensure accurate Latency Monitoring, system date must be synchronized to an NTP server. Ensure to correctly configure the NTP server in System/Date and Time section on both MGW Diamond and MGW Ace Decoder.
- When Latency Monitoring is enabled, SDI timecode (VITC) is no more embedded.

- **PMT PID** – A special identifier of the PMT within the transport stream. The PMT (Program Mapping Table) describes the various services and their PIDs within the transport stream. Default: 1240.
- **Video PID** – A unique identifier of the video service within the transport stream. Only a single video service is available per a transport stream. Default: 1241.
- **PCR PID** – A special identifier of the PCR data within the transport stream. The PCR (Program Clock Reference) data contains clocking information for synchronization between various services. Default: 1241.
- **Audio 1 PID** – A unique identifier of the audio service within the transport stream. Up to two Audio services can be available per a transport stream. Default: 1242.
- **Audio 2 PID** (not available) – A unique identifier of the audio service within the transport stream. Up to two Audio services can be available per a transport stream. Default: 1243.
- **KLV 1 PID** – A unique identifier of the KLV (Key Length Value) metadata service within the transport stream. Default: 497.
- **KLV 2 PID** (not available) – A unique identifier of the KLV (Key Length Value) metadata service within the transport stream. Default: 498.
- **KLV Sampling –** Check the box to sample the KLV frames according to the encoding framerate configured. KLV frames are sampled and synchronized with each encoded frame and transmitted over UDP TS according to MISB 0605.6/0604.4 and STANAG4609 standards. When unchecked, all the KLV metadata frames are captured and transmitted with the Video/Audio stream.
- **DVB Mode** – To be enabled in order to be compliant with DVB standard. At a low bitrate (<1Mbps), enabling this parameter may result in an increased bitrate.
- **RTSP - Server Port** – RTSP Server port.
- **Encryption - AES Mode** – Select between 128 or 256-bit AES encryption mode.
- **Encryption - AES Key** - AES key value available when "Encryption" box is selected. A default key fills the text box.

Advanced Settings - HEVC

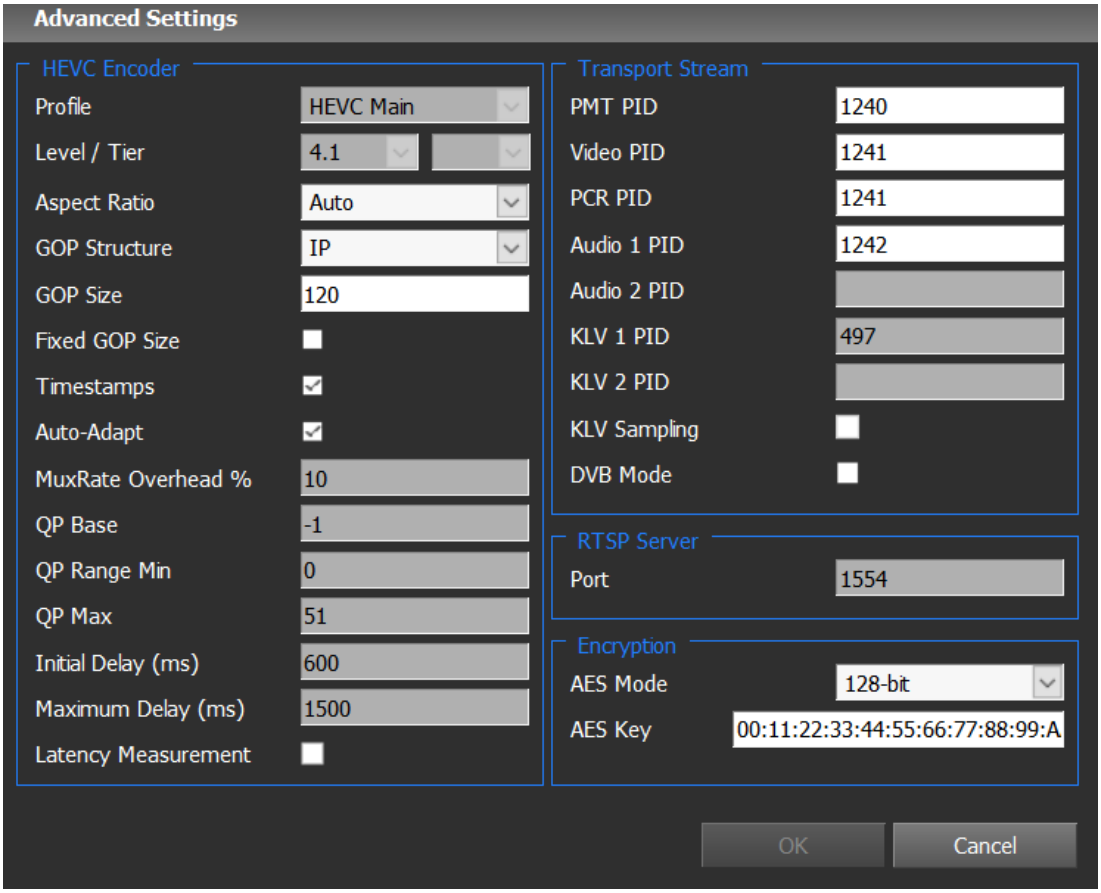


Figure 4-5: The Advanced Settings - HEVC

By default, many of the advanced parameters are determined automatically by the system's internal algorithm and are based on the selected profile, resolution, compression format and bit-rate. However, for certain applications and for unique scenarios you may be able to optimize video quality, latency, and overall behavior of the codec, by manually modifying some of the advanced settings fields. Modifying these advanced settings may also lead to degraded video quality and/or performance in case selected values are not ideal for the targeted application.

Contact VITEC Support Team, to confirm the appropriate settings for an application.

- **Profile / Level / Tier –** Profile, Level and Tier used by the encoder. It is automatically calculated based on the encoding resolution, framerate, bitrate, bit depth and color sampling. The encoder supports the below Profile/Level/Tier:
  - **Profile:** Main, Main10 and Main 4:2:2 10
  - **Level:** up to level 5.2
  - **Tier:** Main / High

- **Aspect Ratio –** The proportional relationship between the video width and its height. For auto configuration "Same as Input" shall be set.
- **GOP Structure -** Specifies the GOP structure used by the encoder. The encoder supports:
  - I: Intra Frame encoding
  - IP: IP encoding is recommended for most applications. This mode provides the best configuration for optimal latency and quality.
  - I(B)P to I(7B)P: for future use.
- **GOP Size** – The intervals between I-Frames. Range is 1-300. A default and optimal value is calculated based on the profile selected and the encoding frame rate.
- **Fixed GOP Size** – If enabled, it ensures GOP structure is not modified during the encoding process. Fixed GOP Size might be necessary for compatibility with sensitive decoder. When enabled, it impacts negatively the compression efficiency.
- **Timestamps** – Enable to insert timing information in the video stream. If KLV is used, the precision timestamp from KLV metadata is also inserted in the Video Elementary stream.
- **Auto-Adapt** – Select the box to allow the encoder to automatically optimize advanced compression and streaming parameters to the bit-rate you defined for the channel.

NOTE:

Use the manual settings option cautiously. Incompatible combination of parameters that were manually set, may result in a video and audio quality degradation. Consult VITEC Support Team for recommendation on specific settings if you wish to optimize the compression and streaming settings for a specific application.

- **MuxRate Overhead %** - The average amount of null packets relative to the video bitrate while streaming CBR. The default value is designed for reaching the best video quality in typical content. However, this parameter can be changed to achieve the best quality in some other contents. Enter the allocated percentage of the stream for the multiplexer. Range is 5-1000).
- **QP Base -** The initial quantization (compression) level value used (range is 1-51). An automatic Qp is used when "-1" value is set.
- **QP Range Min** - Minimum quantization (compression) value (range is 1-51). When a minimum value is set, the encoder will not use a lower value than specified. This setting is mainly relevant for content with minimal movement where bit rate allocation can be reduced.
- **QP Max** - Maximum quantization (compression) value (range is 1-51). When a maximum value is set, the encoder will not use a higher value than specified. This setting is specifically relevant in motion-intensive scenes where higher bit rate allocation is needed.
- **Initial Delay (ms)** - The delay for incoming PTS/DTS relative to PCR (range is 0-5000). This setting enables the control of buffering within the receiver / decoder.

NOTE:

To minimize the end-to-end latency, the initial delay can be reduced to lower values. Such change may impact video quality or encoder bitrate regulation. It is then recommended to allow either a higher bitrate or a higher MuxRate Overhead.

- **Maximum Delay (ms)** - Maximum duration threshold before Access Units (AU's) are multiplexed together. This setting minimizes high bitrate variations (range is 1-1000).
- **Latency Monitoring** – Enable to allow end-to-end latency monitoring when decoding the stream with MGW Ace Decoder. Latency can be monitored within MGW Ace Decoder web interface or via HTTP command.

  If enabled, Timecode input is not captured from SDI input anymore.

  - To ensure accurate Latency Monitoring, system date must be synchronized to an NTP server. Ensure to correctly configure the NTP server in System/Date and Time section on both MGW Diamond and MGW Ace Decoder.
  - When Latency Monitoring is enabled, SDI timecode (VITC) is no more embedded.

- **PMT PID** – A special identifier of the PMT within the transport stream. The PMT (Program Mapping Table) describes the various services and their PIDs within the transport stream. Default: 1240.
- **Video PID** – A unique identifier of the video service within the transport stream. Only a single video service is available per a transport stream. Default: 1241.
- **PCR PID** – A special identifier of the PCR data within the transport stream. The PCR (Program Clock Reference) data contains clocking information for synchronization between various services. Default: 1241.
- **Audio PID 1** – A unique identifier of the first audio service within the stream. Up to two Audio services can be available per a transport stream. Default: 1242.
- **Audio PID 2** (not available) – A unique identifier of the second audio service within the stream. Up to two Audio services can be available per a transport stream. Default: 1243.
- **KLV PID 1** – A unique identifier of the KLV (Key Length Value) metadata service within the transport stream. Default: 497.
- **KLV PID 2** (not available) – A unique identifier of the KLV (Key Length Value) metadata service within the transport stream. Default: 498.
- **KLV Sampling** – Check the box to sample the KLV frames according to the encoding framerate configured. KLV frames are sampled and synchronized with each encoded frame and transmitted over UDP TS according to MISB 0605.6/0604.4 and STANAG4609

standards. When unselected, all the KLV metadata frames are captured and transmitted with the Video/Audio stream.

- **DVB Mode** – Select this check box to comply with DVB standard. At a low bitrate (<1Mbps), enabling DVB mode may result in an increased bitrate.
- **RTSP** - Server Port – RTSP Server port.
- **Encryption - AES Mode** – Select between 128 or 256-bit AES encryption mode.
- **Encryption - AES Key -** AES key value available when "Encryption" box is selected. A default key is provided.

Target Section

Parameter	Description
Channel Name	Enter the channel name. This name will also appear in Session Announcement Protocol (SAP) messages.
Streaming Protocol	Select the streaming protocol: **UDP TS, RTP TS, RTP ES (RTSP), Zixi™** or **Pro-MPEG**.
Target Address	Enter the target IP address.
Target port	Enter the target port.
TTL	Enter the TTL value. • Time-to-live (TTL) tells a network router whether or not the packet has been in the network too long and should be discarded. Each time an IP packet hits a router, TTL value is reduced by '1'. If TTL remains greater than 0, the router forwards the packet. Otherwise, it is discarded. • Set a value which is high enough to ensure streaming packets are reaching the decoder. • TTL value can be found by pinging the remote decoder. • Value range is 1-255.
UDP Packet Size	Select the UDP packet size value. Some transmission link accepts smaller UDP packet size. Reduce the UDP packet size if experiencing decoding problems.
SAP	Select the SAP check box to enable Session Announcement Protocol (currently not in use).
Traffic Shaping	Select the Traffic Shaping check box to enable network smoothing.
Error Correction Settings	Available with Zixi™ and Pro-MPEG modes.

Error Correction Settings

Zixi™

The Zixi™ protocol supports two modes: VITEC Playout / Zixi™ Broadcaster Server, and Point-to-point streaming directly from the VITEC encoder to the VITEC decoder appliance. Zixi™ sessions can be protected by a password. Protected sessions ensure that only authorized encoders/decoders participate in these sessions.

