Technical Reference Hardware

Version 10.03 - March 2010

XS

Studio Production Server

EVS

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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?

The following table describes the sections updated to reflect the new features on the Multicam version 10.03. Click the section number in the table to jump directly to the corresponding section.

Updated sections for Multicam version 10.03	
1.7.3	Update: Support of codec Apple ProRes 422 LT.
1.7.3	Possibility to perform the encoding process in 8-bit or 10 bit
XS is now available with SAS disks:	
1.3.3, 2.1, 3.4.3	Possibility to use an external array (SAS-HDX) with hot-swappable SAS disks.
1.7.4	Recording Capacity for XS servers with SAS disks.
1.7.8	Update of Raid striping process for SAS disks
3.4.2	RTCL Board with SAS Disks.

1. Overview

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

The EVS XS series servers are full digital in PAL (625i), NTSC (525i), 720p, 1080i and 1080p standards. These multi-channel, disk-based video servers are specifically designed for studio applications, to satisfy the needs of near-live and pre-recorded studio productions.

New!

From Multicam version 10.03, the XS server is available in two versions:

- XS: equipped with internal SCSI disks and which can be connected to an XT-HDX external SCSI disk array
- XS-SAS: work with SAS disks. It is equipped with internal SAS disk array and/or can be connected to a SAS-HDX external SAS disk array.

1.1 XS HIGH-RESOLUTION SERVER

The XS server is typically used as a high-resolution server with various third party controllers, applications and automation systems using industry-standard protocols such as Sony BVW75, VDCP, Odetics, DD35, IPDP, or EVS' AVSP, EditRec, Linx API.

XS series servers can also be controlled by EVS applications:

IPDirector: a suite of Windows software applications designed to manage networked EVS video servers. Its applications make it possible to control multiple channels within the 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.

INSIO: an interface to manage single or multi-camera ingests, instant review, clip transfer and streaming to editor and storage, as well as production notes.

1.2 UNPACKING

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

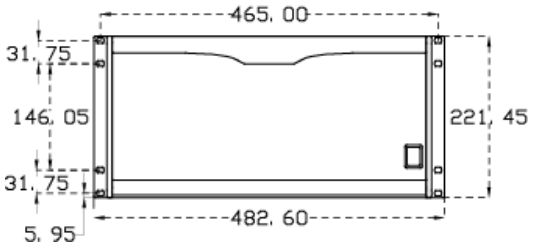
1.3 DIMENSIONS

1.3.1 VIDEO DISK RECORDER MAIN FRAME 19 INCHES

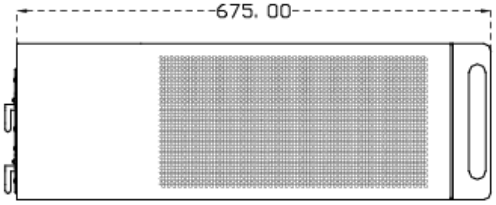
Rack mount 5U – Weight: 37 Kg/ 81.4 Lbs.

The following drawings provide the various dimensions, in mm, of the XS server.

