



Sapphire HEVC Decoder User Manual

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Broadcast Wireless Systems Ltd
Unit 7, Swanwick Business Centre
Swanwick
Southampton
SO31 7GB

Phone: +44 (0) 01489 505034

Email:
sales@broadcastwirelessystems.com

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Change History

Version	Date	Change Summary	Author
V1.0	1.4.2018	Initial Draft	MB
V1.1	9.5.2018	Minor corrections & formatting	SB
V1.2	10.7.2018	Update of menus for 1.3 software	MB
V2.0	5.4.2019	Updated to version 1.5.1 code and new rear panels	MB
V2.1	20.8.2019	Updated with genlock data	MB
V3.0	15.10.2019	Updated with IP Streaming	MB

About the User Manual

This user manual describes the operation of the Sapphire HEVC Decoder.

The user manual is split into two sections.

Section One is the User Guide, in which the reader is introduced to the Sapphire HEVC Decoder and its operation. The various control options are described. A guide to installation of the system is given.

Section Two is the Technical Section, the system specifications, dimensions and interfaces are described.

Warranty and Support

All Broadcast Wireless Systems products are supplied as standard with a 12 month 'Return to Base' warranty.

In the event of a suspected product failure, users should initially contact the Broadcast Wireless Systems Support team on the telephone: **+44 (0) 1489 505034** or via email: support@broadcastwirelessystems.co.uk

It may be necessary to return the equipment to BWS if the problem persists and the Support team are unable to remotely solve the issue.

Equipment should only be returned using the RMA (Returns Management Authorisation) process. Users should request an RMA form and number by contacting the Support team on **+44 (0) 1489 505034** or via email: support@broadcastwirelessystems.co.uk. Equipment can then be returned to:

Returns Department

Broadcast Wireless Systems Ltd
Unit 7, Swanwick Business Centre
Swanwick
Southampton
SO31 7GB

Introduction to the Sapphire HEVC Decoder

HEVC compression offers significant bitrate savings over traditional H.264 solutions, allowing Broadcasters to dramatically cut the amount of bandwidth required. HEVC is set to become the 'go-to' compression standard demanded by SNG Operators. In addition, the inherent efficiencies of HEVC means that the wireless transmission of 4K is possible from smaller, less powerful systems.

Sapphire HEVC is a broadcast-quality H.265 Decoder, offering exceptional compression ratios on video resolutions up to 4K UHD. Existing MCR or Earth Station systems can be upgraded to the latest decoding technology with minimal disruption as the ultra-compact Sapphire Decoders deliver up to 2 x HD streams in a single half-width 1RU enclosure. To ensure backwards-compatibility, legacy compression systems such as H.264 and MPEG2 are also supported via the ASI or IP interface.

The Decoder connects to existing receive equipment via a single ASI co-ax cable for easy upgrade and several units can be looped together for decoding large MCPC signals.

Key Features

- Up to 50% bit-rate reduction compared with H.264
- Decoding of 2x simultaneous HD signals from a single half-rack unit
- Reception of true 4K UHD signals with HDR
- Ultra-low latency for live applications
- IP and DVB-ASI in
- 2x in 1RU rack-kit for high density mounting
- Legacy H.264 and MPEG2 Decoding also supported*

Benefits

- 2x high quality HD Decoders in a single unit
- Saves Rack Real-Estate – up to 4x HD Decoders in a single 1RU!
- Software upgrade to 4K/UHD
- Cost-effective existing IRDs & RF systems

Safe Operating Procedures

- Operate within the environmental limits specified for the product.
- Only authorized, trained personnel should open the product. There are no functions that require the User to gain access to the interior of the product.

EMC / Safety Approvals

The equipment has been designed to meet and has been tested against the following harmonized EMC and safety standards:

EN 61000-3-2:2000

EN 61000-3-3:1995

EN 55022:1998, Class B

EN 61000-4-2:1995

EN 61000-4-3:1996

EN 61000-4-4:1995

EN 61000-4-5:1995

EN 61000-4-6:1996

EN 61000-4-11:1994

EN 60950:2000

Unpacking the Sapphire HEVC Decoder

The Sapphire HEVC Decoder is provided in dedicated protective packaging as shown below.

The Sapphire HEVC Decoder custom packaging should be retained and reused in the event that the Sapphire HEVC Decoder requires onward transportation.



