XT[2]

Technical Reference - Hardware - Issue 5 - April 2008

Production & Playout Server

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IMPROVEMENT REQUESTS

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

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What's New?

A general review of the Hardware Technical Reference manual has taken place in parallel with the releases for Multicam versions 8.04 and 9.00.

For this reason, several sections have been reviewed even if no specific changes related to these sections have been brought on version 9.00. These will not be mentioned in the table below. Moreover, all references to XT servers have been removed since the Multicam version 9.00 is only compatible with XT[2] servers.

Only the changes linked to new features on version 9.00 are listed in the table below:

New on version 8.04	
3.4.3	New external RAID array XT-HDX
3.5 (and subsections)	New MTPC boards

New on version 9.00	
1.5.3	Video codecs and bitrates – updated information
1.5.4	Recording capacitiy for XT[2] servers
1.5.5	Supported SMPTE standards – updated data
1.5.6	Maximum bitrate values – updated data
1.5.7	Avid DNxHD ® and Apple ProRes 422 – new section
2.1	XT[2] 6U and 4U – back plane updated with PC LAN connector
2.5	Updated audio configurations
2.6	Connecting Multiple XT[2] servers on XNet
2.7	Gigabit connection
3.4.1, 3.4.1.2 & 3.4.1.4	HCTX Board – two Gigabit connectors added

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. They can be used 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

IP Director: 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.

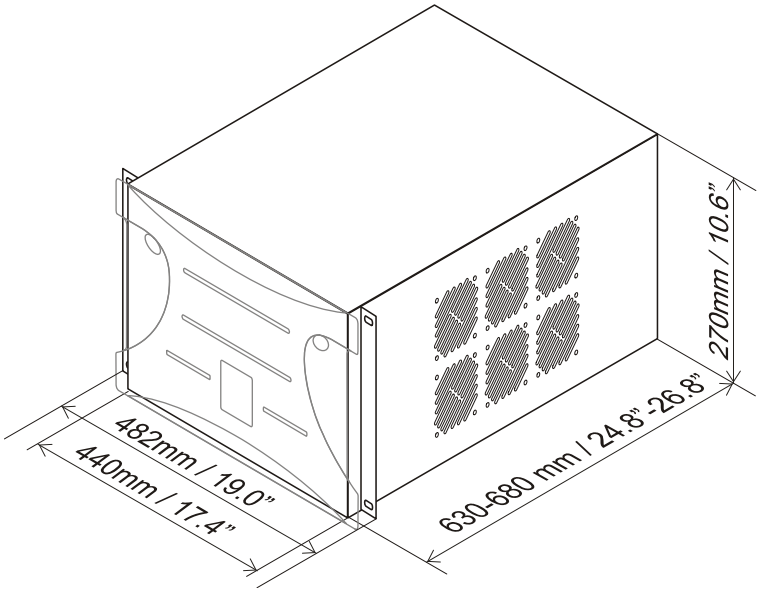
1.1 UNPACKING

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.

1.2 DIMENSIONS

Video disk recorder Main frame 19 inches

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



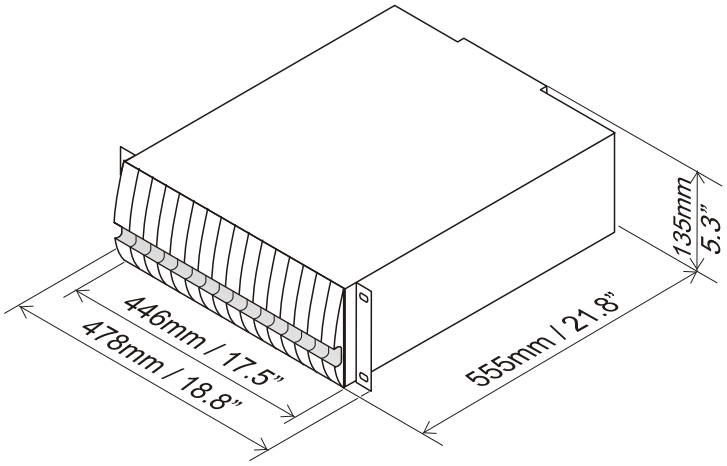
Rack mount 4U: Height: 170 mm

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"

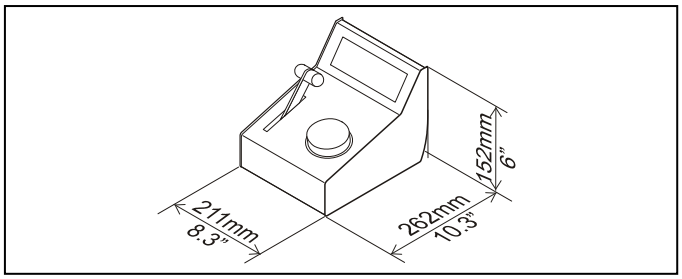
XT-HDX



For more information on the XT-HDX, refer to section 3.4.3 “External RAID Array XT-HDX for XT[2] Server”, on page 50.

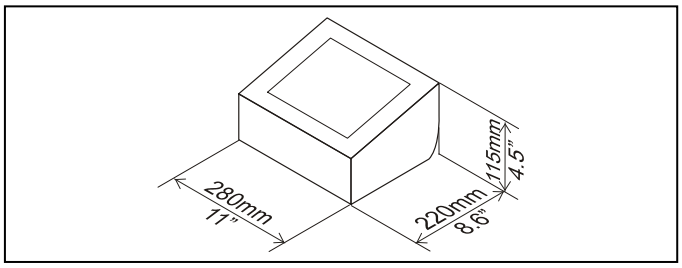
Remote control panel

Weight: 2.9 Kg / 6.3 Lbs.



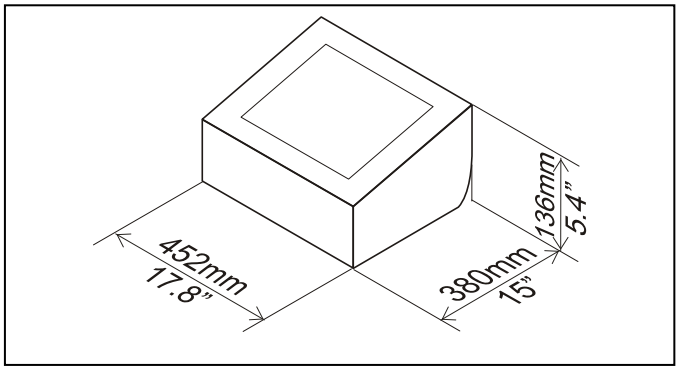
10” Touch Screen Video Monitor

Weight: 3.6 Kg / 7.8 Lbs.



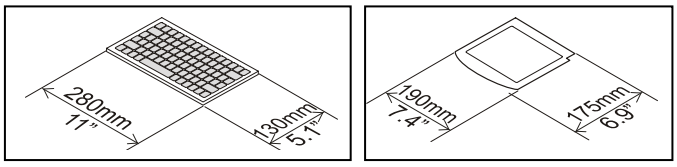
18" Touch Screen Video Monitor

Weight: 11.0 Kg / 23.9 Lbs.



Keyboard - Weight: 0.4 Kg / 0.9 Lbs.

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



1.3 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.

1.4 OPERATING CONDITIONS

1.4.1 POWER SUPPLY

The EVS Disk recorder system operates on 220 VAC +/- 5% or 110 VAC +/- 15% (rear panel selectable), 47-63Hz, 400W (manual switch 110/220VAC) or 510W maximum (autoswitch, depending on the type of power supply unit installed.

The EVS Disk recorder unit is connected to PSU1.

Cold swap 2nd Power Supply

A 2nd power supply (cold swap) for the disk recorder unit is available optionally. To connect this 2nd 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 2nd Power Supply

A 2nd 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.

1.4.2 GROUNDING

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

1.4.3 LOCATION

Avoid using the disk recorder unit in areas having high humidity (operational range: less 90% non-condensing), high temperature (operational range: +5°C to +35°C / 41°F to 95°F), or excessive dust.

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

1.4.5 COMPLIANCE

The EVS Disk recorder systems are in compliance with the Class A norm of the FCC rules and have been verified to comply with the electromagnetic compatibility standards of the European Directive 89/336/EEC particularly standards EN50081-1 and EN50082-2.

1.5 XT[2] SERVER MAIN SPECIFICATIONS

1.5.1 VIDEO

	XT[2] Server	
	Standard Definition	High Definition
Video Formats	525i 59.94fps (NTSC) 625i 60fps (PAL)	720p 50/59.94fps 1080i 50/59.94fps
Digital Interface	10-bit 4:2:2 Serial (SMPTE259M). Full frame synchronizer at input. Dual output for PLAY channels.	10-bit 4:2:2 Serial (SMPTE292M). Full frame synchronizer at input. Dual output for PLAY channels.
Number of channels (6RU rack)	2, 4 or 6 channels, reversible REC/PLAY	2, 4 or 6 channels, reversible REC/PLAY
Number of channels (4RU rack)	2 or 4 channels, reversible REC/PLAY	2 or 4 channels, 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. 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.

1.5.2 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 48 channels embedded audio (8 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

1.5.3 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-field 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.

1.5.4 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.

1.5.5 SUPPORTED SMPTE STANDARDS

The following standards are supported:

SD SDI	SMPTE 259M (525i 625i)
HD SDI	SMPTE 292M (720p 50 and 59.94 ; 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

1.5.6 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

1.5.7 AVID DNXHD ® AND APPLE PRORES 422

1.5.7.1 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).

