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Improvement Requests

Your comments will help us improve the quality of the user documentation. Do not hesitate to send improvement requests, or report any error or inaccuracy on this user manual by e-mail to doc@evs.tv.

Regional Contacts

The address and phone number of the EVS headquarters are usually mentioned in the Help > About menu in the user interface.

You will find the full list of addresses and phone numbers of local offices either at the end of this user manual (for manuals on hardware products) or at the following page on the EVS website: http://www.evs.tv/contacts.

User Manuals on EVS Website

The latest version of the user manual, if any, and other user manuals on EVS products can be found on the EVS download center, on the following webpage: http://www.evs.tv/downloadcenter.

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What's New?

The new features added on release 11.01 do not have an impact on the hardware technical reference manual of this EVS server.

The manual has however been subject to slight changes to reflect the current situation:

Section	Description
4.4	References to SCSI disks have been removed as such disks are no longer mounted on new servers.
6.4	References to and description of HCTX boards have been removed as such boards are no longer mounted on new servers.
6.5.1	The type of the MTPC board mounted on new servers is HS873.
4.1	New references to SMPTE standards .
4.2 - 5.2	Corrections in available audio configurations.
5.6.3	Update in the list of supported switches

Note

This version of the technical reference manual does not include the changes that will result from the introduction of new server chassis in the coming months. These will be taken into account in a future version of the manual.

1. Overview

1.1. Presentation

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

The EVS XTnano servers are full digital in PAL (625i), NTSC (525i), 720p, and 1080i 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.

The XTnano servers are 4-channel HD/SD slow motion replay servers from EVS. Optimized for multiple applications, such as ingestion of audio/video files, live feed recording, live slow motion and super motion, clipping and playlist playout control, XTnano servers offer a flexible configuration (2 REC and 2 PLAY channels for preview and program control, or 3 REC and 1 PLAY channel).

XTnano servers natively support DVCPRO HD and DVCPRO 50 codecs, and with its GigE networking capabilities, A/V files can be played and simultaneously transferred to other EVS servers, as well as all standard NLE and archive systems.

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.

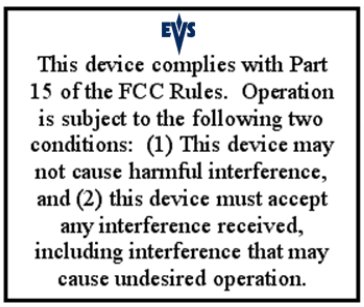
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

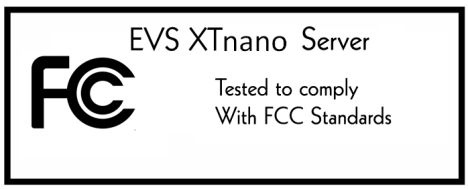
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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

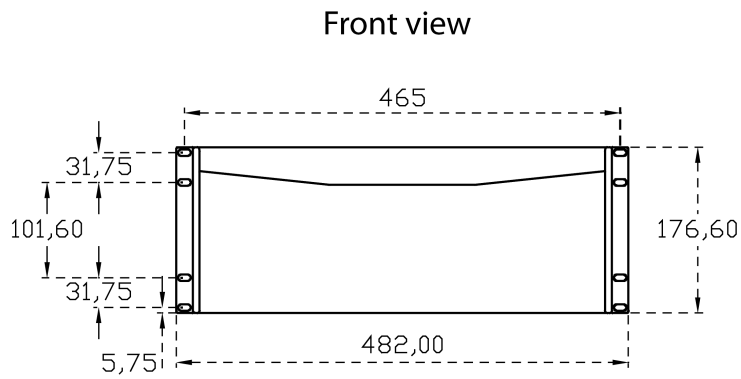
Weight

4U - 19 inches chassis 30 kg / 66.15 lb

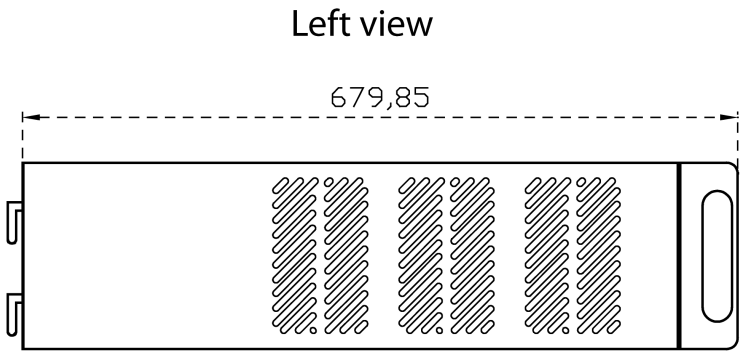
Dimensions

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

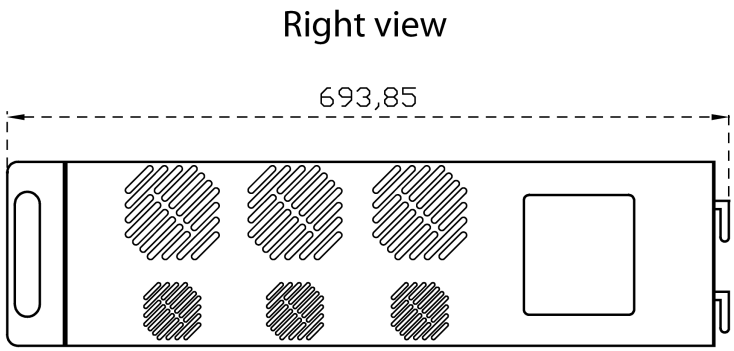
Front view



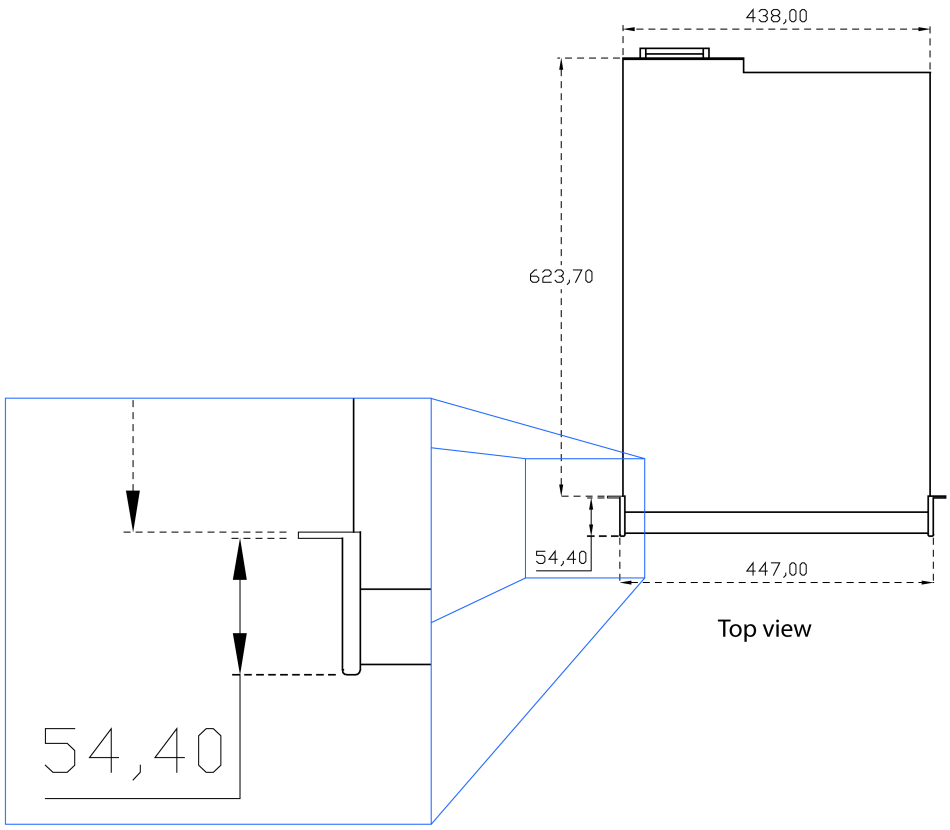
Left view



Right view



Top view

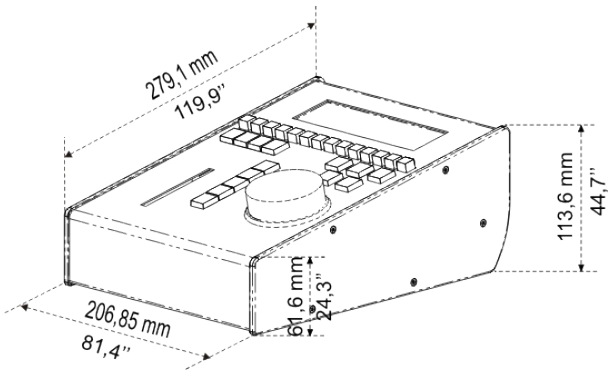


3.1.2. Control Devices

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

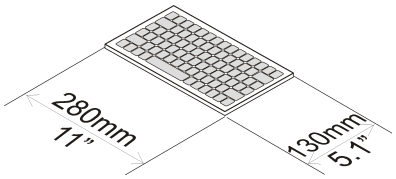
Nano Remote Control Panel

Weight: 3.4 kg / 7.5 lb.