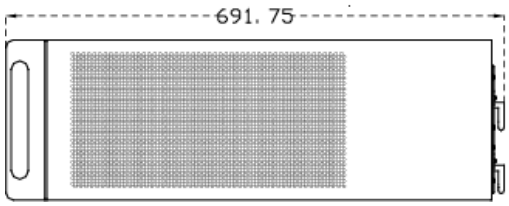
Front view

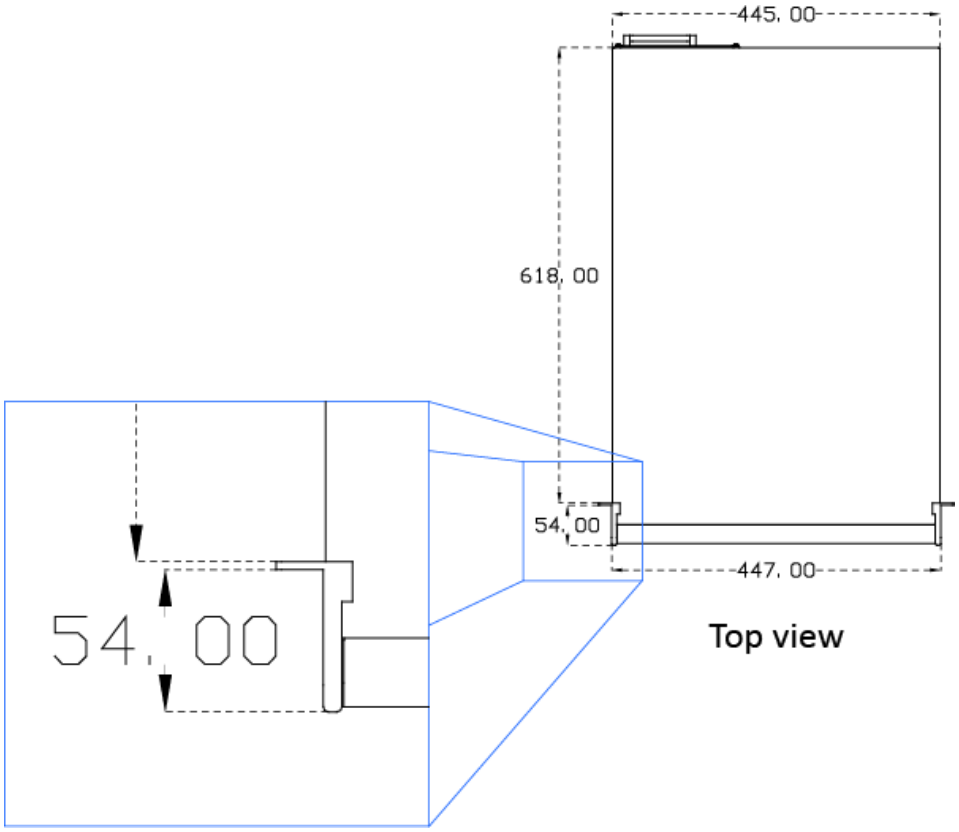


Left view

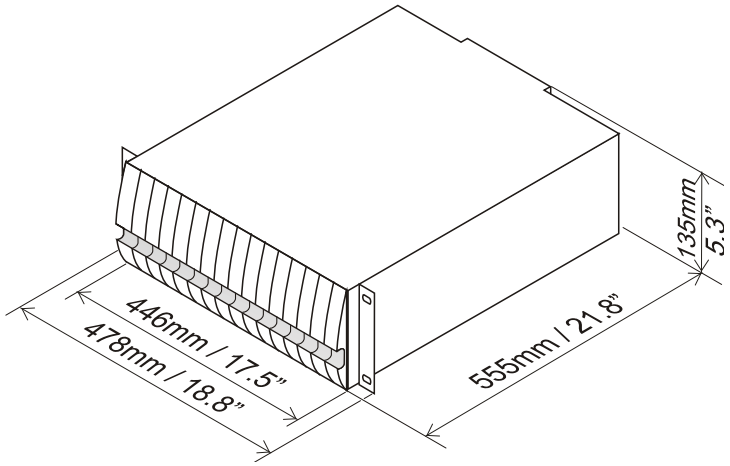


Right view





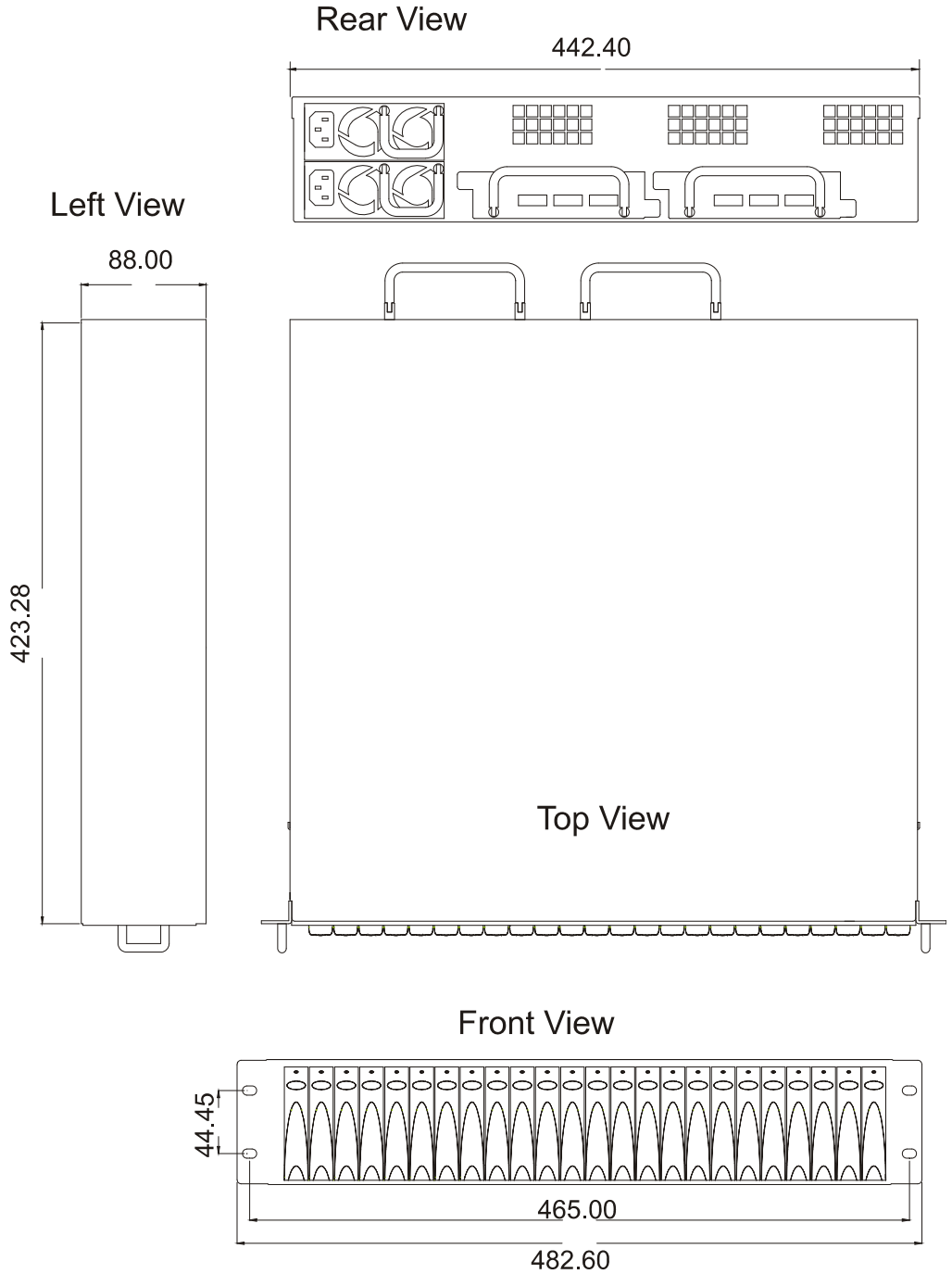
1.3.2 XT-HDX



For more information on the XT-HDX, refer to section “XT-HDX External RAID Array”, on page 62.

1.3.3 SAS-HDX

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



For more information on the SAS-HDX, refer to section 'SAS-HDX External RAID Array' on page 65.

1.4 INSTALLATION

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.

1.5 SAFETY, COMPLIANCE AND OPERATING CONDITIONS

1.5.1 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

1.5.2 EMC STANDARDS

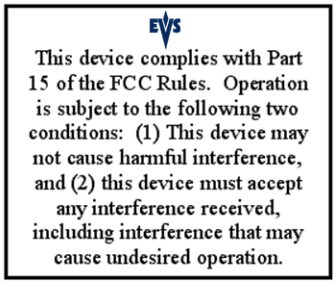
EN 55022	European	Emission Standard
EN 61000-3-2	European	Electromagnetic Compatibility (EMC) Part 3 (Limits); Section2 ; limits for harmonic current emissions (equipment input current <16A per phase)
EN 61000-3-3	European	European Electromagnetic Compatibility (EMC) Part 3 (Limits), Section 3; limitation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

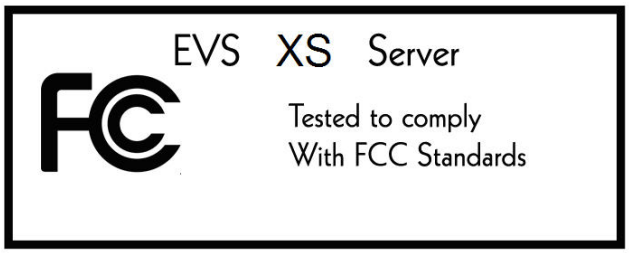
EN 55022	European	Emission Standard
EN 61000-4-5	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits), Section 5; Testing and measurement techniques - Surge immunity test.
EN 61000-4-6	European	European Electromagnetic Compatibility (EMC) Part 4 (Limits); Section 6 ; Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.
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.