1.5.7.2 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.

1.5.7.3 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 x 13.3 + 2 x 40.0 = 126.6 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 Bandwith = 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			XFile Storage Capacity		
					5x73GB	5x146GB	5x300GB	250GB	500GB	750GB
Avid DNxHD®	85 Mbps	35	11.43 MB/s	13.13	6.57h	13.34h	27.62h	5.60h	11.40h	17.19h
Avid DNxHD®	100 Mbps	30	13.33 MB/s	11.25	5.63h	11.44h	23.68h	4.80h	9.77h	14.73h
Avid DNxHD® Apple ProRes 422	120 Mbps	26	15.38 MB/s	9.75	4.88h	9.91h	20.52h	4.16h	8.47h	12.77h
Avid DNxHD® Apple ProRes 422 HQ	185 Mbps	17	23.53 MB/s	6.38	3.19h	6.48h	13.42h	2.72h	5.53h	8.35h

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			XFile Storage Capacity		
					5x73GB	5x146GB	5x300GB	250GB	500GB	750GB
Avid DNxHD®	85 Mbps	12	33.33 MB/s	4.50	2.25h	4.57h	9.47h	1.92h	3.91h	5.89h
Avid DNxHD®	100 Mbps	10	40.00 MB/s	3.75	1.88h	3.81h	7.89h	1.60h	3.26h	4.91h
Avid DNxHD® Apple ProRes 422	120 Mbps	9	44.44 MB/s	3.38	1.69h	3.43h	7.10h	1.44h	2.93h	4.42h
Avid DNxHD® Apple ProRes 422 HQ	185 Mbps	5	66.67 MB/s	2.25	1.13h	2.29h	4.74h	0.96h	1.95h	2.95h

AVID DNXHD® & APPLE PRORES 422 AT 59.94HZ ("NTSC")

Codec	Video Bitrate	Fields /Block	Actual Bandwidth	Max. RT Channels	XT[2] Storage Capacity			XFile Storage Capacity		
					5x73GB	5x146GB	5x300GB	250GB	500GB	750GB
Avid DNxHD®	85 Mbps	42	11.42 MB/s	13.14	6.48h	13.36h	27.65h	5.61h	11.41h	17.21h
Avid DNxHD®	100 Mbps	36	13.32 MB/s	11.26	5.64h	11.45h	23.70h	4.81h	9.78h	14.75h
Avid DNxHD® Apple ProRes 422	145 Mbps	26	18.44 MB/s	8.13	4.07h	8.27h	17.12h	3.47h	7.06h	10.65h
Avid DNxHD® Apple ProRes 422 HQ	220 Mbps	17	28.21 MB/s	5.32	2.66h	5.41h	11.19h	2.27h	4.62h	6.96h

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			XFile Storage Capacity		
					5x73GB	5x146GB	5x300GB	250GB	500GB	750GB
Avid DNxHD®	85 Mbps	15	31.97 MB/s	4.69	2.35h	4.77h	9.87h	2.00h	4.07h	6.15h
Avid DNxHD®	100 Mbps	12	39.96 MB/s	3.75	1.88h	3.82h	7.90h	1.60h	3.26h	4.92h
Avid DNxHD® Apple ProRes 422	145 Mbps	9	53.28 MB/s	2.82	1.41h	2.86h	5.92h	1.20h	2.44h	3.69h
Avid DNxHD® Apple ProRes 422 HQ	220 Mbps	6	79.92 MB/s	1.88	0.94h	1.91h	3.95h	0.80h	1.63h	2.46h

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.

1.5.7.4 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.

1.5.8 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.

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

The original video signal:

O E O E O E O E O E O E O E O E

The output video signal at 50% speed:

O **O** **E** E O **O** **E** E O **O** **E** E O **O** **E** E

The output video signal at 33% speed:

O **O** O E **E** E O **O** O E **E** E O **O** O E

The output video signal at 25% speed :

O **O** O **O** **E** E **E** E O **O** O **O** **E** E **E** E

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

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

1.5.9.1 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.

1.5.9.2 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).

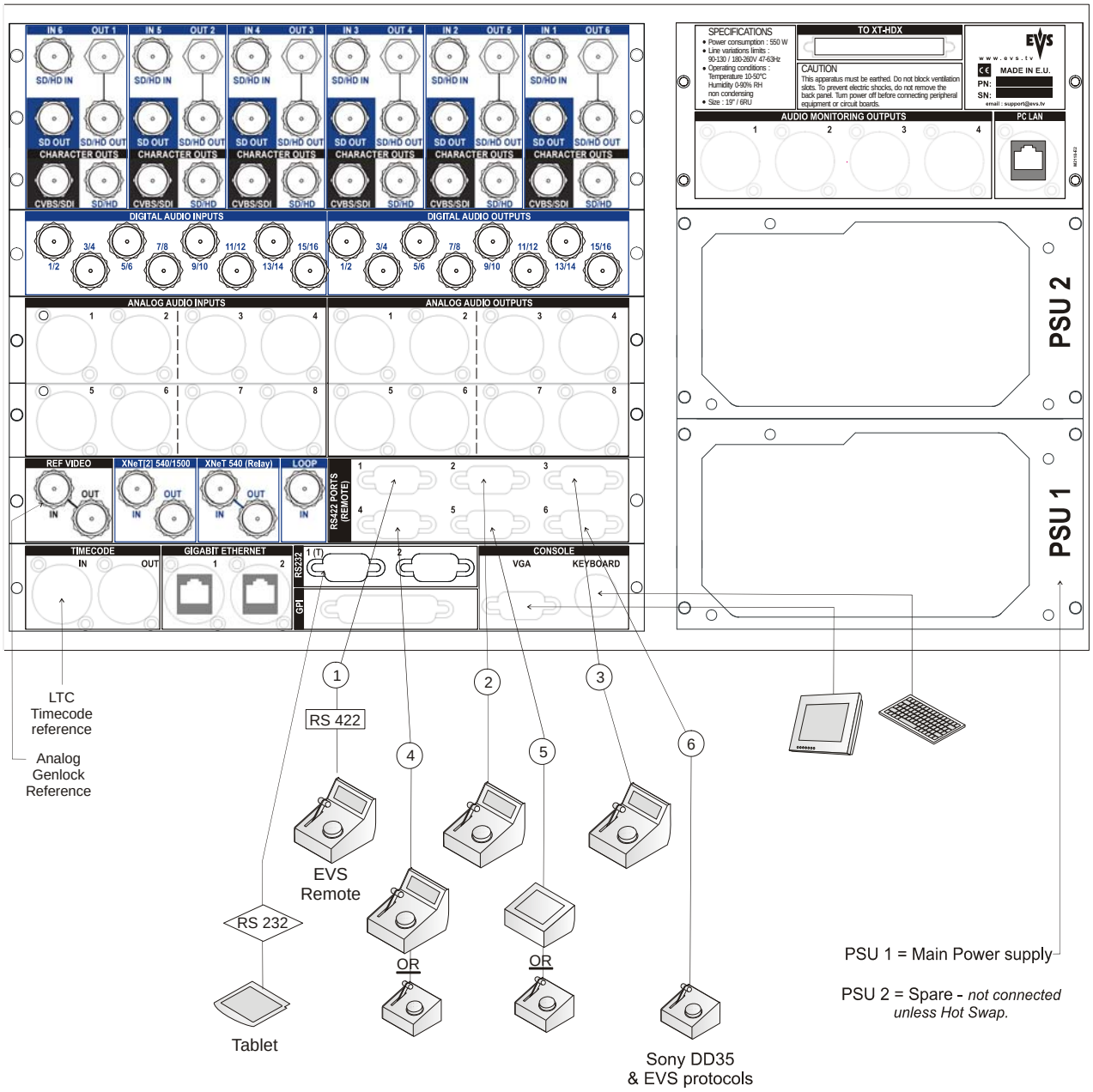
Note

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.

