HARDWARE TECHNICAL REFERENCE MANUAL

Version 14.02 - March 2016

XT3

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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 14.02 are listed below:

MADI connectors available by default

- See section "Audio Specifications" on page 15
- See section "Analog and Digital Audio " on page 50 (6U)
- See section "Analog and Digital Audio " on page 55 (4U)

Single hardware configuration for codec boards

- See section "Rear Panel Configurations" on page 48
- See section "Video and Codecs " on page 49 (6U)
- See section "Video and Codecs " on page 54 (4U)
- See section "Boards and Slots Configuration" on page 80

New MV4 module for the multiviewer

- See section "Controls and Communications " on page 52 (6U)
- See section "Controls and Communications " on page 56 (4U)
- See section "MTPC Board" on page 107

New internal switch

- See section "H3XP Board" on page 98 (6U)

1. Overview

1.1. Presentation

Welcome to the EVS range of products and thank you for using an EVS XT3 server. We will do our best to satisfy your video production needs and we look forward to continuing working with you.

The EVS XT3 servers are full digital in PAL (625i), NTSC (525i), 720p, 1080i, and 1080p standards. These multi-channel, disk-based video servers are ideal for a wide range of broadcast applications, from sports and live production to playout and transmission.

XT3 servers are available in 4U chassis (4 codec modules) or 6U chassis (6 codec modules).

The XT3 servers offer flexible configurations up to 12 channels SD/HD, and optionally 3D or 1080p.

XT3 servers work with SAS disks: they are equipped with internal SAS disk array and/or can be connected to a SAS-HDX external SAS disk array.

They can be used with various third-party controllers, applications, and automation systems using industry-standard protocols such as Sony BVW75, VDCP, Odetics, DD35, IPDP, or EVS AVSP, EditRec, LinX API.

They natively support a wide range of HD Intra codecs, such as Mjpeg, VC-3, Avid DNxHD®, Apple ProRes®, Mpeg-2 Intra, Panasonic DVCPRO HD, AVC-Intra Class 100, XAVC-Intra HD, as well as SD Intra codecs.

They can be operated in multi-essence configurations where the ingested material is directly and simultaneously available in one of the following supported combinations: Intra + LongGOP (XDCAM), Intra + Proxy (Mjpeg), LongGOP + Proxy, as well as in Intra only, or LongGOP only.

XT3 servers can also be controlled by EVS applications, among others:

Live Slow Motion (LSM): for sports production, including replays, highlights editing, and analysis tools like Split Screen to compare 2 synchronized actions side by side, Target Tracking and Painting to highlight a particular detail or provide tactical explanations.

IPDirector: a suite of Windows software applications designed to manage networked EVS video servers. Its applications make it possible to control multiple channels within the XNet2 network, as well as to log an event, to create and manage clips and play-lists with advanced functions, among others to extract clips from a VTR. It also provides extensive database search features.

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.

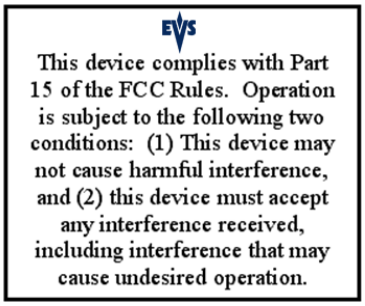
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

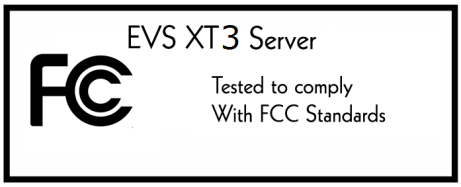
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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 4U Main Frame

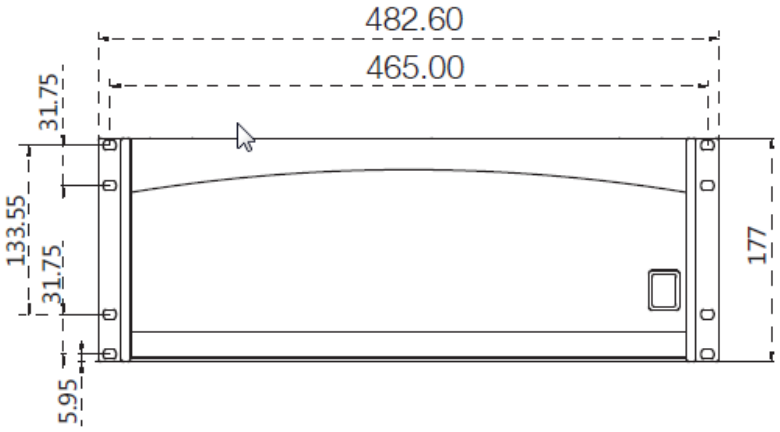
Weight

4U - 19 inches chassis with 6 HDD on RSAS board: 31 kg / 68.3 lb.

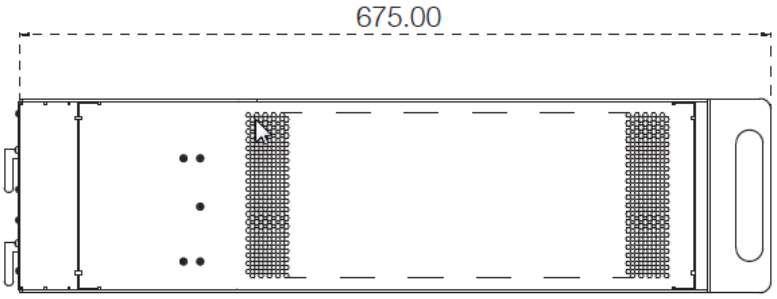
Dimensions

The following drawings provide the various dimensions, in mm, of the XT3 server with a 4U chassis.

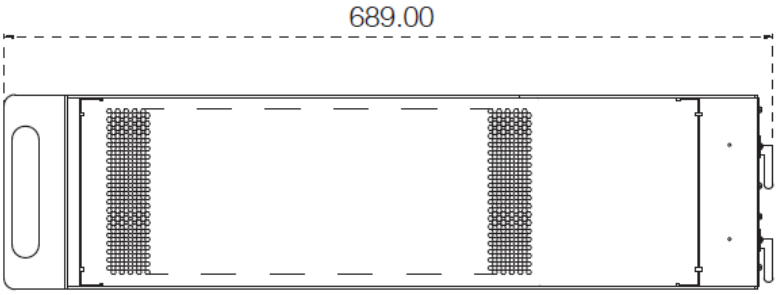
Front View



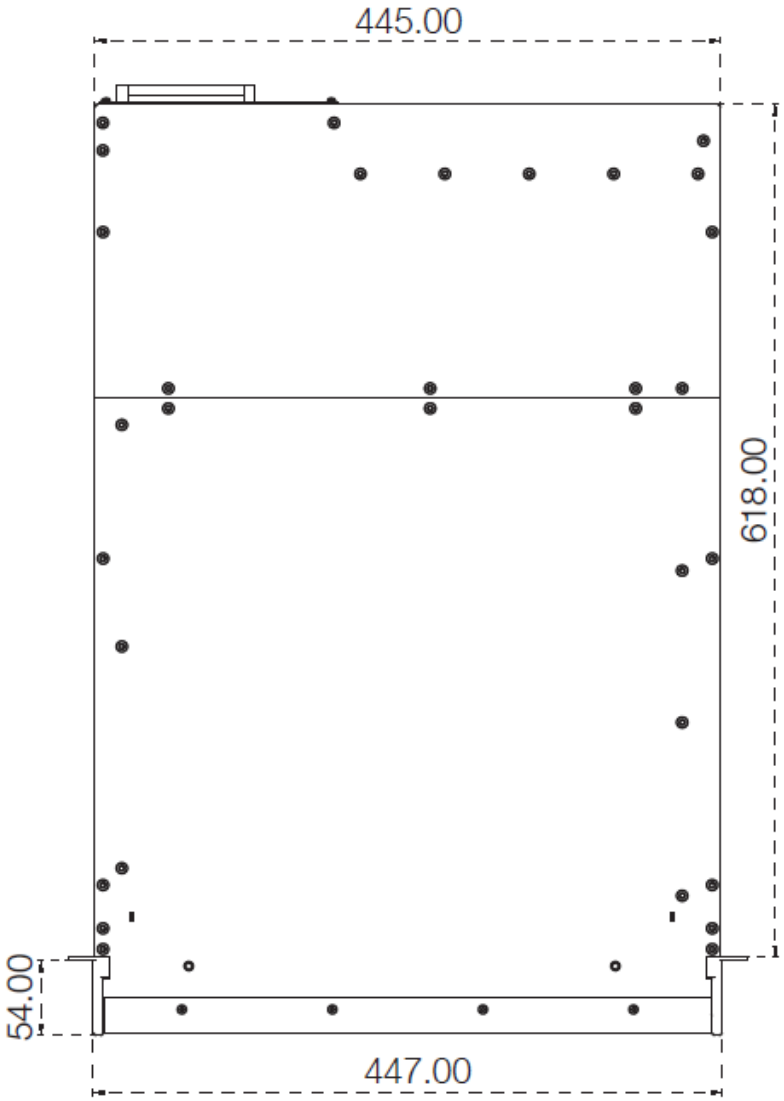
Left View



Right View



Back View



3.1.2. Rack Mount 6U Main Frame

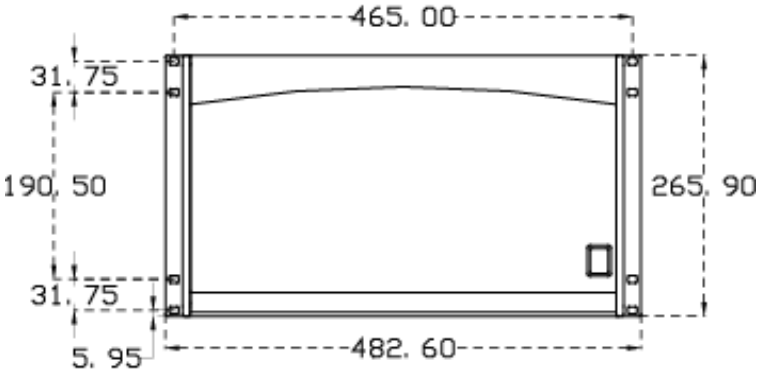
Weight

Disk Configuration	Weight
6U - 19 inches chassis with 6 HDD on RSAS board (fix mounted)	35 kg / 77.2 lb
6U - 19 inches chassis with 12 HDD on RSAS board (fix mounted)	37 kg / 81.6 lb
6U - 19 inches chassis with 6 HDD on hot swap rack	37 kg / 81.6 lb
6U - 19 inches chassis with 12 HDD on hot swap rack	39 kg / 86.0 lb

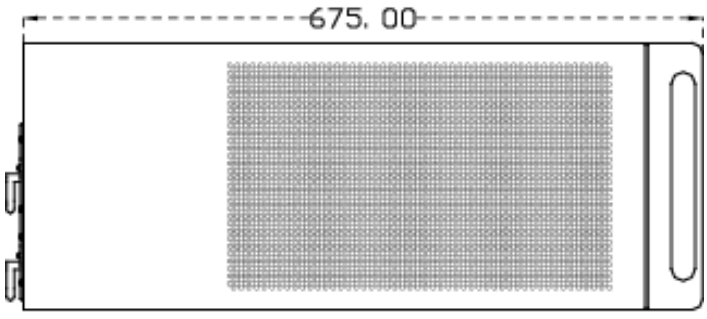
Dimensions

The following drawings provide the various dimensions, in mm, of the XT3 server with a 6U chassis.

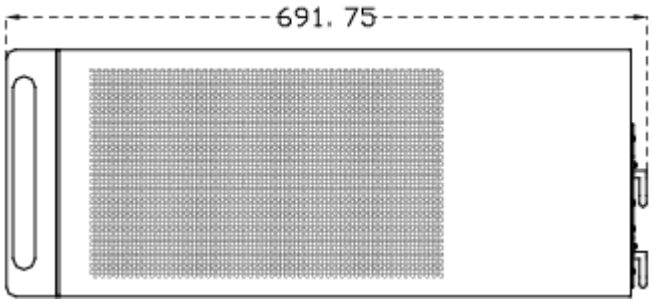
Front view



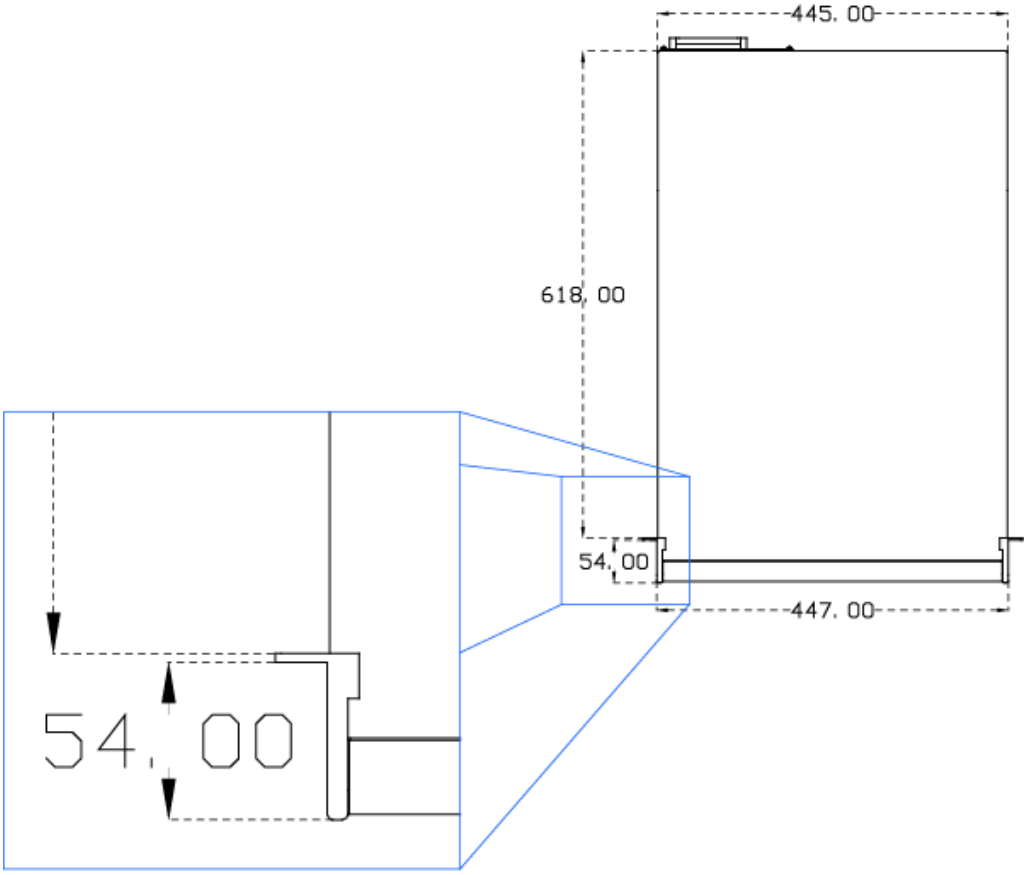
Left view



Right view

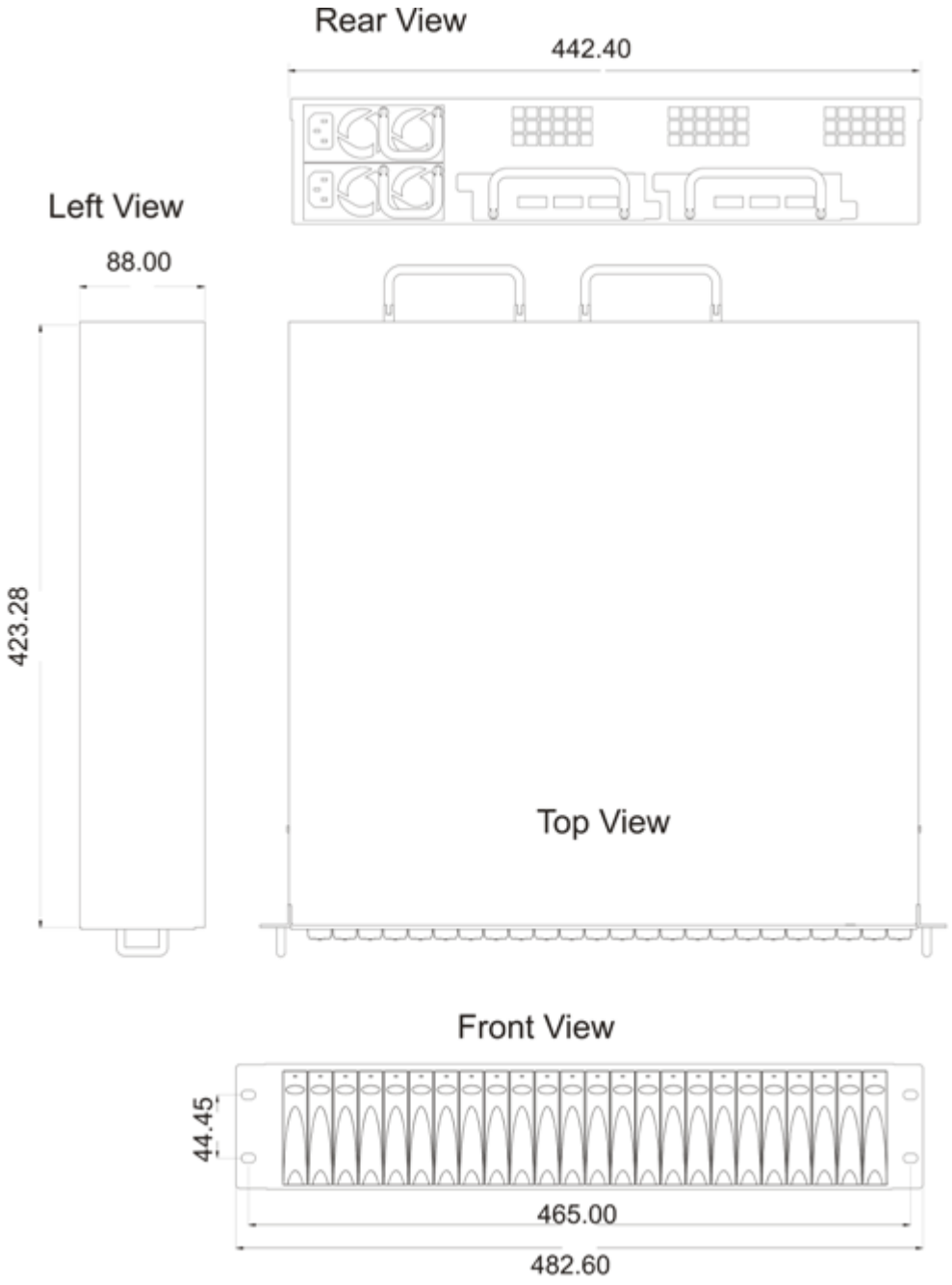


Top view



3.1.3. SAS-HDX Unit

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



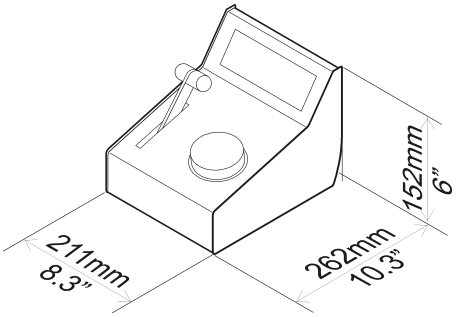
For more information on the SAS-HDX, refer to "External RAID Array SAS-HDX" on page 104.

3.1.4. Control Devices

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

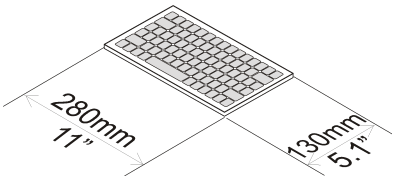
LSM Remote Control Panel

Weight: 2.9 kg / 6.3 lb.



