HCAM

User Manual

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Conventions

NOTE: Notes convey additional information.

⚠ CAUTION: Cautionary notes show where potential equipment damage could occur.

⚠ WARNING: Warnings show where there is potential for personal danger or death. Read and understand warnings before attempting to carry out any work on any equipment attached or otherwise related to the equipment in use. Warnings convey real danger. Not understanding warnings could lead to injury, harm or potential death.

Service/Support Contacts:

Region	Contact Details
Worldwide	UKsupport@vislink.com +44 (0) 1442 431410 +44 (0) 1787 226227
Americas	USsupport@vislink.com +1 978 671 5929 888 777 9221

When contacting Technical Support, please include the following information:

- Model number and serial number of the unit (located on a label on the bottom of each unit).

  …….
- Approximate date of purchase.

  …….

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Document History

Version	Date	Modification
1	05/03/2018	First release of document.
2	29/03/2018	Updated Section 2.1 to reflect the latest HCAM Matrix Added new Section 2.2 for HCAM Optional Items. Updated Section 2.3.2 to correct Summary page access route (using Esc keypad). Updated Section 3.1 to remove Ethernet 1000 option. Minor updates to Section 5.2.6 Analogue Audio Input. Updated Table 6.1 to include new Video Icon functionality. Updated Section 6.2 to show updated menu structure. Updated USB type from Mini-A types to Micro AB throughout. Various minor non-technical updates.
3	30/4/2018	Added Section 6.2 WI-FI Settings and default password. Updated Section 6.3 HCAM Menus. Included note for HCAM Delay setting in Section 6.3.1 Encoder menu section. Added Firmware Release Note part number in Section 8.
3.01	1/11/2018	Added a new Block Diagram to Section 4. Added in new content to cover DVB-T and LMST options under Section 5.4.
3.02	12/03/2019	Updated metalwork images throughout and updated weight in Section 3. Minor update to clarify license options in Section 5.4 Modulator Options. Corrected Link Cable Assembly part number in Section 5.2.1 to SYCA-ASSY-2002. Corrected reference in Table 5.6 to Tally Red Out (pin 1) & Tally Green Out (pin 2) Added new SDI Input Type information in Section 6.2, new Audio Setting information in Section 6.3, Recall Default Settings in Section 6.5 and Advanced Mode Options Section 6.6. Also, added new menu items in Table 6-3. Updated Camera Control information to add to Section 9, updated Section 5.2.4 to add Panasonic and Grass Valley cable descriptions and included camera control updates to Section 6.9.3 menu overview. Included link to the Vislink FTP site for firmware updates in Section 8. Minor non-technical updates
3.03	02/05/2020	Based on firmware HCAM-ASSW-7000-0601 release: Added HDR Signaling 6.3 Added HEVC Delay 6.4 Added Advanced Mode, Fan Mode 6.9.4 Added Advanced Mode, Modulator Carrier 6.9.5

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1. General Information

1.1. General Safety Information

To ensure awareness of potential hazards, personnel concerned with the operation or maintenance of the equipment, must study the information that follows together with local site regulations.

⚠ WARNING: RF Power Hazard: Please see Section 1.6.

⚠ WARNING: GaAs / BeO Hazard: Certain components inside the equipment contain Gallium Arsenide and Beryllium Oxide that are toxic substances. Whilst safe to handle under normal circumstances, DO NOT cut, brake apart, incinerate or chemically process individual components. Beryllium Oxide is a white, ceramic material that has hazardous dust or fumes. Beryllium Oxide is carcinogenic, if ingested, inhaled or if it enters the body via damaged skin. Please consult your local authority before disposing of these components.

⚠ CAUTION: This system contains MOS devices. Employ suitable Electro-Static Discharge (ESD) precautions to prevent accidental damage.

1.2. Environmental

The HCAM is IPX0 rated. Do not expose it to dripping or splashing water/liquid. When used outdoors, protect the unit using the rain cover.

1.3. External Battery

⚠ CAUTION: Only replace the external battery with the same or equivalent type.

⚠ WARNING: Do not expose the battery to sources of excessive heat, such as fire. Extremes of temperature may cause the battery to explode, causing personal injury or death and equipment damage.

⚠ WARNING: Always correctly replace the battery to avoid danger of explosion.

⚠ WARNING: Do not incinerate batteries

1.4. Disposal Instructions

None of the supplied equipment is biodegradable in landfill sites. Do NOT dispose of any equipment with household waste, including batteries (where applicable).

NOTE: Vislink offers a disposal service for batteries bought from IMT Ltd (trading as Vislink).

Always consider the following rules:

1. Advise Vislink of your intent to return prior to shipment via phone +44 1442 431 300.
2. Return any batteries in the correct packaging. If possible in the original packaging:
   - Minimum demand: protection against short circuit.
3. Do not send batteries for disposal using any form of air-transport.

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1.5. CE Compliance

The HCAM is compliant under the ETSI R&TTE directive.

The unit is compliant to CE. The unit is an intentional radiator and the operating frequency may not be authorized in some territories.

It is the operator's responsibility to ensure that he has in his possession valid licenses and site clearances, as may be required by local authorities, for the intended operating frequencies, geographical location and times of operation of the equipment.

1.6. Health & Safety

1.6.1. Exposure to Non-Ionizing (RF) Radiation/Safe Working Distances

You may use HCAM without specific SAR according to the standards EN62311 / EN62479 Annex B.

1.6.1.1. Minimum Safety Information

⚠ WARNING: There should be a minimum separation of 15mm between Operator and the radiating element according to the calculation below:

- Determination of far field, ref. EN62311:
  - The largest dimension of the radiating element (37mm) is shorter than ¼-wavelength, 37.4mm at 2.0 GHz; hence, the radiating near field region is inside the reactive near field region.
  - Far field calculation will only be valid >>2 λ, i.e. >> 30cm.
- Determination of exclusion level, ref. EN 62479:
  - Declared 7 dB bandwidth of antenna: 2.0 - 2.7 GHz
  - Declared distance: Not specified
  - Declared output power: 100mW.

Whilst Annex B of the above standard is used to determine the low-power exclusion level (the lowest power that the EUT needs for physical testing for SAR effects), we can use the same calculation in reverse to determine the required minimum distance for said exclusion. Annex B is applicable over the 300-6000MHz frequency range for devices that are located within 25mm of the body. The levels are based on the basic restriction localized to head and truck of 2W/kg averaged over 10g of tissue.

Frequency of operation:	2350MHz
7dB bandwidth:	700MHz
Pmax:	100mW

The distance (to the nearest whole mm) is therefore 15mm.

⚠ WARNING: Do not touch the radiating element with the unit powered on.

⚠ WARNING: Do not allow anyone to run an RF transmitter or power amplifier with any of its covers removed.

⚠ WARNING: See Table 1-1 for a minimum separation recommendation between Operator and the radiating element for the frequency range 1.5 – 7.5 GHz and transmit power 100 mW & 200mW.

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Frequency (GHz)	Transmit Power	
	100mW	200mW
	Distance in mm	
1.5	12	35
2	14	38
2.5	16	40
3	17	42
3.5	19	43
4	20	45
4.5	21	46
5	22	47
5.5	23	48
6	24	49
6.5	25	50
7	26	51
7.5	27	52

Table 1-1 Minimum Safe Working Distances from a Radiating Element

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1.7. Restrictions on Operation

When operated as a radio transmitter this equipment has the following restrictions on its use in the European Union:

With module L1510-	L1750-1927	L1750-3239	With module L1510-	L1750-1927	L1750-3239
Austria (AT)	✓	X	**Italy (IT)**	✓(8)	TBA
Belgium (BE)	✓(1)	X	**Lithuania (LT)**	✓	X
Bulgaria (BG)	✓(2)	X	**Luxembourg (LU)**	✓(10)	X
Switz/Liecht. (CH)	✓	✓(17)	**Latvia (LV)**	✓	✓(17)
Cyprus (CY)	✓	✓(17)	**Malta (MT)**	✓	X
Czech Republic (CZ)	✓	✓(17)	**Netherlands (NL)**	✓	✓(17)
Germany (DE)	✓(4)	✓(17)	**Norway (NO)**	✓	✓(17)
Denmark (DK)	✓	✓(17)	**Poland (PL)**	✓	TBA
Estonia (EE)	✓	X	**Portugal (PT)**	✓	X
Finland (FI)	✓	✓(17)	**Romania (RO)**	✓	✓(17)
France (FR)	✓(6)	✓(6)	**Spain (ES)**	✓(14)	TBA
Greece (GR)	✓	✓(17)	**Sweden (SE)**	✓	✓(17)
Hungary (HU)	X	X	**Slovenia (SI)**	✓(15)	X
Ireland (IE)	✓	✓(17)	**Slovak Republic (SK)**	✓(16)	X
Iceland (IS)	✓	✓(17)	**United Kingdom (UK)**	✓	✓(17)

Table 1-2 European Country Radio Restrictions

KEY: X – Operation not permitted.
✓ - Operation may be permitted. Do not assume the whole band is available ⓘ.
✓ (n) – Operation permitted with restrictions (see note ‘n’).

We advise operators to check with the relevant frequency authority that their application complies with the local requirements. Frequency allocations vary from time to time. All known restrictions are indicated in the notes below, however Vislink International Ltd. cannot be held liable for any errors.
Unless noted below all countries require individual licenses for operation.

Contact details for all EU spectrum authorities is available here:

- http://ec.europa.eu/enterprise/rtte/spectr.htm.

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1.7.1. HCAM Notes

Country	Notes	Country	Notes
(BE)	It may operate in the frequency bands 1980 – 2110 MHz; 2170 – 2400 or 2.500 – 2.700 MHz (P.S. in Belgium this band is allocated for mobile services (LTE 4G) and therefore only 2 specific channels are available).	(LT)	-
(BG)	The use of this equipment is subject to license (www.crc.bg) Can only use the band 2300 – 2400 MHz	(LU)	Can only use the band 2335-2395MHz
(CH)	-	(LV)	-
(DE)	The use of this equipment is subject to license. Contact your local BNetzA office for individual frequency assignment.	(NO)	-
(FI)	-	(PT)	-
(FR)	These frequency bands are partly reserved in France for activities concerning public security, or national defense. French authorities are intensifying monitoring of the use made of these frequencies bands in order to avoid any harmful interference and you may be liable in case of harmful interference caused by a device you are operating. Consequently, we recommend that you contact the French telecommunications regulatory authority (ARCEP) (http://www.arcep.fr) in order to get the latest information on what operations are permitted.	(ES)	Can only use the band 2300.0 - 2483.5MHz
(GR)	-	(SI)	The use of this equipment is subject to license. Can only use bands 2070-2110 & 2300-2500MHz
(IT)	Can only use the following bands: 2040-2110, 2215-2450, 2450-2500 MHz	(SK)	Can only use the band 2300 – 2383MHz
These spectrum authorities have not made any recorded objections. Check for licensing with the relevant authority.			