- **Password**: If a password was set on Zixi™ server, enter the password for streaming. If no password was set on the VITEC Playout Server or Zixi™ server, no password is required. When connecting directly (point-to-point) to a decoder, a password is not applicable.
- **Latency:** Enter a latency value in milliseconds to be used for correcting errors. The minimal latency to be used must be higher than 3 times the RTT value (Round Trip Time) between the encoder and the targeted decoder. RTT value is available in Zixi™ Channel Statistics window after the Zixi™ channel has been started. Additionally, higher latency increases tolerance to network errors (range 0-6000 milliseconds). The actual error correction rates depend also on the stream bit-rate. On average, 500ms latency yields protection of up to 6% of network errors. 6000ms latency yields protection of up to 30% of network errors.

  - When using a Zixi latency lower than 500ms, FEC data protection is enabled resulting in an increased total output bitrate up to 50%. Ensure the transmission link bandwidth is dimensioned for such bitrate.
  - If Zixi latency is set to 0, no data protection is achieved. Use this value to analyze the quality of your transmission link. Transmission link statistics are reported within the Zixi Statistics Channel (Dashboard).

  Check the Zixi™ Statistic information window to monitor the packet loss of the transmission link used and set the latency accordingly.
- **Enable ABR (Adaptive Bitrate)**: Select the check box to allow either VITEC decoder or the Playout Server/ Zixi™ Broadcaster to automatically change the encoding bit-rate while streaming. When selected, the channel total bit-rate will automatically be optimized, based on network performance and statistics from the Zixi™ stream recipient, to ensure smooth, artifacts-free playback.
  - Minimum Bit-Rate: Set the minimum bit-rate allowed while in dynamic mode
  - Maximum Bit-Rate: Set the maximum bit-rate allowed while in dynamic mode.
- **Enable Failover**: Select the check box to allow MGW Diamond Encoder to switch over a secondary VITEC Playout/ Zixi™ Broadcaster Server when the primary server is no more reachable.
  - Set the IP address of the Zixi™ broadcaster failover server
  - Set the Port address of the Zixi™ broadcaster failover server.

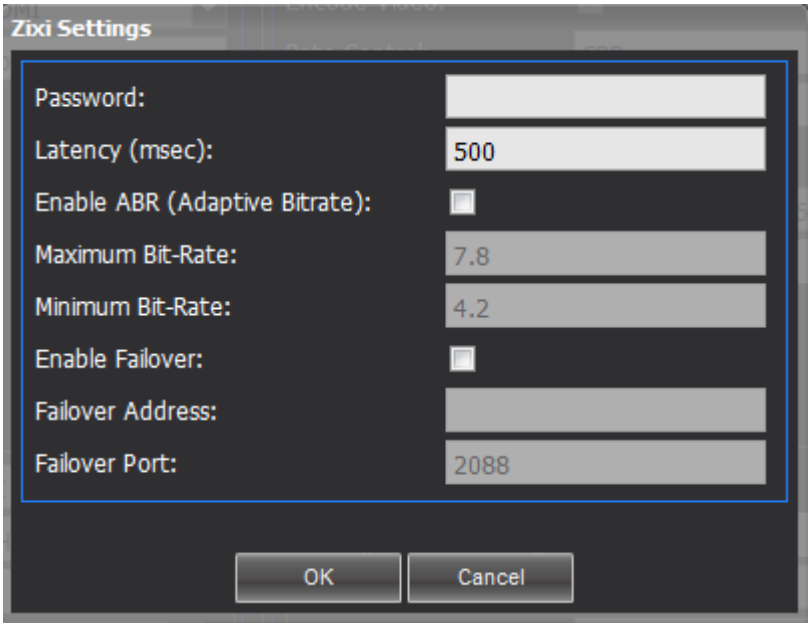


Figure 4-6: The Zixi Settings window

Pro-MPEG Forward Error Correction (SMPTE-2022)

When FEC is implemented, the encoder sends additional data to enable the reconstruction of lost data, regardless if needed or not. The performance of the FEC is always a tradeoff between latency, overhead and error correction capabilities. FECs with large dimensions, e.g. 20x5, 10x10 provide less overhead (between +5% and +20%), but have larger latency and better correction capabilities compared to FEC tables with smaller dimensions.

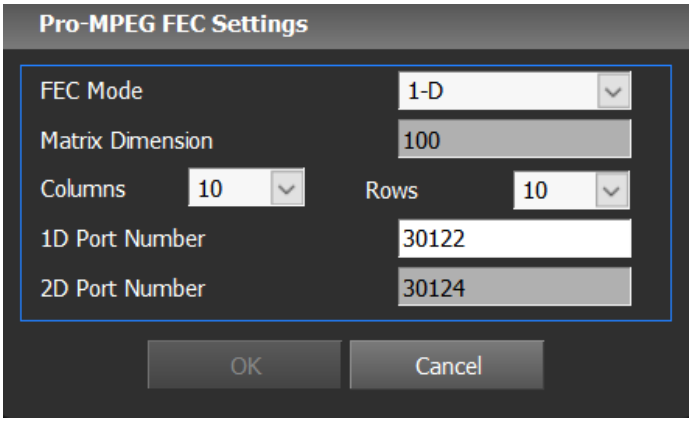
FEC induces additional latency in the transmission. If a FEC packet matrix of 20x5 is chosen, it adds 260 milliseconds latency. Smaller sized FEC packet matrixes and transmissions with higher bitrates will add less delay.

Overhead in data rate, added by 2D-FEC, can be calculated by following formula:

$$2D\text{-}FEC\ Overhead\ in\ \% = \frac{(rows + columns)}{(rows * columns)} * 100\%$$

Overhead in data rate, added by 1D-FEC, can be calculated by following formula:

$$1D\text{-}FEC\ Overhead\ in\ \% = \frac{1}{rows} * 100\%$$



- **FEC Mode**: Select the **Forward Error Correction** dimension mode: **1-D** (only the column checksums will be sent to the destination), or **2-D** (checksums of both columns and rows will be sent to the destination).
- **Matrix Dimension:** The specified FEC rows and FEC Columns from which row checksums and column checksums will be generated (FEC algorithm = XOR)**.** Displays the columns/rows multiplying value of the column/rows. Matrix size value must be less than 100.
- **Columns/Rows:** Select the desired values for the selected FEC. For the column, value can range from 1 to 20.
- **1-D Port Number:** Enter the port number from through columns checksums will be sent.
- **2-D Port Number:** Enter the port number from through rows checksums will be sent when 2-D mode is selected.

The network bandwidth overhead for Pro-MPEG technology is fixed and is determined by the XOR matrix dimensions and size selected values. Bandwidth overhead exists regardless of whether the network link has errors or not.

The System Page

In the **System** page you set the parameters of the following tabs:

- **Network Interfaces**
- **Security**
- **Date and Time**
- **KLV Input**
- **SAP.**

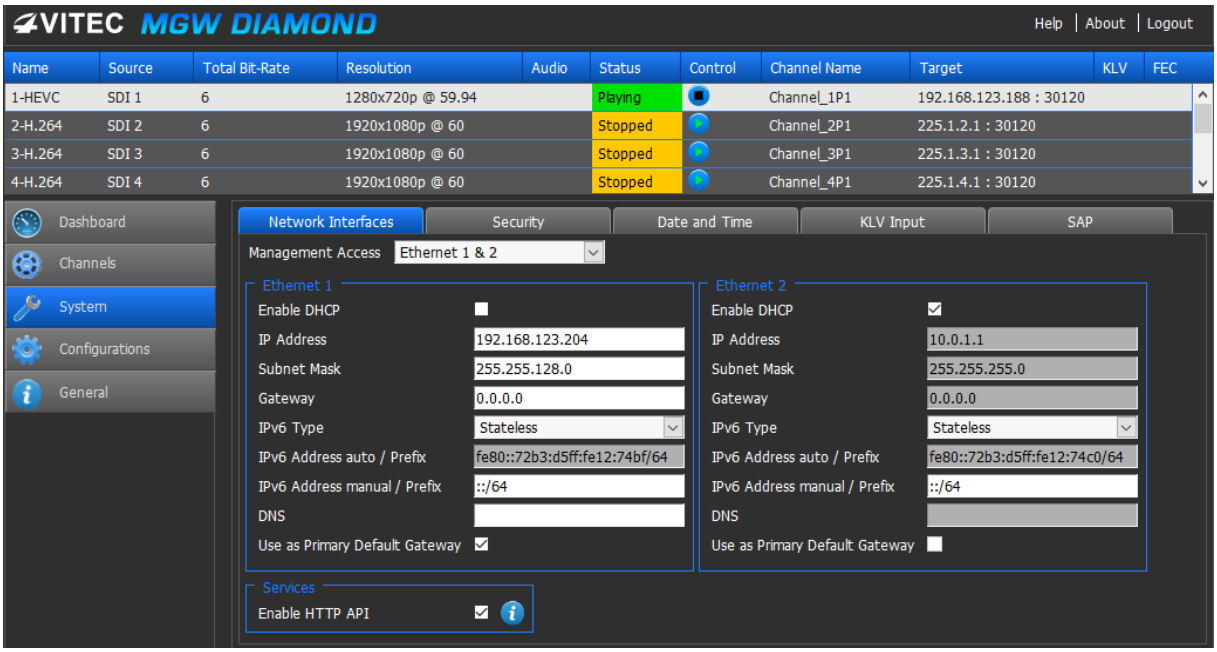


Figure 4-7: The System page

To set the system parameters:

1. From the main menu select **System.**
2. Set the desired parameters as required in each section and click **Apply.**

To set the network interface:

Two network interfaces are available. Each one can be used for either management and/or streaming.

For easier management of the system, Ethernet Port 1 and 2 can be configured in DHCP mode. If DHCP mode is selected, the system will obtain the IP address automatically from the DHCP server.

Parameter	Description
Enable DHCP	Select this box to enable automatic retrieval of IP address and DNS server information from the DHCP server.
IP Address	Enter IPv4 Address if Static mode is selected
Subnet Mask	Enter Subnet Mask if Static mode is selected
Gateway	Enter the default Gateway if Static mode is selected
IPv6 Type	Select either Static, Statefull or Stateless
IPv6 Address auto/prefix	Displays the link-local IPv6 address.
IPv6 Address manual/prefix	Enter or edit an IPv6 static address.
Use as Primary Default Gateway	Select which Ethernet port settings to be used as the default gateway.
DNS	Enter the DNS IP address.
Enable HTTP API	Select this check box to enable system control and status over the HTTPS REST API. The web API documentation is available using the information button or directly at this address: **https://IP_Adress/apidoc.html**.