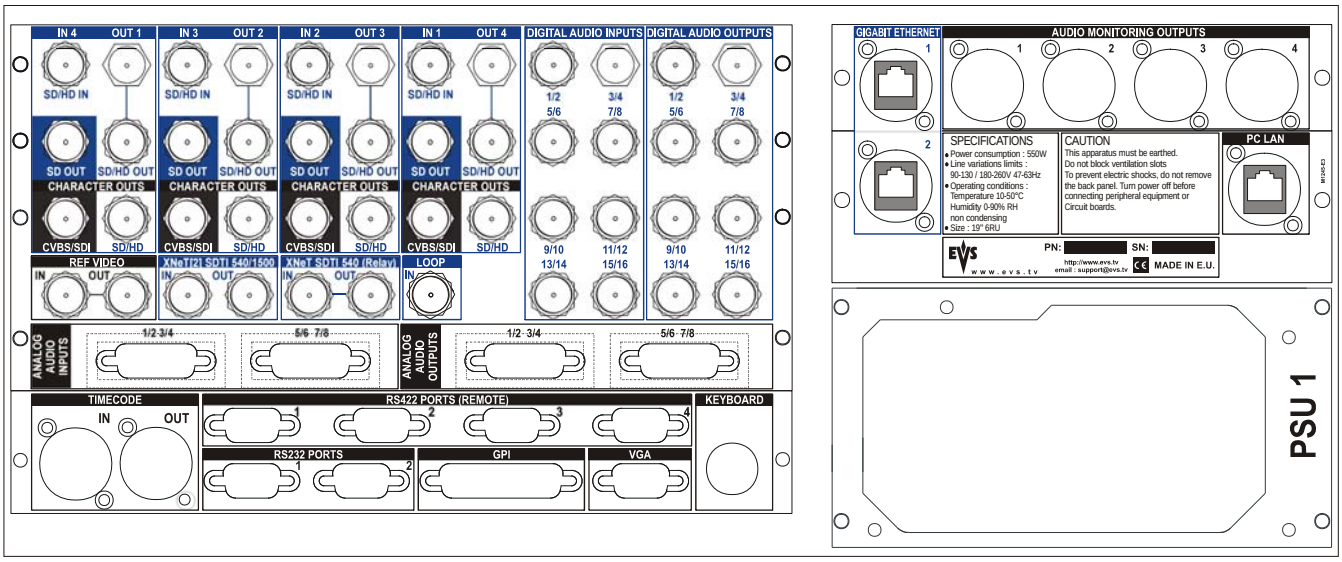
2. Cabling

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

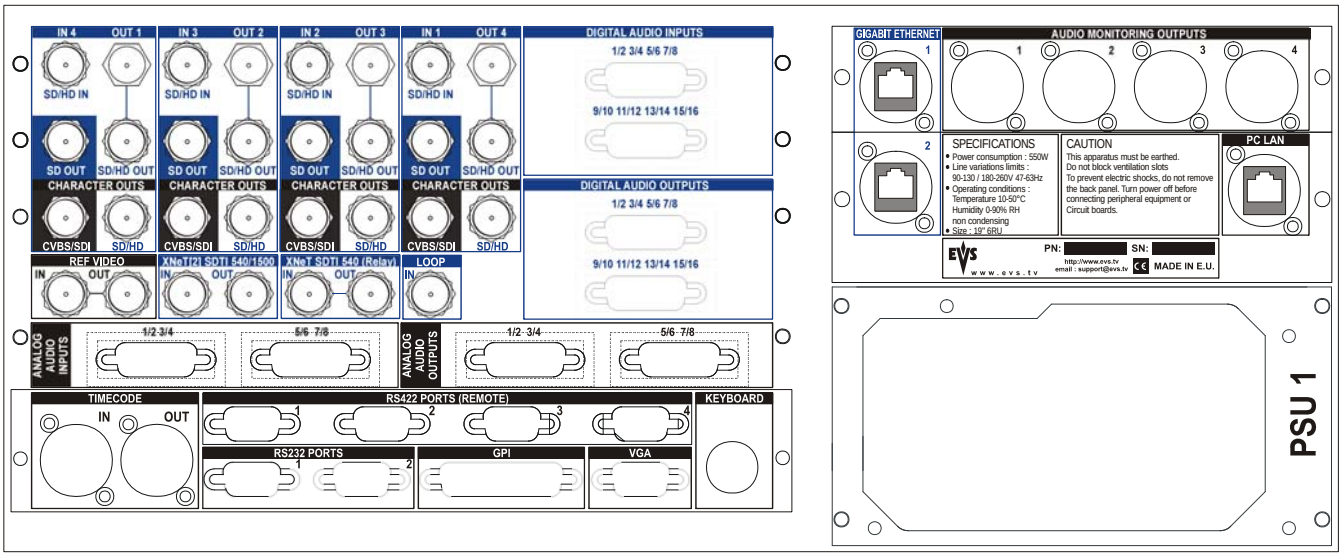


2.2 XT[2] 4U BACK PLANE

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



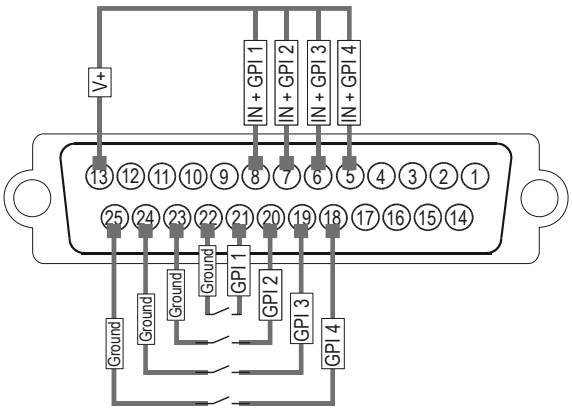
(XT[2]H-4-A3B) Shown with Optional AES on Multi-pin Connector Option



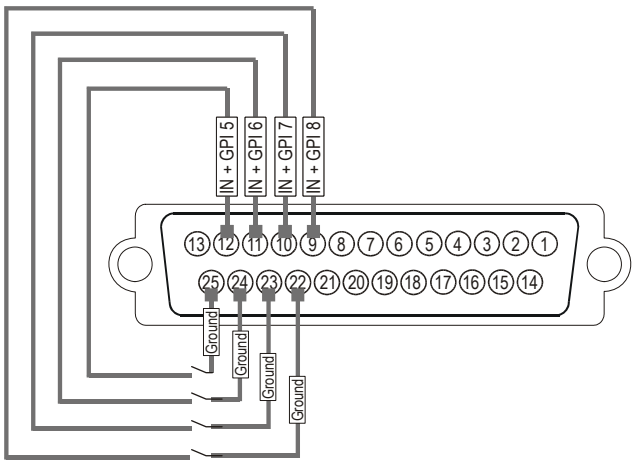
2.3 GPI IN CONNECTIONS

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)

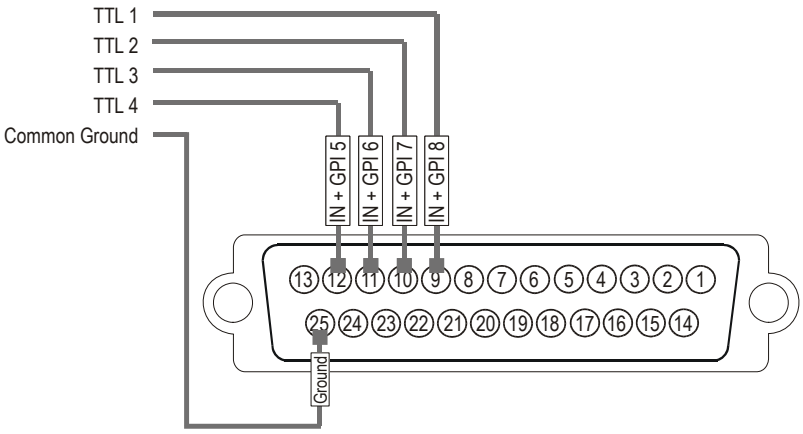


2.3.2 RELAY → TTL INPUTS ON THE XT SERVER (GPI INPUTS 5, 6, 7, 8)



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)

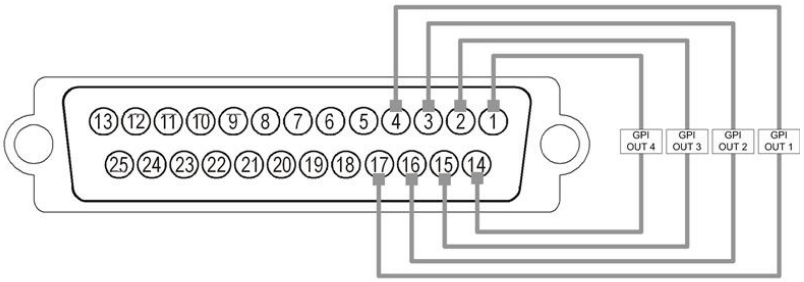


Each TTL input on the DB25 is directly connected to the pin of the TTL connector on the device triggering the GPI. The ground must be common between the DB25 connector of the XT and the external device.

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:

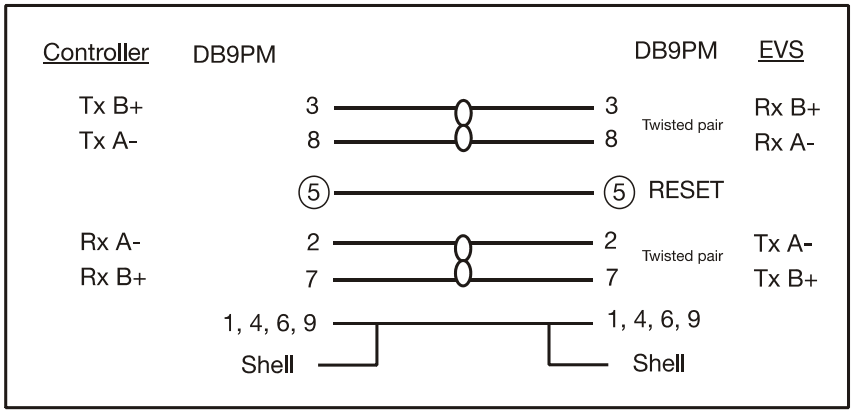
- The input consists in an opto diode (VF @ 1.1 Volt) in series with a 470 ohm resistor).
- Typical switching point @ 1.4 mA, for secure operation:
  - i=0 to 0.5 mA -> opto OFF
  - i=2.5 to 30 mA -> opto ON
  - imax= 30 mA
- Direct connection to a TTL/CMOS signal possible (Pin opto - to GND and pin 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 54 of this manual).