The Sapphire HEVC Decoder is provided with two cables:

Audio Out Cable CAB0026 Hirose to Twin XLR

ASI Link Cable CAB0027 (Only supplied if SAPPH-IP-EIP High Rate Streaming Option is ordered)

The table below shows optional cables and interfaces that can be provided if required:

Optional Mounting Devices, Cables and Interfaces

- CAB0008: Second audio in XLR breakout cable
- CAB0026: Audio Out XLR breakout cable
- 4K_Converter: 12G and Dual 6G Interface Converter
- 19''_Long_Ear: Mounting kit for single Sapphire into 19''
- 19''_Kit: Mounting Kit for Dual Sapphire 19'' Mounting

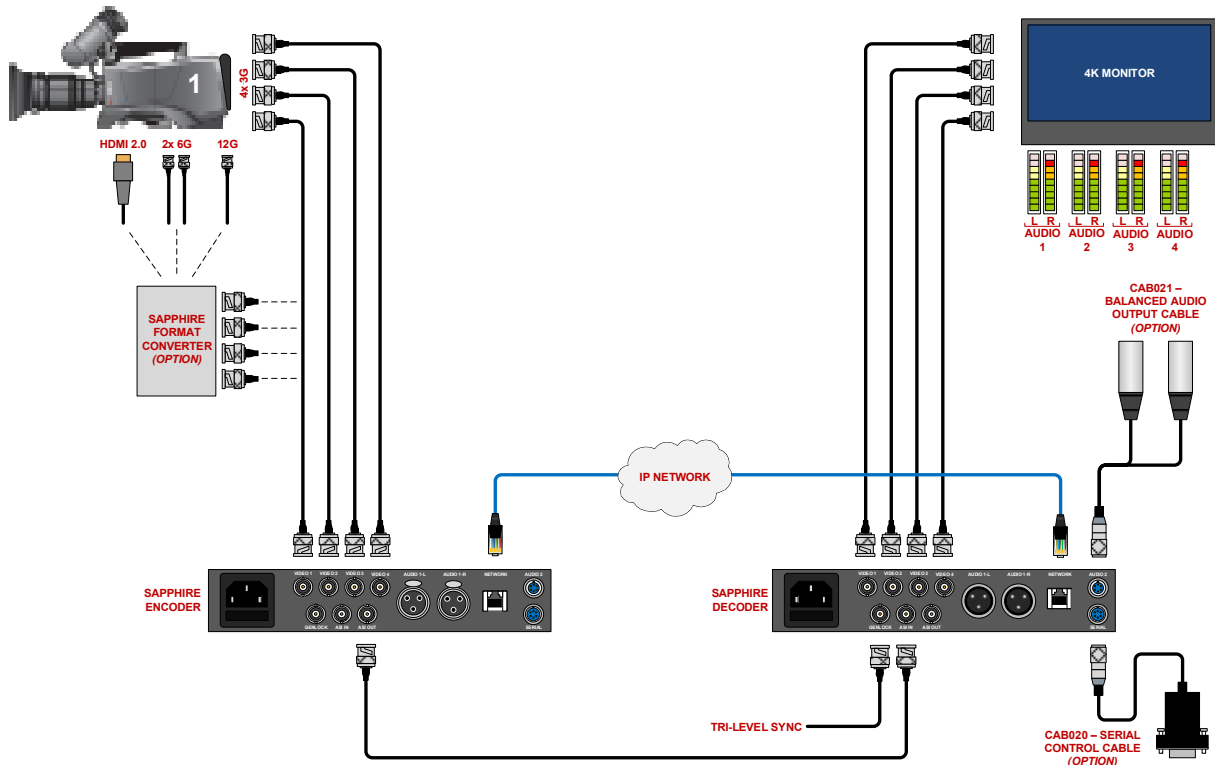
Connecting to the Sapphire HEVC Decoder

There are two principle modes of operation for the Sapphire HEVC Decoder.

Mode 1: 4K Ultra HD Mode. The input video format is 4K Ultra HD

Mode 2: HD Quad Mode. The input video format is HD video, this can be up to 4 separate HD video services.