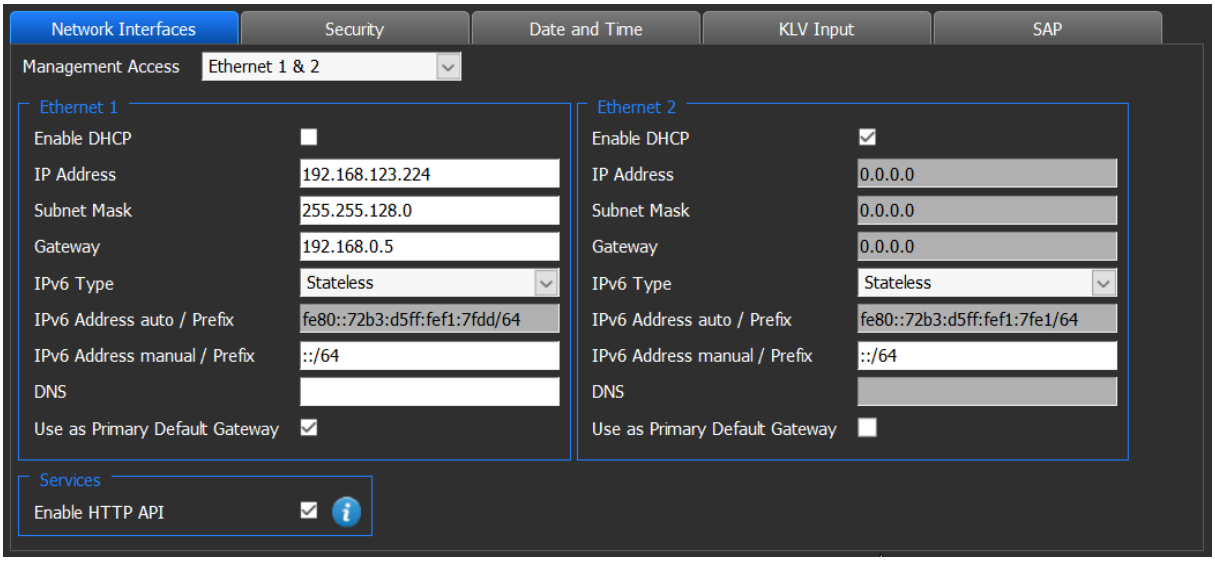


Figure 4-8: The Network Interfaces tab

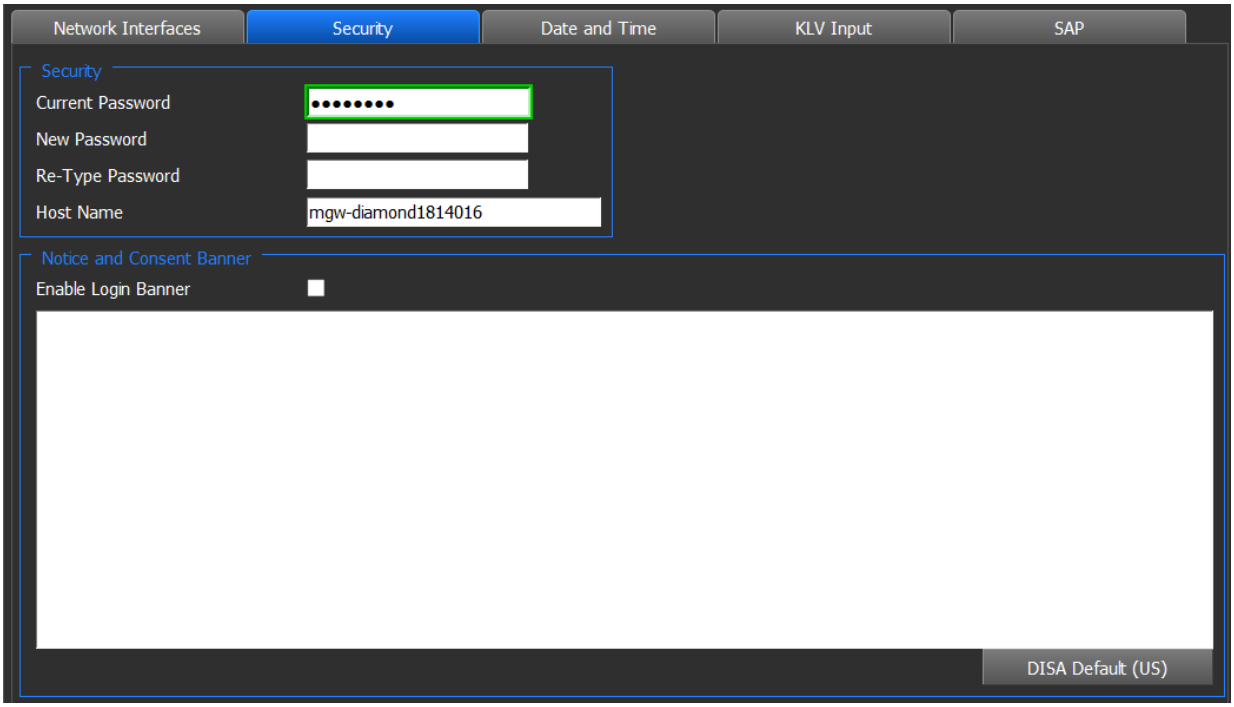
To set Security:

Parameter	Description
Current Password	Type the current password.
New Password	Type the new password (8-14 characters).
Re-Type Password	Re-type the new password.
Host Name	The default is **mgw-diamond<xxxxxxx>** (where the last digits are the system serial number).

To enable warning and consent banner at login:

Select "Enable Login Banner" check box to enable the warning and consent banner. Once enabled, type in the text to be displayed or select "DISA default" button. The banner will be displayed at each login attempt if selected.

"DISA default" automatically sets the text mandated per the US Defense Information Systems Agency.



To set Date and Time:

Parameter	Description
Use NTP	Select the box to enable synchronization with the NTP server.
Server Address	Enter the NTP server address.
Date	Set the date.
Time	Set the time.
Time Zone	Set the time zone.

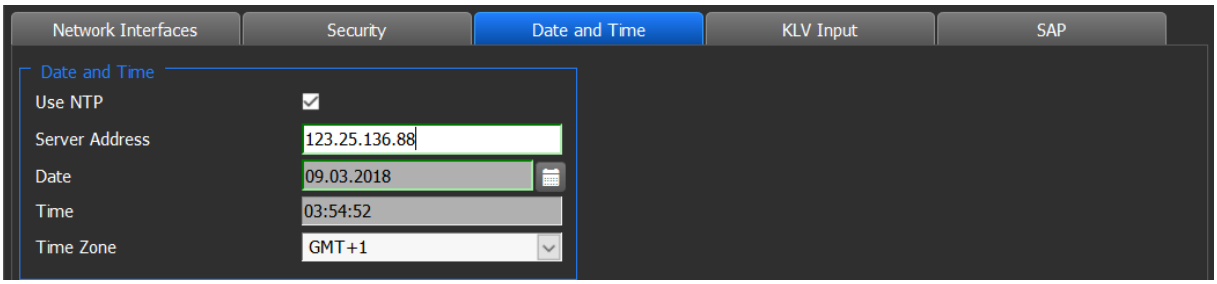


Figure 4-9: System Page - Date and Time

To set KLV Capture over Serial / RS232 Port:

In the **KLV Input / RS-232 Serial** tab screen set the following parameters for each KLV serial input. MGW Diamond can capture up to 4x Serial inputs.

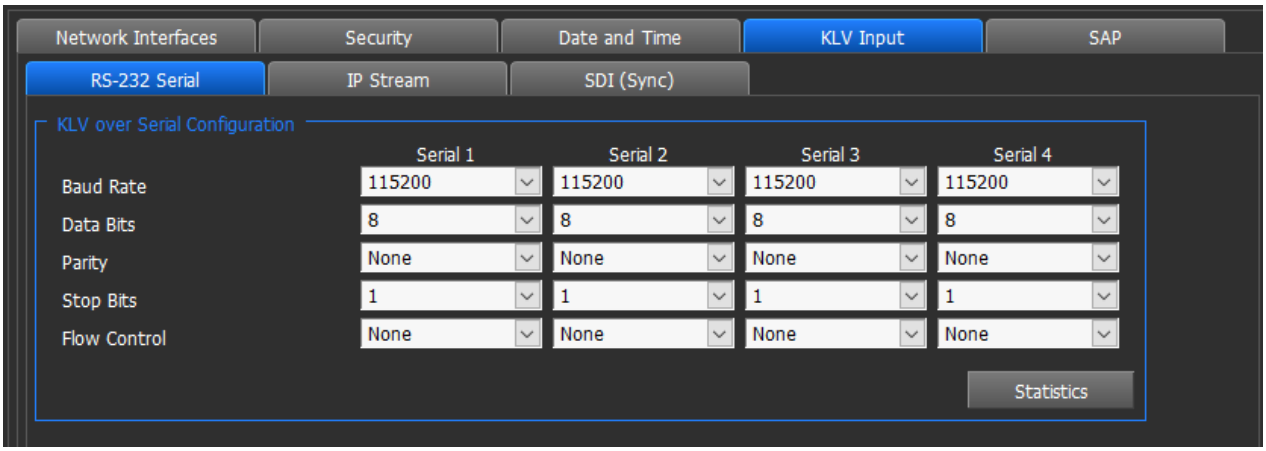


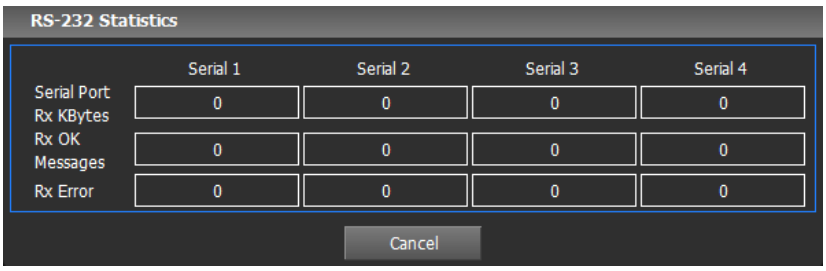
Figure 4-10: The KLV Input screen

Serial Configuration

Parameter	Description
Baud Rate	Select the baud rate.
Data Bits	Select the data bits.
Parity	Select the parity.
Stop Bits	Select the stop bits.
Flow Control	Select the flow control.

Statistics

Provide information regarding each Serial port received data (Kbytes received, Errors).



To set IP Stream as KLV input source:

MGW Diamond can capture KLV from up to 8x IP inputs.

Figure 4-11: The IP Stream tab window

1. Click the **IP Stream** tab and set the following parameters:

Parameter	Description
Input NIC	Select the input network interface.
IP address	For a unicast KLV stream - enter the IP address of the encoder. For a multicast KLV stream - enter the IP address of the multicast group KLV is sent to.
Port	Enter the port number of the source KLV multicast or unicast stream.
Encapsulation	Select one of the following options: • TS (MPEG-2 Transport Stream encapsulation) sent via multicast or unicast stream. • RAW KLV data as per MISB 0601.x sent via multicast or unicast stream.
PID Number	Enter the PID number of the program containing the KLV data in the source multicast stream (available only when TS encapsulation is selected).

Bitrate (bps)	Enter the bitrate value of the incoming KLV Stream. Use a value that covers the highest peak of KLV data you anticipate the data bitstream will yield. In case the KLV IP input stream data rate is unknown, it is recommended to use 200,000 bps as a starting point.

NOTE:

When streaming at low bitrate (for example 500kb/s), the default KLV bitrate value (200kb/s) becomes dominant. Ensure to set an appropriate value matching the actual KLV bitrate of its source. This will ensure that video bitrate is preserved resulting in a better video quality.

To set KLV Input over SDI:

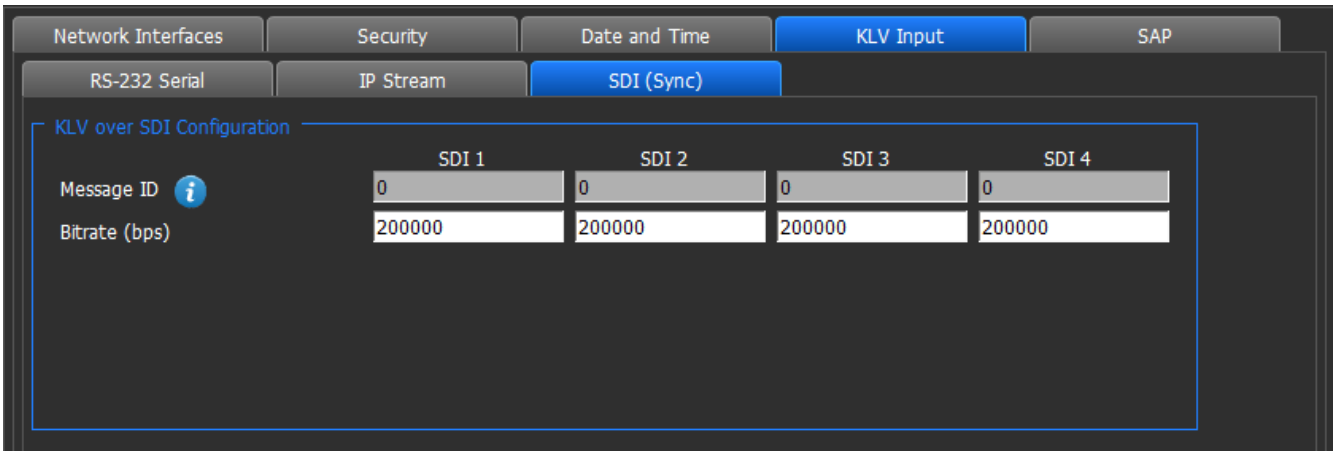


Figure 4-12: The KLV Input-SDI (Sync) tab window

Click the **SDI (Sync)** tab and set the following parameters:

Parameter	Description
Message ID (for future use)	Enter message ID number. Message ID allows you to select specific channels / MIDs within the received KLV data. To capture all the KLV data received, enter '**0**'. To capture a specific set of Message ID, a comma must be used between the Message ID to be captured (for example: 1,5,7).
Bitrate (bps):	Enter the maximal bitrate of the KLV data stream. Define the allocated bitrate to KLV within the total stream bitrate set. It corresponds to the KLV data after TS multiplexing. **This bitrate must be tuned for each particular KLV source connected.**

NOTE:

When streaming at low bitrate (for example 500kb/s), the default KLV bitrate value (200kb/s) becomes dominant. Ensure to set an appropriate value matching the actual KLV bitrate of its source. This will ensure that video bitrate is preserved resulting in a better video quality.

To set SAP:

Parameter	Description
Use default SAP address	Use the default Session Announcement Protocol multicast group and port as per RFC 2974.
IP Address	Set the target multicast IP address to which SAP messages will be sent.
Port	Set the target port to which SAP messages will be sent.
Announcement Interval (sec)	Set the interval between SAP messages.