1.5.3 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





1.5.4 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.

1.5.5 POWER SUPPLY

This equipment is equipped with AUTOSWITCH and hot-swappable power supply.

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

Important

The protective earth must be connected to the ground before powering up the unit.

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)

HOT SWAP SECONDARY POWER SUPPLY

A 2nd power supply (hot swap) for the disk recorder unit is available.

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 external ADA rack is fitted with an AUTOSWITCH power supply.

GROUNDING

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

1.6 VENTILATION & RACK MOUNTING

Adequate ventilation is obviously required for optimum performance. As a 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 XS chassis, support guides are required for this unit into the rack mount. The front ears of the XS unit are not designed to support its full weight. Applying full weight on these might result in bending the metal plate.

1.7 XS SERVER MAIN SPECIFICATIONS

1.7.1 VIDEO

	XS Server	
	Standard Definition	High Definition
Video Formats	525i 59.94fps (NTSC) 625i 60fps (PAL)	720p 50/59.94fps 1080i 50/59.94fps 1080p 50/59.94fps (DualLink)
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	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.

1.7.2 AUDIO

- 8 input and 8 output analogue balanced channels on 4 DB15
- 16 input and 16 output (8 pairs + 8 pairs) AES/EBU
  - on BNC connector, or
  - on DB15 connectors
- up to 64 channels embedded audio (16 audio mono channels per video channel)
- 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

1.7.3 VIDEO CODECS & BITRATES

The EVS XS server uses an intra-frame video encoding technique. The XS server supports natively the following video codecs:

Codec	SD	HD	Code Protection
MJPEG	√	√	No
DVCPro 50	√	-	Code 9
IMX	√	-	No
Intra-frame MPEG-2	-	√	No
Avid DNxHD®	-	√	Code 5
Apple ProRes 422	-	√	Code 6
Apple ProRes 422 HQ	-	√	Code 6
Apple ProRes 422 LT	-	√	Code 6
DVCPro HD	-	√	Code 8

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, Avid DNxHD® and DVCPro codecs working with defined bitrates.

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

The code-protected codecs are solely available when the corresponding code is valid.

Up to Multicam 10.01, all codecs used in the EVS Video servers were encoding in 8-bit. From Multicam 10.03, it is possible to perform the encoding process in 8-bit or 10 bit and to write a 10-bit file on selected codecs.

The following table summarizes the proposed configurations in the XS:

	Encoding	File Header
DNxHD 120/145	8-bit	8-bit
DNxHD 185/220	8-bit	8-bit
DNxHD 185x DNxHD 220x	10-bit	10-bit
ProRes 120/145	8-bit	10-bit

	Encoding	File Header
ProRes 185/220	8-bit or 10-bit	10-bit
DVCPro HD	8-bit	8-bit
M-JPEG	8-bit	8-bit
MPEG	8-bit	8-bit

1.7.4 RECORDING CAPACITY FOR XS SERVERS

SCSI DISKS

The following tables show the record capacity, in hours, 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
	DVCPro 50	11h27	23h15	48h08	96h16	144h24
HD	**MJPEG / MPEG 100Mbps**	5h38	11h27	23h42	47h24	71h06
	DVCPro HD	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
	DVCPro 50	11h26	23h12	48h03	96h06	144h09
HD	**MJPEG / MPEG 100Mbps**	5h38	11h27	23h42	47h24	71h06
	DVCPro HD	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

SAS DISKS

The following tables show the recording capacity, in hours, for 1 record channel (i.e. 1 video + 4 stereo audio tracks in SD; 1 video + 8 stereo audio tracks in HD) with external arrays of 300GB disks compared with the different video bitrates. These tables are valid with the "Operational Disk Size" parameter set to 100%.

