

# Technical Reference - Hardware

Version 10.01 - May 2009

## XT<sup>2</sup>



Production & Playout Server

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# What's New?

Some sections may have been reviewed even if no specific changes related to these sections have been brought on Multicam version 10.00.

The changes linked to new features on Multicam version 10.00 appear with the 'New' logo in the table below:

## Main manual updates for Multicam version 10.00

|       |                                                                                     |                                                                    |
|-------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 1.1   |    | Use of XT[2] as a Proxy Server                                     |
| 1.4   |                                                                                     | Additional information on XT[2] server dimensions                  |
| 1.6   |                                                                                     | Updated information on Safety, Compliance and Operating Conditions |
| 1.8   |                                                                                     | Data on hardware consumption                                       |
| 1.9.2 |  | 16 audio channels per video                                        |
| 1.9.3 |  | Support of Mpeg-2 Intra                                            |
| 2.6   |                                                                                     | Technical specifications on the RS422 connector                    |
| 2.9.4 |                                                                                     | Supported switches with the GigE network                           |
| 2.10  |  | Redundant IPDP Serial Link                                         |
| 3.5   |                                                                                     | MTPC Boards supported with Multicam 10.01                          |
| 3.5.1 |                                                                                     | RJ45 and Header 26 connectors added on MTPC board schemas          |



# 1. Overview

---

Welcome in the EVS range of products and thank you for using an **EVS XT[2] server**. We will do our best to satisfy your video production needs and we look forward to continuing working with you.



The EVS XT[2] series servers are full digital in PAL (625i), NTSC (525i), 720p or 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.

## 1.1 XT[2] HIGH-RESOLUTION SERVER

The XT[2] server is typically used as a high-resolution server with various third party controllers, applications and automation systems using industry-standard protocols: Sony BVW75, Louth VDCP, Odetics, DD35, or EVS' own API (AVSP). XT[2] series servers can also be controlled by EVS applications:

**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 XT series servers. Its applications make it possible to control multiple channels within the XNet 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.

**AirBox:** a Windows GUI to manage clips and play-lists with various advanced functions like loop playback, conditional transitions, etc.

## 1.2 XT[2] PROXY SERVER

From Multicam V10.01, a low-resolution option can be set up to use the XT[2] server as a proxy server only. The Proxy servers can be run on large production events as the counterparts of the high-resolution servers. In this case, they need to be included in an XNet network distinct from the high-resolution XNet network.

The XT[2] proxy servers are used for browsing purposes and can be controlled by IPDirector or EVS' own API (AVSP) protocols.

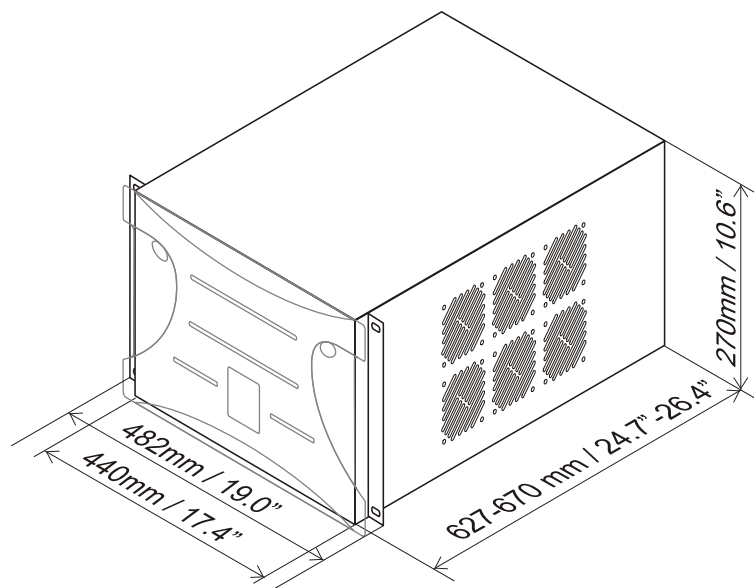
## 1.3 UNPACKING

On 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.

## 1.4 DIMENSIONS

**Video disk recorder Main frame 19 inches**

Rack mount 6U – Weight: 32.5 Kg/ 71.5 Lbs.



Rack mount 4U: Height: 170 mm

The following table specifies the various lengths:

**Cold swap (without redundant power supply)**

| Description                                                                       | Length (mm) | Length (inch.) |
|-----------------------------------------------------------------------------------|-------------|----------------|
| Rackable length (from behind the rack mounting stripes to the back of the server) | 603         | 23,7           |
| Length without the front panel                                                    | 627         | 24,7           |
| Length with the handles                                                           | 660         | 26,0           |
| Length with the front panel                                                       | 670         | 26,4           |

**Hot swap (with redundant power supply)**

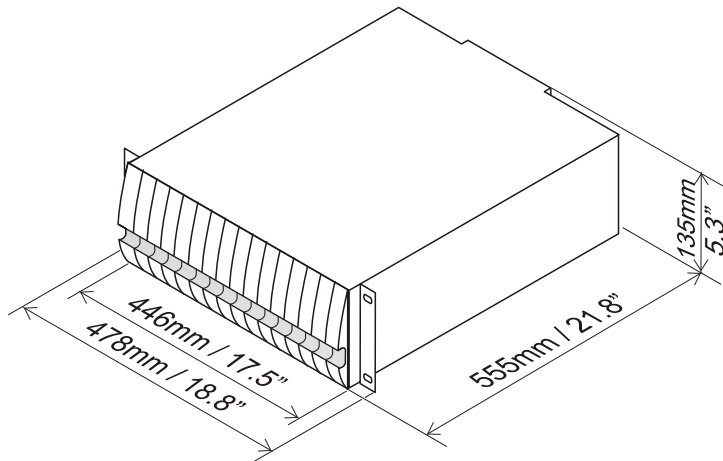
| Description                                                                       | Length (mm) | Length (inch.) |
|-----------------------------------------------------------------------------------|-------------|----------------|
| Rackable length (from behind the rack mounting stripes to the back of the server) | 640         | 25,2           |
| Length without the front panel                                                    | 662         | 26,1           |
| Length with the handles                                                           | 695         | 27,4           |
| Length with the front panel                                                       | 705         | 27,7           |

Hot swap power supplies sticks out by 25mm / 1" (H: 187mm / 7.2' by W: 170mm / 6.65')

Rack mounting stripes: L: 270 mm / 10.6" by W 21 mm / 0.8"

Handles: H: 55mm / 2.2" by L: 160 mm / 6.3" by W: 21 mm / 0.8"

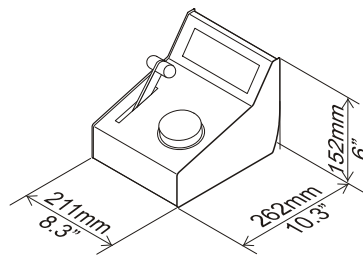
## XT-HDX



For more information on the XT-HDX, refer to section 3.4.3 "External RAID Array XT-HDX for XT[2] Server", on page 58.

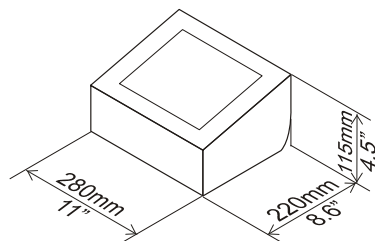
## Remote Control Panel

Weight: 2.9 Kg / 6.3 Lbs.



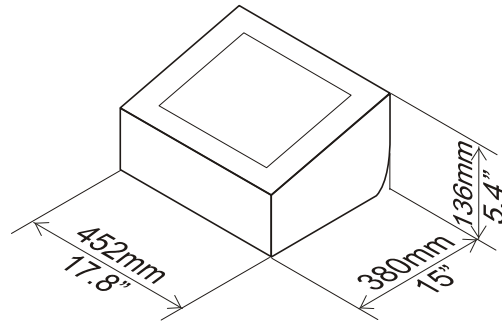
## 10" Touch Screen Video Monitor

Weight: 3.6 Kg / 7.8 Lbs.



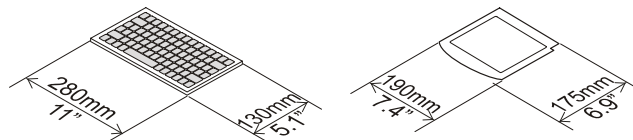
## 18" Touch Screen Video Monitor

Weight: 11.0 Kg / 23.9 Lbs.



### Keybo

Tablet - Weight: 0.5 Kg / 1.2 Lbs. Ref: Wacom® GD0405R



## 1.5 INSTALLATION



### Important

Verify the disk recorder unit has the correct voltage specifications for your power source prior to applying power.

(selectable 110/230 VAC on the rear panel of the power supply, or autoswitch, depending on the type of power supply unit installed)

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.

## 1.6 SAFETY, COMPLIANCE AND OPERATING CONDITIONS

### 1.6.1 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 |
|---------------|-----|-------------------------------------------------------------------------|

### 1.6.2 EMC STANDARDS

|          |          |                   |
|----------|----------|-------------------|
| EN 55022 | European | Emission Standard |
|----------|----------|-------------------|

|              |          |                                                                                                                                                |
|--------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------|
| EN 61000-3-2 | European | Electromagnetic Compatibility (EMC) Part 3 (Limits); Section 2; 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. |
|--------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|

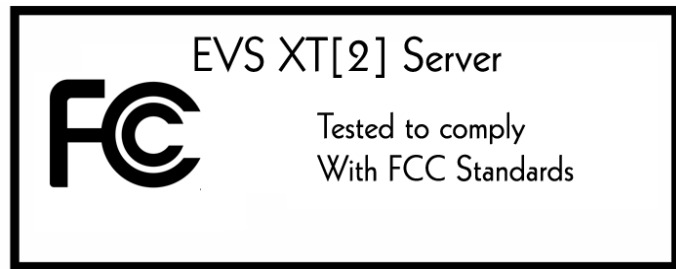
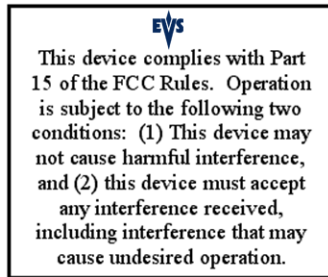
|              |          |                                                                                                                                    |
|--------------|----------|------------------------------------------------------------------------------------------------------------------------------------|
| EN 61000-4-5 | European | European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 5; Testing and measurement techniques - Surge immunity test. |
|--------------|----------|------------------------------------------------------------------------------------------------------------------------------------|

|               |          |                                                                                                                                                                                                                            |
|---------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EN 55022      | European | Emission Standard                                                                                                                                                                                                          |
| 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.                                      |
| 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. |

### 1.6.3 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 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. 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



## 1.6.4 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.



## 1.6.5 POWER SUPPLY

### COLD SWAP

This equipment is fitted with a wide-ranging power supply. It is suitable for supply voltages of 100 to 240 Vac -10%+6% at 50 or 60 Hz nominal.

**Connection to supply:** Pluggable equipment Type A (EN60950 §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 (EN60950 § 1.2.5): electric shock protection by basic insulation and protective earth.

**Rated voltage:** 110 to 240Vac (single phase)

**Rated frequency:** 50/60 Hz

**Related Current:** 10 A (100 to 120 Vac range) 5 A (220 to 240 Vac range)

**Input connector:** CEE22/IEC 320 3-pin male receptacle

## ***Environmental conditions***

The equipment should be kept in the following environmental conditions:

**Temperature:** 0°C to +40°C (32°F to 104°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 transportation temperature:** 0°C to +70°C (32°F to 158°F)

**Storage and transportation relative humidity:** 0% to 90% (non-condensing)

## **HOT SWAP**

This equipment is fitted with a wide-ranging power supply. It is suitable for supply voltages of 115 to 240 Vac +/-10% at 47 or 63 Hz nominal.

**Connection to supply:** Pluggable equipment Type A (EN60950 §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 (EN60950 § 1.2.5): electric shock protection by basic insulation and protective earth.

**Rated voltage:** 115 to 240Vac (single phase)

**Rated frequency:** 47/63 Hz

**Related Current:** 8 A (100 to 120 Vac range) 4 A (220 to 240 Vac range)

**Input connector:** CEE22/IEC 320 3-pin male receptacle

## ***Environmental conditions***

**Temperature:** 0°C to + 50°C (32°F to 104°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 transportation temperature:** 0°C to +70°C (32°F to 158°F)

**Storage and transportation relative humidity:** 0% to 90% (non-condensing)

## SECONDARY POWER SUPPLY

### Cold swap 2<sup>nd</sup> Power Supply

A 2<sup>nd</sup> power supply (cold swap) for the disk recorder unit is available optionally. To connect this 2<sup>nd</sup> power supply in case of failure of the main one, remove the metal plate in the top right corner of the back panel, and swap the large electrical connector located inside this compartment.

This additional power supply should not be connected to mains when not in use.

### Hot swap 2<sup>nd</sup> Power Supply

A 2<sup>nd</sup> power supply (hot swap) for the disk recorder unit is available optionally.

This additional power supply should be connected to mains to allow automatic power switching to the second power supply would the first one fail.

The remote panel, the touch screen and the external ADA rack are fitted with an AUTOSWITCH power supply. A 2<sup>nd</sup> power supply (hot swap) for the disk recorder unit is available optionally.

This additional power supply should be connected to mains to allow automatic power switching to the second power supply would the first one fail.

## GROUNDING

Ensure the disk recorder unit is properly grounded at all times to avoid electrical shock hazard.

## 1.7 VENTILATION & RACK MOUNTING

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



### Important

- 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 XL[2] chassis, support guides are required for this unit into the rack mount. The front ears of the XL[2] unit are not designed to support its full weight. Applying full weight on these might result in bending the metal plate.

## 1.8 HARDWARE CONSUMPTION

| Hardware Description | Current | Watt  | Peak                  |
|----------------------|---------|-------|-----------------------|
| LSM6CH               | 1,37    | 301,4 | 1,94                  |
| ADR                  | 0,24    | 52,8  | NA<br>(not available) |
| REMOTE               | 0,08    | 17,6  | NA                    |
| ADA3U FULL SA1:8     | 0,17    | 37,4  | NA                    |
| ADA3U FULL AA1:8     | 0,19    | 41,8  | NA                    |
| 4UVC820              | 0,65    | 143   | 0,93                  |
| 4UOR840              | 0,63    | 138,6 | 0,69                  |
| RAIDTEK              | 0,99    | 217,8 | 1,6                   |
| NOKIA 15"            | 0,5     | 110   | NA                    |
| BIG ONE              | 1,2     | 264   | NA                    |
| IBOX FULL            | 0,59    | 129,8 | NA                    |
| SONY 20"             | 0,38    | 83,6  | NA                    |
| SONY 14"             | 0,35    | 77    | 0,8                   |
| SONY 9"              | 0,18    | 40    | NA                    |
| VGA 9"               | 0,09    | 19,8  | 0,12                  |
| SDI 20"              | 0,9     | 198   | 1,18                  |
| SUPER SPLIT          | 1,02    | 224,4 | NA                    |
| PC BUREAU            | 0,24    | 52,8  | NA                    |
| DIGIQUAD             | 0,17    | 37,4  | NA                    |
| SPLITTER             | 0,24    | 52,8  | NA                    |
| SERVER 5U 10HDD      | 1,25    | 275   | NA                    |
| PC1U PIII            | 0,56    | 123,2 | NA                    |
| PC1U PIV             | 0,69    | 151,8 | NA                    |
| PC4U PIV             | 0,56    | 123,2 | NA                    |
| PC2U XF[2]           | 0,6     | 132   | 0,8                   |

| Hardware Description                   | Current | Watt  | Peak |
|----------------------------------------|---------|-------|------|
| TFT 17"                                | 0,05    | 11    | 0,08 |
| XT[2] 6CH                              | 1,12    | 246,4 | NA   |
| IPD                                    | 0,65    | 143   | NA   |
| 1U IPD                                 | 0,15    | 33    | 0,25 |
| 1U IPD DUAL CORE                       | NA      | NA    | NA   |
| TOUCH SREEN 10"                        | 0,11    | 24,2  | 0,13 |
| XF[2]                                  | 0,9     | 198   | NA   |
| XHUB[2]                                | 0,17    | 37,4  | NA   |
| XSTORE[2]                              | 1,57    | 345,4 | NA   |
| XSTORE[2] no drive                     | 1,05    | 231   | NA   |
| XSTORE[2] 24 HDD SAS                   | 2,1     | 462   | NA   |
| XSTORE[2] 10 HDD SCSI                  | 1,7     | 374   | NA   |
| SQL DB in EAGLE 3201 with Hot swap PSU | 0,56    | 123,2 | NA   |
| SQL DB in EAGLE 3201 standard PSU      | 0       | 0     | NA   |
| HDX EXTERNAL ARRAY                     | 0       | 0     | NA   |
| XT[2] 6U 6CH 5HDD COLD SWAP            | 0       | 0     | NA   |
| XT[2] 6U 6CH 10 HDD COLD SWAP          | 0       | 0     | NA   |
| XT[2] 6U 6CH NO DRIVE COLD SWAP        | 0       | 0     | NA   |
| XT[2] 6U 4CH 5HDD COLD SWAP            | 1       | 220   | NA   |
| XT[2] 6U 2CH 5HDD COLD SWAP            | 0       | 0     | NA   |
| XT[2] 6U 6CH 5HDD HOT SWAP ZIPPY       | 1,23    | 270,6 | NA   |
| XT[2] 6U 6CH 10 HDD HOT SWAP ZIPPY     | 1,4     | 308   | NA   |
| XT[2] 6U 6CH NO DRIVE HOT SWAP ZIPPY   | 0,84    | 184,8 | NA   |
| XT[2] 6U 4CH 5HDD HOT SWAP ZIPPY       | 1,06    | 233,2 | NA   |

| Hardware Description             | Current | Watt  | Peak |
|----------------------------------|---------|-------|------|
| XT[2] 6U 2CH 5HDD HOT SWAP ZIPPY | 0,94    | 206,8 | NA   |
| XT[2] 4U 4CH 5HDD COLD SWAP      | 0,92    | 202,4 | NA   |