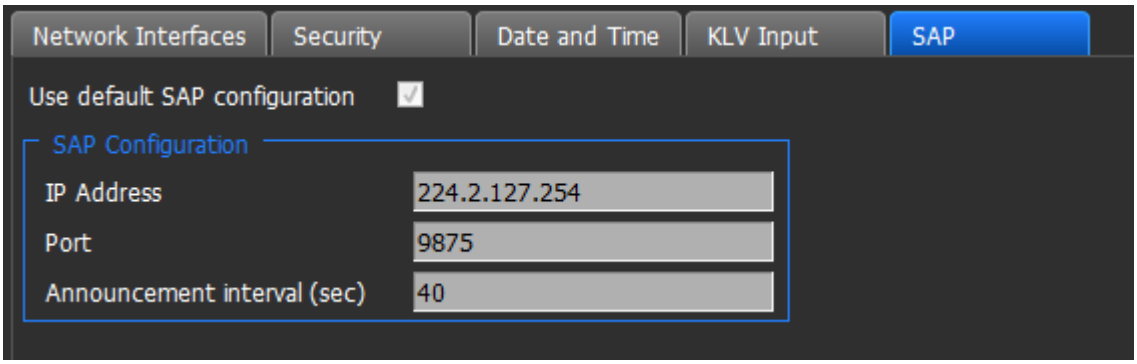


Figure 4-13: The System SAP tab window

NOTE:

You must click **Apply** for the new settings to be saved.

The Configurations Page

The MGW Diamond web interface allows you to save screen shots of various configurations to be loaded manually or automatically in the future.

In the **Configurations** page you can add, activate, and delete channel configurations.

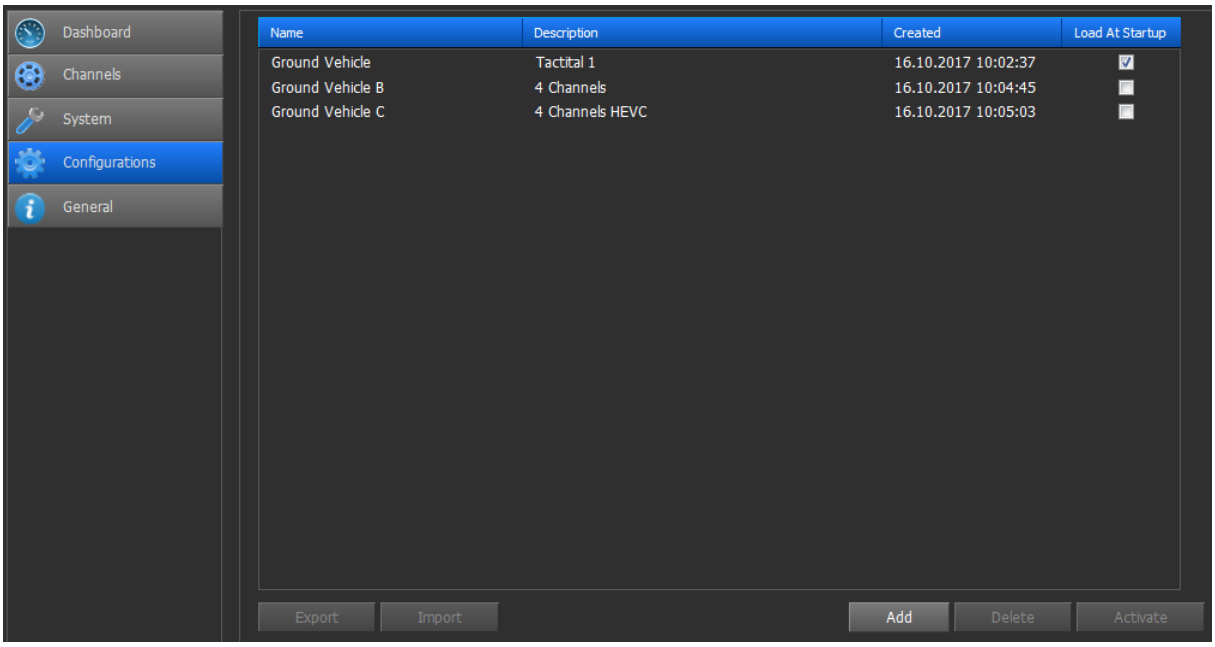
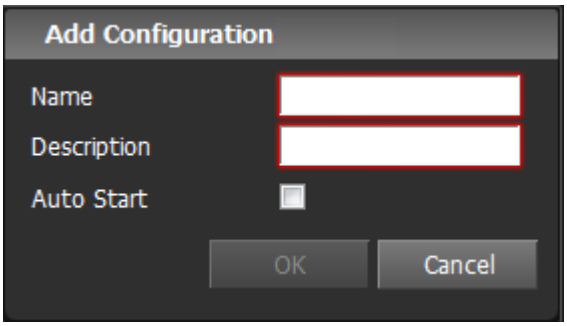


Figure 4-14: The Configuration page

To add a configuration:

1. Click **Add.**



2. Type the configuration name and description.
3. Select Auto Start to load this configuration at boot up
4. Click **Save**. The new configuration appears in the top row.

To activate a configuration:

1. Select the desired configuration row.
2. Click **Activate** to activate the configuration. The activated configuration is applied.

To delete a configuration:

1. Select the desired configuration row.
2. Click **Delete** to delete the configuration.

To activate Auto Start:

1. Select the desired configuration row.
2. Click the desired configuration row under the **Load at Startup** column**.** The ✓ icon appears in the **Load at Startup** column in the relevant configuration row.

   On next reboot, the selected configuration will load automatically.

NOTE:

The video sources must be the same ones used when the configuration was created for auto-start configuration successful load.

The General Page

In the **General** page you can view appliance related parameters, and perform license and firmware upgrades.

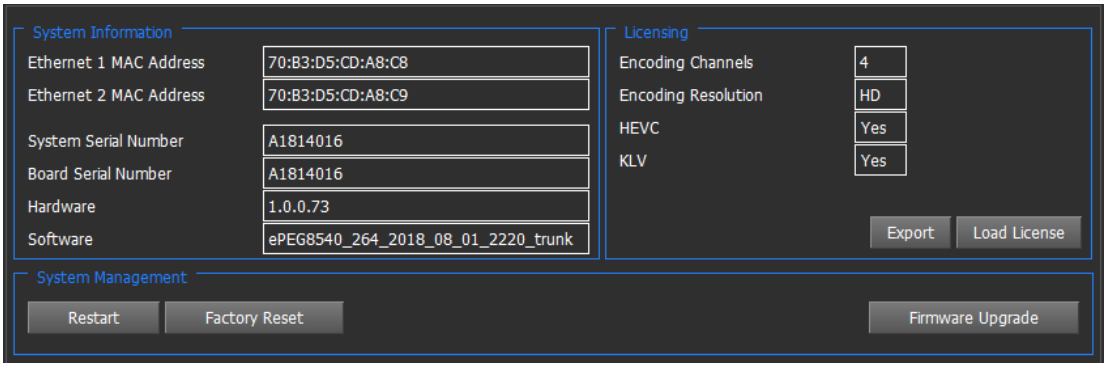


Figure 4-15: The General page

To view the System Information parameters:

Parameter	Description
Ethernet 1 MAC Address	Displays the Network Interface #1 MAC Address.
Ethernet 2 MAC Address	Displays the Network Interface #2 MAC Address.
System Serial Number	Displays the system serial number.
Board Serial Number	Displays the video board serial number.
Hardware	Displays the current hardware revision.
Software	Displays the active software version.

To view software and hardware licensing info:

Parameter	Description
Encoding Channels	Displays the number of main encoding channel (1-4). Main channel is composed of a Primary and Secondary channel up to 1080p60 maximum.
Encoding Resolution	Displays the Encoding Resolutions license status (SD/HD/4K)
HEVC	Displays the HEVC license status
KLV	Displays the KLV license status

To register a new license:

NOTE:

Contact your VITEC sales representative to activate the required license for your appliance.

1. Click **Export** to get the license file of your system. Provide this license file to VITEC Customer Support along with the requested licenses.
2. Upon the receipt of the new license, click **Load License,** and select the new license file.
3. Click **Load.** The new licenses are now registered and enabled.

To restart, reset or upgrade the system:

To restart the appliance, click **Restart**. The **Restart** window appears.

To upgrade the firmware, refer to Upgrading Firmware.

To reset the appliance, refer to Resetting MGW Diamond Encoder Settings (on page 57).

CHAPTER 5

MGW Diamond Encoder Reset

In This Chapter

Resetting MGW Diamond Encoder Settings

The appliance can be reset in one of the following ways:

- A hardware reset
- A software reset.

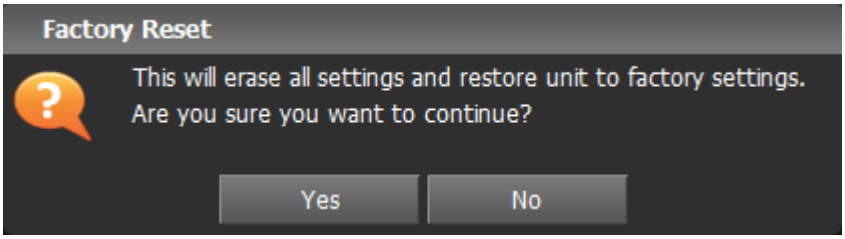
To reset the MGW Diamond Encoder (Hardware):

On the MGW Diamond Encoder rear panel use the Reset dry contact (located in connector J2) to connect an external push-button-switch or controller for performing a Reset.

- A short press will restart the appliance.
- A long press (6 seconds) will return the unit to factory settings (erasing all user-stored channel and network settings).
- Pressing for 2-3 seconds while powering the appliance will re-load the last known good firmware. To be used only when the appliance does not respond (after a failed firmware upgrade for example). Restoring to factory will allow to relaunch the upgrade procedure.

To reset the MGW Diamond Encoder (through the web interface):

1. In the **General** page, click **Factory Reset** to reset all values to default factory values. The **Factory Reset** window appears:



2. Click **Yes** to restore the unit to its factory settings**.**

NOTE:

- The Factory Reset function will return the unit to its default IP settings: 192.168.1.1 with subnet mask 255.255.255.0 , and password **1qaz!QAZ**.
- If you are connected to the unit from a PC on a different subnet, reconfigure your computer to the 192.168.1.x subnet to gain access to the unit and modify its settings for network use.

CHAPTER 6

Firmware Upgrade

In This Chapter

Upgrading Firmware

Important Notes Prior to Upgrade

VITEC periodically releases new firmware versions that include critical updates as well as feature enhancements.

MGW Diamond Encoder firmware and software upgrade process involves uploading a "firmware file" from within the unit HTTPS user interface, allowing the unit to extract the required files and perform internal updates. Uploading time of the "firmware file" may vary from one computer to another. It also depends on network speed and the connection's quality between the computer and the MGW Diamond Encoder appliance.

To verify if the upgrade had finished, observe the physical power LED on the appliance's front panel - blinking LED indicates that the upgrade is still ongoing. A solid LED indicates that the upgrade is completed and the appliance is ready for re-login. Log on using a new browser tab.

Read carefully the step-by-step procedure below and pay extra attention to notes and warnings.

To upgrade MGW Diamond Encoder Firmware version:

1. Send VITEC your firmware upgrade request.
2. Before starting the upgrade procedure, disconnect all video and audio sources. Only power and Ethernet cables should remain connected.
3. Delete all saved configurations, including auto start configurations (refer to The Configurations Page (on page 52) for detailed instructions).

NOTE:

If not deleted, old configurations may cause to the MGW Diamond Encoder to load with the new firmware into an unsupported state.