Table 1-3 HCAM Notes

Ensure that you earth all mains power equipment. Operate the equipment within environmental limits (see Section 3) and ensure as much ventilation as possible. Only authorized personnel should open the product, broken seals invalidates any repairs or warranty. The equipment is CE compliant and an EC Declaration of Conformity and Technical files are available on request.

Ensure that you take suitable anti-static precautions when removing the HCAM modules from the main unit.

NOTE: This product is not approved for permanent mounting in commercial vehicles.

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2. HCAM Encoder Transmitter Introduction

HCAM represents the next generation of flexible, portable, HEVC 4K UHD wireless systems from Vislink. The highly flexible and configurable mounting options and video interfaces offered make the HCAM unit mountable to broadcast cameras for sporting events, ENG cameras for news and even prosumer cameras. With user interchangeable RF modules and a range of software options, the HCAM continues the line of innovative, high performance wireless camera systems available from Vislink.

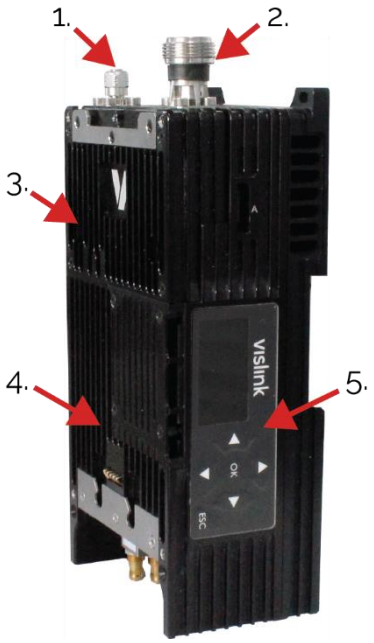

Figure 2-1 HCAM Encoder Transmitter

ID	Explanation
1	UHF receiver antenna connector
2	OFDM transmit antenna connector
3	Modulator/Up converter module
4	HEVC encoder
5	Control panel

Table 2-1 HCAM Encoder Transmitter ID Table

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2.1. HCAM Matrix

The HCAM unit comprises of two parts with the main chassis and interchangeable RF unit, meaning the unit is flexible to changing needs.

Unit Number	O/P Power	Freq	Video Inputs	RF/UHF Module	Chassis
HCAM-ASSY-7001	100/ 250mW	1.3-1.7 GHz	4x HD-BNC 3G-SDI/ SFP form factor	HCAM-ASSY-5500	HCAM-ASSY-5014
HCAM-ASSY-7002		1.95-2.7 GHz		HCAM-ASSY-5501	
HCAM-ASSY-7003		3.2-3.9 GHz		HCAM-ASSY-5502	
HCAM-ASSY-7004	100mW	4.4-5.0 GHz		HCAM-ASSY-5503	
HCAM-ASSY-7005		6.425-7.125 GHz		HCAM-ASSY-5504	
HCAM-ASSY-7006		6.8-7.5 GHz		HCAM-ASSY-5505	
HCAM-ASSY-7007		5.4-5.925 GHz		HCAM-ASSY-5506	
HCAM-ASSY-7008		7.25-7.75 GHz		HCAM-ASSY-5505	
HCAM-ASSY-7500	100/ 250mW	1.3-1.7 GHz	1x HD-BNC 3G-SDI/ SFP form factor	HCAM-ASSY-5500	HCAM-ASSY-5001
HCAM-ASSY-7501		1.95-2.7 GHz		HCAM-ASSY-5501	
HCAM-ASSY-7502		3.2-3.9 GHz		HCAM-ASSY-5502	
HCAM-ASSY-7503	100mW	4.4-5.0 GHz		HCAM-ASSY-5503	
HCAM-ASSY-7504		6.425-7.125 GHz		HCAM-ASSY-5504	
HCAM-ASSY-7505		6.8-7.5 GHz		HCAM-ASSY-5505	
HCAM-ASSY-7506		5.4-5.925 GHz		HCAM-ASSY-5506	
HCAM-ASSY-7507		7.25-7.75 GHz		HCAM-ASSY-5505	

Table 2-2 HCAM Matrix

2.2. HCAM Optional Items

The following table outlines the currently available HCAM license and Antenna options.

HCAM Licenses	
HCAM-LICE-0001	HCAM LICENSE SERVICE 1 4K UHD ENCODE + HD 1080P
HCAM-LICE-0002	HCAM LICENSE SERVICE 2 HD ENCODE 1080P
HCAM-LICE-0003	HCAM LICENSE SERVICE 3 HD ENCODE 1080P
HCAM-LICE-0004	HCAM LICENSE SERVICE 4 HD ENCODE 1080P
HCAM-LICE-0007	HCAM LICENSE H.264 ENCODING
HCAM-LICE-0008	HCAM LICENSE DEEP INTERLEAVING
HCAM-LICE-0009	HCAM LICENSE VARIABLE BANDWIDTH LMS-T
HCAM-LICE-0010	HCAM LICENSE UHF RX CAMERA CONTROL
HCAM-LICE-0011	HCAM LICENSE BISS SCRAMBLING

Table 2-3 HCAM License Information

Antenna Options	
L0018-4145	ANTENNA UHF 410-450MHz SMA(M) RED CAP
L0018-4549	ANTENNA UHF 450-490MHz SMA(M) BLUE CAP

Table 2-4 HCAM Antenna Options

Kit ID	Description	Front Cover Module Battery Side		Rear Cover Module Camera Side	
HCAM-ASSY-RK01	Runway Kit	IDX	HCAM-ASSY-5011	IDX	HCAM-ASSY-5012
HCAM-ASSY-RK02		IDX	HCAM-ASSY-5011	Anton Bauer	HCAM-ASSY-5010
HCAM-ASSY-RK03		Anton Bauer	HCAM-ASSY-5009	Anton Bauer	HCAM-ASSY-5010
HCAM-ASSY-RK04		Anton Bauer	HCAM-ASSY-5009	IDX	HCAM-ASSY-5012
HCAM-ASSY-RK10		4x HDBNC TO BNC CABLES / 600mm Audio Lead / 600mm Data Cable			

Table 2-5 HCAM Runway Kit

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2.3. Control Panel Operation

Use the HCAM control panel to configure and make in-field changes to the unit's configuration.

Figure 2-2 HCAM Display Example

Use the directional pads to navigate through the menu structure, displayed on the OLED screen.

Press **OK** to accept and save changes.

Press **ESC** to cancel, exit and back out of menus.

Table 2-6 explains the editing parameters available for the directional buttons.

Action	Function
Up and down	Modifies alphanumeric values
Left and right	Changes the alphanumeric character being edited / Navigates
OK	Accepts the newly edited value (or enters menus)
ESC	Cancels the edit (or exits menus)

Table 2-6 Keypad Overview

When you power on the HCAM, it reverts to the last known condition.

2.4. HCAM Display

2.4.1. Main Display

The HCAM encoder has an integrated OLED display. The brightness of OLED displays reduces with usage. To increase the life of the OLED display, we advise that you enable the display time-out where possible. Operating the directional keys reactivates the display after a time-out. The default for the timeout comes enabled and set to 30 seconds.

2.4.2. Summary Pages

The HCAM display provides a tree like menu structure of control parameters and status indicators. In addition, at the top level of the menu structure, there are summary pages, accessed using the **Esc** keypad. The summary pages, along with the display icons, give quick access to important parameters. Press **OK** to access menus.

See Section 6 for an overview of the icons used and software menus.

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3. Specifications

3.1. Physical

Feature	Description
Dimensions	165 x 43 x 82 mm
Weight	725g
Temperature	0°C to 50°C (32°F to 122°F)
Power Connector	2-pin LEMO
Power Supply	Extended operating voltage range 10V to 32.2V
Power Consumption	Nominally 25W in standard configuration (with L1750-1927)
Data	3-way LEMO
Ethernet Control & IP Video	RJ45 (10/100 Base-T Ethernet)
USB Ports	Micro-USB AB-type
2x SFP	Quad 3/6/12G SDI/HDMI/Fiber Optic/ SMPTE 2022-6 HD-SDI over IP interfaces
Audio	5-way LEMO
Camera Control	7-way LEMO

3.2. Inputs

Feature	Description	
SFP	2x SFP+ module slots supporting electrical and optical interfaces carrying:	
	4x SDI	SMPTE ST-259M
	4x HD-SDI	SMPTE ST-292M
	4x 3G-SDI	SMPTE ST-424M
	2x 6G-SDI	SMPTE ST-2081
	1x12G-SDI	SMPTE ST-2082
ASI	Input for service multiplexing (Remux) (available on multi-function pins)	
Audio	Embedded audio over SDI/HD-SDI/3G, 6G & 12G SDI 1x analogue audio stereo pair (LEMO) Mic/Line level support with phantom power	
UHF Receiver	410 to 490MHz range FocalPoint camera control compatibility	

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3.3. Output

Feature	Description
Frequency Band	See the HCAM Matrix document. Part number: HCAM-MATRIX
Transmit Power	10 to 250mW (or add barrel booster option)
Transmit Antenna	Omni-directional 3 dBi gain (nominal)
Frequency Selection	Up to 16 preset channels for tuning
Modulation	COFDM DVB-T or LMS-T
Modulation Modes	DVB-T: - QPSK, 16QAM, 64QAM - FEC: 1/2, 2/3, 3/4, 5/6, 7/8 - Guard Interval: 1/32, 1/16, 1/8, 1/4
	LMS-T: - QPSK, 16QAM - FEC: 1/2, 2/3, 3/4, 5/6, 7/8, 9/10, 14/15 - Guard Interval: 1/16, 1/8
Data Rate	DVB-T 4.98 to 31.7 Mbit/s
	LMS-T up to 43 Mbit/s bandwidth dependent (licensed option)
Bandwidth	DVB-T: 6/7/8MHz
	LMS-T: 3/4/5/6/7/8/10/12/14/16/20MHz or 24MHz with two carrier density options
	Optional pre-distortion for enhanced adjacent channel performance (frequency permitting)
ASI	Output (available on multi-function pins)