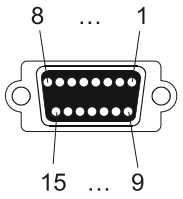
2.7 AUDIO CONFIGURATIONS

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 Inputs 1-8 (mono)	Sub-DB15 #2 Inputs 9-16 (mono)	Sub-DB15 #3 Outputs 1-8 (mono)	Sub-DB15 #4 Outputs 9-16 (mono)
1	GND	GND	GND	GND
2	AES input 1/2 +	AES input 9/10 +	AES output 1/2 +	AES output 9/10 +
3	GND	GND	GND	GND
4	AES input 3/4 +	AES input 11/12 +	AES output 3/4 +	AES output 11/12 +
5	GND	GND	GND	GND
6	AES input 5/6 +	AES input 13/14 +	AES output 5/6 +	AES output 13/14 +
7	GND	GND	GND	GND
8	AES input 7/8 +	AES input 15/16 +	AES output 7/8 +	AES output 15/16 +
9	AES input 1/2 -	AES input 9/10 -	AES output 1/2 -	AES output 9/10 -
10	GND	GND	GND	GND
11	AES input 3/4 -	AES input 11/12 -	AES output 3/4 -	AES output 11/12 -
12	GND	GND	GND	GND
13	AES input 5/6 -	AES input 13/14 -	AES output 5/6 -	AES output 13/14 -
14	GND	GND	GND	GND
15	AES input 7/8 -	AES input 15/16 -	AES output 7/8 -	AES output 15/16 -

Analogue DB15 Connectors

Pin #	Sub-DB15 #1 Inputs 1-4 (mono)	Sub-DB15 #2 Inputs 5-8 (mono)	Sub-DB15 #3 Outputs 1-4 (mono)	Sub-DB15 #4 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.

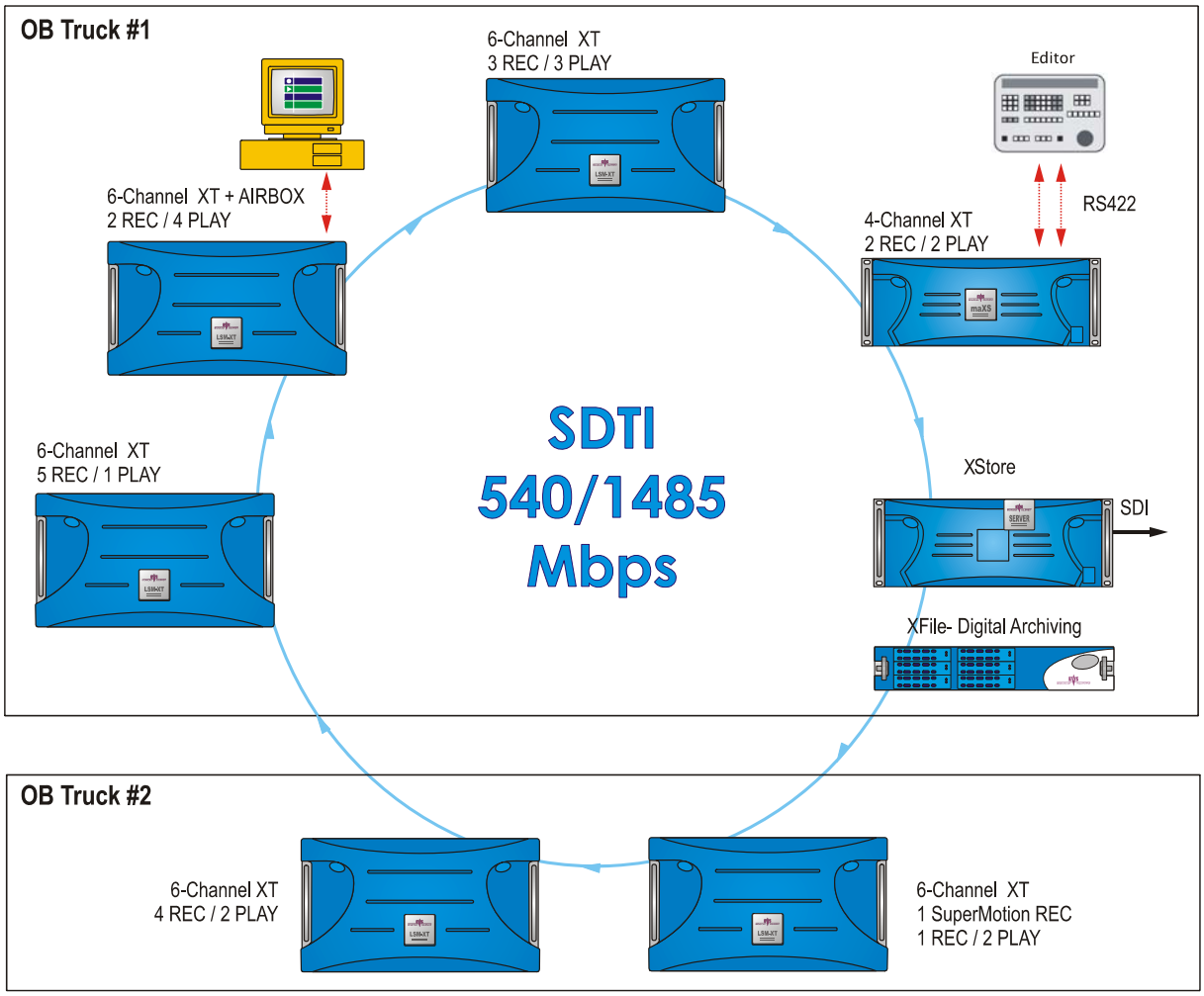
On XT[2] servers there are two pairs of SDTI connectors :

- 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.

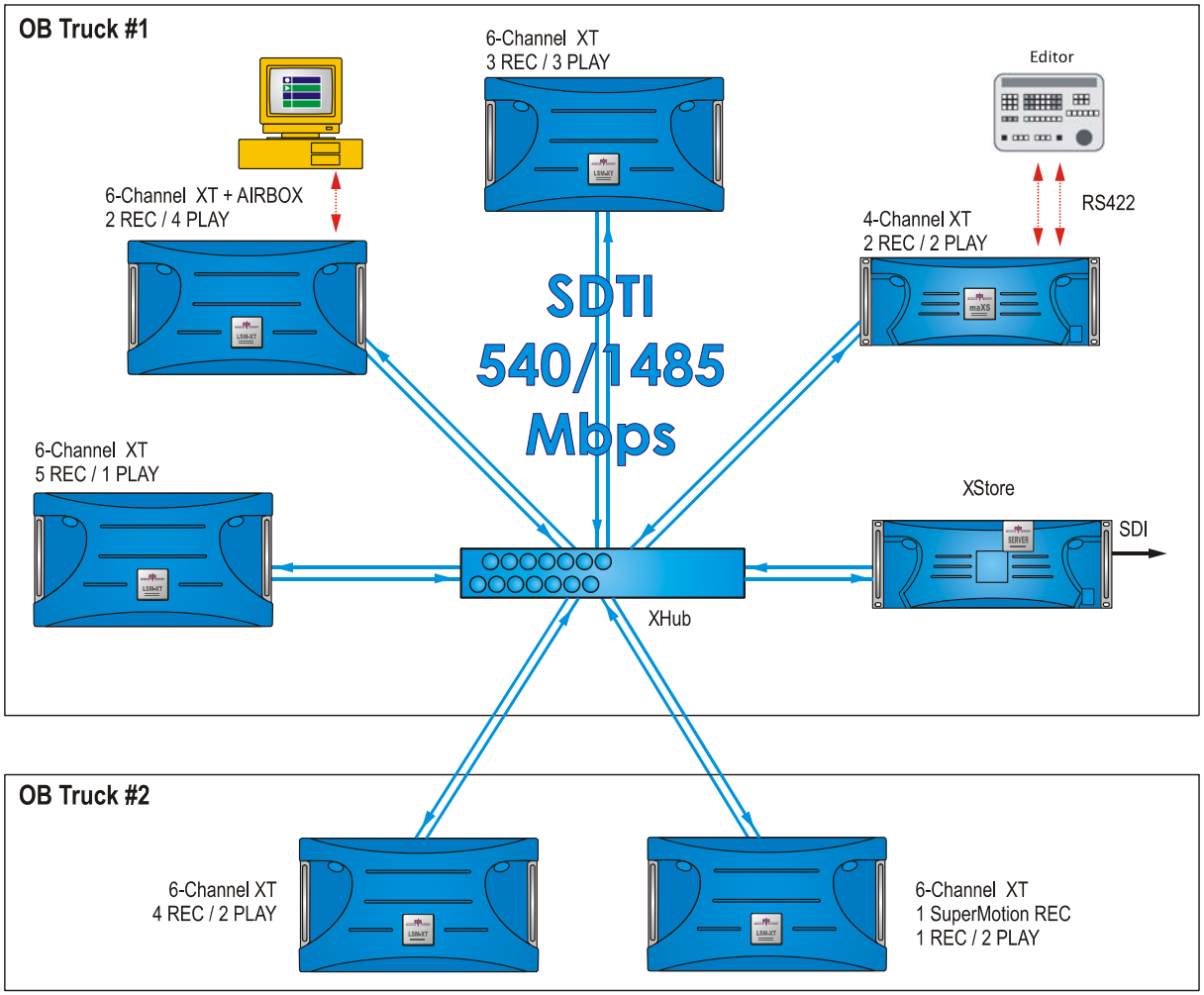
When connected on the SDTI network through Relay connectors, the SDTI loop is always established, even if the XT is not powered on. If connected through Non-Relay connectors, the SDTI loop is closed only when the Multicam software is started. It is therefore recommended to use XHub when using Non-Relay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

b. Telecast TX/RX292 (www.telecast-fiber.com)

c. Network Electronics SDI-EO-13T (electrical to optical) / SDI-OE-S (optical to electrical) (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)

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

1. 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.