4. Click the **General** tab.

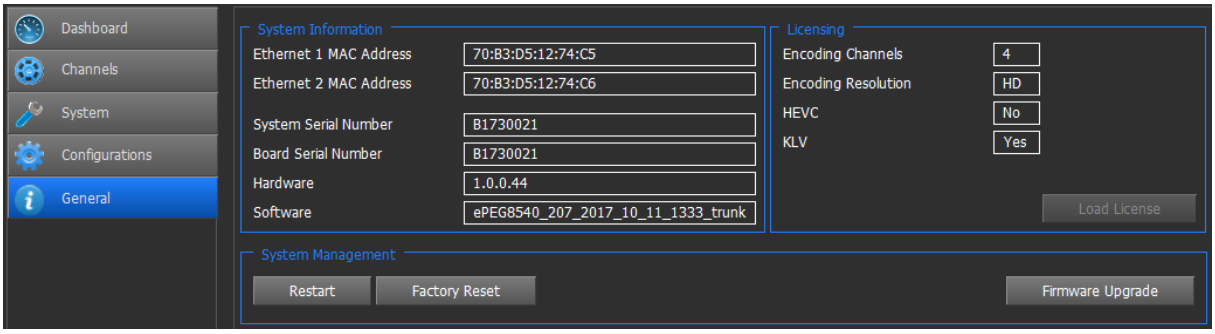


Figure 6-1: The General page

5. Click **Firmware Upgrade.** The **Load Firmware** window appears.

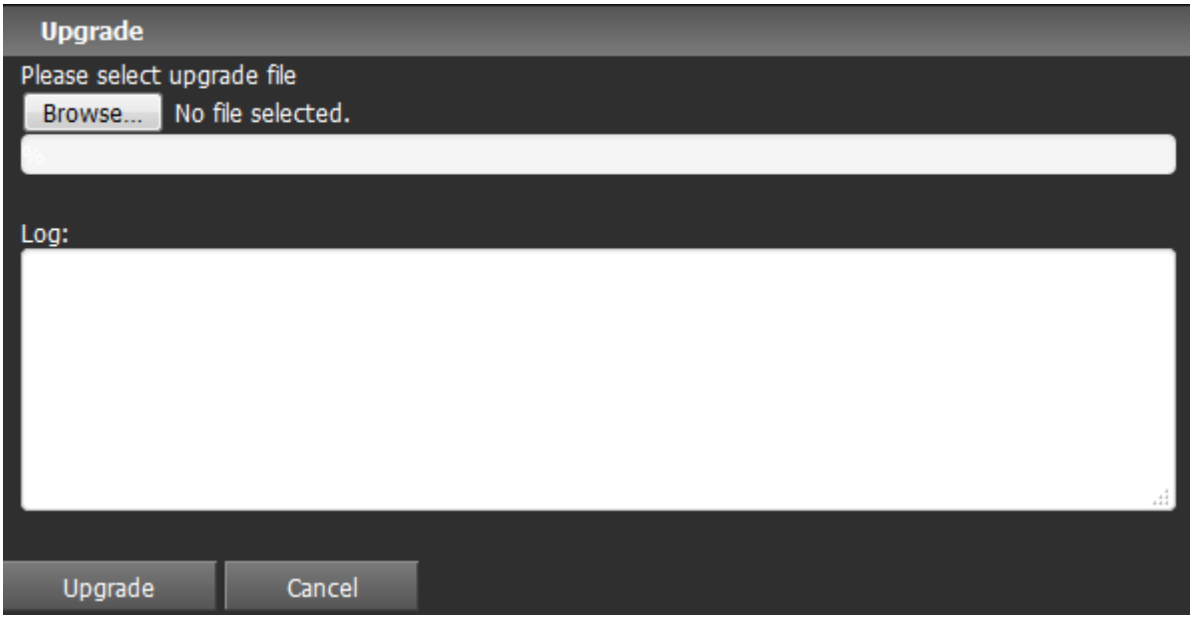


Figure 6-2: The Load Firmware window

6. Click **Browse.** A browser window opens.

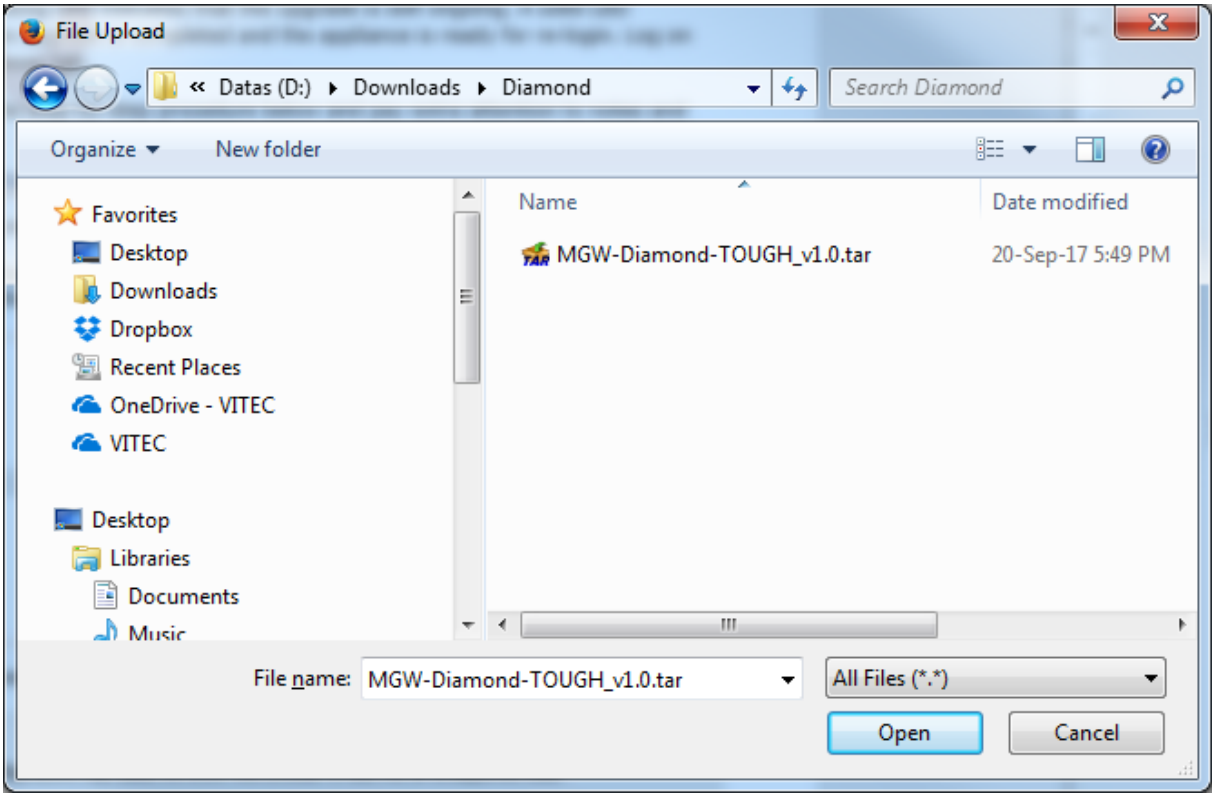


Figure 6-3: Selecting the Upgrade File

7. Select the appropriate firmware file (provided by VITEC - see example in the figure above), click **Open,** and in the **Load Firmware** window click **Load.**

8. The new version is loaded:

   - The Power green LED on the MGW Diamond Encoder appliance front panel is blinking:

   The loading process might take a few minutes.

   - When loading completes, the power LED stops blinking for a few seconds. The appliance will now start its update and reset process and the power green LED starts blinking fast. The reset process might take a few minutes.

WARNING:

The internet browser on your computer attempts to poll the appliance's status throughout the execution of the update and reset. Allow the reset process to complete without any intervention. Do not attempt to refresh the browser or take any other actions during the reset process.

When reset completes, **the power green LED is steady on** and the login window appears (see figure below).

- If the login window does not appear, open a new browser tab. Insert (in the URL field) the IP address that was set to the MGW Diamond Encoder prior to the upgrade. If the login window appears close the previous browser tab and proceed to step 7.

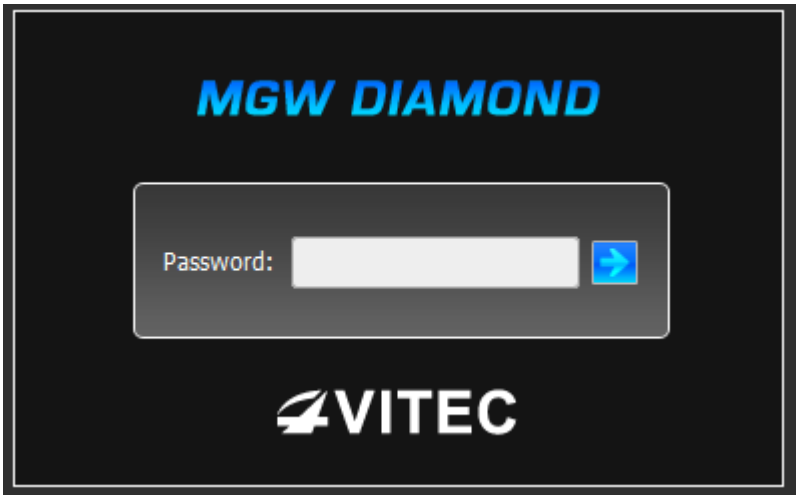


Figure 6-4: MGW Diamond Login window

9. Log on (refer to the Logging on section for details).

10. In the **General** screen, verify that the upgrade was successful by inspecting the **Software Version** in the **System Information** section.

CHAPTER 7

Decoding MGW Diamond Encoder Video Streams

In This Chapter

Playing MGW Diamond Encoder Video Streams

The MGW Diamond Encoder streams can be played using VITEC Decoders or third party decoders that support the relevant compression standards. While MPEG-4 H.264 decoders are widely available from many vendors, decoding of real-time advanced HEVC streams is offered only by selected manufacturers. For HEVC decoding solutions by VITEC you may use MGW Ace Decoder or MGW D265 hardware appliance, EZ TV software player, HDM850 + PCI decoder card or VITEC's EZ TV Mobile App for Android devices. For recommendations on third-party decoders, consult VITEC or VITEC's Channel Partners.

Below are few recommended third-party common software decoders. Please note that the highly popular VLC Player features very basic support for HEVC streams. While certain configurations may work well on VLC - various advanced HEVC compression tools MGW Diamond Encoder uses are not yet supported by VLC. If you encounter an atypical behavior with the latest VLC version, please use one of VITEC's professional HEVC decoders.

Setting EZ TV as the Player

1. On the EZ TV portal, go to **Static Channels** and click **Add Channel.**
2. From the **Channel Type** drop-down list, select **UDP TS.**

> **NOTE**:
>
> Pro-MPEG is not currently supported on EZ TV system.

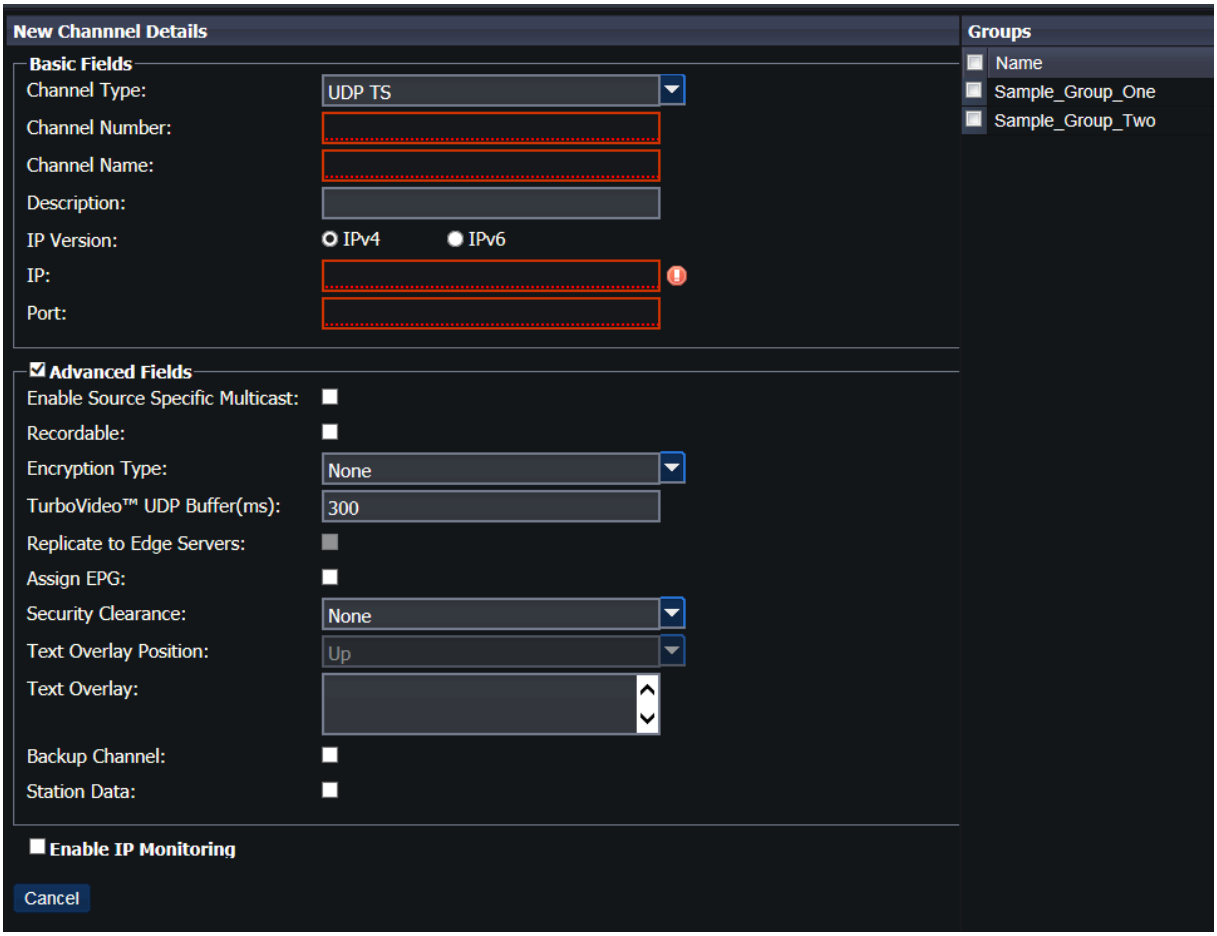


Figure 7-1: Adding Multicast Channel

3. Enter the **Channel Number,** the **Channel Name** and the **Description.**
4. Select one of the following options: **IPv4** or I**Pv6**.
5. Enter the **IP** address and the **Port** number.