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3.4. Video

Feature	Description
Video Formats	480i/29.97 576i/25 720p/50, 59.94, 60 1080i/50, 59.94, 60 1080p/23.98, 24, 25, 29.97, 30, 50, 59.94, 60 2160p/23.98, 24, 25, 29.97, 30, 50, 59.94, 60
Video Encoder Profiles	H.265 HEVC Main, Main-10: - H.265 HEVC 8/10 Bit to 4K 60p H.264 AVC Main, High, Baseline up to Level 5.2: - H.264 AVC High 10/4:2:2 - H.264 AVC 4:2:0/4:2:2 - 8/10 Bit to HD 60p 4K Native and UHD (1 Service) HD (Up to 4 Services) SD (Up to 4 Services): - 4.2.0 Main - 4.2.2 Main
Encoding	HEVC (H.265) AVC (H.264) MPEG-2 (H.262)
IP Video Protocol	IEEE802.3 Ethernet Encapsulation for ASI-RTP (RFC2250), ARP, IPv4, IGMPv2/3, TCP/UDP MultiCast
IP Video FEC	Pro-MPEG Forum Code of Practice #3 release 2 (CoP3)/SMPTE 2022-2007

3.5. Audio

Feature	Description
Encoding	AAC MPEG-1 AES/Dolby Pass through

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4. HCAM Connections

4.1. Antenna Connections

HCAM antenna connections are located on the top side of the unit, labelled RF and UHF, providing RF and camera control functionality.

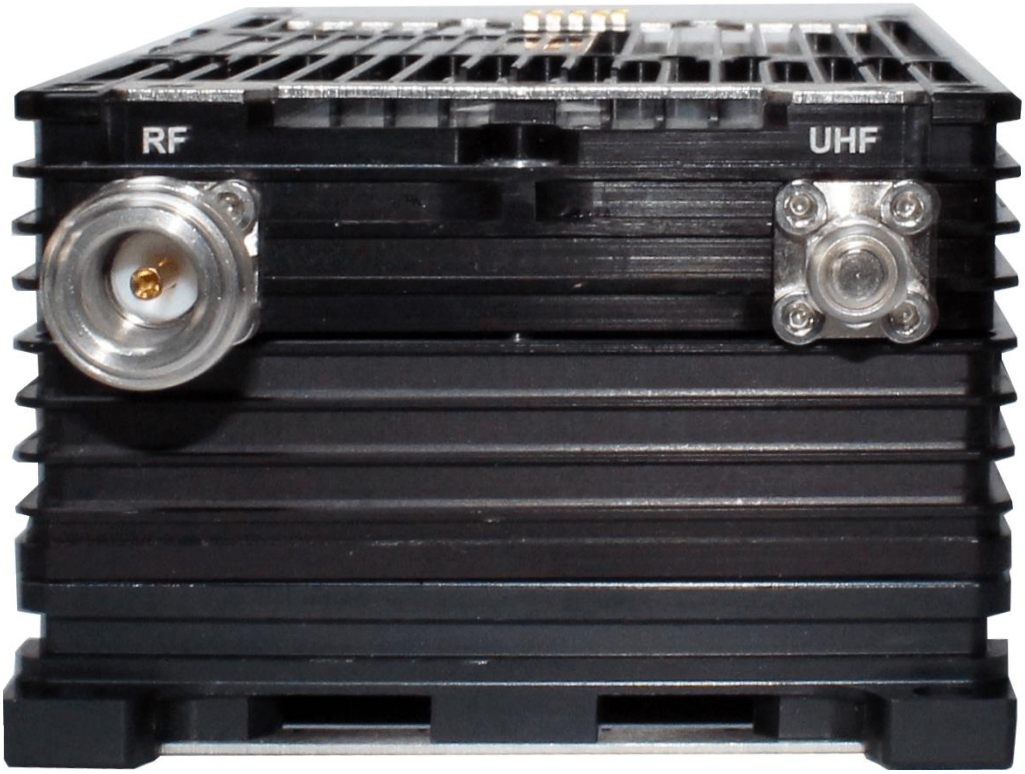

Figure 4-1 Antenna Connector Overview

Connector type	Legend	Description
RF Out	RF	N-Type Male 50 Ohm connector
UHF In	UHF	SMA 50 Ohm connector

Table 4-1 Antenna Connector Overview

4.2. USB Connector

The micro-AB type USB connector is located on the side panel of the unit.

Connector type	Legend	Description
USB	-	Micro-AB USB 2.0

Table 4-2 USB Connector Overview

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4.3. HCAM Connector Interface Overview

Figure 4-2 HCAM Main Connector Panel Interface

Connector Type	Legend	Description
2x SFP+ module Slots carrying 4x BNC 75Ω bayonet socket	-	Quad 3/6/12G SDI/HDMI/Fiber Optic/SMPTE 2022-6 HD-SDI over IP interfaces
RJ45	-	Network port, access to internal webserver, used to configure the unit
7-way Lemo	CC	DVB-ASI output
		DVB-ASI input for remux operation MAX cable length 10m
		Camera Control
5-way Lemo	AUDIO	Analogue audio stereo pair input at Line or Mic levels
3-way Lemo	DATA & Tally	RS232 connection for Link Control or Data input
		Tally
2-way LEMO	POWER	External 12V battery supply

Table 4-3 HCAM Connector Overview

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4.4.HCAM Block Diagram

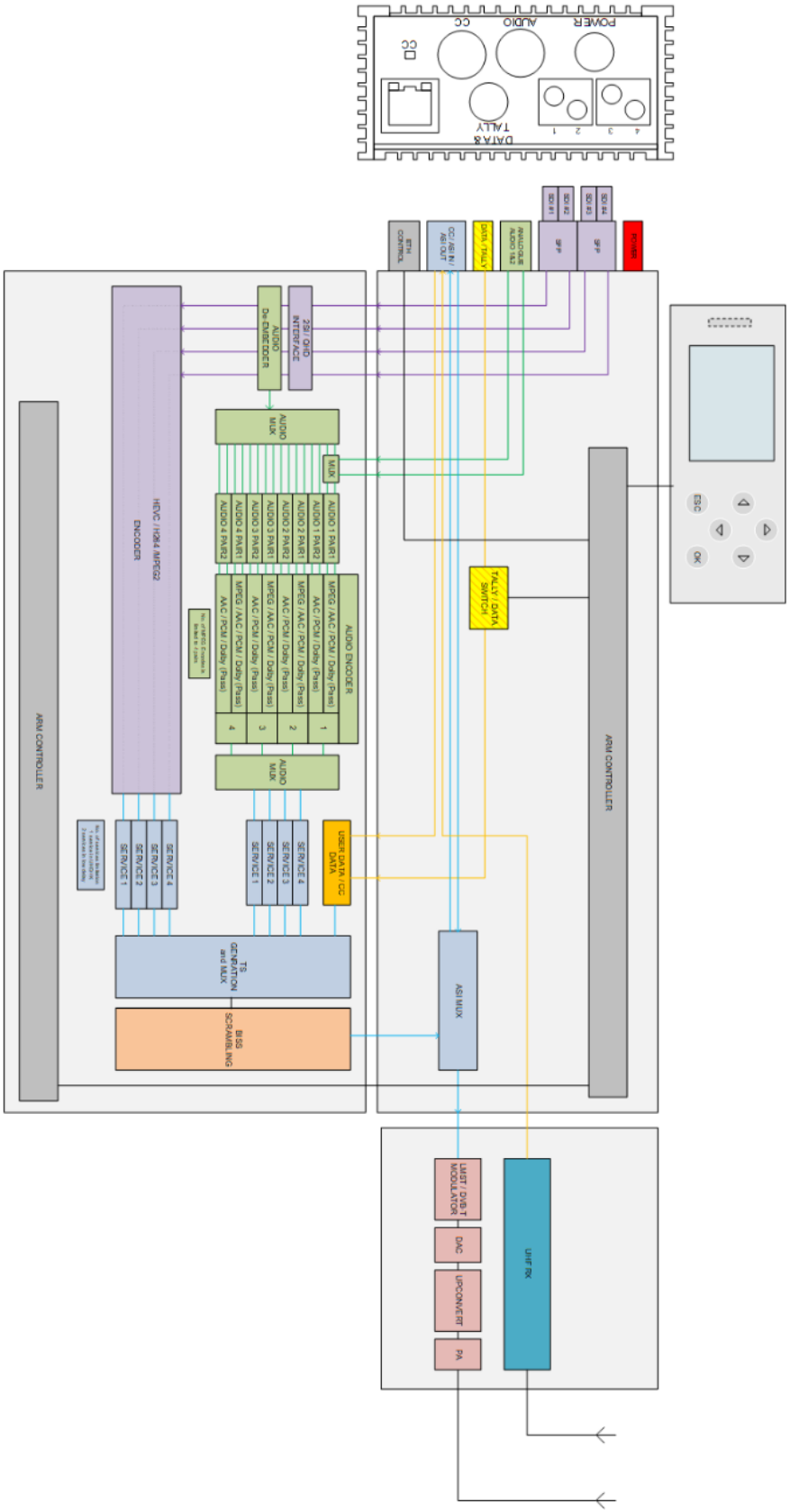

Figure 4-3 System Block Diagram

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5. HCAM Transmitter Connector Descriptions

The HCAM unit consists of two assemblies. The main chassis housing the encoder hardware and the interchangeable transmitter module. Section 6 contains an overview of the modules and how they fit together.

5.1. Analogue Audio Routing

The HCAM has one analogue A & B stereo codec.

5.2. Encoder Input / Output Connections

This following section details the connector types and pin-outs of the interface connectors on the HCAM Encoder module.

5.2.1. DC Power Connection

HCAM ~38W 12V DC nominal (10V minimum, 32.2V maximum)

Actual power consumption depends on the operating mode and video content.