2. 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.

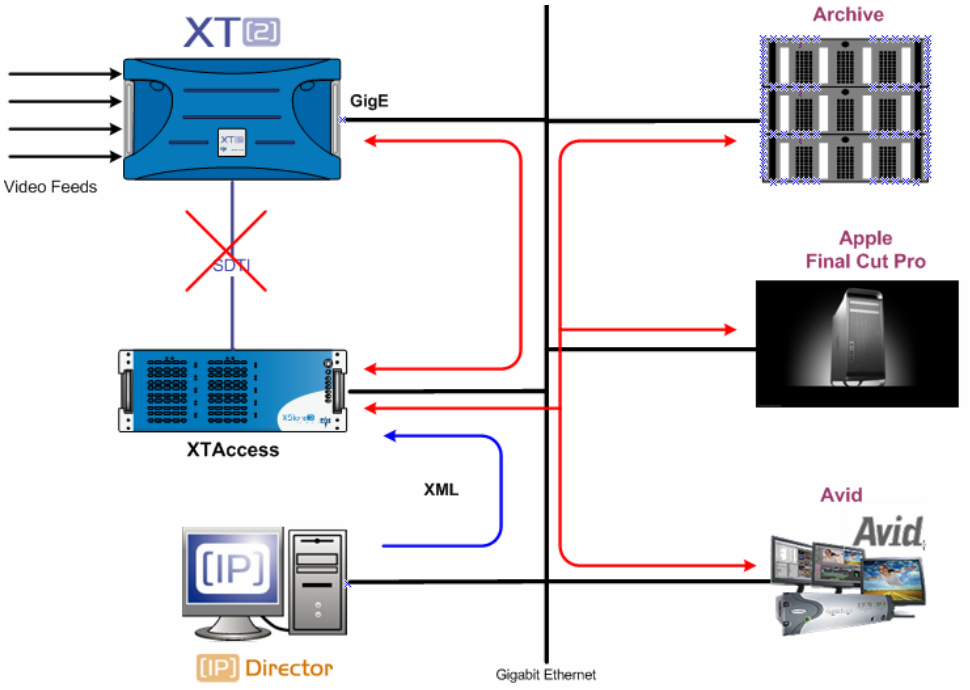
2.9 GIGABIT CONNECTION

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[2]/XF[2]/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.

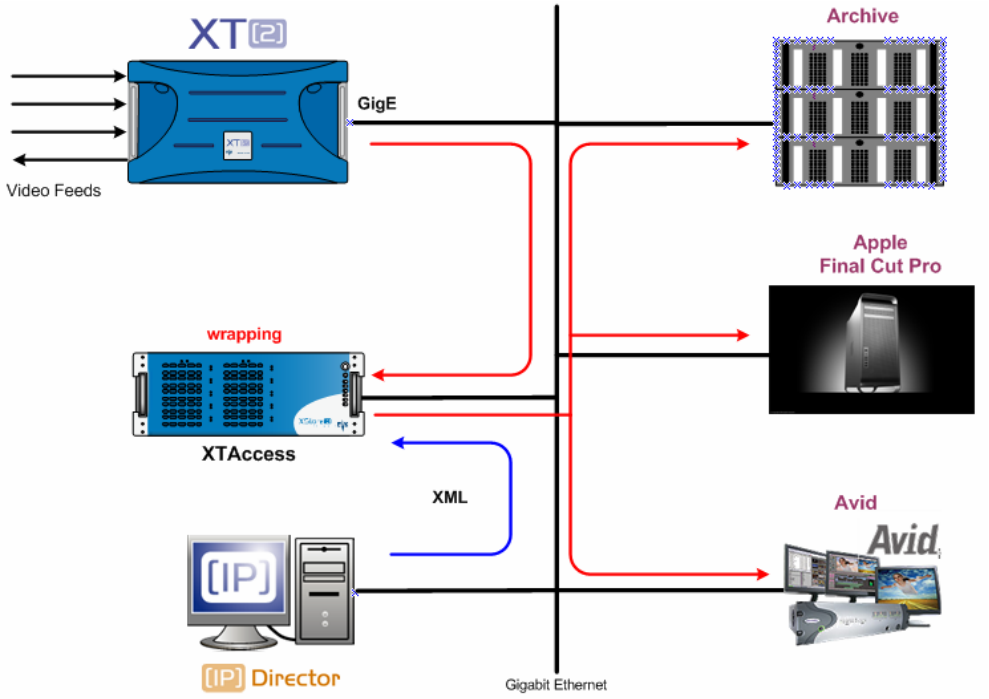
The Gigabit connection fulfill the following functions in relation with the XT[2] servers:

- 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.

2.9.1 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.

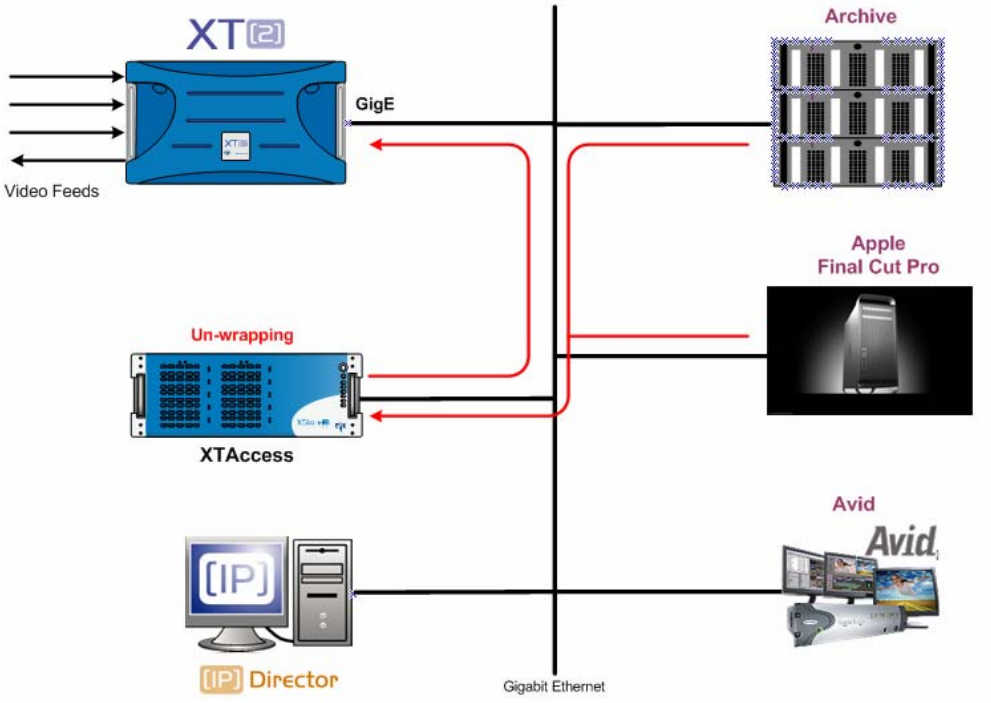
2.9.2 RESTORE OF CLIPS

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.

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 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 Genlock
1	MTPC

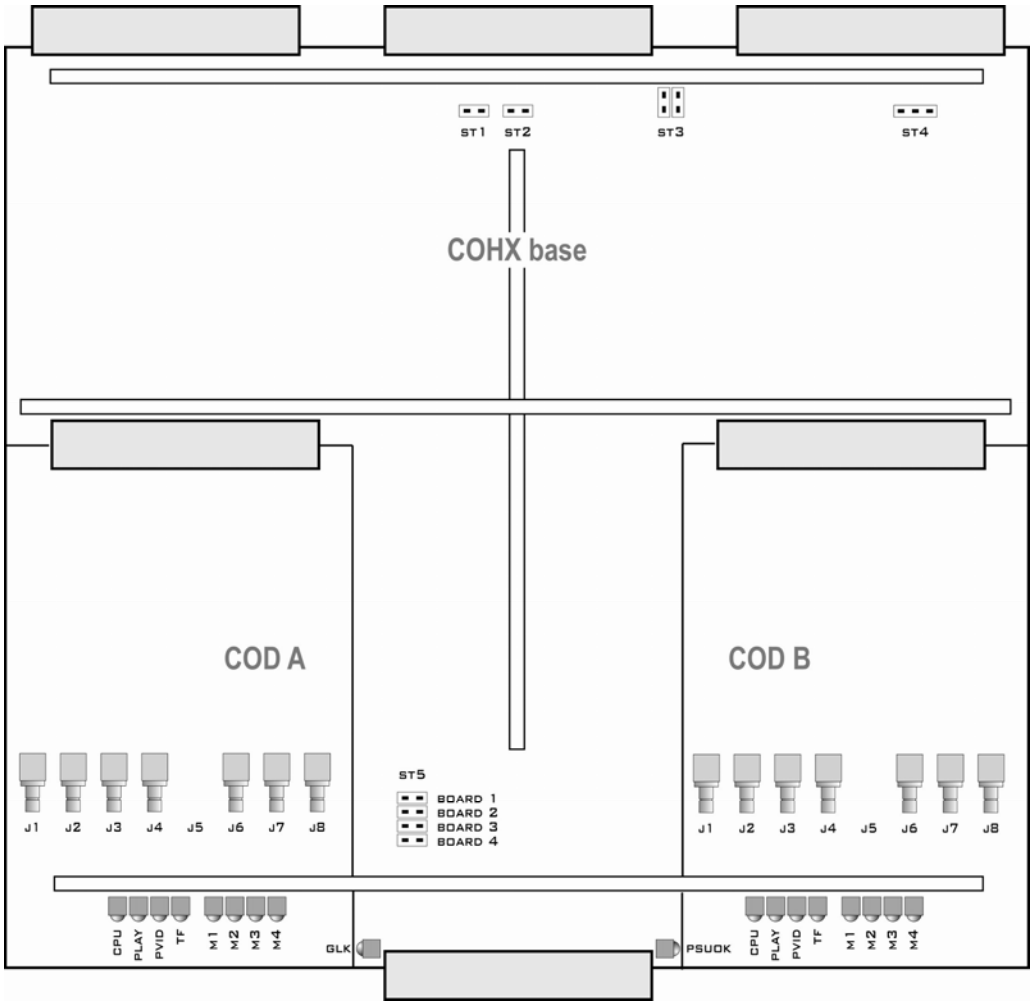
3.2 VIDEO AND REFERENCE BOARDS

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.