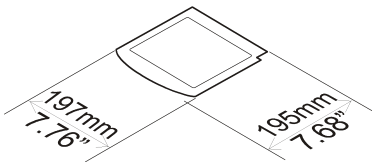
Keyboard

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.

3.3. Environmental Conditions

Operating

- Temperature: 10°C to + 50°C (50°F to 122°F) ambient with free air flow
- Relative humidity: 0% to 90% (non-condensing)
- Cooling requirements: Forced air cooling air flow from front to back
- 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 XTnano server.

	Standard Definition	High Definition
Video Formats	525i 59.94fps (NTSC) 625i 60fps (PAL)	720p 50/59.94fps 1080i 50/59.94fps
Digital Interface	10-bit 4:2:2 Serial (ST 259:2008). Full frame synchronizer at input.	10-bit 4:2:2 Serial (ST 292-1:2011). Full frame synchronizer at input.
Number of channels	4 channels, reversible REC/PLAY	4 channels, reversible REC/PLAY
Monitoring & Down-converters	1 CVBS per channel, with OSD	1 dedicated HD SDI output with OSD per channel
Reference	analog Black Burst	analog Black Burst and HD Tri-Level Sync
Graphics Board	n.a.	n.a.

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
Dual Link 1.5 Gb/s (1080p)	ST 372:2011
Mapping of Audio Metadata into Vertical Ancillary data	ST 2020-2:2008, ST 2020-3:2008

4.2. Audio Specifications

Audio Analog and Digital Configurations

The following optional audio configurations are available:

- **Configuration BNC AES/EBU + DB15 Analog:**
  - 16 input and 16 output (8 pairs + 8 pairs) AES/EBU or Dolby E unbalanced on 16 BNC connectors
  - 8 input and 8 output analog balanced channels on 4 DB15 connectors
- **Configuration DB15 AES/EBU + DB15 Analog:**
  - 16 input and 16 output (8 pairs + 8 pairs) AES/EBU or Dolby E on 4 DB15 connectors
  - 8 input and 8 output analog balanced channels on 4 DB15 connectors

Additional Audio Specifications

- 4 additional analog balanced output channels for monitoring
- All audio connectors on mainframe

- Up to 64 embedded audio channels (4*16 audio mono channels per video channel)
- Up to 48 embedded audio channels (6*8 audi mono channels per video channel) in configurations with 2 recorders per codec module (2R/CM)

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 XTnano server uses an intra-frame video encoding technique. It supports natively the following video codecs:

Codec	SD	HD	Code Protection
DVCPro 50	√	-	Code 9
DVCPro HD	-	√	Code 8

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 and DVCPro codecs defined bitrates for high definition.

4.3.2. Maximum bitrates

These maximum values are valid for XTnano servers running Multicam version 11.00 or 11.01. They guarantee a smooth play and a browse at 100% speed on all channels simultaneously.

Codec	Format	2 ch	4 ch
DVCPro 50	PAL	50	50
	NTSC	50	50
DVCPro HD	PAL	100	100
	NTSC	100	100

4.3.3. 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).

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

The original video signal:

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

The output video signal at 50% speed:

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

The output video signal at 33% speed:

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

The output video signal at 25% speed :

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

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

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

2-Line Interpolator

The 2-line interpolator actually generates a new field, when the original field is in parity violation. Each line of this new field is calculated by a weighted average of the 2 neighboring lines. This process solves the problem of parity violation and vertical jitter, but the drawback is a reduction of the vertical resolution on the interpolated fields, that appear unfocused. Another by-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 use 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 got 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 SuperLSM configuration in which 4-line interpolator mode is enabled.

4.4. Recording Capacities

Disk Storage

The maximum internal disk storage available on SAS disks, is as follows:

- 6 (5+1) x 300 GB or 900 GB SAS disks.

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 table shows the recording capacity, in hours:

- for a SAS (5+1) disks raid configuration in 50Hz and 59.94 Hz
- for 1 record channel, that is 1 video + 4 stereo audio tracks in SD; 1 video + 8 stereo audio tracks in HD
- in DVCPro 50 and DVCPro HD
- with the **Operational Disk Size** parameter set to 100%.

# Disks	Disks size (GB)	# Usable disks	Capacity (GB)	DVCPro 50 (50Mbps) (hours)	DVCPro HD (100Mbps) (hours)
5	300	4	1200	48	23
6	300	5	1500	60	29
5	900	4	3600	144	69
6	900	5	4500	180	87

5. Hardware Installation and Cabling

5.1. Rack Installation

5.1.1. 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.

5.1.2. 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.

5.1.3. Boards Checking

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

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

5.2. Rear Panel Description

5.2.1. Rear Panel Configurations

The XTnano server is available in one configuration but various rear panel variants:

- 4U rack with 4 channels and various audio connectors.

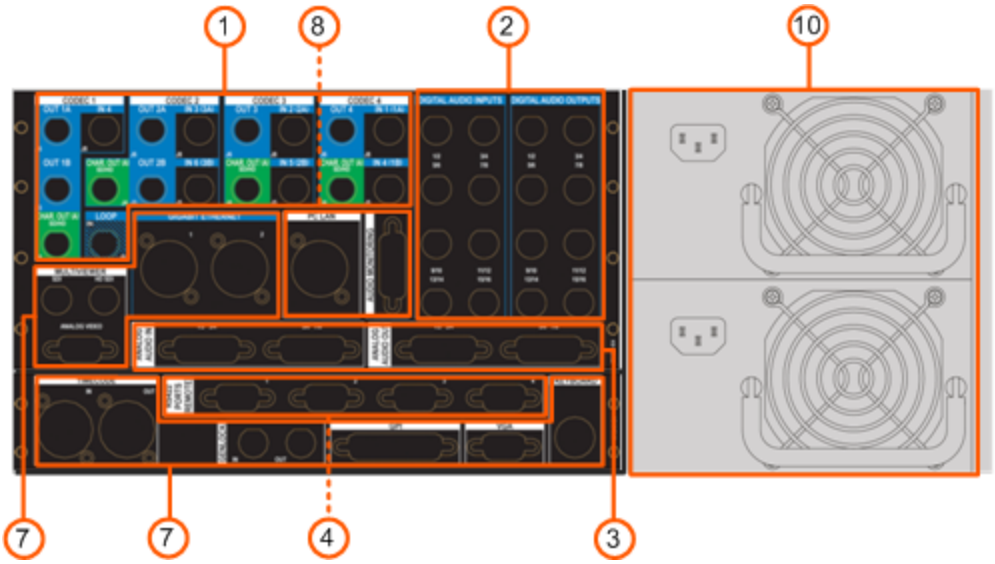
The different connectors positions and types for each of these variants are described in the following topics.

5.2.2. 4U Rear Panel Layout

Rear Panel Areas

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

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

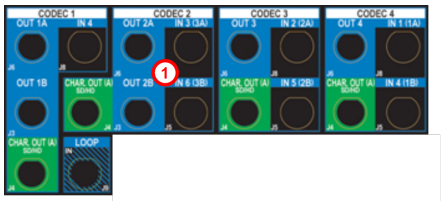


Video and Codecs ①

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 35 for more details on each connector specific usage according to the different configurations.

The following video and codecs connectors layouts are available according to your configuration:

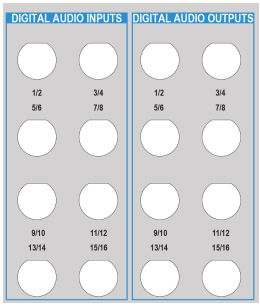
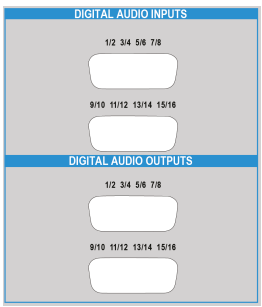
Config	Layout	Description
All		4 channels version

Digital Audio ②

The digital audio inputs and outputs are available on BNC or on multi-pin (DB15) connectors for audio signals input and output in digital format.