Connections in Mode 1 – 4K Ultra HD Mode



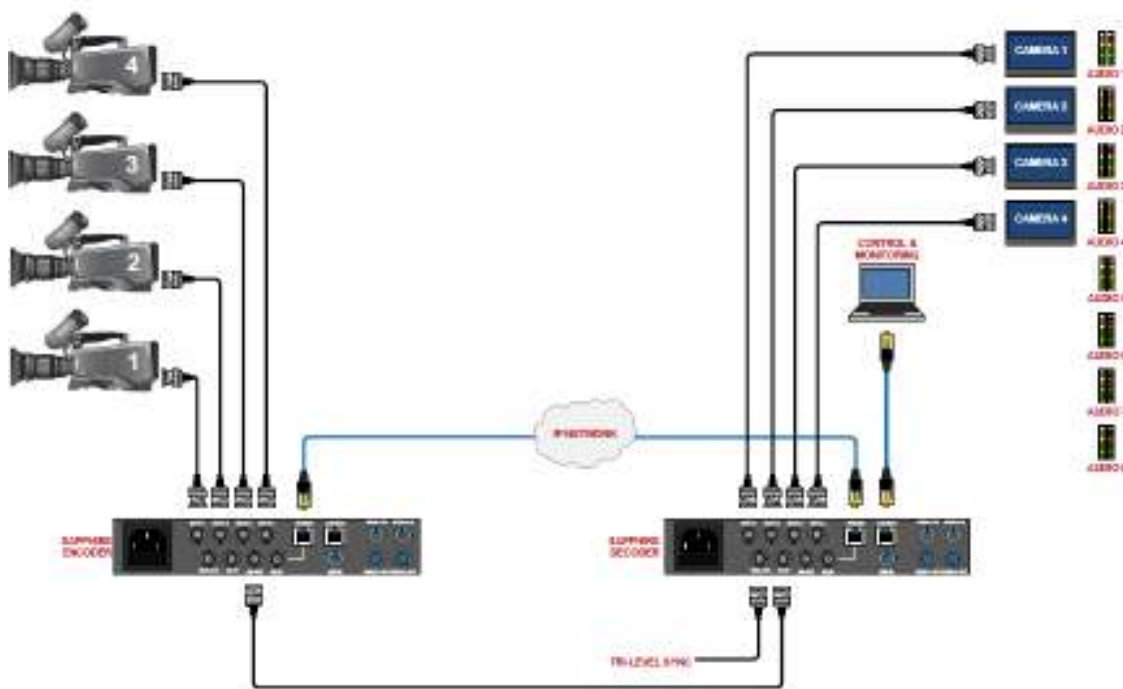
The primary connections in Mode 1 are as follows:

- 3G HDSDI signals from the camera to the Encoder and from the Decoder to the monitor. **NB: care should be taken to connect these in the correct order.**
- Suitable quality coaxial cables should be used to allow the passage of 3.5GHz 3G HDSDI signals.
- ASI Connection. The ASI interface from the Encoder to the Decoder is critical and care should be taken to use an appropriate quality coaxial cable.

Secondary Connections in Mode 1 are as follows:

- Ethernet Network. Ethernet is only required for web-browser control of the Sapphire HEVC Decoder or for Ethernet streaming applications; both of these functions are only supported in version 1.4 software or higher.
- Analogue Audio. These connections are only required if analogue audio is employed.

Connections in Mode 2 – HD Quad Mode



The primary connections in Mode 2 are as follows:

- 3G HDSDI signals from the camera sources to the Encoder and from the Decoder to the monitor. A minimum of 1 camera source is required. A maximum of 4 camera sources can be connected. Inputs should be connected in order from 1 to 4 as required. Good quality coaxial cables suitable for 3G-HDSDI should be employed.
- ASI Connection. The ASI interface from the Encoder to the Decoder is critical and care should be taken to use an appropriate quality coaxial cable.

Secondary Connections in Mode 2 are as follows:

- Ethernet Network: Ethernet is only required for web-browser control of the Sapphire HEVC Decoder or for Ethernet streaming applications; both of these are only supported in version 1.4 software or higher.
- Analogue Audio: These connections are only required if analogue audio is employed.

Getting started with Sapphire HEVC Decoder

With the primary connections in place as described previously, the Sapphire HEVC Decoder is ready to be powered.

The Sapphire HEVC Decoder can be powered on by connecting an IEC mains cable to the mains socket and setting the On/Off switch on the front panel to the On position. The front panel switch will illuminate to show that the unit is On.

After approximately 45 seconds the front panel will move from its 'Initialising' screen to the 'Status' Menu.



For successful decoding the following key parameters must be correctly set to match the video source and to match the bandwidth of the transport mechanism. Incorrect setting of these parameters may result in errors in the Decoder stream or possibly no stream at all.

The key parameters can be set in the Configuration Menu (See Front panel Menu Structures for more details).

Key Parameters

Mode 1: 4K Ultra HD Mode

VIDEO FORMAT: The Video Format is automatically detected at the receiver.

PIDS: All the PIDs (video, Audio, PRC and PMT) should match between the Sapphire HEVC Encoder and Decoder. Alternatively, Service Select Auto mode can be used.