3.2.1.1 JUMPERS ON THE COHX BASE MODULE

ST1, ST2:	These 2 jumpers must 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). Note that the Genlock Loop connector on the back panel of the XT[2] server must always be terminated with a 75 Ohm load if it is not used.
ST5 :	It defines the position of the board inside the server. 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.

3.2.1.2 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

3.2.1.3 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

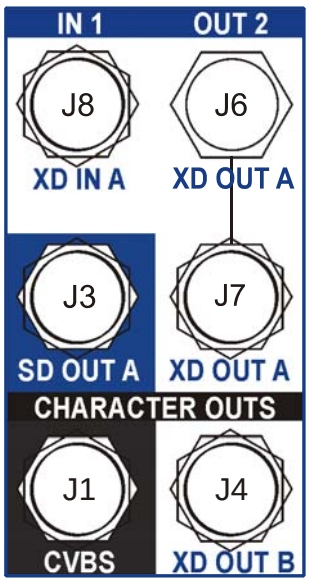
TF (transfer)	
Blinks green	while data transfers occur between the COD module and the HCTX board
M1, M2, M3, M4	not yet used

3.2.1.4 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.

3.2.1.5 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

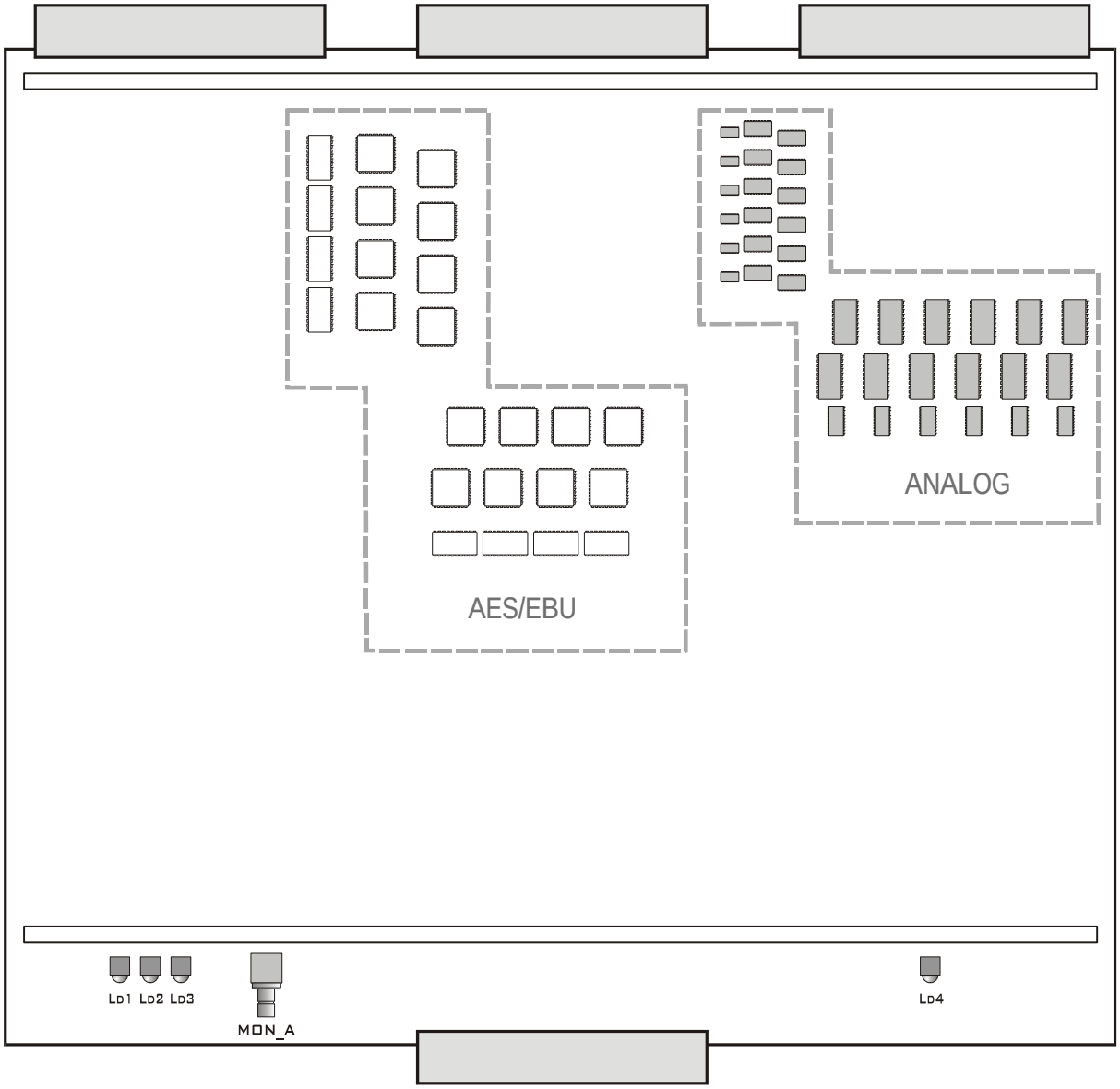
Upper Codec (#5)

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.



3.3.1.1 LED INFORMATION AND CONNECTOR

LD 1-3: Internal EVS information only

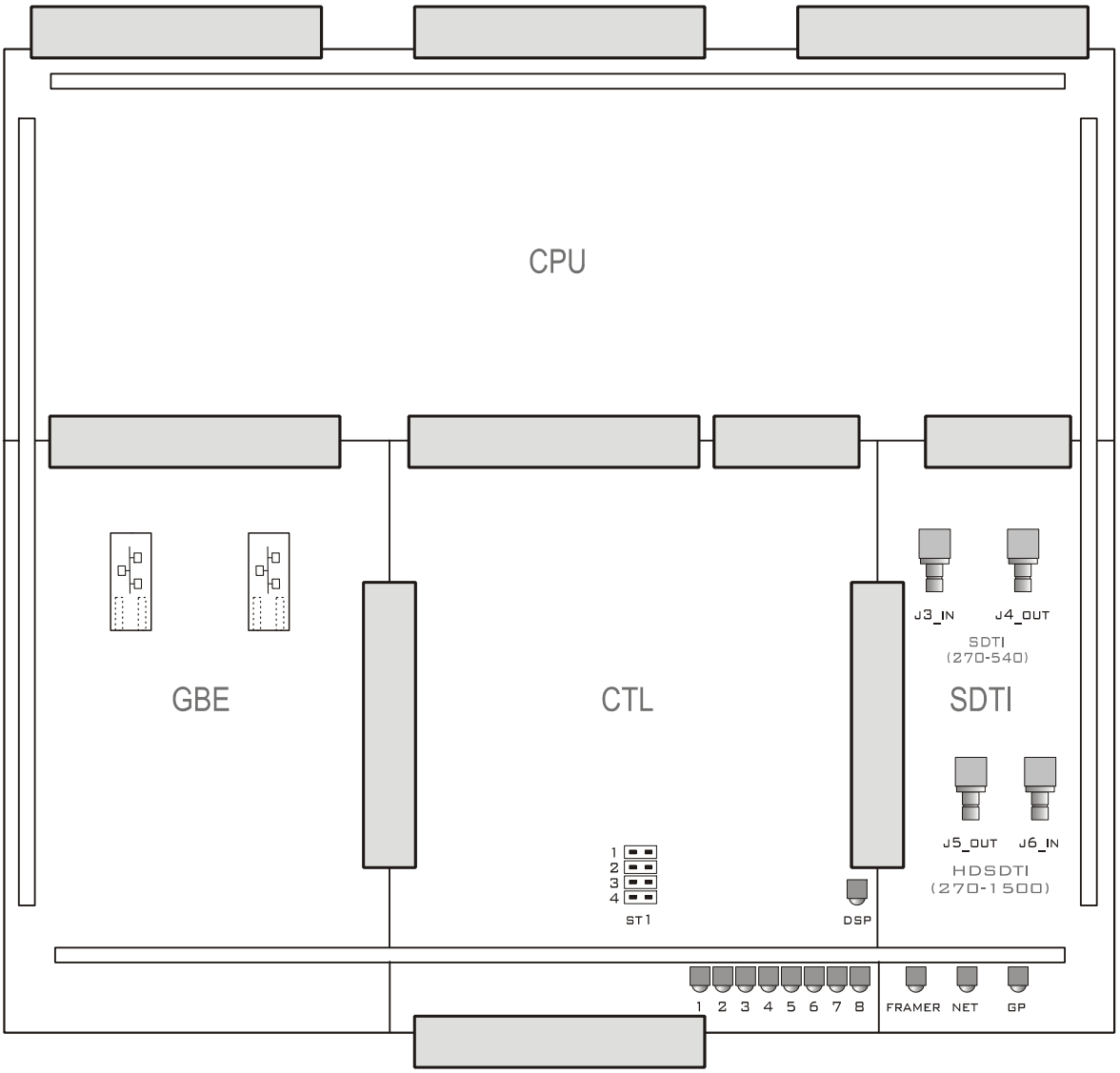
LD4: transfer activity to/from the HCTX board

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



3.4.1.1 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 !