## 1.9 XT[2] SERVER MAIN SPECIFICATIONS

### 1.9.1 VIDEO

|                               | XT[2] Server                                                                                            |                                                                                                                                                                       |
|-------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               | Standard Definition                                                                                     | High Definition                                                                                                                                                       |
| Video Formats                 | 525i 59.94fps (NTSC)<br>625i 60fps (PAL)                                                                | 720p 50/59.94fps<br>1080i 50/59.94fps                                                                                                                                 |
| Digital Interface             | 10-bit 4:2:2 Serial (SMPTE259M).<br>Full frame synchronizer at input.<br>Dual output for PLAY channels. | 10-bit 4:2:2 Serial (SMPTE292M).<br>Full frame synchronizer at input.<br>Dual output for PLAY channels.                                                               |
| Number of channels (6RU rack) | 2, 4 or 6 channels,<br>reversible REC/PLAY                                                              | 2, 4 or 6 channels,<br>reversible REC/PLAY                                                                                                                            |
| Number of channels (4RU rack) | 2 or 4 channels,<br>reversible REC/PLAY                                                                 | 2 or 4 channels,<br>reversible REC/PLAY                                                                                                                               |
| Monitoring & Down-converters  | 1 CVBS or SDI (software select) per channel, with OSD                                                   | 1 built-in down-converter per channel, CVBS or SDI output (software select) with OSD + additional clean SDI output.<br>1 dedicated HD SDI output with OSD per channel |
| Reference                     | Analogue Black Burst                                                                                    | Analogue Black Burst and HD Tri-Level Sync                                                                                                                            |
| Graphics Board                | n.a.                                                                                                    | n.a.                                                                                                                                                                  |

### 1.9.2 AUDIO

- up to 8+8 analogue balanced input & output channels
- up to 16+16 (8 pairs + 8 pairs) AES/EBU or Dolby E input & output channels
- up to 64 channels embedded audio (16 audio per video)
- 4 additional analogue balanced output channels for monitoring
- all audio connectors on mainframe

#### Audio Processing

- uncompressed audio
- 24 bit processing and storage
- sample rate converter from 25-55 kHz to 48KHz
- audio scrub
- audio mix

### 1.9.3 VIDEO CODECS & BITRATES

The EVS XT[2] server uses an intra-frame video encoding technique. The XT[2] server supports natively the following video codecs:

- MJPEG (SD & HD)
- IMX (SD only)
- Avid DNxHD® (HD only, code-protected)
- Intra-frame MPEG-2 (SD & HD)
- Apple ProRes 422 (HD only, code-protected)

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

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

### 1.9.4 RECORDING CAPACITY FOR XT[2] SERVERS

The following tables show the record duration for 1 record channel (i.e. 1 video + 2 stereo audio tracks in SD ; 1 video + 4 stereo audio tracks in HD) with arrays of 73GB, 146GB or 300GB disks compared with the different video bitrates & codecs. These tables are valid with the “Operational Disk Size” parameter set to 100%.

The different drive arrangements are:

- Internal/External module (4 + 1) x 73 GB drives (total 292 GB usable)
- Internal/External module (4 + 1) x 146 GB drives (total 584 GB usable)
- Internal/External module (4 + 1) x 300 GB drives (total 1200 GB usable)
- Internal/External module (8 + 2) x 300 GB drives (total 2400 GB usable)
- External module (12 + 3) x 300 GB drives (total 3600 GB usable)

|     |                              | Disks Size |         |         |          |          |
|-----|------------------------------|------------|---------|---------|----------|----------|
| PAL | Compression + Bitrate        | 5x73GB     | 5x146GB | 5x300GB | 10x300GB | 15x300GB |
| SD  | MJPEG / IMX 30Mbps           | 18h        | 36h36   | 75h45   | 151h30   | 227h15   |
|     | MJPEG / IMX 40Mbps           | 14h54      | 28h35   | 59h11   | 118h22   | 177h33   |
|     | MJPEG / IMX 50Mbps           | 11h27      | 23h15   | 48h08   | 96h16    | 144h24   |
| HD  | MJPEG / MPEG 100Mbps         | 5h38       | 11h27   | 23h42   | 47h24    | 71h06    |
|     | Avid DNxHD® 100Mbps          | 5h38       | 11h27   | 23h42   | 47h24    | 71h06    |
|     | Avid DNxHD® 120Mbps          | 4h42       | 9h31    | 19h43   | 39h26    | 59h09    |
|     | Avid DNxHD® 185Mbps          | 3h11       | 6h28    | 13h25   | 26h50    | 40h15    |
| HD  | Apple ProRes 422 120 Mbps    | 4h42       | 9h31    | 19h43   | 39h26    | 59h09    |
|     | Apple ProRes 422 HQ 185 Mbps | 3h11       | 6h28    | 13h25   | 26h50    | 40h15    |

|      |                              | Disks Size |         |         |          |          |
|------|------------------------------|------------|---------|---------|----------|----------|
| NTSC | Compression + Bitrate        | 5x73GB     | 5x146GB | 5x300GB | 10x300GB | 15x300GB |
| SD   | MJPEG / IMX 30Mbps           | 18h10      | 36h53   | 76h21   | 152h41   | 229h03   |
|      | MJPEG / IMX 40Mbps           | 14h06      | 28h37   | 59h15   | 118h30   | 177h45   |
|      | MJPEG / IMX 50Mbps           | 11h26      | 23h12   | 48h03   | 96h06    | 144h09   |
| HD   | MJPEG / MPEG 100Mbps         | 5h38       | 11h27   | 23h42   | 47h24    | 71h06    |
|      | Avid DNxHD® 100Mbps          | 5h38       | 11h27   | 23h42   | 47h24    | 71h06    |
|      | Avid DNxHD® 145Mbps          | 4h04       | 8h16    | 17h07   | 34h14    | 51h21    |
|      | Avid DNxHD® 220Mbps          | 2h39       | 5h24    | 11h11   | 22h22    | 33h33    |
| HD   | Apple ProRes 422 145 Mbps    | 4h04       | 8h16    | 17h07   | 34h14    | 51h21    |
|      | Apple ProRes 422 HQ 220 Mbps | 2h39       | 5h24    | 11h11   | 22h22    | 33h33    |



#### Note

A special top cover plate is required to work with 2 internal disk trays (total 10 disks). This brings the total height of the mainframe to 7RU.

## 1.9.5 POWER CONSUMPTIONS

## 1.9.6 SUPPORTED SMPTE STANDARDS

The following standards are supported:

|                         |                                                        |
|-------------------------|--------------------------------------------------------|
| SD SDI                  | SMPTE 259M (525i 625i)                                 |
| HD SDI                  | SMPTE 292M (720p 50 and 59.94 ;<br>1080i 50 and 59.94) |
| Embedded audio HD       | SMPTE 299M                                             |
| AES/EBU audio           | SMPTE 272M                                             |
| LTC                     | SMPTE 12M                                              |
| D-VITC                  | SMPTE 266M                                             |
| Ancillary TC in HD      | RP 188                                                 |
| Vertical Ancillary Data | SMPTE 334M                                             |
| VC-3                    | SMPTE 2019-1                                           |
| IMX D-10                | SMPTE 356M                                             |

## 1.9.7 MAXIMUM BITRATE VALUES

Those maximum values are valid for XT[2] servers running Multicam version 08.00.xx or higher. They guarantee a smooth play and a browse at 100% speed on all channels simultaneously.

|                  |      | 2 ch | 4 ch | 6 ch |
|------------------|------|------|------|------|
| SD JPEG          | PAL  | 100  | 100  | 100  |
|                  | NTSC | 100  | 100  | 100  |
| HD JPEG          | PAL  | 225  | 225  | 160  |
|                  | NTSC | 250  | 250  | 160  |
| HD MPEG          | PAL  | 225  | 225  | 160  |
|                  | NTSC | 250  | 250  | 160  |
| Avid DNxHD®      | PAL  | 185  | 185  | 120  |
|                  | NTSC | 220  | 220  | 145  |
| Apple ProRes 422 | PAL  | 185  | 185  | 120  |
|                  | NTSC | 220  | 220  | 145  |

## 1.9.8 AVID DNxHD® AND APPLE PRORES 422

### INTRODUCTION

EVS XT[2] servers feature a native implementation of the Avid DNxHD® and Apple ProRes 422 high definition video codecs. This enables native audio and video file transfers in either direction between the EVS XT[2] servers, and Avid and Apple post-production tools in High Definition. This document explains the impact of using Avid DNxHD® and Apple ProRes codecs on XT[2] servers, on the XNet[2] SDTI network and on the XFile[2] or XF[2] in terms of storage capacity, number of usable video channels and network transfers.

For details on how to setup a direct connection between an HD XT[2] server and an Avid or Apple server, please refer to the specific documents (EVS\_AvidTM\_integration\_v2.09 or EVS\_Apple\_integration\_v.2.00).

### VIDEO BITRATE COMPATIBILITY WITH AVID AND APPLE PRODUCTS

**Avid DNxHD®** is standardized at specific bitrates according to 2 profiles:

1. Standard profile: 120Mbps in “PAL” (50Hz) and 145Mbps in “NTSC” (59.94Hz)
2. High Level profile: 185Mbps in “PAL” (50Hz) and 225Mbps in “NTSC” (59.94Hz)

Although Avid DNxHD® is standardized at the specific bitrates mentioned here above, Avid products can seamlessly read DNxHD® files and streams at other bitrates. DNxHD® pictures at other bitrates than those defined by the 2 official Avid profiles can also be referred to as “VC-3” as defined in SMPTE 1019.

To allow users to determine the best balance between picture quality, storage capacity, number of video channels per server, and network speed, EVS XT[2] servers can generate Avid DNxHD® files and streams at any given bitrate between 20Mbps and 220Mbps. These files and streams should remain compatible with Avid production tools.

**Apple ProRes 422** is also standardized at specific bitrates according to 2 profiles:

1. Apple ProRes 422 (also sometimes referred to as Apple ProRes 422 SQ): 120Mbps in “PAL” (50Hz) and 145Mbps in “NTSC” (59.94Hz)
2. Apple ProRes 422 HQ: 185Mbps in “PAL” (50Hz) and 225Mbps in “NTSC” (59.94Hz)

Apple ProRes 422 on EVS XT[2] servers is only available at these bitrates.

## CHOICES OF BITRATES WHEN USING AVID DNxHD® OR APPLE PRORES 422 WITH EVS XT[2] SERVERS

### *How to Read the Following Tables ?*

1. **Video Bitrate:** value set by the user in the advanced parameters window of the XT[2] server
2. **Fields/Block:** number of video fields that can be stored in one disk block of 8MB, taking into account 8 audio tracks.
3. **Actual Bandwidth:** this is the actual disk/network bandwidth that is required for the real time record or real time playback of one video stream and its associated audio tracks.
4. **Max. RT Channels:** this is the maximum number of video channels (real time record or real time playback) that one XT[2] server can support for a given frame rate and bitrate. Since an XT[2] server can have a maximum of 6 local video channels, any value higher than 6 means that these additional real time access can be used over the XNet[2] SDTI network.

For mixed configuration with standard and super motion channels on the same server, the following rule must be used to ensure that the settings do not exceed the maximum bandwidth of the server : (nbr of standard channels x their actual bandwidth) + (nbr of super motion channels x their actual bandwidth) must be lower or equal to 150 MB/s.

**Example:** Can I run an XT[2] server with 2 records (1 super motion + 1 standard) + 2 play (1 super motion + 1 standard) in Avid DNxHD® with a video bitrate of 100Mbps in "PAL" ?

**Calculation:** 1 standard rec/play at 100Mbps uses 13.3 MB/s ; 1 super motion record/play at 100Mbps uses 40.0 MB/s;  $2 \times 13.3 + 2 \times 40.0 = 106.6$  MB/s.

**Conclusion:** this configuration is supported.

5. **Network transfers:** the maximum bandwidth over the XNet[2] SDTI network is approximately 110 MB/s. To determine the number of real time transfers that can occur simultaneously over the network, this number must be divided by the actual bandwidth given in the table for a selected bitrate.

**Example:** How many real time transfers can I do over an XNet[2] SDTI network (set at 1485Mbps) if I work with Apple ProRes 422 at 145Mbps in "NTSC" ?

### Calculation:

Maximum SDTI bandwidth / Actual Bandwidth = real time transfers:  
110MB/s / 18.4MB/s = 6 real time transfers.