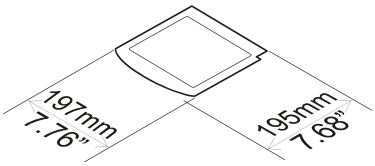
Keyboard

Weight: 0.4 kg / 0.9 lb.



Tablet

Weight: 0.3 kg / 0.66 lb. (Ref: Wacom® CTF-430 Bamboo One)



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 XT3 6U 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 both in SD and in HD format for your XT3 server.

	Standard Definition	High Definition
Video Formats	525i 29.97fps (NTSC) 625i 25fps (PAL)	720p 50/59.94fps 1080i 50/59.94fps 1080p 50/59.94fps (Dual Link or 3G)
Digital Interface	10-bit 4:2:2 Serial (ST 259:2008). Full frame synchronizer at input. Dual output for PLAY channels.	10-bit 4:2:2 Serial (ST 292-1:2011). Full frame synchronizer at input. Dual output for PLAY channels.
Number of Channels	2, 4, 6, 8* or 12* channels, reversible REC/PLAY	2, 4, 6, 8* or 12* channels, reversible REC/PLAY
Monitoring & Down-converters	1 CVBS per channel, with OSD 1 SD SDI per channel, with OSD	1 built-in down-converter per channel, CVBS output with OSD 1 HD SDI output per channel, with OSD Additional clean SD SDI output
Reference	Analog Black Burst	Analog Black Burst and HD Tri-Level Sync
Graphics Board	n.a.	n.a.

* From a hardware point of view, six codec modules remain available on the backplane (on large chassis). However, it is possible to increase the number of connected record channels by connecting distinct recorders or players to the primary **and** the secondary connectors of a codec module.

Such configurations, available with the XREC license code (30), Channels Max license code (34) or Channels Max Spotbox license code (35), 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
SD SDI	ST 259:2008 (525i 59.94 Hz; 625i 50 Hz)
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
Vertical Ancillary Data	ST 334:2000
VC-3	ST 2019-1:2008
IMX D-10	ST 356:2001
Dual Link 1.5 Gb/s	ST 372:2011
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

4.2. Audio Specifications

Audio Analog and Digital Configurations

4U Server

The following audio configurations are delivered:

- **Configuration DA-15 AES/EBU:**
  - 16 input and 16 output (8 pairs + 8 pairs) AES/EBU or Dolby E on 4 DA-15 connectors
- **Configuration BNC MADI + DA-15 Analog:**
  - 128 input and 128 output (2x64 in and 2x64 out) MADI on 4 BNC connectors
  - 4 input and 4 output analog balanced channels on 2 DA-15 connectors

NEW ! 6U Server

The following optional audio configurations are available:

- **Configuration BNC MADI + BNC AES/EBU + DA-15 Analog:**
  - 128 input and 128 output (2x64 in and 2x64 out) MADI on 4 BNC connectors
  - 16 input and 16 output (8 pairs + 8 pairs) AES/EBU or Dolby E unbalanced on 16 BNC connectors
  - 4 or 8 input and 4 or 8 output analog balanced channels on 2 or 4 DA-15 connectors
- **Configuration BNC MADI + DA-15 AES/EBU + DA-15 Analog:**
  - 128 input and 128 output (2x64 in and 2x64 out) MADI on 4 BNC connectors
  - 16 input and 16 output (8 pairs + 8 pairs) AES/EBU or Dolby E on 4 DA-15 connectors
  - 4 or 8 input and 4 or 8 output analog balanced channels on 2 or 4 DA-15 connectors

Additional Audio Specifications

- 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 Audio Channels

The 4U servers provide the following maximum number of embedded or MADI audio mono channels per video channel with intra codecs:

Configuration Mode	Embedded	MADI
4-channel configurations	4*16 audio mono (= 64 tracks)	4*32 audio mono (= 128 tracks)
XRec configurations	7*16 audio mono (= 112 tracks)	7*16 audio mono (= 112 tracks)
ChannelMax configurations	8*16 audio mono (= 128 tracks)	8*16 audio mono (= 128 tracks)

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

Configuration Mode	Embedded	MADI
6-channel configurations	6*16 audio mono (= 96 tracks)	6*32 audio mono (= 192 tracks)
XRec configurations	8*16 audio mono (= 128 tracks)	8*16 audio mono (= 128 tracks)
ChannelMax configurations	12*16 mono (=192 tracks)	12*16 mono (=192 tracks)
UHD-4K	3*16 audio mono	3*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 XT3 server supports natively the video codecs presented in the table below when the required license code is valid.

The codecs corresponding to license codes 10 to 12 are installed by default on the XT3 server.

Codec	SD	HD	Code Protection
IMX	√	-	Code 11
Mjpeg SD	√	-	Code 10
DVCPro 50	√	-	Code 9
Mjpeg Standard HD **Mjpeg EVS HD**	-	√	Code 10
Mpeg-2 Intra	-	√	Code 12
Avid DNxHD®	-	√	Code 5
Apple ProRes 422	-	√	Code 6
DVCPro HD	-	√	Code 8
AVC-Intra **XAVC-Intra HD**	-	√	Code 13
XDCAM (LongGOP)	-	√	Code 14

Target Bitrate Range and Default Values

The target bitrate of the encoded video stream can be set by the user within the accepted range: 8 to 100 Mbps for standard definition, 40 to 250 Mbps for high definition with the exception of Apple ProRes, Avid DNxHD® and DVCPro codecs working with defined bitrates.

The default values are Mjpeg 30 Mbps for standard definition and Mjpeg 100 Mbps for high definition.

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:

Codec	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
DVCPro HD	8-bit
Mjpeg	8-bit
Mpeg-2 Intra	8-bit
AVC-Intra	10-bit
XAVC-Intra HD	10-bit
XDCAM HD 50	8-bit

4.3.2. Maximum Bitrates

These maximum values are valid for XT3 servers running Multicam version 12.02 or higher. They guarantee a smooth play and a browse at 100% speed on all channels simultaneously.

Codec	Format	2 ch	4 ch	4ch (3D)	4ch (3D SLSM 3x)	6 ch	8 ch	6ch* (1080p)
SD Mjpeg	PAL	100	100	N/A	N/A	100	100	N/A
	NTSC	100	100	N/A	N/A	100	100	N/A
HD Mjpeg	PAL	225	225	180	100	180	180	N/A
	NTSC	250	250	180	100	180	180	N/A
HD Mpeg-2 Intra	PAL	225	225	180	N/A	180	180	N/A
	NTSC	250	250	180	N/A	180	180	N/A
Avid DNxHD®	PAL	185	185	185	100	185	185	367
	NTSC	220	220	220	100	220	220	403
Apple ProRes 422	PAL	185	185	185	85	185	185	367
	NTSC	220	220	220	102	220	220	293
DVCPro 50	PAL	50	50	N/A	N/A	50	50	N/A
	NTSC	50	50	N/A	N/A	50	50	N/A
DVCPro HD	PAL	100	100	100	N/A	100	100	N/A
	NTSC	100	100	100	N/A	100	100	N/A
AVC-Intra 100	PAL	111	111	110	N/A	111	111	222
	NTSC	111	111	110	N/A	111	111	222
XAVC-Intra HD	PAL	111	111	110	N/A	111	111	222
	NTSC	111	111	110	N/A	111	111	222
XDCAM 50 (LongGOP)	PAL	50	50	50	N/A	50	50	N/A
	NTSC	50	50	50	N/A	50	50	N/A

* This value can be achieved with internal SAS HDD disks with revision 10K.5.

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 track, in 1080i.
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 XT3 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 300 GB (10K5) configured in 4+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
XDCAM HD	50.00	50	61	6.5	61
Apple ProRes 422 LT	50.00	85	35	11.4	35
HD Mjpeg Standard	50.00	100	12	33.3	12
HD Mpeg-2 Intra	50.00	100	12	33.3	12
DVCPro HD	50.00	100	31	12.9	31
AVC-Intra 100	50.00	111	30	13.3	30
XAVC-Intra HD	50.00	111	30	13.3	30
Avid DNxHD® 120	50.00	120	27	14.8	27
Apple ProRes 422 SQ	50.00	120	24	16.6	24
Avid DNxHD® 185	50.00	185	18	22.2	18
Apple ProRes 422 HQ	50.00	185	16	25.0	16

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	12	34.3	11.6
HD Mjpeg Standard	150.00	100	4	100.0	4.0
HD Mpeg-2 Intra	150.00	100	4	100.0	4.0
DVCPro HD	150.00	100	10	38.7	10.3
AVC-Intra 100	150.00	111	10	40.0	10.0
XAVC-Intra HD	150.00	111	10	40.0	10.0
Avid DNxHD® 120	150.00	120	9	44.4	9.0
Apple ProRes 422 SQ	150.00	120	8	50.0	8.0
Avid DNxHD® 185	150.00	185	6	66.6	6.0
Apple ProRes 422 HQ	150.00	185	5	75.0	5.3

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
XDCAM HD	59.94	50	74	6.4	61.7
Apple ProRes 422 LT	59.94	85	35	13.7	29.2
HD Mjpeg Standard	59.94	100	14	34.2	11.6
HD Mpeg-2 Intra	59.94	100	14	34.2	11.6
DVCPro HD	59.94	100	35	13.7	29.7
AVC-Intra 100	59.94	111	36	13.3	30.3
XAVC-Intra HD	59.94	111	36	13.3	30.3
Avid DNxHD® 145	59.94	145	27	17.7	22.5
Apple ProRes 422 SQ	59.94	145	24	20.0	20.0
Avid DNxHD® 220	59.94	220	18	26.6	15.0
Apple ProRes 422 HQ	59.94	220	16	30.0	13.3

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	12	41.1	9.7
HD Mjpeg Standard	179.82	100	5	102.7	3.9
HD Mpeg-2 Intra	179.82	100	5	102.7	3.9
DVCPro HD	179.82	100	12	41.1	9.7
AVC-Intra 100	179.82	111	12	40.0	10.0
XAVC-Intra HD	179.82	111	12	40.0	10.0
Avid DNxHD®	179.82	145	9	53.3	7.5
Apple ProRes 422 SQ	179.82	145	8	60.0	6.6
Avid DNxHD®	179.82	220	6	80.0	5.0
Apple ProRes 422 HQ	179.82	220	5	90.0	4.4

Real-Time Channel Calculation

Rule

The maximum server bandwidth depends on the disks. Based on the assumption that Seagate disks of 300 GB (10K5) 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)
```

For a multi-essence configuration, a similar calculation is used, and the results cannot exceed the maximum server bandwidth:

```
    (nbr of standard channels x their block-based bandwidth)
    + (nbr of XDCAM channels x their block-based bandwidth)
    /(nbr of Lo-Res channels x their block-based bandwidth)
```

Example with Standard and Supermotion Channels

Can I run an XT3 server with 2 record channels (1 super motion + 1 standard) + 2 play channels (1 super motion + 1 standard) in Avid DNxHD® with a video bitrate of 120 Mbps in PAL ?

Calculation:

- 1 standard rec/play at 120 Mbps uses 14.8 MB/s
- 1 super motion record/play at 120 Mbps uses 44.4 MB/s
- All channels will use: 2 x 14.8 + 2 x 44.4 = 118.4 MB/s.

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

Example with Multi-Essence Configuration

Can I run an XT3 server with 4 record channels + 2 play channels in the multi-essence configuration with Apple ProRes 422 HQ with a video bitrate of 220 Mbps and with XDCAM (with a video bitrate of 50 Mbps) in NTSC?

Calculation:

- 1 standard rec/play at 220 Mbps uses 30.0 MB/s,
- 1 XDCAM record at 50 Mbps uses 6.4 MB/s,
- All channels will use: 6 x 30.0 + 6 x 6.4 = 218 MB/s.

Conclusion: this configuration is supported as it is 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 300 GB or 900 GB SAS disks
- external storage only: up to 4 arrays with 24 x 300 GB or 900 GB SAS disks, with or without spare disks
- both internal and external storage.

Warning
The sum of internal and external disk storage on an XT3 server cannot exceed 20 TB. This is therefore not possible to have higher recording capacities than the ones described in the following tables.

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 + 4 stereo audio tracks in SD; 1 video + 8 stereo audio tracks in HD.
- With the Operational Disk Size parameter set to 100%.
- With arrays of 300 GB disks.

Tip
The table figures should be multiplied by 3 for 900 GB disk arrays.

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

				DNxHD 100	DNxHD 100 +XDCAM 50	DNxHD 120	DNxHD 120 +XDCAM 50	XDCAM 50
# Disks	#ext array	# RAID Units	spares	8 audio	8 audio	8 audio	8 audio	8 audio
5	1	1	0	24	22	20	19	44
6	1	1	1	24	22	20	19	44
10	1	2	0	48	44	41	38	88
11	1	2	1	48	44	41	38	88
15	1	3	0	72	66	62	58	132
16	1	3	1	72	66	62	58	132
20	1	4	0	96	88	83	77	177
21	1	4	1	96	88	83	77	177
25	2	5	0	120	110	104	97	221
27	2	5	2	120	110	104	97	221
30	2	6	0	144	132	125	116	265
32	2	6	2	144	132	125	116	265
35	2	7	0	168	154	146	136	309
37	2	7	2	168	154	146	136	309
40	2	8	0	192	177	167	155	354
42	2	8	2	192	177	167	155	354
45	2	9	0	216	199	188	174	398
47	2	9	2	216	199	188	174	398
50	3	10	0	240	221	209	194	442
53	3	10	3	240	221	209	194	442
55	3	11	0	264	243	229	213	486
58	3	11	3	2664	243	229	213	486
60	3	12	0	288	265	250	233	531
63	3	12	3	288	265	250	233	531
65	3	13	0	312	287	271	252	575
68	3	13	3	312	287	271	252	575

				DNxHD 100	DNxHD 100 +XDCAM 50	DNxHD 120	DNxHD 120 +XDCAM 50	XDCAM 50
# Disks	#ext array	# RAID Units	spares	8 audio	8 audio	8 audio	8 audio	8 audio
70	3	14	0	336	309	292	272	619
74	4	14	4	336	309	292	272	619
75	4	15	0	360	331	313	291	663
79	4	15	4	360	331	313	291	663
80	4	16	0	384	354	334	311	708
84	4	16	4	384	354	334	311	708
85	4	17	0	407	374	354	329	749
89	4	17	4	407	374	354	329	749

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

				DNxHD 100	DNxHD 100 +XDCAM 50	DNxHD 120	DNxHD 120 +XDCAM 50	XDCAM 50
# Disks	#ext array	# RAID Units	spares	8 audios	8 audios	8 audios	8 audios	8 audios
6	1	1	0	30	27	26	24	55
7	1	1	1	30	27	26	24	55
12	1	2	0	60	55	52	48	110
13	1	2	1	60	55	52	48	110
18	1	3	0	90	82	78	72	165
19	1	3	1	90	82	78	72	165
24	1	4	0	120	110	104	97	221
26	2	4	2	120	110	104	97	221
30	2	5	0	150	138	130	121	276
32	2	5	2	150	138	130	121	276
36	2	6	0	180	165	156	145	331
38	2	6	2	180	165	156	145	331
42	2	7	0	210	193	182	170	387
44	2	7	2	210	193	182	170	387
48	2	8	0	240	221	209	194	442
51	3	8	3	240	221	209	194	442
54	3	9	0	270	248	235	218	497
57	3	9	3	270	248	235	218	497
60	3	10	0	300	276	261	243	553
63	3	10	3	300	276	261	243	553
66	3	11	0	330	304	287	267	608
69	3	11	3	330	304	287	267	608
72	3	12	0	360	331	313	291	663
76	4	12	4	360	331	313	291	663
78	4	13	0	390	359	339	315	719
82	4	13	4	390	359	339	315	719

				DNxHD 100	DNxHD 100 +XDCAM 50	DNxHD 120	DNxHD 120 +XDCAM 50	XDCAM 50
# Disks	#ext array	# RAID Units	spares	8 audios	8 audios	8 audios	8 audios	8 audios
84	4	14	0	407	374	354	329	749
88	4	14	4	407	374	354	329	749

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

				DNxHD 100	DNxHD 100 +XDCAM 50	DNxHD 145	DNxHD 145 +XDCAM 50	XDCAM 50
# Disks	#ext array	# RAID Units	spares	8 audios	8 audios	8 audios	8 audios	8 audios
5	1	1	0	24	22	17	16	44
6	1	1	1	24	22	17	16	44
10	1	2	0	48	44	35	33	88
11	1	2	1	48	44	35	33	88
15	1	3	0	72	66	52	49	132
16	1	3	1	72	66	52	49	132
20	1	4	0	96	88	70	66	177
21	1	4	1	96	88	70	66	177
25	2	5	0	120	110	87	82	221
27	2	5	2	120	110	87	82	221
30	2	6	0	144	132	105	99	265
32	2	6	2	144	132	105	99	265
35	2	7	0	168	155	122	115	310
37	2	7	2	168	155	122	115	310
40	2	8	0	192	177	140	132	354
42	2	8	2	192	177	140	132	354
45	2	9	0	216	199	157	148	398
47	2	9	2	216	199	157	148	398
50	3	10	0	240	221	175	165	443
53	3	10	3	240	221	175	165	443
55	3	11	0	264	243	192	181	487
58	3	11	3	264	243	192	181	487
60	3	12	0	288	265	210	198	531
63	3	12	3	288	265	210	198	531
65	3	13	0	312	288	227	214	576
68	3	13	3	312	288	227	214	576
70	3	14	0	336	310	245	231	620
74	4	14	4	336	310	245	231	620

				DNxHD 100	DNxHD 100 +XDCAM 50	DNxHD 145	DNxHD 145 +XDCAM 50	XDCAM 50
# Disks	#ext array	# RAID Units	spares	8 audios	8 audios	8 audios	8 audios	8 audios
75	4	15	0	360	332	263	247	664
79	4	15	4	360	332	263	247	664
80	4	16	0	384	354	280	264	709
84	4	16	4	384	354	280	264	709
85	4	17	0	407	375	297	279	751
89	4	17	4	407	375	297	279	751

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

				DNxHD 100	DNxHD 100 +XDCAM 50	DNxHD 145	DNxHD 145 +XDCAM 50	XDCAM 50
# Disks	#ext array	# RAID Units	spares	8 audios	8 audios	8 audios	8 audios	8 audios
6	1	1	0	30	27	21	20	55
7	1	1	1	30	27	21	20	55
12	1	2	0	60	55	43	41	110
13	1	2	1	60	55	43	41	110
18	1	3	0	90	83	65	61	166
19	1	3	1	90	83	65	61	166
24	1	4	0	120	110	87	82	221
26	2	4	2	120	110	87	82	221
30	2	5	0	150	138	109	103	277
32	2	5	2	150	138	109	103	277
36	2	6	0	180	166	131	123	332
38	2	6	2	180	166	131	123	332
42	2	7	0	210	193	153	144	387
44	2	7	2	210	193	153	144	387
48	2	8	0	240	221	175	165	443
51	3	8	3	240	221	175	165	443
54	3	9	0	270	249	197	185	498
57	3	9	3	270	249	197	185	498
60	3	10	0	300	277	219	206	554
63	3	10	3	300	277	219	206	554
66	3	11	0	330	304	241	226	609
69	3	11	3	330	304	241	226	609
72	3	12	0	360	332	263	247	664
76	4	12	4	360	332	263	247	664
78	4	13	0	390	360	284	268	720
82	4	13	4	390	360	284	268	720
84	4	14	0	407	375	297	279	751
88	4	14	4	407	375	297	279	751

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 maximum SDTI bandwidth of 110 MB/s for SDTI 1.5 Gbps, and 200 MB/s for SDTI 3 Gbps.

Example

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

110 MB/s / 16.6 MB/s = 6.6 real time transfers for SDTI 1.5 Gbps

200 MB/s / 16.6 MB/s = 12.0 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 XT3 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 XT3 server are summarized in the following table.

The following tables take into account a field rate of 50.00 Hz, and the resolution 1080i, without SLSM REC, and the following reference bandwidths:

- an SDTI network of 1.5 Gbps, with a maximum bandwidth of 110 MB/s
- an SDTI network of 3 Gbps, with a maximum bandwidth of 200 MB/s.

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 15.2x faster than real-time for XDCAM HD, and around 8.7x faster than real-time for Apple ProRes 422 LT.