Chassis Socket Connector:	CONN-LEMO-EGG7
Mating Cable Plug:	CONN-LEMO-LM02
Link Cable Assembly:	SYCA-ASSY-2002 (HCAM 300mm LEMO to D-Tap Power cable)

LEMO Pin	Function
1	+12V DC nominal supply
2	GND

Table 5-1 HCAM DC Power Pinout

5.2.2. Network Connector

RJ45 connector for webserver access, streaming out, and streaming in to remux (not yet available).

5.2.3. SFP Modules

HCAM uses a pair of 3 GHz, SMPTE 424M, SMPTE 292M, and SMPTE 259M compliant SFP modules with HD-BNC 75Ω connectors.

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5.2.4. Camera Control Out

7-pin LEMO connector for interfacing to the camera to provide a camera control function.

CC 7-pin LEMO Pin	Function	Description
Pin 1	Rx Data (input) RS485 B(-)/CTS	RS232 or RS485 camera control data receive
Pin 2	Rx Data (input) RS485 A(+) / RS232	
Pin 3	Tx Data (output) RS485 A(+)/RTS	RS232 or RS485 camera control data transmit
Pin 4	Tx Data (output) RS485 B(-) / RS232	
Pin 5	GND	GND
Pin 6	ASI In	See Table 5-3
Pin 7	ASI Out	

Table 5-2 Camera Control Out Pinout

Description	Part Number
Chassis Socket Connector:	LEMO EEG0B307CLV
Mating Cable Plug:	LEMO FGG0B307CLAD52Z
Sony Cable Assembly:	9011189 (300mm HCAM Sony Camera Control Cable)
Sony Cable Assembly:	9011273 (300mm HCAM Sony Camera Control Cable - Right Angle)
Thomson Cable Assembly:	9011280 (700mm HCAM Thomson/LDK Camera Control Cable)
Hitachi Cable Assembly:	9013032 (600mm HCAM Hitachi Camera Control Cable)
Ikegami Cable Assembly:	9013209 (400mm HCAM Ikegami Camera Control Cable)
Panasonic 4K Cable Assembly:	CARK-ASSY-2036 (530mm HCAM Panasonic 4K Camera Control Cable)
Grass Valley RS232 Hirose Cable Assembly:	CARK-ASSY-2357 (420mm HCAM GV Camera Control Cable)
Grass Valley Compact Cable Assembly:	CABK-ASSY-2327 (300mm HCAM GV Camera Control Cable)

5.2.5. ASI

Both ASI input and ASI output connect to the encoder unit via two pins on a 7-pin Lemo connector, shared with camera control.

CC 7-pin LEMO Pin	Function
Pin 5	GND
Pin 6	ASI In
Pin 7	ASI out

Table 5-3 ASI Pinout

Chassis Socket Connector: LEMO EEG0B307CLV

Mating Cable Plug: LEMO FGG0B307CLAD52Z

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5.2.6. Analogue Audio Input

A single differential input stereo pair at Mic level (with or without phantom power) or Line Level is available. Selecting Mic Level adds an additional 25dB of gain. Variable gain of (+14.5 to -17.5dB) may be applied at Line Level and (+20.5 to -11.5dB) at Mic Level. Phantom power automatically disables in line mode or with 600Ω input impedance selected.

Input Impedance:	>20kΩ nominal input impedance
Frequency response:	20Hz to 20kHz nominally flat to <0.25dB
Clipping level:	+8dBu
Phantom power:	40V, 15mA through 6k8 per input to IEC268-15A
Chassis Socket Connector:	LEMO EEG0B305CLV
Mating Cable Plug:	LEMO FGG0B305CLAD52Z
Standard Cable Assembly:	L0001M (600mm)
Optional Cable Assembly:	L0001 (200mm) / L0001H (3000mm) / L0001S (1000mm)

AUDIO 5-pin LEMO Pin	Function
Pin 1	Left Line + (Line)
Pin 2	Left Line - (Return)
Pin 3	GND
Pin 4	Right Line + (Line)
Pin 5	Right Line - (Return)

Table 5-4 Analogue Audio Pinout

5.2.7. RS232 Data and Tally Output Port

This 3-pin Lemo connector provides either RS232 input/output for User Data or Tally Output. Note that either or both of the Tx or Rx pins of this connector can be alternatively be used for tally output.

Chassis Socket Connector:	LEMO XBG00303HLN
Mating Cable Plug:	LEMO FGG00303CLAD35
Standard Cable Assembly:	Data: 9011235 HCAM data Cable (600mm)
	Tally: N/A

DATA LEMO Pin	Function
Pin 1	Tx Data (output)
Pin 2	Rx Data (input)
Pin 3	0v

Table 5-5 RS232 Data Port Pinout

DATA LEMO Pin	Function
Pin 1	Tally Red Out (+12V or GND)
Pin 2	Tally Green Out (+12V or GND)
Pin 3	0v

Table 5-6 Tally Output Pinout

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5.3. Modulator Input / Output Connectors

This following section details the connector types for the HCAM transmitter module.

5.3.1. COFDM TX RF

100mW into 50Ω – switchable. 10, 50, 100 and 250mW fixed power settings, and a user-adjustable mode between zero and 24dBm.

NOTE: 250mW is for use in FCC regulatory regions only.

50Ω chassis mounted 'N' type bulkhead socket.

Antenna:	L3421 TX Omni Spring 3 dBi 1.95-2.7GHZ
	L3423 TX Omni Spring 3 dBi 1.95-2.7GHZ (Extra Long)
	L3424 TX Omni Spring 3 dBi 3.0-3.7GHZ

⚠ WARNING: There should always be an antenna connected to the N-type connector when the unit is powered.

5.3.2. UHF RX RF

SMA connector for UHF receive antenna: 410-490MHz.

Antenna: L0018-4145 410-450MHz SMA (M) Red Cap

Antenna: L0018-4549 450-490MHz SMA (M) Blue Cap

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5.4. Modulation Options

The modulator operates as one of three main types:

1. Single Pedestal LMST(S)
2. Dual Pedestal LMST(D)
3. DVB-T

Modulation options are selected in the **MODULATOR** > **Modulation** menu. Here, you select either **LMST** or **DVB-T**.

Select the Bandwidth from **MODULATOR** > **Bandwidth** menu.

NOTE: In **LMST(D)** mode, the bandwidth shown is the combined width of the two pedestals.

The LMST bandwidths:

- Single Pedestal:
  - 3, 4, 5, 6, 7, 8, 10, 12 MHz

NOTE: Without a variable bandwidth license, only 10MHz is available.

- Dual Pedestal:
  - 6, 8, 10, 12, 14, 16, 20 & 24 MHz

NOTE: Without a variable bandwidth license, only 20MHz is available.

The DVB-T bandwidths:

- 6, 7 & 8 MHz

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5.4.1.DVB-T Operation

Table 5-7 defines the corresponding gross bit rates for DVB-T operation. This includes video, audio, data and other transport stream data tables.

Bitrates (Mbit/s) for a DVB-T system in 8 MHz channels					
Modulation	**Code Rate**	**Guard Interval**			
		1/4	**1/8**	**1/16**	**1/32**
QPSK	1/2	4.976	5.529	5.855	6.032
	2/3	6.635	7.373	7.806	8.043
	3/4	7.465	8.294	8.782	9.048
	5/6	8.294	9.216	9.758	10.053
	7/8	8.709	9.676	10.246	10.556
16-QAM	1/2	9.953	11.059	11.709	12.064
	2/3	13.271	14.745	15.612	16.086
	3/4	14.929	16.588	17.564	18.096
	5/6	16.588	18.431	19.516	20.107
	7/8	17.418	19.353	20.491	21.112
64-QAM	1/2	14.929	16.588	17.564	18.096
	2/3	19.906	22.118	23.419	24.128
	3/4	22.394	24.882	26.346	27.144
	5/6	24.882	27.647	29.273	30.16
	7/8	26.126	29.029	30.737	31.668

Table 5-7 DVB-T Bitrate Operation

5.4.2. LMS-T Operation

The table below defines the corresponding gross bit rates for LMS-T operation at the most common bandwidths (Single or Dual pedestal):

Bitrates (Mbit/s) for a LMS-T system							
Channels		**Guard Interval**					
Modulation	**Code Rate**	**10MHz**		**20MHz**		**24 MHz**	
		1/8	**1/16**	**1/8**	**1/16**	**1/8**	**1/16**
QPSK	2/3	9.2	9.7	18.4	19.5	22.1	23.4
16QAM	2/3	18.4	19.5	36.8	39	44.2	46.8

Table 5-8 LMS-T Bitrate Operation

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6. Software Menus

6.1. Icons

Icon	Condition	Format
Tx Icon	RF on	 (Animated antenna icon)
	RF off	 (Antenna icon with cross)
Video Icon	Video input locked	 (Quadrant solid white)
	Video not locked	 (Quadrant flashes)
	Video input not selected	 (Quadrant blank)
	All Video inputs not selected	 (Screen out icon)
Alarm	indicates a system error or warning	

Table 6-1 Icons Table

NOTE: The Video locked icon shows any active screens shaded in white.

6.2. SDI Input Type

The HCAM accepts both Level-A and Level B 3G-SDI streams. When using UHD or 4K video formats, the video can be carried over quad, dual or single link SDI interfaces

-	Quad Link	SMPTE ST-	Dual Link	SMPTE ST-	Single Link	SMPTE ST-
UHDp60	4x 3G-SDI	425-5	2x 6G-SDI	2081-11	1x 12G-SDI	2082-10
UHDp59	4x 3G-SDI	425-5	2x 6G-SDI	2081-11	1x 12G-SDI	2082-10
UHDp50	4x 3G-SDI	425-5	2x 6G-SDI	2081-11	1x 12G-SDI	2082-10
UHDp30	4x HD-SDI	425-3	2x 3G-SDI	425-3	1x 6G-SDI	2081-10
UHDp29	4x HD-SDI	425-3	2x 3G-SDI	425-3	1x 6G-SDI	2081-10
UHDp25	4x HD-SDI	425-3	2x 3G-SDI	425-3	1x 6G-SDI	2081-10
UHDp24	4x HD-SDI	425-3	2x 3G-SDI	425-3	1x 6G-SDI	2081-10
UHDp23	4x HD-SDI	425-3	2x 3G-SDI	425-3	1x 6G-SDI	2081-10

Table 6-2 SDI Input Type

6.3. HDR Signaling

The HCAM supports SDI(SMP-352m), ASI(ETSI TS 101-154), HLG, PQ & S-Log

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6.4. HEVC Delay

The HCAM delay options vary the maximum Services available

Delay Mode	Maximum Services
Low	2
Medium	4
Standard	4
Long	4

6.5. Audio Settings

The HCAM supports up to eight AAC or four MPEG compressed audio pairs at various bit rates from 32kbps up to 576kbps. It also supports four uncompressed PCM or Dolby-E pass-through pairs.