See section "Audio Connections" on page 21 for more details on the DB15 connector pinout according to the different configurations.

The following digital audio connectors layouts are available according to your configuration:

Config	Layout	Description
BNC		• 16 BNC connectors (8 in and 8 out)
DB15		• 4 multi-pin DB15 connectors (2 in and 2 out)

Analog Audio ③

The analog audio inputs and outputs are available on multi-pin (DB15) connectors for audio signal inputs and outputs in analog format.

See section "Audio Connections" on page 21 for more details on the DB15 connectors pinout according to the different configurations.

The analog audio connectors layout is as follows:

Config	Layout	Description
All		• 4 multi-pin DB15 connectors (2 in and 2 out)

RS422 Ports ④

The RS422 ports allow the server to be remotely controlled through remote panels or third-party control devices.

In Spotbox mode, the remote panel, if used, should be connected on the first RS422 port.

The RS422 connectors layout is as follow:

Config	Layout	Description
All		4 connectors

Controls and Communications ⑦

This rear panel part presents some or all of the following connectors according to your configuration:

- The **Ref Video** connectors allow the server to receive or send back the analog genlock reference signal.
- The **XNet2** connectors allow the interconnection of EVS servers, XF2, 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 **Multiviewer** connectors allow a monitor to be connected directly to the server, and to display PGM and REC channels as configured in the Multicam Configuration window, in the Monitoring tab, Multiviewer page. See the Multicam Configuration manual for a description of the configuration parameters.
- The **Loop IN** connector allows the loop of PGM1 on REC1 to be able to use the loop feature.
- The **Timecode** connectors allow the server to receive or send back the LTC timecode reference signal.
- The **Gigabit Ethernet** connectors allow the interconnection of servers, other EVS, and/or third-party systems into a Gigabit Ethernet network.
- The **RS232** connector allows a tablet to be connected to the server.
- The **Multiviewer** connector provides an analog Multiviewer output on a DB15 connectors, that can be configured in CVBS, RGB HD or YUV HD.
- 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 **Console** connector allows a monitor and a keyboard to be connected to the server.

Controls and Communications ⑧

This rear panel part presents some or all of the following connectors according to your configuration:

- The **PC LAN** connector is a XLR connector that enables the connection to the PC LAN network.
- The **Audio Monitoring Outputs** connectors are AES XLR connectors that allow audio output connections for monitoring purposes.

Power Supplies ⑩

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, Supported Configuration chapter.

5.4. Audio Connections

5.4.1. Audio Channels

The XTnano server manages up to 64 embedded 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 your server configuration you can find the following audio connectors on the rear panel:

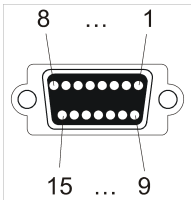
- Digital audio:
  - DB15 connectors: 16 inputs and 16 outputs (110 Ohm balanced).
  - BNC connectors: 8 inputs and 8 outputs (75 Ohm unbalanced).
- Analog audio:
  - DB15 connectors: 16 inputs (high-Z balanced) and 16 outputs (600 Ohm drive capable - breakout cables with XLR connectors available).
- Audio monitoring :
  - DB15 connector: 4 analog mono outputs (600 Ohm drive capable).

See also section "Audio Specifications" on page 11 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 DB15 Pinout

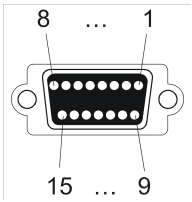
The digital audio DB15 connector is illustrated hereunder (connector installed on the rear panel and viewed from outside). Its pinout is described in the following table where each column corresponds to one of the 4 available connectors.



Pin #	DB15 connector #1 Inputs 1-8 (mono)	DB15 connector #2 Inputs 9-16 (mono)	DB15 connector #3 Outputs 1-8 (mono)	DB15 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 DB15 Pinout

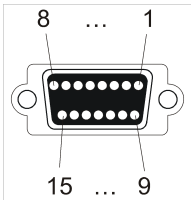
The analog audio DB15 connector is illustrated hereunder (connector installed on the rear panel and viewed from outside). Its pinout is described in the following table where each column corresponds to one of the 4 available connectors.



Pin #	DB15 connector #1 Inputs 1-4 (mono)	DB15 connector #2 Inputs 5-8 (mono)	DB15 connector #3 Outputs 1-4 (mono)	DB15 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 DB15 Pinout

The monitoring audio DB15 connector is illustrated hereunder (connector installed on the rear panel and viewed from outside). Its pinout is described in the following table.



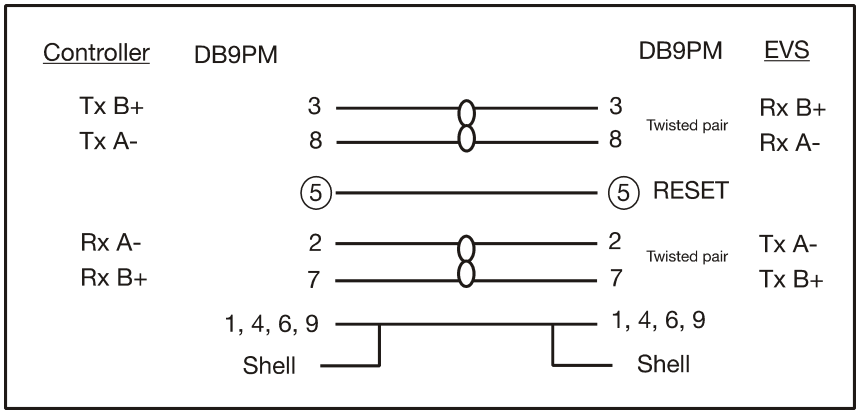
Pin #	DB15 connector Outputs 1-4 (mono)
1	Gnd
2	Analog output 1 +
3	Gnd
4	Analog output 2 +
5	Gnd
6	Analog output 3 +
7	Gnd
8	Analog output 4 +
9	Analog output 1 -
10	Gnd
11	Analog output 2 -
12	Gnd
13	Analog output 3 -
14	Gnd
15	Analog output 4 -

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

5.6. Gigabit Network

5.6.1. Functional Overview

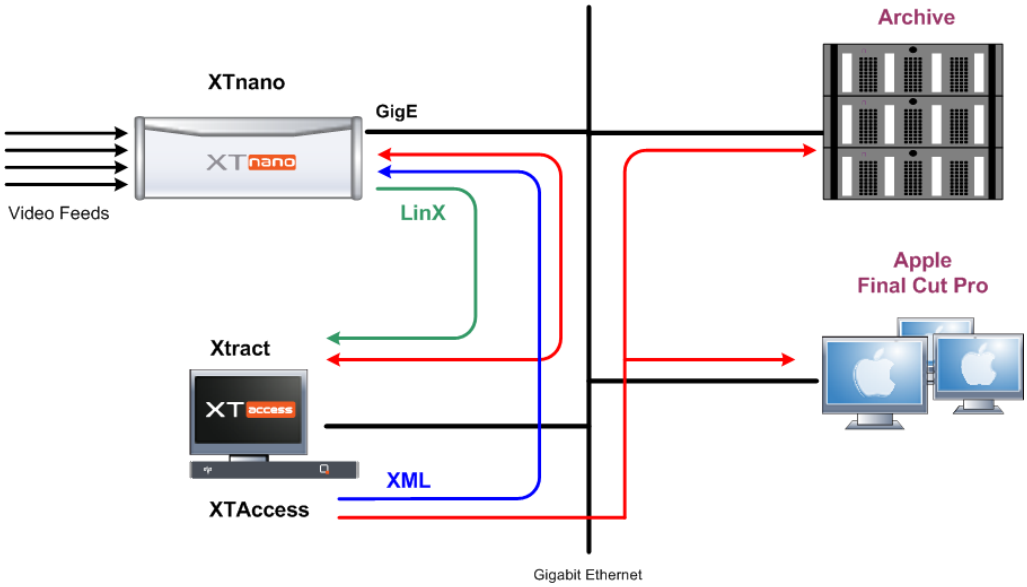
The Gigabit connection makes it possible to transfer video and audio material from your XTnano server to external systems via the TCP/IP network.