Configurations in normal characters are the recommended ones without hot spare disks.

Configurations in bold characters are the recommended ones with hot spare disks.

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

- internal storage only: 6 or 12 x 300GB SAS disks.
- external storage only: up to 4 arrays with 24 x 300 GB SAS disks, with or without spare disks
- both internal and external storage.

Recording Capacity in hours for 5 disks (4+1) RAID configuration – 50Hz

		(4+1)							
# Disks	# Ext array	# RAIDS	# Spares	30Mbps 4 audios	40Mbps 4 audios	50Mbps 4 audios	100Mbps 8 audios	120Mbps 8 audios	185Mbps 8 audios
5	1	1	0	75	58	48	23	19	13
6	**1**	**1**	**1**	**75**	**58**	**48**	**23**	**19**	**13**
10	1	2	0	152	117	96	47	39	26
11	**1**	**2**	**1**	**152**	**117**	**96**	**47**	**39**	**26**
15	1	3	0	228	176	145	71	59	40
16	**1**	**3**	**1**	**228**	**176**	**145**	**71**	**59**	**40**
20	1	4	0	304	234	193	95	79	53
21	**1**	**4**	**1**	**304**	**234**	**193**	**95**	**79**	**53**
25	2	5	0	380	293	242	119	99	67
27	**2**	**5**	**2**	**380**	**293**	**242**	**119**	**99**	**67**
30	2	6	0	457	352	290	142	119	80
32	**2**	**6**	**2**	**457**	**352**	**290**	**142**	**119**	**80**
35	2	7	0	533	411	339	166	138	94
37	**2**	**7**	**2**	**533**	**411**	**339**	**166**	**138**	**94**
40	2	8	0	609	470	387	190	158	107
42	**2**	**8**	**2**	**609**	**470**	**387**	**190**	**158**	**107**
45	2	9	0	686	528	435	214	178	121
47	**2**	**9**	**2**	**686**	**528**	**435**	**214**	**178**	**121**
50	3	10	0	762	587	484	238	198	135
53	**3**	**10**	**3**	**762**	**587**	**484**	**238**	**198**	**135**
55	3	11	0	838	646	532	262	218	148
58	**3**	**11**	**3**	**838**	**646**	**532**	**262**	**218**	**148**
60	3	12	0	914	705	581	285	238	162
63	**3**	**12**	**3**	**914**	**705**	**581**	**285**	**238**	**162**
65	3	13	0	991	764	629	309	258	175
68	**3**	**13**	**3**	**991**	**764**	**629**	**309**	**258**	**175**
70	3	14	0	1067	822	678	333	278	189
74	**4**	**14**	**4**	**1067**	**822**	**678**	**333**	**278**	**189**
75	4	15	0	1143	881	726	357	297	202
79	**4**	**15**	**4**	**1143**	**881**	**726**	**357**	**297**	**202**
80	4	16	0	1220	940	775	381	317	216
84	**4**	**16**	**4**	**1220**	**940**	**775**	**381**	**317**	**216**