3.4.1.2 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		

3.4.1.3 CONNECTORS

On the XNet[2] module (SDTI) :

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

3.4.1.4 GIGABIT CONNECTORS

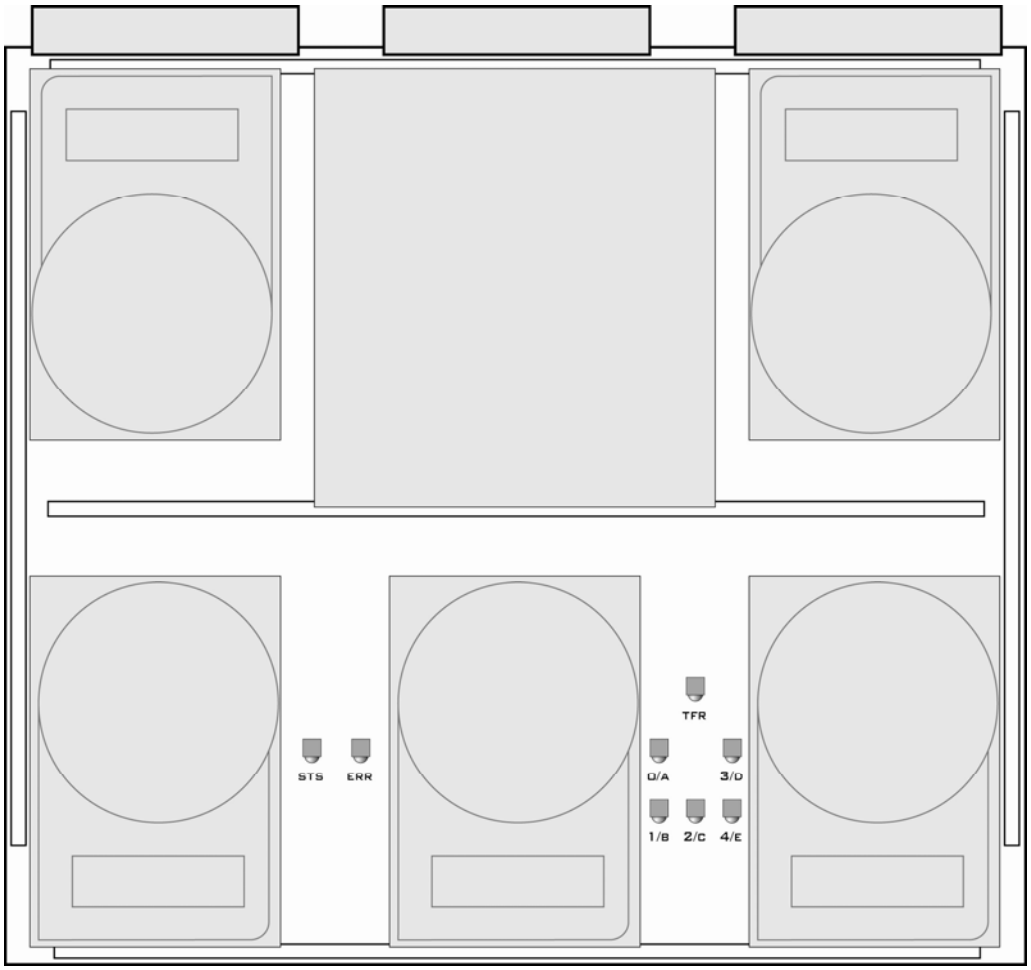
The two Gigabit connectors of the card are connected to the two Gigabit ports of the backplane.

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.



3.4.2.1 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. 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.

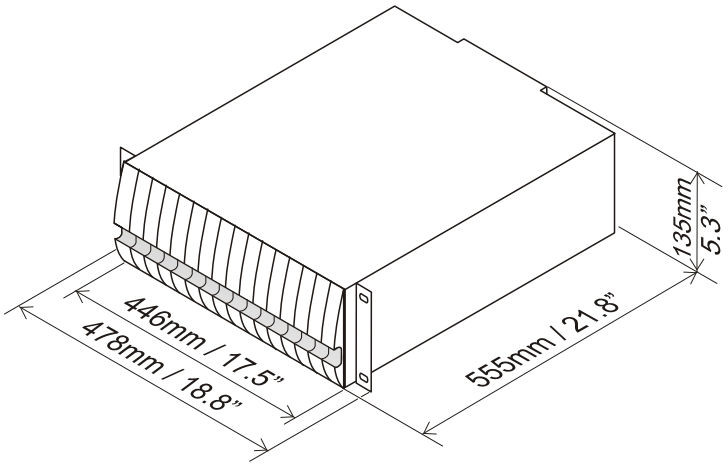
Necessary equipment

- 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.

3.4.3.1 XT-HDX DIMENSIONS



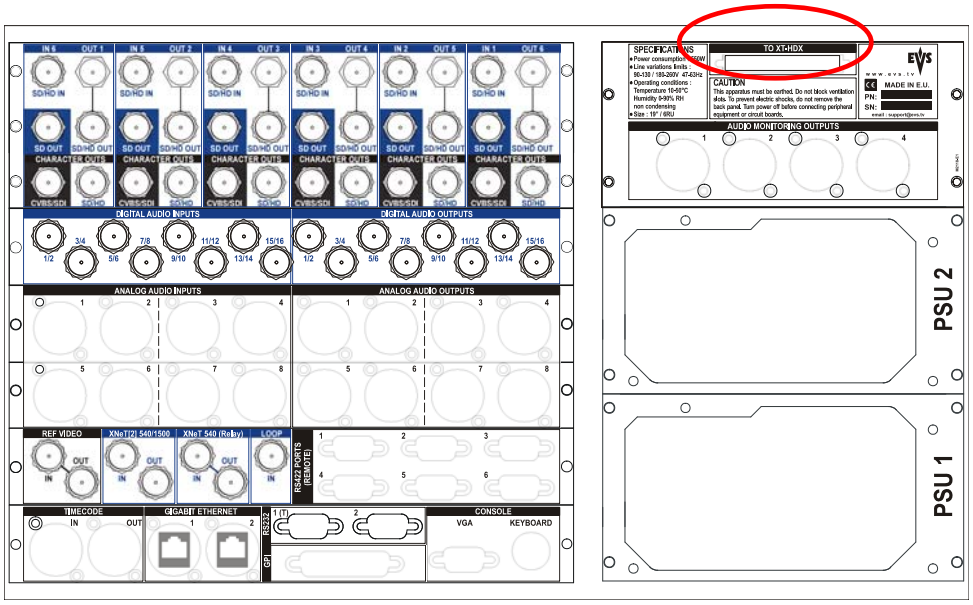
3.4.3.2 INSTALLATION AND OPERATION

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)

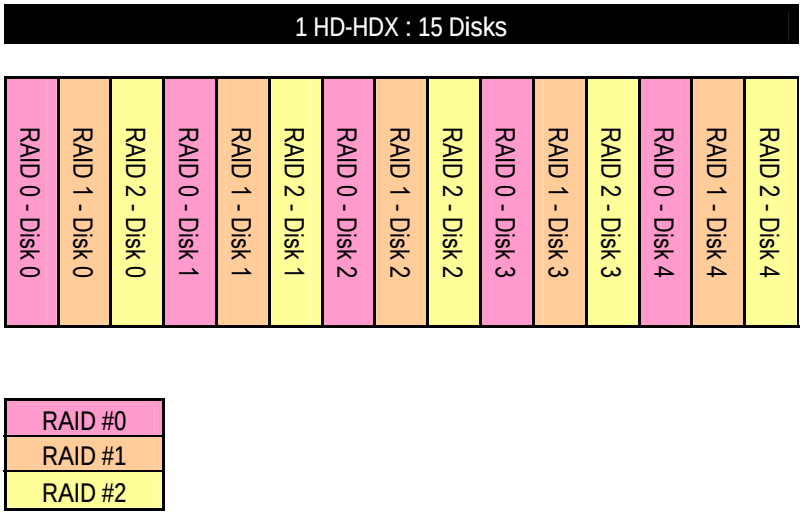


5. Power on the XT-HDX before powering on the XT[2] server.

3.4.3.3 DISK ORGANISATION

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

The disks are organized in the following way:



3.4.3.4 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 (3 times per second)	The disk is being mounted
Red blinking (1 second cycle)	The disk is disconnected
Red blinking slowly (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.

3.4.3.5 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

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.

