TECHNICAL REFERENCE MANUAL

Version 15.3 - April 2018

XT 4K

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Regional Contacts

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User Manuals on EVS Website

The latest version of the user manual, if any, and other user manuals on EVS products can be found on the EVS download center, on the following webpage: https://www.evs.com/en/download-area.

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What's New?

In the Technical Reference manual, the icon NEW ! has been added on the left margin to highlight information on new and updated features.

The changes linked to new features in version 15.3 are listed below:

Support of SMPTE 334M packets

- See section "Video Specifications" on page 10

Support of SMPTE ST2110-10/20/30/50

- See section "Video Specifications" on page 10

Supported SFP+ video connectors

- See section "SFP+ Video Connectors" on page 39

The following changes unrelated to new features for release 15.3 have been brought to this technical reference manual. They are not highlighted with the **New** icon:

Information added on internal array of hot-swappable disks

- See section "RSAS Board with SAS Disk Array" on page 75

Precision on maximum audio channels with MADI connectors

- See section "Audio Specifications" on page 12

1. Overview

1.1. Presentation

Welcome to the EVS range of products and thank you for using an EVS XT4K server. We will do our best to satisfy your video production needs and we look forward to continuing working with you.

The XT4K EVS server is a production server offering a wide range of format and codec configurations for UHD-4K operations as well as high dynamic range (HDR) operations to produce the most vivid UHD-4K content and HD productions.

The XT4K server is available in 6U chassis. It provides up to 4 channels of UHD-4K (XAVC-4K) or 12 channels of HD (AVC-I, DNxHD, or ProRes 422) via an SDI or IP interface. The Mix on one channel feature is supported in all configurations in 720p, 1080i and 1080p.

In addition to EVS loop recording technology, the XT4K provides support of supermotion cameras and native XAVC-Intra 4K encoding and decoding for live editing, slowmotion replays and multi-channel playback with server-to server transfer options.

Media can be shared through the 10Gbps GbE connection or the 3Gbps XNet production network, and metadata can be shared through the 1Gbps PC LAN redundant ports.

The XT4K server can be operated in multi-essence configurations where the ingested material is directly and simultaneously available in one of the following supported combinations: Intra + Proxy (Mjpeg) or Intra only.

The following features are not available with the XT4K server:

- 3D
- EditRec
- TwinRec
- SD autosense
- Internal loop mode
- Graphics: Paint target, Offside line (internal)

2. Safety and Compliance

2.1. Safety

This equipment has been designed and tested to meet the requirements of the following:

- EN 60950 (European): Safety of information technology equipment including business equipment.
- IEC 950 (International): Safety of information technology equipment including business equipment.

In addition, this equipment has been designed to meet the following:

- UL 1950 - USA (USA): Safety of information technology equipment including business equipment.

2.2. EMC Standards

This equipment complies with following EMC standards:

Standard	Area	Title
EN 55022	European	Emission Standard
EN 61000-3-2	European	Electromagnetic Compatibility (EMC) Part 3 (Limits); Section2 ; limits for harmonic current emissions (equipment input current <16A per phase)
EN 61000-3-3	European	European Electromagnetic Compatibility (EMC) Part 3 (Limits), Section 3; limitation of voltage fluctuation and flicker in low-voltage supply systems for equipment with rated current of 16 A.
EN 61000-4-3	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 3; Testing and measurement techniques - Radiated, radio-Frequency, electromagnetic field immunity test.
EN 61000-4-4	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 4; Testing and measurement techniques - Electrical fast transient/burst immunity test.
EN 61000-4-5	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 5; Testing and measurement techniques - Surge immunity test.
EN 61000-4-6	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits); Section 6 ; Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.

Standard	Area	Title
EN 61000-4-7	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 7; harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto.
EN 61000-4-11	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits); Section 11 ; Voltage dips, short interruptions and voltage variations immunity tests.
EN 50082-1	European	European Generic Immunity Standard – Part 1: Domestic, commercial and light industry environment.
FCC	USA	Conducted and radiated emission limits for a Class A digital device, pursuant to the Code of Federal Regulations (CFR) Title 47 – Telecommunications, Part 15: Radio Frequency devices, subpart B-Unintentional Radiators.

2.3. EMC Warning

Changes or modifications not expressly approved by the manufacturer for compliance could void the user's authority to operate the equipment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

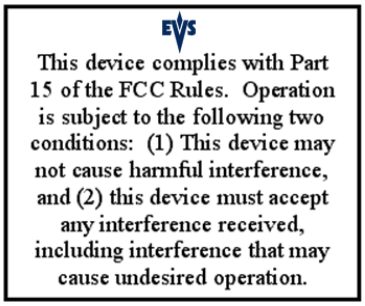
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

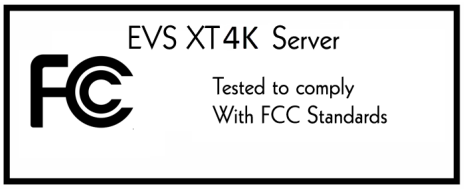
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

2.4. FCC Marking

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

The following labels are affixed on the equipment:





2.5. CE Marking

The CE marking is affixed to indicate compliance with the following directives:

- 89/336//EEC of 3 May 1989 on the approximation of the laws of the Members States to electromagnetic compatibility.
- 73/23/EEC of 19 February 1973 on the harmonization of the laws of the Members States relating to electrical equipment designed for use within certain voltage limits.
- 1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

3. Hardware Specifications

3.1. Mechanical Dimensions and Weights

3.1.1. Rack Mount 6U Main Frame

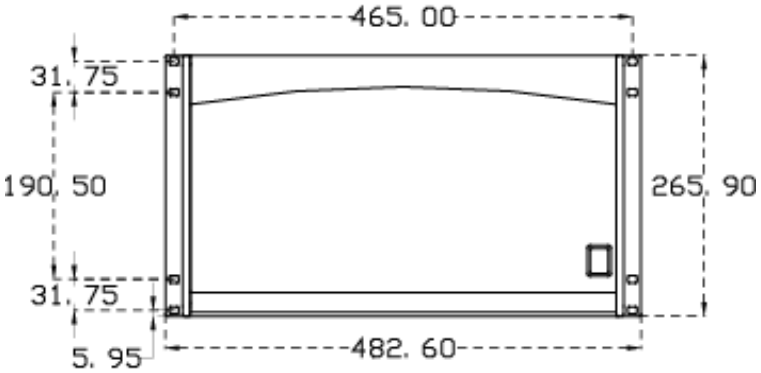
Weight

Disk Configuration	Weight
6U - 19 inches chassis with 12 HDD on hot swap rack	39 kg / 86.0 lb

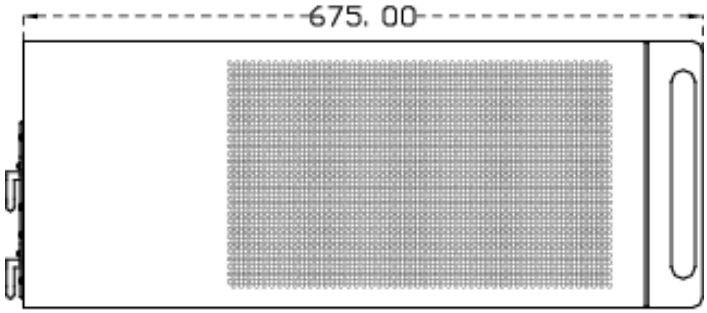
Dimensions

The following drawings provide the various dimensions, in mm, of the XT4K server with a 6U chassis.

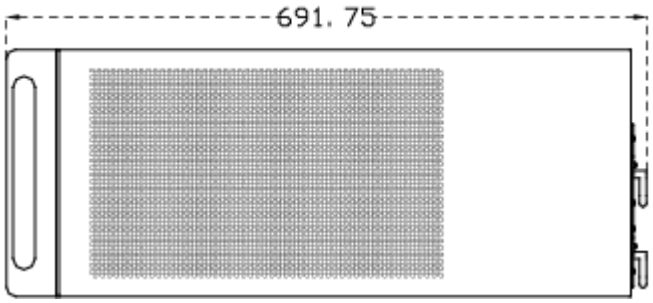
Front view



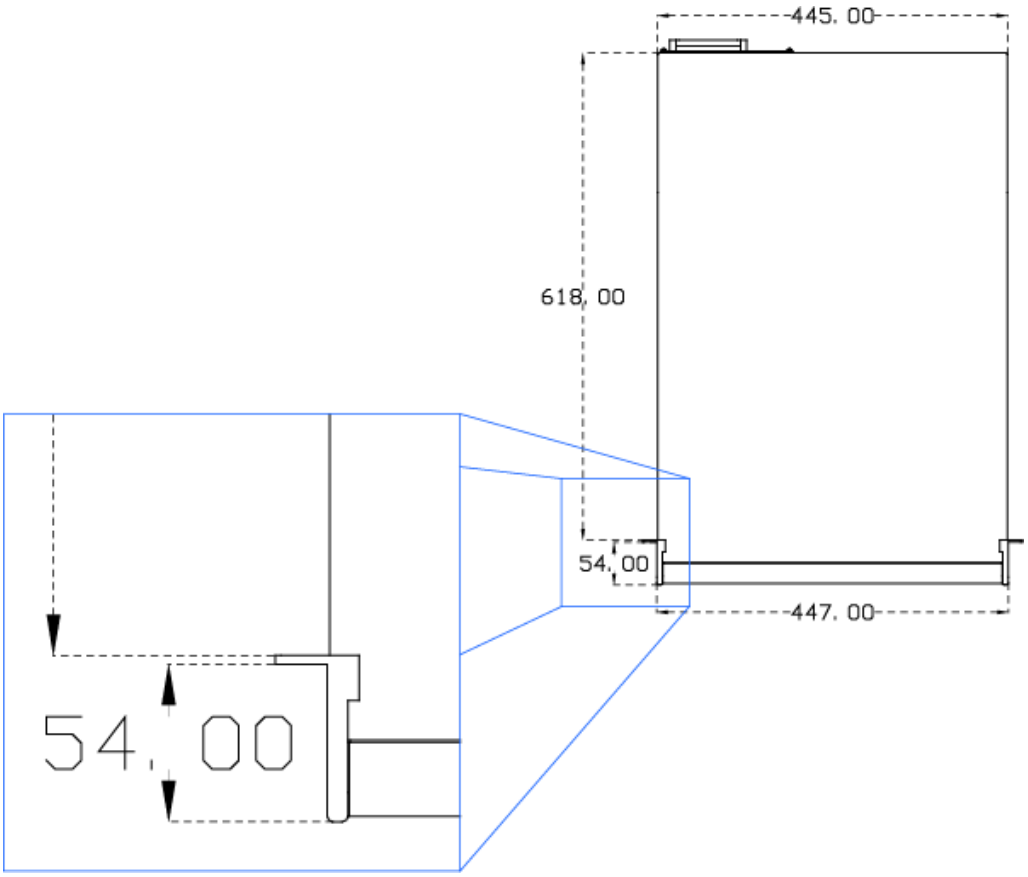
Left view



Right view

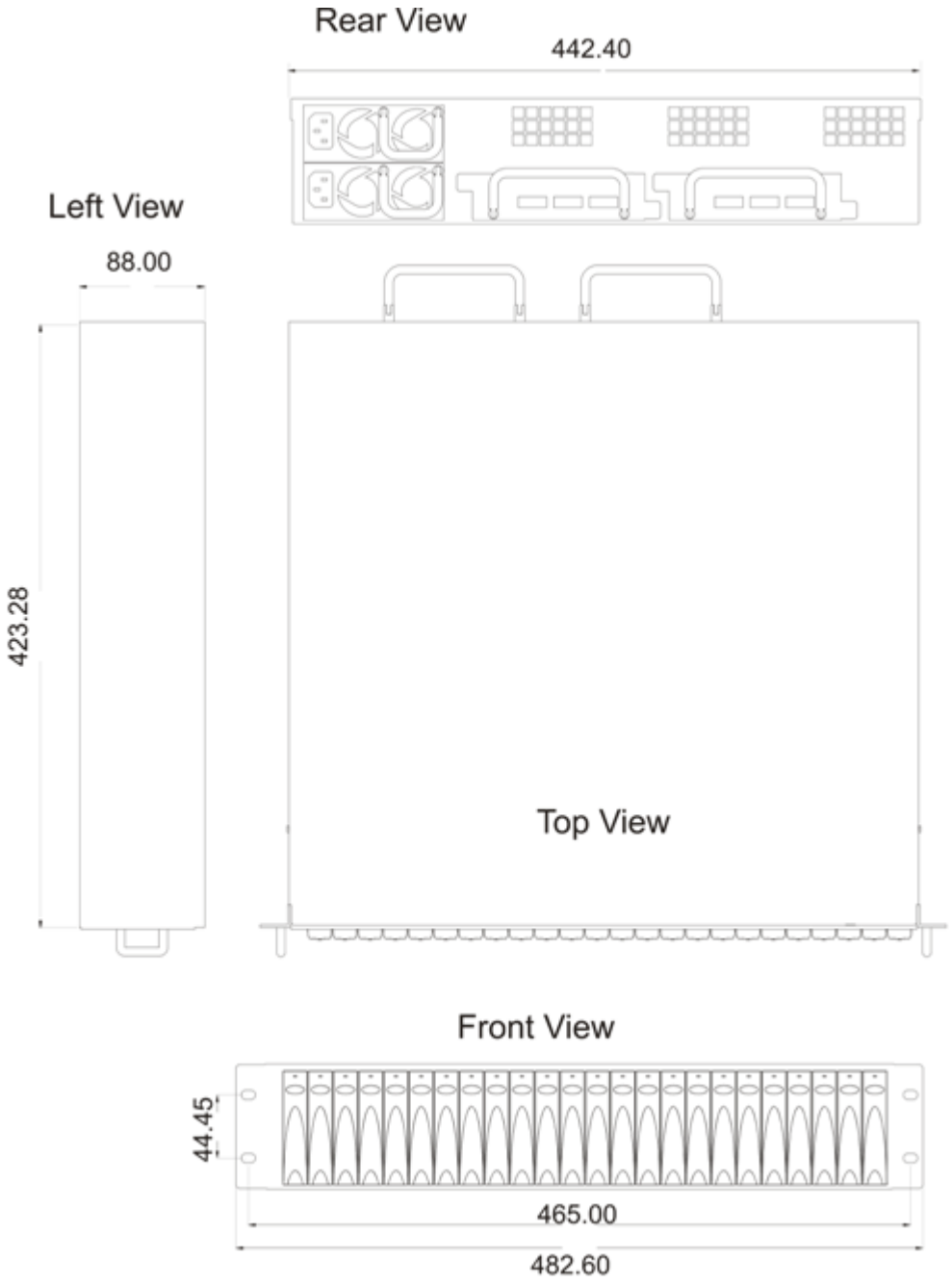


Top view



3.1.2. SAS-HDX Unit

The following drawings provide the various dimensions, in mm, of the SAS-HDX external array.



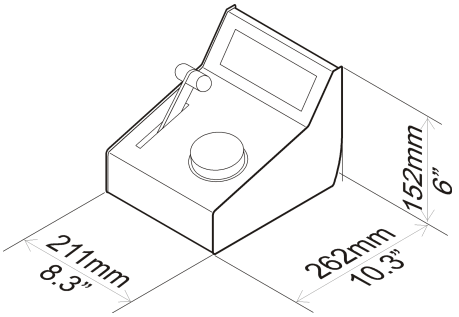
For more information on the SAS-HDX, refer to "External RAID Array SAS-HDX" on page 76.

3.1.3. Control Devices

The following control devices can optionally be connected to your server to control it.

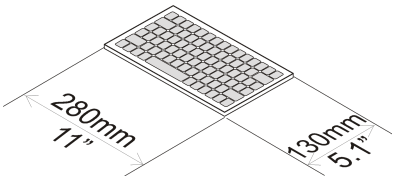
LSM Remote Control Panel

Weight: 2.9 kg / 6.3 lb.



Keyboard

Weight: 0.4 kg / 0.9 lb.



3.2. Power Supply

Redundant Power Supply

The server is fitted with two auto switching and hot-swappable power supplies.

The secondary hot-swappable power supply should be connected to the mains to allow automatic power switching to this second power supply should the first one fail.

Grounding

WARNING

The protective earth must be connected to the ground before powering up the unit.
Ensure the disk recorder unit is properly grounded at all times to avoid electrical shock hazard.

Electrical Specifications

Rated voltage: 115 to 240 VAC (single phase)

Rated frequency: 47-63 Hz

Input connector: CEE 22/IEC 320 3-pin male receptacle

Connection to supply: Pluggable equipment Type A (EN 60950 §1.2.5): Equipment which is intended for connection to the building power supply wiring via a non-industrial plug and socket-outlet or a non-industrial appliance coupler or both. Correct mains polarity must always be observed. Do not use reversible power plugs with this equipment.

Class of equipment: Class 1 equipment (EN 60950 § 1.2.5): electric shock protection by basic insulation and protective earth.

Electrical Consumption

The following electrical specifications are valid for the XT4K server :

Data Type	Voltage	Value
Inrush current (PSU plugged on power grid)	230 V	3.8 A
Maximal current (full load, CPU at 100%)	230 V	1.7 A
Inrush current (PSU plugged on power grid)	115 V	7.9 A
Maximal current (full load, CPU at 100%)	115 V	3.6 A
Maximal power consumption (full load, CPU at 100%)	-	400 W

3.3. Environmental Conditions

Operating

- Temperature: 10°C to + 45°C (50°F to 113°F) ambient with free air flow
- Relative humidity: 0% to 90% (non-condensing)
- Cooling requirements: Forced cooling air flow from right to left when looking at the EVS server from the back panel.
- Handling/movement: Designed for fixed use when in operation

Storage and Transport

- Temperature: 0°C to +70°C (32°F to 158°F)
- Relative humidity: 0% to 90% (non-condensing)

4. Software Specifications

4.1. Video Specifications

Video Standards

The following table lists the video specifications in HD and UHD-4K formats for your XT4K server.

	High Definition	UHD-4K
Video Formats	720p 50/59.9 fields/sec 1080i 50/59.94 fields/sec 1080p 50/59.94 fields/sec (3G)	UHDTV-4K 50/59.94 fields/sec
Digital Interface	10-bit 4:2:2 Serial (ST 292-1:2011). Full frame synchronizer at input.	10-bit 4:2:2 Serial (ST 292-1:2011). Full frame synchronizer at input.
Number of Channels	2, 4, 6, 8, 10 or 12 channels, reversible REC/PLAY	2 or 4 channels, reversible REC/PLAY
Monitoring & Down-converters	1 SDI or IP output per channel, with OSD	1-built in down-converter per channel. 1 3G-SDI or IP output per channel with OSD.
Reference	Analog Black Burst and HD Tri-Level Sync	HD Tri-Level Sync

The extended configurations, including 10 or 12 channels, are available with the 10-Channel configurations license code (36), Channels Max license code (34) and are described in the Configuration manual, Supported Configurations chapter.