NOTE:

- The above steps are partial instructions. Refer to EZ TV Platform and EZ TV Player user manuals for detailed instructions.
- When SAP is enabled on one or more of MGW Diamond Encoder's channels, EZ TV will automatically discover the broadcasting and list these channels under Dynamic Channels in EZ TV Player.

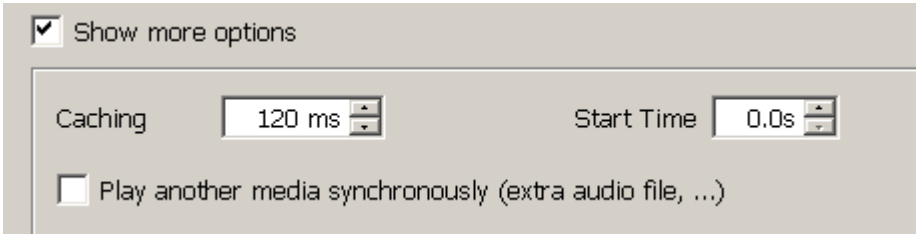
6. From the EZ TV Player, select the appropriate channel. The MGW Diamond Encoder stream is played on EZ TV Player under Static Channels. Refer to EZ TV Player user manual for detailed instructions.

Setting FITIS as the Player

Setting FITIS as the player is done in a similar manner as in EZ TV.

Setting VLC as the Player

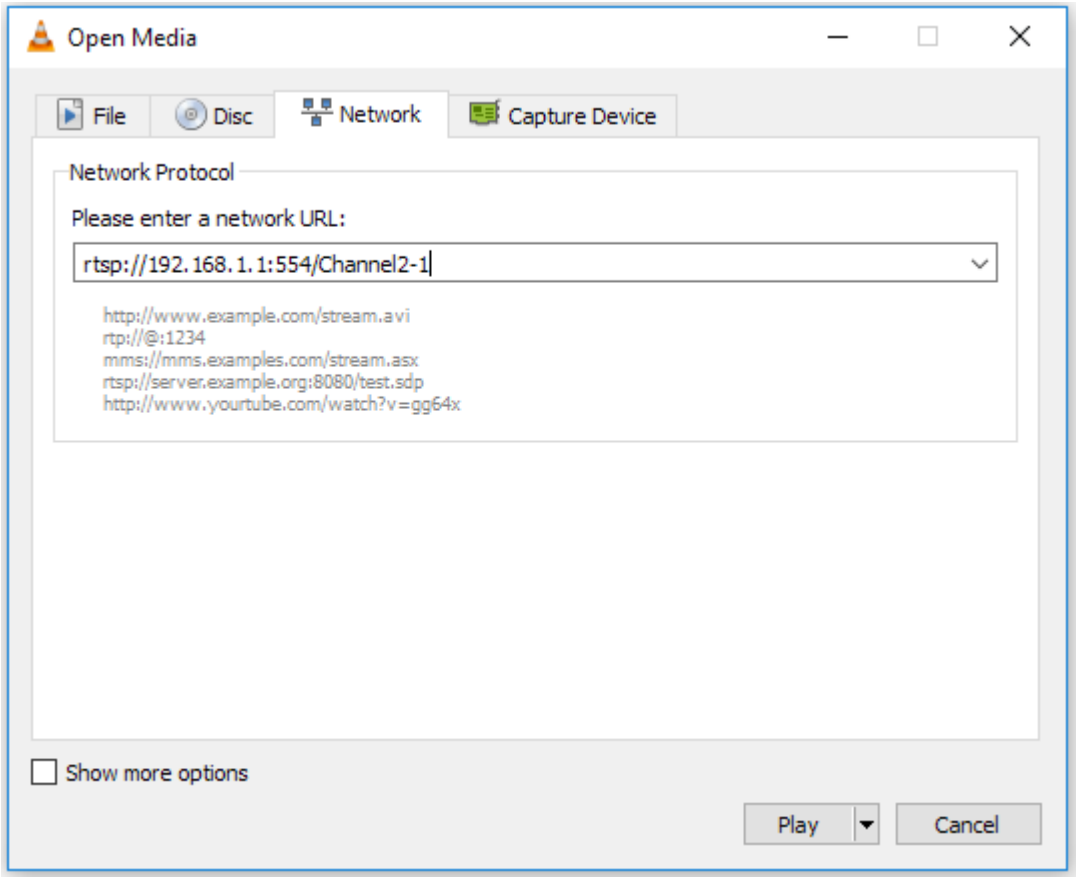
1. Invoke VLC Media Player.
2. Select **Media>Open Network Stream**. The Open Media window appears.
3. Set **Caching** by Clicking the **Show more options** box and set the caching to a value between **120** to **140** milliseconds depending on your network performance:



4. Select the **Network** tab and depending on the encoding mode and the selected streaming protocol (UDP TS, Pro-MPEG), enter the following syntax in the URL field:

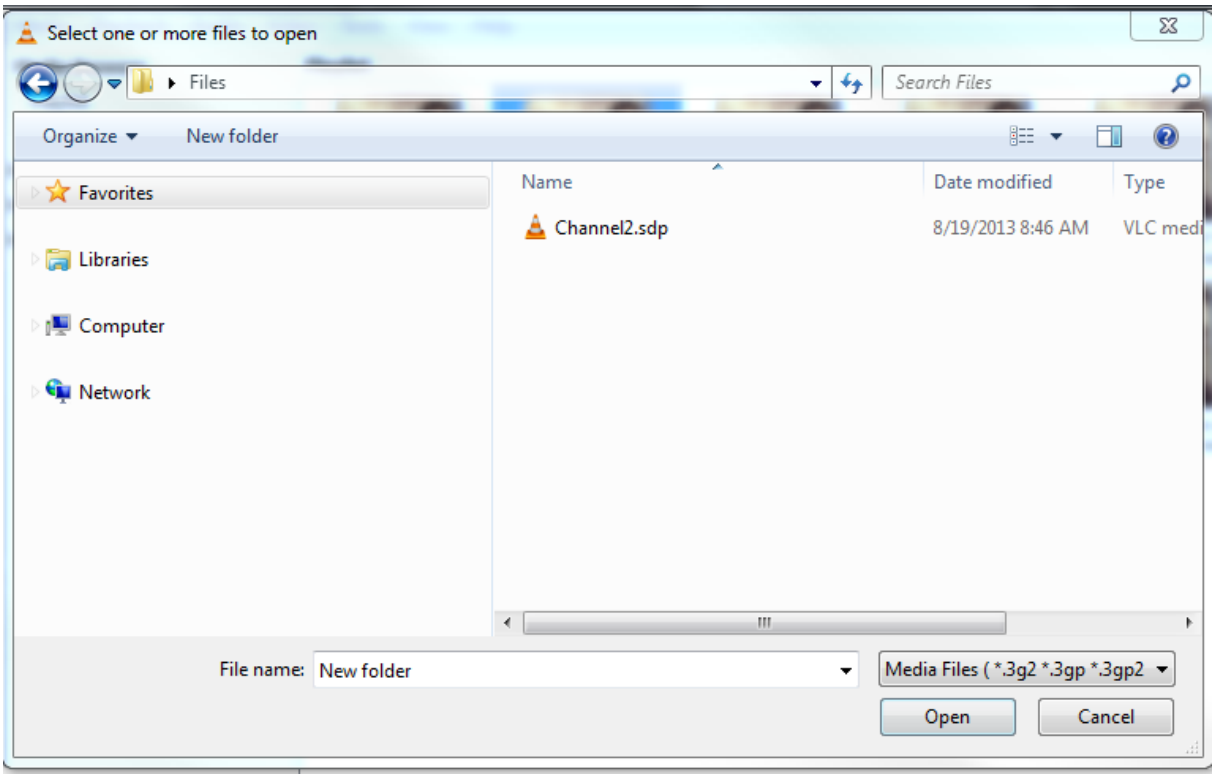
   - **For RTP ES Stream:**

   rtsp://<MGW IP Address>:<RTSP Server Port>/<CHANNEL NAME> (see example in the figure below).



NOTE:

- URL syntax is case sensitive so ensure that the channel name is initial letter is capitalized.
- The IP address is the MGW Diamond Encoder IP address.
- Channel Name is the name as set on the **Channels** page, **Target** section.

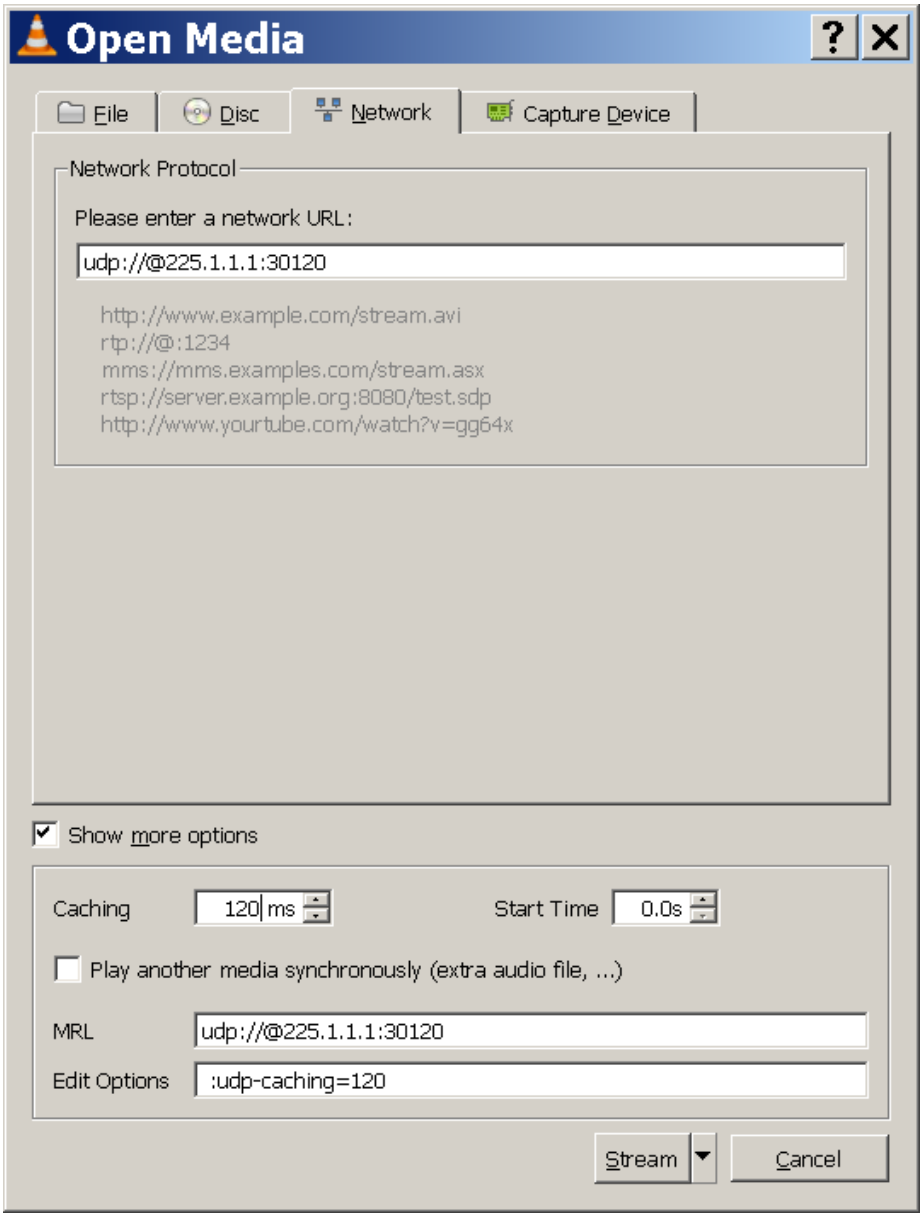


- **For UDP TS Streams:**

udp://@<Target IP Address>:<TargetPort>

NOTE:

- Older versions of VLC do not require "@" symbol.
- IP address is the Target Address as set in Channels page, Target section.
- The port number is the **Target Port** as set in the **Channels** page, **Target** section.