Codec	Field Rate	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	RT Transfers (1.5G SDTI)	RT Transfers (3G SDTI)
XDCAM HD	50.00 Hz	50	6.5	16.7	30.5
Apple ProRes 422 LT	50.00 Hz	85	11.4	9.6	17.5
HD Mjpeg Standard	50.00 Hz	100	33.3	3.3	6.0
HD Mpeg-2 Intra	50.00 Hz	100	33.3	3.3	6.0
DVCPro HD	50.00 Hz	100	12.9	8.5	15.5
AVC-Intra 100	50.00 Hz	111	13.3	8.2	15.0
XAVC-Intra HD	50.00 Hz	111	13.3	8.2	15.0
Avid DNxHD® 120	50.00 Hz	120	14.8	7.4	13.5
Apple ProRes 422 SQ	50.00 Hz	120	16.6	6.6	12.0
Avid DNxHD® 185	50.00 Hz	185	22.2	4.9	9.0
Apple ProRes 422 HQ	50.00 Hz	185	25.0	4.4	8.0

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	220 MB/s	140 MB/s	150 MB/s	80 MB/s

Backup Transfers

1GbE Connection

The maximum transfer speed through one 1GbE port of the GbE board on an XT3 server in 1080i, without SLSM REC, are summarized in the following table:

Codec	Field Rate	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	Transfer Speed (faster than RT)
XDCAM HD	50.00 Hz	50	6.5	13.7x
Apple ProRes 422 LT	50.00 Hz	85	11.4	7.8x
HD Mjpeg Standard	50.00 Hz	100	33.3	2.7x
HD Mpeg-2 Intra	50.00 Hz	100	33.3	2.7x
DVCPro HD	50.00 Hz	100	12.9	6.9x
AVC-Intra 100	50.00 Hz	111	13.3	6.7x
XAVC-Intra HD	50.00 Hz	111	13.3	6.7x
Avid DNxHD® 120	50.00 Hz	120	14.8	6.1x
Apple ProRes 422 SQ	50.00 Hz	120	16.6	5.4x
Avid DNxHD® 185	50.00 Hz	185	22.2	4.0x
Apple ProRes 422 HQ	50.00 Hz	185	25.0	3.6x

10GbE Connection

The maximum number of real-time transfers through the 10GbE ports of the XT3 server in 1080i, without SLSM REC, are summarized in the following table:

Codec	Field Rate	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	RT Transfers	Transfer Speed (faster than RT)
XDCAM HD	50.00 Hz	50	6.5	33.5	30.5 x
Apple ProRes 422 LT	50.00 Hz	85	11.4	19.2	17.5 x
HD Mjpeg Standard	50.00 Hz	100	33.3	6.6	6 x
HD Mpeg-2 Intra	50.00 Hz	100	33.3	6.6	6 x
DVCPro HD	50.00 Hz	100	12.9	17.0	15.5 x
AVC-Intra 100	50.00 Hz	111	13.3	16.5	15x
XAVC-Intra HD	50.00 Hz	111	13.3	16.5	15x
Avid DNxHD® 120	50.00 Hz	120	14.8	14.8	13.5 x
Apple ProRes 422 SQ	50.00 Hz	120	16.6	13.2	12 x
Avid DNxHD® 185	50.00 Hz	185	22.2	9.9	9 x
Apple ProRes 422 HQ	50.00 Hz	185	25.0	8.8	8 x

Restore Transfers

1GbE Connection

The maximum transfer speed through one 1GbE port of the GbE board on an XT3 server in 1080i, without SLSM REC, are summarized in the following table:

Codec	Field Rate	Video Bitrate (Mbps)	Block-Based Bandwidth (MB/s)	Transfer Speed (faster than RT)
XDCAM HD	50.00 Hz	50	6.5	10.6x
Apple ProRes 422 LT	50.00 Hz	85	11.4	6.1x
HD Mjpeg Standard	50.00 Hz	100	33.3	2.1x
HD Mpeg-2 Intra	50.00 Hz	100	33.3	2.1x
DVCPro HD	50.00 Hz	100	12.9	5.4x
AVC-Intra 100	50.00 Hz	111	13.3	5.2x
XAVC-Intra HD	50.00 Hz	111	13.3	5.2x
Avid DNxHD® 120	50.00 Hz	120	14.8	4.7x
Apple ProRes 422 SQ	50.00 Hz	120	16.6	4.2x
Avid DNxHD® 185	50.00 Hz	185	22.2	3.1x
Apple ProRes 422 HQ	50.00 Hz	185	25.0	2.8x

10GbE Connection

The maximum number of real-time transfers through the 10GbE ports of the XT3 server in 1080i, without SLSM REC, are summarized in the following table:

Codec	Field Rate	Video Bitrate (Mbps)	Block-based bandwidth (MB/s)	RT Transfers	Transfer Speed (faster than RT)
XDCAM HD	50.00 Hz	50	6.5	15.2	12.2x
Apple ProRes 422 LT	50.00 Hz	85	11.4	8.7	7.0x
HD Mjpeg Standard	50.00 Hz	100	33.3	3.0	2.4x
HD Mpeg-2 Intra	50.00 Hz	100	33.3	3.0	2.4x
DVCPro HD	50.00 Hz	100	12.9	7.7	6.2x
AVC-Intra 100	50.00 Hz	111	13.3	7.5	6.0x
XAVC-Intra HD	50.00 Hz	111	13.3	7.5	6.0x
Avid DNxHD® 120	50.00 Hz	120	14.8	6.7	5.4x
Apple ProRes 422 SQ	50.00 Hz	120	16.6	6.0	4.8x
Avid DNxHD® 185	50.00 Hz	185	22.2	4.5	3.6x
Apple ProRes 422 HQ	50.00 Hz	185	25.0	4.0	3.2x

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.

The gigabit prioritization mechanism is not impacted by the rule specified above.

4.4.3. XFile3 Capacities

Storage Capacity for 720p / 1080i at 50 Hz (PAL)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 720 and 1080i video at a frame rate of 50 Hz:

Codec	Fields/ Block	1 TB	2 TB
XDCAM HD	61	44:25	88:50
Apple ProRes 422 LT	35	25:29	50:58
HD Mjpeg Standard	12	8:44	17:29
HD Mpeg-2 Intra	12	8:44	17:29
DVCPro HD	31	22:34	45:08
AVC-Intra 100	30	21:51	43:42
XAVC-Intra HD	30	21:51	43:42
Avid DNxHD® 120	27	19:40	39:19
Apple ProRes 422 SQ	24	17:29	34:58
Avid DNxHD® 185	18	13:07	26:13
Apple ProRes 422 HQ	16	11:39	23:18

Storage Capacity for 720p / 1080i at 150 Hz (PAL Super Motion 3x)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 720 and 1080i video at a frame rate of 150 Hz:

Codec	Fields/ Block	1 TB	2 TB
Apple ProRes 422 LT	12	8:30	16:59
HD Mjpeg Standard	4	2:55	5:50
HD Mpeg-2 Intra	4	2:55	5:50
DVCPro HD	10	7:31	15:03
AVC-Intra 100	10	7:17	14:34
XAVC-Intra HD	10	7:17	14:34
Avid DNxHD® 120	9	6:33	13:07
Apple ProRes 422 SQ	8	5:50	11:39
Avid DNxHD® 185	6	4:22	8:44
Apple ProRes 422 HQ	5	3:53	7:46

Storage Capacity for 720p / 1080i at 59.94 Hz (NTSC)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 720 and 1080i video at a frame rate of 59.94 Hz:

Codec	Fields/ Block	1 TB	2 TB
XDCAM HD	74	44:54	89:48
Apple ProRes 422 LT	35	21:14	42:29
HD Mjpeg Standard	14	8:30	17:00
HD Mpeg-2 Intra	14	8:30	17:00
DVCPro HD	35	21:14	42:29
AVC-Intra 100	36	21:51	43:42
XAVC-Intra HD	36	21:51	43:42
Avid DNxHD® 120	27	16:23	32:46
Apple ProRes 422 SQ	24	14:34	29:07
Avid DNxHD® 185	18	10:55	21:50
Apple ProRes 422 HQ	16	9:43	19:25

Storage Capacity for 720p / 1080i at 180 Hz (NTSC Super Motion 3x)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 720 and 1080i video at a frame rate of 180 Hz:

Codec	Fields/ Block	1 TB	2 TB
Apple ProRes 422 LT	12	7:05	14:10
HD Mjpeg Standard	5	2:50	5:40
HD Mpeg-2 Intra	5	2:50	5:40
DVCPro HD	12	7:05	14:10
AVC-Intra 100	12	7:17	14:34
XAVC-Intra HD	12	7:17	14:34
Avid DNxHD® 120	9	5:28	10:55
Apple ProRes 422 SQ	8	4:50	9:43
Avid DNxHD® 185	6	3:38	7:17
Apple ProRes 422 HQ	5	3:14	6:28

Storage Capacity for 1080p at 50 Hz (PAL)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 1080p video at a frame rate of 50 Hz:

Codec	Fields/ Block	1 TB	2 TB
AVC-Intra 100	15	10:55	21:50
XAVC-Intra HD	15	10:55	21:50
Avid DNxHD® 240	13	9:28	18:56
Apple ProRes 422 LT	18	13:07	26:13
Apple ProRes 422 SQ	12	10:24	20:48
Apple ProRes 422 HQ	8	5:50	11:40

Storage Capacity for 1080p at 59.94 Hz (NTSC)

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 1080p video at a frame rate of 59.94 Hz:

Codec	Fields/ Block	1 TB	2 TB
AVC-Intra 100	18	10:55	21:50
XAVC-Intra HD	18	10:55	21:50
Avid DNxHD® 365	14	8:30	17:00
Apple ProRes 422 LT	18	10:55	21:50
Apple ProRes 422 SQ	12	7:17	14:34
Apple ProRes 422 HQ	8	4:50	9:41

Storage Capacity for 4K

The following tables gives the time (in hours and minutes) of A/V content of a given codec that can be stored on the XFile3 hardware for 4K video:

Codec	Field Rate	Fields/ Block	1 TB	2 TB
Avid DNxHD® 200/240 x 4	50 Hz (PAL)	3	2:11	4:22
Avid DNxHD® 200/260 x 4	59.94 Hz (NTSC)	3	1:49	3:38

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

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

NEW !

The XT3 server comes in the following rear panel variants:

- 6U rack with 6 codec modules and various optional audio connectors.
- 4U rack with 4 codec modules and various optional audio connectors.

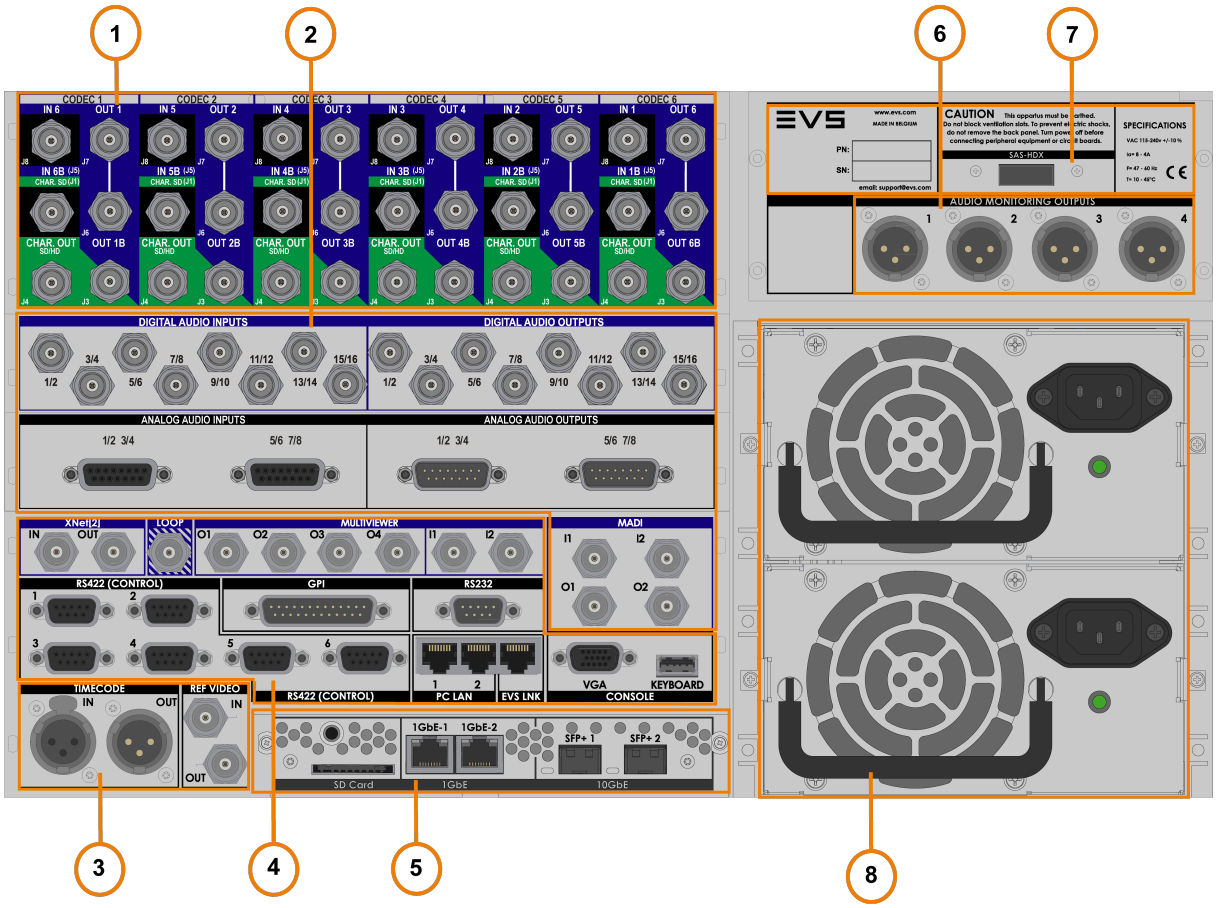
The different available configurations and the connectors positions and types for each of these variants are described in the following topics.

5.2.2. 6U Rear Panel Layout

Rear Panel Areas

The following drawing represents an example of a 6U rear panel available on an XT3 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.