Mode 2: HD Quad Mode

VIDEO FORMAT: The Video Format is automatically detected at the receiver.

PIDS: All the PIDs (video, Audio, PRC and PMT) should match between the Sapphire HEVC Encoder and Decoder. Alternatively, Service Select Auto mode can be used.

Front Panel Status Indicators

Status data is presented on the front panel screen of the Sapphire HEVC Decoder.

The front panel screen has two key status indicators.

ASI Lock

ASI Lock status is available from the Status Screen. To achieve ASI lock, a suitable ASI transport stream should be connected to the ASI input connector.

Temperature

Temperature status is available from the front panel unit menu. Temperatures should be below 85 deg C for correct operation.

Changing Video Format UHD and HD

The switch between Mode 1 (4K Ultra HD Mode) and Mode 2 (HD Mode), is achieved using the VIDEO FORMAT command from the configuration menus. The selected VIDEO FORMAT must match the video format generated by the Encoder.

Ultra Low Delay vs. Low Delay

The Sapphire HEVC Decoder has two styles of decoding, Ultra Low Delay and Low Delay. In Ultra Low Delay the Decoder is optimised to minimise end-to-end video latency. The latencies shown below can be achieved when using a Sapphire HEVC Encoder and Decoder in Ultra Low Delay mode.

4K Ultra HD 59p (2SI format) = 66ms
4K Ultra HD 50p (2SI format) = 75ms
HD 1080 59p = 55ms

HD 1080 50p = 70ms
HD 1080 59i = 83ms
HD 1080 50i = 98ms

In Ultra Low Delay mode, the Encoder is not optimised to achieve best image quality. If signal delay is not a key concern, Low Latency rather than Ultra Low Latency should be employed. In Low Latency mode a noticeable improvement in image quality can be achieved for a given bitrate.

Automatic Service Selection

Users can avoid the manual setting of PIDs (Packet Identifiers) by selecting SERVICE SELECT = AUTO in the configuration menu. In this mode, the Sapphire HEVC Decoder uses the PSI (Program Service Information) in the transport stream from the Encoder to select the correct service.

Using Genlock

The Sapphire HEVC Decoder has a Genlock function.

Users wishing to Genlock should connect a suitable Trilevel Sync or Black and Burst signal to the Genlock input on the rear of the Encoder. The sync signal should be of the same video format as is being decoded by the Sapphire HEVC Decoder.

There are three Genlock modes.

1) Genlock Off:

In this mode the original video timing is recovered using PCRs (Program Clock references) in the stream.

2) Genlock Internal:

In this mode recovered video timing from the stream is not used for the SDI output, a fixed internal reference is used. This is useful for situations where PCR jitter is getting transferred onto the SDI output (maybe from a jittery IP link).

Because the original video timing is not used the Genlock frame store will skip or repeat frames as necessary. In practical use this is not noticeable, however Picture quality analysers will rely on getting exactly the same number of frames on both inputs. The skipping of frames may cause a problem in these circumstances.

3) Genlock External:

In this mode the SDI output is locked to an externally provided reference. This will have the same effect of not transferring PCR jitter onto the SDI output, and is of course also used for synchronising many devices for production.

If you the same Genlock reference is proved to both the decoder and original video source then this will result in no frames being skipped or repeated. If the genlock references don't match skipped frames may occur as with the internal mode.

When Genlock mode is selected, the Sapphire HEVC Decoder must first achieve lock to the Genlock signal. Confirmation of a lock can be verified via the Genlock Lock status menus. Achieving lock can take 30-40 seconds.

Once Genlock Lock has been achieved, users can make Line and Pixel adjustments via the Genlock Line Offset and Genlock Pixel Offset commands in the configuration menu.

Line offsets can be made in the range 0 to frame length -1.

Pixel adjustments can be made in the range 0 to line length -1.

So in practical use of the system we would recommend Internal (or External if you have an event requiring synchronisation). But for testing with Picture quality analysers you will need to either set Genlock to Off (an hope jitter isn't a problem for the test), or you will need to use External and lock the decoder and source material together. I can't make out what video source you are using for the test but most will support an external reference input.

Front Panel Menu Structures

Control of the Sapphire HEVC Decoder is achieved by using the Front Panel Display.

During boot-up, the front panel display will show the text 'INITIALISING...'. This will last for approximately 45 seconds followed by the 'Status' screen. The Home screen is the default screen for the Sapphire HEVC Decoder.



Sapphire HEVC Decoder Status Screen

The Sapphire HEVC Decoder menu system is navigated using the two front panel buttons.