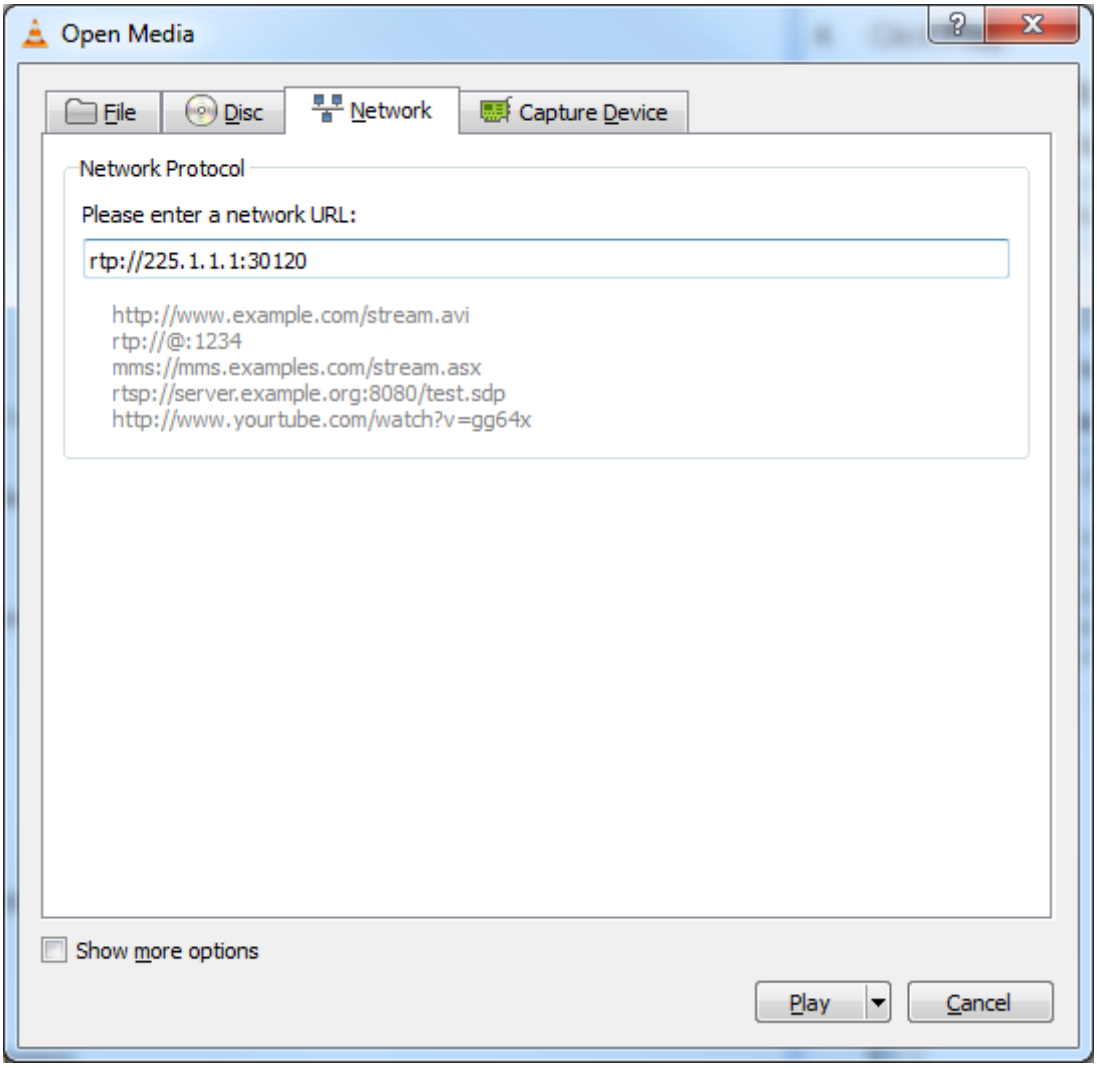
NOTE:

Configure the buffer size according to your network performance and the compression settings of the streams. When B-Frames are used, it is recommended to set VLC UDP buffer to 300 to allow for smooth playback. To reduce end-to-end latency when B-Frames are not in use, you may set the UDP buffer size to as low as 100 ms, depending on your network characteristics. In certain network environments you may need to adjust the decoder buffers to large size to allow for smooth playback while maintaining minimal latency.

5. Click **Play.**

- **For RTP TS or Pro-MPEG Streams:**

rtp://<Target IP Address>:<TargetPort>

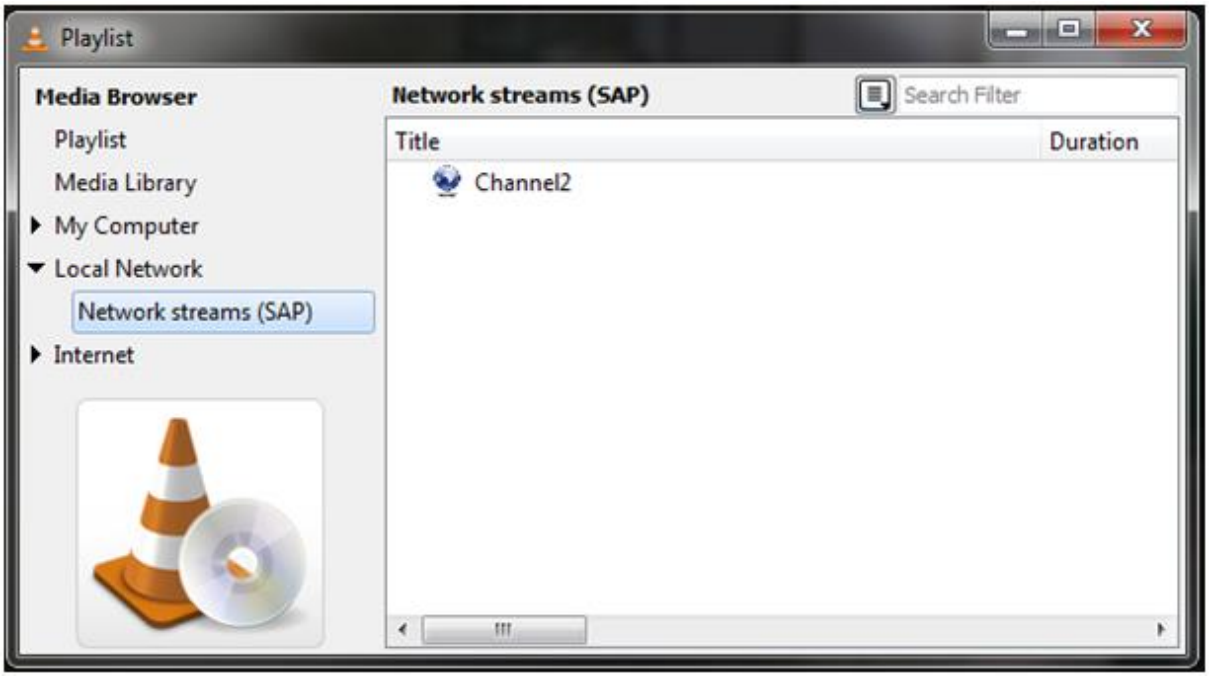


NOTE:

- VLC doesn't support FEC so while it is possible to play Pro-MPEG stream, no error correction will occur.
- Older versions of VLC do not require "@" symbol.
- IP address is the Target Address as set in Channels page, Target section.
- The port number is the **Target Port** as set in the **Channels** page, **Target** section.

To set VLC Player using SAP protocol:

1. From VLC main menu select View>Playlist. The Playlist window appears.
2. Under Media Browser, expand Local Network and select Network Stream. A list of available streams appears.



3. Select the desired stream you wish to play.

NOTE:

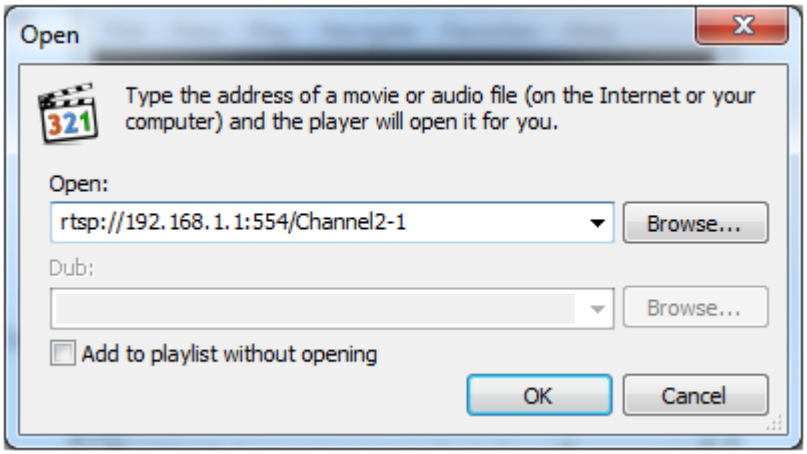
SAP must be activated in Channels page, Target section, as shown in the figure below.

Using Media Player Classics

1. Invoke MPC-HC (Media Player Classics Home Cinema).
2. Select File>Open File.

- **For RTP ES Streams:**

rtsp://<MGW IP Address>:<RTSP Server Port>/<CHANNEL NAME> (see example in figure below).

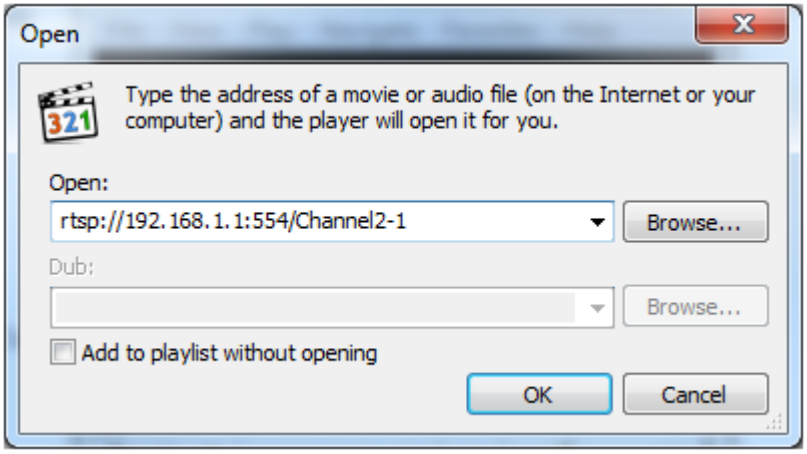


NOTE:

- URL syntax is case sensitive so ensure that the channel name initial letter is capitalized.
- IP address is the Target Address as set on the Channels page, Target section.
- The port number is the Target Port as set on the Channels page, Target section

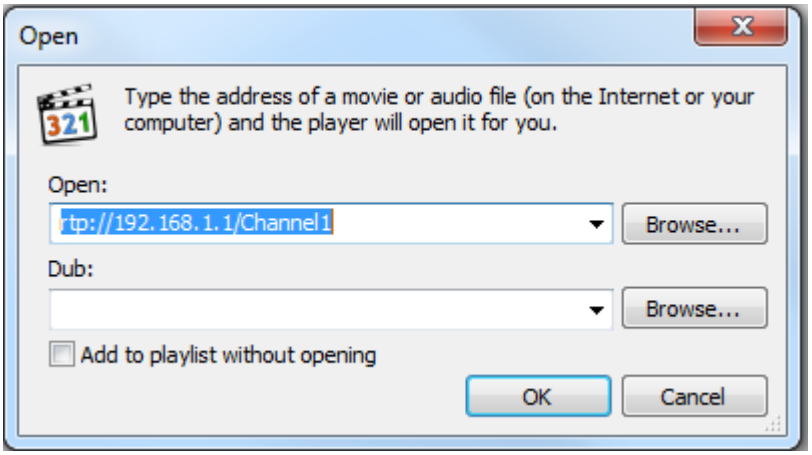
- **For UDP TS Streams:**

udp://@<Target IP Address>:<TargetPort>



- **For RTP TS or Pro-MPEG Streams:**

rtp://<Target IP Address>:<TargetPort>



NOTE:

- MPC doesn't support FEC so while it is possible to play Pro-MPEG stream, no error correction will occur.
- URL syntax is case sensitive so ensure that the channel name is initial letter is capitalized.
- IP address is the Target Address as set on the Channels page, Target section.
- Channel Name is the name as set on the Channels page, Target section.