Recording Capacity in hours for 6 disk (5+1) RAID configuration – 50Hz

		(5+1)							
# Disks	# Ext array	# RAIDS	# Spares	30Mbps 4 audios	40Mbps 4 audios	50Mbps 4 audios	100Mbps 8 audios	120Mbps 8 audios	185Mbps 8 audios
6	1	1	0	94	73	60	29	24	16
7	**1**	**1**	**1**	**94**	**73**	**60**	**29**	**24**	**16**
12	1	2	0	190	146	120	59	49	33
13	**1**	**2**	**1**	**190**	**146**	**120**	**59**	**49**	**33**
18	1	3	0	285	220	181	89	74	50
19	**1**	**3**	**1**	**285**	**220**	**181**	**89**	**74**	**50**
24	1	4	0	380	293	242	119	99	67
26	**2**	**4**	**2**	**380**	**293**	**242**	**119**	**99**	**67**
30	2	5	0	476	367	302	148	124	84
32	**2**	**5**	**2**	**476**	**367**	**302**	**148**	**124**	**84**
36	2	6	0	571	440	363	178	148	101
38	**2**	**6**	**2**	**571**	**440**	**363**	**178**	**148**	**101**
42	2	7	0	667	514	423	208	173	118
44	**2**	**7**	**2**	**667**	**514**	**423**	**208**	**173**	**118**
48	2	8	0	762	587	484	238	198	135
51	**3**	**8**	**3**	**762**	**587**	**484**	**238**	**198**	**135**
54	3	9	0	857	661	545	268	223	151
57	**3**	**9**	**3**	**857**	**661**	**545**	**268**	**223**	**151**
60	3	10	0	953	734	605	297	248	168
63	**3**	**10**	**3**	**953**	**734**	**605**	**297**	**248**	**168**
66	3	11	0	1048	808	666	327	273	185
69	**3**	**11**	**3**	**1048**	**808**	**666**	**327**	**273**	**185**
72	3	12	0	1143	881	726	357	297	202
76	**4**	**12**	**4**	**1143**	**881**	**726**	**357**	**297**	**202**
78	4	13	0	1220	940	775	381	317	216
82	**4**	**13**	**4**	**1220**	**940**	**775**	**381**	**317**	**216**

Recording Capacity in hours for 5 disk (4+1) RAID configuration – 59.94Hz

		(4+1)							
# Disks	# Ext array	# RAIDS	# Spares	30Mbps 4 audios	40Mbps 4 audios	50Mbps 4 audios	100Mbps 8 audios	145Mbps 8 audios	220Mbps 8 audios
5	1	1	0	75	58	48	23	16	11
6	**1**	**1**	**1**	**75**	**58**	**48**	**23**	**16**	**11**
10	1	2	0	151	117	96	47	33	22
11	**1**	**2**	**1**	**151**	**117**	**96**	**47**	**33**	**22**
15	1	3	0	228	176	144	71	49	33
16	**1**	**3**	**1**	**228**	**176**	**144**	**71**	**49**	**33**
20	1	4	0	304	235	193	95	66	45
21	**1**	**4**	**1**	**304**	**235**	**193**	**95**	**66**	**45**
25	2	5	0	380	294	241	119	82	56
27	**2**	**5**	**2**	**380**	**294**	**241**	**119**	**82**	**56**
30	2	6	0	456	353	290	143	99	67
32	**2**	**6**	**2**	**456**	**353**	**290**	**143**	**99**	**67**
35	2	7	0	533	412	338	166	115	78
37	**2**	**7**	**2**	**533**	**412**	**338**	**166**	**115**	**78**
40	2	8	0	609	471	386	190	132	90
42	**2**	**8**	**2**	**609**	**471**	**386**	**190**	**132**	**90**
45	2	9	0	685	530	435	214	149	101
47	**2**	**9**	**2**	**685**	**530**	**435**	**214**	**149**	**101**
50	3	10	0	761	589	483	238	165	112
53	**3**	**10**	**3**	**761**	**589**	**483**	**238**	**165**	**112**
55	3	11	0	838	648	531	262	182	123
58	**3**	**11**	**3**	**838**	**648**	**531**	**262**	**182**	**123**
60	3	12	0	914	707	580	286	198	135
63	**3**	**12**	**3**	**914**	**707**	**580**	**286**	**198**	**135**
65	3	13	0	990	766	628	310	215	146
68	**3**	**13**	**3**	**990**	**766**	**628**	**310**	**215**	**146**
70	3	14	0	1066	825	677	333	231	157
74	**4**	**14**	**4**	**1066**	**825**	**677**	**333**	**231**	**157**
75	4	15	0	1143	884	725	357	248	168
79	**4**	**15**	**4**	**1143**	**884**	**725**	**357**	**248**	**168**
80	4	16	0	1219	943	773	381	265	180
84	**4**	**16**	**4**	**1219**	**943**	**773**	**381**	**265**	**180**