SMPTE Standards

The following table lists the SMPTE standards supported by your server.

Configuration	SMPTE standard
HD SDI	ST 292-1:2011, ST 292:2012 (720p 50 and 59.94 Hz; 1080i 50 and 59.94 Hz)
Embedded audio HD	ST 299-0:2010, ST 299-1:2009
AES/EBU audio	ST 272:2004
LTC	ST 12-1:2008, ST12-2:2008
D-VITC	ST 266:2012
Ancillary TC in HD	RP 188
NEW ! **Vertical Ancillary Data**	ST 334:2000
VC-3	ST 2019-1:2008
Mapping of Audio Metadata into Vertical Ancillary data	ST 2020-2:2008, ST 2020-3:2008
3G SDI	ST 424:2006
3G SDI – Data mapping	ST 425-B:2008
Image Format and Ancillary Data Mapping for the Quad Link 3 Gb/s Serial Interface	ST 425-5:2014
12G-SDI Bit-Serial Interfaces	ST 2082
Transport of High Bit Rate Media Signals over IP Networks	ST 2022-6:2012
NEW ! **Interoperation of ST 2022-6 streams**	ST 2022-8
NEW ! **Professional Media Over Managed IP Networks: System Timing**	ST 2110-10
NEW ! **Professional Media Over Managed IP Networks: Uncompressed Video**	ST 2110-20
NEW ! **Professional Media Over Managed IP Networks: PCM Audio**	ST 2110-30

4.2. Audio Specifications

General Specifications

See section "Audio Channels" on page 40 for an overview on the possible audio hardware configurations.

- 4 additional analog balanced output channels for monitoring
- All audio connectors on mainframe
- The Lo-Res audio is Mpeg-1 Layer II at 48 kHz sampling frequency.
- The MADI interface supports 64 synchronous audio tracks @ 48KHz.

Maximum Number of Embedded or MADI Audio Channels

The 6U servers provide the following maximum number of embedded or MADI audio channels per video channel with intra codecs:

Configuration Mode	Embedded	MADI
2-channel configurations	2*16 audio mono (= 32 tracks)	2*16 audio mono (= 32 tracks)
4-channel configurations	4*16 audio mono (= 64 tracks)	4*16 audio mono (= 64 tracks)
6-channel configurations	6*16 audio mono (= 96 tracks)	6*16 audio mono (= 96 tracks)
8-channel configurations	8*16 audio mono (= 128 tracks)	8*16 audio mono (= 128 tracks)
10-channel configurations	10*16 mono (=160 tracks)	10*16 mono (=160 tracks)
ChannelMax LSM configurations	12*16 mono (=192 tracks)	12*16 mono (=192 tracks) if # IN ≤ 8 12*8 mono (= 96 tracks) if # IN > 8
UHD-4K	4*16 audio mono	4*16 audio mono

Audio Processing

- Uncompressed audio
- 24 bit processing and storage
- Sample rate converter from 25-55 kHz to 48 kHz
- Audio scrub
- Audio mix

4.3. Video Codecs and Bitrates

4.3.1. Supported Codecs

Codecs and Related License Codes

The XT4K server supports natively the video codecs presented in the table below when the required license code is valid.

Proxy codecs	V4X Codec Board
Mjpeg	code 32

HD codecs	V4X Codec Board
Avid DNxHD®	code 5
Apple ProRes 422, 422 LT, 422 HQ	code 6
AVC-Intra	code 13
XAVC-Intra HD	code 15

UHD codecs	V4X Codec Board
XAVC-Intra 4K	code 19

Content Transfer Encoding and File Header

It is possible to perform the encoding process in 8-bit or 10-bit and to write a 10-bit file on selected codecs.

The following table summarizes the proposed configurations, valid for encoding and file header:

HD Codecs	Encoding & File Header
DNxHD 120/145	8-bit
DNxHD 185/220	8-bit
DNxHD 185x/220x	10-bit
ProRes LT	10-bit
ProRes SQ	10-bit
ProRes HQ	10-bit
AVC-Intra	10-bit
XAVC-Intra HD	10-bit

UHD Codecs	Encoding & File Header
XAVC-Intra 4K	10-bit

4.3.2. Maximum Bitrates

These maximum values are valid for XT4K servers running Multicam version 15.00 or higher. They guarantee a smooth play and a browse at 100% speed on all channels simultaneously.

Codec	Format	2-12ch (720p/1080i)	2-8ch (1080p)
Avid DNxHD®	PAL	185	367
	NTSC	220	440
Apple ProRes 422	PAL	185	367
	NTSC	220	293
AVC-Intra 100	PAL	111	222
	NTSC	111	222
XAVC-Intra 100	PAL	111	222
	NTSC	111	222

Codec	Format	2 ch	4 ch
XAVC-Intra 4K	PAL	500	500
	NTSC	600	600

4.3.3. Internal Bandwidth

General Description

This section helps you select the most appropriate bitrate for the native codec(s) on the EVS server, on the basis of the internal bandwidth, the channel configuration, and the calculated number of real-time channels at the EVS server level.

The section therefore presents tables including the following parameters:

1. **Video Bitrate:** codec bitrate set by the user in the **Codec** section of the **Server** tab in the Multicam Configuration window.
2. **Fields/Block:** numbers of video fields that can be stored in one disk block of 8 MB, taking into account 8 audio tracks, in 1080i and UHD-4K.
3. **Actual Bandwidth:** actual disk/network bandwidth required for the real-time record or real-time playback of one video stream and its associated audio tracks.
4. **Max. RT Channels:** maximum number of video channels (real-time record or real-time playback) that one EVS server can support for a given frame rate and bitrate.

   Since an XT4K server can have a maximum of 12 local video channels, any value higher than 12 means that these additional real-time accesses can be used for transfers over the XNet (SDTI) network.

   The RT Channels calculation is based on the use of Seagate disks of 900 GB (10K8) configured in 5+1 raids. Such disks are able to write 400 MB/s.

Bandwidth and RT Channels at 50 Hz (PAL)

Codec	Field Rate (Hz)	Video Bitrate (Mbps)	Fields/ Block	Block-based bandwidth (MB/s)	Max. RT Channels
Apple ProRes 422 LT	50.00	85	34	11.7	34
AVC-Intra 100	50.00	111	27	14.8	27
XAVC-Intra HD	50.00	111	27	14.8	27
Avid DNxHD® 120	50.00	120	24	16.6	24
Apple ProRes 422 SQ	50.00	120	24	16.6	24
Avid DNxHD® 185	50.00	185	16	25.0	16
Apple ProRes 422 HQ	50.00	185	16	25.0	16
XAVC-Intra 4K	50.00	500	6	66.6	6

Bandwidth and RT Channels at 100 Hz (PAL SLSM 2x)

Codec	Field Rate (Hz)	Video Bitrate (Mbps)	Fields/ Block	Block-based bandwidth (MB/s)	Max. RT Channels
XAVC-Intra 4K	100.00	500	3	133	3

Bandwidth and RT Channels at 150 Hz (PAL SLSM 3x)

Codec	Field Rate (Hz)	Video Bitrate (Mbps)	Fields/ Block	Block-based bandwidth (MB/s)	Max. RT Channels
Apple ProRes 422 LT	150.00	85	11	35.3	11.3
AVC-Intra 100	150.00	111	9	44.4	9.0
XAVC-Intra HD	150.00	111	9	44.4	9.0
Avid DNxHD® 120	150.00	120	8	50.0	8.0
Apple ProRes 422 SQ	150.00	120	8	50.0	8.0
Avid DNxHD® 185	150.00	185	5	75.0	5.3
Apple ProRes 422 HQ	150.00	185	5	80.0	5.0

Bandwidth and RT Channels at 59.94 Hz (NTSC)

Codec	Field Rate (Hz)	Video Bitrate (Mbps)	Fields/ Block	Block-based bandwidth (MB/s)	Max. RT Channels
Apple ProRes 422 LT	59.94	100	34	14.1	28.3
AVC-Intra 100	59.94	111	33	14.5	27.5
XAVC-Intra HD	59.94	111	33	14.5	27.5
Avid DNxHD® 145	59.94	145	23	20.8	19.2
Apple ProRes 422 SQ	59.94	145	25	19.2	20.8
Avid DNxHD® 220	59.94	220	16	30.0	13.3
Apple ProRes 422 HQ	59.94	220	16	30.0	13.3
XAVC-Intra 4K	59.94	600	7	68.5	5.8

Bandwidth and RT Channels at 120 Hz (NTSC SLSM 2x)

Codec	Field Rate (Hz)	Video Bitrate (Mbps)	Fields/ Block	Block-based bandwidth (MB/s)	Max. RT Channels
XAVC-Intra 4K	119.88	600	3	160	2.5

Bandwidth and RT Channels at 180 Hz (NTSC SLSM 3x)

Codec	Field Rate (Hz)	Video Bitrate (Mbps)	Fields/ Block	Block-based bandwidth (MB/s)	Max. RT Channels
Apple ProRes 422 LT	179.82	85	11	42.3	9.4
AVC-Intra 100	179.82	111	11	43.6	9.1
XAVC-Intra HD	179.82	111	11	43.6	9.1
Avid DNxHD®	179.82	145	8	62.5	6.4
Apple ProRes 422 SQ	179.82	145	8	57.4	6.9
Avid DNxHD®	179.82	220	5	89.9	4.4
Apple ProRes 422 HQ	179.82	220	5	89.9	4.4

Real-Time Channel Calculation

Rule

The maximum server bandwidth depends on the disks. Based on the assumption that Seagate disks of 900 GB (10K8) are used in 4+1 raids, the disks will be able to write 400 MB/s, and the maximum server bandwidth is therefore 400 MB/s.

For a mixed configuration with standard and super motion channels on the same EVS server, the following calculation must be used to ensure that the settings do not exceed the maximum bandwidth of the server, that is to say 400 MB/s:

```
    (nbr of standard channels x their block-based bandwidth)
+ (nbr of super motion channels x their block-based bandwidth)
```

Example with Standard and SLSM Channels in 4K

Can I run an XT4K server with 2 record channels (1x 4K SLSM2x + 1x 4K standard) + 2 play channels (1x 4K SLSM2x + 1x 4K standard) in XAVC-Intra 4K with a video bitrate of 500 Mbps in PAL ?

Calculation:

- 1 standard rec/play at 500 Mbps uses 66.6 MB/s
- 1 SLSM record/play at 500 Mbps uses 133.3 MB/s
- All channels will use: 2 x 66.6 + 2 x 133.3 = 399.6 MB/s.

Conclusion: this configuration is supported as it is just lower than 400 MB/s.

4.3.4. Recording Capacities

Disk Storage

The disk storage, on SAS disks, can be as follows, with a total of up to 84 disks:

- internal storage only: 6 or 12 x 900 GB or 1.8 TB SAS disks
- external storage only: up to 4 arrays with 24 x 900 GB or 1.8 TB SAS disks, with or without spare disks
- both internal and external storage.

Warning
The sum of internal and external disk storage on an XT4K server cannot exceed 40 TB. This limit will be achieved with 60 disks of 900 GB.

RAID Level: 3

The video RAID uses striping process across 5 or 6 disk drives. The video and audio data is striped over the first 4 or 5 drives while the parity information is saved on the fifth or sixth drive.

If one drive is damaged, the video RAID can use the parity information to recover the missing information, so that operation can continue seamlessly without bandwidth loss.

Recording Capacity Figures

The following tables show the recording capacity, in hours, for different video bitrates for:

- 1 record channel, that is 1 video + 8 stereo audio tracks in UHD-4K.
- With the Operational Disk Size parameter set to 100%.
- With arrays of 900 GB disks.
- Without activating the SMPTE 334M packages.

Tip
The table figures should be multiplied by 2 for 1.8 TB disk arrays.

Recording Capacity in Hours for 5 Disks (4+1) RAID Configuration – 50Hz

	DNxHD 100	DNxHD 120	XAVC-Intra 4K
# RAID Units	8 audio	8 audio	8 audio
1	63	56	14
2	127	113	28
3	190	169	42
4	254	225	56
5	317	282	70
6	380	338	84
7	444	395	98
8	507	451	112
9	571	507	126
10	634	564	140
11	697	620	154

Recording Capacity in Hours for 6 Disks (5+1) RAID Configuration – 50Hz

	DNxHD 100	DNxHD 120	XAVC-Intra 4K
# RAID Units	8 audios	8 audios	8 audio
1	79	70	18
2	159	141	36
3	238	211	54
4	317	282	72
5	396	352	90
6	476	423	108
7	555	493	126
8	634	564	144
9	713	634	162

Recording Capacity in Hours for 5 Disks (4+1) RAID Configuration – 59.94Hz

	DNxHD 100	DNxHD 145	XAVC-Intra 4K
# RAID Units	8 audios	8 audios	8 audio
1	64	47	12
2	128	94	24
3	192	141	36
4	256	188	48
5	320	235	60
6	384	282	72
7	448	329	84
8	512	376	96
9	576	423	108
10	640	470	120
11	704	517	132

Recording Capacity in Hours for 6 Disks (5+1) RAID Configuration – 59.94Hz

	DNxHD 100	DNxHD 145	XAVC-Intra 4K
# RAID Units	8 audios	8 audios	8 audio
1	80	58	15
2	160	116	30
3	240	174	45
4	320	232	60
5	400	290	75
6	480	348	90
7	560	406	105
8	640	464	120
9	720	522	135

4.4. Network Transfers

4.4.1. XNet Transfers

Rule

This section provides figures on transfer speeds for jobs processed by the XNet (SDTI) network.

The section presents data in tables including the following parameters:

1. **Field Rate:** field frequency used, or number of video fields transferred per second.
2. **Video Bitrate:** codec bitrate set by the user in the **Codec** section of the **Server** tab in the Multicam Configuration window.
3. **RT Transfers:** maximum number of simultaneous transfers of A/V data that can be processed for the given frame rate and video bitrate through the SDTI network.

   Calculation formula: `Maximum SDTI bandwidth / actual block-based bandwidth = real-time transfers`

When A/V data is transferred through the XNet network, you should take into account the following maximum bandwidths on an SDTI 3 Gbps network:

- 240 MB/s for transfers between EVS server having only H3XP H3XP-S boards.

Example in HD

How many real time transfers can I do over an XNet network if I work with Apple ProRes 422 at 120 Mbps in PAL?

Calculation: Maximum SDTI bandwidth / Actual bandwidth = real time transfers

240 MB/s / 16.6 MB/s = 14.4 real time transfers for SDTI 3 Gbps

This is the maximum real-time transfers the network connection can support.

Example in UHD-4K

How many real time transfers can I do over an XNet network if I work with XAVC-Intra 4K at 500 Mbps in PAL?

Calculation: Maximum SDTI bandwidth / Actual Bandwidth = real time transfers

240 MB/s / 66.6 MB/s = 3.6 real time transfers for SDTI 3 Gbps.

This is the maximum real-time transfers the network connection can support.

It is obviously also necessary that the XT4K where the material is stored has enough local disk bandwidth to feed the network accesses, on top of its own local channels (see Max. RT Channels).

XNet Transfers

The maximum number of real-time channels between EVS servers through the SDTI ports of the XT4K server are summarized in the following table.

The following tables take into account a field rate of 50.00 Hz, the resolution HD 1080i and UHD-4K, without SLSM REC, and the maximum reference bandwidth of 240 MB/s on an SDTI network of 3 Gbps.

NOTE

The transfer speed in real-time for a single A/V stream is 10% lower compared to the number of real-time transfers.
For example, a single transfer will be processed 18.3x faster than real-time for Apple ProRes 422 LT.

Codec	Field Rate	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	RT Transfers (3G SDTI)
Apple ProRes 422 LT	50.00 Hz	85	11.7	20.4
AVC-Intra 100	50.00 Hz	111	14.8	14.4
XAVC-Intra HD	50.00 Hz	111	14.8	14.4
Avid DNxHD® 120	50.00 Hz	120	16.6	12.0
Apple ProRes 422 SQ	50.00 Hz	120	16.6	12.0
Avid DNxHD® 185	50.00 Hz	185	25.0	9.6
Apple ProRes 422 HQ	50.00 Hz	185	25.0	9.6
XAVC-Intra 4K	50.00 Hz	500	66.6	3.6

4.4.2. Gigabit Ethernet Transfers

General Description

This section provides empirical figures on real-time transfers for backup and restore jobs processed by the GbE network. The GbE bandwidth however relies on the customer network behavior, which depends on external conditions, and partly on the EVS servers.

WARNING

The observations and data focus on steady rates: the transfer performances with small clips will be lower as they generate a lot of starts and ends of sessions.

The section presents data in tables including the following parameters:

1. **Field Rate:** field frequency used, or number of video fields transferred per second.
2. **Video Bitrate:** codec bitrate set by the user in the **Codec** section of the **Server** tab in the Multicam Configuration window.
3. **RT Transfers:** maximum number of simultaneous transfers of A/V data that can be processed for the given frame rate and video bitrate through the GbE network.

   Calculation formula: `Maximum GbE bandwidth / actual block-based bandwidth = real-time transfers`
4. **Transfer Speed:** transfer speed for a single transfer expressed in faster than-real time speed. The calculation formula is the same with a reference GbE bandwidth that is slightly smaller.

Reference Bandwidth

The table below specifies the reference GbE bandwidth used for calculations in this section. However, the effective bandwidth depends on network behavior, which only partly relies on the EVS server.

Gigabit Connection Type	Real-Time Transfers		Single Transfer Speed	
	Backup	Restore	Backup	Restore
1GbE (GbE board)	90 MB/s	70 MB/s	80 MB/s	70 MB/s
2GbE (LACP teaming)	180 MB/s	140 MB/s	80 MB/s	70 MB/s
10GbE (GbE board)	220 MB/s	140 MB/s	150 MB/s	80 MB/s

Backup Transfers

The maximum transfer speed through one port the GbE board on an XT4K server in 1080i and UHD-4K, without SLSM REC, are summarized in the following tables.