3. Click **OK**.

CHAPTER 8

Decoding Zixi™ and Pro-MPEG Streams (HEVC and H.264)

In This Chapter

Setting and Playing Zixi™ Protected Channels

Zixi™ protected streams and Pro-MPEG protocol are not supported by open source free software players such as VLC or MPC.

You may use VITEC MGW Ace Decoder (HEVC/H.264), or VITEC Playout Server / Zixi™ Broadcaster. Pro-MPEG streams may be decoded by 3rd party decoders that support SMPTE-2022 protocol.

To send Zixi streams to the VITEC Playout Server/ Zixi™ Broadcaster:

In the Channels page Target section:

1. Enter the VITEC Playout/ Zixi™ Broadcaster server's **IP address** and **Port** (see Target table above).
2. Click **Error Correction Settings.** The **Zixi Settings** window opens. Enter the following parameters:

- **Password:** Enter the password for streaming to a Zixi™ receiver (Server or a Stand-alone decoder).

NOTE:

The password you enter must be identical to the password entered in the Zixi™ Broadcaster Web interface).

- **Latency:** Enter a latency value in milliseconds to be used for correcting errors. The minimal latency value must be three times higher than the RTT (Round Trip Time) value that is used between the encoder and the targeted decoder. RTT value is available in Zixi Statistic window (see The Dashboard Page section) after the Zixi™ channel has been started.

  Additionally, higher latency increases tolerance to network errors (range 0-6000 milliseconds). The actual error correction rates depend also on the stream bit-rate. On average, 500ms latency yields protection of up to 6% of network errors. 6000ms latency yields protection of up to 30% of network errors.

  - When using a Zixi latency lower than 500ms, FEC data protection is enabled resulting in an increased total output bitrate up to 50%. Ensure the transmission link bandwidth is dimensioned for such bitrate.
  - If Zixi latency is set to 0, no data protection is achieved. Use this value to analyze the quality of your transmission link. Transmission link statistics are reported within the Zixi Statistics Channel (Dashboard).

  Check the Zixi Channel Statistic window (see The Dashboard Page section) to monitor the packet loss of the transmission link used and set the latency accordingly.
- **Enable Dynamic Bit-rate Control:** Select the check box to allow either VITEC decoder or Broadcaster Server to automatically change the encoding bit-rate while streaming.

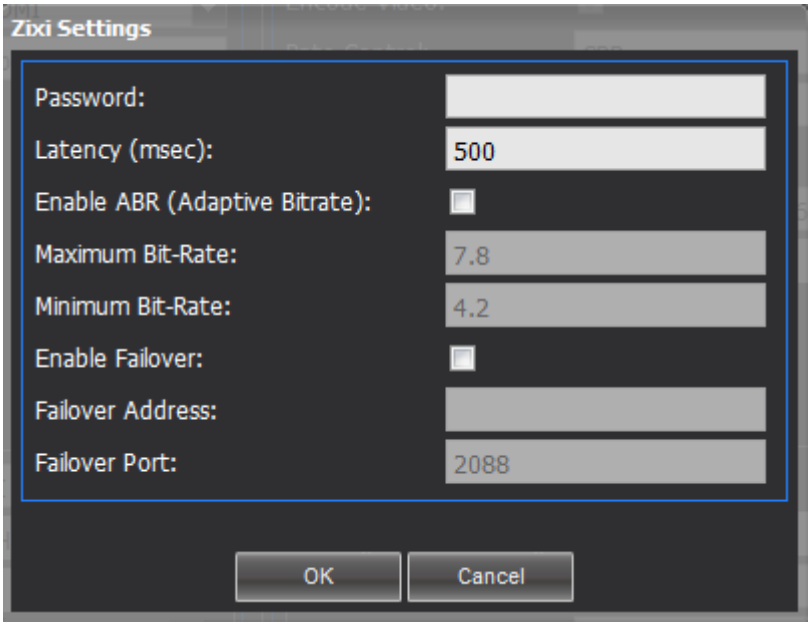


Figure 8-1: The Zixi Settings window

In the VITEC Playout Server/ Zixi™ Broadcater Web interface:

1. Add a new input stream. The **stream ID** must match MGW Diamond Encoder Channel Name that was entered in the **Channels page>Target section> Channel Name** field, and it is case sensitive.

2. Select **Push**.

NOTE:

Latency is set by the MGW Diamond Encoder.

3. Click **OK**, the input channel is created.

To play the Zixi™ protected channel:

1. Click the play icon in the Dashboard Frame, **Control** column (H.264 or H.265 channels). "Zixi" is indicated in the **FEC** column (see The Dashboard Frame).

NOTE:

If an error occurs and "Zixi" appears in red, ensure that:

- MGW Diamond has access to the Playout Server/ Zixi™ Broadcaster.
- The channel was created correctly on the Playout Server/ Zixi™ Broadcaster.

APPENDIX A

Technical Specifications

Compliance

- FCC Part 15, Class A
- CE
- ICES-003
- RoHS.

Environmental

- Operating Temperatures: -20 ºC to +55 ºC (-4 ºF to 131 ºF)
- Storage Temperatures: -40 ºC to +70 ºC (-40 ºF to 158 ºF)
- Relative Humidity: 5% to 95% (non-condensing)
- Not controlled under ITAR.

Physical

- 1.57" H x 4.29" W x 4.21" D (40.1mm H x 109.6mm W x 107.6mm D)
- Weight 1.01lb (0.46Kg)
- Enclosure: Industrial-grade, with mounting holes for seamless installation in vehicles / onto flat surfaces
- Status LEDs for power, streaming and video source indication
- Optional rack-mount kit for standard 1RU 19” wide rack (16858).

Power

- DC Input: 12VDC, 14W (Typical), 17W (Max)

Functional Description

Inputs

Video Inputs

- SDI / Composite Inputs
- Supported standards:
  - 3G/HD/SD-SDI (SMPTE 259M-C, SMPTE 292M, SMPTE 274M, SMPTE 296M, SMPTE 424M, 425M Level A only).
  - Analog Composite / RS-170 (NTSC, PAL, PAL-M)
- Quad channel mode in 3G-SDI, HD-SDI, SD-SDI and Composite

Input Resolutions / Frame Rates Support

- 1920x1080p @ 60, 59.94, 50, 30, 29.97, 25, 24, 23.976 Hz
- 1920x1080i @ 60, 59.94, 50 Hz
- 1280x720p @ 60, 59.94, 50, 30, 29.97, 25 Hz
- 720x480i @ 59.94 Hz
- 720x576i @ 50 Hz.

Audio Inputs

- SDI Embedded audio (PCM support)
- 4 x Analog unbalanced stereo audio, AC-coupled (currently not in use).

Stream Output:

- Simultaneous H.264 and HEVC encoding of 4 x independent channels (up to 1080p60 per channel)
- Two output streams available for each input with independent resolution (downscaling), frame rate and bitrate.

Network Protocols

- UDP TS
- RTP TS
- RTP ES (RTSP)
- Zixi™ Error-Correction
- RTP TS with ProMPEG Forward Error Correction (SMPTE 2022).

Video Output - HEVC (H.265)

MPEG-H HEVC (ISO/IEC 23008-2) Modes:

- Main / Main 10 and main 4:2:2 up to 4:2:2 10-bits
- Level up to Level 5.2, Main and High Tier
- Selectable GOP structure: I, IP, IBP, I(2B)P, and I(7B)P (currently not in use)
- Bit Rate: 36Kbps to 30Mbps

- Frame Rate: 1-60 fps. Configurable framerate from 60 down to 1fps
- Bit Rate Regulation Modes: Constant (CBR), Variable (VBR)
- Output Resolutions: Configurable from CIF up to 1920x1080p60
- Encoding latency less than 55ms.

Video Output - H.264

H.264 (MPEG-4 AVC Part 10) - ISO\IEC 14496-10 MPEG-4 AVC – Rec.

ITU-T H.264 Modes:

- Profiles
- Baseline Profile L3
- Main Profile L3 and L4
- High Profile L4 and L4.2
- Bit Rate: 36Kbps to 20Mbps
- Selectable GOP structure and size: I, IP, IBP, I(2B)P, and I(7B)P (currently not in use)
- Frame Rate: 1-60 fps. Configurable framerate from 60 down to 1fps
- Bit Rate Regulation Modes: Constant (CBR), Variable (VBR)
- Output Resolutions: Configurable from CIF up to 1920x1080p60
- Encoding latency less than 55ms.

Audio Output

MPEG-4 AAC-LC (ISO/IEC 14496-3), MPEG-1 L2

- Stereo and mono modes
- Up to 2 stereo channels support (currently one stereo channel is available)
- Bit Rate: 32Kbps - 256Kbps in Stereo, 16Kbps - 128Kbps in Mono
- Sampling Rate: 16 kHz - 48 kHz.

Metadata

- Support for KLV over UDP, Serial and SDI (MISB STD 0605.7, VANC per SMPTE 336M)
- Support for CoT over Serial/RS-232 - currently not in use
- Absolute Time System and Timestamps (MISB STD 0603.4)
- Time Stamping and Transport of Compressed Motion Imagery and Metadata (MISB STD 0604.5)
- Security Metadata Universal and Local Sets for Digital Motion Imagery (MISB STD 0102.11)
- Cursor on Target (CoT) Conversions to Key- Length-Value (KLV) Metadata (MISB STD 0805.1) - currently not in use.
- UAS Datalink Local Metadata Set (MISB STD 0601.11, STD 0902.6)
- STANAG 4609 output stream over UDP/IP
- JITC-MISB Compliant streaming of HD/SD ISR video.

APPENDIX B

Technical Support

VITEC provides phone supports and online helpdesk access during standard business hours. Silver, Gold and Platinum customers are eligible to access preferred support tools as described in your extended support agreement. For more information, visit our web site at https://www.vitec.com/support/.

The VITEC's Products Knowledge Base is part of our web site at http://support.vitec.com/portal/. It offers technical tips, downloads of User Manuals, access to latest firmware files and general information about IPTV products.

APPENDIX C

Warranty

Limited Hardware Warranty Terms

Subject to the terms and conditions specified below your VITEC product (the **"Product"**) is warranted against defects in material and workmanship (the "Warranty") for a period of 12 (twelve) months following the Delivery Date (the **"Warranty Period"**). The Warranty provided to you hereunder supersedes any warranty which may be provided to you by the original manufacturer of the Product.

VITEC (collectively "**company**") will repair or replace (at its option) any defective part during the Warranty Period, provided that (i) the Warranty remains in force. Your dated sales receipt or invoice shall be considered as the delivery date of the Product form VITEC's premises to your designated address (the "**Delivery Date**"); (ii) your Product unit carries a serial number on its rear panel; (iii) you received from VITEC Customer Service department a Return Materials Authorization (RMA) number. No Product unit will be accepted for repair without RMA number; and (iv) the entire Product unit is returned to the company by prepaid shipping in VITEC's original packaging.

VITEC will not be responsible for (i) any damages resulting from the use, maintenance or installation of any Product; or (ii) for the incorporation of any spare or replacement parts not approved by the company.

Without limiting the generality of the foregoing, The company reserves the right to refuse to provide any services under the Warranty for any Product that, in the company opinion, has been subjected to any abnormal electrical, mechanical, or environmental abuse, or shows signs of modification by an unauthorized person or company. Call your local distributor or reseller for out-of-warranty repair charge estimates prior to returning a product.

You acknowledge that the product licensed or sold hereunder, which may include technology and software, are subject to the export control laws and regulations of the United States ("U.S.") and/or any other country in which the product is received. You agree that you will not knowingly transfer, divert, export or re-export, directly or indirectly, the product, including the software, the software source code, or technical data (as defined by the U.S. Export Administration Regulations) restricted by such regulations or by other applicable national regulations to any person, firm, entity country or destination to which such transfer, diversion, export or re-export is restricted or prohibited by U.S. or other applicable law, without obtaining prior authorization from the U.S.

Department of Commerce and other competent government authorities to the extent required by those laws.

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