The analogue audio input (available on Pair 1) supports both line and mic level inputs and can provide 40V phantom power.

MPEG compression is available on pairs 1, 3, 5 and 7.

6.6. WI-FI Settings

To connect to the HCAM over a wireless network, either set your own private details or connect using the default, out of box, WI-FI settings.

To access the HCAM WI-FI settings, navigate to **SYSTEM** > **WI-FI** and scroll through each parameter to view or edit settings.

NOTE: Default password: “1234567890”.

You can also see a summary of the WI-FI settings using the **WI-FI Summary** page.

6.7. Recall Default Settings

Recalling default settings is useful when first testing HCAM with the Vislink UltraReceiver. When recalling defaults on the HCAM, you need to power cycle the unit before setting the TX frequency and turning on the modulator.

6.8. Advanced Menu

The menu structure hides less frequently used menu items. To reveal these settings, enter the passcode “0000” into the **Advanced** menu.

NOTE: Changes made to **Advanced** settings are maintained after power cycling.

6.9. Advanced Mode Options

6.9.1. Encoder Firmware Option

The **Encoder Firmware Option** allows you to select between two encoder firmware versions:

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- **Baseline**
- **Experimental**

Baseline is the most robust option. **Experimental** offers further video quality improvements.

6.9.2. Video Wipespeed

The **Video Wipespeed** menu allows you to select between **Fast**, **Medium** (default) or **Slow** settings. On most occasions, slower wipespeed settings provide better image quality.

NOTE: Slower wipespeed settings take longer to rebuild the picture after an RF break.

6.9.3. Video Filter

The **Video Filter** menu allows you to set pre-filtering to **Auto** (default), **Off, Weak**, **Medium** or **Strong**.

NOTE: Pre-filtering is best used for low data rate links.

6.9.4. Fan Mode

The **Fan Mode** menu allows you to set the units Fans to Auto (default) or On,

- Auto – Fan speed is controlled by the units temperature
- On – Fan speed is maximum

6.9.5. Modulator Carrier

The Modulator advanced menu allows you to set the modulated output to Carrier

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6.10. HCAM Menus

The below table shows the entire menu structure for HCAM. Your system may not display all menu options. Some menu options are context sensitive, depending on your current configuration. Some menu options may be license dependent.

6.10.1. Encoder Menu

NOTE: When ".." shows in between two values, it indicates the value available. For instance: "Service 1..4" means there are four services to select from.

- MODULATOR
  - Frequency
    - Min: 1.950000
  - Channel
    - Manual
    - 1..32
  - Off/On
    - Off
    - On
  - TxPower(mW)
    - ---
    - 10 mW
    - 50 mW
    - 100 mW
    - 250 mW
  - TxPower(dBm)
    - Min: 0.0
  - Modulation
    - DVB-T
    - LMS-T
  - Constellation
    - QPSK
    - 16-QAM
    - 64-QAM
  - Bandwidth
    - 3 MHz
    - 4 MHz
    - 5 MHz
    - 6 MHz
    - 7 MHz
    - 8 MHz
    - 10 MHz
    - 12 MHz

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- 6 MHz Dual
- 8 MHz Dual
- 10 MHz Dual
- 12 MHz Dual
- 14 MHz Dual
- 16 MHz Dual
- 20 MHz Dual
- 24 MHz Dual

Guard Interval
- 1/32
- 1/16
- 1/8
- 1/4

FEC
- 1/2
- 2/3
- 3/4
- 5/6
- 7/8

Pre Distortion
- Off
- On

Ext Amp Power
- Off
- On

DEEP INTERLEAVER
- FEC
  - Off
  - 1/2
  - 2/3
  - 3/4
  - 5/6
  - 7/8
  - 9/10
  - 14/15
- Burst
  - Min: 0
- Burst
  - Min: 0
- Delay

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- Label (read only value)
- ADVANCED*[1]
  - Channel Offset
    - Minus
    - Centre
    - Plus
    - Off
  - Carriers Offset
    - 0
    - -1
    - 1
  - Spectrum
    - Normal
    - Inverted
  - Modulator
    - On
    - Carrier Only
    - Off

ENCODER

- SETTINGS
  - Standard
    - HEVC
    - AVC (H.264)
    - MPEG-2
  - Format
    - 480i59
    - 576i50
    - 720p50
    - 720p59
    - 720p60
    - 1080i50
    - 1080i59
    - 1080i60
    - 1080p23
    - 1080p24
    - 1080p25
    - 1080p29
    - 1080p30
    - 1080PsF23
    - 1080PsF24
    - 1080PsF25

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- 1080PsF29
- 1080p50
- 1080p59
- 1080p60
- UHDp23
- UHDp24
- UHDp25
- UHDp29
- UHDp30
- UHDp50
- UHDp59
- UHDp60
- 4Kp23
- 4Kp24
- 4Kp25
- 4Kp29
- 4Kp30
- 4Kp50
- 4Kp59
- 4Kp60

Delay Mode
- Low
- Medium
- Standard
- Long

SDI Type*2
- Quad Link
- Dual Link
- Single Link

4K Mode*2
- Quad Split
- 2SI

Network Name
- Max length : 16

Logging
- Disabled
- Enabled

Low Overhead
- Disabled
- Enabled

Encoder Firmware Option

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- Baseline
- Experimental

VIDEO

VIDEO 1..4

- Enable
  - Off
  - On
- Linked To
  - Service 1..4
- Source
  - Video
  - Bars
- Chroma
  - 4:2:0
  - 4:2:2
- Bit Depth
  - 8 bit
  - 10 bits
- Video PID
  - Min: 32
- Video Wipespeed*[1]
  - Fast
  - Medium
  - Slow
- Video Filter*[1]
  - Auto
  - Off
  - Weak
  - Medium
  - Strong
- Video HDR
  - Auto
  - SDR 709
  - SDR 2020
  - HLG 709
  - HLG 2020
  - PQ 709
  - PQ 2020
  - S-Log 709
  - S-Log 2020

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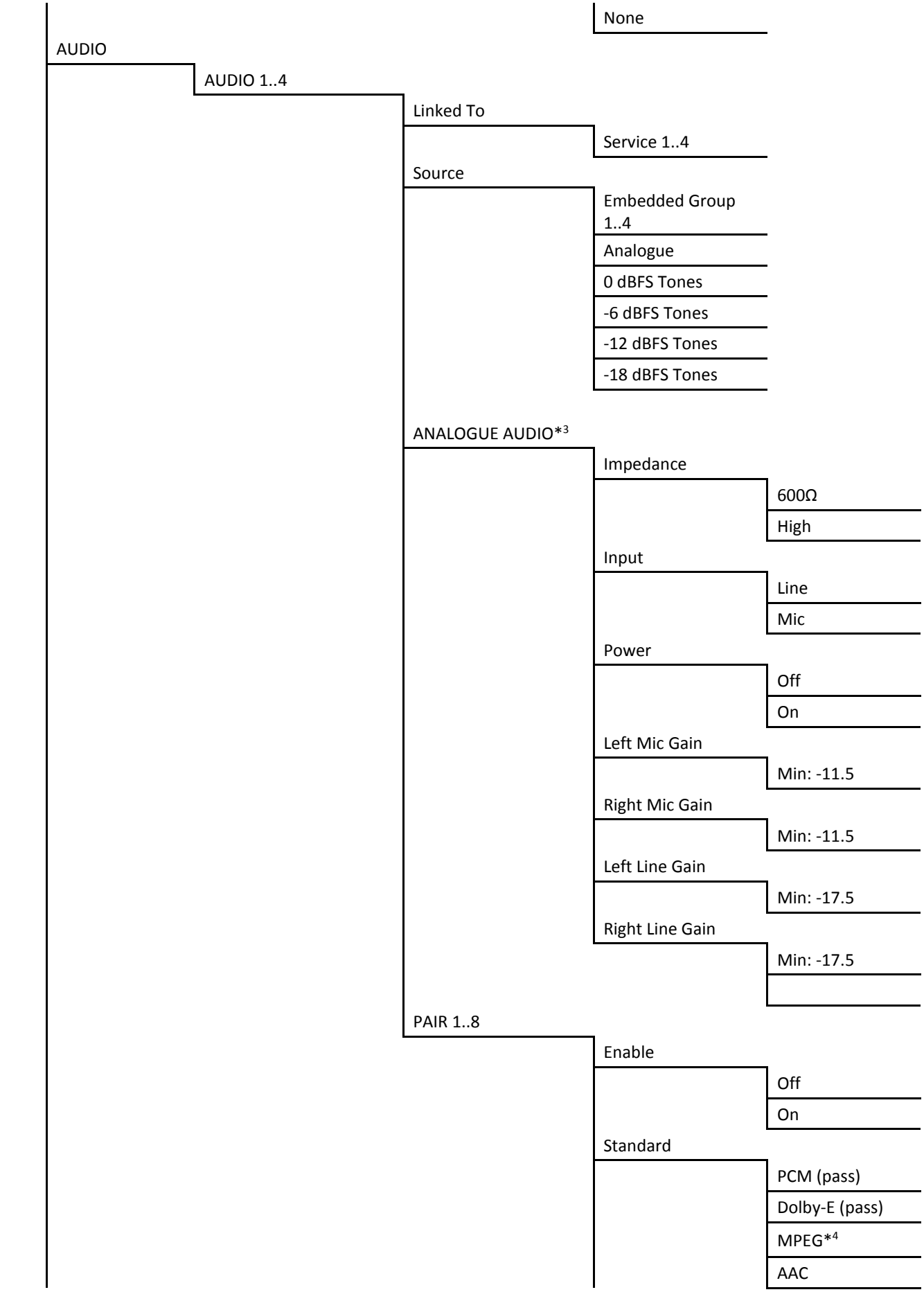