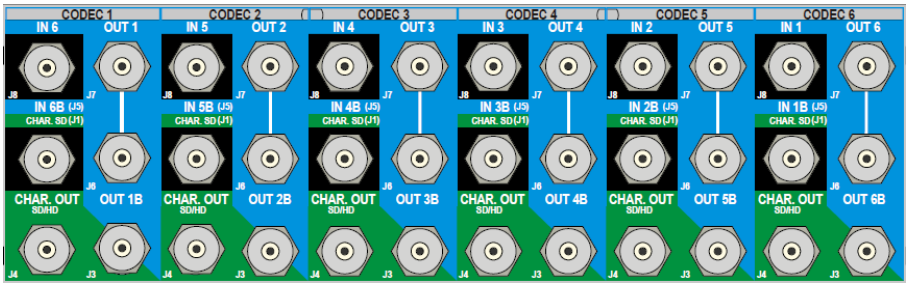


Video and Codecs 1

The codecs modules allow connections for recording and playback of video material. Each connector on a codec module is connected to the corresponding J connector on the COD A or COD B module of a V3X board.

See section "V3X Video and Reference Boards" on page 81 for more details on each connector specific usage according to the different configurations.

NEW ! The video and codec connector layout available with the XT3 6U server includes 6 codec modules:



NEW !

Analog and Digital Audio 2

This section shows the available associations of analog and digital connectors.

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

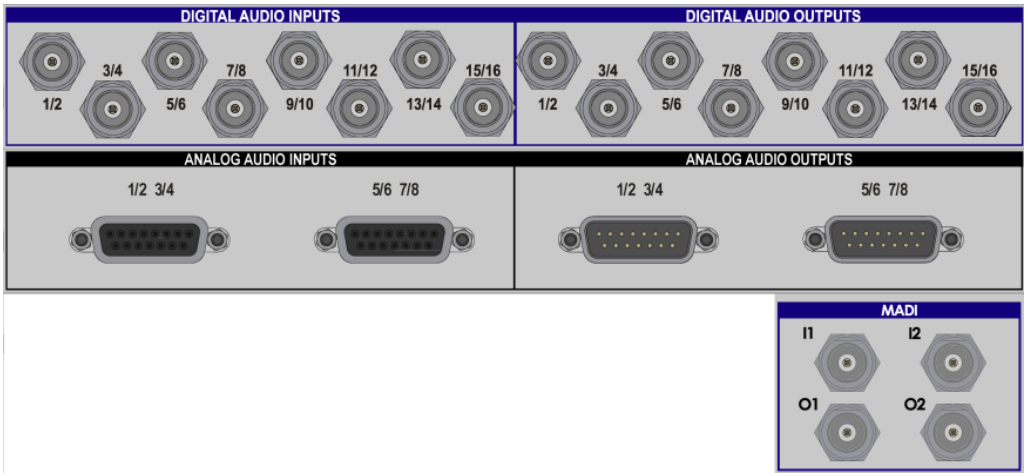
The MADI connectors are available by default on every XT3 server.

See section "Audio Specifications" on page 15 for more details on the available audio configurations.

See section "Audio Connections" on page 58 for more details on the DA-15 connectors pinout depending on the configuration.

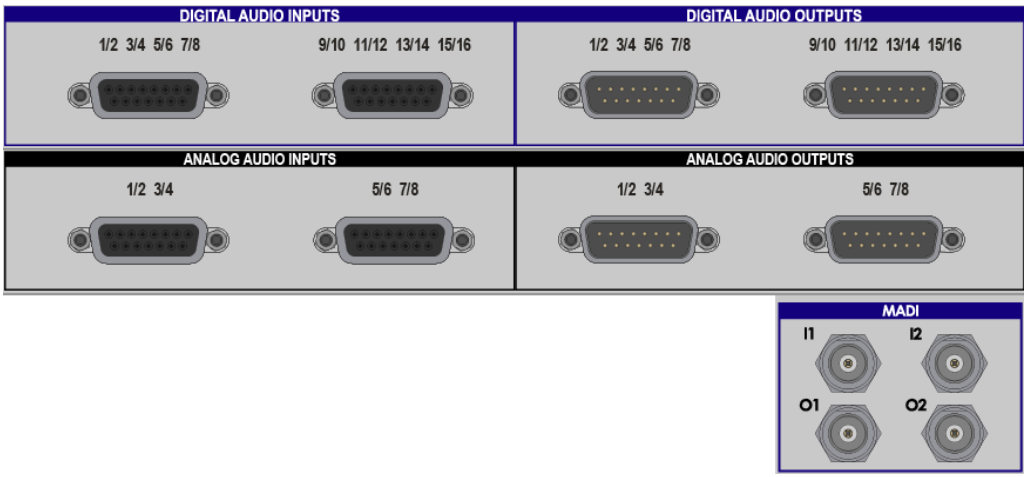
MADI BNC + Digital BNC + Analog DA-15 Connectors

- MADI Digital audio: 4 BNC connectors (2 in and 2 out)
- Digital audio: 16 BNC connectors (8 in and 8 out)
- Analog audio: 4 multi-pin DA-15 connectors (2 in and 2 out)



MADI BNC + Digital DA-15 + Analog DA-15 Connectors

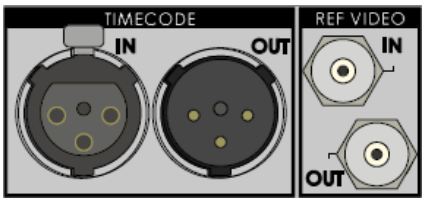
- MADI audio: 4 BNC connectors (2 in and 2 out)
- Digital audio: 4 multi-pin DA-15 connectors (2 in and 2 out)
- Analog audio: 4 multi-pin DA-15 connectors (2 in and 2 out)



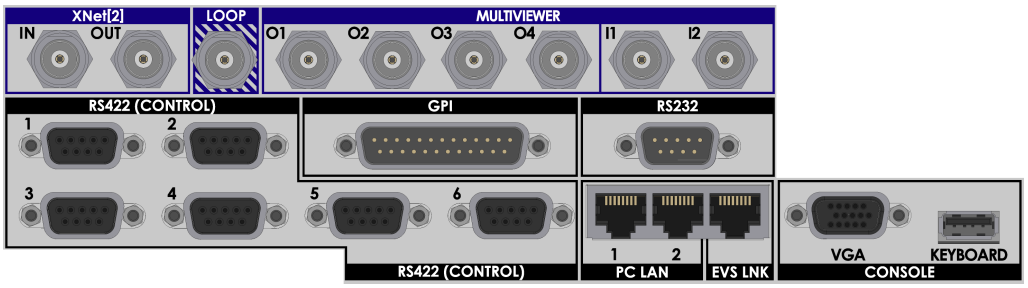
Timecode and Video Ref Connectors 3

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, and/or XStore 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 **Loop** connector allows the loop of PGM1 on REC1 to be able to use the internal loop feature.

NEW !

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.

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

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

Gigabit Ethernet Connectors Module 5

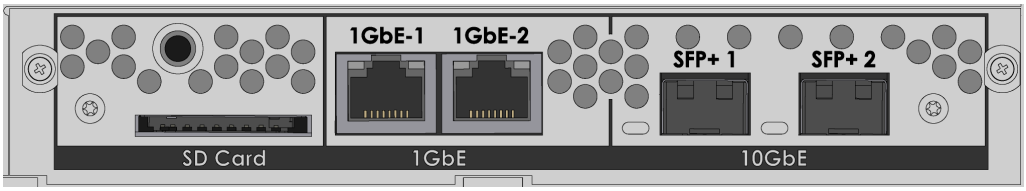
The Gigabit Ethernet Connector module of the GbE board is located at the bottom center of the rear panel.

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

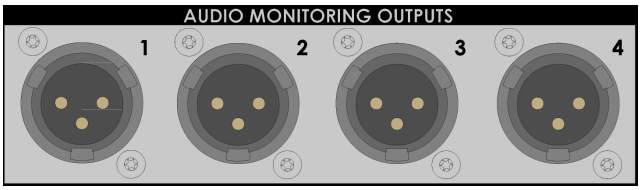


Note
The 10 GbE and 1GbE connectors cannot be used at the same time.

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 AES 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

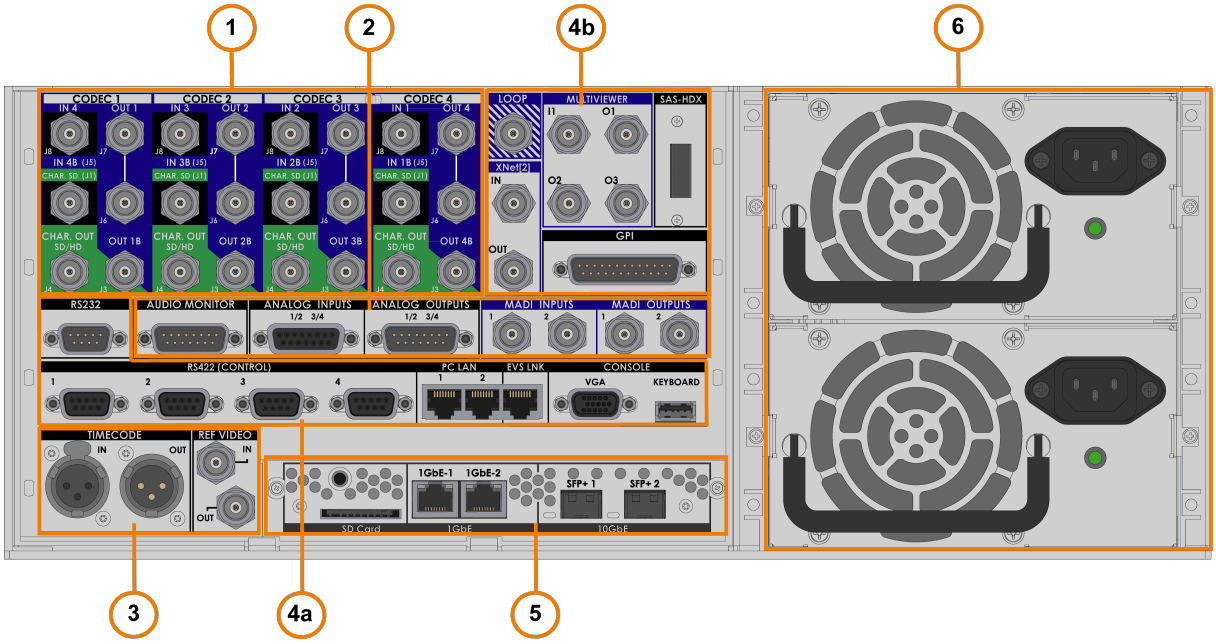
The server power supply is made of two hot-swappable units. Both of these units are connected to allow automatic power switching to the second power supply should the first one fail.

5.2.3. 4U Rear Panel Layout

Rear Panel Areas

The following drawing represents an example of a 4U rear panel available on an XT3 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.

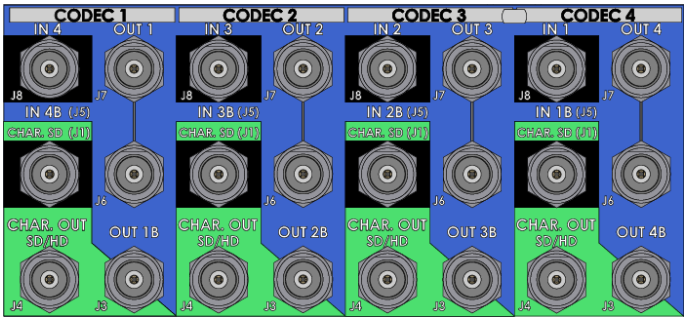


Video and Codecs 1

The codecs modules allow connections for recording and playback of video material. Each connector on a codec module is connected to the corresponding J connector on the COD A or COD B module of a V3X board.

See section "V3X Video and Reference Boards" on page 81 for more details on each connector specific usage according to the different configurations.

NEW ! The video and codec connector layout available with the XT3 4U server includes 4 codec modules:



NEW !

Analog and Digital Audio 2

This section shows the available associations of audio connectors.

See section "Audio Specifications" on page 15 for more details on the available audio configurations.

See section "Audio Connections" on page 58 for more details on the DA-15 connectors pinout according to the different configurations.

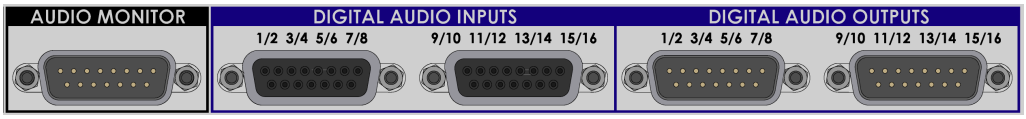
The audio connector layouts described in this section are available according to your configuration:

MADI BNC + Analog DA-15 Connectors

- Analog audio: 2 multi-pin DA-15 connectors (1 in and 1 out)
- MADI audio: 4 BNC connectors (2 in and 2 out)
- 1 multi-pin DA-15 for audio output connection for monitoring purposes

Digital DA-15 Connectors

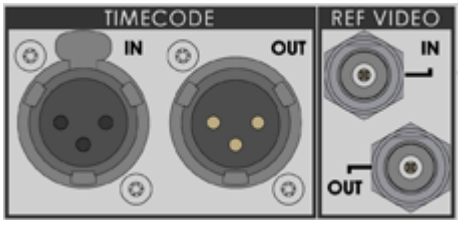
- Digital audio: 4 multi-pin DA-15 connectors (2 in and 2 out)
- 1 multi-pin DA-15 for audio output connection for monitoring purposes



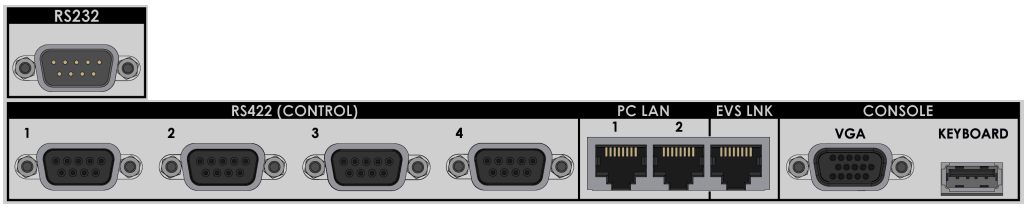
Timecode and Video Ref Connectors 3

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 4a



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

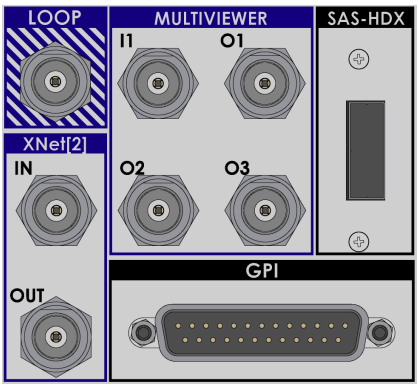
The **RS422 ports** allow the server to be remotely controlled through remote panels or third-party control devices. When a remote panel is used, it should be connected on the first RS422 port.

Two **PC LAN** connectors allow connection of the PC LAN interface of the EVS server to an Ethernet network.

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

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

Controls and Communications 4b



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

The **Loop** connector allows the loop of PGM1 on REC1 to be able to use the internal loop feature.

NEW ! The **Multiviewer** connectors provides:

- 3 OUT connectors to connect monitors directly to the server, and display PGM and REC channels on the monitors.
- 1 IN connector 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 **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.

The **XNet2** connectors allow the interconnection of EVS servers, and/or XStore 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 **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.

Gigabit Ethernet Connector Module 5

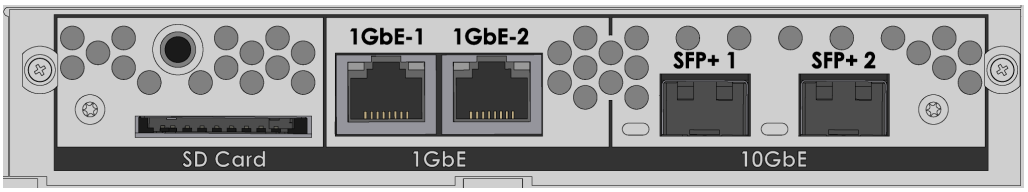
The Gigabit Ethernet Connector module is located at the bottom center of the rear panel.

This area has the following layout:

- 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.

Power Supplies 6

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".

5.4. Audio Connections

5.4.1. Audio Channels

The XT3 server 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), or analog audio 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 (75 Ohm unbalanced)

    on an XT3 6U server.
- MADI Digital audio:
  - BNC connectors: 2 inputs and 2 outputs (75 Ohm unbalanced).
- Analog audio:
  - DA-15 connectors: 4 inputs (high-balanced) and 4 outputs

    on an XT3 6U server.
  - DA-15 connectors: 2 inputs (high-balanced) and 2 outputs

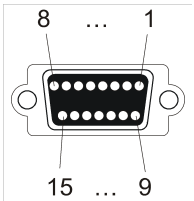
    on an XT3 4U server.
- Audio monitoring :
  - DA-15 connector: 4 analog mono outputs (600 Ohm drive capable) (XT3 4U).
  - XLR connectors: 4 analog mono outputs (600 Ohm drive capable) (XT3 6U).
- Breakout cables with XLR connectors can be adapted on DA-15 connectors.

See also section "Audio Specifications" on page 15 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.

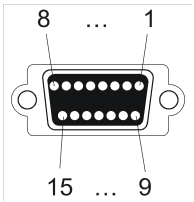


Pin #	DA-15 connector #1 Inputs 1-8 (mono)	DA-15 connector #2 Inputs 9-16 (mono)	DA-15 connector #3 Outputs 1-8 (mono)	DA-15 connector #4 Outputs 9-16 (mono)
1	Gnd	Gnd	Gnd	Gnd
2	AES input 1/2 +	AES input 9/10 +	AES output 1/2 +	AES output 9/10 +
3	Gnd	Gnd	Gnd	Gnd
4	AES input 3/4 +	AES input 11/12 +	AES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

5.4.3. Analog Audio DA-15 Pinout

The analog 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.

The DA-15 analog audio connectors are not available on the 4U chassis of the XT3 server.