The external systems can be the following:

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

However, the external systems cannot read the raw files coming from a XTnano server. For this reason, XTAccess is used as a “gateway” between your server and the IT world.

Moreover, the XTnano is not able to directly send commands to the XTAccess. Consequently, a backup tool called Xtract is used as the interface to send commands to the XTAccess for file transfer operations and wrapping.



XT Access is directly connected to the XTnano servers through the Gigabit network. It runs on an XP workstation and is controlled, in this context, by Xtract via XML files.

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

- Backup of clips from an XTnano server.
- Restore of clips to an XTnano server.

Please refer to the Xtract user manual for more information on the backup from and restore of clips to the XTnano, using the Gigabit network, in combination with Xtract and XTAccess.

5.6.2. Important Rules

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

- The hardware used on GigE networks with EVS servers need to support jumbo frames.
- Both GigE ports of an EVS server need to be defined on different sub-networks.
- Teaming between the GigE1 and GigE2 ports is not possible.
- This is not possible to implement failover through the GigE network.
- The GigE 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 GigE port.

5.6.3. Switches

Supported Switches

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

The following models of 19-inch Gigabit switches have been validated for use with EVS workflows:

- HP Procurve 2510G-24
- Cisco Catalyst 2960S-24TD/2960S-48TD/2960S-24TS/2960S-48TS
- Cisco Catalyst 3750X-24TS/3750X-48TS

Comparison

The models HP Procurve 2510G-24, Cisco Catalyst 2960S-24TS and 2960S-48TS can be used for small setups where no inter-VLAN routing is needed.

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 GigE ports of the XTnano servers or/and several ports on the SANs are often used to increase the bandwidth or to allow redundancy. Since both GigE ports of an XTnano 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.

A switch of the Cisco Catalyst 3750X series should be used on larger setups as they support jumbo frames, allow traffic to be routed between different VLANs and provide stacking capabilities.

The following table gives an overview on the supported switches:

Model/Product Number	R-U	Gb ports	Uplinks	JF switching	JF routing	Stacking	Dual PS
HP Procurve 2510G-24	1	20 (+4)	4x1G SFP	Y	N	N	No
Cisco Catalyst WS-C2960S-24TD-L	1	24	2x10GIG SFP+ or 2x1G SFP	Y	N	Y	No
Cisco Catalyst WS-C2960S-48TD-L	1	48	2x10GIG SFP+ or 2x1G SFP	Y	N	Y	No
Cisco Catalyst WS-C2960S-24TS-L	1	24	4x1G SFP	Y	N	Y	No
Cisco Catalyst WS-C2960S-48TS-L	1	48	4x1G SFP	Y	N	Y	No
Cisco Catalyst WS-C3750X-24TS	1	24	Optional module	Y	Y	Y	Optional
Cisco Catalyst WS-C3750X-48TS	1	48	Optional module	Y	Y	Y	Optional

A layer 2 device can be used when all machines are configured to be on the same LAN, when another layer 3 device is present to do the routing if needed, or when no routing between VLANs is needed.

The following table gives the list of available uplink modules for the Cisco Catalyst switches of the WS-C3750X series:

Product Number	Description
C3KX-NM-1G	Four GbE port network module
C3KX-NM-10G	Two 10GbE SFP+ ports and Two SFP ports network module
C3KX-NM-10GT	Two 10GB-T ports network module

Additional Information

HP switches have a lifetime guarantee with next-business-day advance replacement with no additional contract purchase.

HP switches are not compatible with Cisco's proprietary protocols (ISL, PagP, PVST, etc.) which could be a problem for integration in some legacy Cisco environment. However, such a case is quite unlikely to arise and most of the time workarounds can be found.

The stacking possibilities of the Cisco 3750X series permit to have fully active LACP teams for redundancy to the hosts.

5.7. GPIO Connections

5.7.1. GPIO Connector Pin-Out

The following table lists the GPIO connector pin-out:

1	Relay Out 4	14	Relay Out 4
2	Relay Out 3	15	Relay Out 3
3	Relay Out 2	16	Relay Out 2
4	Relay Out 1	17	Relay Out 1
5	IN + opto 4	18	IN - opto 4
6	IN + opto 3	19	IN - opto 3
7	IN + opto 2	20	IN - opto 2
8	IN + opto 1	21	IN - opto 1
9	I/O TTL 8	22	GND (Return I/O 8)
10	I/O TTL 7	23	GND (Return I/O 7)
11	I/O TTL 6	24	GND (Return I/O 6)
12	I/O TTL 5	25	GND (Return I/O 5)
13	+ 5 V 50 mA max.		

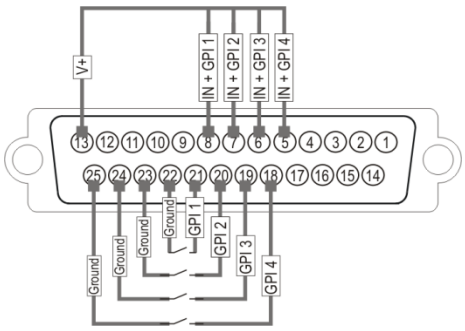
5.7.2. GP In Connections

GPI Triggers

The allocation of the XTnano 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



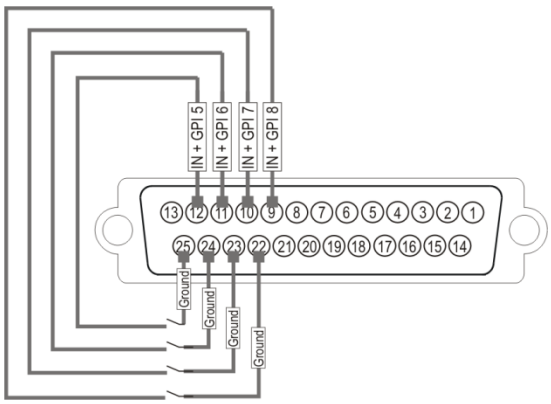
Specifications

- 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)

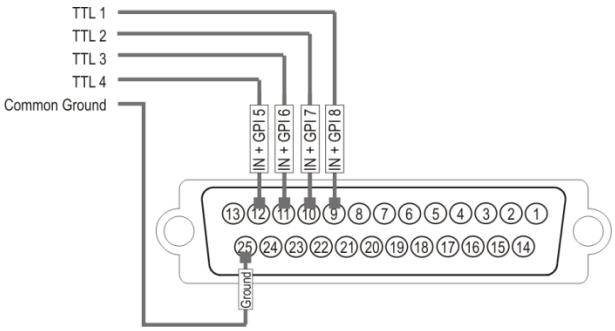
Relay Inputs Pin-Out



The relay must be connected between the ground and the corresponding TTL input on the DB25.

TTL Inputs Pin-Out

Each TTL input on the DB25 is directly connected to the pin of the TTL connector on the device triggering the GPI. The ground must be common between the DB25 connector of the XT3 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)

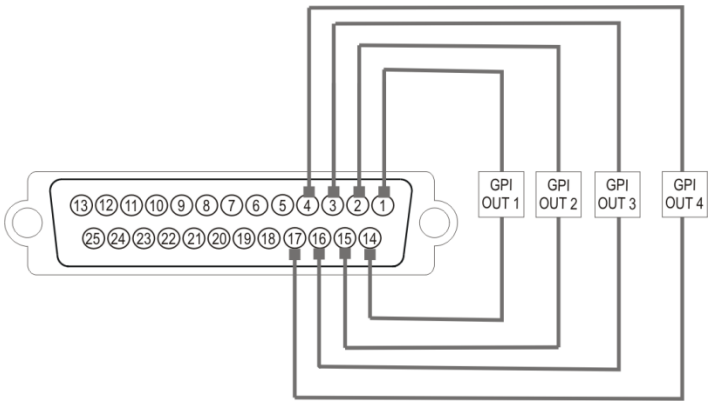
5.7.3. GP Out Connections

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 (pages 8.3 & 8.4)
- IP Director settings (GPI and Auxiliary Track tab)

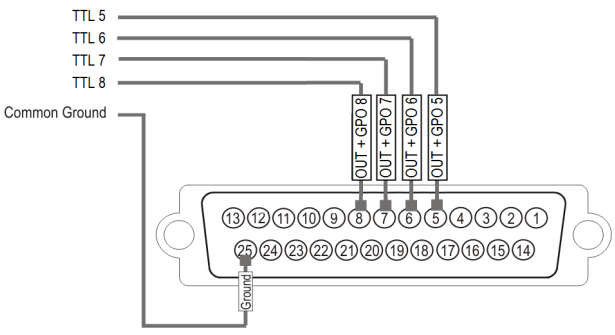


Specifications

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

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

4U Rack

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

6.2. V3X Video and Reference Boards

6.2.1. Description

The V3X board is divided in 3 parts: a base board identified as COHX base (rear section and center extension), and two modules identified as COD A V3X (front left) and COD B V3X (front right).