The data is available for:

- one 1GbE and 10 GbE port of the GbE board
- field rates of 50.00Hz (PAL) and 59.94Hz (NTSC)

1GbE Connection (PAL)

Codec	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	Transfer Speed (faster than RT)
Apple ProRes 422 LT	85	11.7	7.6x
AVC-Intra 100	111	14.8	6.0x
XAVC-Intra HD	111	14.8	6.0x
Avid DNxHD® 120	120	16.6	5.4x
Apple ProRes 422 SQ	120	16.6	5.4x
Avid DNxHD® 185	185	25.0	3.6x
Apple ProRes 422 HQ	185	25.0	3.6x
XAVC-Intra 4K	500	66.6	1.3x

1GbE Connection (NTSC)

Codec	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	Transfer Speed (faster than RT)
Apple ProRes 422 LT	100	14.1	6.4x
AVC-Intra 100	111	14.5	6.2x
XAVC-Intra HD	111	14.5	6.2x
Avid DNxHD® 145	145	20.8	4.3x
Apple ProRes 422 SQ	145	19.2	4.7x
Avid DNxHD® 220	220	30.0	3.0x
Apple ProRes 422 HQ	220	30.0	3.0x
XAVC-Intra 4K	600	68.5	1.3x

10GbE Connection (PAL)

Codec	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	RT Transfers	Transfer Speed (faster than RT)
Apple ProRes 422 LT	85	11.7	18.7	17.0x
AVC-Intra 100	111	14.8	14.8	13.5x
XAVC-Intra HD	111	14.8	14.8	13.5x
Avid DNxHD® 120	120	16.6	13.2	12x
Apple ProRes 422 SQ	120	16.6	13.2	12x
Avid DNxHD® 185	185	25.0	8.8	8x
Apple ProRes 422 HQ	185	25.0	8.8	8x
XAVC-Intra 4K	500	66.6	3.3	3x

10 GbE Connection (NTSC)

Codec	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	RT Transfers	Transfer Speed (faster than RT)
Apple ProRes 422 LT	100	14.1	15.6	14.1x
AVC-Intra 100	111	14.5	15.1	13.7x
XAVC-Intra HD	111	14.5	15.1	13.7x
Avid DNxHD® 145	145	20.8	10.5	9.6x
Apple ProRes 422 SQ	145	19.2	11.4	10.4x
Avid DNxHD® 220	220	30.0	7.3	6.6x
Apple ProRes 422 HQ	220	30.0	7.3	6.6x
XAVC-Intra 4K	600	68.5	3.2	2.9x

Restore Transfers

The maximum transfer speed through one port the GbE board on an XT4K server in 1080i and UHD-4K, without SLSM REC, are summarized in the following tables.

The data are available for:

- one 1GbE and 10 GbE port of the GbE board
- field rates of 50.00Hz (PAL) and 59.94Hz (NTSC)

1GbE Connection (PAL)

Codec	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	Transfer Speed (faster than RT)
Apple ProRes 422 LT	85	11.7	5.9x
AVC-Intra 100	111	14.8	4.7x
XAVC-Intra HD	111	14.8	4.7x
Avid DNxHD® 120	120	16.6	4.2x
Apple ProRes 422 SQ	120	16.6	4.2x
Avid DNxHD® 185	185	25.0	2.8x
Apple ProRes 422 HQ	185	25.0	2.8x
XAVC-Intra 4K	500	66.6	1.0x

1GbE Connection (NTSC)

Codec	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	Transfer Speed (faster than RT)
Apple ProRes 422 LT	100	14.1	4.9x
AVC-Intra 100	111	14.5	4.8x
XAVC-Intra HD	111	14.5	4.8x
Avid DNxHD® 145	145	20.8	3.3x
Apple ProRes 422 SQ	145	19.2	3.6x
Avid DNxHD® 220	220	30.0	2.3x
Apple ProRes 422 HQ	220	30.0	2.3x
XAVC-Intra 4K	600	68.5	1.0x

10GbE Connection (PAL)

Codec	Video Bitrate (Mbps)	Block-based Bandwidth (MB/s)	RT Transfers	Transfer Speed (faster than RT)
Apple ProRes 422 LT	85	11.7	11.9	6.8x
AVC-Intra 100	111	14.8	9.4	5.4x
XAVC-Intra HD	111	14.8	9.4	5.4x
Avid DNxHD® 120	120	16.6	8.4	4.8x
Apple ProRes 422 SQ	120	16.6	8.4	4.8x
Avid DNxHD® 185	185	25.0	5.6	3.2x
Apple ProRes 422 HQ	185	25.0	5.6	3.2x
XAVC-Intra 4K	500	66.6	2.1	1.2x

10GbE Connection (NTSC)

Codec	Video Bitrate (Mbps)	Block-based Bandwidth (MB/s)	RT Transfers	Transfer Speed (faster than RT)
Apple ProRes 422 LT	100	14.1	9.9	5.6x
AVC-Intra 100	111	14.5	9.6	5.5x
XAVC-Intra HD	111	14.5	9.6	5.5x
Avid DNxHD® 145	145	20.8	6.7	3.8x
Apple ProRes 422 SQ	145	19.2	7.3	4.1x
Avid DNxHD® 220	220	30.0	4.6	2.6x
Apple ProRes 422 HQ	220	30.0	4.6	2.6x
XAVC-Intra 4K	600	68.5	2.0	1.1x

Simultaneous Backup and Restore

The backup sessions reach higher bandwidth and pre-empt the bandwidth against the restore sessions. On a ‘per session’ base, the system allocates between 3.75 and 6 times more bandwidth to backup session than to restore session.

4.5. Video Interpolation

Introduction

The playing back of smooth slow motion pictures carries specific issues: since some fields must be repeated at regular interval to provide the video at the playback speed required by the operator, parity violation appears regularly on the output video signal. This issue is specific to interlaced formats (525i, 625i and 1080i) and does not concern progressive formats (720p and 1080p).

If O and E represent respectively the odd and even fields of a standard video signal (50/60 Hz), we have:

The original video signal:

- O E O E O E O E O E O E O E O E

The output video signal at 50% speed:

- O **O** **E** E O **O** **E** E O **O** **E** E O **O** **E** E

The output video signal at 33% speed:

- O **O** O E **E** E O **O** O E **E** E O **O** O E

The output video signal at 25% speed :

- O **O** O **O** **E** E **E** E O **O** O **O** **E** E **E** E

Fields with parity violation are shown in bold, underlined letters. As it appears from the above table, whatever the playback speed (with the exception of the normal 100% playback speed), a number of fields violate the normal parity of the output signal. This parity violation induces a 1-line shift of the field, resulting in a vertical jitter of the picture. The jitter frequency depends upon the chosen playback speed.

To avoid this phenomenon and provide a stable output picture, EVS developed 2 types of line interpolator: 2-line and 4-line interpolators. The interpolation process can be enabled or disabled by the operator on all EVS slow motion systems.

2-Line Interpolator

The 2-line interpolator actually generates a new field, when the original field is in parity violation. Each line of this new field is calculated by a weighted average of the 2 neighboring lines. This process solves the problem of parity violation and vertical jitter, but the drawback is a reduction of the vertical resolution on the interpolated fields, that appear unfocused. Another side effect is the alternation of original fields (perfectly focused) and interpolated fields (unfocused), resulting in a "pumping" video signal.

4-Line Interpolator

The 4-line interpolator uses a more sophisticated calculation based on the 4 neighboring lines. By using suitable coefficients for the weight of each line in the resulting calculation, we apply this interpolation to all fields. The final result is a permanently, slightly unfocused picture. The advantage is a stable output signal with no jitter and no "pumping", but the vertical bandwidth is even more reduced.

The interpolator is of course always disabled at 100% playback speed, because there is no parity violation.

EVS uses the same techniques with the Super Slow Motion disk recorder, working with all models of Super Motion cameras (150/180 Hz). The only difference between the processing of Super Motion and normal scan (50/60 Hz) signals is that the interpolator is always disabled at 33% playback speed, because the Super Motion signal does not cause parity violation at this particular speed.

Whatever the choice, the resulting picture is thus always a compromise between stability and resolution. With EVS systems, the operator always has the choice between any of the 3 above described techniques: no interpolation, 2-line interpolation or 4-line interpolation. Even if the operator chooses to use the interpolation, this process will be automatically disabled when not necessary (100% playback for 50/60 Hz signal, 33% and 100% playback for 150/180 Hz signal).

NOTE

All professional VTRs use line interpolation in PlayVar mode to avoid vertical jitters.
Default value is interpolator off for all configurations except SLSM configurations in which 4-line interpolator mode is enabled.

5. Hardware Installation and Cabling

5.1. Rack Installation

Unpacking

Upon receipt of the equipment examine packing for obvious signs of damage. If damaged, do not unpack and inform the carrier immediately. Check thanks to the included packing list if all the items are present and if they show any mechanical damage. If yes, report damage or the missing parts to EVS or their appropriate representative.

Ventilation and Rack Mounting

Adequate ventilation is obviously required for optimum performance. As a result of this consideration, ensure that no other equipment is located close to the mainframe.

WARNING

- Remember that fans are used to air cool the equipment and protect it from overheating.
- Do not block fans intakes during operations.

Having regard to the weight of the server chassis, support guides are required for this unit into the rack mount. The front ears of the unit are not designed to support its full weight. Applying full weight on these might result in bending the metal plate.

Boards Checking

The main power switch is located at the front side (lower right corner) of the unit.

Before turning on the power, open the front door of Video disk recorder unit to check if all boards fit into their guides. If a board is out of its guides, remove carefully the board and replace it in the same slot.

5.2. Rear Panel Description

5.2.1. Rear Panel Configurations

The XT4K server comes in the following rear panel:

- 6U rack with 4 codec modules.

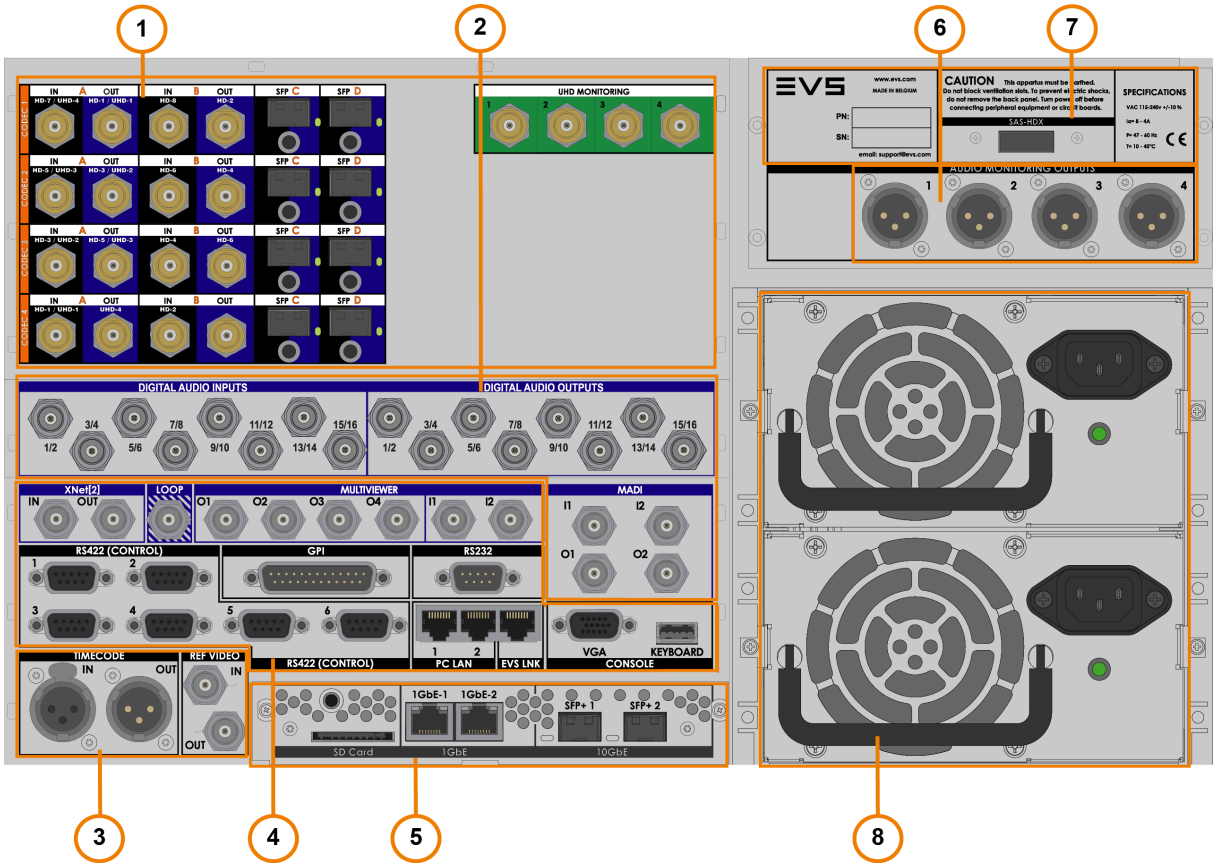
The various parts of the rear panel are described in the following topics.

5.2.2. Rear Panel Layout

Rear Panel Areas

The following drawing represents an example of a rear panel available on XT4K server.

The various areas of the rear panel are highlighted in the drawing and their respective variants are listed in the sections below along with a short description of the related connectors.



Video and Codecs 1

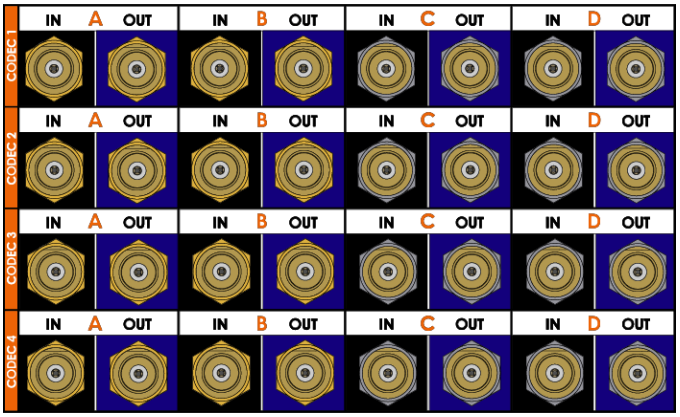
The codec modules allow connections for recording and playback of video material.

See section "V4X Video and Reference Boards" on page 60 for more details on each connector specific usage according to the different configurations.

The video and codec connector layout available with the XT4K server includes 4 codec modules with one of the following layout **on each codec module**:

- 8 BNC ports for 3G-SDI connectivity

  The first 4 left ports, with a copper ring, are 12G-SDI capable.



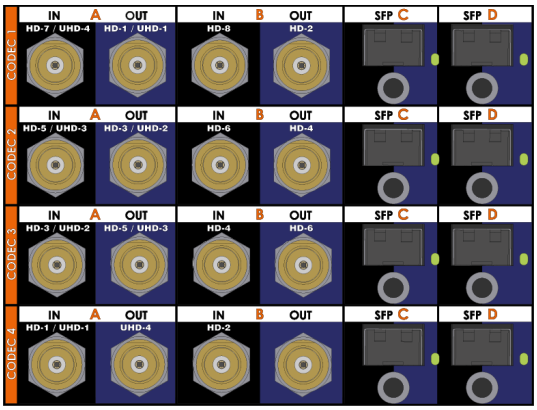
NOTE

When using a 12G-SDI interface on a codec module, cable only the IN A or OUT A connector of the codec module.

- 4 BNC ports for 3G-SDI or 12G-SDI connectivity

  AND

- 2 SFP+ ports (10GbE ports) for IP connectivity



NOTE

When the SFP+ is used, the BNC connectors are no longer operational, and vice versa. See the XT4K configuration manual for more information.

Digital Audio 2

This section shows the available associations of digital connectors.

The audio connector layouts described in this section are available according to your configuration.

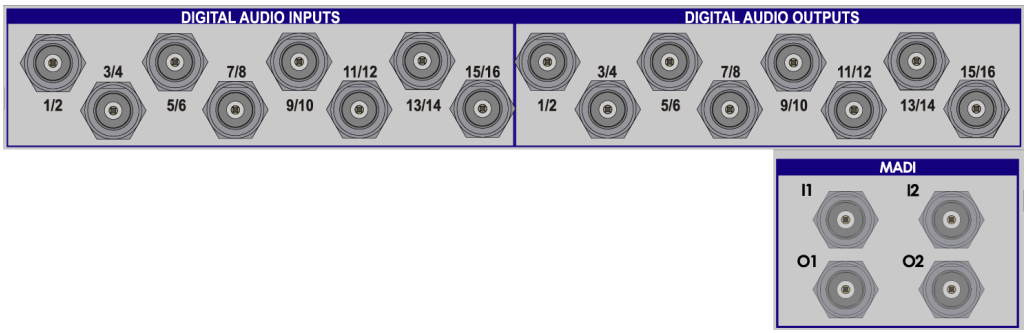
The MADI connectors are available by default on every XT4K server.

See section "Audio Specifications" on page 12 for more details on the available audio configurations.

See section "Audio Connections" on page 40 for more details on the DA-15 connectors pinout depending on the configuration.

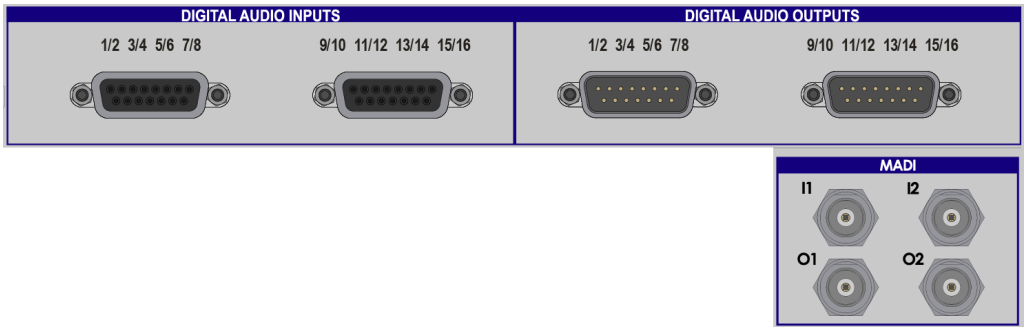
MADI BNC + Digital BNC

- MADI Digital audio: 4 BNC connectors (2 in and 2 out)
- Digital audio: 16 BNC connectors (8 in and 8 out)



MADI BNC + Digital DA-15

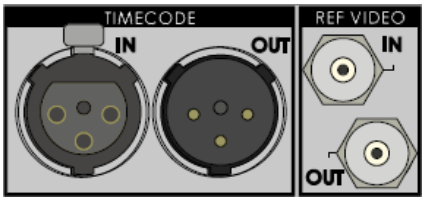
- MADI audio: 4 BNC connectors (2 in and 2 out)
- Digital audio: 4 multi-pin DA-15 connectors (2 in and 2 out)



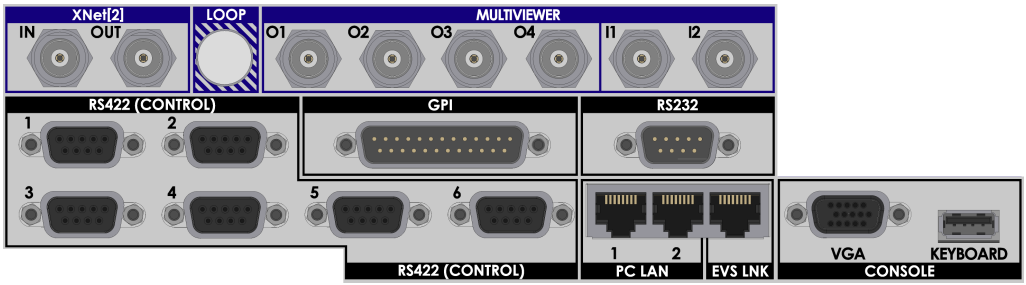
Timecode and Video Ref Connectors 3

The **Timecode** connectors allow the server to receive the LTC timecode reference signal and send the LTC timecode that corresponds to PGM1.