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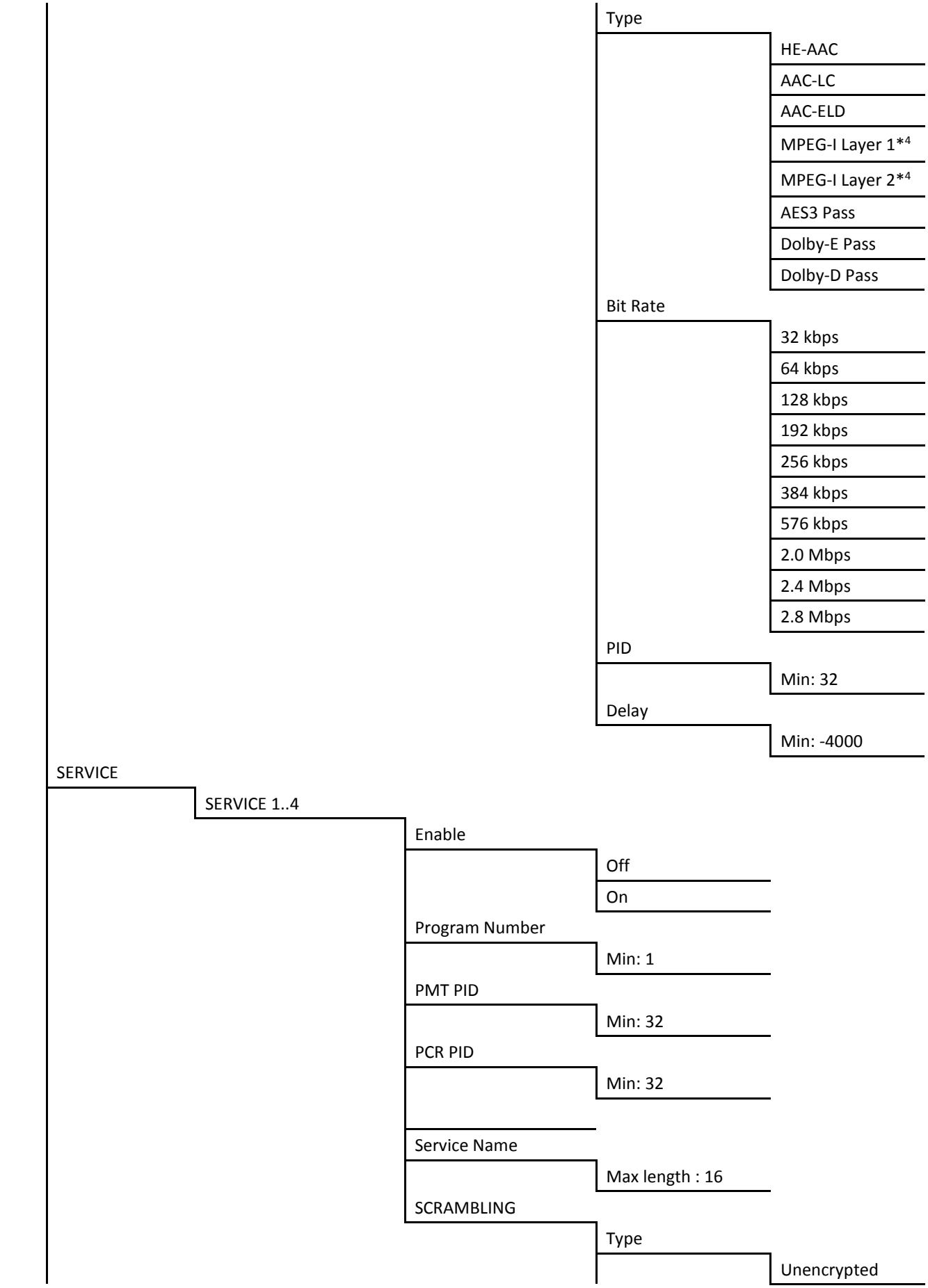

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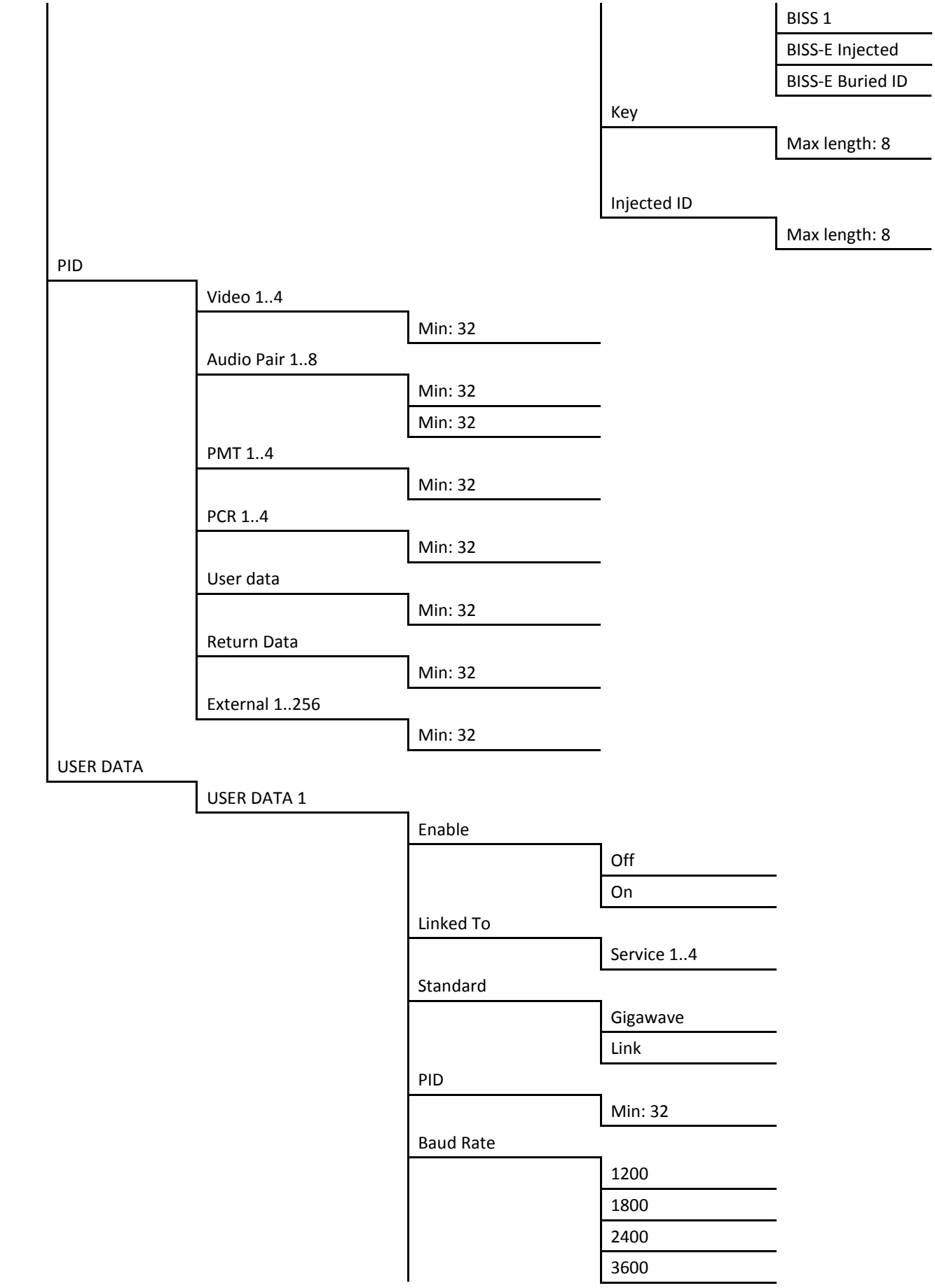

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- 4800
- 7200
- 9600
- 14400
- 19200
- 28800
- 38400
- 57600
- 76800
- 115200
- 153600
- 230400

Parity

- Odd Parity
- Even Parity
- No Parity

MUX

Mode

- Encoder
- Ext ASI
- Enc. + Ext ASI

Encoder

- Label
  (read only value)

Ext ASI

- Min: 0.000

Output

- Label
  (read only value)

Input

- Label (read only value)

CAMERA CONTROL

Control

- Disabled
- Enabled

SETUP

Camera ID

- Min: 1

OCP Type

- Gigawave OCP5
- Gigawave Legacy

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- Sony RCP-15xx
- G.Valley OCP-400
- Hitachi RU-1500
- Panasonic 4K
- Panasonic ENG
- Panasonic PTZ
- Ikegami 300/399
- Generic

Camera Model

- Sony 950
- HDC-1500
- PMW-EX3
- PDW-700
- HXC-100K
- PMW-350K
- HDC-P1
- PXW-X500
- HK-399
- HK-79
- LDX80
- LDK6000
- LDK-8000
- LDX-86
- DK-H100
- SK-HD1200
- AJ-HPX2100E
- JVC-D29
- HDMC
- sinaCAM
- Generic Data

Return Data

- Disabled
- Enabled

RETURN DATA SETUP

- Enable
  - Off
  - On
- Linked To
  - Service 1..4
  - Standard

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- Gigawave
- Link

PID
- Min: 32

Baud Rate
- 1200
- 1800
- 2400
- 3600
- 4800
- 7200
- 9600
- 14400
- 19200
- 28800
- 38400
- 57600
- 76800
- 115200
- 153600
- 230400