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.

They support the following new feature(s):

- Full resolution 3D HD on a single V3X module (Dual Link HD SDI)

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 back of the COHX 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.

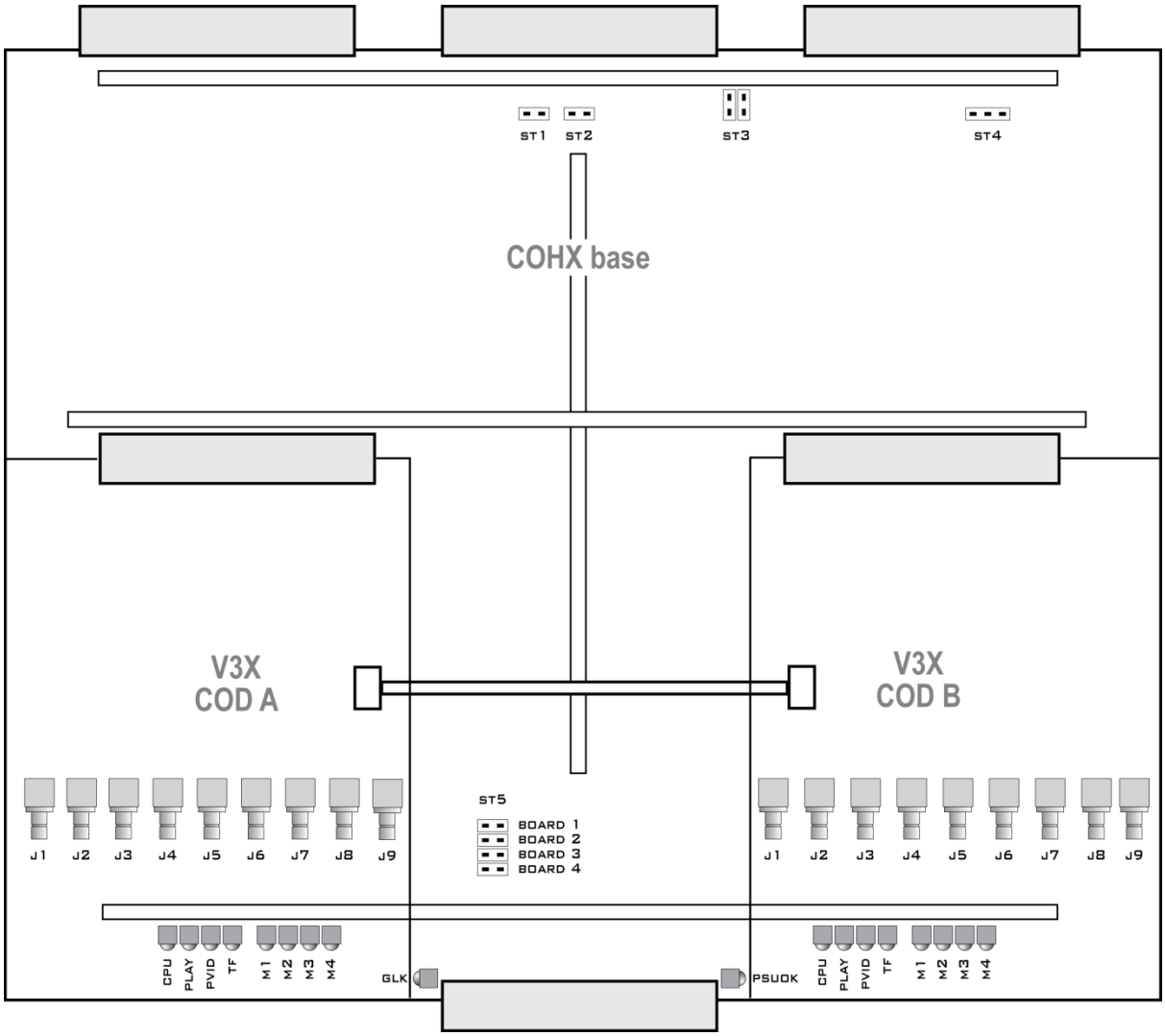
Note that a V3X board with genlock must be installed as V3X #1 in first position (slot 2) in the server. A V3X board with genlock can never be installed in any other slot, and thus cannot be used instead of V3X #2 or #3. Doing so will result in conflicting electrical signals inside the system.

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.

Block Diagram

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



Base Board Jumpers

The following table lists the COHX 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 following table lists the LEDs available on the COHX base board with the genlock functionnality:

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

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 Dual Link is described in the following sections.

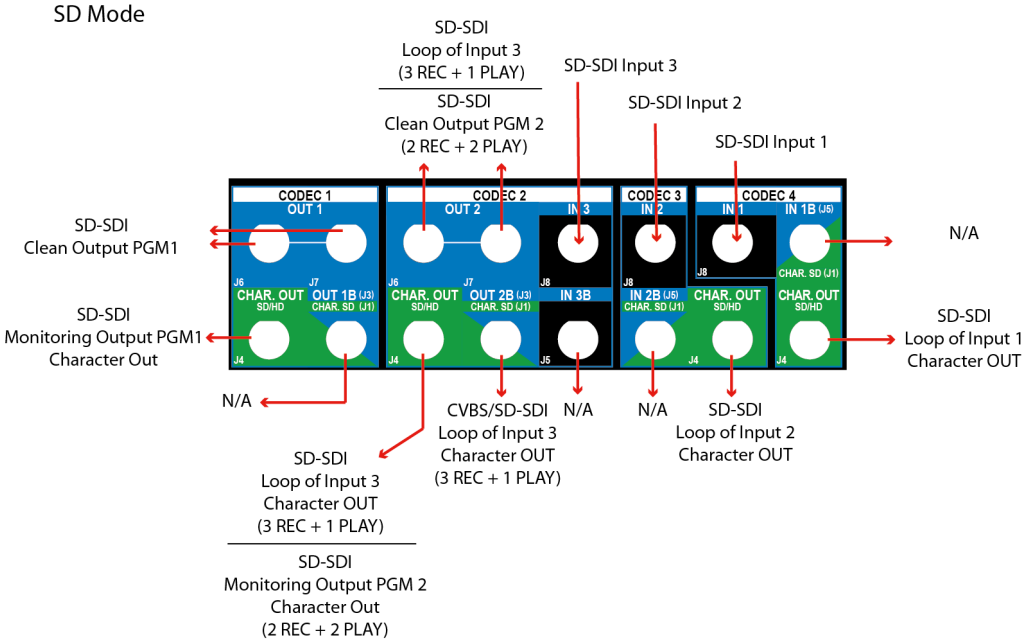
Connector Assignments

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)	
J2	SDI monitoring output (SD)	SDI monitoring output (SD, down-converted)	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	Not used	IN B
J6	SDI program output (SD, identical to J7)	HD SDI program output (HD, 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 hardware loop)	Alternate HD SDI input (HD, for hardware loop)	Not wired to the backplane. Used for internal loop in

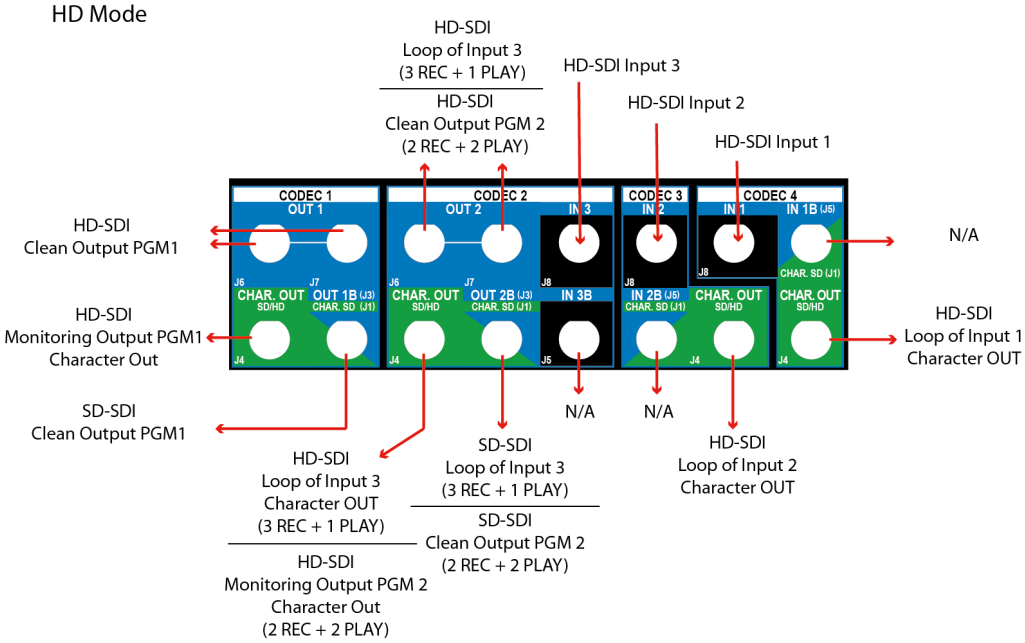
Note
The loops of the input signal are not genlocked.