**Note:** This number is the maximum that the network connection can support. Of course it is also necessary that the XT[2] where the material is stored has enough local disk bandwidth to feed the network accesses, on top of its own local channels (cfr point 4. Max. RT Channels)

### ***Avid DNxHD® & Apple ProRes 422 at 50Hz (“PAL”)***

| Codec                              | Video Bitrate | Fields /Block | Actual Bandwidth | Max. RT Channels | XT[2] Storage Capacity (in hours and minutes) |         |         | XF[2] Storage Capacity (in hours and minutes) |       |       |       |
|------------------------------------|---------------|---------------|------------------|------------------|-----------------------------------------------|---------|---------|-----------------------------------------------|-------|-------|-------|
|                                    |               |               |                  |                  | 5x73GB                                        | 5x146GB | 5x300GB | 250GB                                         | 500GB | 750GB | 1TB   |
| Avid DNxHD®                        | 85 Mbps       | 35            | 11.43 MB/s       | 13.13            | 6.34                                          | 13.20   | 27.37   | 5.36                                          | 11.24 | 17.11 | 22.48 |
| Avid DNxHD®                        | 100 Mbps      | 30            | 13.33 MB/s       | 11.25            | 5.38                                          | 11.26   | 23.41   | 4.48                                          | 9.46  | 14.44 | 19.32 |
| Avid DNxHD®<br>Apple ProRes 422    | 120 Mbps      | 26            | 15.38 MB/s       | 9.75             | 4.53                                          | 9.54    | 20.31   | 4.09                                          | 8.28  | 12.46 | 16.56 |
| Avid DNxHD®<br>Apple ProRes 422 HQ | 185 Mbps      | 17            | 23.53 MB/s       | 6.38             | 3.11                                          | 6.29    | 13.25   | 2.43                                          | 5.32  | 8.21  | 11.04 |

### ***Avid DNxHD® & Apple ProRes 422 at 150Hz (“PAL Super Motion 3x”)***

| Codec                              | Video Bitrate | Fields /Block | Actual Bandwidth | Max. RT Channels | XT[2] Storage Capacity (in hours and minutes) |         |         | XF[2] Storage Capacity (in hours and minutes) |       |       |      |
|------------------------------------|---------------|---------------|------------------|------------------|-----------------------------------------------|---------|---------|-----------------------------------------------|-------|-------|------|
|                                    |               |               |                  |                  | 5x73GB                                        | 5x146GB | 5x300GB | 250GB                                         | 500GB | 750GB | 1TB  |
| Avid DNxHD®                        | 85 Mbps       | 12            | 33.33 MB/s       | 4.50             | 2.15                                          | 4.34    | 9.28    | 1.55                                          | 3.54  | 5.53  | 7.48 |
| Avid DNxHD®                        | 100 Mbps      | 10            | 40.00 MB/s       | 3.75             | 1.53                                          | 3.48    | 7.53    | 1.36                                          | 3.15  | 4.54  | 6.30 |
| Avid DNxHD®<br>Apple ProRes 422    | 120 Mbps      | 9             | 44.44 MB/s       | 3.38             | 1.41                                          | 3.26    | 7.06    | 1.26                                          | 2.56  | 4.25  | 5.52 |
| Avid DNxHD®<br>Apple ProRes 422 HQ | 185 Mbps      | 5             | 66.67 MB/s       | 2.25             | 1.08                                          | 2.17    | 4.44    | 0.57                                          | 1.57  | 2.57  | 3.54 |

**Avid DNxHD® & Apple ProRes 422 at 59.94Hz (“NTSC”)**

| Codec                              | Video Bitrate | Fields /Block | Actual Bandwidth | Max. RT Channels | XT[2] Storage Capacity (in hours and minutes) |         |         | XF[2] Storage Capacity (in hours and minutes) |       |       |       |
|------------------------------------|---------------|---------------|------------------|------------------|-----------------------------------------------|---------|---------|-----------------------------------------------|-------|-------|-------|
|                                    |               |               |                  |                  | 5x73GB                                        | 5x146GB | 5x300GB | 250GB                                         | 500GB | 750GB | 1TB   |
| Avid DNxHD®                        | 85 Mbps       | 42            | 11.42 MB/s       | 13.14            | 6.29                                          | 13.21   | 27.39   | 5.36                                          | 11.24 | 17.12 | 22.48 |
| Avid DNxHD®                        | 100 Mbps      | 36            | 13.32 MB/s       | 11.26            | 5.38                                          | 11.27   | 23.42   | 4.48                                          | 9.47  | 14.45 | 19.34 |
| Avid DNxHD®<br>Apple ProRes 422    | 145 Mbps      | 26            | 18.44 MB/s       | 8.13             | 4.04                                          | 8.16    | 17.07   | 3.28                                          | 7.03  | 10.39 | 14.06 |
| Avid DNxHD®<br>Apple ProRes 422 HQ | 220 Mbps      | 17            | 28.21 MB/s       | 5.32             | 2.39                                          | 5.24    | 11.11   | 2.16                                          | 4.37  | 6.57  | 9.14  |

**Avid DNxHD® & Apple ProRes 422 at 180Hz (“NTSC Super Motion 3x”)**

| Codec                              | Video Bitrate | Fields /Block | Actual Bandwidth | Max. RT Channels | XT[2] Storage Capacity (in hours and minutes) |         |         | XF[2] Storage Capacity (in hours and minutes) |       |       |      |
|------------------------------------|---------------|---------------|------------------|------------------|-----------------------------------------------|---------|---------|-----------------------------------------------|-------|-------|------|
|                                    |               |               |                  |                  | 5x73GB                                        | 5x146GB | 5x300GB | 250GB                                         | 500GB | 750GB | 1TB  |
| Avid DNxHD®                        | 85 Mbps       | 15            | 31.97 MB/s       | 4.69             | 2.21                                          | 4.46    | 9.52    | 2.00                                          | 4.04  | 6.09  | 8.08 |
| Avid DNxHD®                        | 100 Mbps      | 12            | 39.96 MB/s       | 3.75             | 1.53                                          | 3.49    | 7.54    | 1.36                                          | 3.15  | 4.55  | 6.30 |
| Avid DNxHD®<br>Apple ProRes 422    | 145 Mbps      | 9             | 53.28 MB/s       | 2.82             | 1.24                                          | 2.51    | 5.55    | 1.12                                          | 2.26  | 3.41  | 4.52 |
| Avid DNxHD®<br>Apple ProRes 422 HQ | 220 Mbps      | 6             | 79.92 MB/s       | 1.88             | 0.56                                          | 1.54    | 3.57    | 0.48                                          | 1.38  | 2.27  | 3.16 |

**XFile[2] and XF[2] Transfers for Avid DNxHD® and Apple ProRes 422**

XFile[2] bandwidth for backup and restore is 27MB/s. Therefore, it can support:

- 2.4 real time transfers with Avid DNxHD® 85Mbps
- 2.0 real time transfers with Avid DNxHD® 100Mbps
- 1.8 real time transfers with Avid DNxHD® or Apple ProRes 422 at 120Mbps (PAL)
- 1.5 real time transfers with Avid DNxHD® or Apple ProRes 422 at 145Mbps (NTSC)

**XF[2]** bandwidth for backup is 50MB/s and 32MB/s for restore.

Therefore, it can support in **backup** mode:

- 4.0 real time transfers with Avid DNxHD® 85Mbps
- 3.5 real time transfers with Avid DNxHD® 100Mbps
- 3.0 real time transfers with Avid DNxHD® or Apple ProRes 422 at 120Mbps (PAL)
- 2.5 real time transfers with Avid DNxHD® or Apple ProRes 422 at 145Mbps (NTSC)

Therefore it can support in **restore** mode:

- 2.8 real time transfers with Avid DNxHD® 85Mbps
- 2.4 real time transfers with Avid DNxHD® 100Mbps
- 2.0 real time transfers with Avid DNxHD® or Apple ProRes 422 at 120Mbps (PAL)
- 1.7 real time transfers with Avid DNxHD® or Apple ProRes 422 at 145Mbps (NTSC)

### ***Gigabit Ethernet Transfers with XT[2] servers for Avid DNxHD® and Apple ProRes 422***



#### **Preliminary note**

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

### **BACKUP**

Maximum transfer speeds through the Gigabit ports of the XT[2] server :

- 6 simultaneous real time transfers with Avid DNxHD® 85Mbps
- 6.2 x faster than real time on a single transfers with Avid DNxHD® 85Mbps
- 6 simultaneous real time transfers with Avid DNxHD® 100Mbps
- 5.3 x faster than real time on a single transfers with Avid DNxHD® 100Mbps
- 5.8 simultaneous real time transfers with Avid DNxHD® or Apple ProRes 422 at 120Mbps (PAL)

- 4.6 x faster than real time on a single transfers with Avid DNxHD® or Apple ProRes 422 at 120Mbps (PAL)
- 4.8 simultaneous real time transfers with Avid DNxHD® or Apple ProRes 422 at 145Mbps (NTSC)
- 3.8 x faster than real time on a single transfers with Avid DNxHD® or Apple ProRes 422 at 145Mbps (NTSC)

## RESTORE

Maximum transfer speeds through the Gigabit ports of the XT[2] server :

- 6 simultaneous real time transfers with Avid DNxHD® 85Mbps
- 4x faster than real time on a single transfers with Avid DNxHD® 85Mbps
- 5.7 simultaneous real time transfers with Avid DNxHD® 100Mbps
- 3.4 x faster than real time on a single transfers with Avid DNxHD® 100Mbps
- 5 simultaneous real time transfers with Avid DNxHD® or Apple ProRes 422 at 120Mbps (PAL)
- 3 x faster than real time on a single transfers with Avid DNxHD® or Apple ProRes 422 at 120Mbps (PAL)
- 4.1 simultaneous real time transfers with Avid DNxHD® or Apple ProRes 422 at 145Mbps (NTSC)
- 2.5 x faster than real time on a single transfers with Avid DNxHD® or Apple ProRes 422 at 145Mbps (NTSC)

## SIMULTANEOUS BACKUP AND RESTORE

The backup sessions reach higher bandwidth and pre-empt the bandwidth against the restore sessions. On a 'per session' based, the system allocate between 3.75 and 6 times more bandwidth to backup session than to restore session.

## IMPORTANT RECOMMENDATIONS

- For 6-channel configuration, maximum bitrates for Avid DNxHD® or Apple ProRes 422 should be 145Mbps (NTSC) or 120Mbps (PAL).
- "Super Motion + 1 Cam" configuration (i.e. 1 Super Motion REC + 1 Std REC + 1 Super Motion PLAY + 1 Std PLAY) : maximum bitrates for Avid DNxHD® or Apple ProRes 422 should be 145Mbps (NTSC) or 120Mbps (PAL).

- When using the Avid DNxHD® codec, we advise to work at 100Mbps if the picture quality is satisfactory → the XT[2] can sustain 6 local channels + 5 network transfers.

## 1.9.9 RAID LEVEL: 3

The Video Raid uses striping process across 5 disk drives. The video and audio data is striped over the first 4 drives while the parity information is saved on the fifth 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.

For more information on online rebuild, refer to the section dedicated to this subject in the XT Technical Reference manual.

## 1.9.10 INTERPOLATION

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  $\circ$  and  $\square$  represent respectively the odd and even fields of a standard video signal (50/60 Hz), we have:

The original video signal:

$\circ \square \circ \square \circ \square \circ \square \circ \square \circ \square \circ \square$

The output video signal at 50% speed:

$\circ \underline{\square} \underline{\square} \square \circ \underline{\square} \underline{\square} \square \circ \underline{\square} \underline{\square} \square \circ \underline{\square} \underline{\square}$

The output video signal at 33% speed:

$\circ \underline{\square} \underline{\square} \square \underline{\square} \underline{\square} \square \circ \underline{\square} \underline{\square} \underline{\square} \underline{\square} \square \circ \underline{\square} \underline{\square}$

The output video signal at 25% speed :

$\circ \underline{\square} \underline{\square} \underline{\square} \underline{\square} \underline{\square} \underline{\square} \square \circ \underline{\square} \underline{\square} \underline{\square} \underline{\square} \underline{\square} \underline{\square}$

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 neighbouring 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 neighbouring 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

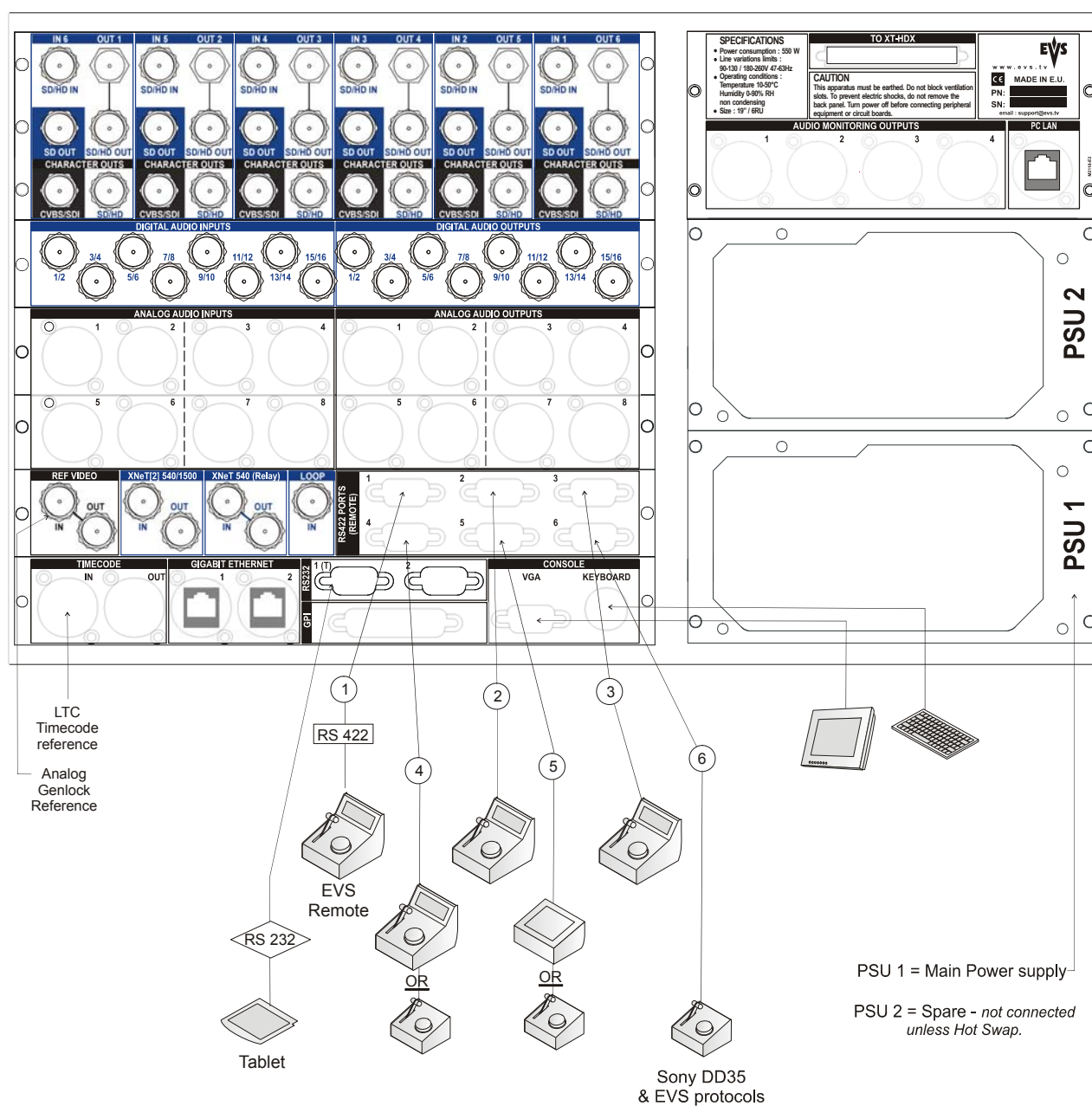
All professional VTRs use line interpolation in PlayVar mode to avoid vertical jitters.

Default value is interpolator off for all configurations except SuperLSM configuration in which 4-line interpolator mode is enabled.