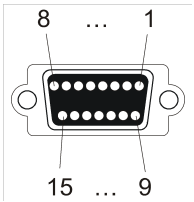


Pin #	DA-15 connector #1 Inputs 1-4 (mono)	DA-15 connector #2 Inputs 5-8 (mono)	DA-15 connector #3 Outputs 1-4 (mono)	DA-15 connector #4 Outputs 5-8 (mono)
1	Gnd	Gnd	Gnd	Gnd
2	Analog input 1 +	Analog input 5 +	Analog output 1 +	Analog output 5 +
3	Gnd	Gnd	Gnd	Gnd
4	Analog input 2 +	Analog input 6 +	Analog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

5.4.4. Monitoring Audio DA-15 Pinout

The monitoring 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.

The DA-15 monitoring audio connector is only available on the 4U chassis of the XT3 server.



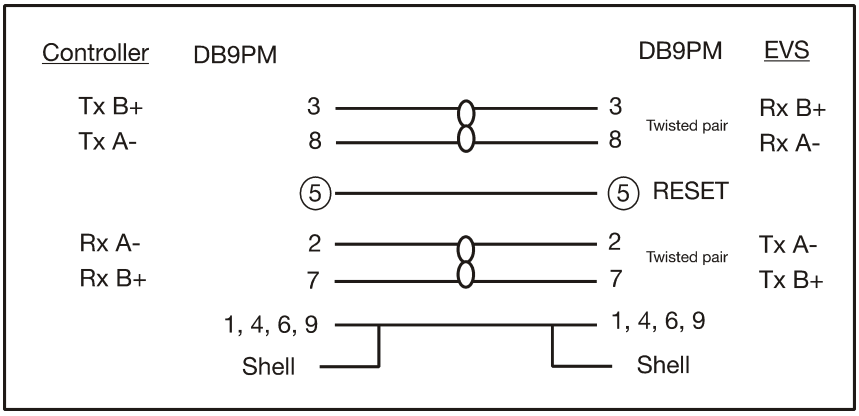
Pin #	DA-15 connector Outputs 1-4 (mono)
1	Gnd
2	Analog output 1 +
3	Gnd
4	Analog output 2 +
5	Gnd
6	Analog output 3 +
7	Gnd
8	Analog output 4 +
9	Analog output 1 -
10	Gnd
11	Analog output 2 -
12	Gnd
13	Analog output 3 -
14	Gnd
15	Analog output 4 -

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:

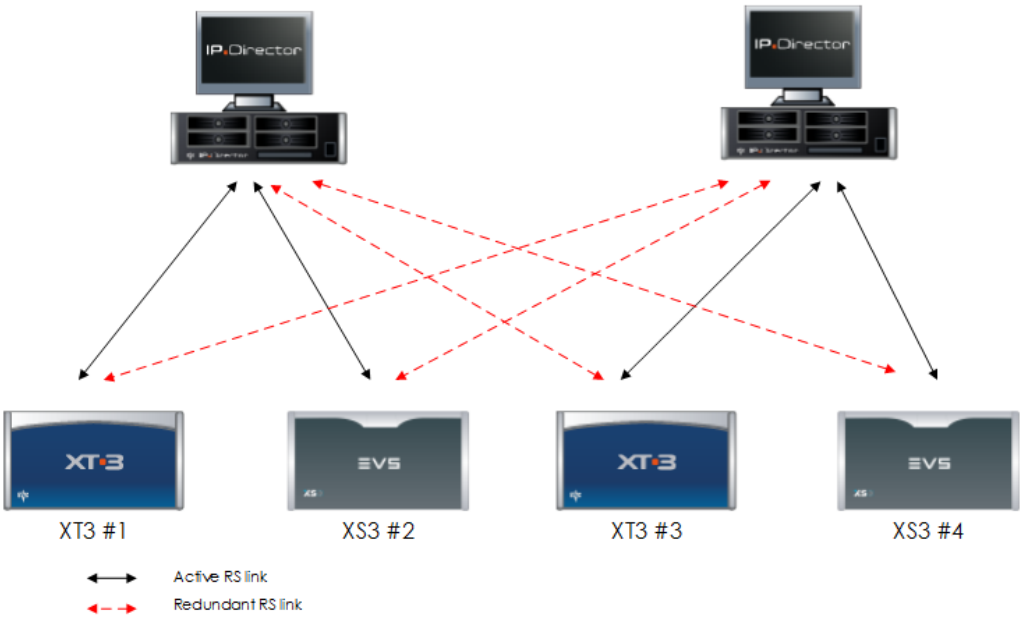
- 19200 bauds
- No parity
- 8 data bits
- 1 stop bit

5.5.2. Redundant IPDP Serial Link

The IPDirector communicates with the server via one serial link. If that link fails, the XT3 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 an XT3 server to another port on another XT3 server.

To ensure the failover, the backup links between IPDirector workstations and the XT3 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 1485 Mbps (1.5 Gbps) or 2970 Mbps (3 Gbps) , with non-relay connectors. The 2970 Mbps speed for the SDTI network is restricted to EVS servers fitted with H3X boards.

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

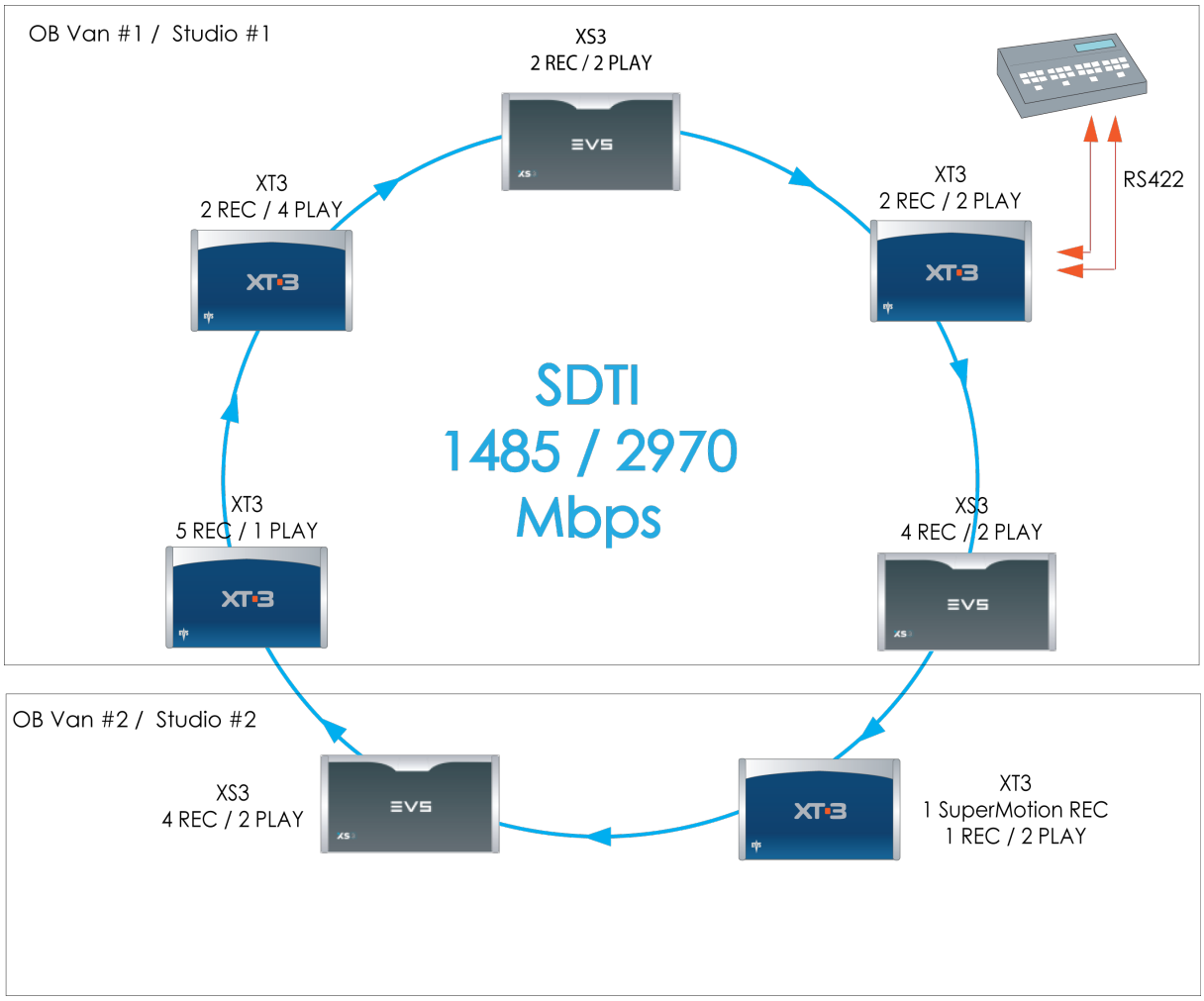
Introduction

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
Multicam 14.02 can work with XHub version 3.03 or above but 3G-SDTI is only supported with version 4.00.

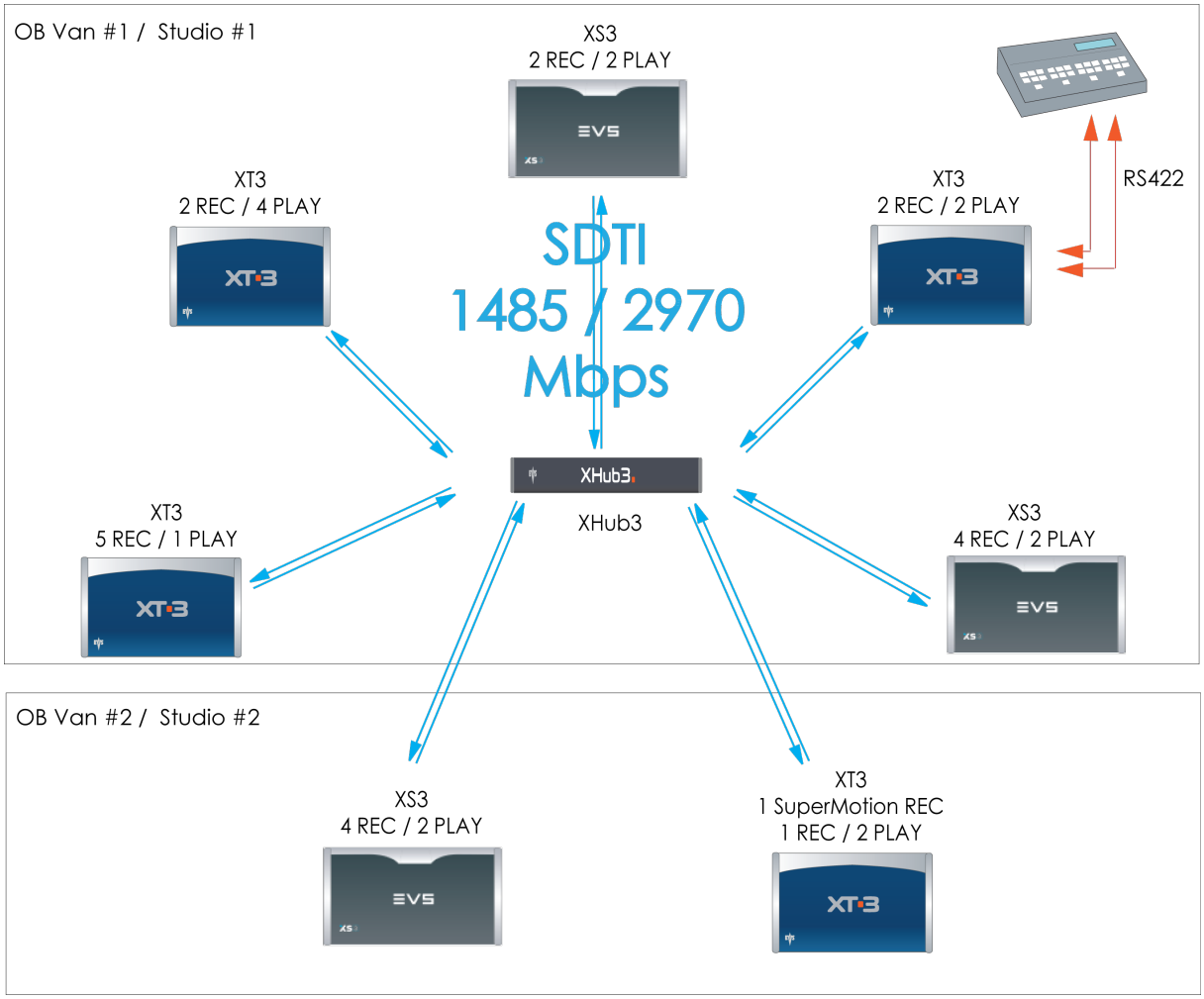
Connection Diagram Without EVS XHub SDTI Hub

Example of XNet2 network without hub:



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, XS, XS3 servers, XStoreSE, 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 EVS video servers shall operate the same multi-essence configuration.
5. The SDTI speed parameter shall have the same value on all EVS servers (**Network** page, **SDTI** section). The SDTI speed 2970 Mbps is available with EVS servers equipped with H3X boards.

6. 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).
7. 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.
8. 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.
9. 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	@ 1485 Mbps
RG59	30 m / 98 ft	45 m / 148 ft
RG6	70 m / 230 ft	90 m / 295 ft
RG11	85 m / 279 ft	120 m / 394 ft
Fiber	55 km (*)	80 km (*)

(*) 55 km/80 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. 40 km @ 1485 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.

5.6.5. XNet Performances and Troubleshooting

Performances

Transfers

With the default settings, the following performances can be achieved in normal conditions:

Material	Transfers	Distant copy
SD content	10 real-time transfers	Up to 5 times faster than real-time (depends on network load)
HD content	3 to 4 real-time transfers	Up to 2 times faster than real-time (depends on network load)
SLSM content	3 real-time transfers	-

These performances are also limited by the disk bandwidth available from the EVS server where the clips are stored. To prevent freeze issues and to maximize network bandwidth efficiency, priority levels have been implemented in the following order, from the high to the low priority:

1. Play requests
2. Search/Browse and Live (E2E) requests
3. Copy requests.

Delays

Delay times between playback and ingest depend on two factors:

- local or distant video material on the SDTI network
- codec type (intra field-type codec, intra frame-type codec, longop codec)

The following table provides the delay times depending on these two factors:

	Local Clips	Distant Clips (SDTI)
Intra field-type codec	6 frames	5 seconds
Intra frame-type codec	9 frames	5 seconds
LongGOP codec	2 seconds	9 seconds

Troubleshooting

1. If the network does not start up properly although all machines are apparently configured properly and Multicam is actually started on all of them, check that selected cables to connect all EVS servers are suitable and not too long to operate.
2. If the connection cannot be established, please make sure that all equipments are set to the same speed and connected to the non-relay connectors.
3. Once the network has been established, if the EVS server acting as the network "Server" is disconnected or shut down, another server will automatically be assigned to act as a new network "Server". The next machine to be automatically assigned as new network server is the one with the highest serial number in the SDTI network.

5.7. Gigabit Network

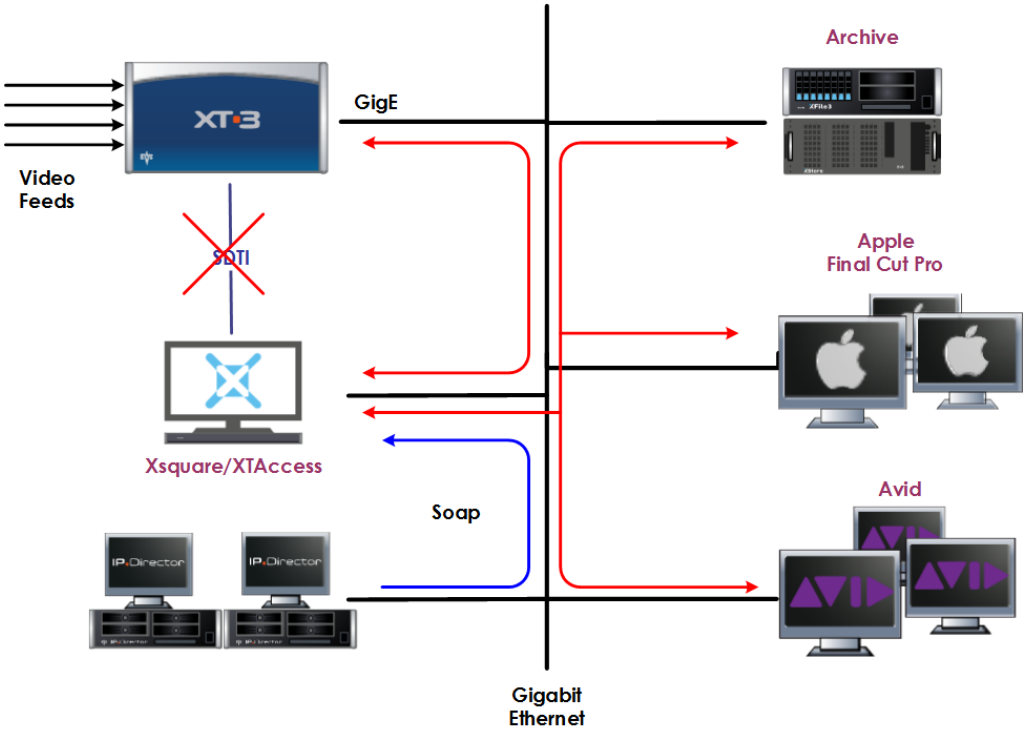
5.7.1. Functional Overview

The Gigabit connection makes it possible to transfer video and audio material from your XT3 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 Xedio, Apple Final Cut Pro, or Avid.

However, the external systems cannot read the raw files coming from an XT3 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 XT3 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.

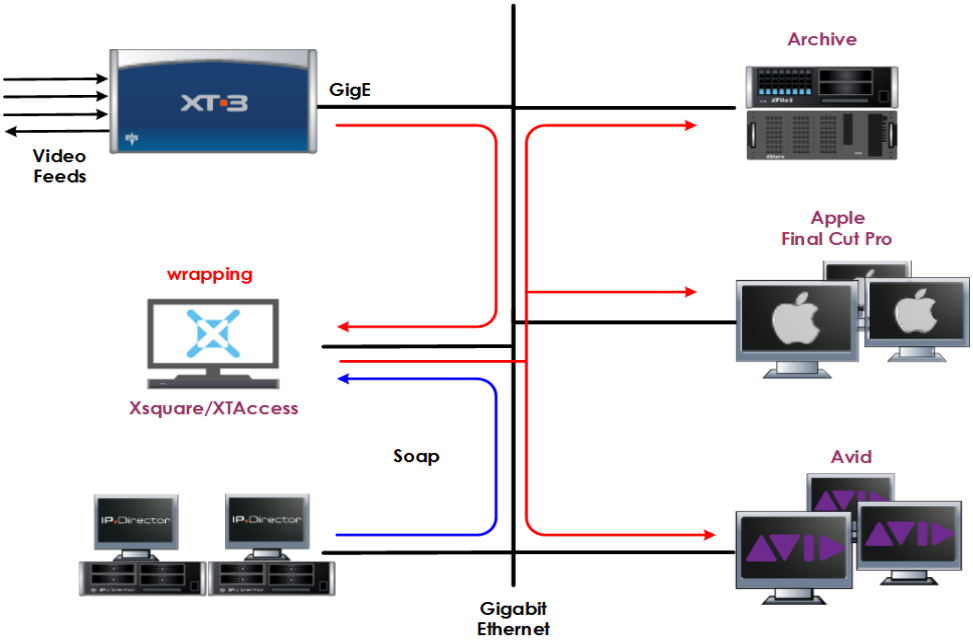
The Gigabit connection fulfills the following functions in relation with the XT3 server:

- Backup of clips from an XT3 server.
- Restore of clips to an XT3 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 an XT3 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. The metadata of the clip are included in the file (in EVS MXF) and sent via an XML metadata file.

5.7.3. Restore of Clips

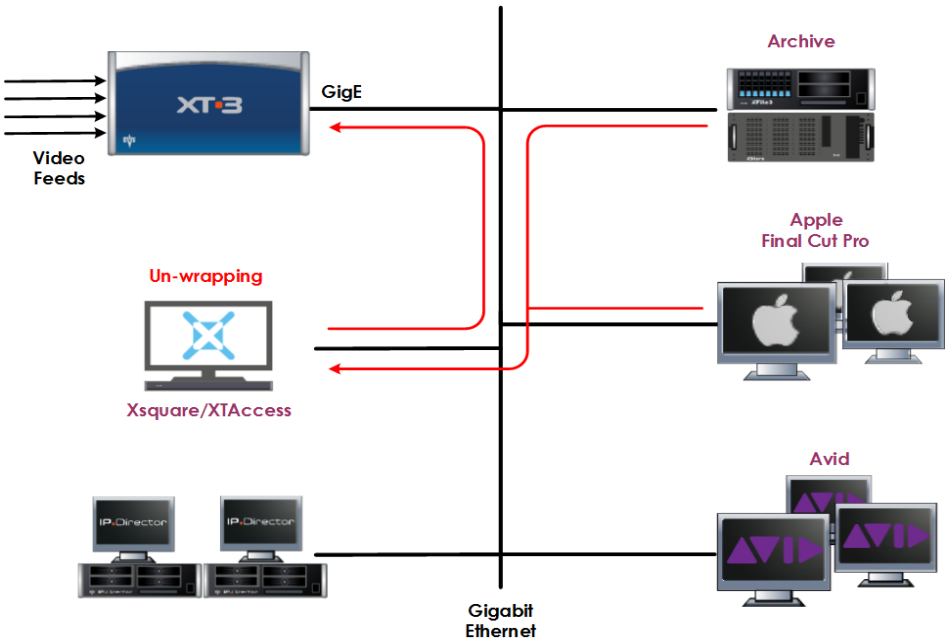
Overview

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 XT3 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.
- Teaming between the GbE1 and GbE2 ports is not possible.
- This is not possible to implement failover through the GbE network.
- The GbE port available on the MTPC board (PC LAN) is a 100Base-T port.

  This is used for monitoring purposes (XNet Monitor) or for the communication with other applications (LinX). This can be in the same sub-network as the GbE port.

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-2960S-24TD-L	24 10/100/1000 Base-T	2 10G SFP+ or 2 1G SFP	Yes	Switching	No
Cisco WS-2960S-48TD-L	48 10/100/1000 Base-T	2 10G SFP+ or 2 1G SFP	Yes	Switching	No
Cisco WS-2960S-24TS-L	24 10/100/1000 Base-T	4 1G SFP	Yes	Switching	No
Cisco WS-2960S-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 2960S-24TS and 2960S-48TS can be used for small setups where no inter-VLAN routing is needed and no 10G uplinks.

The models Cisco Catalyst 2960S-24TD and 2960S-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 XT3 servers or/and several ports on the SANs are often used to increase the bandwidth or to allow redundancy. Since both GbE ports of an XT3 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

XT3 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 XT3 server and the 10 Gbps SFP+ NICs equipped in some EVS servers.

Switches

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

5.8. GPIO Connections

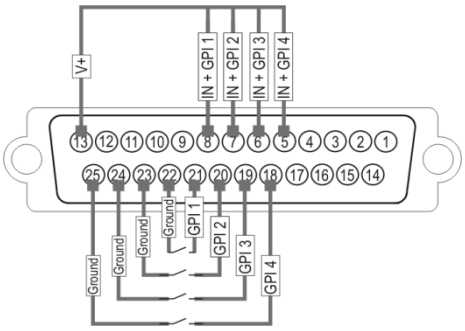
5.8.1. GP In Connections

GPI Triggers

The allocation of the XT3 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



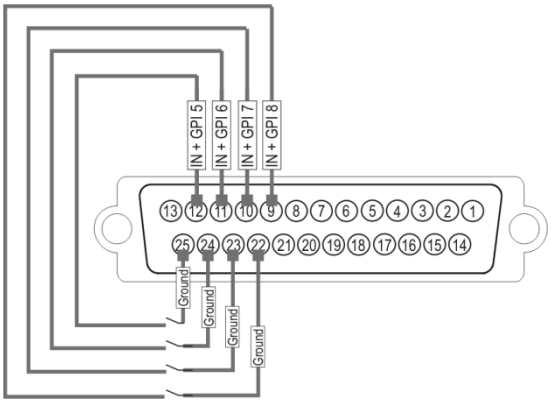