Connectors Positions and Assignments

SD Mode



HD Mode



6.2.3. COD Connectivity in 3D Dual Link

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

Connector Assignments

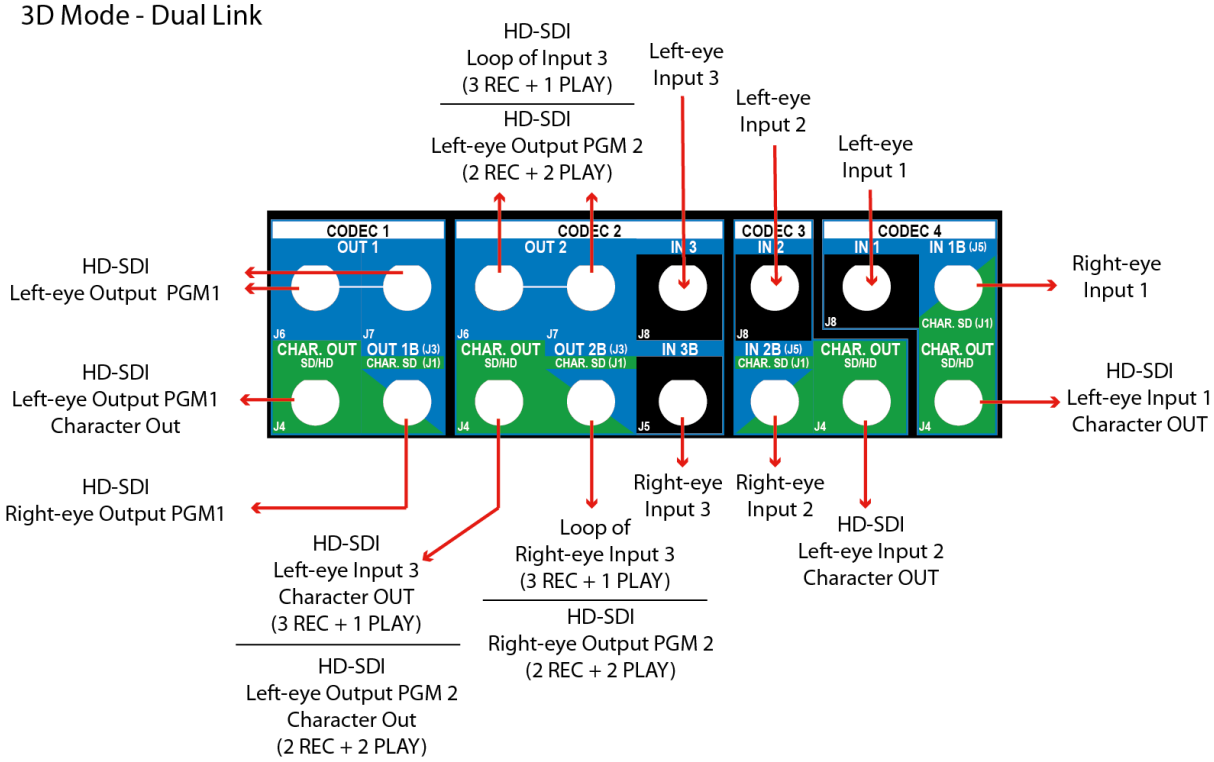
Connector	3D mode	Connector label
J1	N/A	CHAR SD
J2	SDI monitoring output (SD, down-converted)	Not wired to the backplane. Used for onboard multiviewer input
J3	HD SDI program output for right eye (3D) (HD)	OUT B
J4	SDI monitoring output for left eye (3D) (HD/SD)	CHAR OUT SD/HD
J5	HD SDI input for right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

Note

The loops of the input signal are not genlocked.