---

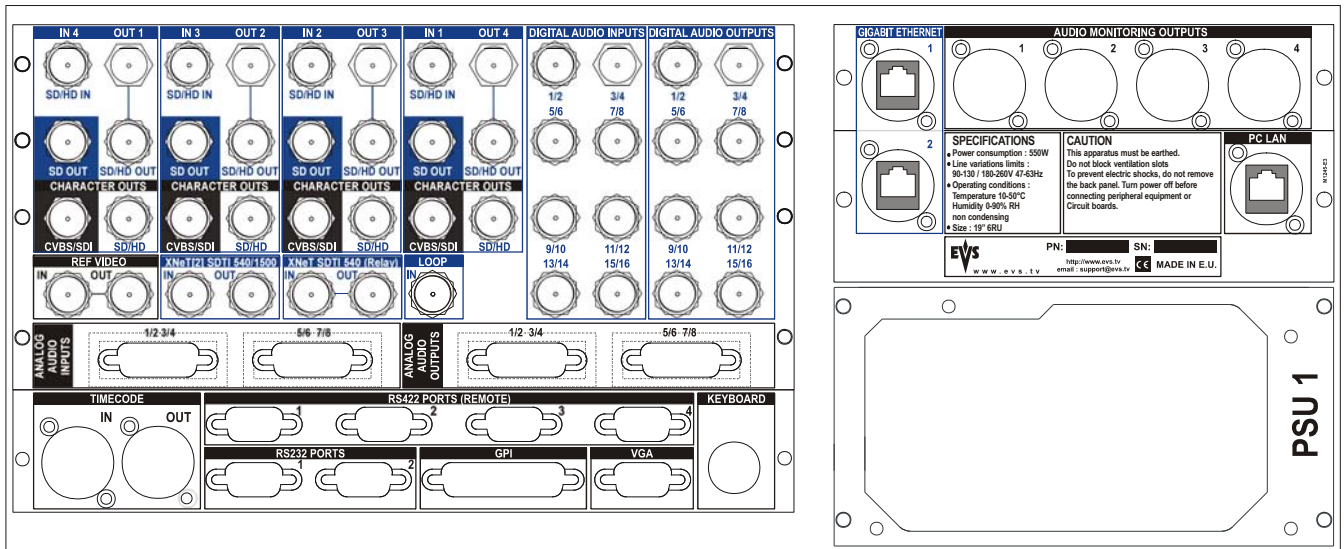
## 2. Cabling

### 2.1 XT[2] 6U BACK PLANE, MULTICAM MODE

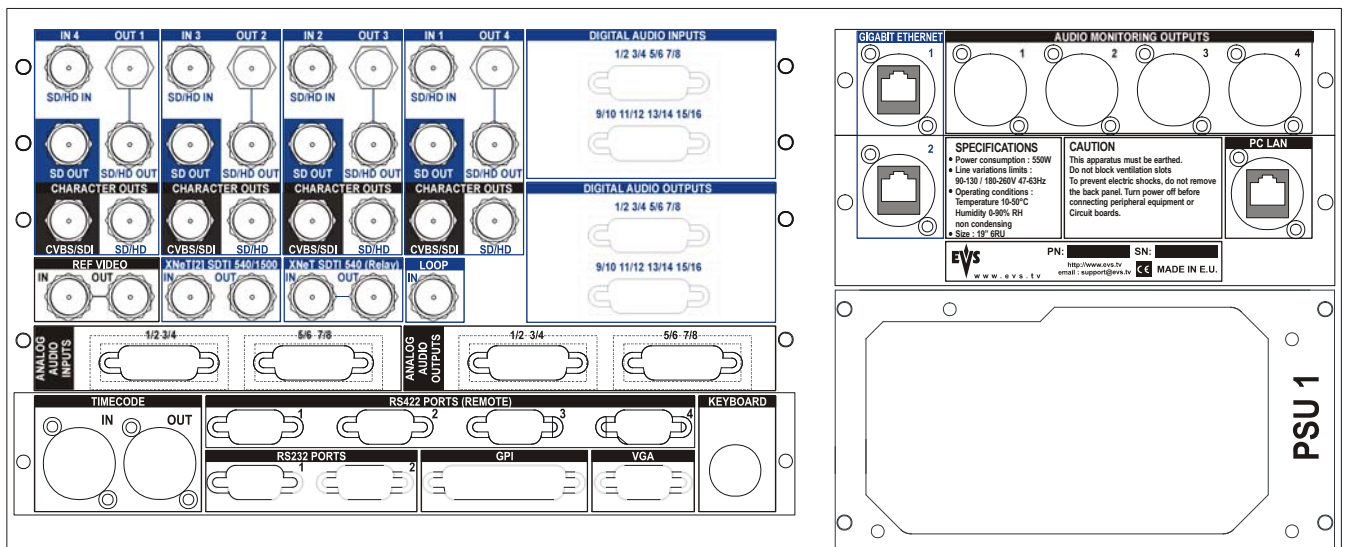


## 2.2 XT[2] 4U BACK PLANE

(XT[2]H-4-A3) Shown with Optional AES on BNC Connector Option



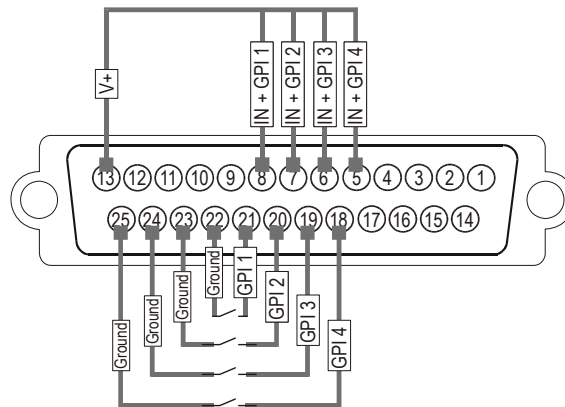
(XT[2]H-4-A3B) Shown with Optional AES on Multi-pin Connector Option



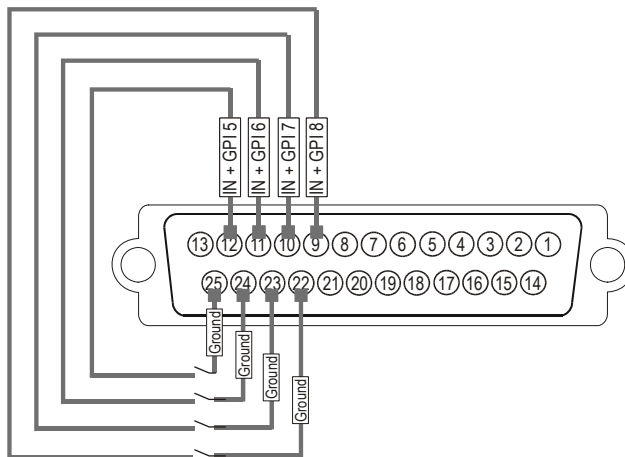
## 2.3 GPI IN CONNECTIONS

On XT servers, GPI triggers are available from Multicam version 5.03.25 or higher. Refer to the Multicam or AirBox user manuals for GPI allocation.

### 2.3.1 RELAY → OPTO INPUTS ON THE XT SERVER (GPI INPUTS 1, 2, 3, 4)

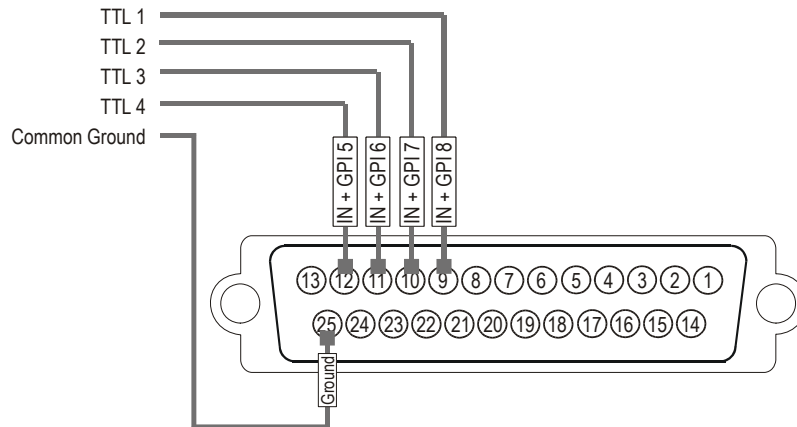


### 2.3.2 RELAY → TTL INPUTS ON THE XT SERVER (GPI INPUTS 5, 6, 7, 8)



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

### 2.3.3 TTL → TTL INPUTS ON THE XT SERVER (GPI INPUT 5, 6, 7, 8)

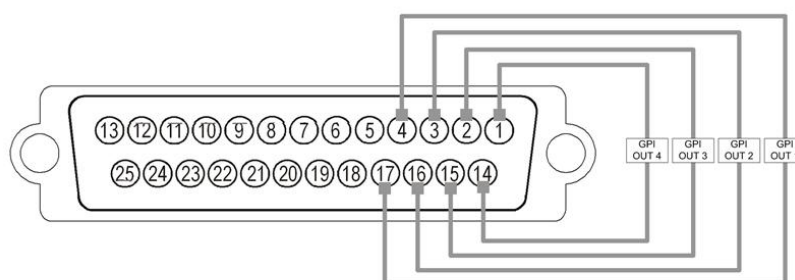


Each TTL input on the DB25 is directly connected to the pin of the TTL connector on the device triggering the GPI. The ground must be common between the DB25 connector of the XT and the external device.

## 2.4 GPI OUT SETTINGS

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)



## 2.5 MTPC GPIO CONNECTOR 15/10/02

### 2.5.1 GPIO CONNECTOR: SUB-D 25-PINS MALE

|    |                |    |                    |
|----|----------------|----|--------------------|
| 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 | + 5V 50mA max. |    |                    |

## 2.5.2 GPIO HARDWARE SPECIFICATION

### 4 X Relay isolated output:

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

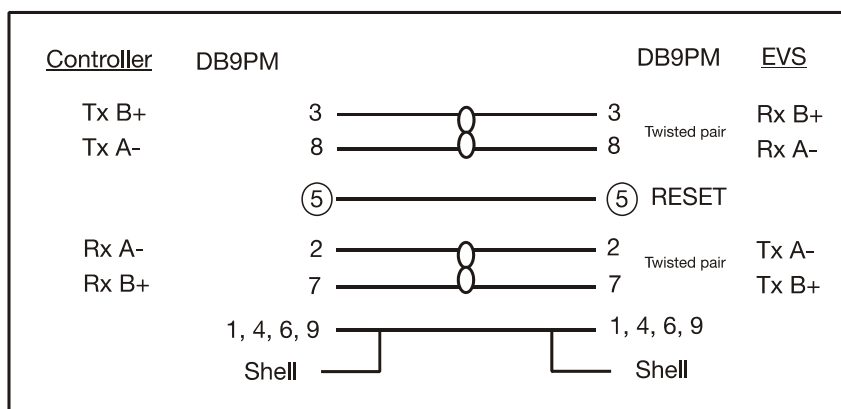
### 4 X Opto isolated input:

- 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

### 4 X CMOS input/output:

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

## 2.6 RS422 CONNECTOR OF THE REMOTE CONTROL PANEL



The RS 422 cable of the Remote control panel must be wired PIN TO PIN following the above diagram. Use shielded cable to avoid electromagnetic interference on long distances.



### Important

The Reset command from the Remote is sent through the Pin n°5 of RS422 connector. This function should be disabled when the controller on RS422 #1 is not an EVS controller (refer to the section 'MTPC Board' on page 62 of this manual).

The technical specifications for the RS422 connector are the following:

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

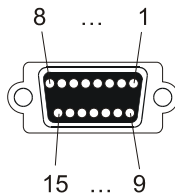
## 2.7 AUDIO CONFIGURATIONS

### 2.7.1 CODA FOR XT[2]

Internal Audio Module: Embedded + AES/EBU + Analogue Balanced

- Embedded Audio 24 stereo channels (input or output)
- AES/EBU Audio 8 stereo inputs + 8 stereo outputs (110 Ohm balanced on SUB-DB15, breakout cable with 4 XLR IN/OUT available optionally OR 75 Ohm unbalanced on BNC)
- Analogue Balanced audio 4 stereo inputs + 4 stereo outputs (110 Ohm balanced on SUB-DB15, breakout cable with 4 XLR IN/OUT available optionally OR XLR)
- Audio monitoring : 4 analogue balanced mono outputs (XLR)

### 2.7.2 PIN ASSIGNMENT ON SUB-DB15 CONNECTORS



AES DB15 Connectors

| Pin # | Sub-DB15 #1<br>Inputs 1-8 (mono) | Sub-DB15 #2<br>Inputs 9-16 (mono) | Sub-DB15 #3<br>Outputs 1-8 (mono) | Sub-DB15 #4<br>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 -                 |

### Analogue DB15 Connectors

| Pin # | Sub-DB15 #1<br>Inputs 1-4 (mono) | Sub-DB15 #2<br>Inputs 5-8 (mono) | Sub-DB15 #3<br>Outputs 1-4 (mono) | Sub-DB15 #4<br>Outputs 5-8 (mono) |
|-------|----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|
| 1     | GND                              | GND                              | GND                               | GND                               |
| 2     | Analogue input 1 +               | Analogue input 5 +               | Analogue output 1 +               | Analogue output 5 +               |
| 3     | GND                              | GND                              | GND                               | GND                               |
| 4     | Analogue input 2 +               | Analogue input 6 +               | Analogue output 2 +               | Analogue output 6 +               |
| 5     | GND                              | GND                              | GND                               | GND                               |
| 6     | Analogue input 3 +               | Analogue input 7 +               | Analogue output 3 +               | Analogue output 7 +               |
| 7     | GND                              | GND                              | GND                               | GND                               |
| 8     | Analogue input 4 +               | Analogue input 8 +               | Analogue output 4 +               | Analogue output 8 +               |
| 9     | Analogue input 1 -               | Analogue input 5 -               | Analogue output 1 -               | Analogue output 5 -               |
| 10    | GND                              | GND                              | GND                               | GND                               |
| 11    | Analogue input 2 -               | Analogue input 6 -               | Analogue output 2 -               | Analogue output 6 -               |
| 12    | GND                              | GND                              | GND                               | GND                               |
| 13    | Analogue input 3 -               | Analogue input 7 -               | Analogue output 3 -               | Analogue output 7 -               |
| 14    | GND                              | GND                              | GND                               | GND                               |
| 15    | Analogue input 4 -               | Analogue input 8 -               | Analogue output 4 -               | Analogue output 8 -               |

## 2.8 CONNECTING MULTIPLE XT[2] SERVERS ON XNET

The XNet network is composed by several XT systems all connected with a 75-Ohm coaxial cable (BNC).

The exchange between systems is operated through the SDTI interface at 540 or 1485 Mbps.

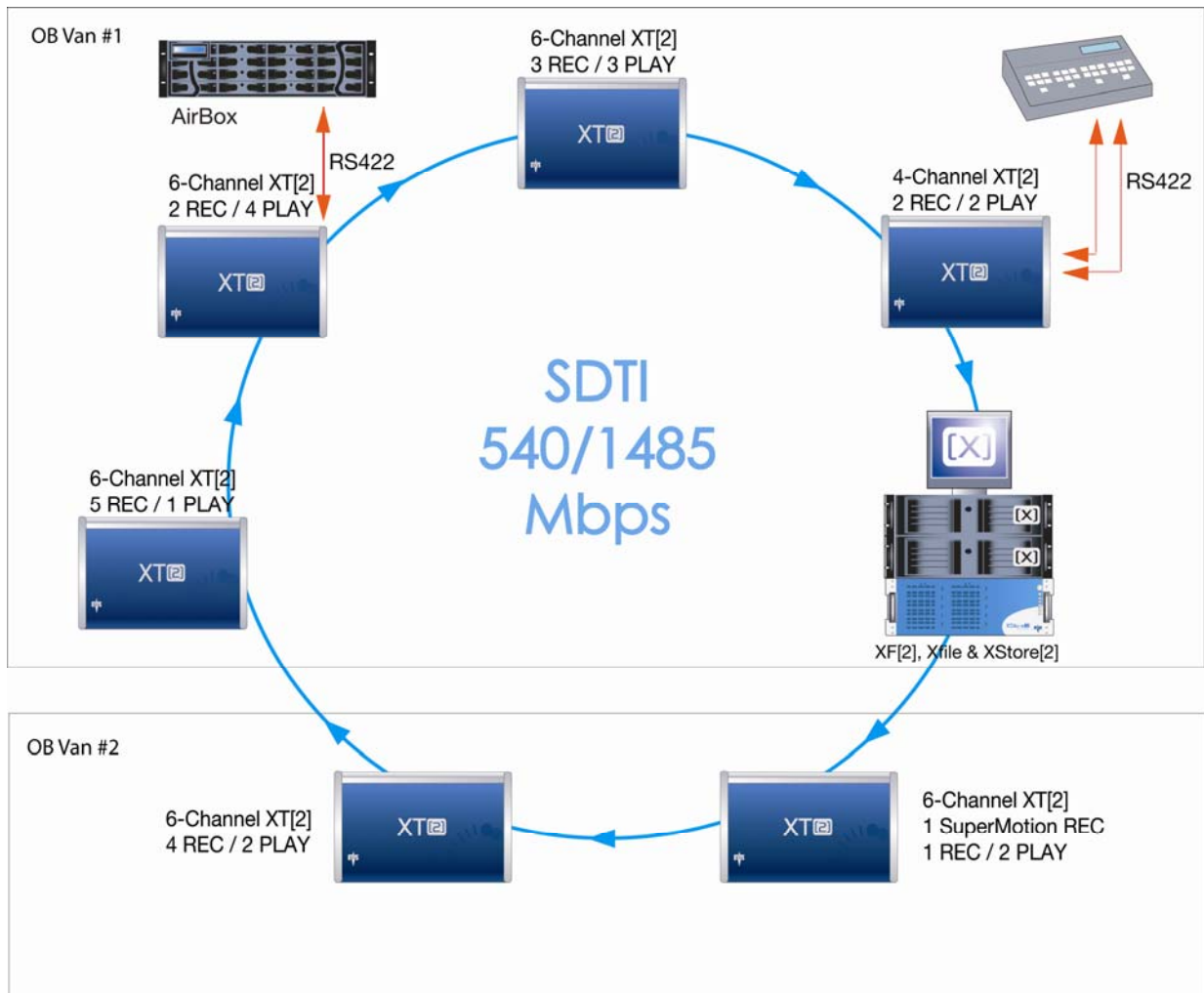
On XT[2] servers there are two pairs of SDTI connectors :

- XNet Relay connectors can be used at a maximum speed of 540 Mbps.
- XNet[2] Non-Relay connectors can be used at 540 or 1485 Mbps.