Left Button: is a press only button and is for cancel and return.

Right Button: is a 5 way joystick (press for Enter, Left, Right, Up, Down)



*Cancel/Return
button*

*Joystick button: Enter
(centre), Left, Right,*

Pressing the left Cancel button will enter the Top Level Menus as shown below.

Front Panel buttons have the following functions:

Cancel Button: Enter top level menus, exit menus and cancel operation

Joystick Press: To enter and select a new value

Joystick Left: To move the cursor left

- | | |
|-----------------|---|
| Joystick Right: | To move the cursor right |
| Joystick Up: | To move up in a list or increment a value |
| Joystick Down: | To move down in a list or decrement a value |

Status Menu



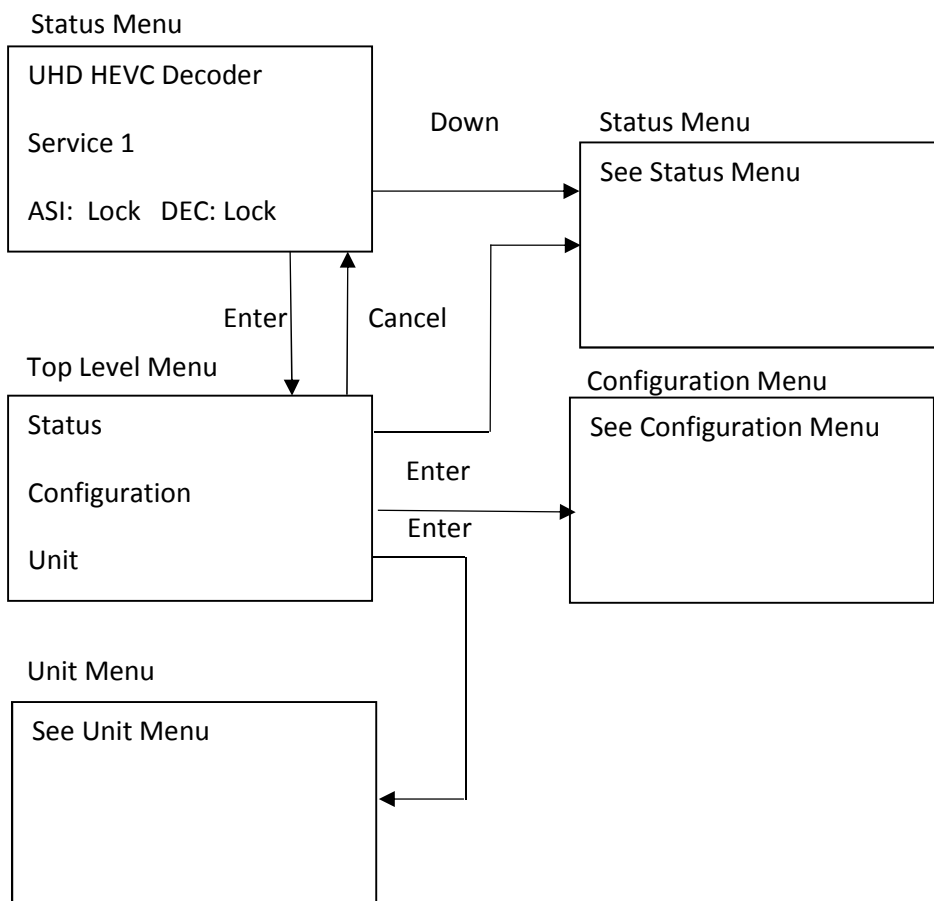
The Home Menu displays the following information:

Video format

ASI input lock status

Navigating the Sapphire HEVC Decoder Menus

The Enter and Cancel buttons can be used to Navigate the menu structure as shown below:



Status Menu Structure

The Status Menu Structure, with example settings, is shown below. The up and down joystick button is used to navigate between menus.

Status Menu 1 is shown below and is used to indicate selected Service Name, ASI Lock and Decoder status.