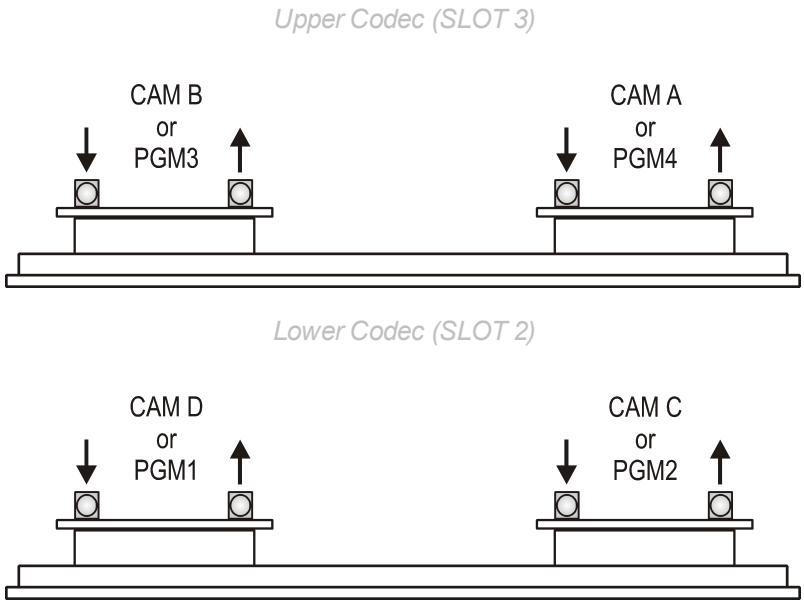
Connectors Positions and Assignments

3D Mode - Dual Link



6.2.4. Channel Assignment

4 Channels Server



2 Channels Server

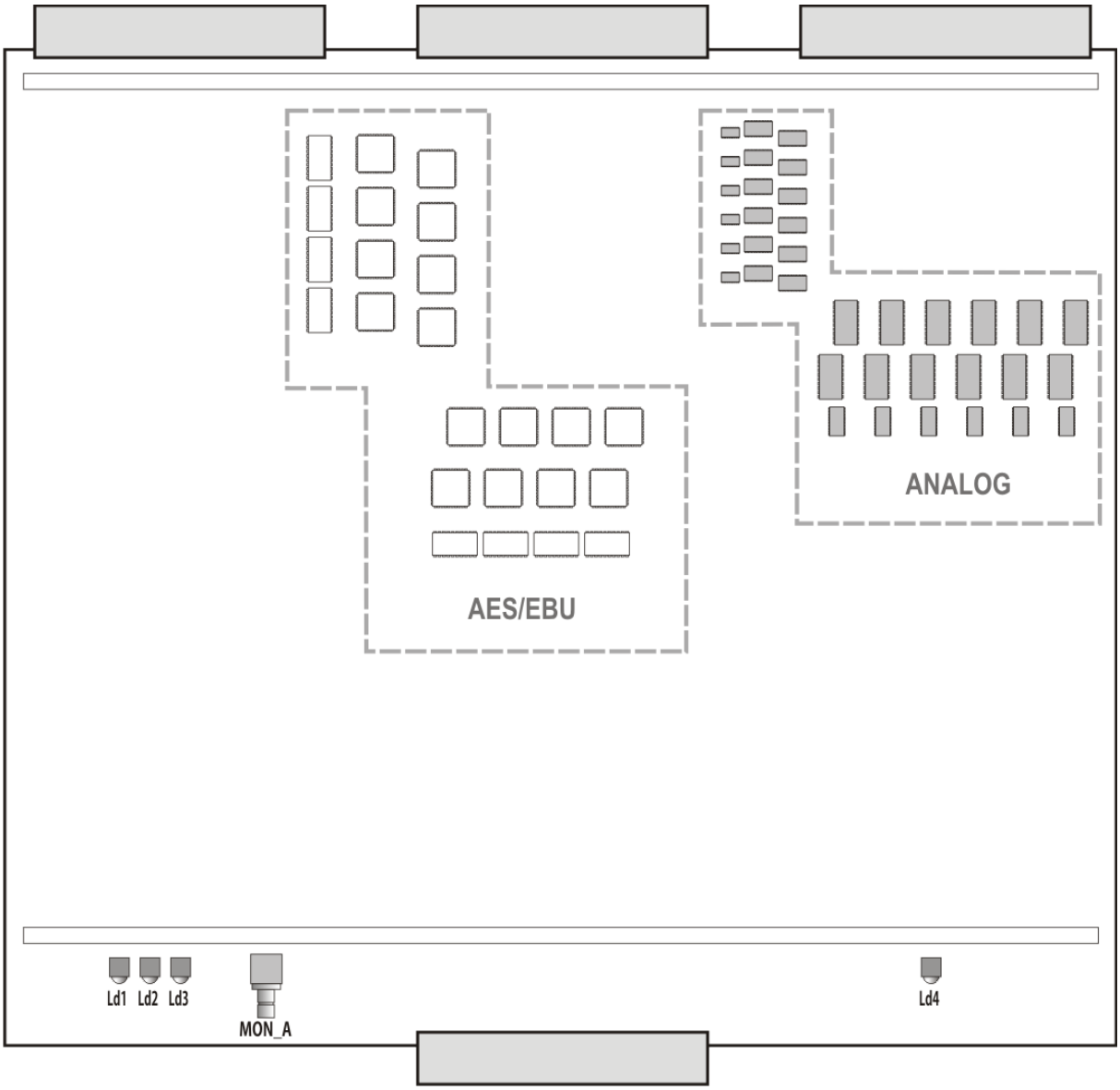
Lower Codec (SLOT 2)

6.3. Audio Codec Board

The audio codec board is the audio interface between the V3X boards and the H3X board. Video codec and audio codec boards are tied to the H3X board with one bus connector on the front side. Different audio configurations are available with the audio codec board. See "Audio Connections" on page 21 for details.

The following LEDs are available on the audio codec board:

- LD 1-3: Internal EVS information only.
- LD 4: transfer activity to/from the H3X board.

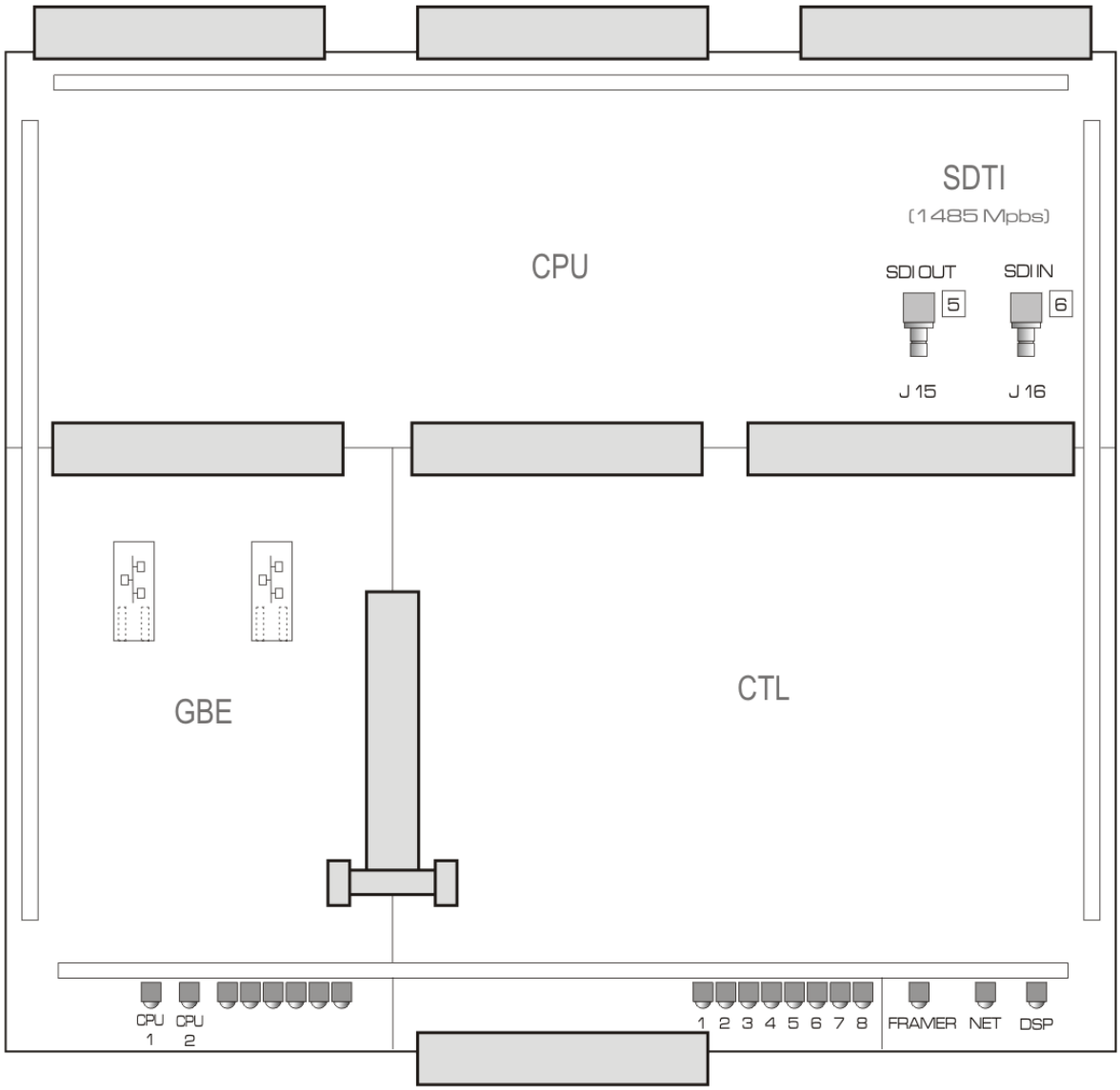


6.4. Raid Controller Boards

6.4.1. H3X Board

The H3X raid controller board is divided in 4 parts (2 in front, 2 in the back).

- Front left: GBE (GigE) module.
- Front right: CTL controller module.
- Back left: CPU module .
- Back right: not installed (SDTI).



LEDs Function

The available LEDs on the XNet2CTL controller module are, from left to right:

LED	Color	Status	Function
LED 1	Green	On	Ok.
	Red	On	An error occurred while booting the H3X board.
LED 2 to LED 8	—	—	For EVS internal use only.
FRAMER	Green	On	Not used.
NET	Green	On	Not used.
DSP	Green	Blinking	Indicates DSP activity (audio processing).

The available LEDs on the GBE Gigabit module module are, from left to right:

LED	Color	Status	Function
CPU1 CPU2	Green	Blinking	These LEDs blink alternately every 250 milliseconds to indicate that the processor is running.
Other LEDs	—	—	For EVS internal use only.

Gigabit Connectors

The two board Gigabit connectors are connected to the two backplane Gigabit ports.

The Gigabit connectors must be on a network that supports Jumbo Frames of (at least) 9014 bytes Ethernet frames. One of the tested switch belongs to the Cisco 3750 G family, for example the WS-C3750G-24T-S.