The **Ref Video** connectors allow the server to receive or send back the analog genlock reference signal.



Controls and Communications 4



This rear panel part, located below the audio connectors, presents connectors that allow the EVS server to communicate with other devices. The connectors are described from top left to bottom right:

The **XNet2** connectors allow the interconnection of EVS servers in an XNet2 network. The IN connector of a server is connected to the OUT connector of another server, and so on to form a closed loop network.

The **Multiviewer** connectors provides:

- 4 OUT connectors to connect monitors directly to the server, and display PGM and REC channels on the monitors.
- 2 IN connectors to connect an external source and display it as an individual channel on the monitors.

The monitor display is configured in the Multicam Configuration window, Monitoring tab, Multiviewer page. See the Multicam Configuration manual for a description of the configuration parameters.

The **RS422 ports** allow the server to be remotely controlled through remote panels or third-party control devices. When a remote panel is used, it should be connected on the first RS422 port.

The **GPI** connector allows GPI (General Purpose Interface) devices to send or receive electric pulses that will trigger commands on the server or to be connected with third-party devices.

The **RS232** connector allows a tablet to be connected to the server.

Two **PC LAN** connectors allow connection of the PC LAN interface of the EVS server to an Ethernet network. Refer to the XT4K Configuration manual for more information on PC LAN redundancy.

The **EVS Link** connector is reserved for internal use.

The **Console** connectors allow a monitor and a keyboard to be connected to the server.

Gigabit Ethernet Connectors Module 5

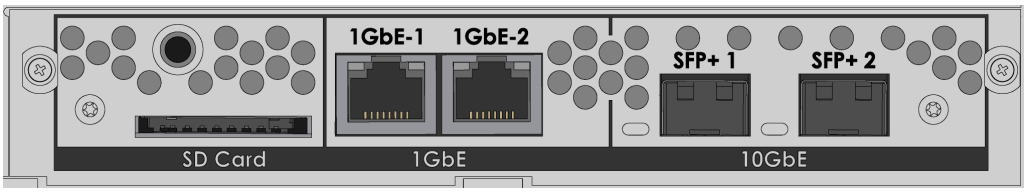
The Gigabit Ethernet Connector module of the GbE board is located at the bottom center of the rear panel.

This area can have one of the following layouts:

- It hosts the **full** Gigabit connector module.

  The **Gigabit Ethernet** connector module allows the interconnection of servers, other EVS, and/or third-party systems into a Gigabit Ethernet network via:

  - 2 SFP+ connectors, each offering a global bandwidth of 10 GbE
  - 2 RJ45 connectors, each offering a global bandwidth of 1 GbE
  - SD card slot



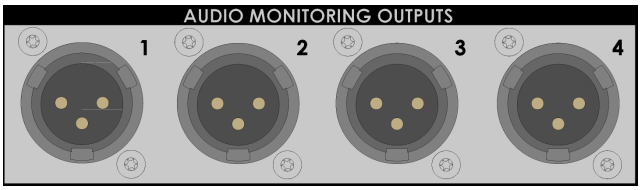
NOTE

The 10 GbE and 1GbE connectors cannot be used at the same time.

Audio Monitoring Connectors 6

This connector is located on the top right part of the rear panel, above the PSU.

The **Audio Monitoring Outputs** connectors are analog XLR connectors that allow audio output connections for monitoring purposes.



SAS-HDX Connector 7

This connector is located on the top right part of the rear panel, above the PSU.

The **SAS-HDX** connector allows the connection to the external disk array SAS-HDX if it is installed. By default, it is covered with a cap.

Power Supplies 8

The server power supply is made of two hot-swappable units. Both of these units are connected to allow automatic power switching to the second power supply should the first one fail.

5.3. Video Connections

You fill find full details on video connections in the Configuration manual, in the chapter "Supported Configurations".

5.3.1. SFP+ Video Connectors

NEW ! Supported SFP+ Connectors

The SFP+ connectors of 10GBASE-SR type have been tested and validated as video connectors:

Brand	Connector Reference
Skylane	SPP85P30100D
Arista	ETH-SFP-10G-SR
Intel	ESSFP-I-10G-SR
Cisco	ESSFP-C-10G-SR

5.4. Audio Connections

5.4.1. Audio Channels

The XT4K server manages up to 192 audio channels, depending on the chosen variant and the installed hardware.

The embedded audio modules and codecs can be used as input or output channels for embedded, digital (AES/EBU) signals.

Depending on the server chassis or configuration, you can find the following audio connectors on the rear panel:

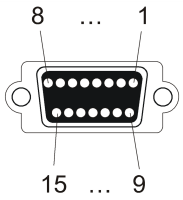
- Digital audio:
  - DA-15 connectors: 16 inputs (8 pairs) and 16 outputs (8 pairs) (110 Ohm balanced).
  - BNC connectors: 8 inputs and 8 outputs on an XT4K server (75 Ohm unbalanced).
- MADI Digital audio:
  - BNC connectors: 2 inputs and 2 outputs (75 Ohm unbalanced).
- Audio monitoring :
  - XLR connectors: 4 analog mono outputs (600 Ohm drive capable).
- Breakout cables with XLR connectors can be adapted on DA-15 connectors.

See also section "Audio Specifications" on page 12 for full information on the available audio hardware configurations.

The connectors are illustrated along with their respective pinouts in the following topics.

5.4.2. Digital Audio DA-15 Pinout

The digital audio DA-15 connector is illustrated hereunder (connector installed on the rear panel and viewed from outside). Its pinout is described in the following table where each column corresponds to one of the 4 available connectors.



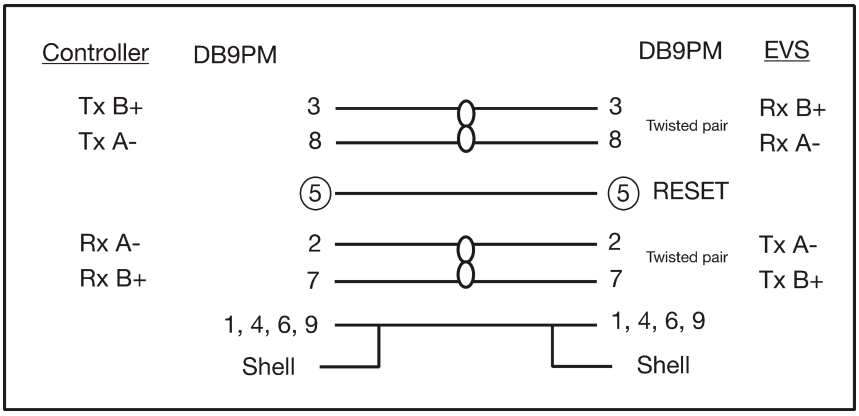
Pin #	DA-15 connector #1 Inputs 1-8 (mono)	DA-15 connector #2 Inputs 9-16 (mono)	DA-15 connector #3 Outputs 1-8 (mono)	DA-15 connector #4 Outputs 9-16 (mono)
1	Gnd	Gnd	Gnd	Gnd
2	AES input 1/2 +	AES input 9/10 +	AES output 1/2 +	AES output 9/10 +
3	Gnd	Gnd	Gnd	Gnd
4	AES input 3/4 +	AES input 11/12 +	AES output 3/4 +	AES output 11/12 +
5	Gnd	Gnd	Gnd	Gnd
6	AES input 5/6 +	AES input 13/14 +	AES output 5/6 +	AES output 13/14 +
7	Gnd	Gnd	Gnd	Gnd
8	AES input 7/8 +	AES input 15/16 +	AES output 7/8 +	AES output 15/16 +
9	AES input 1/2 -	AES input 9/10 -	AES output 1/2 -	AES output 9/10 -
10	Gnd	Gnd	Gnd	Gnd
11	AES input 3/4 -	AES input 11/12 -	AES output 3/4 -	AES output 11/12 -
12	Gnd	Gnd	Gnd	Gnd
13	AES input 5/6 -	AES input 13/14 -	AES output 5/6 -	AES output 13/14 -
14	Gnd	Gnd	Gnd	Gnd
15	AES input 7/8 -	AES input 15/16 -	AES output 7/8 -	AES output 15/16 -

5.5. RS422 Connections

5.5.1. RS422 Connector Pinout

The RS422 connectors are used to connect a remote control (from EVS or third party) to your server.

The cable wiring is a straightforward pin-to-pin connection as illustrated in the following diagram. You should use a shielded cable to avoid electromagnetic interference on long distances.



WARNING

The RESET command line from the remote control is sent through the pin 5 of the RS422 connector. This function should be disabled when the controller on connector #1 is not an EVS controller.

The technical specification for the RS422 link is as follows:

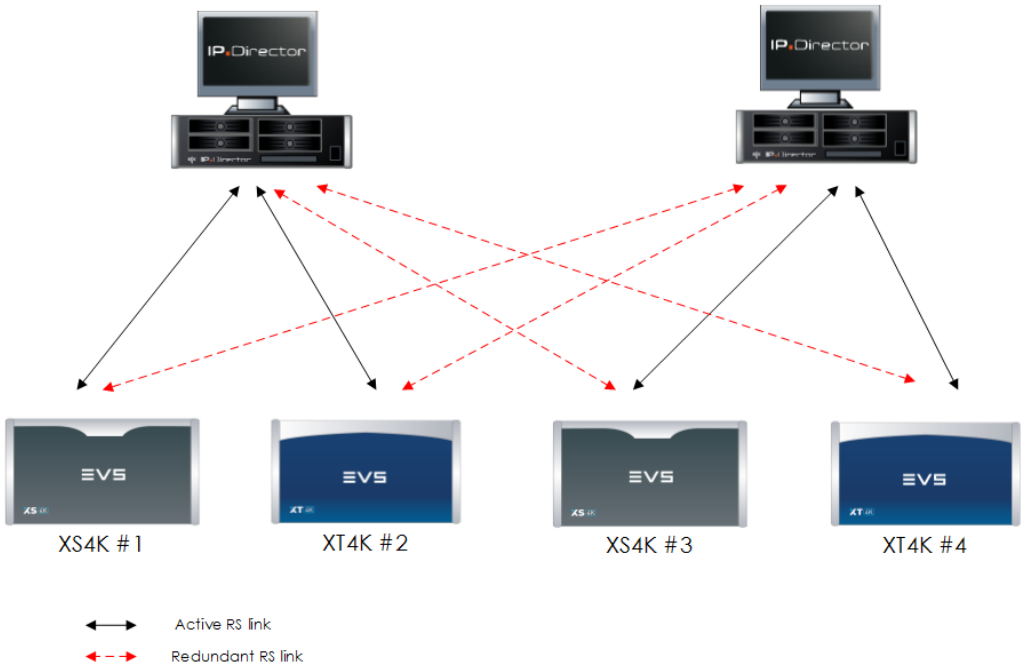
- 19200 bauds
- No parity
- 8 data bits
- 1 stop bit

5.5.2. Redundant IPDP Serial Link

The IPDirector communicates with the server via one serial link. If that link fails, the XT4K server can no longer be controlled by any IPDirector.

A failover mechanism has been put into place: it switches the IPDirector link from one port of XT4K server to another port on another XT4K server.

To ensure the failover, the backup links between IPDirector workstations and the XT4K servers need to be physically wired to a second RS422 port, as shown on the following schema:



The serial link redundancy will ensure that there is no single point of failure in the setup. However, you need to put into place a thoroughly thought through IPDP configuration for the SynchroDB to continue working correctly. This can be achieved, for example, by defining an IPDirector workstation in Network mode.

5.6. XNet Network

5.6.1. Introduction

The XNet2 network consists of several EVS video servers or other EVS hardware all connected with a 75-Ohm coaxial cable (BNC).

The data exchange between systems is operated through the SDTI interface at 2970 Mbps (3 Gbps), with non-relay connectors.

The SDTI loop is closed only when the Multicam software is started. As non-relay connectors are used, it is recommended to use XHub to avoid network interruptions.

The XNet2 requires a network server dedicated to the management of the database shared among all EVS video servers. This is assigned to one of the EVS servers on the network. The EVS server acting as the network server can of course be used for standard server operations.

5.6.2. Network Architectures

Introduction

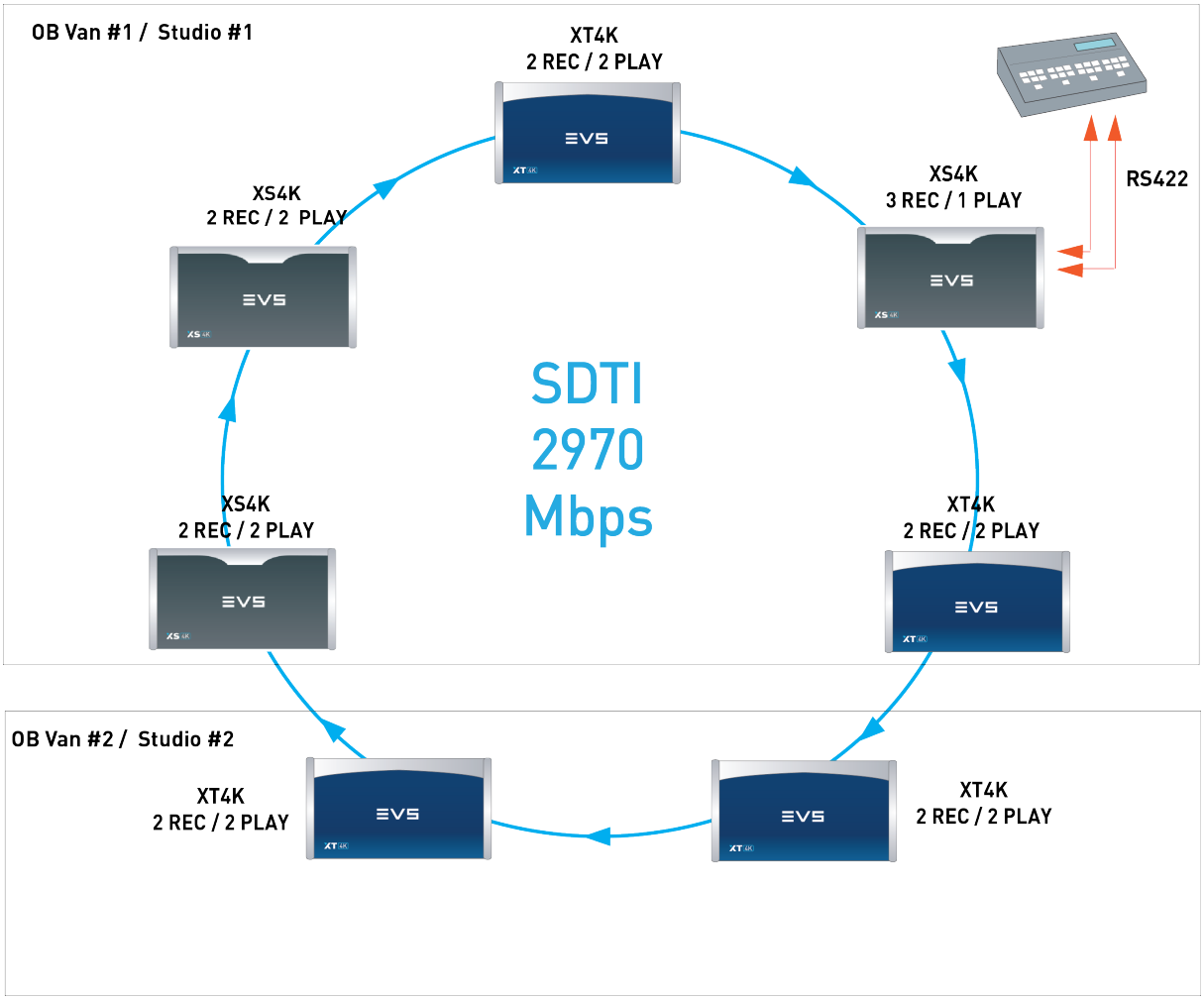
To set up an XNet network, EVS servers may be connected directly in a closed loop architecture. Using a dedicated hub, they may be connected in a star architecture as illustrated in the following figure.

NOTE

With an SDTI network of 3Gbps, XHub v4.00 only is supported.