Status Menu 2 is shown below and is used to indicate Video Status information:



Status Menu 3-6, as shown below, provides the Service PID (Packet Identifier Descriptor) Information for the decoded service:



Status Menu 7 is shown below and provides Genlock Status:



Status Menu 8-16, shown below, provides Audio Level Meters for Audio Ch.1 to 8:



Status Menu 17 is shown below and provides the unit IP Address:



The Configuration Menu Structure

The Configuration Menu has 4 sub-menus (note IP is an Option and may not be displayed). The VIDEO, AUDIO, SERVICE and IP ENC sub-menus are where the associated Decoder parameters are controlled:



Video	
	Default Decoder Mode
	Default Video Format
	UHD Sample Format
	Quad Sync Mode
	Default Latency Mode
	HD Duplication
	Genlock Mode
	Genlock Line Offset
	Genlock Pixel Offset
	Video Fail Mode
	Error Conceal Level
Audio	
	Audio Test Tone
Service	
	Program Number
	Service Select Mode
	Manual Vid PID
	Manual Audio PID CH1
	Manual Audio PID CH2
	Manual Audio PID CH3
	Manual Audio PID CH4
	Manual Audio PID CH5
	Manual Audio PID CH6
	Manual Audio PID CH7
	Manual Audio PID CH8
	Manual Data PID
	Manual PCR PID
	Manual PMT PID
	DES Descramling
	DES Key
IP Dec	
	DHCP Mode
	Active IP Address
	Active Subnet Mask
	Active Gateway Address
	IP Receive
	IP Interface
	Stream Type
	Multicast Address
	UDP Port Number
	Buffer Delay
	Bitrate Control
	Use FEC

Unit Menu Structure

The Unit Menu Structure, with example settings, is shown below. The up and down joystick button is used to navigate between menus.

Unit	Menu Option
	DHCP Mode
	Active IP Address
	IP Subnet Mask
	IP Gateway
	IP Bridge
	Software Version
	Temperature
	Unit ESN
	License Mask
	Unit Mode
	Restore Defaults

Web Browser Control of Sapphire HEVC Decoder

Sapphire HEVC decoders include a comprehensive web browser control interface.

From a PC with a suitable browser application such as 'Firefox' or 'Chrome', navigate to the IP address of the Sapphire HEVC Decoder. The IP address can be found on the front panel menus.

The Web browser STATUS page below will be displayed.

Web Browser Status Page

Sapphire HEVC 4K Decoder

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The Status Page has the following key sections:

Input Stream: The status of the input stream is shown including ASI / IP lock status, and service lock.

Unit: Input voltage status and unit temperatures are displayed with associated warning colours if temperature or voltage is out of range.

Genlock: Shows if the decoder is locked to incoming Genlock signals

Video Decoder: Will show the mode and format information extracted from the video stream.

Monitoring: Shows a video snapshot and also audio level information.

Web Browser Configuration Changes Pages

Changes to Sapphire settings are made using the Config tab. The Config tab has sub headings for Video, Audio, Service and IP. The APPLY button is used to enact changes of settings. The REFRESH button will recall setting from the unit and refresh the web page. The RESET button causes a soft reset of the Sapphire Decoder. Most decoder settings are detected automatically from the input stream.



Web Browser Unit Menu

The unit menu is primarily concerned with configuring the IP address parameters of the Sapphire Decoder. Ethernet port 1 is (labelled 'control' on the rear panel), Ethernet port 2 is not normally presented to the rear of the Sapphire Encoder unit it is an internal port. Ethernet Port IP Module (labelled 'stream' on the rear panel) is optional and depends if the SAPPH-IP-DIP hardware option is fitted.

Sapphire HEVC 4K Decoder



Web Browser Presets Tab

The web browser Preset tab allows users to save the current Sapphire Encoder settings to a file (Create), and also to recall pre-saved files (Import). Files can be managed using the Manage options.

Sapphire HEVC 4K Decoder



Web Browser Info Page

The web browser info page gives information about the software and licensing status of the Sapphire decoder. The software version number and ESN (Electronic Serial Number, used for

licensing) are available on this page. Users can also see which license codes have been loaded. License codes appearing greyed out and not currently loaded.



Firmware and License Upgrades

It is possible to upgrade firmware and licenses on the Sapphire HEVC Decoder through the web-browser, upgrade tab.

To carry out a web update follow the procedure below:

- From a PC with a suitable browser application such as 'Firefox' or 'Chrome', navigate to the IP address of the Sapphire HEVC Decoder. The IP address can be found on the front panel menus.
- In the web browser status page select the UPGRADE tab.

The page shown below will be displayed:

Sapphire HEVC 4K Decoder



- Navigate to the appropriate upgrade file, usually a .tar file for firmware upgrades or a .lic file for license upgrades.
- After uploading the file to the unit, follow the instructions that are presented. A firmware update can take up to 10 minutes and the unit should not be repowered during this time. After the installation is complete the unit will automatically reboot and the enhanced features will be available immediately.