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

6.4.2. RCTL 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
- No internal storage

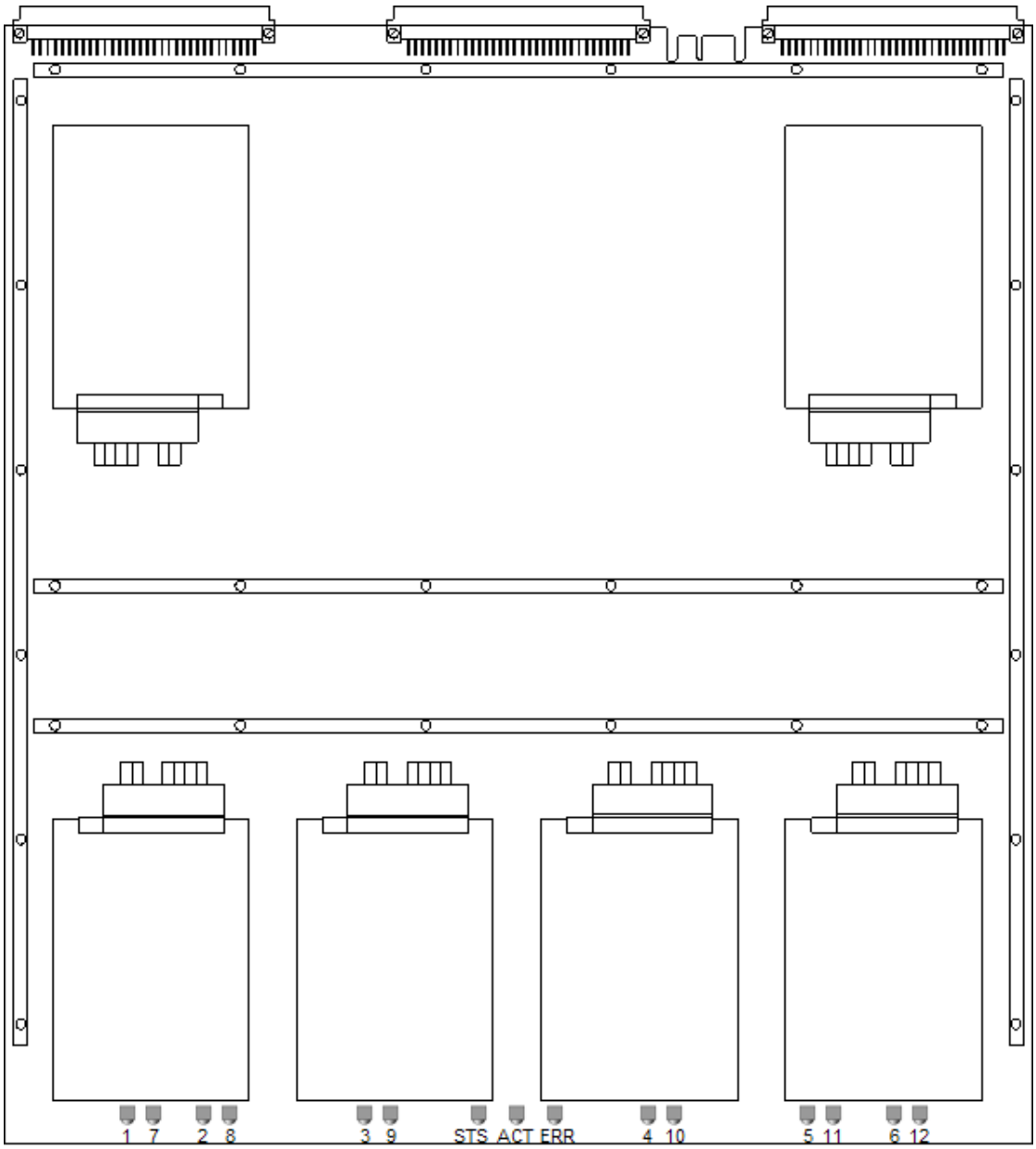
LEDs on Internal Array

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

LEDs correspond to the disks as schematized as followed:

1			6
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 RCTL RAID controller is properly booted.
ERR	on (red)	errors occur during the data transfer between the RAID controller and the disks


1 7
2 8
3 9
STS ACT ERR
4 10
5 11
6 12

6.5. MTPC Board

6.5.1. 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.

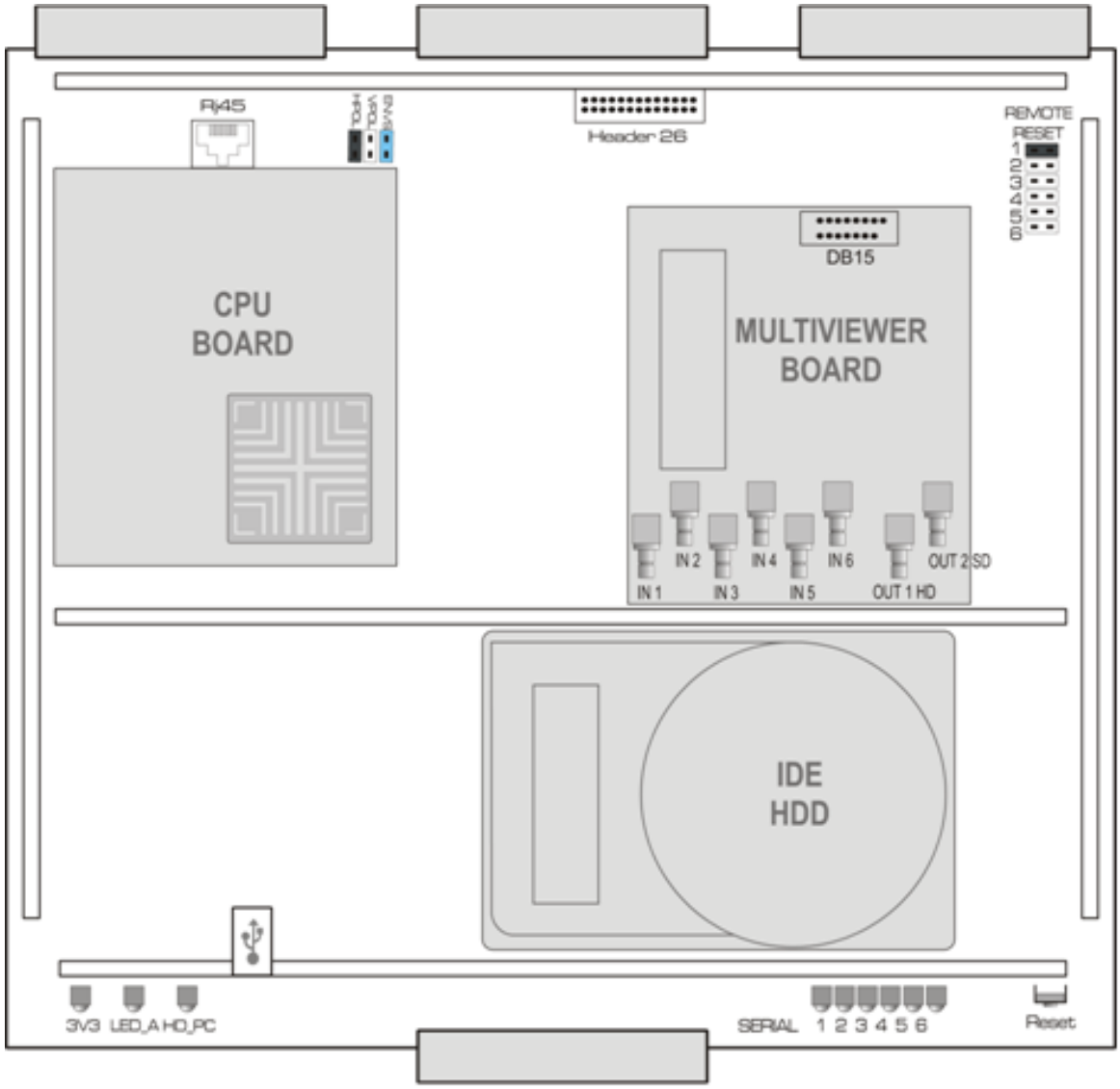
The following MTPC board is used:

- Revision A2/A4 with COMMEL HS873 motherboard and a new time code management module (with bootable USB).

In standard configuration the PC hardware is composed by:

- One mounting PC board, with serial ports, LTC reader and generator, is controlled by the motherboard.
- IDE System Hard disk: the IDE disk drive is used for storing the EVS software and the DOS 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 1 GB. The remaining capacity of this drive is not used.
- 128 MB (or higher) SDRAM modified. The SDRAM used has been modified to suit the system requirements. Please contact EVS support for RAMs upgrade. Do not use standard PC RAM modules.

6.5.2. A2/A4 Board



Multiviewer

The multiviewer board is an option on XTnano servers.

Connectors	Function
IN	The J2 connectors from the CODEC modules of the COHX board are connected to the IN connectors of the multiviewer board.
OUT1 HD	The OUT HD connector of the multiviewer board is connected to the MULTIVIEWER HD SDI connector on the rear panel of the server.
OUT2 SD	The OUT SD connector of the multiviewer board is connected to the MULTIVIEWER SD SDI connector on the rear panel of the server.
DB15	The DB15 connector of the multiviewer board is connected to the MULTI DB15 connector on the rear panel of the server.

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.