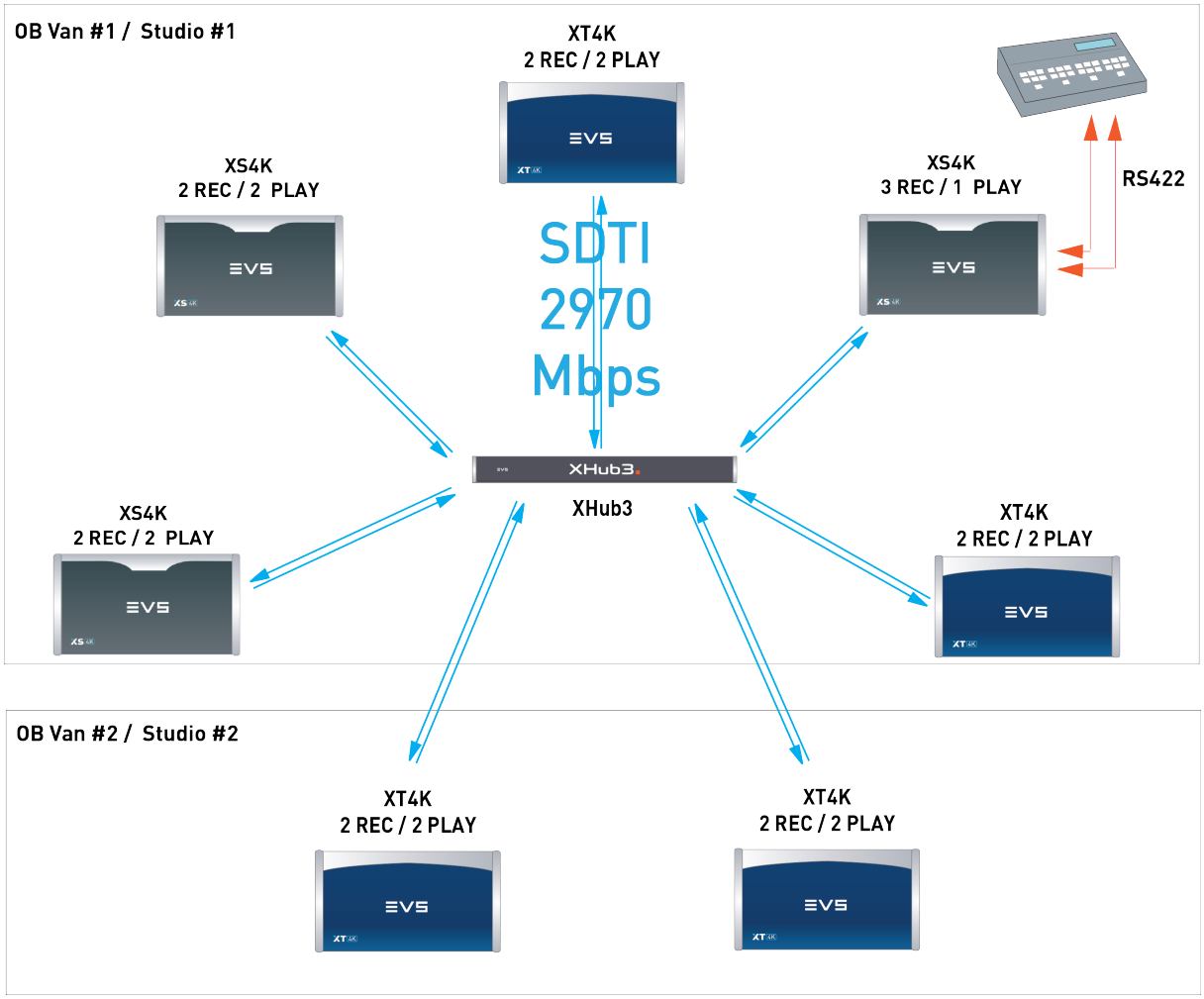
Connection Diagram Without EVS XHub SDTI Hub

Example of XNet2 network without XHub:



Connection Diagram With EVS XHub SDTI Hub

Example of XNet2 network with a SDTI hub:



5.6.3. Required Conditions to Set up and Run XNet

1. All systems on the network shall belong to the XT3, XS3, XT4K, XS4K servers, XHub3 devices.
2. The SDTI advanced option code (for network client, master, or server modes) shall be validated in the options list.
3. They shall all be running compatible software versions. Otherwise, warning message is displayed.
4. The SDTI speed parameter shall have the same value on all EVS servers (**Network** page, **SDTI** section).
5. The EVS video servers shall operate the same multi-essence configuration.

6. The EVS video servers shall operate the same codec for video material to be fully interoperable between EVS video servers.
7. The network type must be set to "Server" on one and only one EVS video server on the network. The others must be set to either "Master" (to share clips and view others clips) or "Client" (to share clips only).
8. A different network number must be specified for each EVS video server that you want to connect to the network. If the same network number is assigned to 2 different systems, the second one will not be able to connect and a warning message will be displayed.
9. All EVS video servers must be connected with a good quality BNC 75 Ohm cable to form a closed loop.

   Connect the SDTI OUT connector of the first EVS video server to the SDTI IN connector of the second one, etc until the loop is closed by connecting the SDTI OUT connector of the last EVS video server to the SDTI IN connector of the first one.

   The SDTI loop must be closed at all times during network operation. If for any reason the loop is open, all network communication will be interrupted and all systems will automatically switch to stand alone mode. When the loop is closed again, network operation will resume automatically. This problem can be avoided or limited using an XHub.
10. The distance shown in the table below is the maximum cable length between two active EVS servers, or 2 SDTI reclockers, on an XNet2 SDTI network, using a single piece of cable between 2 servers or 2 reclockers.

    Intermediate connectors, patch panels, etc., might degrade these figures. Depending on the number of servers connected on the network, the location of the master server, the presence or not of an XHub SDTI hub, the actual maximum values may be higher than indicated. If longer distances between servers are required, SDTI to Fiber converters can be used, allowing distances over thousands of meters if necessary.

    EVS has validated the following SDI-fiber converters:

    - BlueBell BC313T and BC313R (Single channel) or BC323TR (Dual channel)

      (www.bluebell.tv)
    - Barnfind BarnMini-01 (Dual channel)

      (www.barnfind.no)
    - Yellobrik OBD 1810 (multiplexer), OTR 1810 & OTR1840 (transceiver)

      (www.yellobrik.com)
    - Extron FOX 3G HD-SDI P

      (www.extron.com)
    - Multidyne HD 3000 TRX

      (www.multidyne.com)

Cable type	@ 2970 Mbps
RG59	30 m / 98 ft
RG6	70 m / 230 ft
RG11	85 m / 279 ft
Fiber	55 km (*)

(*) 55 km is the total length of the return path, i.e. the actual distances between the 2 servers connected via the fiber link is half of this value, i.e. 22.5 km @ 2970 Mbps.

NOTE

When reclockers are used, the total delay induced by these reclockers between 2 active servers on the network may not exceed 15 µs.

5.6.4. Starting XNet

1. When all above conditions are fulfilled and the cabling is correct, turn on the "Server" EVS video server.
2. Make sure the value to **Server** in the **Type** field in the **SDTI** section on the **Network** page. Then start Multicam.
3. Turn on all "Master" and "Client" EVS video servers, and make sure the appropriate value is selected in the Type field in the SDTI section.
4. Start Multicam on all of the Master and Client EVS servers.

They should see the "Server" on the network and they will connect automatically. Connection takes a few seconds (usually between 2 and 5 sec) for each EVS video server.

5.7. Gigabit Network

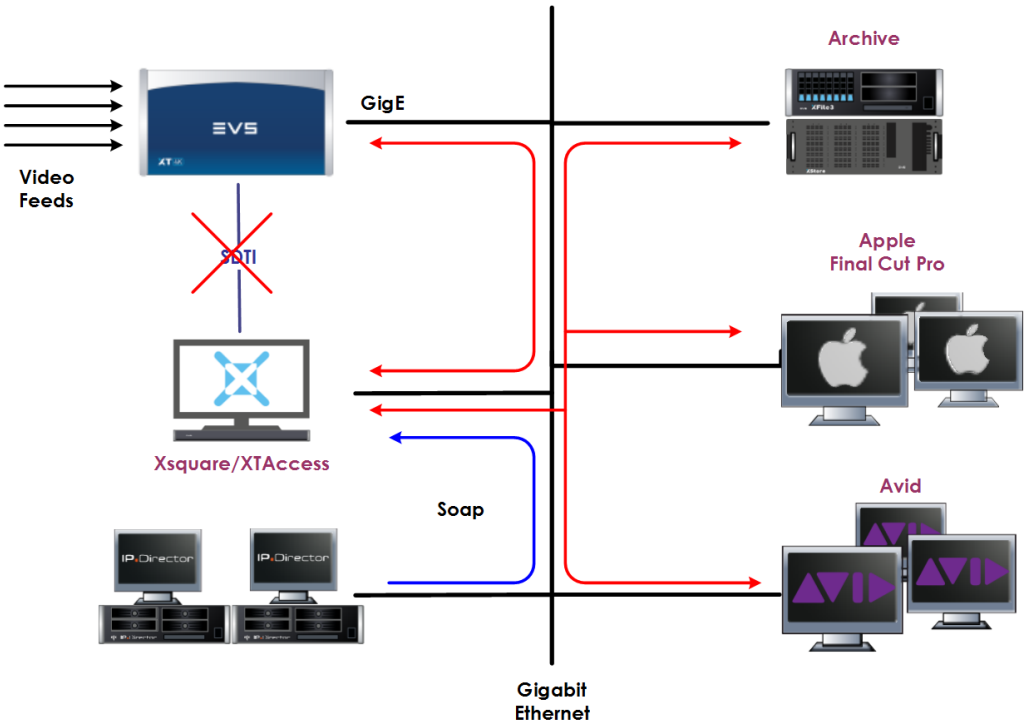
5.7.1. Functional Overview

The Gigabit connection makes it possible to transfer video and audio material from your XT4K server to external systems via the TCP/IP network.

The external systems can be the following:

- A storage system or an archiving system, such as XStore.
- A non-linear editing system, such as Apple Final Cut Pro, or Avid.

However, the external systems cannot read the raw files coming from an XT4K server. For this reason, Xsquare/XTAccess are used as a "gateway" between your server and the IT world. In this architecture, the Xsquare application plays the role of XTAccess orchestrator on the Gigabit network, communicating via the PC LAN connection.



Xsquare is directly connected to the XT4K server through the Gigabit network via an FTP client. It runs on a Windows workstation and is mainly controlled by the external systems (no user interface) via soap requests or other processes.

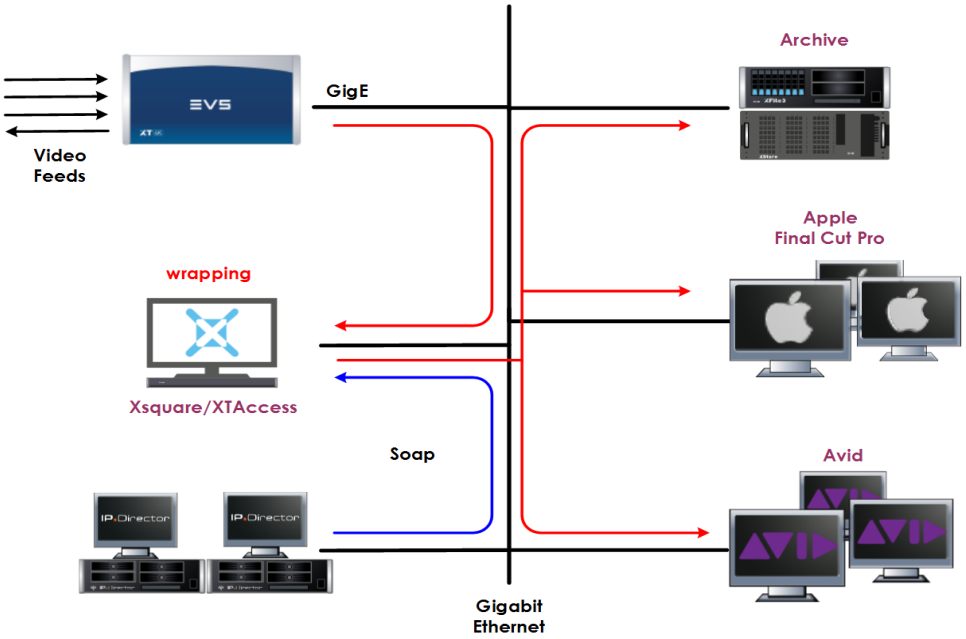
The Gigabit connection fulfills the following functions in relation with the XT4K server:

- Backup of clips from an XT4K server.
- Restore of clips to an XT4K server.
- Transfer of clips between servers.

5.7.2. Backup of Clips

Overview

The following schema shows how the backup of clips is performed with the Gigabit connection and Xsquare/XTAccess:



Workflow

1. An external system, for example IP Director, sends a soap request to Xsquare to request the backup of a given clip created on XT4K server .
2. Xsquare processes the soap request:
   - It gets the clip content that has to be backed up from the server.
   - It generates a backup file of the clip in the format specified by the external system (no transcoding feature, only native codec).
   - It stores the backup file in the target folder specified by the external system.

5.7.3. Restore of Clips

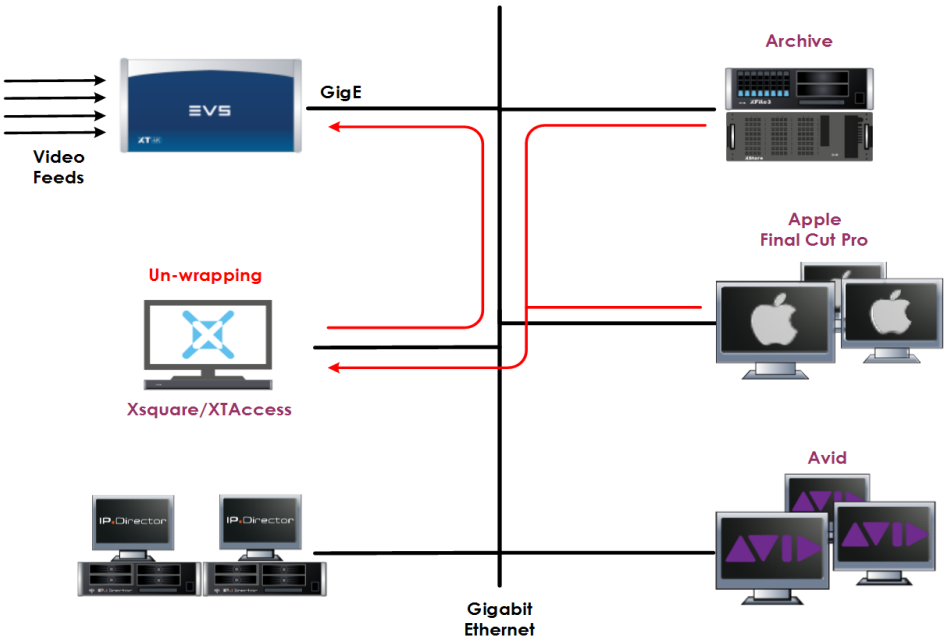
Overview

Clips having one of the supported formats can be restored. Refer to the Xsquare release notes for more information about supported formats.

The restore process can be set up in two different ways:

- via a soap request sent by the external application.
- via folder scan.

The following schema shows how the restore of clips is performed with the Gigabit connection and Xsquare:



Workflow (Restore via Soap)

1. An external system (which can generate soap requests for restoring clips, for example IPDirector) sends a soap request to Xsquare for restoring (copy) the clips from an archiving or backup system to a given XT4K server.
2. Xsquare processes the soap request:
   - It gets the clip file to restore from the external system.
   - It restores, i.e. copies, the clip on the server specified in the soap request.

Workflow (Restore via Folder Scan)

1. Based on the parameters defined in Xsquare, this application scans specific folders on external backup or archiving systems.
2. When a clip file has been written to the scanned folder, Xsquare creates a copy of the clip on the server specified in the Xsquare parameters.

   The restored clip receives a new UmID and LSM ID:

   - Multicam automatically assigns a UmID to the restored clip.
   - A start LSM ID is specified in Xsquare and incremented as defined for each new clip that is restored in order to find an empty location on the server.

   The restored clip contains the clip metadata.
3. The restored clip is moved from the scanned folder to one of the following subfolders on the external archiving or backup system:
   - \Restore.done\: folder where the files are moved to when they are successfully restored.
   - \Restore.error\: folder where files are moved to when they failed to restore.

5.7.4. Important Rules

Gigabit networks including EVS servers need to abide by the following rules:

- The hardware used on GbE networks with EVS servers need to support jumbo frames.
- Both GbE ports of an EVS server need to be defined on different sub-networks.
- This is not possible to implement failover through the GbE network.
- The two GbE ports available on the internal switch (PC LAN) are 1000 Base-T ports.

  They are used for monitoring purposes (XNet Monitor) or for the communication with other applications (LinX)

5.7.5. Switches

1GbE Switches

All switches used on the GbE networks of EVS systems need to support jumbo frames (Ethernet frames with more than 1,500 bytes of payload).

The following table gives an overview on the supported 1GbE switches:

Type	Ports	Uplinks	Stackable	Jumbo Frames	Dual PSU
Cisco WS-2960X-24TD-L	24 10/100/1000 Base-T	2 10G SFP+ or 2 1G SFP	Yes	Switching	No
Cisco WS-2960X-48TD-L	48 10/100/1000 Base-T	2 10G SFP+ or 2 1G SFP	Yes	Switching	No
Cisco WS-2960X-24TS-L	24 10/100/1000 Base-T	4 1G SFP	Yes	Switching	No
Cisco WS-2960X-48TS-L	48 10/100/1000 Base-T	4 1G SFP	Yes	Switching	No
Cisco WS-3850X-24T-S	24 10/100/1000 Base-T	Module	Yes	Routing	Opt.
Cisco WS-3850X-48T-S	48 10/100/1000 Base-T	Module	Yes	Routing	Opt.
Arista 7048T-A	48 10/100/1000 Base-T	4 10G SFP+	No	Routing	Yes

Optional Modules for the Cisco WS-3850X

Product Number	Description
C3850-NM-4-1G	4 Gigabit Ethernet SFP
C3850-NM-2-10G	4 Gigabit Ethernet SFP / 2 10 Gigabit Ethernet SFP+
C3850-NM-4-10G	4 Gigabit Ethernet SFP / 4 10 Gigabit Ethernet SFP+

Remark: 4x10 Gigabit uplinks are only possible with the 48-port version, the 24-port version only supports 2x10GbE uplinks.

Recommendations

The models Cisco Catalyst 2960X-24TS and 2960X-48TS can be used for small setups where no inter-VLAN routing is needed and no 10G uplinks.

The models Cisco Catalyst 2960X-24TD and 2960X-48TD can be used for small setups where 10G uplinks are required, but no inter-VLAN routing is needed.

On larger setups, both GbE ports of the XT4K servers or/and several ports on the SANs are often used to increase the bandwidth or to allow redundancy. Since both GbE ports of XT4K server cannot be used on the same sub-network, virtual LANs need to be created. To allow the transfer of packets between the virtual LANs, layer 3 switches are required. You need to select a layer 3 switch that is able to route jumbo frames. The Cisco Catalyst 3850X series does support jumbo frames, allows traffic to be routed between different VLANs and provides stacking capabilities.