Parity
- Odd Parity
- Even Parity
- No Parity

Interface
- Internal TTL
- RS 232/422

Tally Command
- Tally
- Call

Shutter 1/60
- Not present
- Present

Shutter 1/100
- Not present
- Present

Tally Control
- Off
- On low level
- On high level

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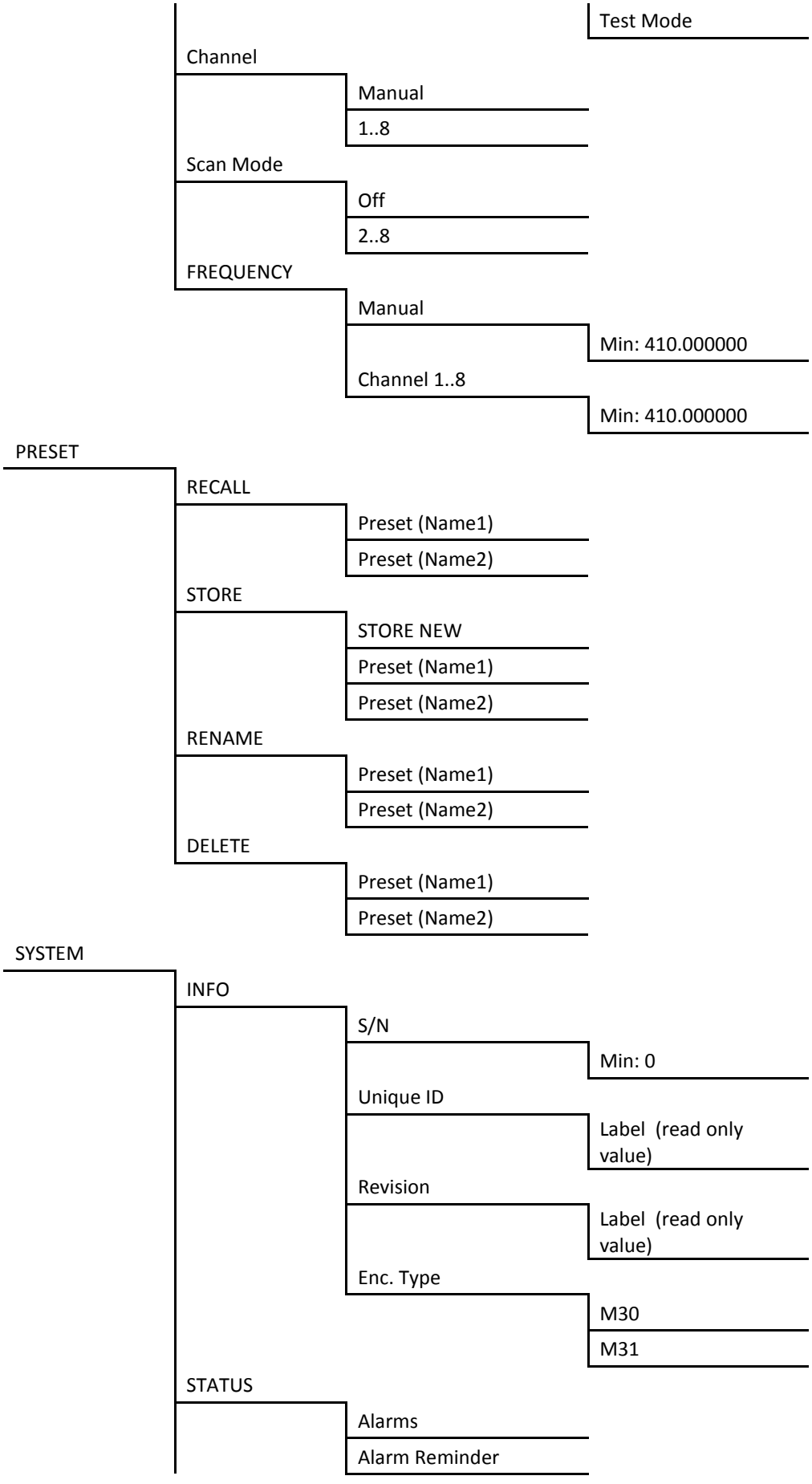

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- On
- Off
- TEMPERATURE
  - Carrier
    - (read only value)
  - Carrier Zynq
    - (read only value)
  - Modulator
    - (read only value)
  - Encoder
    - (read only value)
- DATE & TIME
  - Format
    - MM/DD/YYYY
    - DD/MM/YYYY
  - Date
    - Date
  - Time
    - Time
- VERSIONS
  - ENCODER
  - MODULATOR
  - OTHERS
  - SUITE
- ETHERNET
  - Ethernet Info
  - IP Address
    - Network address
  - Subnet Mask
    - Network address
  - Gateway
    - Network address
  - MAC
    - Max length : 17
- WI-FI
  - Enable
    - Off
    - On
  - Mode
    - Access Point
  - SSID

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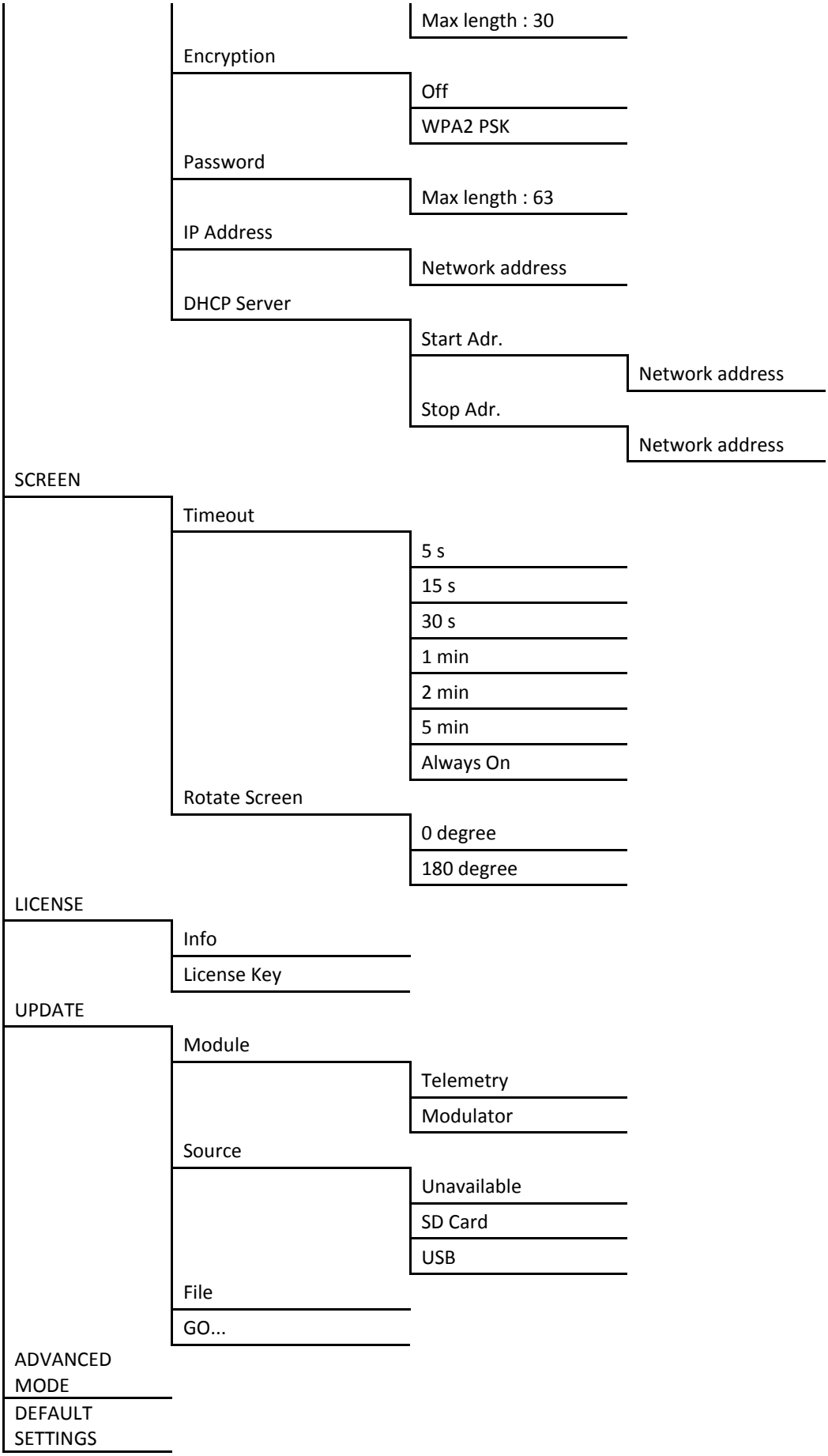

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Table 6-3 Encoder Menu

*[1] Advanced features available when in advanced mode. See Section 6.5.

*[2] Available in UHD and 4K formats

*[3] Available in Audio pair 1 only

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6.11. HCAM Webserver Operation over RJ45 Network Port

6.11.1. Setting up a Connection

To make individual HCAM configuration easier, you can access its menu system using the integrated webserver. To connect to the webserver over the RJ45 network port, follow the procedure described below:

1. Power up the HCAM and wait for the unit to boot.
2. Connect the HCAM to a PC running a web browser, either directly, using an RJ45 network cable (or via a router).

NOTE: Depending on the age of your PC, you may require a crossover RJ45 cable. In most cases, modern PCs and routers include auto-switching (Auto MDIX) so either type of RJ45 cable are suitable.

3. Configure the IP addresses from the HCAM control panel:
    a. **MAIN MENU** > **SYSTEM** > **ETHERNET** > I**P ADDRESS** > **OK**
    b. Change the IP address and Subnet Mask to the below values pressing **OK** each time to save.

NOTE: The HCAM network port only supports static IP addressing.

- RJ45 IP address: 192.168.100.210
- RJ45 subnet mask: 255.255.255.0

4. If you wish to use the default HCAM settings, modify the network settings of your PC to use the same subnet mask and an address from the same subnet e.g.:

- PC subnet mask: 192.168.100.1 (for example)
- PC subnet mask: 255.255.255.0

NOTE: The ‘Default Gateway’ address is not used so can be set to some address in the subnet range.

NOTE: If you want to use a particular subnet address, then you can edit the HCAM network parameters via the front panel menu as required.

5. Once you have configured the IP ports and connected the RJ45 cable, an LED illuminates on the HCAM RJ45 connector to indicate a connection.

6.11.2. Accessing HCAM via Web Browser

1. From your chosen browser, in the address bar, enter the IP address for the HCAM unit. The factory default address is:
    - http://192.168.100.210
2. After a short delay, the Vislink HCAM menu displays on the webpage.
3. Make your required configuration changes to the HCAM unit using the webpage instead of the control panel.