Specifications

- 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)

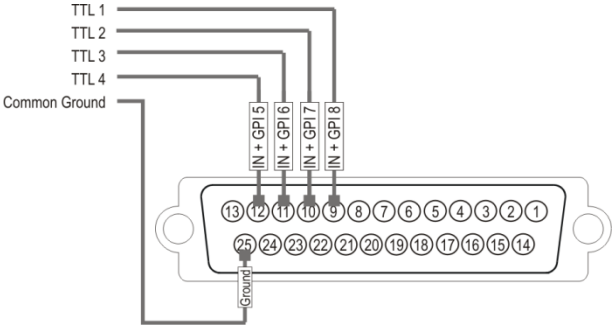
Relay Inputs Pin-Out



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 XT3 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)

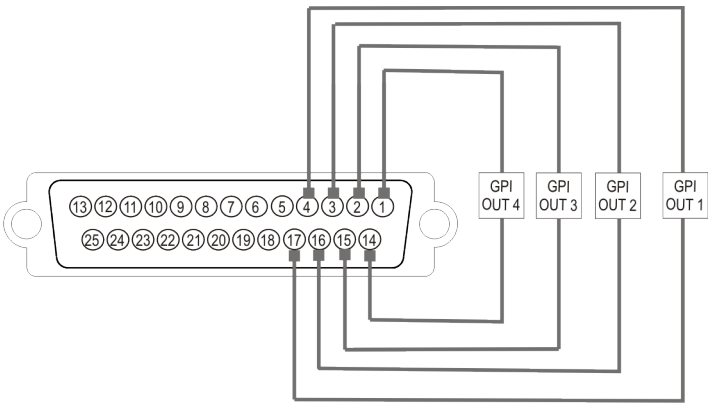
5.8.2. GP Out Connections

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)

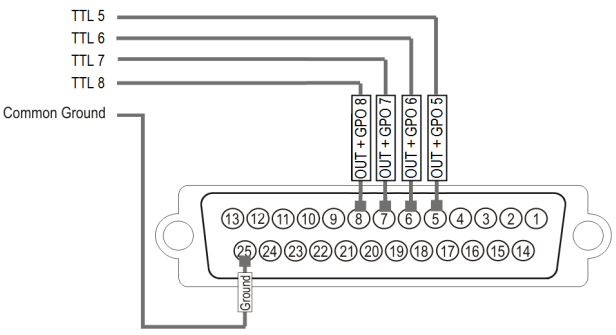


Specifications

- 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 XT3 server is equipped with several boards that are all developed by EVS.

According to your server version, the following setup configurations are available:

6U Rack

Slot #	Installed boards
	6 video channels
7	RSAS
6	H3X or H3XP
5	CODA or A3X (Audio Codec)
4	V3X (SD/HD) #3
3	V3X (SD/HD) #2
2	V3X (SD/HD) #1 Genlock
1	MTPC

4U Rack

Slot #	Installed boards
	4 video channels
6	RSAS
5	H3X or H3XP
4	CODA or A3X (Audio Codec)
3	V3X (SD/HD) #2
2	V3X (SD/HD) #1 Genlock
1	MTPC

6.2. V3X Video and Reference Boards

6.2.1. Description

Overview

The V3X board is divided in several parts:

- a base board identified as V3X base (rear section and center extension)
- two modules identified as COD A V3X (front left) and COD B V3X (front right)
- two modules identified as XDCAM (rear section, plugged onto the left and right sides of the base board)

Warning
It is highly advised not to remove a V3X 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

The COD A V3X and COD B V3X 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). The COD V3X modules are SD, HD, and 3 Gbps capable.

They support the following feature(s):

- Full resolution 3D HD on a single V3X module (Dual Link HD SDI or single link 3 Gbps)
- 1080p 50/59.94 Hz video standard on a single V3X module (Dual Link HD SDI or single link 3 Gbps)

XDCAM Modules

The XDCAM modules provides the option to encode the incoming video feeds in XDCAM codec. These modules do not include LEDs and are therefore not further detailed below.

Genlock

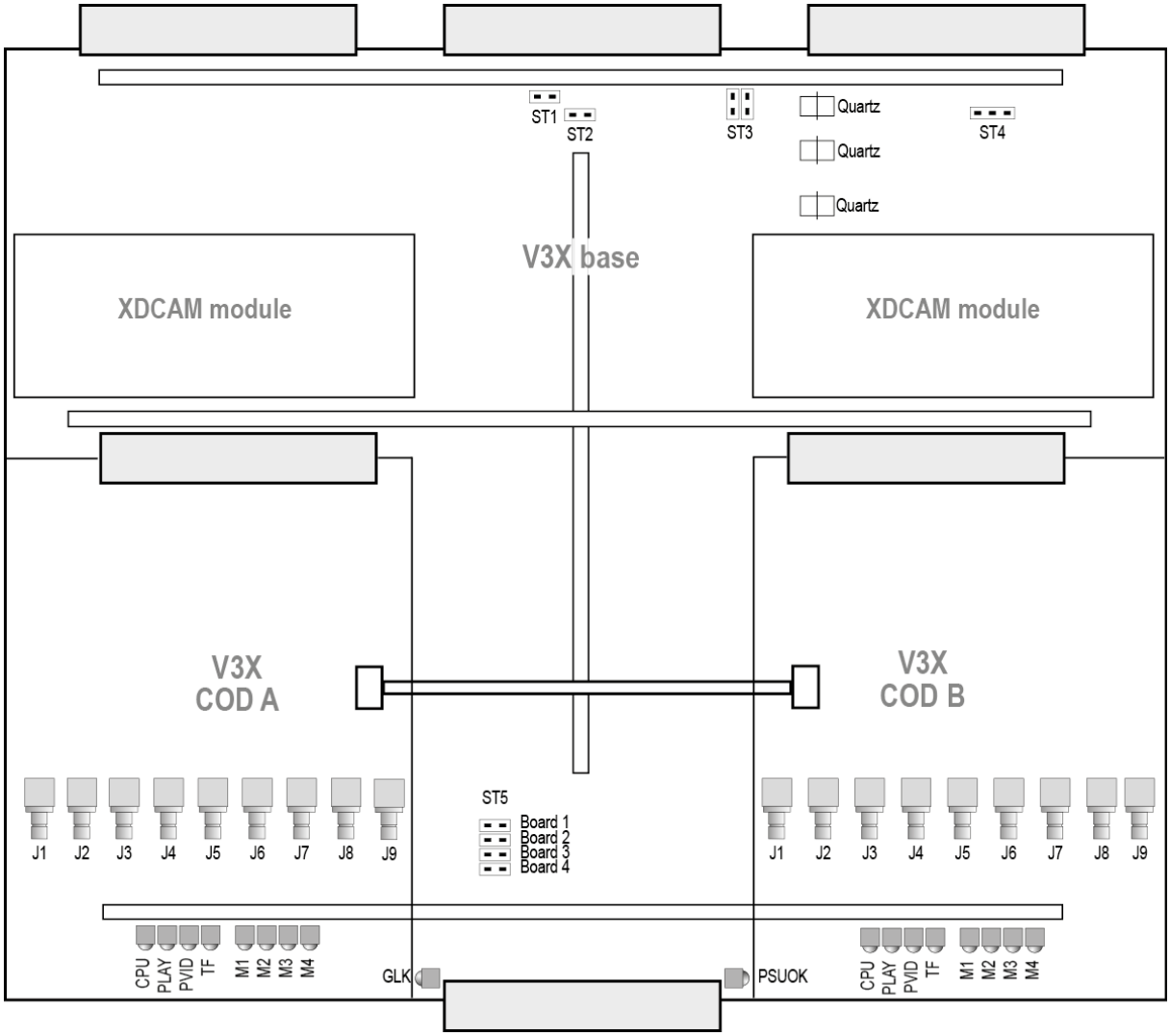
There are 2 versions of the V3X board: one with genlock, one without genlock.

The genlock model can easily be identified by the presence of 3 quartz synthesizers at the rear of the V3X base board, on the right-hand side, and by the presence of the GLK and PSU OK LEDs on either side of the DIN connector at the center front of the board.

Note that a V3X board with genlock must be installed as V3X #1 in first position (slot 2) in the server. A V3X board with genlock can never be installed in any other slot, and thus cannot be used instead of V3X #2 or #3. Doing so will result in conflicting electrical signals inside the system.

Block Diagram

The block diagram of the V3X board with genlock is illustrated hereunder with the connectors, jumpers and LEDs location:



Base Board Jumpers

The following table lists the V3X base board jumpers and their respective function:

Jumper	Function
ST1, ST2	These 2 jumpers must be installed on the last V3X board of the server (that is on V3X #1, 2, or 3 if there are respectively 1, 2, or 3 V3X boards installed in the server).
ST3 (SPARE)	«Parking» for ST1 and ST2 jumpers when they are not used.
ST4 (only on V3X with genlock)	Must be set to HiZ (or not installed). Note that the Genlock Loop connector on the back panel of the server (if available) must always be terminated with a 75 Ohm load if it is not used.
ST5	Defines the position of the board inside the server. It must be set to « 1 » for a V3X with genlock, and to « 2 » or « 3 » for a V3X board without genlock, depending on its position in the server.

Base Board LEDs

The table below lists the LEDs available on the V3X base board 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.
PSU OK	Green	On	All voltages are present and in the allowed range.
	—	Off	There is a voltage problem.

V3X COD Modules LEDs

The following table lists the LEDs available on then V3X COD 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.
PVID	Green	On	A valid video signal has been detected on the J8 connector (SD/HD SDI input), whether the module is in play or record mode.
TF (transfer)	Green	Blinking	Data transfers occur between the module and the H3X board.
M1	—	—	Not used.
M2			
M3			
M4			

6.2.2. COD Connectivity in SD and HD

Connector Assignments

This section describes the connector assignments and layout for the video standards SD 525i, SD 625i, HD 1080i and HD 720p.

The specific connectivity for HD 3D/1080p Dual Link and 3D/1080p Single Link 3 Gbps is described in the following sections.

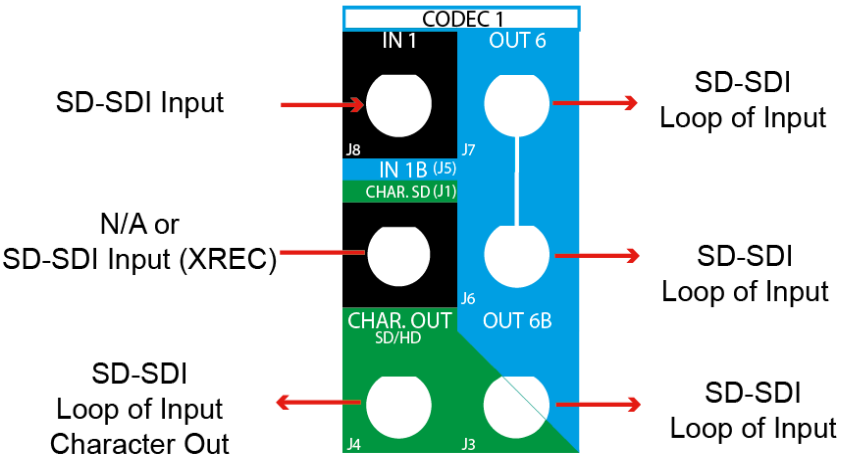
Connector	SD mode	HD mode	Connector label
J1	J5 is factory-wired to the backplane instead of J1. You can connect J1 instead of J5 if CVBS monitoring is required in SD or HD mode. SDI monitoring is no longer available on J1.		CHAR SD
	CVBS monitoring output (SD)	CVBS monitoring output (SD, down-converted)	

Connector	SD mode	HD mode	Connector label
J2	SDI monitoring output (SD)	SDI monitoring output (HD)	Not wired to the backplane. Used for onboard multiviewer input.
J3	Loop-through for the SDI input signal (SD)	Loop-through for the SDI input signal (SD, down-converted)	OUT B
J4	SDI monitoring output (SD)	SDI monitoring output (SD/HD)	CHAR OUT SD/HD
J5	Not used or SDI input (SD) in an XREC configuration	Not used or SDI input (HD) in an XREC configuration	IN B
J6	SDI program output (SD, identical to J7)	HD SDI program output (SD, identical to J7)	OUT
J7	SDI program output (SD, identical to J6)	HD SDI program output (HD, identical to J6)	OUT
J8	SDI input (SD)	HD SDI input (HD)	IN
J9	Alternate SDI input (SD, for the internal loop)	Alternate HD SDI input (HD, for the internal loop)	Not wired to the backplane. J9 of REC1 only connected to Loop connector.

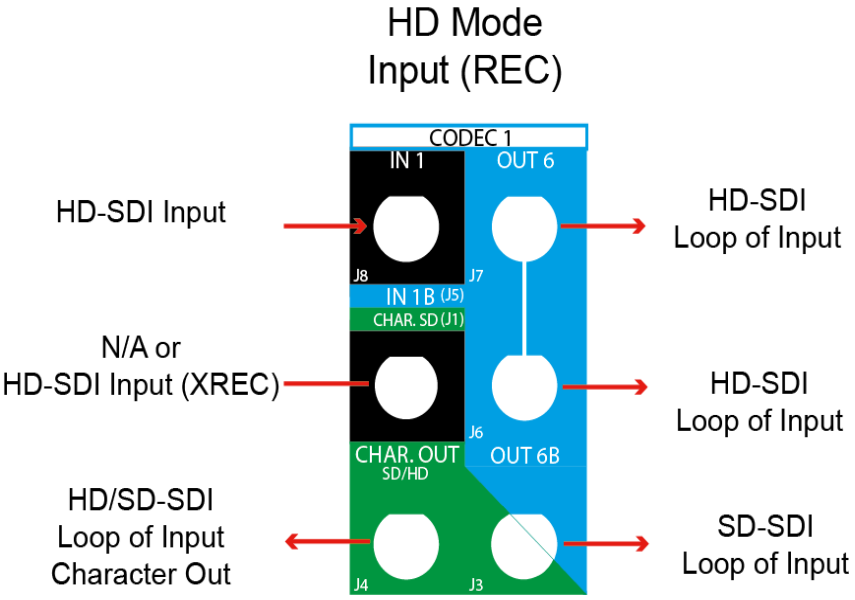
Note
The loops of the input signal are not genlocked.

Connector Layouts

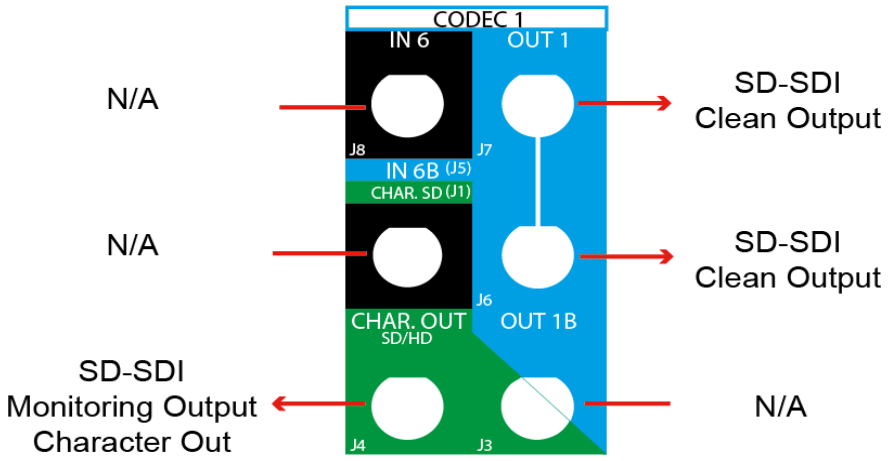
SD Mode
Input (REC)



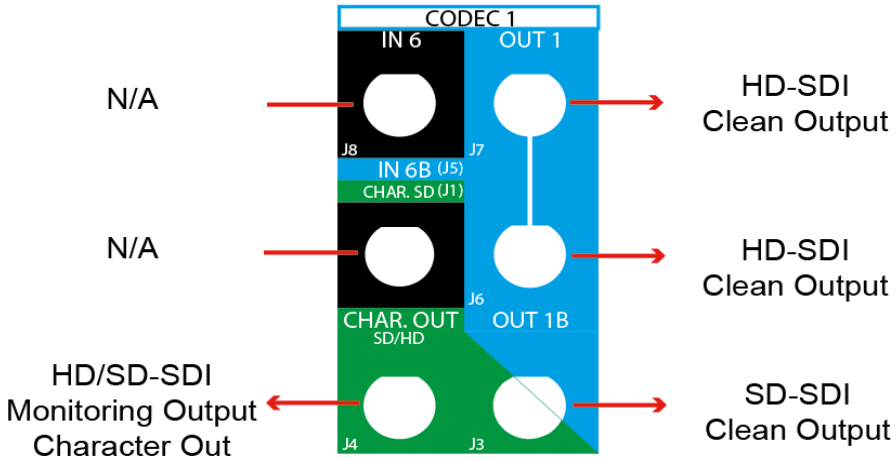
HD Mode
Input (REC)



SD Mode
Output (PLAY)



HD Mode
Output (PLAY)



6.2.3. COD Connectivity in 3D and 1080p Dual Link

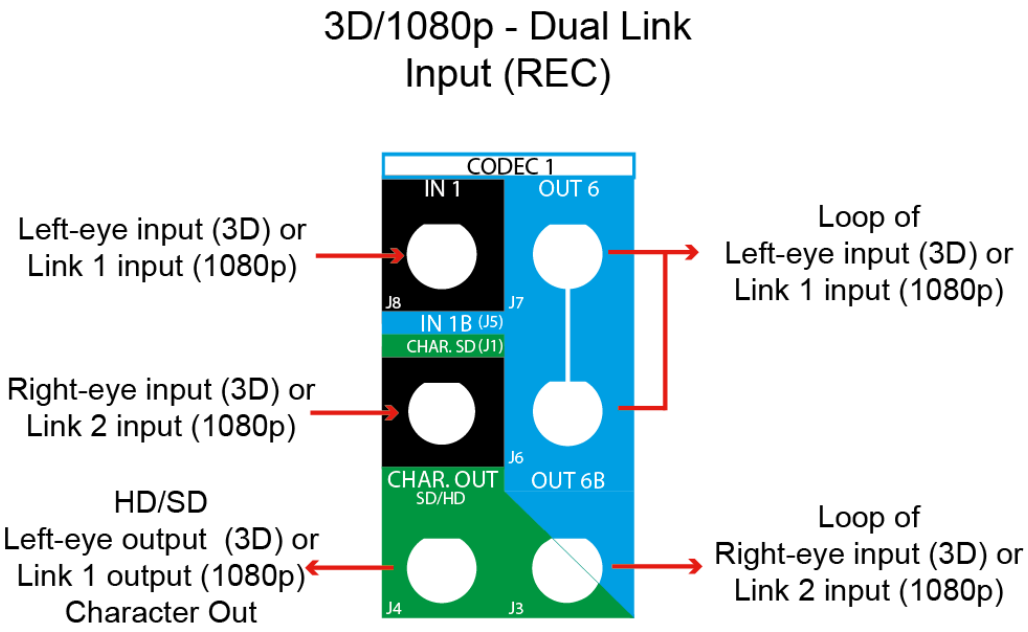
Connector Assignments

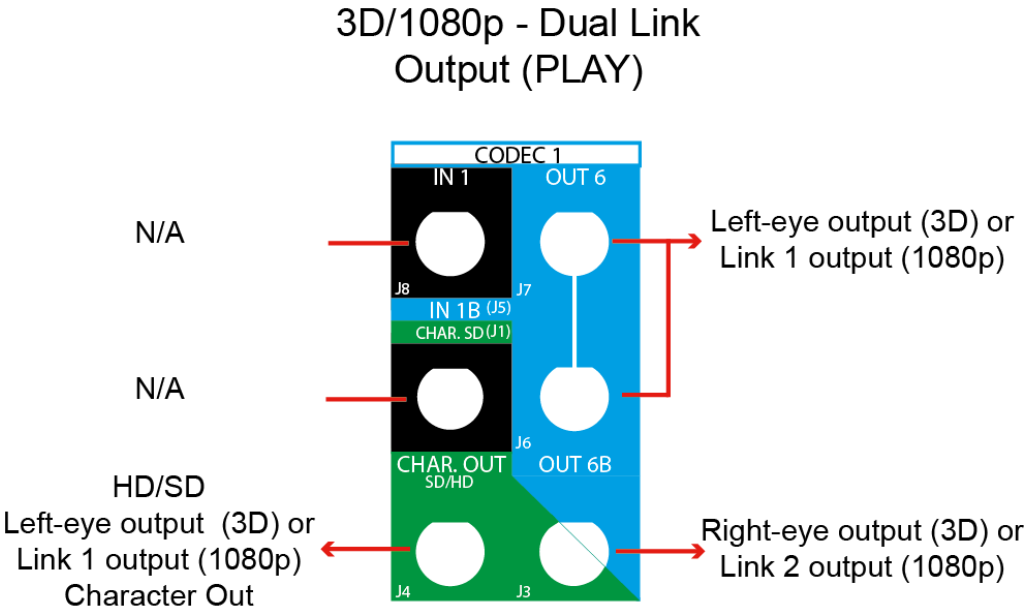
This section describes the connector assignments and layout for the video standards HD 3D and 1080p in Dual Link mode.

Connector	3D/1080p mode	Connector label
J1	N/A	CHAR SD
J2	SDI monitoring output (HD)	Not wired to the backplane. Used for onboard multiviewer input
J3	HD SDI program output for right eye (3D) or link 2 (1080p) (HD)	OUT B
J4	SDI monitoring output for left eye (3D) or link 1 (1080p) (HD/SD)	CHAR OUT SD/HD
J5	HD SDI input for right eye (3D) or link 2 (1080p) (HD)	IN B
J6	HD SDI program output for left eye (3D) or link 1 (1080p) (HD, identical to J7)	OUT
J7	HD SDI program output for left eye (3D) or link 1 (1080p) (HD, identical to J6)	OUT
J8	HD SDI input for left eye (3D) or link 1 (1080p) (HD)	IN
J9	Alternate HD SDI input (HD, for the internal loop)	Not wired to the backplane. J9 of REC1 only connected to Loop connector.

Note
The loops of the input signal are not genlocked.

Connector Layouts





6.2.4. COD Connectivity in 3D and 1080p Single Link 3G-SDI

Connector Assignments

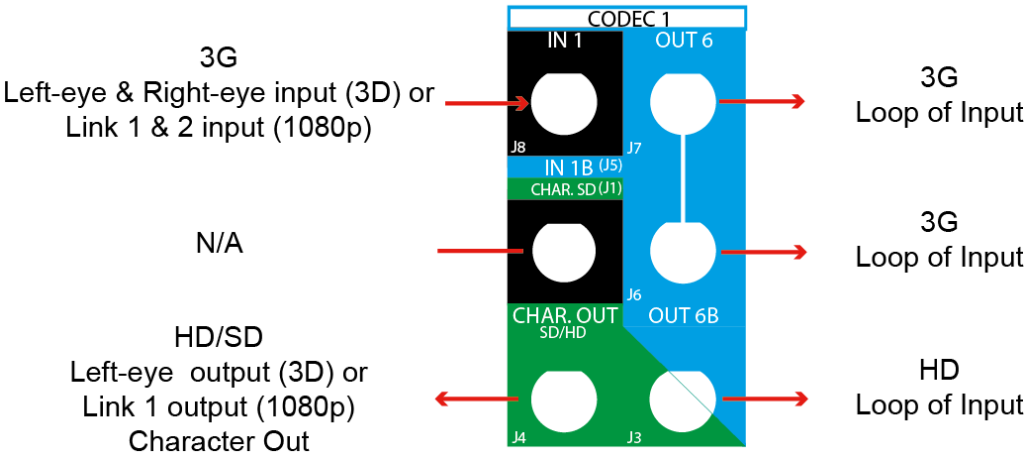
This section describes the connector assignments and layout for the video standards HD 3D and 1080p in Single Link 3G-SDI mode.

Connector	3D/1080p Mode	Connector label
J1	N/A	CHAR SD
J2	SDI program output 2D (HD)	Not wired to the backplane. Used for onboard multiviewer input