10 GbE Switches

The following table gives an overview on the supported 10 GbE switches:

Type	Ports	Uplinks	Stackable	Jumbo Frames	Dual PSU
Cisco N3K-3524P-10G	24 1/10G SFP+	-	No	Routing	Yes
Cisco N3K-3548P-10G	48 1/10G SFP+	-	No	Routing	Yes
Arista DCS-7150S-24	24 1/10G SFP+	-	No	Routing	Yes
Arista DCS-7150S-52	52 1/10G SFP+	-	No	Routing	Yes

Recommended SFP+ Modules

XT4K server TGE Module

- Intel® Ethernet SFP+ SR Optic (E10GSFPSR)
- Intel® Ethernet SFP+ LR Optic (E10GSFPLR)

Those modules are tested to be compatible with the TGE interface board of the XT4K server and the 10 Gbps SFP+ NICs.

Switches

On the switches it is recommended to use the modules recommended by the switch vendors.

5.8. GPIO Connections

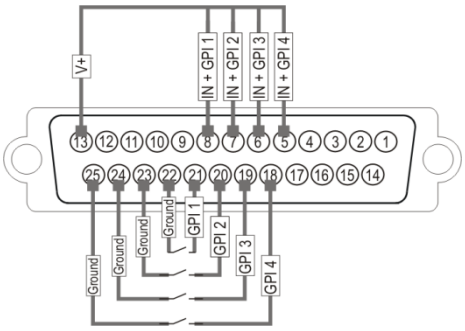
5.8.1. GP In Connections

GPI Triggers

The allocation of the XT4K server GPI triggers is performed in the Multicam Configuration window, in the GPI tab. See the Configuration manual for detailed information on allocating GPI triggers.

Opto isolated Inputs (GP In 1, 2, 3, 4)

Pin-Out



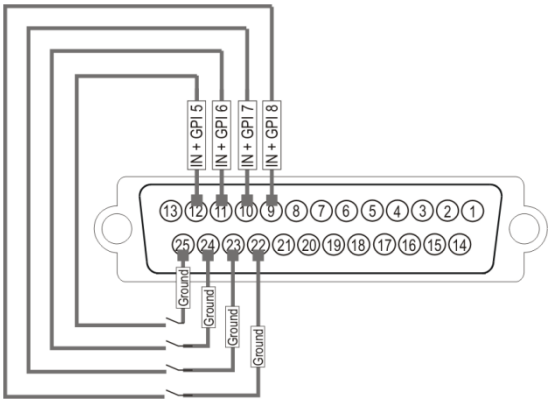
Specifications

- The input consists in an opto diode (VF @ 1.1 Volt) in series with a 470 ohm resistor.
- Typical switching point @ 1.4 mA, for secure operation:
  - i=0 to 0.5 mA -> opto OFF
  - i=2.5 to 30 mA -> opto ON
  - imax= 30 mA
- Direct connection to a TTL/CMOS signal possible (Pin opto - to GND and pin opto + to the TTL/CMOS signal).

  Typical switching point @ 1.6 Volts, for secure operation:
  - Vin< 0.8 Volts -> opto OFF
  - Vin> 2.2 Volts @ 2 mA -> opto ON
  - Vin max (without external resistor) = 15 Volts

TTL Inputs (GP In 5, 6, 7, 8)

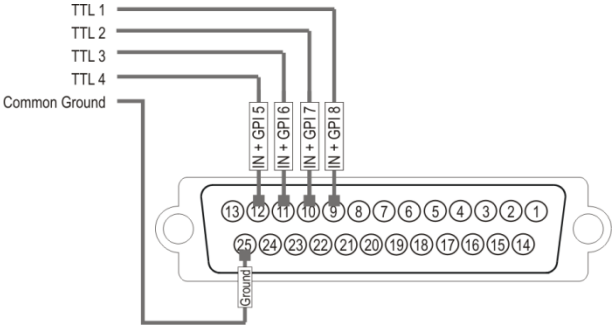
Relay Inputs Pin-Out



The relay must be connected between the ground and the corresponding TTL input on the DB-25.

TTL Inputs Pin-Out

Each TTL input on the DB-25 is directly connected to the pin of the TTL connector on the device triggering the GPI. The ground must be common between the DB-25 connector of the XT4K server and the external device.



Specifications

- each pin can be individually configured as an output or an input
- internal 4K7 pull up to +5 V
- low level Vi < 1.5 Volt (U12 = 74HC245)
- high level Vi > 3.5 Volt (U12 = 74HC245)
- optional TTL compatible level (U12 = 74HCT245)

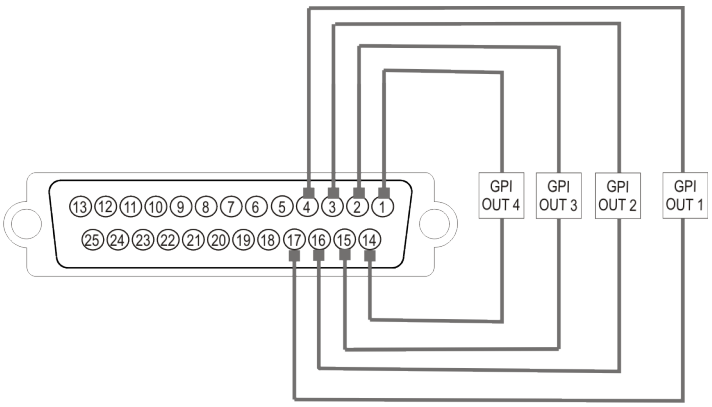
5.8.2. GP Out Connections

Relay Isolated Outputs (GP Out 1, 2, 3, 4)

Pin-Out

The user can define the functions, types and settings associated to the GPI outs in the following applications:

- Setup menu of the Remote Panel
- IP Director settings (GPI and Auxiliary Track tab)

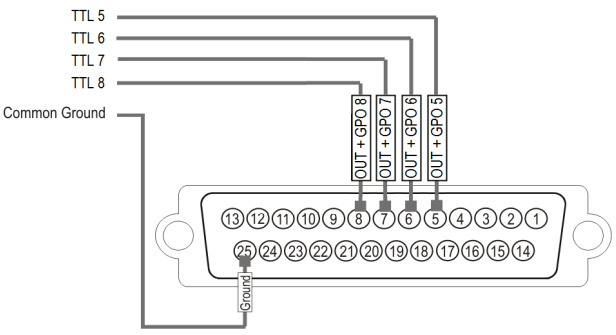


Specifications

- normally open contact (power off -> open)
- maximum 1 A
- maximum 50 Volts
- typical life time: 100.000.000 switchings

TTL Outputs (GP Out 5, 6, 7, 8)

Pin-Out



Specifications

- each pin can be individually configured as an output or an input
- internal 4K7 pull up to +5 V
- low level Vi < 1.5 Volt (U12 = 74HC245)
- high level Vi > 3.5 Volt (U12 = 74HC245)
- optional TTL compatible level (U12 = 74HCT245)

6. Boards Description

6.1. Boards and Slots Configuration

The XT4K server is equipped with several boards that are all developed by EVS:

Slot #	Installed boards
	4 x UHD-4K video channels
7	RSAS
6	H3XP
5	A3X (Audio Codec)
4	—
3	—
2	V4X #1 Genlock
1	MTPC

6.2. Hardware Edition History

The following table lists the various hardware editions, with the boards and hardware options available for each edition. The table aims at giving guidelines to differentiate one revision to the other. However, other hardware combinations are possible.

The table lists the hardware editions regardless of the date when a given EVS server was first commercialized. Consequently, any hardware revision earlier than the hardware revision of the first commercialization should be disregarded.

Hardware Edition	MTPC	Multiviewer	Controller Board	Audio	Video Base	Video Module	GBE-H3X	TGE	Rear Panel	Internal LAN	Multicam Version
5.00	HS-873	MV4	H3XP-S	A3X	V4X	V4X	-	TGE	4ch 4K	Yes	15, ...
5.10	HS-873	MV4	H3XP-S	A3X	V4X v2	V4X	-	TGE	12ch HD	Yes	15, ...

6.3. V4X Video and Reference Boards

6.3.1. Description

Overview

The V4X board is divided in several parts:

- a base board identified as V4X base
- four modules identified as V4X A, B, C and D

WARNING

It is highly advised not to remove a V4X board from your EVS server. Should you have to do so, manipulate the board very carefully, making sure it is not exposed to mechanical or electric shocks.

COD Modules

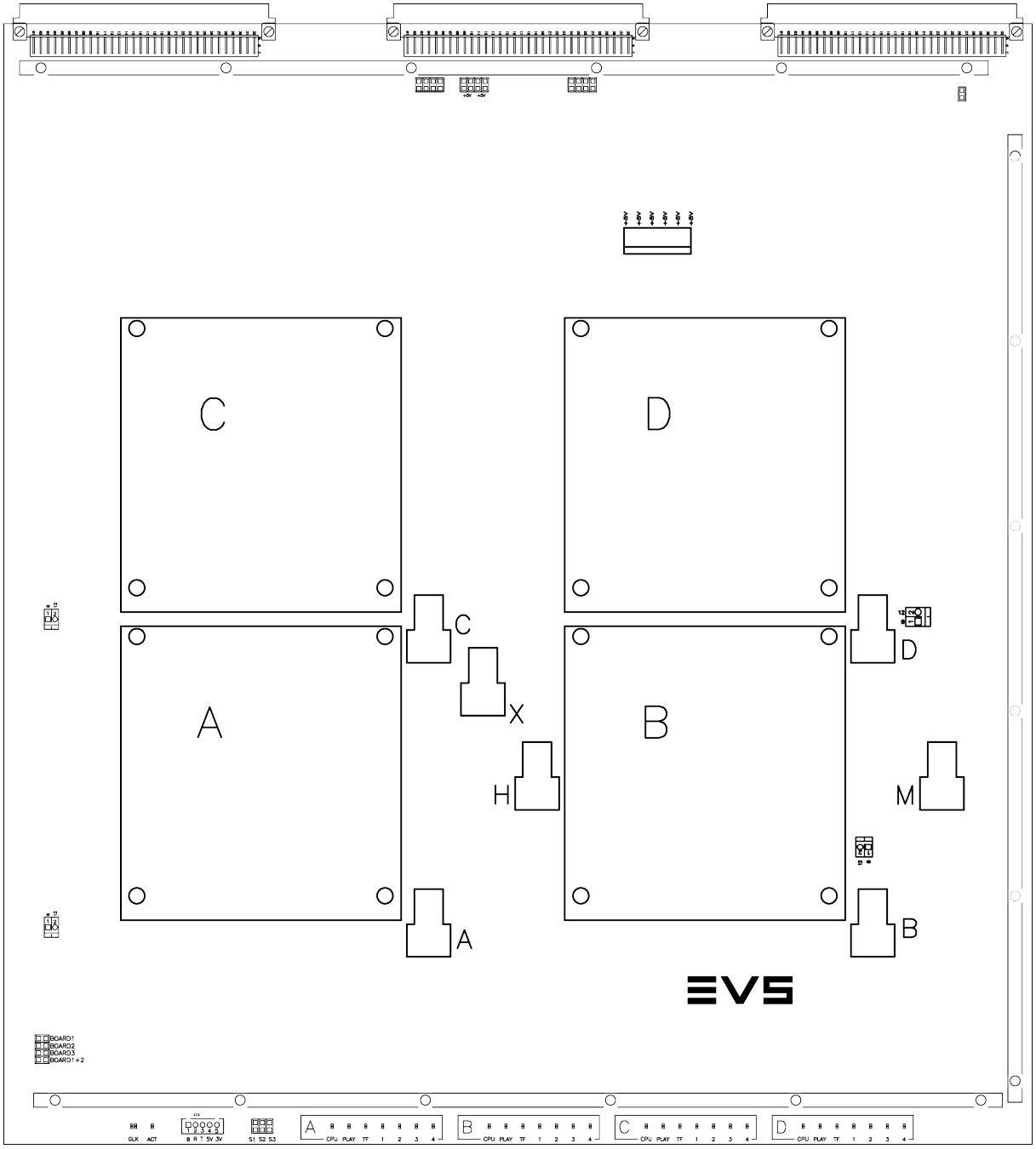
V4X modules are the actual codec modules, each of them being able to be configured by software either as an encoder (for a record channel) or as a decoder (for a play channel).

They support the following features:

- UHD-4K on a single V4X module
- 720p / 1080i / 1080p 50/59.94 Hz video standards

Block Diagram

The block diagram of the V4X board is illustrated hereunder with the connectors, and LEDs location:



Connectors

The following table lists the connectors and their respective function:

Connector	Function
A	Rear panel connection for codec 1
B	Rear panel connection for codec 2
C	Rear panel connection for codec 3
D	Rear panel connection for codec 4
M	Rear panel connection for monitoring
H	Link to H3XP-S board
X	For internal use

LEDs

The table below lists the LEDs available with the genlock functionality.

WARNING

It is crucial to have a continuous and stable genlock signal when the server is in operation. In case of interferences on the genlock signal that would cause parity violations, the recorders will automatically be restarted to maintain data integrity.

LED	Color	Status	Function
GLK	—	Off	The genlock module is not initialized.
	Green	Blinking	The genlock module is properly initialized, but no valid genlock signal is detected.
		On	The module is initialized and a valid genlock signal is detected.
	Red	Blinking	There is a genlock problem.
		On	A resync is needed.

V4X Modules LEDs

The following table lists the LEDs available on then V4X modules (from left to right):

LED	Color	Status	Function
CPU	Green	Blinking	Indicates CPU activity.
		On	There is a problem with the module processor.
PLAY	Green	On	The module is set in play mode by the software.
		Off	The module is set in record mode.
TF (transfer)	Green	Blinking	Data transfers occur between the module and the H3XP board.
1	—	—	Not used.
2			
3			
4			

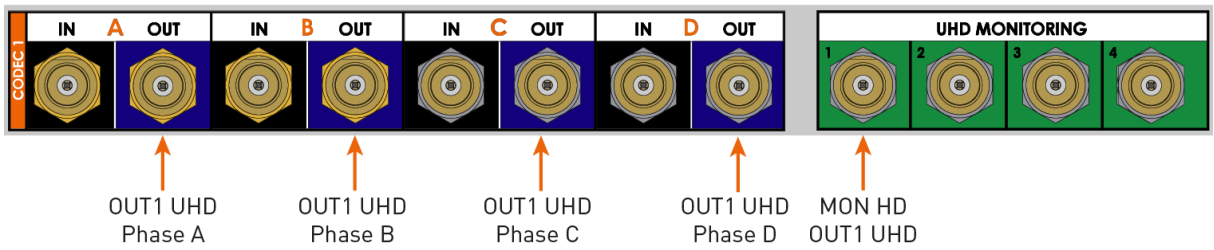
6.3.2. COD Connectivity in 4K

SDI Panels

NOTE

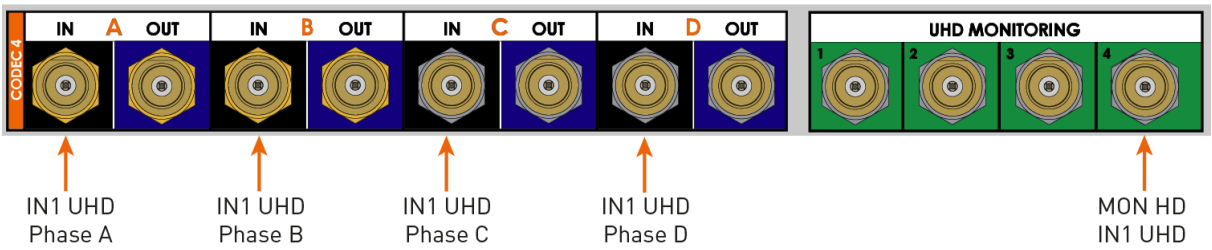
The 12G-SDI connectivity presented below with SDI & IP hybrid panels is also available on SDI panels. See section "SDI & IP Hybrid Panels" on page 65.

OUT Channels



Connector label	UHD 4K in 3G-SDI
OUT 1A	3G-SDI output of the top left frame (square division) or 3G-SDI output of a 1080p frame at 1/4 of 4K resolution (two-sample interleave)
OUT 1B	3G-SDI output of the top right frame (square division) or 3G-SDI output of a 1080p frame at 1/4 of 4K resolution (two-sample interleave)
OUT 1C	3G-SDI output of the bottom left frame (square division) or 3G-SDI output of a 1080p frame at 1/4 of 4K resolution (two-sample interleave)
OUT 1D	3G-SDI output of the bottom right frame (square division) or 3G-SDI output of a 1080p frame at 1/4 of 4K resolution (two-sample interleave)
UHD MON 1	HD (1080p) monitoring of UHD OUT1 The monitoring output results from a mean of the 4 corresponding UHD-4K pixels.

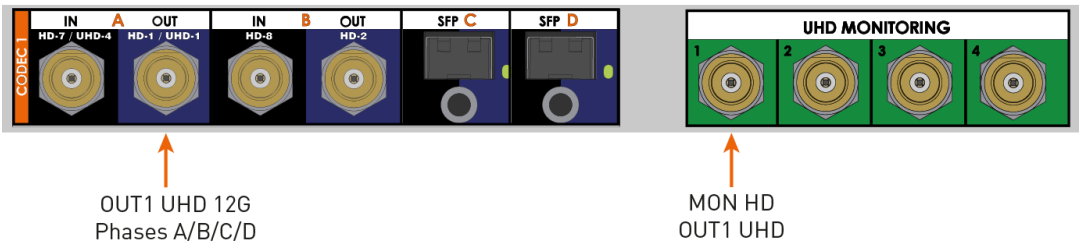
IN Channels



Connector label	UHD 4K 3G-SDI
IN 1A	3G-SDI input of the top left frame (square division) or 3G-SDI input of a 1080p frame at 1/4 of 4K resolution (two-sample interleave)
IN 1B	3G-SDI input of the top right frame (square division) or 3G-SDI input of a 1080p frame at 1/4 of 4K resolution (two-sample interleave)
IN 1C	3G-SDI input of the bottom left frame (square division) or 3G-SDI input of a 1080p frame at 1/4 of 4K resolution (two-sample interleave)
IN 1D	3G-SDI input of the bottom right frame (square division) or 3G-SDI input of a 1080p frame at 1/4 of 4K resolution (two-sample interleave)
UHD MON 1	HD (1080p) monitoring of UHD IN1 The monitoring output results from a mean of the 4 corresponding UHD-4K pixels.