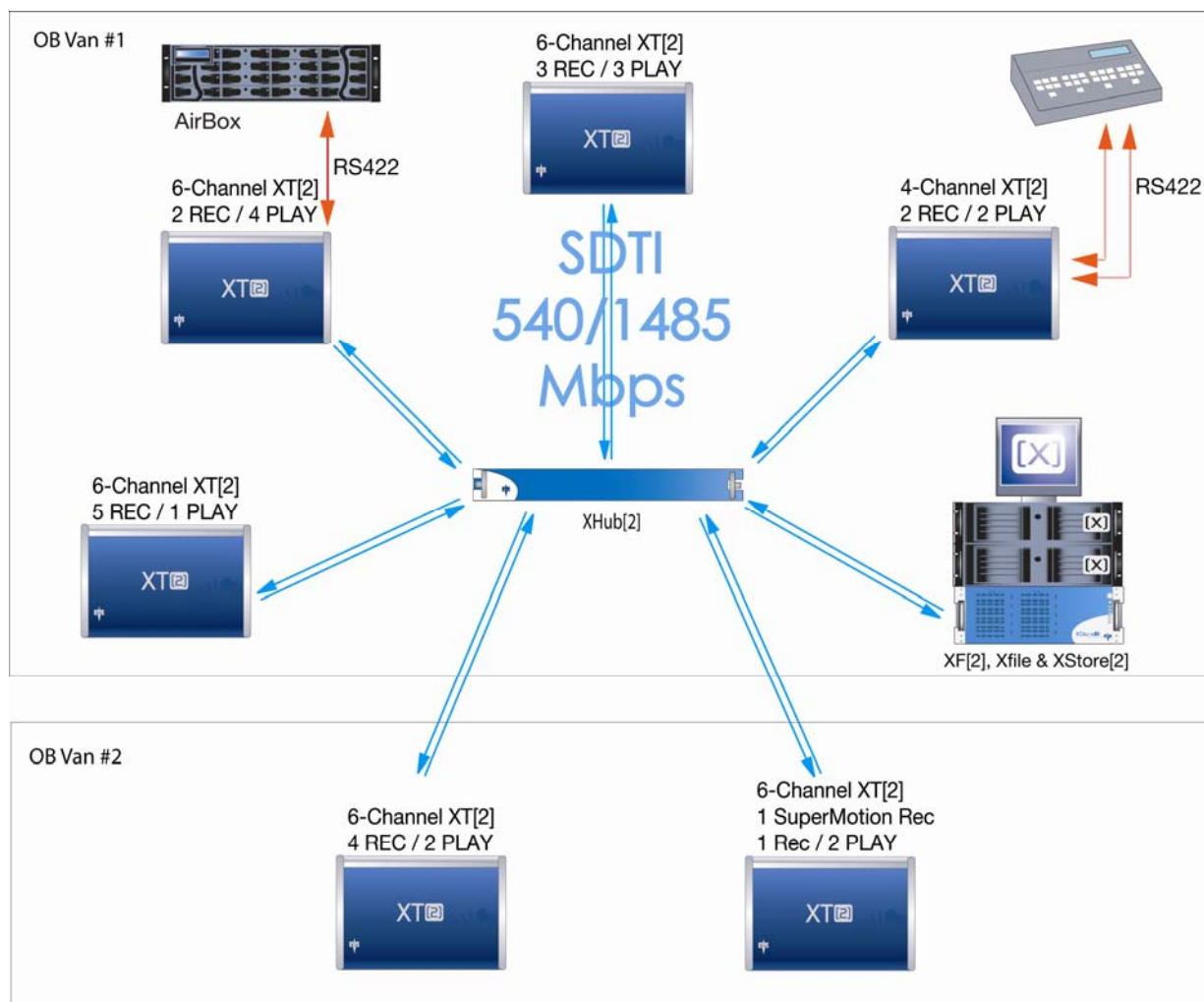
When connected on the SDTI network through Relay connectors, the SDTI loop is always established, even if the XT is not powered on. If connected through Non-Relay connectors, the SDTI loop is closed only when the Multicam software is started. It is therefore recommended to use XHub when using Non-Relay connectors to avoid network interruptions.

The XNet requires a network server dedicated to the management of the Database shared among all LSM-XTs. This is assigned to one of the LSM-XT systems on the network. The XT acting as the network server can of course be used for standard LSM/video server operation.

## 2.8.1 CONNECTION DIAGRAM WITHOUT EVS XHUB SDTI HUB



## 2.8.2 CONNECTION DIAGRAM WITH EVS XHUB SDTI HUB



## 2.8.3 REQUIRED CONDITIONS TO SET UP AND RUN XNET

1. All systems on the network must be XT[2] Series Servers, XFile[2] or XF[2], XStore[2] or XHub[2].
2. The SDTI advanced option code (for network client, master or server modes) must be validated in the options list.
3. They should all be running compatible software version. A warning message is displayed when trying to connect an XT[2] system with a software version that is not compatible with the network server.
4. The following parameters must be similar on all systems :
  - a. SDTI Speed (usually 540Mbps or 1485Mbps, from Hardware Configuration menu)
  - b. Number of clips
5. Network Type must be set to “Server” on 1 XT (and only 1) on the network. The others must be set to either “Master” (to share clips and view others’ clips) or “Client” (to share clips only).
6. A different network number must be specified for each XT system 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.
7. All XTs must be connected with a good quality BNC 75Ohm cable to form a closed loop. Connect the SDTI OUT connector of the first XT to the SDTI IN connector of the second one, etc until the loop is closed by connecting the SDTI OUT connector of the last XT 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 EVS XHub SDTI hub.
8. The distance shown in the table below is the maximum cable length between two active EVS servers, or 2 SDTI reclockers, on an XNet 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-Fibre converters:

- a. Stratos Lightwave Media Converter TX/RX VMC-T-H-2/VMC-R-H-2 ([www.stratoslightwave.com](http://www.stratoslightwave.com))
- b. Telecast TX/RX292 ([www.telecast-fiber.com](http://www.telecast-fiber.com))
- c. Network Electronics SDI-EO-13T (electrical to optical) / SDI-OE-S (optical to electrical) ([www.network-electronics.com](http://www.network-electronics.com))
- d. Network Electronics HD-EO-13T (electrical to optical) / HD-OE (optical to electrical)
- e. BlueBell BB320T (TX) and BB320R (RX) ([www.bluebell.tv](http://www.bluebell.tv))

| Cable type | @ 1485 Mbps  | @ 540 Mbps    |
|------------|--------------|---------------|
| RG59       | 45m / 148ft  | 100m / 328ft  |
| RG6        | 90m / 484ft  | 180m / 590ft  |
| RG11       | 120m / 393ft | 250m / 820ft  |
| Super HiQ  | 150m / 492ft | 350m / 1148ft |
| Fiber      | 80km(*)      | 200km(*)      |

(\*) 80km/200km 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 @ 1485Mbps, 100 km @ 540Mbps.



#### Note

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

## 2.8.4 STARTING XNET

- When all above conditions are fulfilled, turn on all “Masters” and “Clients” XTs, and make sure the Multicam application is started on all of them. A message appears because they are looking for the “Server” XT.
- Turn on the “Server” XT and start the Multicam application. The other XTs should see the “Server” arriving on the network and will connect automatically. Connection takes a few seconds (usually between 2 and 5 sec) for each XT.

## 2.8.5 XNET PERFORMANCES & TROUBLESHOOTING

1. With the default settings, 10 real-time transfers can be achieved on the network with standard definition pictures in normal conditions, and 3 real-time transfers with super motion pictures. Copy of a clip between 2 servers on the network can be made up to 5 times faster than real time, depending on network occupancy.

With high definition pictures, these numbers are reduced to 3-4 real-time transfers and copy clip 2 times faster than real time.

These performances are also limited by the disk bandwidth available from the XT where the clips are stored. If the XT “owning” the clips is doing multiple playbacks at the same time, freezes can occur on the remote XT using those clips. Priority levels have been implemented to maximize network bandwidth efficiency: PLAY requests have a higher priority than SEARCH/BROWSE requests, which in turn have a higher priority than COPY requests. Note that “Live” (E2E) mode on a remote record train has the same priority level as a SEARCH/BROWSE request.

2. Note that when working at 1485Mbps or 540Mbps, only passive SDI routing equipment may be used. The use of active SDI equipment should be avoided, because they could cause additional line delays and prevent the proper operation of XNet.
3. If the start-up of the network at a specific speed does not work properly and all machines are apparently configured properly and the Multicam is actually started on all of them, this can be due to the fact that the selected cables to connect all XTs together are not suitable or too long to operate at such a speed. You can decrease the speed of the SDTI network on all machines and try working in this mode. The number of simultaneous real-time transfers you can achieve is of course reduced.
4. While working at 1485 Mbps, 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. All equipments should be started if not connected to an XHub.
5. It is recommended to use XHub if the network speed is set to 1485 Mbps.
6. Once the network has been established, if the system acting as the network server is disconnected or shut down, another system will automatically be assigned to act as a new network server. The switch is automatic and seamless. The next machine to be automatically assigned as new network server is the one with the highest serial number in the SDTI network.

## 2.9 GIGABIT NETWORK

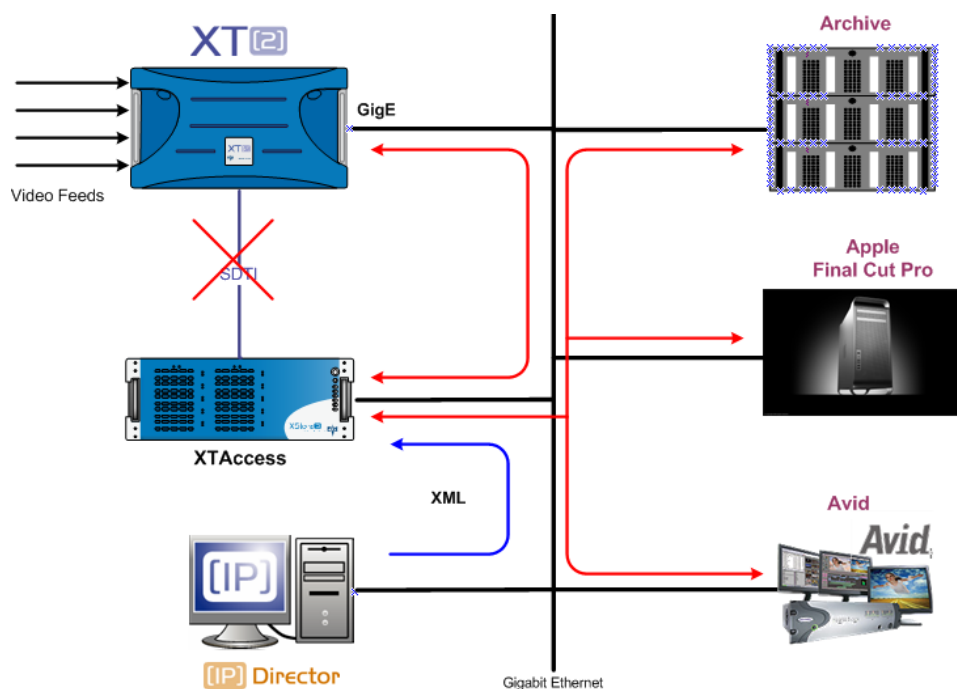
### 2.9.1 FUNCTIONAL OVERVIEW

The Gigabit connection makes it possible to transfer video and audio material from the XT servers 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 or XFile[2] or XF[2].
- A non-linear Editing system, such as CleanEdit, Apple Final Cut Pro or Avid.

However, the external systems cannot read the raw files coming from the XT[2] servers. For this reason, XT Access is used as a “gateway” between the XT[2] and the IT world. It takes up the role of gateway used so far by XFile/XStream as it creates file formats compliant with external systems.



XT Access is directly connected to the XT[2] servers through the Gigabit network via an FTP client. It runs on an XP workstation and is mainly controlled by the external systems (no user interface) via XML files or other processes.

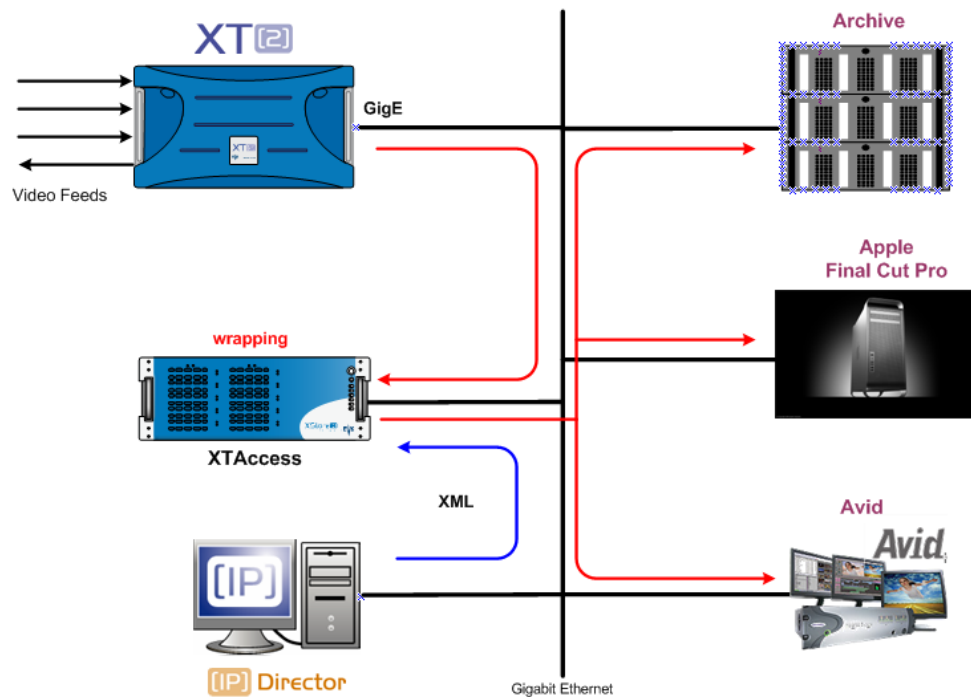
The Gigabit connection fulfill the following functions in relation with the XT[2] servers:

- Backup of clips from an XT[2] server
- Restore of clips to an XT[2] server

The sections below briefly present the backup and restore of clips through the Gigabit connection. Please refer to the XT Access technical manual for full information about the possible workflows with third-party systems.

## 2.9.2 BACKUP OF CLIPS

The following schema shows how the backup of clips is performed with the Gigabit connection and XT Access:



### Workflow

1. An external system, for example IP Director, sends an XML file to XT Access to request the backup of a given clip created on an XT[2] server.
2. XT Access processes the XML file:
  - a. It gets the clip content that has to be backed up from the XT[2] server.
  - b. It generates a backup file of the clip in the format specified by the external system (no transcoding feature, only native codec). The following formats are supported: EVS MXF, MXF OP-1A, Quick Time (depending on the video codec).
  - c. It stores the backup file in the target folder specified by the external system. The metadata on the clip are either included in the file (in EVS MXF) or sent via an XML file.