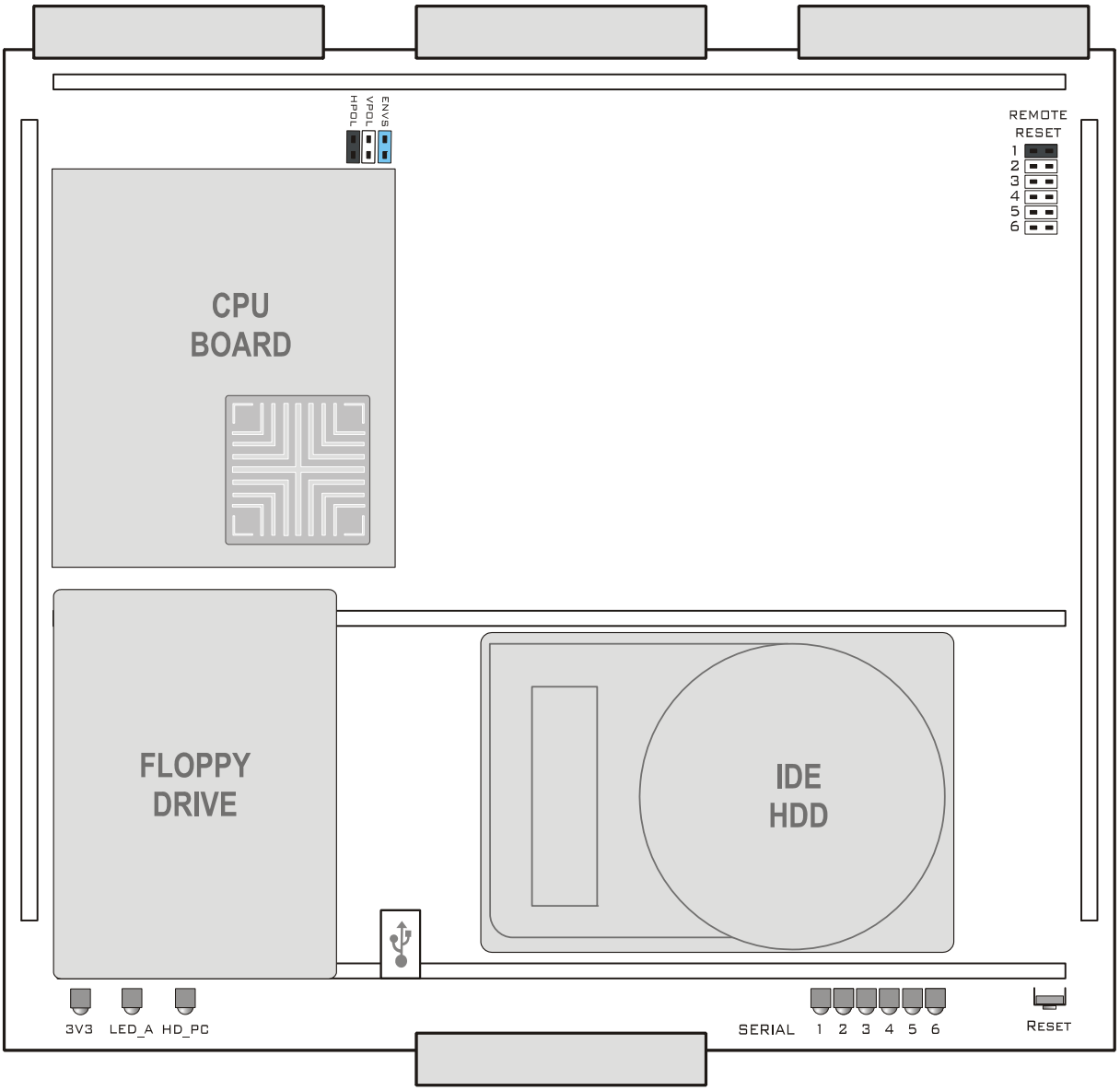
Three types of MTPC boards can be used:

- **A1/R2** with JUKI 3712 motherboard (with Floppy Disk Drive)
- **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.

3.5.1 A1/R2 BOARD



3.5.1.1 LED INFORMATION

Internal EVS information

3.5.1.2 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)

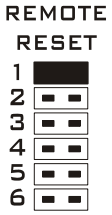
The VPOL jumper can be used to invert or not the VGA VS signal (Vertical Sync) to generate the composite output signal (TV mode)

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 A1/R2, set up the jumpers as follows:

- HPOL=On; VPOL=Off; ENVS=Off if non windows CE software
- HPOL=On; VPOL=Off; ENVS=On if windows CE software



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

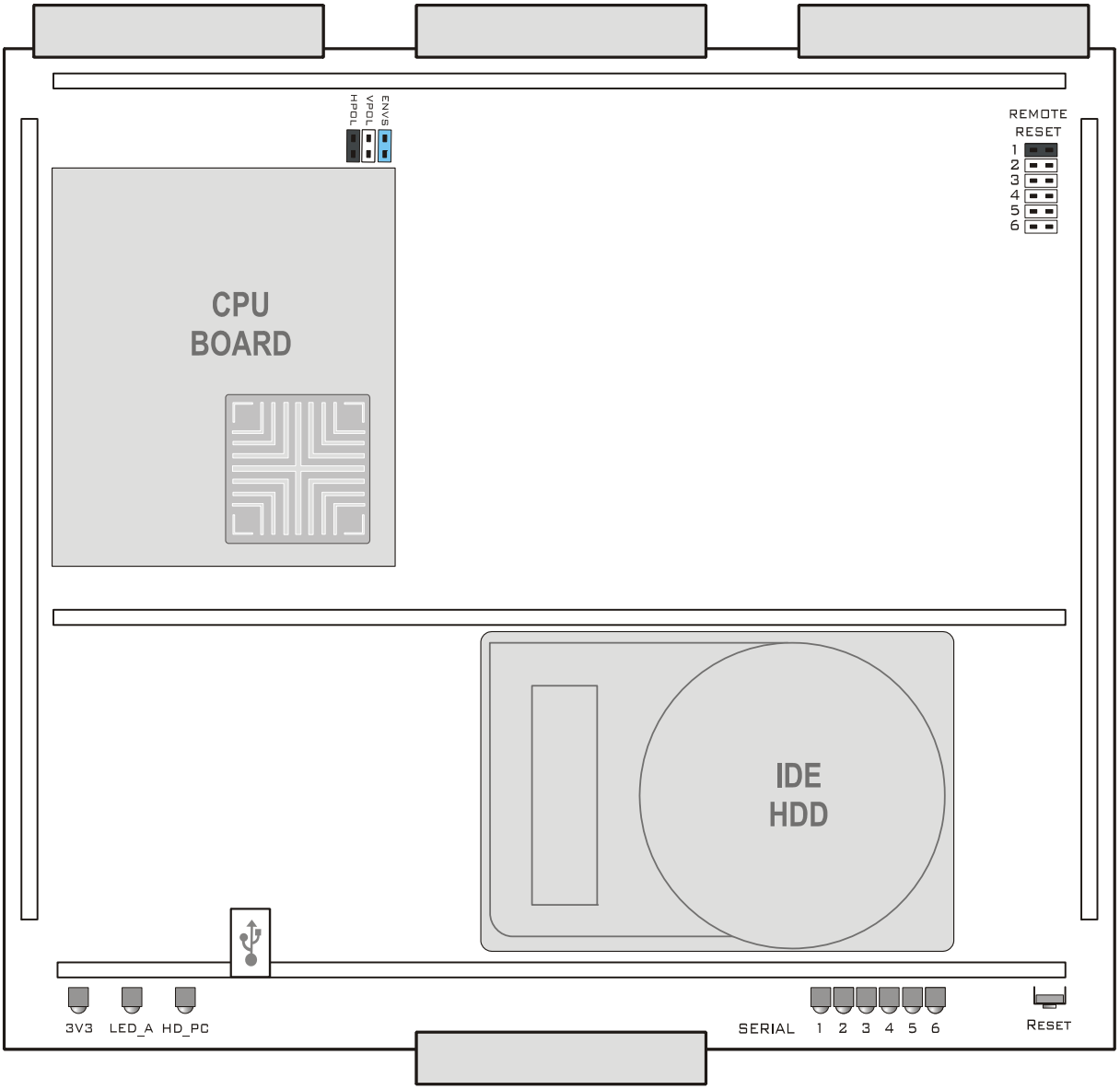
This command resets the whole system: PC and video hardware.

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

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.

3.5.2 A2/A3 AND A2/A4 BOARD



3.5.2.1 LED INFORMATION:

Internal EVS information

3.5.2.2 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)

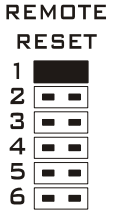
The VPOL jumper can be used to invert or not the VGA VS signal (Vertical Sync) to generate the composite output signal (TV mode)

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

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

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

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 COMPATIBILITY BETWEEN MTPC, XT SERVER AND MULTICAM VERSION

	MTPC revision		
	A1/R2	A2/A3	A2/A4
Multicam before v. 8.04	Memory hole enabled	Memory hole enabled + patch "Patch multicam versions inf 08.04 for A2-A3 MTPC.zip"	Memory hole enabled + patch "Patch multicam versions inf 08.04 for A2-A3 MTPC.zip"
Multicam v. 8.04	Memory hole enabled	Memory hole enabled or disabled	Memory hole enabled or disabled
Multicam v. 9 & later	Memory hole disabled and ENVS jumper set.	Memory hole disabled.	Memory hole disabled.

MEMORY HOLE ACTIVATION FOR XT SERVERS

When the version 9.00 or a later version is installed, the BIOS parameters are automatically adapted to the hardware.

Notes:

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