Upgrading B130 Front Panel Code

The Sapphire HEVC Decoder front panel can be upgraded to show the latest menu structures by pressing the smaller left side “cancel” button AT THE SAME TIME as moving the right - hand joystick to the towards the left. An update will be triggered, a message to this effect being displayed before the unit automatically reboots and the front panel reverts back to normal operation.

The IP Streaming Option

The Sapphire HEVC Decoder can receive compressed streams on ASI or over IP. To receive streams in UDP, RTP or SMPTE 2022 (streams with Forward Error Correction) the option SAPPH-IP-IPD should be employed. Fitting this option and the appropriate license enables all the associated IP menus in the control interface.

Before streaming can start, it is vital that the ASI Link Cable (CAB0027) is fitted as shown below.

Fitting this cable disables the ASI Output (Input on Decoders) and should therefore only be carried out if IP streaming is required.



ASI Link Cable
Fitted to Sapphire
HEVC Encoder

ASI Link Cable
Fitted to Sapphire
HEVC Decoder

The Sapphire Decoder with SAPPH-IP-IPD should be configured as follows for IP streaming.

The Sapphire Decoder will use the “Ethernet Port IP Stream” labelled ‘STREAM’ on the rear so this requires appropriate IP connection/setup. The web browser Unit tab contains link status (Up/Down) information and TX/RX packet counts. This allows users to see if the interface is active.

The following configurations should be made:

- Unicast or Multicast should be selected to match the type of address used by the Encoder.
- Buffer Delay in general defines the amount of packet jitter which can be coped with
- Buffer Control has several options but most of the time should be set to PCR, some VBR streams will require the Disabled mode.
 - o PCR – “Bitrate is estimated using PCRs if possible, otherwise the bitrate is estimated without PCRs”
 - o Buffer – “Bitrate estimation is disabled; Packets are buffered, and transmitted with a fixed delay”
 - o Stream – “Bitrate is estimated without the use of PCRs”
 - o Disabled – “Bitrate estimation is disabled; Packets are routed to the ASI port immediately”

- Alongside the IP stream setup there are also diagnostics info
 - o Estimated Bitrate relates to the bitrate coming in on the IP input, if this shows 0.0 Mb/s then there's no stream detected but the Address/Port may be incorrect or something may be blocking the stream.
 - o FEC Columns/Rows/Delay show FEC setup detected on incoming stream.
 - o Lost Before and After show how effect the FEC is being.
 - o Delay factor shows the maximum packet jitter seen in the last second or so, if you see numbers approaching the Jitter Tolerance field then it's best to increase the Buffer delay to compensate.
 - o Jitter and Lock errors increment which problems occur, steady numbers are what you want to see here.
- On the Status tab there is an IP Transmit status which shows the current mode and changes colour based on state
 - o Green is all good
 - o Orange for packets lost before FEC or no FEC columns/rows detected when Use FEC is enabled
 - o Red for packets lost after FEC or if other error counters are incrementing

Installing the Sapphire HEVC Decoder

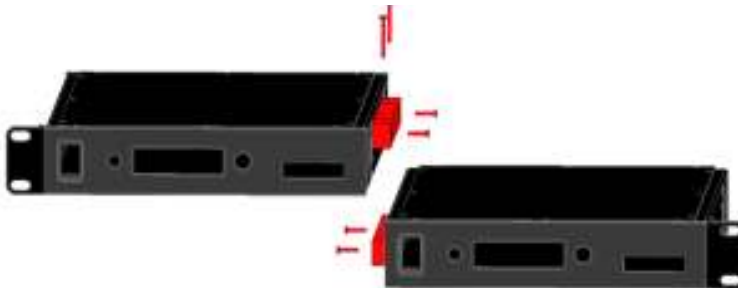
The Sapphire HEVC Decoder is designed for 19" Rack or desk-mount operation. The Sapphire HEVC Decoder is not suitable for outdoor use. Care should be taken when installing the Sapphire HEVC Decoder to ensure that the air vents on the side of the unit are not obstructed. Obstruction of these vents can cause overheating and subsequent damage.