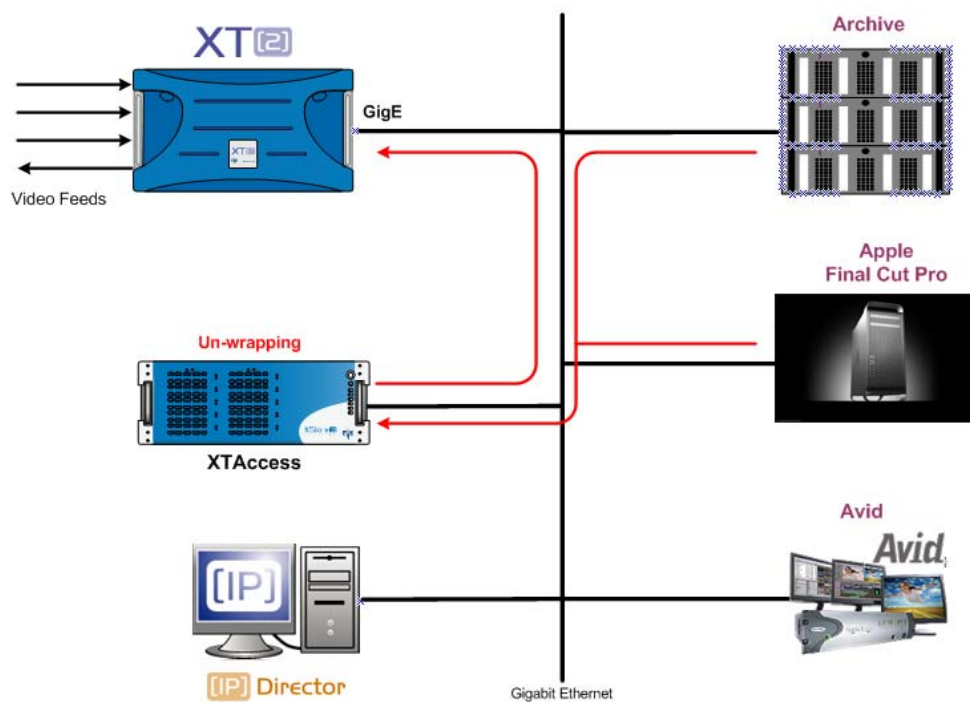
## 2.9.3 RESTORE OF CLIPS

The restore of clips can be performed on clips having one of the following formats: EVS MXF, MXF OP-1A or Quick Time (depending on the video codec).

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

- via XML file sent by the external application.
- via folder scan.

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



### ***Workflow (Restore via XML File)***

1. An external system (which can generate XML files for restoring clips, for example MediaXChange) sends to XT Access an XML file to request the restore (copy) of clips from an archiving or backup system to a given XT server.
2. XT Access processes the XML file:
  - a. It gets the clip file to restore from the external system.
  - b. It restores, i.e. copies, the clip on the XT server specified in the XML file.

### ***Workflow (Restore via Folder Scan)***

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

The restored clip receives a new UmID and LSM ID:

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

## **2.9.4 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).

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

- HP Procurve 2510G-24
- Cisco Catalyst 2960G-24TC

- Cisco Catalyst 3750E-24TD/3750E-48TD

## COMPARISON

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

On larger setups, both GigE ports of the XT[2] servers or/and several ports on the XF[2] are often used to increase the bandwidth or to allow redundancy. Since both GigE ports of an XT[2] 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 3750E 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                     | RU | Layer | Gb ports | SFP       | 10Gb (X2) | JF switching | JF routing | Stacking |
|---------------------------|----|-------|----------|-----------|-----------|--------------|------------|----------|
| HP Procurve 2510G-24      | 1  | 2     | 20(+4)   | 4         | 0         | Y            | N          | N        |
| Cisco Catalyst 2960G-24TC | 1  | 2     | 20       | 4         | 0         | Y            | N          | N        |
| Cisco Catalyst 3750E-24TD | 1  | 3     | 24       | (up to 4) | 2         | Y            | Y          | Y        |
| Cisco Catalyst 3750E-48TD | 1  | 3     | 48       | (up to 4) | 2         | Y            | Y          | Y        |

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.

## 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.

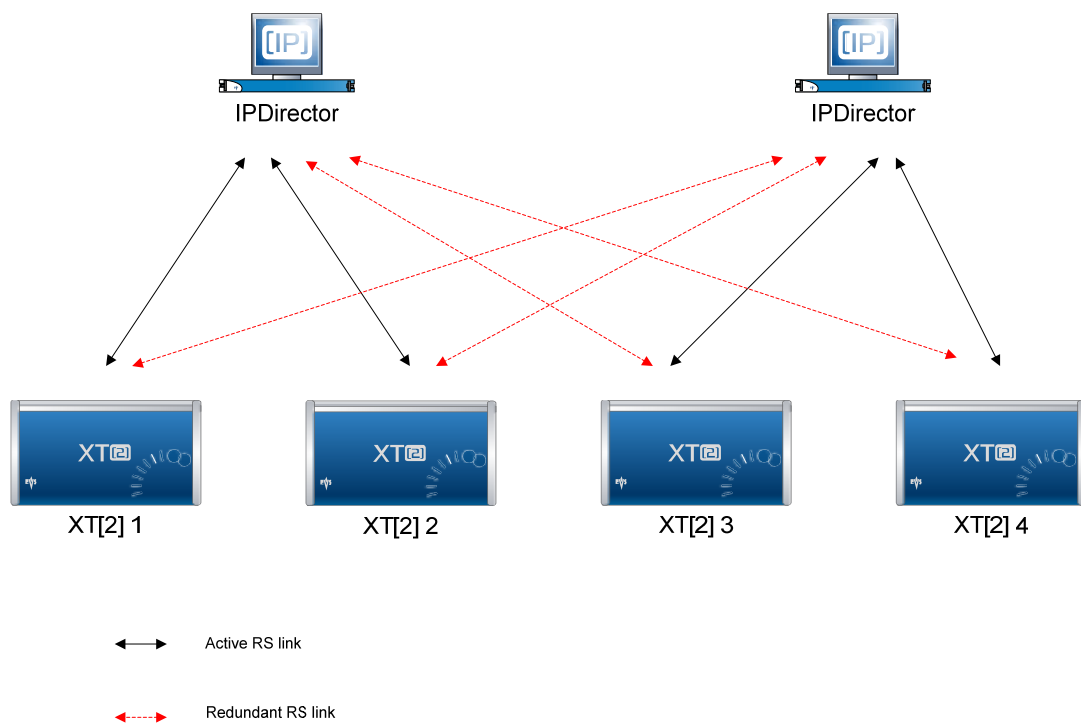
The stacking possibilities of the Cisco 3750E series permit to have fully active LACP teams for redundancy to the hosts.

## 2.10 REDUNDANT IPDP SERIAL LINK

The IPDirector communicates with the XT[2] server via one serial link. If that link fails, the XT[2] server can no longer be controlled by any IPDirector.

From Multicam version 10.01, a failover mechanism has been put into place. This mechanism will switch the IPDirector link from one port of an XT[2] server to another port on another XT[2] server.

To ensure the failover, the backup links between IPDirector workstations and the XT[2] servers need to be physically cabled 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.

## 3. Hardware Description

### 3.1 BOARDS AND SLOT CONFIGURATIONS

The EVS Disk Recorder contains all the EVS developed boards. Several board configurations are available.

#### 3.1.1 6U FRAME

| Slot # | XT[2] SD, HD or HD/SD     |
|--------|---------------------------|
| 9      | Disk Array                |
| 8      | HCTX                      |
| 7      | CODA (Audio Codec)        |
| 6      | (empty)                   |
| 5      | COHX (SD, HD or SD/HD) #3 |
| 4      | COHX (SD, HD or SD/HD) #2 |
| 3      | (empty)                   |
| 2      | COHX (SD, HD or SD/HD) #1 |
| 2      | Genlock                   |
| 1      | MTPC                      |

#### 3.1.2 4U FRAME

| Slot # | XT[2] SD, HD or HD/SD     |
|--------|---------------------------|
| 6      | Disk Array                |
| 5      | HCTX                      |
| 4      | CODA (Audio Codec)        |
| 3      | COHX (SD, HD or SD/HD) #2 |
| 2      | COHX (SD, HD or SD/HD) #1 |
| 2      | Genlock                   |
| 1      | MTPC                      |

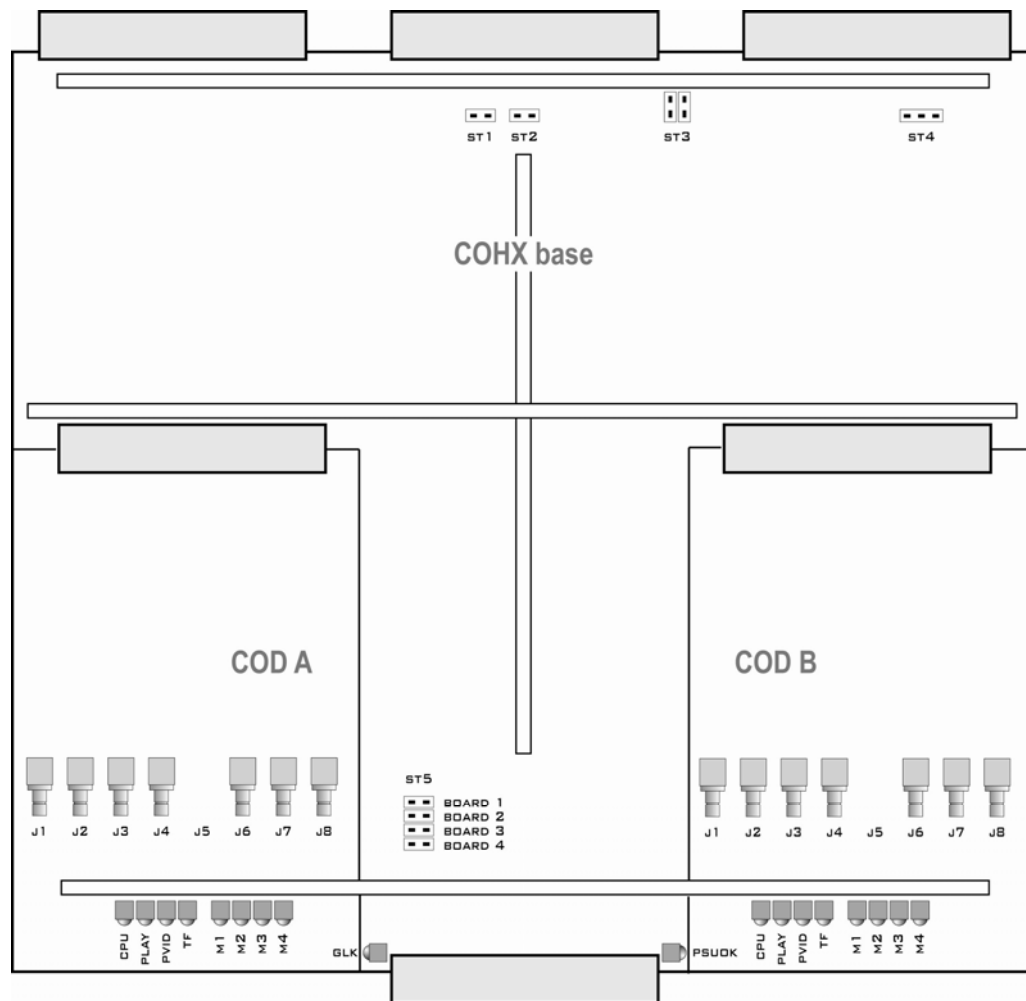
## 3.2 VIDEO AND REFERENCE BOARDS

### 3.2.1 COHX BOARD

The COHX board is divided in 3 parts: COHX base (centre front and back), COD A module (front left), and COD B module (front right).

COD A and COD B 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). There are 3 hardware versions of COD modules : SD only, HD only, or HD/SD. They are clearly identified by the sticker at the front of the board.

There are 2 versions of the COHX base : one with genlock, one without genlock. The genlock model can easily be identified by the presence of 3 quartz synthesizer at the back of the 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 centre front of the board. Note that a COHX board with genlock must be installed as COHX #1 in first position (slot 2) in an XT[2] system (6U or 4U). A COHX board with genlock can never be installed in any other slot, and thus can not be used instead of COHX #2 or #3. Doing so will result in conflicting electrical signals inside the system.



## JUMPERS ON THE COHX BASE MODULE

|                                   |                                                                                                                                                                                                                  |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST1, ST2:                         | These 2 jumpers <u>must</u> be installed on the last COHX board of the server (i.e. on COHX #1, 2 or 3 if there are respectively 1, 2 or 3 COHX board installed in the server)                                   |
| ST3 (SPARE):                      | « parking » for jumpers for ST1 and ST2 when these are not used                                                                                                                                                  |
| ST4 (only on COHX with genlock) : | It must be set to HiZ (or not installed).<br><br>Note that the Genlock Loop connector on the back panel of the XT[2] server <u>must always</u> be terminated with a 75 Ohm load if it is not used.               |
| ST5 :                             | It defines the position of the board inside the server.<br><br>It must be set to « 1 » for a COHX with genlock, and to « 2 » or « 3 » for a COHX board without genlock, depending on its position in the server. |

## LEDS ON THE COHX BASE MODULE WITH GENLOCK

### GLK

|                    |                                                                                           |
|--------------------|-------------------------------------------------------------------------------------------|
| Off                | when the genlock module is not initialized                                                |
| Blinks green       | when the genlock module is properly initialized, but not valid genlock signal is detected |
| On, steady green   | when the module is initialized and a valid genlock signal is detected                     |
| Red (intermittent) | when there is a genlock problem                                                           |
| Red (steady)       | when a resync is needed                                                                   |

### PSU OK

|            |                                                                                  |
|------------|----------------------------------------------------------------------------------|
| On (green) | when all voltages are present and in the allowed range, otherwise the led is off |
|------------|----------------------------------------------------------------------------------|

## LEDS ON THE COD A AND COD B MODULES (FROM LEFT TO RIGHT)

### CPU

|                  |                                                              |
|------------------|--------------------------------------------------------------|
| Blinks green     | to indicate CPU activity                                     |
| On, steady green | when there is a problem with the processor of the COD module |

### PLAY

|            |                                                         |
|------------|---------------------------------------------------------|
| On (green) | when the COD module is set by the software in play mode |
| Off        | when the COD module is set in record mode               |

### PVID

|            |                                                                                                                                     |
|------------|-------------------------------------------------------------------------------------------------------------------------------------|
| on (green) | when a valid video signal has been detected on the J8 connector (SD/HD SDI input), whether the COD module is in play or record mode |
|------------|-------------------------------------------------------------------------------------------------------------------------------------|

### TF (transfer)

Blinks green while data transfers occur between the COD module and the HCTX board

M1, M2, not yet used

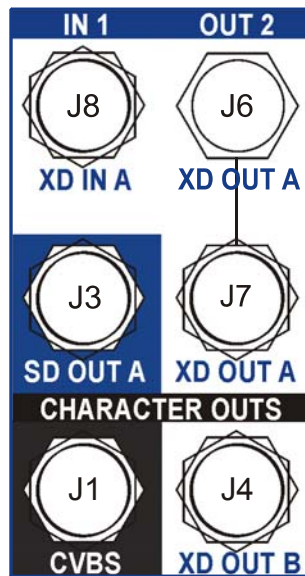
M3, M4

## CONNECTORS ON THE COD A AND COD B MODULES

| Connector | SD mode                                     | HD mode                                            | Connector label on rear panel |
|-----------|---------------------------------------------|----------------------------------------------------|-------------------------------|
| J1        | SDI/CVBS (*) monitoring output (SD)         | SDI/CVBS(*) monitoring output (SD, down-converted) | Character Outs, CVBS/SDI      |
| J2        | SDI monitoring output (SD)                  | SDI monitoring output (SD, down-converted)         | Not connected                 |
| J3        | Loop-through for the SDI input signal (SD)  | SDI program output (SD, down-converted)            | SD Out                        |
| J4        | SDI monitoring output (SD)                  | HD SDI monitoring output (HD)                      | Character Outs, SD/HD         |
| J5        | Not installed                               | Not installed                                      | n.a.                          |
| J6        | SDI program output (SD)                     | HD SDI program output (HD)                         | SD/HD Out                     |
| J7        | SDI program output (SD, identical to J6)    | HD SDI program output (HD, identical to J6)        | SD/HD Out                     |
| J8        | SDI input (SD)                              | HD SDI input (HD)                                  | SD/HD In                      |
| J9        | Alternate SDI input (SD, for hardware loop) | Alternate HD SDI input (HD, for hardware loop)     | Used for loop in              |

(\*) The switch between SDI and CVBS on J1 is done by a software setting in the EVS Configuration menu.

The following schema shows the connector positions:



#### Note

Only front backplanes labelled BKP7 are compatible with COHX boards (4 slots for 4U frames, and 7 slots for 6U frames). The BKP7 backplanes (compatible with COHX boards) have 3 rows of soldering per slot, while the backplanes compatible with IO-E, COHD or COHU boards have 2 rows of soldering per slot. Note that the top slot of BKP7 backplanes must always be connected to the HCTX board.