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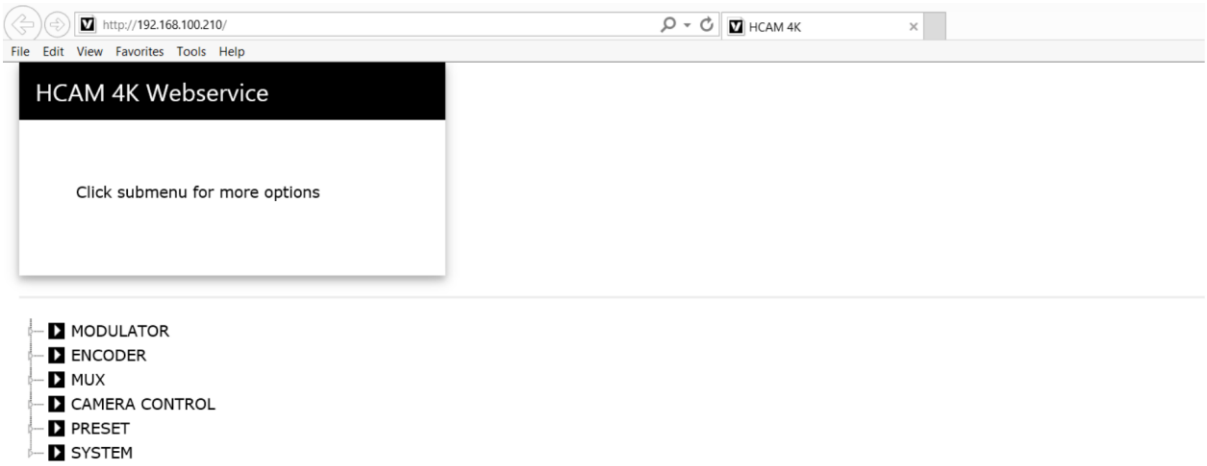

Figure 6-1 HCAM Menu Home Page

NOTE: The content of the web pages closely follows the structure of the front panel menus so we do not describe them further here.

6.11.3. Menu Change Overview:

1. Use your PCs mouse or touchpad to access each menu item, drilling down to each item using the embedded dropdown menu system.
2. Click and edit the functionality you wish to modify.
3. Click **OK** to confirm and save the change.

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7. Mechanics

7.1. Module Docking

⚠ CAUTION: The HCAM is not hot-swap compatible. Do not dock or undock any module with the power applied.

⚠ CAUTION: Take necessary ESD precautions to avoid electrostatic damage to either module. Avoid contact with any connectors and store any electronic devices not in use in appropriate anti-static packaging.

The encoder module and transmitter modules fit together as shown in Figure 7-1.

Ensure that the modules remain parallel during the docking procedure. Fasten the two and a quarter turn screws and the single, centrally placed retained locking screw once the two modules are mated. Firmly tightening the screws ensures that the modules make good thermal contact via the thermal gaskets on the encoder module mating face.

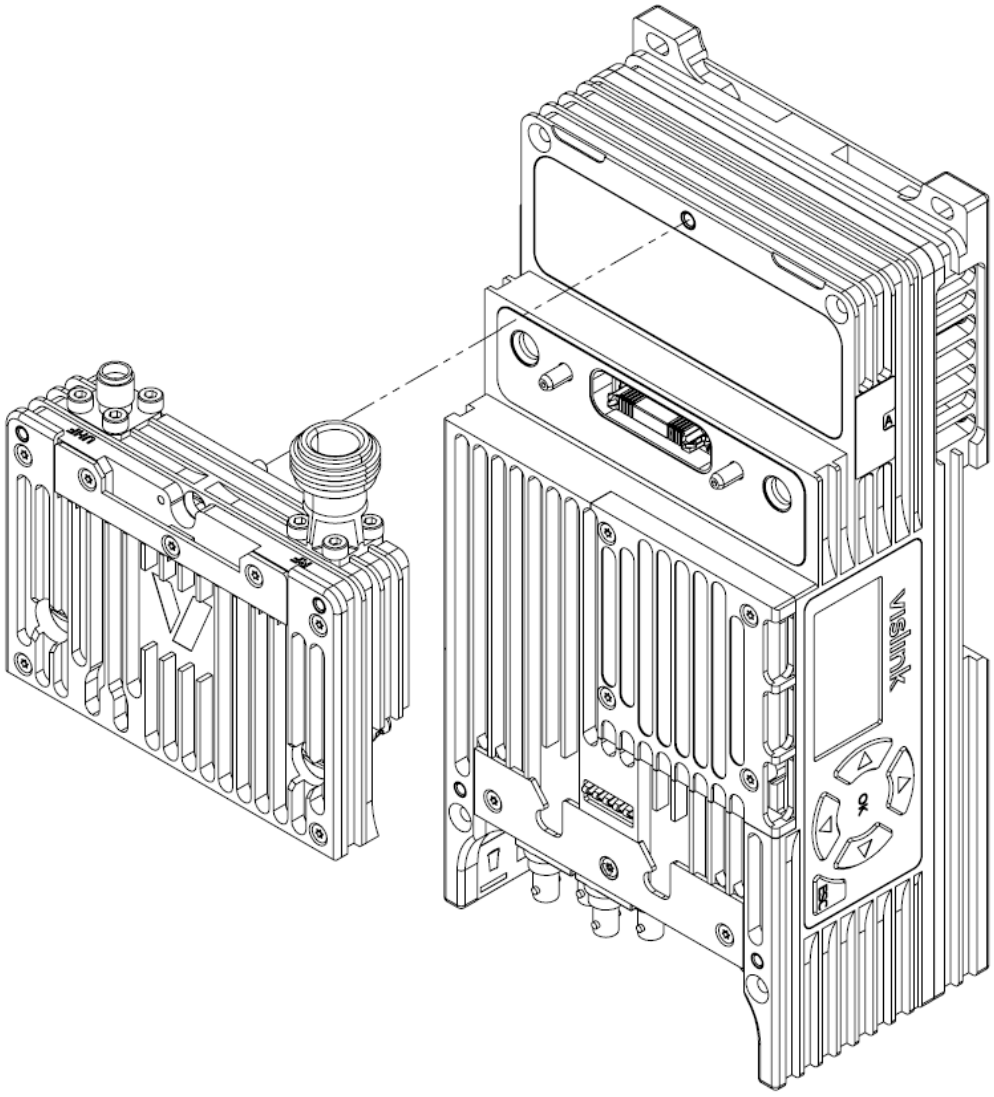

Figure 7-1 Module Docking

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8. Firmware Upgrades

Refer to the firmware upgrade procedure supplied with the Firmware Release Notes, document number RD002230.

Software updates are available from the Vislink FTP site: ftp.vislink.com.

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9. FocalPoint Camera Control

9.1. Introduction

The HCAM transmitter is fully interoperable with the Vislink FocalPoint system via the internal Data Receiver module. You can configure the Data Receiver via the HCAM Transmitter menu.

NOTE: You need a valid license to access the Camera Control items.

The CC connector allows remote connectivity to various camera manufactures and models using the corresponding Data Cable.

NOTE: Vislink sell Data cables to suit your needs.

9.2. FocalPoint Camera Control Overview

The FocalPoint Camera Control system offers control to various camera manufactures and models using one-way data with the Vislink OCP5 and one-way or return data using various Manufacturer controllers:

- Sony
- Hitachi
- Ikegami
- Grass Valley
- Panasonic ENG, 4K & PTZ
- Ikegami
- Grass Valley (Transparent)

NOTE: Refer to the FocalPoint manual for full product information and safety awareness.

9.2.1. Menu descriptions

The following menus are an overview of the available options:

CAMERA CONTROL> **Control**

- Enables or Disables Camera Control functionality
  Can only be Enabled if the Camera Control is Licensed

SETUP> **Camera ID**

- Sets the address of the data received from Controller. OCP/RCP address.

SETUP> **OCP Type**

- Sets the Manufacturer Camera/Controller

SETUP> **Camera Model**

- Sets Camera Model when using Gigawave OCP5/Legacy Controller

SETUP> **Return Data**

- Enables or Disables Return data
  Return data is a way of sending camera data back to the controller. The data is Encoded & Decoded through the Video links ‘User Data’ path.
  Return Data is not always required but preferred.

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SETUP> **RETURN DATA SETUP**> **Linked To**

- Sets the required HCAM Service for the Return Data path

SETUP> **RETURN DATA SETUP**> **Standard**

- Sets the User Data Standard to 'Link' or 'Gigawave' to accommodate Video Receiver

SETUP> **RETURN DATA SETUP**> **PID**

- Sets Return Data PID number. This must match the User Data PID set in the Video Receiver

SETUP> **RETURN DATA SETUP**> **Baud Rate**

- Sets the baud rate required for Manufacturer.
  115200 is common for Manufacturer and 9600 for Generic

SETUP> **RETURN DATA SETUP**> **Parity**

- Sets Return Data Parity
  Default to 'No Parity'

SETUP> **Interface**

- Sets interface connection between HCAM and Camera
  RS 232/422 is common Manufacturer, Hitachi is TTL

SETUP> **Tally Command**

- Sets the Tally command sent to the camera:
  - **Sony ENG Cameras – Tally**
  - **Sony Camcorders – Call**
  - **Grass Valley – Call**

SETUP> **Shutter 1/60**

- Enable or Disable Shutter range if available in camera
  Only required when using OCP Type – Gigawave OCP5/Legacy

SETUP> **Shutter 1/100**

- Enable or Disable Shutter range if available in camera
  Only required when using OCP Type – Gigawave OCP5/Legacy

SETUP> **Tally Control**

- Configures HCAM external Tally connection
  - **Off**
  - **On High Level** – activates external Red/Green Tally
  - **On Low Level** – activates external Red Tally to Panasonic ENG Camera (Connects to Panasonic Tally connection using Vislink cable)
  - **Test Mode** – activates external Red/Green Tally with data comms (Red – Received RF data, Green Return data from Camera)

CAMERA CONTROL> **Channel**

- Select **RF Channel**, **Manual** or **Preset**

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CAMERA CONTROL> **Scan Mode**

- Enables or Disables Scan Mode
  Scan Mode cannot be used with OCP Type – Generic

CAMERA CONTROL> **FREQUENCY**

- Set Manual and Preset RF frequencies

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