J3	SDI program output 2D (HD)	OUT B
J4	SDI monitoring output for left eye (3D) or link 1 (1080p) (HD/SD)	CHAR OUT SD/HD
J5	Not installed	IN B
J6	3G-SDI program output for left & right eyes (3D) or link 1 & 2 (1080p) (3G, identical to J7)	OUT
J7	3G-SDI program output for left & right eyes (3D) or link 1 & 2 (1080p) (3G, identical to J6)	OUT
J8	3G-SDI input left & right eyes (3D) or link 1 & 2 (1080p) (3G)	IN
J9	Alternate 3G-SDI input (3G, for the internal loop)	Not wired to the backplane. J9 of REC1 only connected to Loop connector.

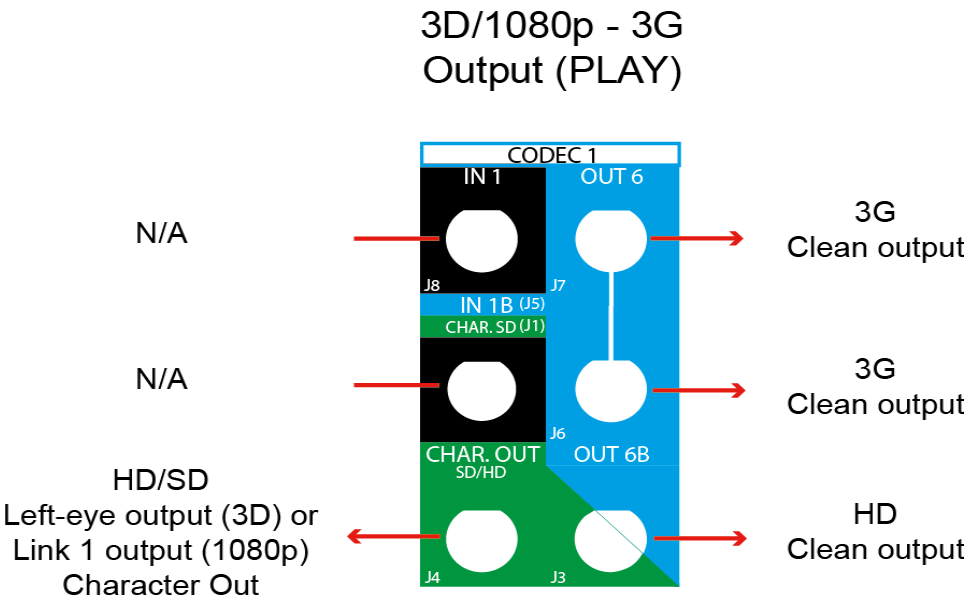
Note
The loops of the input signal are not genlocked.

Connector Layouts

3D/1080p - 3G
Input (REC)



3D/1080p - 3G
Output (PLAY)



6.2.5. COD Connectivity in SLSM 2Ph Single Link 3G-SDI

Connector Assignments

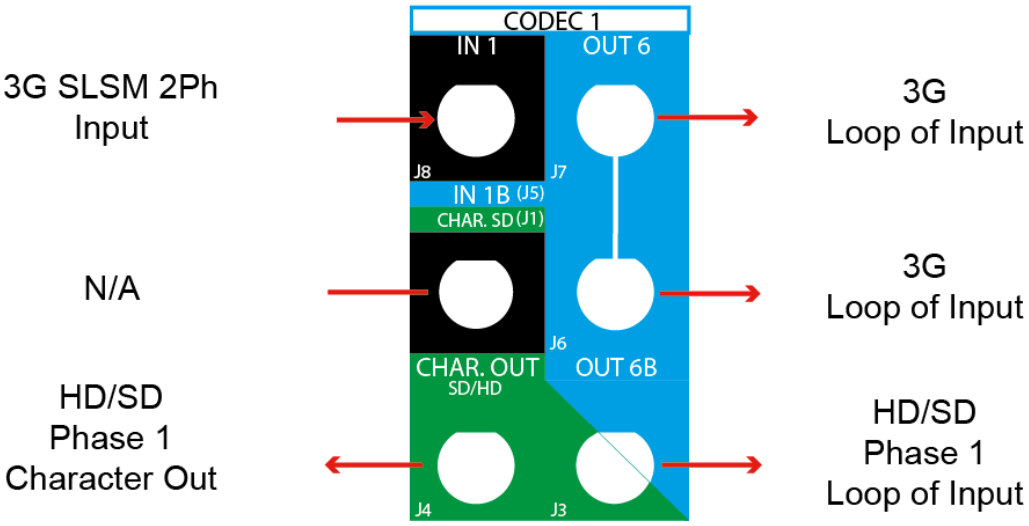
This section describes the connector assignments and layout for the SLSM 2-phase cameras in Single Link 3G-SDI mode.

Connector	SLSM 2-Phase 3G Mode	Connector label
J1	N/A	CHAR SD
J2	SDI program output (HD)	Not wired to the backplane. Used for onboard multiviewer input
J3	SDI program output of phase 1 (HD/SD)	OUT B
J4	SDI monitoring output in SLSM (HD/SD)	CHAR OUT SD/HD
J5	Not installed	IN B
J6	HD program output of phase 1 (identical to J7)	OUT
J7	HD program output of phase 1 (identical to J6)	OUT
J8	3G-SDI SLSM 2Ph input (3G)	IN
J9	Alternate 3G-SDI SLSM 2Ph input (3G, for internal loop)	Not wired to the backplane. J9 of REC1 only connected to Loop connector.

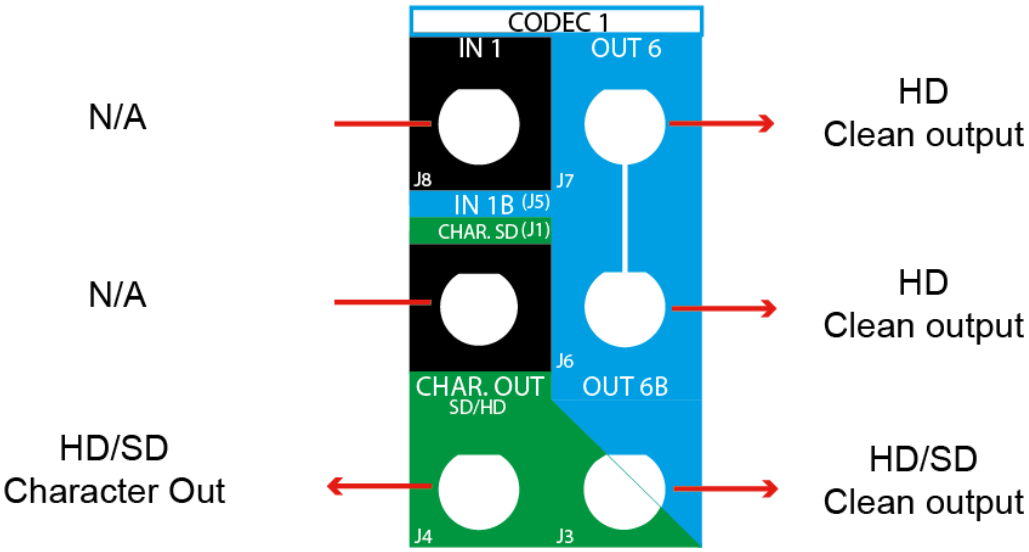
Note
The loops of the input signal are not genlocked.

Connector Layouts

SLSM 2Ph 3G
Input (REC)



SLSM 2Ph 3G
Output (PLAY)



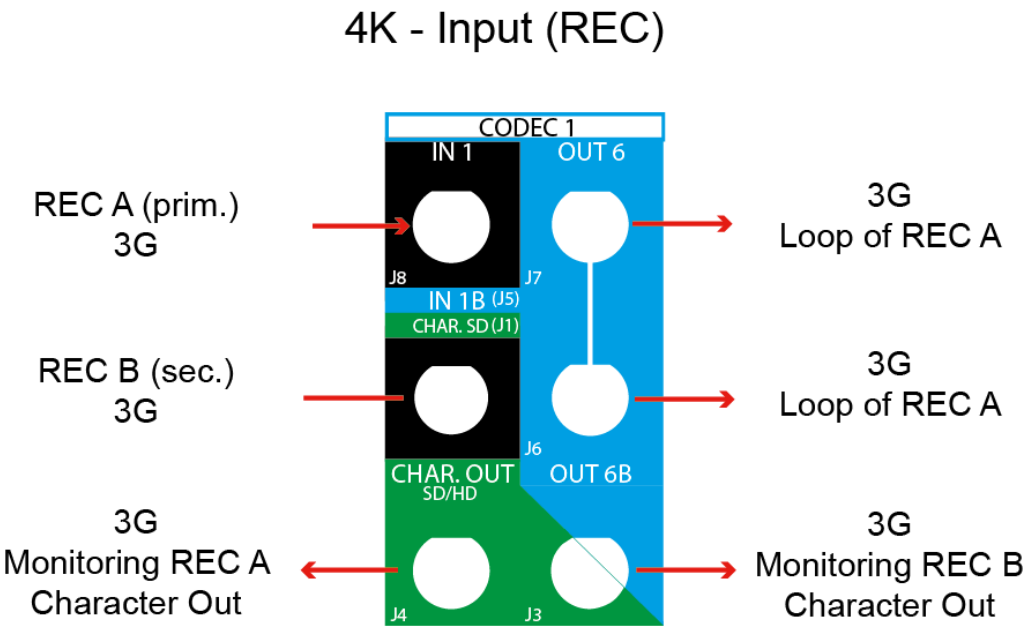
6.2.6. COD Connectivity in 4K

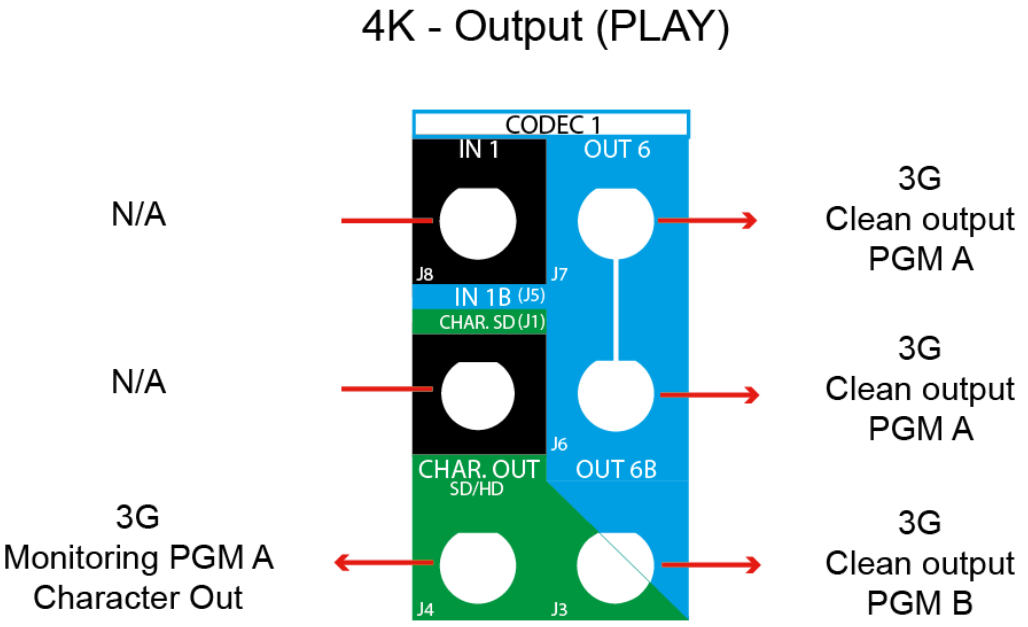
Connector Assignments

This section describes the connector assignments and layout for the 4K cameras that provide 4 x 3G-SDI connectors.

Connector	4K 3G Mode	Connector label
J1	N/A	CHAR SD
J2	N/A	Not wired to the backplane. Used for onboard multiviewer input
J3	SDI output (3G)	OUT B
J4	SDI monitoring output (3G)	CHAR OUT SD/HD
J5	3G-SDI input	IN B
J6	3G program output (identical to J7)	OUT
J7	3G program output (identical to J6)	OUT
J8	3G-SDI input	IN
J9	N/A	Not wired to the backplane.

Connector Layouts





Monitoring Limitations

The monitoring of PGM B on J3 is only possible in a 1 REC + 1 PLAY configuration.

In a 2REC + 1 PLAY configuration, the monitoring of the player 1 is only available with the internal multiviewer.

In a 1REC + 2PLAY configuration, the monitoring of the player 2 is only available with the internal multiviewer.

6.2.7. Channel Assignment

Server with Three Codec Boards (6U)

The following table shows how the channels (play or record channels) are assigned to the codec boards and connectors:

Codec Board	Codec Connector	Channel Number
Lower codec board (slot 2)	COD A	CAM F or PGM 1
Lower codec board (slot 2)	COD B	CAM E or PGM 2
Middle codec board (slot 3)	COD A	CAM D or PGM 3
Middle codec board (slot 3)	COD B	CAM C or PGM 4
Upper codec board (slot 4)	COD A	CAM B or PGM 5
Upper codec board (slot 4)	COD B	CAM A or PGM 6

Server with Two Codec Boards (4U)

The following table shows how the channels (play or record channels) are assigned to the codec boards and connectors:

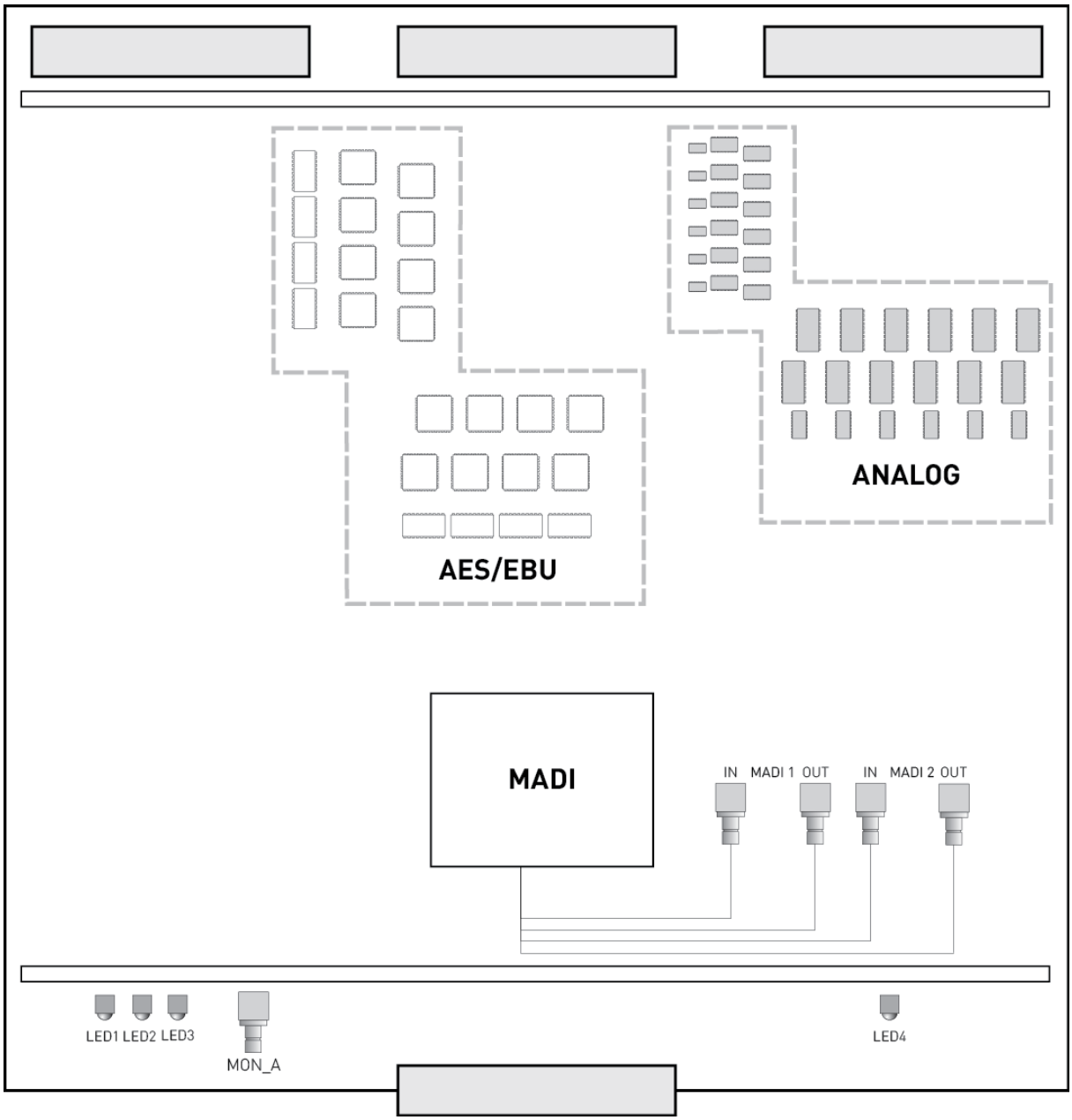
Codec Board	Codec Connector	Channel Number
Lower codec board (slot 2)	COD A	CAM D or PGM 1
Lower codec board (slot 2)	COD B	CAM C or PGM 2
Middle codec board (slot 3)	COD A	CAM B or PGM 3
Middle codec board (slot 3)	COD B	CAM A or PGM 4

6.3. Audio Codec Board

The audio codec board (A3X) is the audio interface between the V3X boards and the H3X/H3XP board. Video codec and audio codec boards are tied to the H3X/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 58 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 H3X/H3XP board.

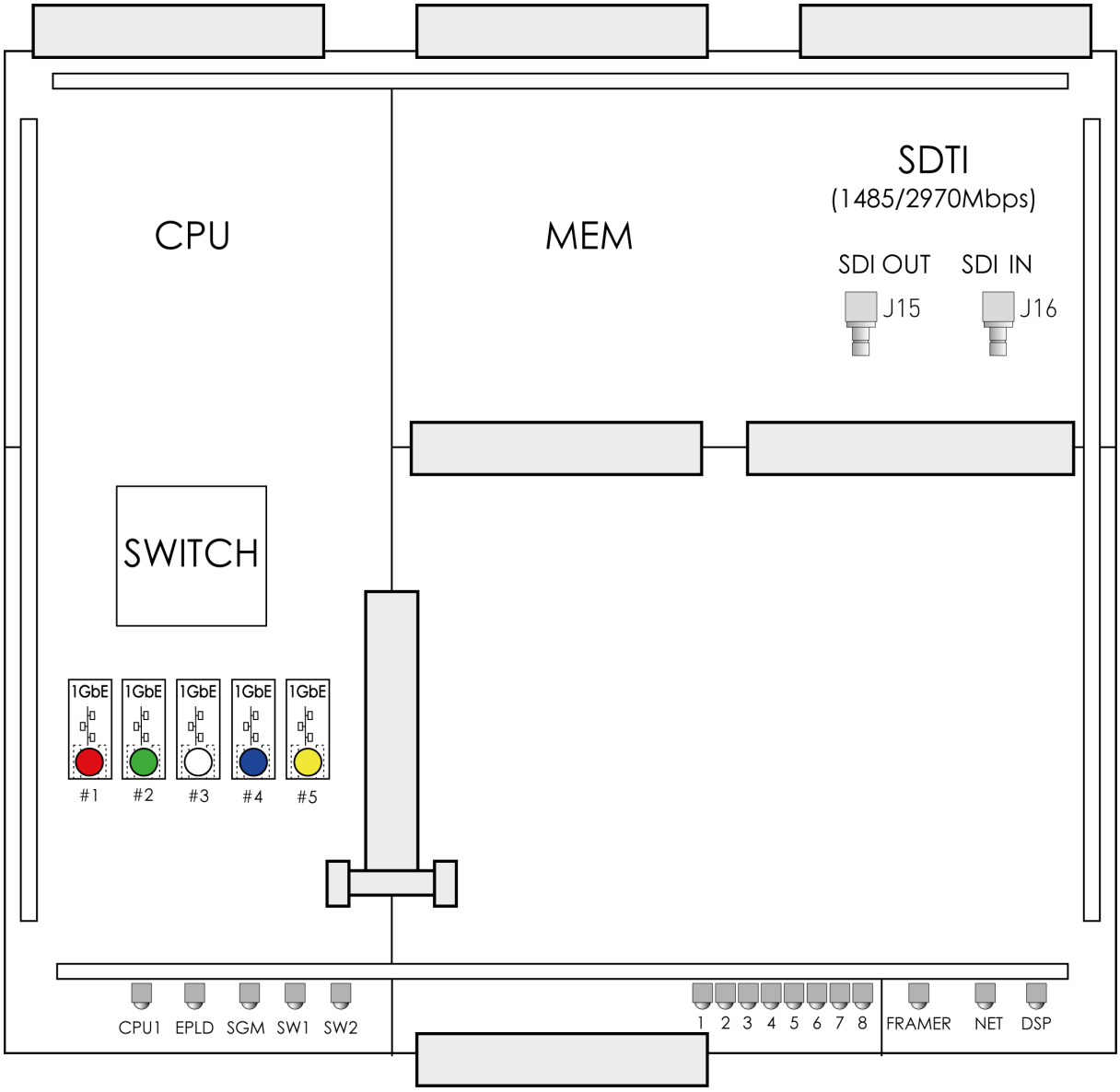


6.4. Controller Boards

6.4.1. H3XP Board

NEW ! The H3XP 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: not used currently



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 1485/2970 Mbps without relay).
J16	IN connector for XNet2 (SDTI network 1485/2970 Mbps without relay).

NEW ! 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.

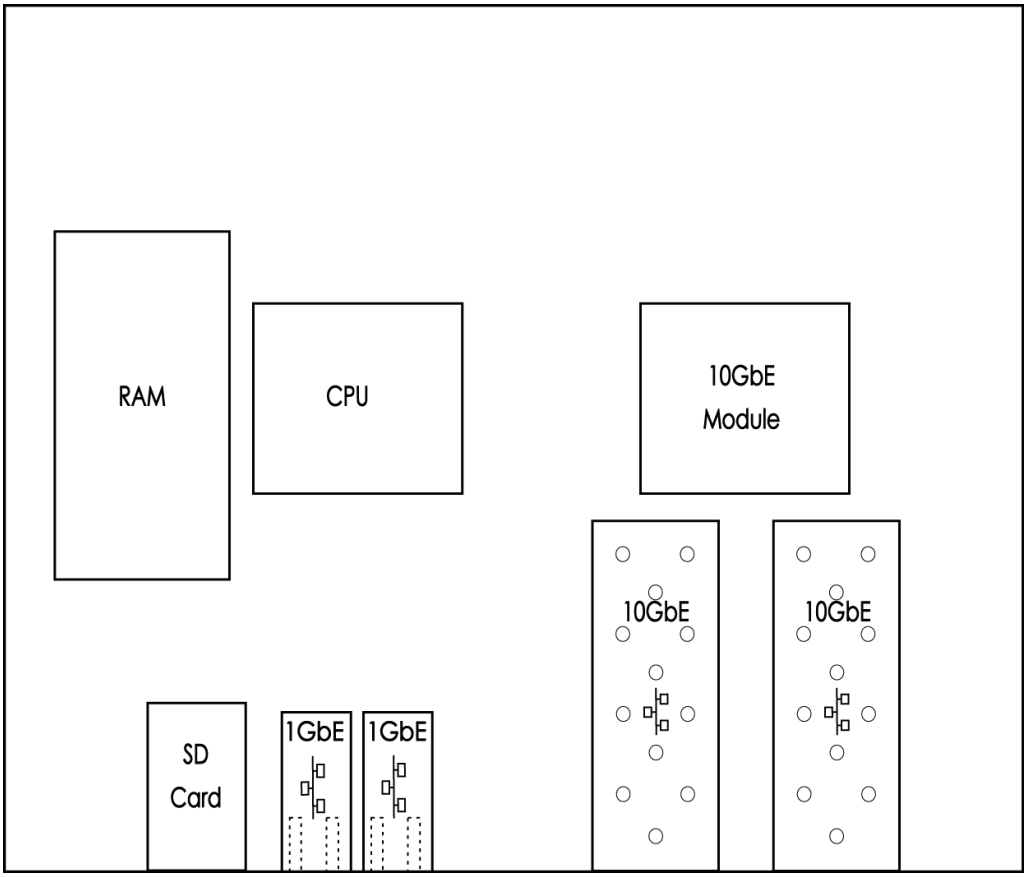
The following connectors are available on the internal switch module and need to be cabled as described below:

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

6.5. GbE Board

Schema

The following schema shows the 10GbE board and its main components on an XT3 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 73 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)

6.6. RAID Controller Boards

6.6.1. RSAS Board on SAS Disk Array

Disk Arrays on systems with H3X boards have a controller on the disk array board.

Different configurations can be used

- One internal array with a series of 6 disks
- One internal array with two stacked series of 6 disks,
- No internal storage

LEDs on Internal Array

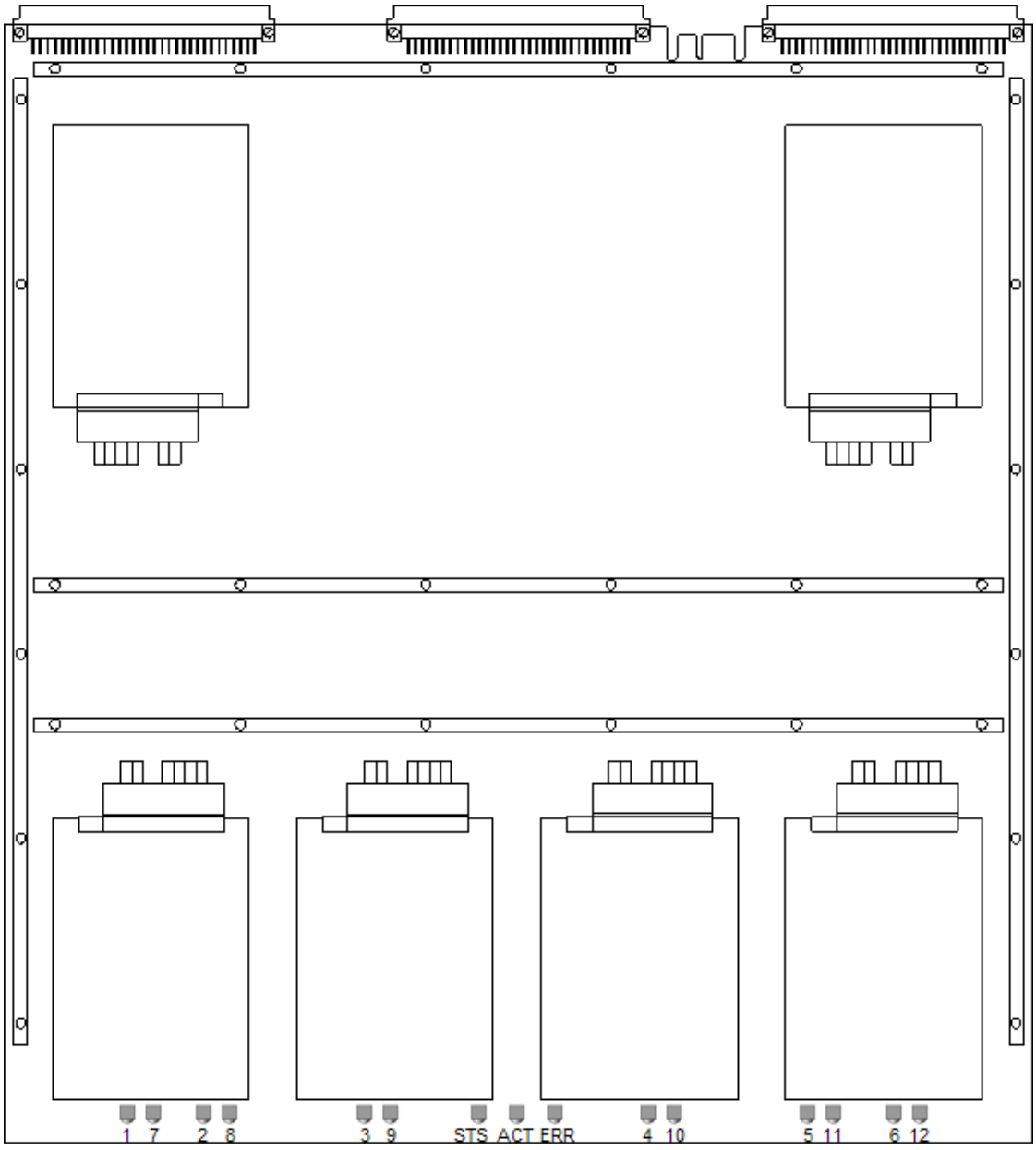
LEDs 1 to 6 are used in case of one internal array of 6 disks.

LEDs 7 to 12 are used for the upper series of disks in case of one internal array of 2x6 disks.

LEDs correspond to the disks as schematized as followed:

upper	7			12
lower	1			6
upper	8	9	10	11
lower	2	3	4	5

LED	Status	Function
Disk LEDs	Off	the corresponding disk is not started (not spinning)
	On, fast blinking (green)	the corresponding disk is starting (spinning)
	On, steady (green)	the corresponding disk is started and used in the RAID array
	On, slowly blinking (green)	the corresponding disk is started but not used in the RAID array
STS	On (green)	the RSAS RAID controller is properly booted.
ERR	On (red)	errors occur during the data transfer between the RAID controller and the disks



6.6.2. 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.

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.
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.

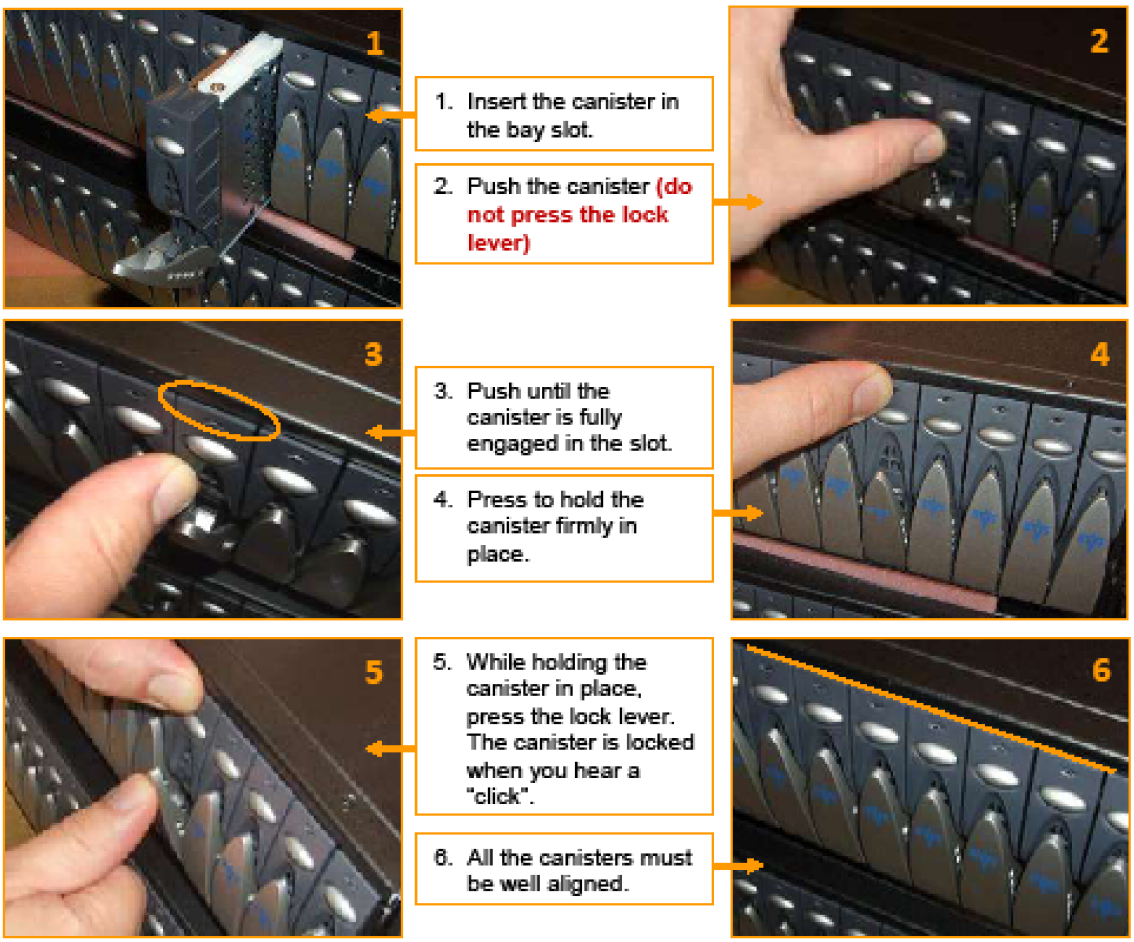
Sound Alert on External Array

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.

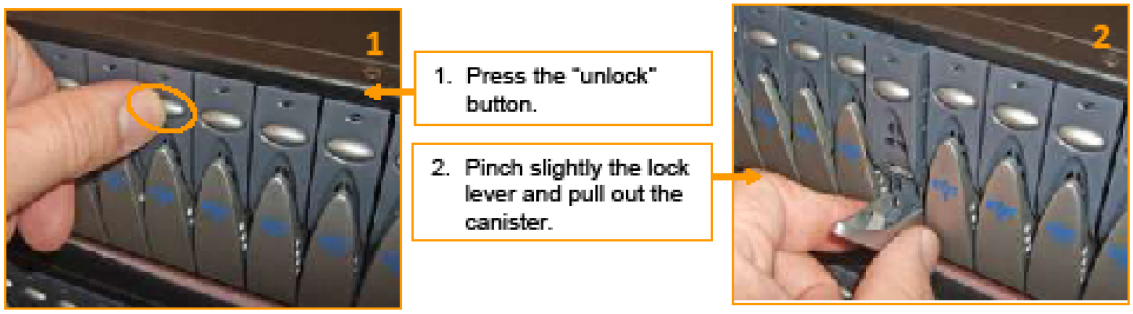
Disk Insertion and Removal

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

1. **How to insert**



2. **How to remove**



6.7. 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.

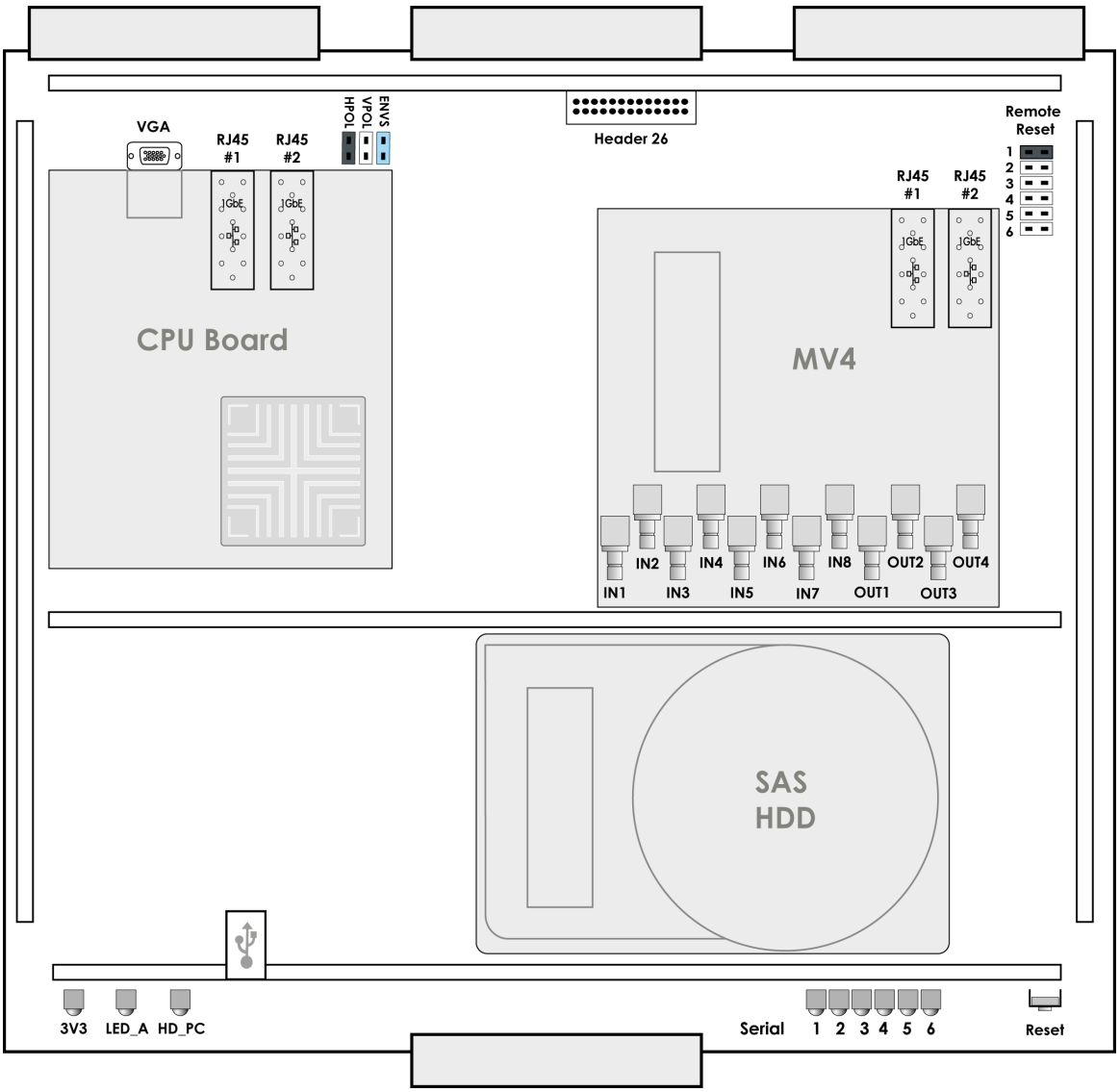
The following MTPC board is used:

- 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 the system partition is always set to 2 GB. The remaining capacity of this drive is not used.
- 256 MB SDRAM (or higher) to suit the system requirements from Multicam 12.00. Please contact EVS support for RAMs upgrade. Do not use standard PC RAM modules.

Illustration



NEW !

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.
IN1-6	The connectors IN1 to IN6 of the multiviewer board are connected to the J2 connectors from the CODEC modules of the V3X board.
IN7-8	The connectors IN7 and IN8 of the multiviewer board are connected to the Multiviewer I1 and I2 connectors IN on the rear panel of the server.
OUT1-4	The OUT1 connector of the multiviewer board is connected to the Multiviewer O1 connector on the rear panel of the server, and so on for the other connectors.

HS873 Motherboard

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.

NEW !

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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