## CHANNEL ASSIGNMENT

### 2-ch XT[2] Server

Lower Codec (#2)



## 4-ch XT[2] Server

Upper Codec (#4)



Lower Codec (#2)

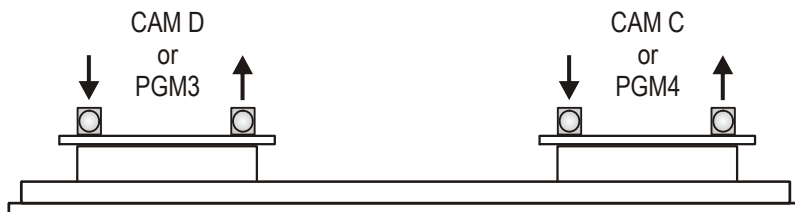


## 6-ch XT[2] Server

Upper Codec (#5)



Middle Codec (#4)

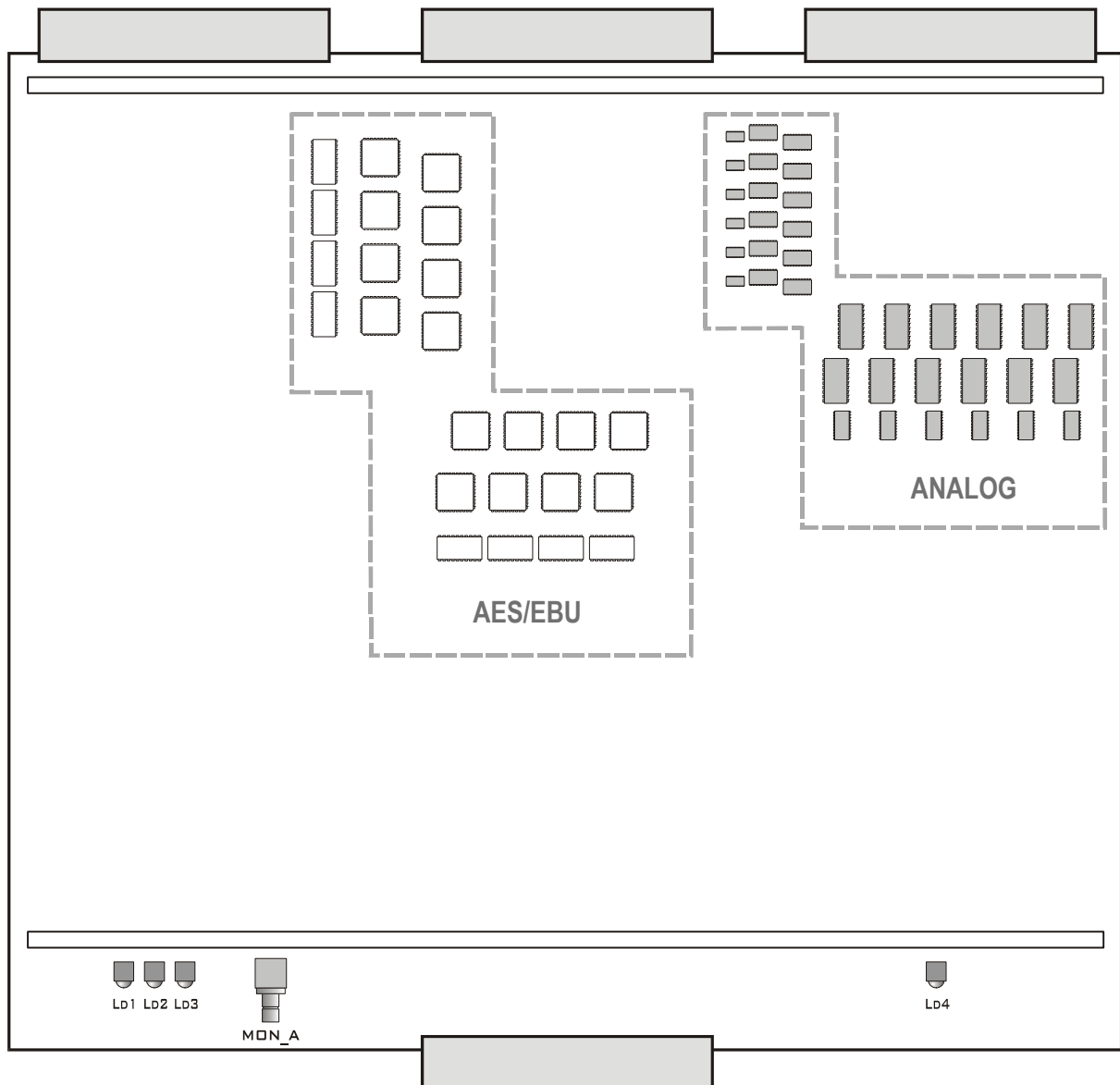


Lower Codec (#2)



## 3.3 AUDIO CODEC BOARD

The AUDIO CODEC board is the audio interface between the COHX boards and the HCTX board. VIDEO CODEC and AUDIO CODEC board are tied to the HCTX board with one Bus connector on the front side. Different audio configurations are available with the AUDIO CODEC board. See Audio configurations in chapter 2 for details.



### LED INFORMATION AND CONNECTOR

LD 1-3: Internal EVS information only

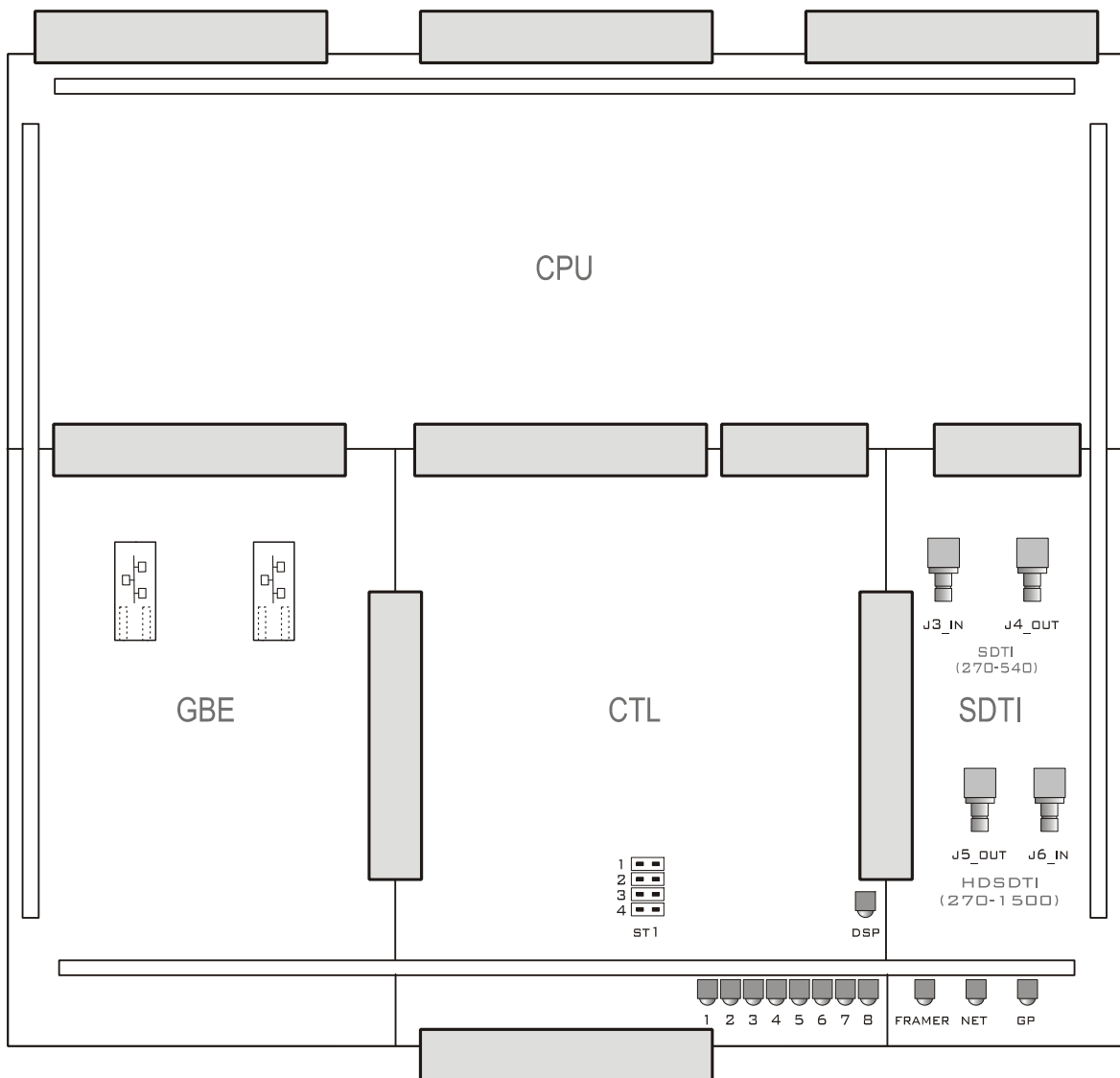
LD4: transfer activity to/from the HCTX board

## 3.4 RAID CONTROLLER BOARDS

### 3.4.1 HCTX BOARD

The HCTX board is actually divided in 4 parts (3 in front, 1 in the back).

- Front left : GBE module
- Front centre : CTL controller module
- Front right : SDTI XNet[2] module
- Back : CPU module



## JUMPERS

ST1-1 on controller module (front centre) : jumper must be installed on ST1-1 only when the HCTX board is used with previous video codec boards (SD CODEC6, COHD, COHU). This jumper is automatically detected by the software application, and an error message is generated if it is not properly set

ST1-2, ST1-3 and ST1-4 on controller module are not used. No jumper must be installed on these

ST1 on CPU module (rear corner, left) : for EVS internal tests only (used to reset the board). Never install that jumper, or the board will be in a permanent reset state !

## LEDs

LEDs on the XNet[2] module (SDTI), from left to right :

### FRAMER

---

|            |                                                                                |
|------------|--------------------------------------------------------------------------------|
| on (green) | when the signal on the XNet or XNet[2] IN connector is a valid EVS SDTI signal |
|------------|--------------------------------------------------------------------------------|

### NET

---

|            |                                                                                           |
|------------|-------------------------------------------------------------------------------------------|
| on (green) | when the XNet SDTI network is actually established (SDTI loop closed, correct speed, etc) |
|------------|-------------------------------------------------------------------------------------------|

|    |          |
|----|----------|
| GP | not used |
|----|----------|

---

LEDs on the CTL controller module (centre), from left to right :

|       |                                                              |
|-------|--------------------------------------------------------------|
| LED 1 | lights red when an error occurs while booting the HCTX board |
|-------|--------------------------------------------------------------|

|               |                                                              |
|---------------|--------------------------------------------------------------|
| LEDs 2 to 8 : | display the boot sequence of the HCTX board (cfr note below) |
|---------------|--------------------------------------------------------------|

|           |                                   |
|-----------|-----------------------------------|
| DSP led : | blinks green to show DSP activity |
|-----------|-----------------------------------|

---

LEDs on the GBE Gigabit module (left), from left to right:

|                |                                                                                           |
|----------------|-------------------------------------------------------------------------------------------|
| LEDs CPU1/CPU2 | indicate that the processor is running. The LEDs blink alternately every 250 milliseconds |
|----------------|-------------------------------------------------------------------------------------------|

|            |                                             |
|------------|---------------------------------------------|
| Other LEDs | The six other LEDs are for EVS internal use |
|------------|---------------------------------------------|

---



### Note

When booting the HCTX board, LEDs 1 to 8 will light according to the following sequence :

|                                                    |   |                                             |
|----------------------------------------------------|---|---------------------------------------------|
| Hardware reset                                     | → | all LEDs on (1 : red ; 2 to 7 : green)      |
| Setup of CPU basic registers                       | → | led 2 on (green)                            |
| Check of CPU/PC DPRAM                              | → | if error: led 1 on (red) + led 8 on (green) |
|                                                    | → | if check is successful: led 3 on (green)    |
| Polling for PC commands                            | → | led 4 on (green)                            |
| Switching to enhanced mode                         | → | led 5 on (green)                            |
| Executing PC commands until execution requests end |   | led 6 on (green)                            |
| Jump to SDRAM and execute microcode                |   |                                             |

## CONNECTORS

On the XNet[2] module (SDTI) :

|            |                                                                         |
|------------|-------------------------------------------------------------------------|
| <b>J3:</b> | IN connector for XNet (SDTI network 270/540Mbps with relay)             |
| <b>J4:</b> | OUT connector for XNet (SDTI network 270/540Mbps with relay)            |
| <b>J5:</b> | OUT connector for XNet[2] (SDTI network 270/540/1485Mbps without relay) |
| <b>J6:</b> | IN connector for XNet[2] (SDTI network 270/540/1485Mbps without relay)  |



### Note

J3 must be used with J4, and J5 must be used with J6. Never use J3 with J5 or J4 with J6.

## GIGABIT CONNECTORS

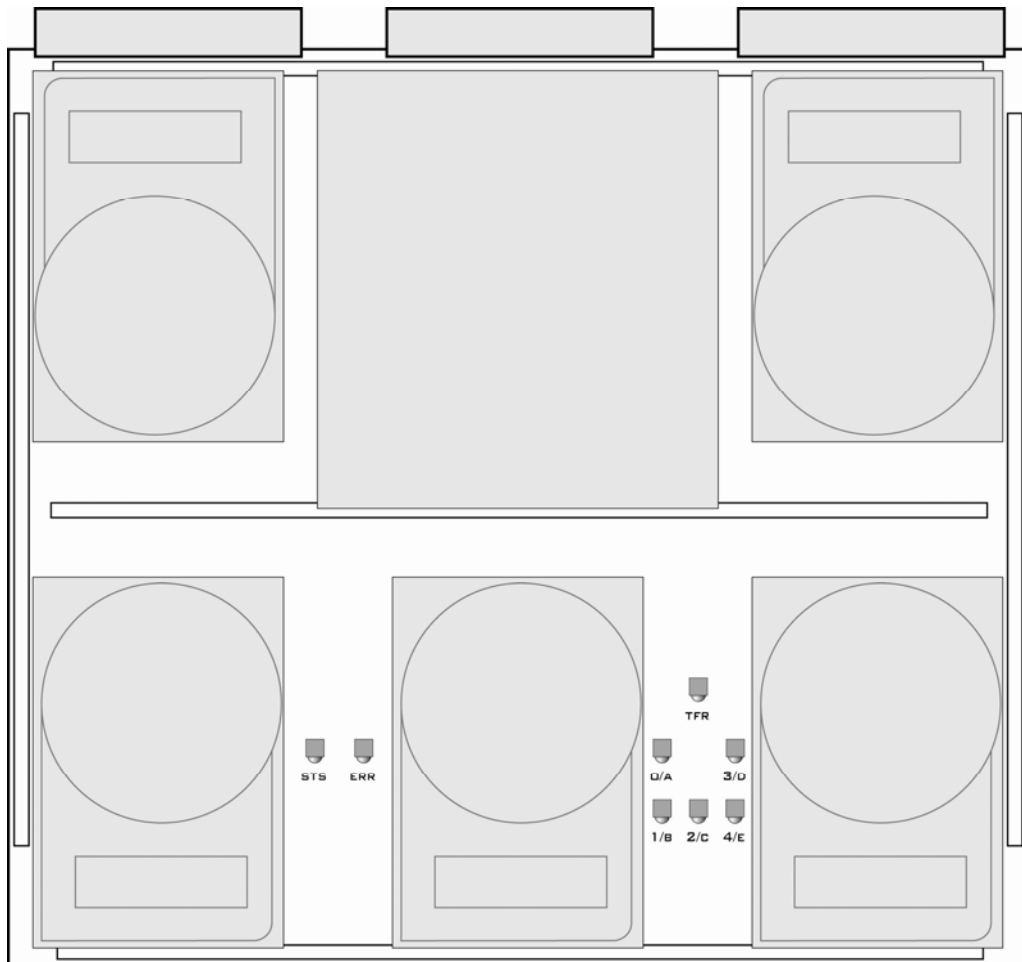
The two Gigabit connectors of the card are connected to the two Gigabit ports of the backplane.

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.

For more information, refer to the Software Technical Reference manual for setting up the IP addresses.

### 3.4.2 RTCL BOARD ON DISK ARRAY (WITH HCTX)

Disk Arrays on systems with HCTX Boards have a controller on the disk array board.