For 19" Rack mounting there are two options:

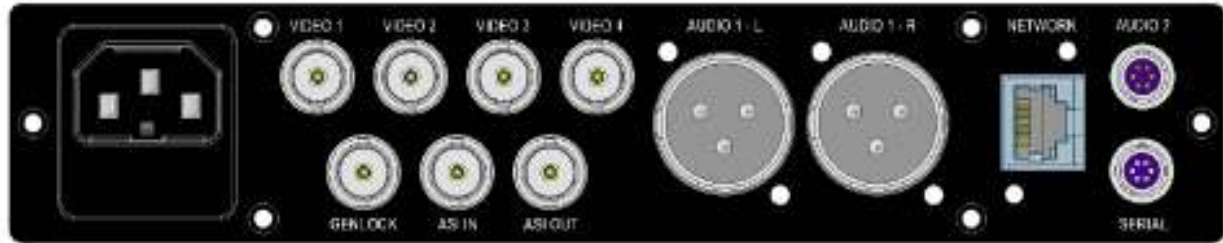
Option 1 allows a single Sapphire HEVC Decoder to be mounted in a 19" rack by using the 19" Long Ear Rack Mount bracket option as shown below:



Option 2 allows two Sapphire HEVC Decoders to be mounted in a 19" rack by using the Dual 19" Mounting bracket kit.



Connector Interfaces (Pre April 2019)



Video 1 – 4

Connector: BNC Female (note 3GHz specified)

Audio 1 – L / R

Connector: XLR 3 Pin Male

Pins
1: GND
2: Audio-
3: Audio+

Genlock

Connector: BNC Female

ASI In

Connector: BNC Female

ASI Out

Connector: BNC Female

Network

Connector: RJ45

Audio 2

Connector: 6 pin Hirose HR10 Male

Part Num: HR10-7R-6P(73)

Pins
1: Audio 2 L+
2: Audio 2 L-
3: GND
4: Audio 2 R+
5: Audio 2 R-
6: GND

Serial

Connector: 6 pin Hirose HR10 Male

Part Num: HR10-7R-6P(73)

Pins
1: RS232 Data TX (out)
2: RS232 Data RX (In)
3: GND
4: RS232 Proc TX (out)
5: RS232 Proc RX (In)
6: GND

Connector Interfaces (Post April 2019)



Video 1 – 4

Connector: BNC Female (note 3GHz specified)

Genlock

Connector: BNC Female

ASI In

Connector: BNC Female

ASI Out

Connector: BNC Female

ASI IP

Connector: BNC Female

Control

Connector: RJ45

Stream

Connector: RJ45

Audio 1 and Audio 2 Out

Connector: 6 pin Hirose HR10 Male

Part Num: HR10-7R-6P(73)

Pins	1:	Audio L+
	2:	Audio L-
	3:	GND
	4:	Audio R+
	5:	Audio R-
	6:	GND

Serial

Connector: 6 pin Hirose HR10 Male

Part Num: HR10-7R-6P(73)

Pins	1:	RS232 Data TX (out)
	2:	RS232 Data RX (In)
	3:	GND
	4:	RS232 Proc TX (out)
	5:	RS232 Proc RX (In)
	6:	GND

Technical Specifications

Connectors

HDSDI 3G 1-4	4x BNC Female 75 ohm
ASI IN	BNC Female 75 ohm
ASI OUT	BNC Female 75 ohm
ASI IP	BNC Female 75 ohm
Control	RJ45
Stream	RJ45
Audio	Hirose 6 pin Male
AC In	IEC

Video Decoder

Profiles 4K UHD.	4:2:2/4:2:0, 8/10-bit 2160p / 23.98 / 24 / 25 / 29.97 / 30 / 50 / 59.94 / 60
HD.	4:2:2/4:2:0, 8/10-bit 720p / 50 / 59.94 / 60 1080i / 50 / 59.94 / 60 1080p / 23.98 / 24 / 25 / 29.97 / 30 / 50 / 59.94 / 60
SD	4.2.2/4.2.0 480i / 29.97 576i / 25
Legacy encoding modes H.264 and MPEG2*	

Latency

Encoder + Decoder	60ms (70ms in 4K mode) with ULL option
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Audio Decoder

Format	Embedded
Decoder	MPEG-1 Layer2, AAC-LC, HE-AAC (Linear PCM in Ultra-Low Delay)
Quantity	4 pairs (1 pair in Ultra-Low Delay)

Analogue Audio

Format	2 pairs line / mic level
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Stream Inputs / Outputs

DVB_ASI	Transport stream to 100Mb/s
IP Interface	10/100/1000 base-T
IP Stream Format	Unicast / Multicast / RTSP

Indicators

Display	Hi-brightness OLED
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Control

Local	Joystick and menu screen
Remote	IP web browser Control
RS232	(module only)

Dimensions

Size (WxDxH)	210x352x1RU
Weight	1.9Kg
Mounting	Side-by-side mount kit available as an option

Power

AC In:	90-255VAC 15W @ 4K Decoding
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Dimension Drawings