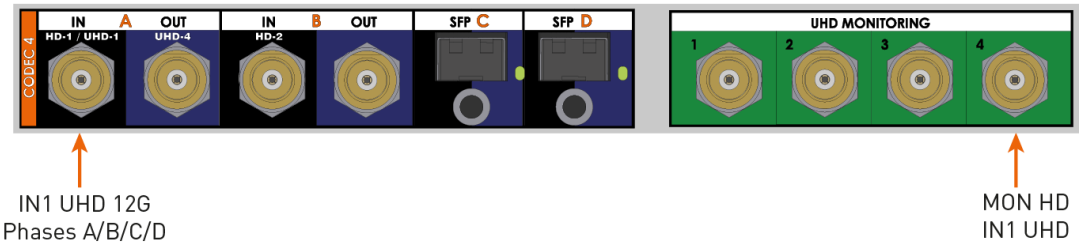
SDI & IP Hybrid Panels

OUT Channels



Connector label	UHD 4K 12G-SDI
OUT 1A	12G-SDI output of the UHD-4K image
UHD MON1	HD (1080p) monitoring of UHD OUT1 The monitoring output results from a mean of the 4 corresponding UHD-4K pixels.

IN Channels



Connector label	UHD 4K 12G-SDI
IN 1A	12G-SDI input of the UHD-4K image
UHD MON1	HD (1080p) monitoring of UHD IN1A The monitoring output results from a mean of the 4 corresponding UHD-4K pixels.

6.3.3. COD Connectivity in HD

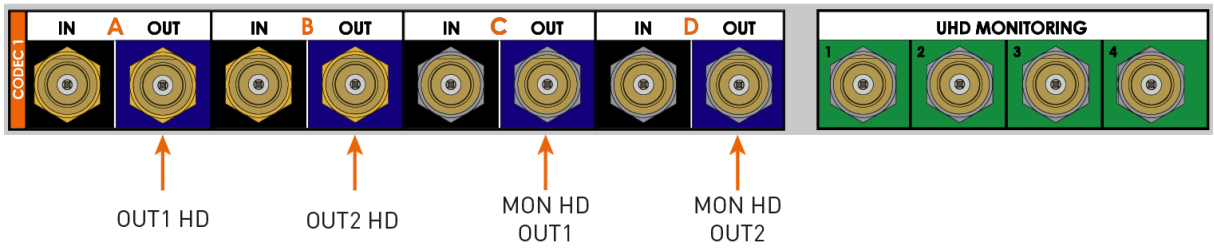
SDI Panels

In a 1st step, the OUT channels are cabled first starting from top to bottom, using only the first two connectors of the codec modules.

In a 2nd step, the IN channels are cabled starting from bottom to top, using the first two connectors of each available codec module.

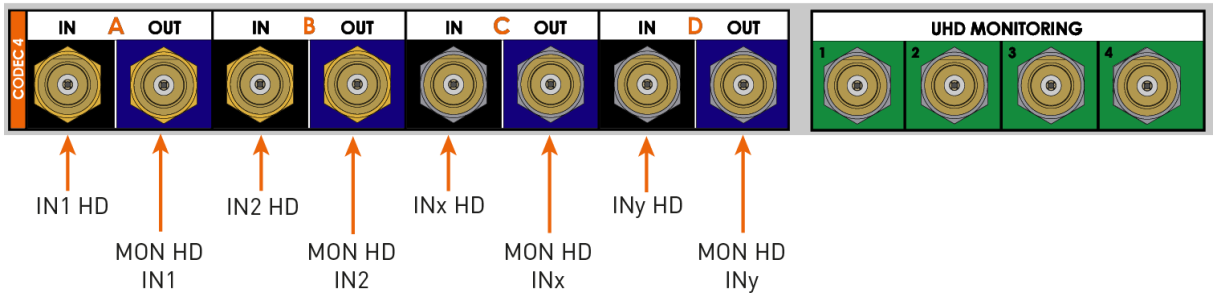
The remaining IN channels can only be cabled on the connectors C and D of the codec modules on which HD IN channels are already cabled.

OUT Channels



Connector label	HD Mode
OUT 1A	SDI output of the OUT1 channel.
OUT 1B	SDI output of the OUT2 channel.
OUT 1C	SDI monitoring output of the OUT1 channel.
OUT 1D	SDI monitoring output of the OUT2 channel.

IN Channels



Connector label	HD Mode
IN 4A	SDI input of the IN1 channel.
IN 4B	SDI input of the IN2 channel.

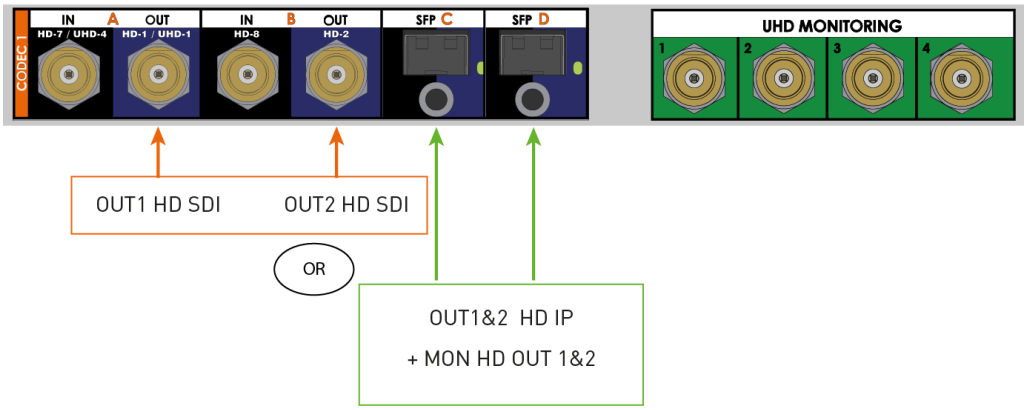
Connector label	HD Mode
IN 4C	SDI input of another IN channel (cabled when all connectors A & B of codec modules used with recorders have been cabled).
IN 4D	SDI input of another IN channel (cabled when all connectors A & B of codec modules used with recorders have been cabled).
OUT 4A	SDI monitoring output of the IN1 channel.
OUT 4B	SDI monitoring output of the IN2 channel.
OUT 4C	SDI monitoring output of the IN channel cabled on IN 4C.
OUT 4D	SDI monitoring output of the IN channel cabled on IN 4D.

SDI & IP Hybrid Panels

On hybrid panels, you can use either the SDI connectors or the IP connectors, but not both connector types concurrently. The cabling principles on hybrid panels are the same as on SDI panels.

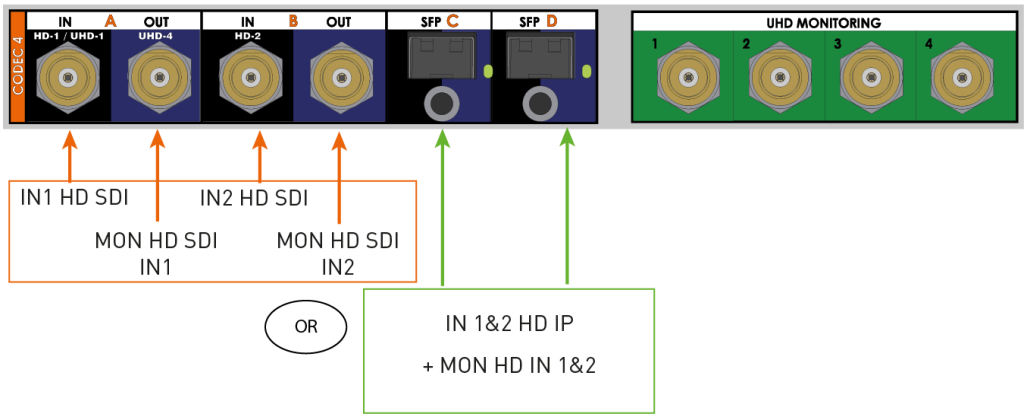
The hybrid panels can accommodate configurations with maximum 8 channels using the 4 codec modules on the SDI or IP interface.

OUT Channels



Connector label	HD Mode
OUT 1A	SDI output of the OUT1 channel (no SDI monitoring).
OUT 1B	SDI output of the OUT2 channel (no SDI monitoring).
OR	
SFP 1C	IP output of the OUT1&2 channels **and** IP monitoring of the OUT1&2 channels
SFP 1D	

IN Channels



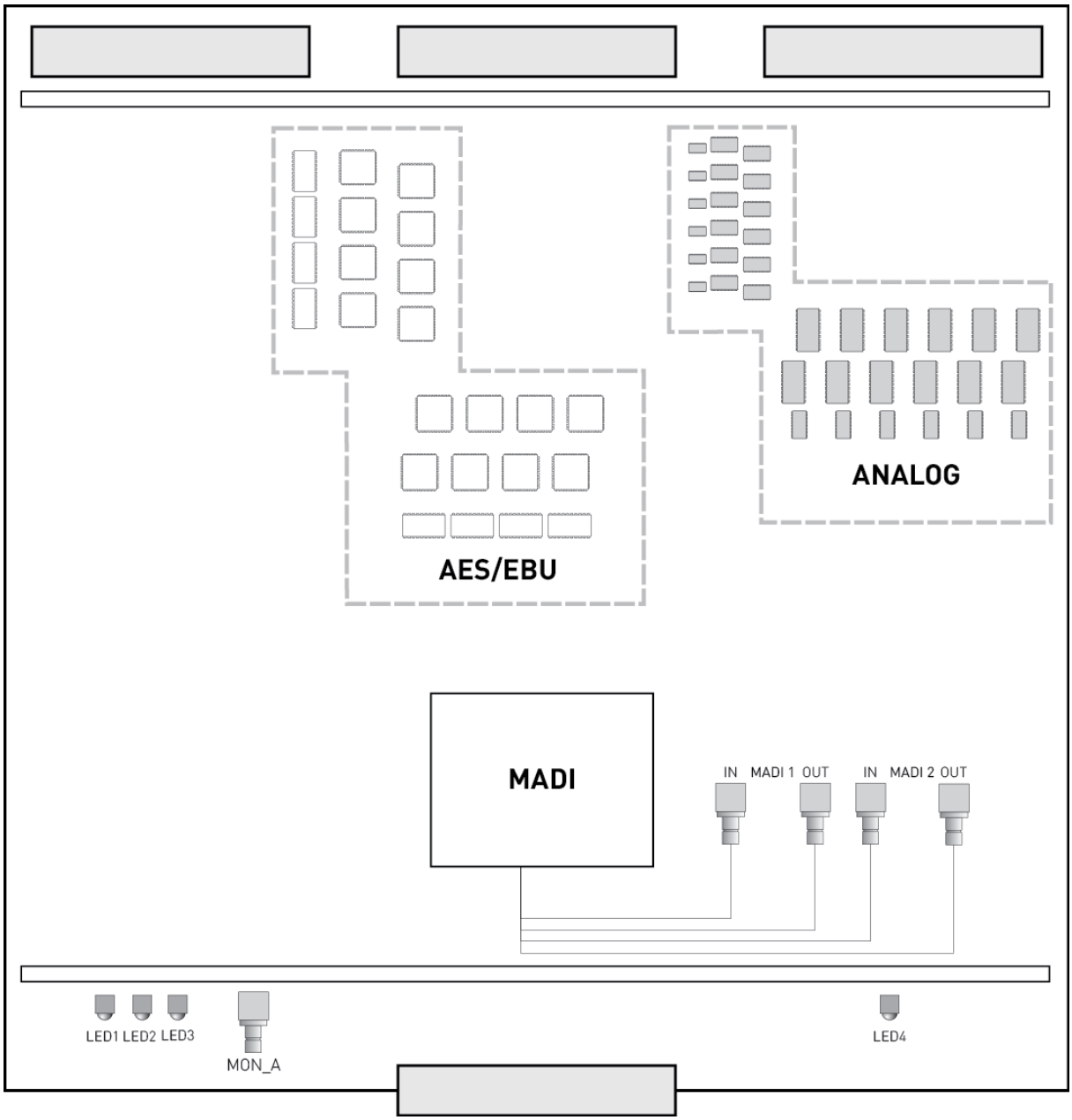
Connector label	HD Mode
IN 4A	SDI input of the IN1 channel.
IN 4B	SDI input of the IN2 channel.
OUT 4A	SDI monitoring output of the IN1 channel.
OUT 4B	SDI monitoring output of the IN2 channel.
OR	
SFP 4C	IP input of the IN1&2 channels **and** IP monitoring of the IN1&2 channels
SFP 4D	

6.4. Audio Codec Board

The audio codec board (A3X) is the audio interface between the V4X boards and the H3XP board. Video codec and audio codec boards are tied to the H3XP board with one bus connector on the front side. Different audio configurations are available with the audio codec board. See section "Audio Connections" on page 40 for details.

The following LEDs are available on the audio codec board:

- LED 1-3: internal EVS information only.
- LED 4: transfer activity to/from the H3XP board.

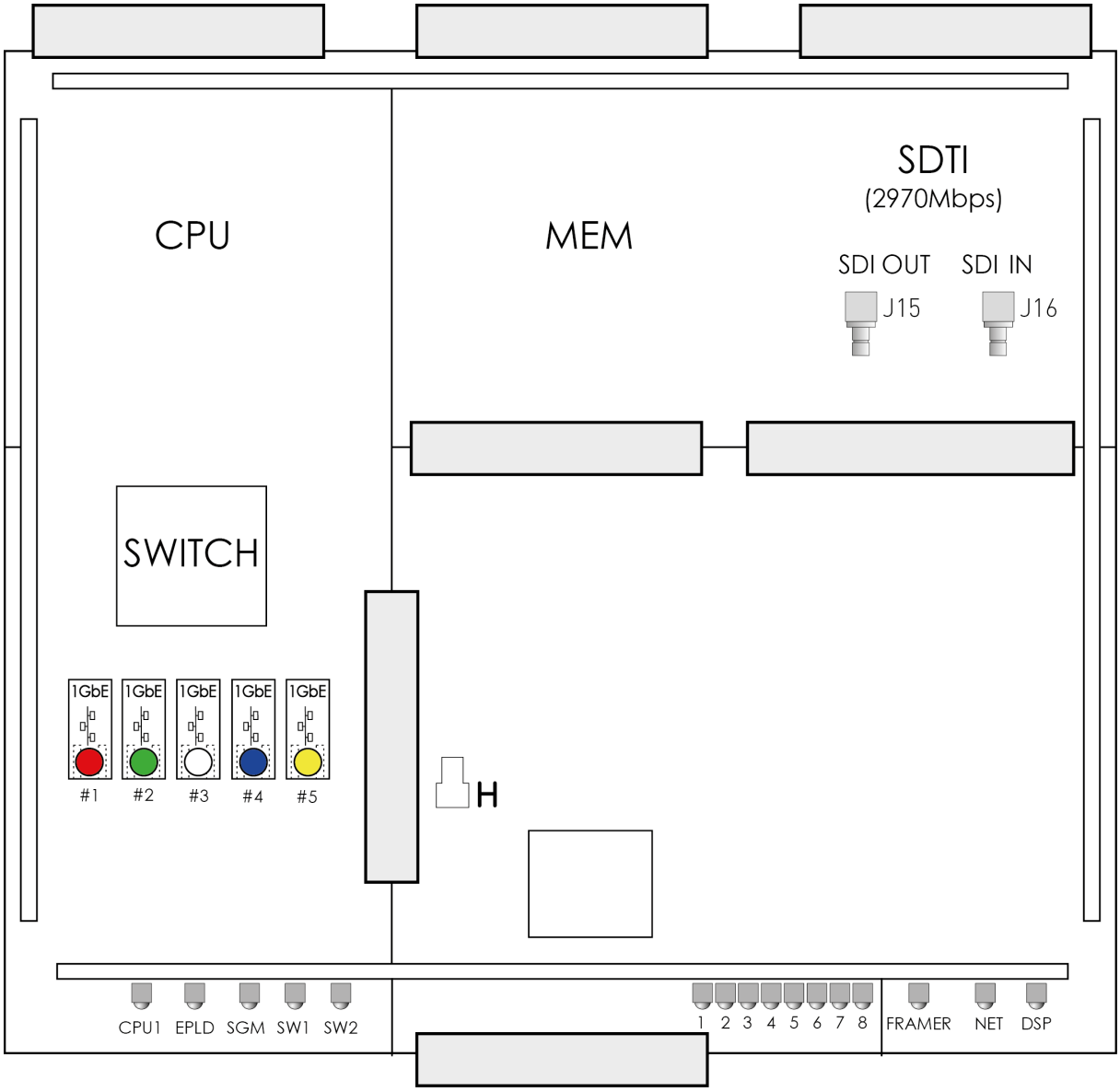


6.5. Controller Boards

6.5.1. H3XP-S Board

The H3XP-S board is divided in 5 parts:

- Back left: CPU module.
- Back center: MEM module.
- Back right: SDTI module.
- Front left: Internal switch module
- Front right: Connectivity to V4X base board



LEDs Function

The available LEDs linked to the CPU module are, from left to right:

LED	Color	Status	Function
CPU1 EPLD	Green	Blinking	These LEDs blink to indicate that the processor is running.
Other LEDs	—	—	For EVS internal use only.

The available LEDs linked to the SDTI controller module are, from left to right:

LED	Color	Status	Function
LED 1	Green	On	Ok.
	Red	On	An error occurred while booting the H3XP board.
LED 2 to LED 8	—	—	For EVS internal use only.
FRAMER	Green	On	The signal on the XNet2 IN connector is a valid EVS SDTI signal.
NET	Green	On	The XNet2 SDTI network is established (SDTI loop closed, correct speed, etc).
DSP	Green	Blinking	Indicates DSP activity (audio processing).

Connectors

The following connectors are available on the XNet2 (SDTI) module:

J15	OUT connector for XNet2 (SDTI network 2970 Mbps without relay).
J16	IN connector for XNet2 (SDTI network 2970 Mbps without relay).

Switch Cabling

The internal switch module provides a more efficient communication between the H3XP board on one hand, and the MTPC board and MV4 board on the other hand.

The internal switch relies on the internal LAN, an IP-based network inside the EVS server.