## LEDs

**0/A – 1/B – 2/C – 3/D – 4/E** (between the 2nd and 3rd disk from left in front) :

These LEDs match the position of the disks on the board, i.e :

0/A     RTCL     3/D

1/B     2/C     4/E

### 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 |

### TF (just behind the 5 disks LEDs) :

|            |                                                                                                                                                                                                                                                                        |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| on (green) | when data is transferred between the RAID array and the HCTX board.<br><br>If the led is nearly permanently on, it means that data is transferred almost all the time between the RAID array and the HCTX board, thus being close to the max. bandwidth of the system. |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### STS (between the 1st and 2nd disk from left in front) :

|            |                                               |
|------------|-----------------------------------------------|
| on (green) | when RCTL RAID controller is properly booted. |
|------------|-----------------------------------------------|

### ERR (next to STS) :

|            |                                                                                      |
|------------|--------------------------------------------------------------------------------------|
| lights red | when errors occur during the data transfer between the RAID controller and the disks |
|------------|--------------------------------------------------------------------------------------|

### 3.4.3 EXTERNAL RAID ARRAY XT-HDX FOR XT[2] SERVER

The XT-HDX is an external disk storage containing up to 15 SCSI disks. It is connected to the XT[2] server via a dedicated SCSI cable on the backplane of the server.

This XT-HDX is only available with XT[2] 6U with hot-swappable power supply.

Necessary equipment

- XT[2] 6U with XT-HDX connector on the back plane and MT5D\_LNK board
- Multicam version 08.04.25 or later
- XT-HDX external disk storage

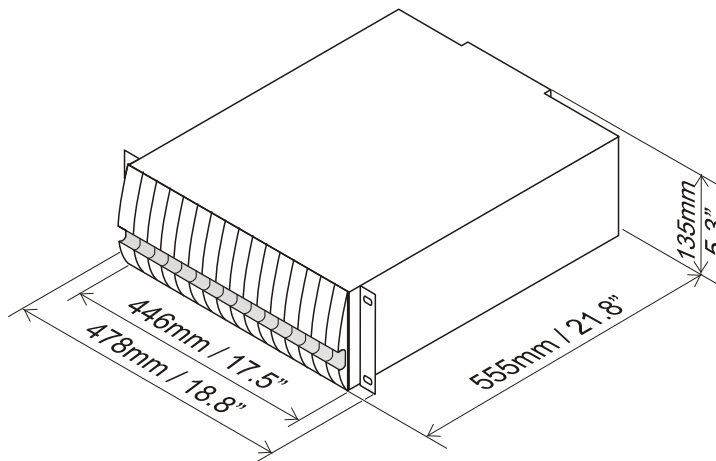


#### Important

An XT[2] server can not work simultaneously with an internal RAID array (MT5D) and an external RAID array (XT-HDX). When an XT[2] server is equipped with the XT-HDX external disk storage, the MT5D internal RAID is replaced by the MT5D\_LNK board. This replacement has to be done by EVS staff.

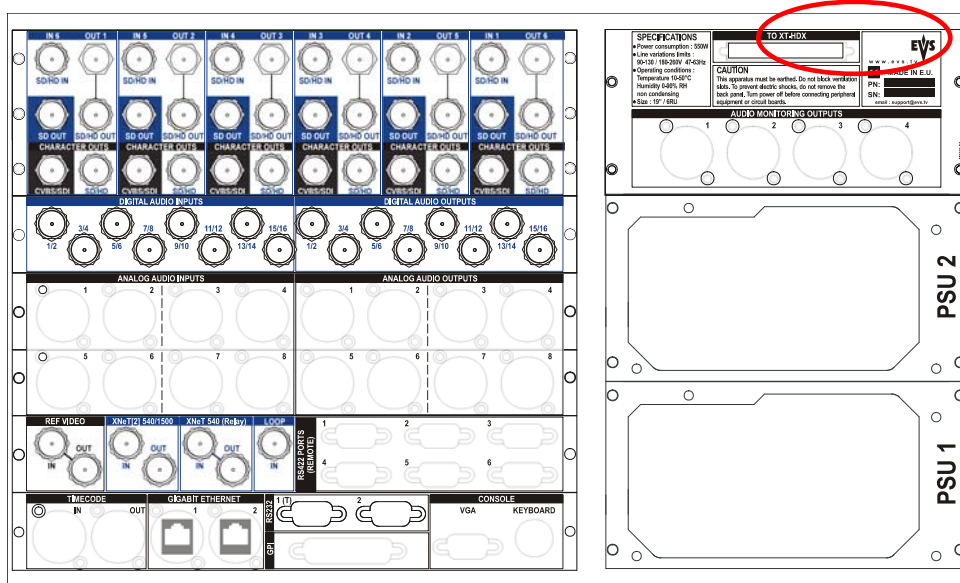
---

### XT-HDX DIMENSIONS



## INSTALLATION AND OPERATION

1. Both the XT[2] server and the XT-HDX need to be switched off.
2. The XT-HDX expansion chassis must be located immediately above the chassis of the XT[2] server.
3. Connect the XT-HDX to the server only with the external SCSI cable provided by EVS (see schema and picture)
4. Disks in the XT-HDX rack are hot-swappable. However, a disk can only be extracted from the rack when it has been stopped by the software application (disk led blinking slowly red with a 4-second cycle)

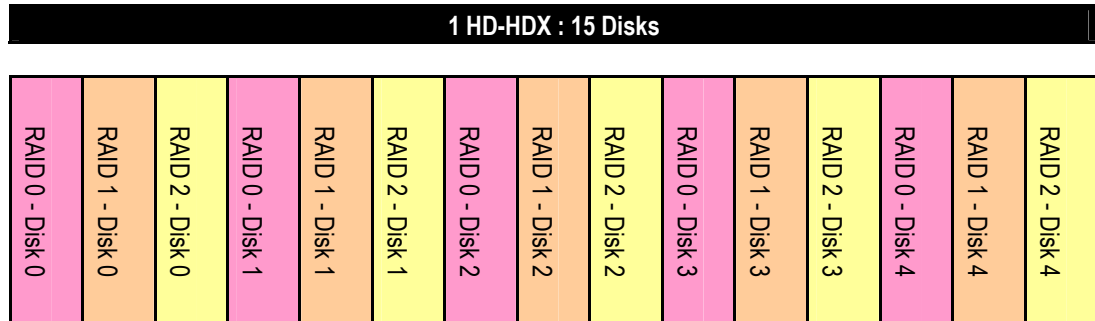


5. Power on the XT-HDX before powering on the XT[2] server.

## DISK ORGANISATION

The XT-HDX can hold up to 15 disks organized in 3 RAID's of 5 disks.

The disks are organized in the following way:



|         |
|---------|
| RAID #0 |
| RAID #1 |
| RAID #2 |

## LED STATUS

### LEDs on the disk canisters

|                                              |                                                    |
|----------------------------------------------|----------------------------------------------------|
| No colour                                    | The disk is operational                            |
| Green                                        | There is activity (write/read) on the disk         |
| Red                                          | The disk is either not detected or not present     |
| Red blinking rapidly<br>(3 times per second) | The disk is being mounted                          |
| Red blinking<br>(1 second cycle)             | The disk is disconnected                           |
| Red blinking slowly<br>(4 seconds cycle)     | The disk is disconnected and the motor is stopped. |



### Note on Disk LEDs Activity

When starting from a clean disk array (after a “Clear Video Disks” from the EVS maintenance menu), the XT[2] 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 5, 10 or 15 disks depending on how much material (clips and record trains) is stored on the server.

---

### LEDs at the back of the XT-HDX rack

Status LED blinking green

Device operational

---

Error LED blinking red

Error writing or reading

---

The two other LEDs are not used yet.

## HOW TO REPLACE A DISK

Before replacing a disk, ensure that the software application has disconnected and stopped the disk. In this case, the disk LED is blinking slowly red with a 4-second cycle.

1. When the disk is stopped, disconnect the canister.
2. Replace the disk in the canister.
3. Put the canister back sliding it to the bottom of the frame.

The LED on the canister should first blink rapidly red with a 3-second cycle while the disk is being mounted. Then, it should blink green.

## 3.5 MTPC BOARD

### 3.5.1 INTRODUCTION

The function of the PC board is mainly the control of the Video hardware via the software and to interface the peripheral equipment (i.e. remote controller) with the Video hardware.

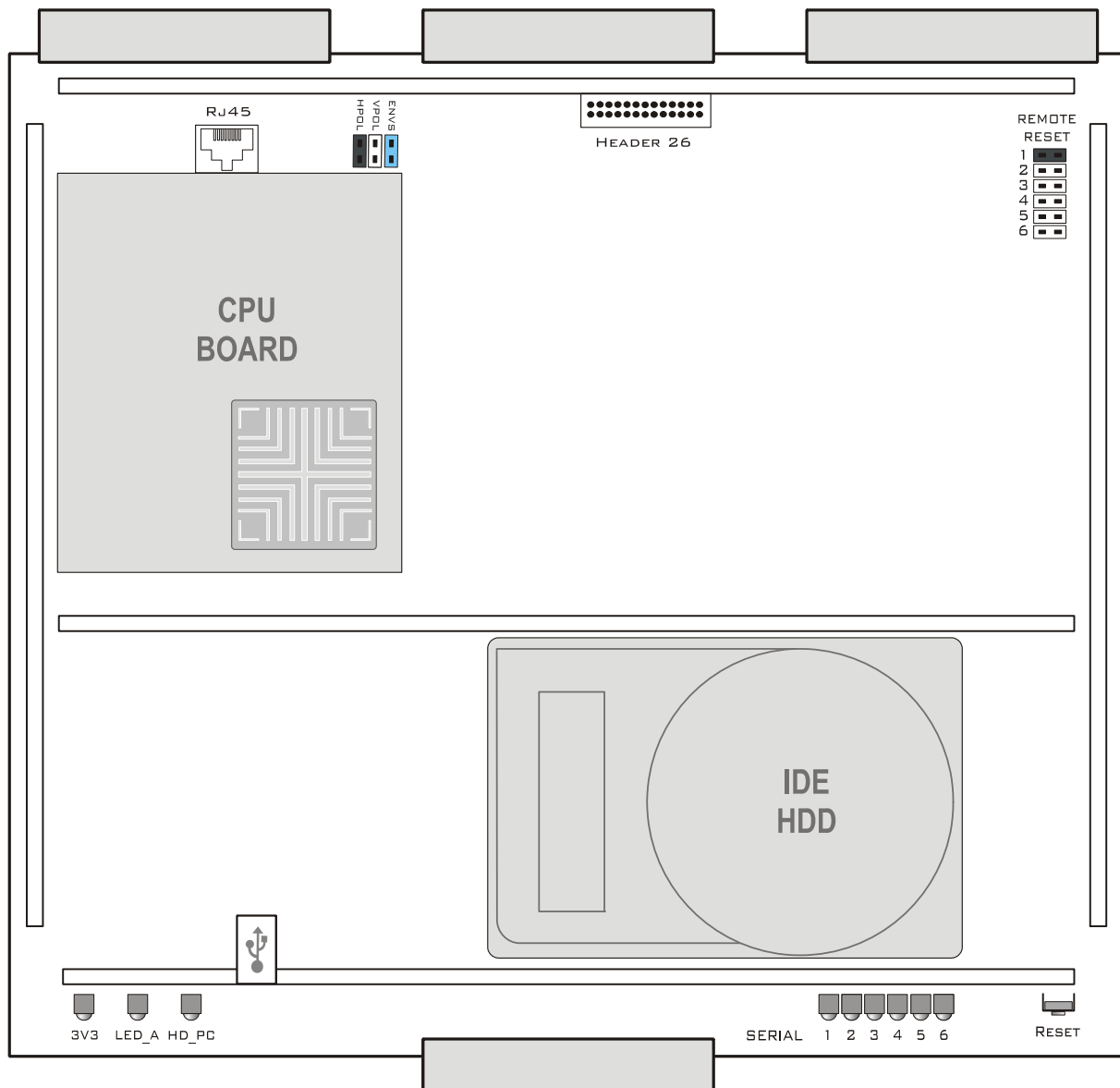
Three types of MTPC boards can be used:

- **A2/A3** with COMMEL HS870 motherboard (with bootable USB)
- **A2/A4** with COMMEL HS870 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 1GB. The remaining capacity of this drive is not used.
- 64/128MB 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.

## 3.5.2 A2/A3 AND A2/A4 BOARD



### 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 LSM 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 LSM software version and CPU board model/revision:

With MPTC board A2/A3 or A2/A4, set up the jumpers as follows:

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

| REMOTE<br>RESET |                                                                                   | REMOTE RESET jumpers are available to designate the remote(s) from which the RESET command can be sent. |
|-----------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 1               |  |                                                                                                         |
| 2               |  | This command resets the whole system: PC and video hardware.                                            |
| 3               |  |                                                                                                         |
| 4               |  |                                                                                                         |
| 5               |  | In standard configuration only Remote one (on RS422 port 1) is allowed to reset the system.             |
| 6               |  |                                                                                                         |



#### Important

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 XT 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.

### 3.5.3 MEMORY HOLE ACTIVATION

The memory hole is disabled from Multicam version 9.00. From this version onwards, the BIOS parameters are automatically adapted to the hardware.

## Notes:

# Regional Contacts

## AMERICA (NORTH & LATIN)

|              |                                                                             |            |
|--------------|-----------------------------------------------------------------------------|------------|
| EVS Americas | Tel: +1 973 575 7811<br>Fax: +1 973 575 7812<br>Tech. line: +1 973 575 7813 | usa@evs.tv |
|--------------|-----------------------------------------------------------------------------|------------|

|            |                                                                             |            |
|------------|-----------------------------------------------------------------------------|------------|
| EVS Canada | Tel: +1 514 750 7544<br>Fax: +1 514 750 7518<br>Tech. line: +1 973 575 7813 | usa@evs.tv |
|------------|-----------------------------------------------------------------------------|------------|

## ASIA & PACIFIC

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|---------------|---------------------------------------------------------------------------|-----------------------|
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|---------------|---------------------------------------------------------------------------|-----------------------|

|           |                                                                                 |                 |
|-----------|---------------------------------------------------------------------------------|-----------------|
| EVS China | Tel: +86 10 6808 0248<br>Fax: +86 10 6808 0246<br>Tech. line: +86 139 1028 9860 | evschina@evs.tv |
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|               |                                                                          |                       |
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|---------------|--------------------------------------------------------------------------|-----------------------|

|           |                                                                            |                       |
|-----------|----------------------------------------------------------------------------|-----------------------|
| EVS India | Tel: +91 22 6697 2999<br>Fax: +91 22 2673 2092<br>Mobile: +91 98 9017 5958 | sales@evs-asia.com.hk |
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## EUROPE, MIDDLE EAST & AFRICA

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|--------------|------------------------------------------------|-----------------|

|            |                                                                                |               |
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|------------|--------------------------------------------------------------------------------|---------------|

|             |                                                                             |                |
|-------------|-----------------------------------------------------------------------------|----------------|
| EVS Iberica | Tel: +34 91 490 3930<br>Fax: +34 91 490 3939<br>Tech. line: +34 91 490 3933 | iberica@evs.tv |
|-------------|-----------------------------------------------------------------------------|----------------|

|           |                                                                               |              |
|-----------|-------------------------------------------------------------------------------|--------------|
| EVS Italy | Tel: +39 030 296 400<br>Fax: +39 030 294 3650<br>Tech. line: +39 334 631 1493 | italy@evs.tv |
|-----------|-------------------------------------------------------------------------------|--------------|

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|                 |                                                                          |                    |
|-----------------|--------------------------------------------------------------------------|--------------------|
| EVS Middle East | Tel: +971 4 365 4222<br>Fax: +971 4 425 3501<br>Mobile: +971 50 887 8758 | middle-east@evs.tv |
|-----------------|--------------------------------------------------------------------------|--------------------|

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|        |                                                                                |           |
|--------|--------------------------------------------------------------------------------|-----------|
| EVS UK | Tel: +44 1372 387 250<br>Fax: +44 1372 387 269<br>Tech. line: +44 1372 387 266 | uk@evs.tv |
|--------|--------------------------------------------------------------------------------|-----------|

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To learn more about EVS go to **[www.evs.tv](http://www.evs.tv)**