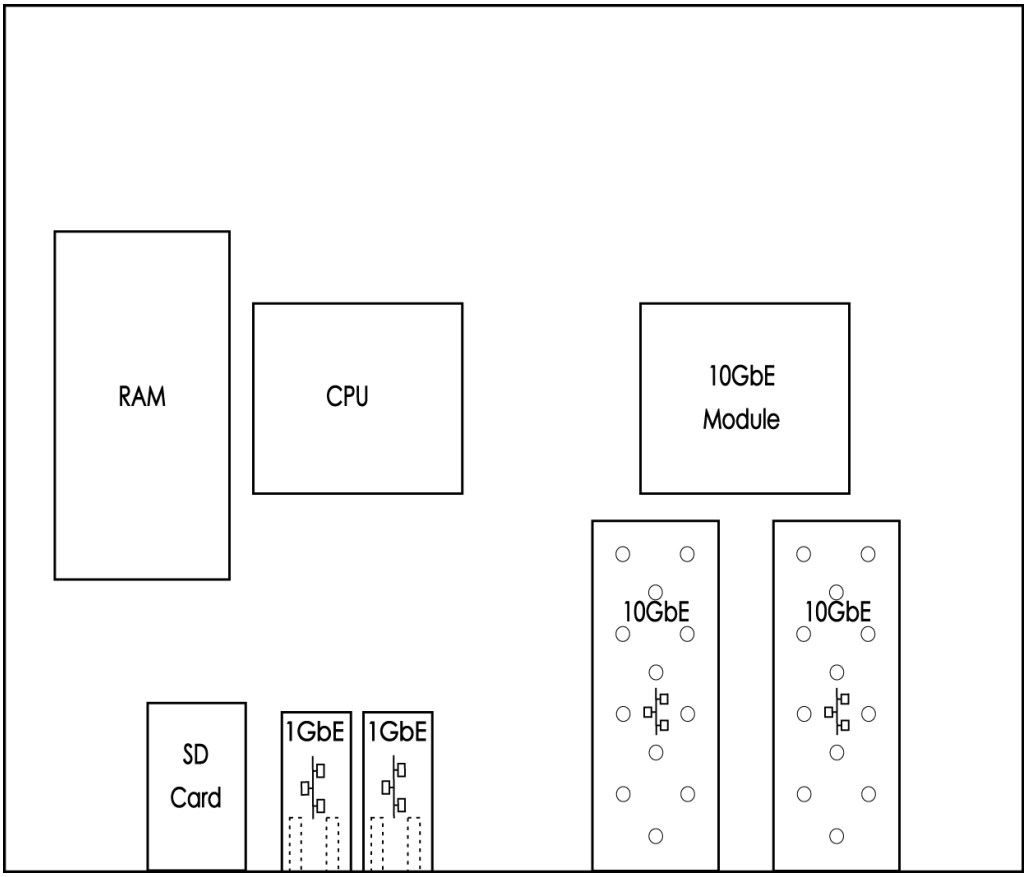
The following connectors are available on the internal switch module and need to be cabled as described below:

Connector	Cable Color	Connection
#1	Red	Connection to the HS873 motherboard on the MTPC board
#2	Green	Connection to the MV4 module (multiviewer) on the MTPC board
#3	White	Connection to the EVS LNK connector on the rear panel (not currently used)
#4	Blue	Connection to the PCLAN 1 connector on the rear panel
#5	Yellow	Connection to the PCLAN 2 connector on the rear panel

6.6. GbE Board

Schema

The following schema shows the 10GbE board and its main components on an XT4K server:



Connectors

The SD card is connected to a slot on the 10GbE module of the EVS server backplane.

The two 1GbE connectors are connected to the two backplane 1GbE ports.

The two 10GbE connectors are connected to the two backplane 10GbE ports.

The Gigabit connectors must be on a network that supports Jumbo Frames of (at least) 9014 bytes Ethernet frames. See section "Switches" on page 51 for the list of supported switches.

You can set up the GbE IP addresses in the Multicam Configuration window, in the Network tab, Gigabit Ethernet section. See the Configuration manual for more information.

SFP+ Modules

The following 10 GbE SFP+ modules are compatible with the 10GbE connectors of the GbE board:

- Intel® Ethernet SFP+ SR Optic (E10GSFPSR)
- Intel® Ethernet SFP+ LR Optic (E10GSFPLR)

6.7. RAID Controller Boards

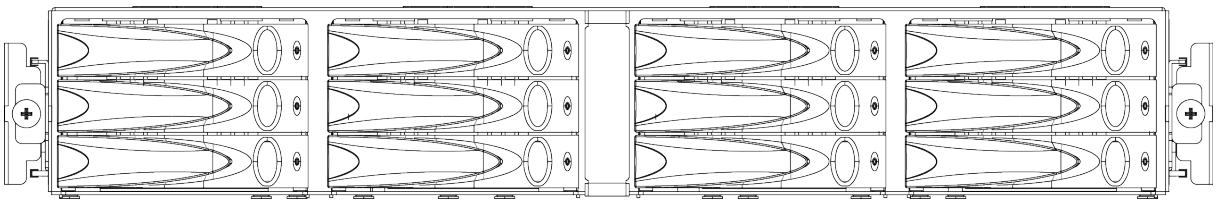
6.7.1. RSAS Board with SAS Disk Array

Disk Arrays on systems with H3XP-S boards have a controller on the disk array board.

The following disk configurations are possible:

- One internal array with one or two series of 6 hot-swappable disks (mounted in two or four stacked series of 3 disks)
- No internal storage

Hot-Swappable Disk Array



An array of six hot-swappable SAS disks consists of two stacked series of three disks, mounted from left to right.

An array of 12 hot-swappable SAS disks consists of four stacked series of three disks, mounted from left to right.

It is connected to the server via a dedicated SAS cable on the rear panel of the server, provided that the X-ESAS connection module has been placed inside the server.

LEDs Status and Function

For each disk, a blue LED and a red LED are present behind a single light display:

Status		Function
Blue LED	**Red LED**	
Off	On (steady)	Defect drive – must be replaced.
Blinking	Off	Connected, disk being written to / read from.
On (steady)	Off	Connected, disk not currently written to / read from.
On (steady)	On, slowly blinking	Spare disk - the corresponding disk is started and used in the RAID array. Blue and red blinking light makes the LED look purple.
Off	Off	The corresponding disk is not present.

6.7.2. External RAID Array SAS-HDX

The SAS-HDX is a 2U external disk storage containing up to 24 hot-swappable SAS disks, with a minimum of 5 disks. External storage can be used with or without internal storage.

It is connected to the server via a dedicated SAS cable on the rear panel of the server, provided that the X-ESAS connection module has been placed inside the server.

Necessary equipment:

- Server with SAS-HDX connector on the rear panel.
- Multicam version 10.05 or higher
- SAS-HDX external disk storage

LEDs on the External Array

For each disk, a blue LED and a red LED are present behind a single light display:

Status		Function
Blue LED	**Red LED**	
Off	On (steady)	Defect drive – must be replaced.
Blinking	Off	Connected, disk being written to / read from.
On (steady)	Off	Connected, disk not currently written to / read from.
On (steady)	On, slowly blinking	Spare disk - the corresponding disk is started and used in the RAID array. Blue and red blinking light makes the LED look purple.
Off	Off	The corresponding disk is not present.

NOTE

When starting from a clean disk array (after a “Clear Video Disks” from the EVS maintenance menu), the server is recording first on RAID #0 until this one is full, then on RAID #1 and finally on RAID #2. It is therefore normal to see activity only on some disks depending on how much material (clips and record trains) is stored on the server.

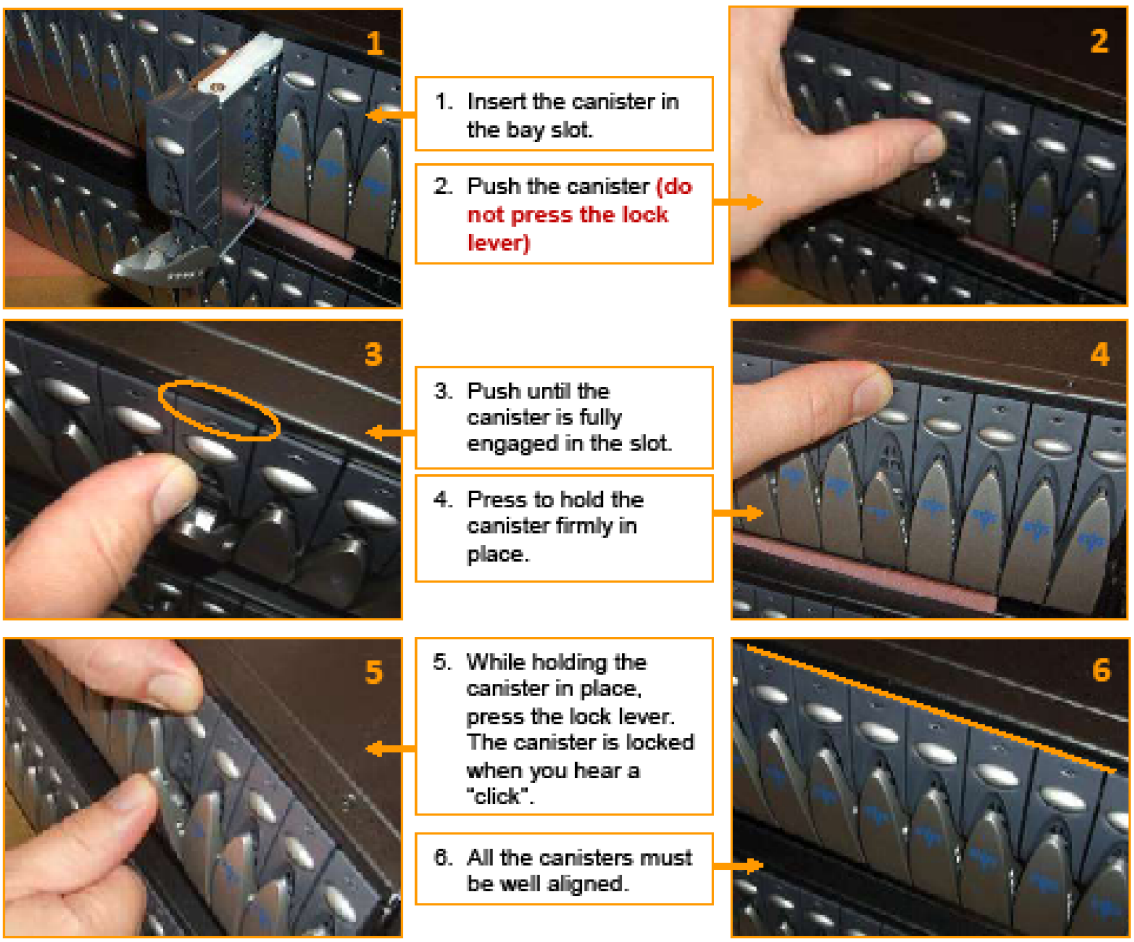
Sound Alert on External Array

When a fan or a power supply unit fails on an external array, a sound alert is given and can be stopped by pressing the Mute button on the array.

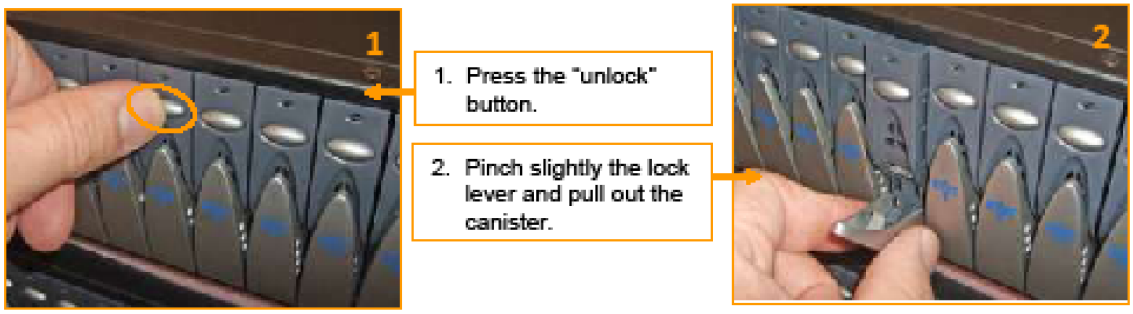
Disk Insertion and Removal

To insert or remove a disk from an external array, carefully follow these steps:

1. **How to insert**



2. **How to remove**



6.8. MTPC Board

Introduction

The function of the PC board is mainly the control of the video hardware and the interface of the peripheral equipment (such as a remote controller) with the video hardware.

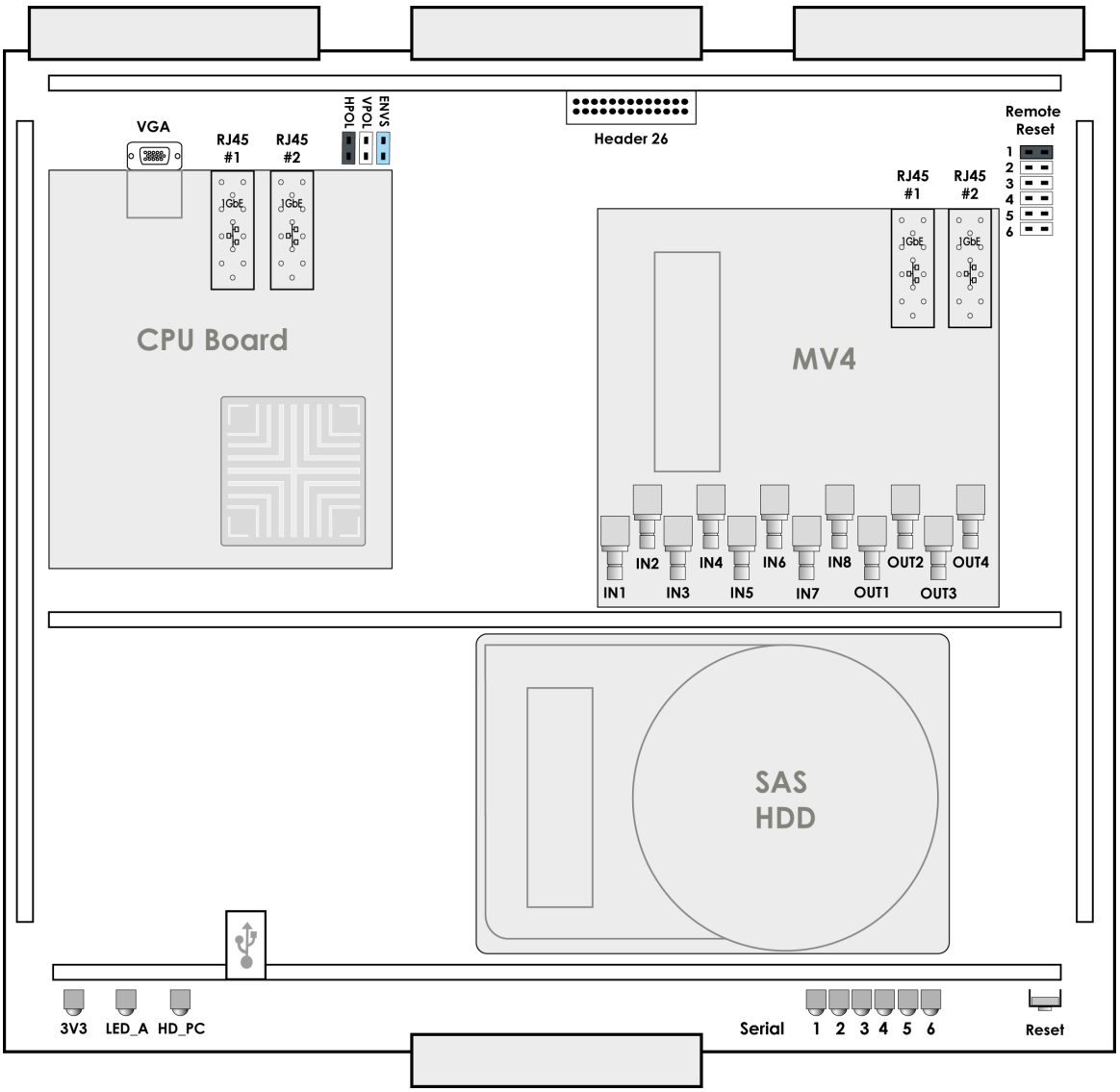
The following MTPC board is used:

- Revision A3/A6 with COMMEL HS873 motherboard and a new time code management module (with bootable USB).

In standard configuration the PC hardware is composed of:

- One mounting PC board, with serial ports, LTC reader and generator, is controlled by the motherboard.
- SAS System Hard disk: the SAS disk drive is used for storing the EVS software and the operating system. Neither audio nor video data is saved on this disk. The capacity of this drive may vary depending on market availability, but two system partitions are defined:
  - one system partition of 2GB for Multicam versions up to 14.XX
  - one system partition of the remaining disk capacity for Multicam versions from 15.00.
- 1GB SDRAM (or higher) to suit the system requirements from Multicam 15.00. Please contact EVS support for RAMs upgrade. Do not use standard PC RAM modules.

Illustration



MV4

The connectors on the MV4 board are described from top to down, and from left to right.

Connectors	Function
GbE #1 (left)	The GbE #1 connector (RJ45) is not used.
GbE #2 (right)	The GbE #2 connector (RJ45) is connected to the green cable coming from the GbE #2 connector on the H3XP board.
IN 1-6	The connectors IN1 to IN6 of the MV4 board are connected to the J2 connectors from the CODEC modules of the V4X board.
IN7-8	The connectors IN7 and IN8 of the MV4 board are connected to the Multiviewer I1 and I2 connectors on the rear panel of the server.
OUT1-4	The OUT1 connector of the MV4 board is connected to the Multiviewer O1 connector on the rear panel of the server, and so on for the other connectors.

CPU (HS873)

Connectors	Function
VGA	The VGA connector is connected to the VGA connector on the rear panel.
GbE #1 (left)	The GbE #1 connector (RJ45) is connected to the red cable coming from the GbE #1 connector on the H3XP board.
GbE #2 (right)	The GbE #2 connector (RJ45) is not used.

LED Information

Internal EVS information.

Board Configuration

HPOL, VPOL and ENVS are used to configure the composite sync generator used in LSM TV mode (no effect if the server is only used with a VGA monitor).

The HPOL jumper can be used to invert or not the VGA HS signal (Horizontal Sync) to generate the composite output signal (TV mode).

The VPOL jumper can be used to invert or not the VGA VS signal (Vertical Sync) to generate the composite output signal (TV mode).

The ENVS jumper can be used to enable or not the presence of the VGA VS signal (Vertical Sync) in the composite output signal (TV mode).

If the LSM TV mode is used, these jumpers must be set up according to EVS recommendations, which depend on software version and CPU board model/revision:

Set up the jumpers as follows:

- HPOL=On; VPOL=Off; ENVS=On

REMOTE RESET jumpers are available to designate the remote(s) from which the RESET command can be sent.

This command resets the whole system: PC and video hardware.

In standard configuration only Remote one (on RS422 port 1) is allowed to reset the system.

WARNING

This jumper should be removed if the device connected to the RS422 port is NOT an EVS controller. Maximum voltage on pin 5 of an RS422 port of the server should not exceed 5 Volt when the corresponding jumper is engaged. Applying a higher voltage on pin 5 when the corresponding jumper is engaged will result in permanent electronic damage to the board.

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