Recording Capacity in hours for 6 disk (5+1) RAID configuration – 59.94Hz

		(5+1)							
# Disks	# Ext array	# RAIDS	# Spares	30Mbps 4 audios	40Mbps 4 audios	50Mbps 4 audios	100Mbps 8 audios	145Mbps 8 audios	220Mbps 8 audios
6	1	1	0	94	73	60	29	20	14
7	**1**	**1**	**1**	**94**	**73**	**60**	**29**	**20**	**14**
12	1	2	0	190	147	120	59	41	28
13	**1**	**2**	**1**	**190**	**147**	**120**	**59**	**41**	**28**
18	1	3	0	285	220	181	89	62	42
19	**1**	**3**	**1**	**285**	**220**	**181**	**89**	**62**	**42**
24	1	4	0	380	294	241	119	82	56
26	**2**	**4**	**2**	**380**	**294**	**241**	**119**	**82**	**56**
30	2	5	0	475	368	302	148	103	70
32	**2**	**5**	**2**	**475**	**368**	**302**	**148**	**103**	**70**
36	2	6	0	571	442	362	178	124	84
38	**2**	**6**	**2**	**571**	**442**	**362**	**178**	**124**	**84**
42	2	7	0	666	515	423	208	144	98
44	**2**	**7**	**2**	**666**	**515**	**423**	**208**	**144**	**98**
48	2	8	0	761	589	483	238	165	112
51	**3**	**8**	**3**	**761**	**589**	**483**	**238**	**165**	**112**
54	3	9	0	857	663	544	268	186	126
57	**3**	**9**	**3**	**857**	**663**	**544**	**268**	**186**	**126**
60	3	10	0	952	737	604	298	207	140
63	**3**	**10**	**3**	**952**	**737**	**604**	**298**	**207**	**140**
66	3	11	0	1047	810	665	327	227	154
69	**3**	**11**	**3**	**1047**	**810**	**665**	**327**	**227**	**154**
72	3	12	0	1143	884	725	357	248	168
76	**4**	**12**	**4**	**1143**	**884**	**725**	**357**	**248**	**168**
78	4	13	0	1219	943	773	381	265	180
82	**4**	**13**	**4**	**1219**	**943**	**773**	**381**	**265**	**180**

1.7.5 SUPPORTED SMPTE STANDARDS

The following standards are supported:

SD SDI	SMPTE 259M (525i 59.94Hz; 625i 50Hz)
HD SDI	SMPTE 292M (720p 50 and 59.94Hz; 1080i 50 and 59.94Hz)
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
1080p 50 and 59.94Hz	SMPTE 372M

1.7.6 MAXIMUM BITRATE VALUES

These maximum values are valid for XS servers running Multicam version 10.03 or higher. They guarantee a smooth play and a browse at 100% speed on all channels simultaneously.

		2 ch	4 ch
SD JPEG	PAL	100	100
	NTSC	100	100
HD JPEG	PAL	225	225
	NTSC	250	250
HD MPEG	PAL	225	225
	NTSC	250	250
Avid DNxHD®	PAL	185	185
	NTSC	220	220
Apple ProRes 422	PAL	185	185

		2 ch	4 ch
	NTSC	220	220
DVCPro 50	PAL	50	50
	NTSC	50	50
DVCPro HD	PAL	100	100
	NTSC	100	100

1.7.7 AVID DNxHD ® AND APPLE PRORES 422

INTRODUCTION

EVS XS 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 XS 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 XS servers, on the XNet[2] SDTI network and on the 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 XS server and an Avid or Apple server, please refer to the specific documents (EVS_Avid_integration or EVS_Apple_integration).

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 220Mbps 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 XS 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 3 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)
3. Apple ProRes 422 LT: 85Mbps in “PAL” (50Hz) and 102Mbps in “NTSC”

(59.94Hz)

Apple ProRes 422 on EVS XS servers is only available at these bitrates.

CHOICES OF BITRATES WHEN USING AVID DNxHD® OR APPLE PRORES 422 WITH EVS XS SERVERS

How to Read the Following Tables ?

1. Video Bitrate: value set by the user in the advanced parameters window of the XS 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 XS server can support for a given frame rate and bitrate. Since an XS server can have a maximum of 4 local video channels, any value higher than 4 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 than or equal to 150 MB/s (SCSI disks) or 205 MB/s (SAS disks).
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 XS 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).

To get information on the recording capacity of the servers according to the video bitrates and the disks used, refer to section 1.7.4 ‘Recording Capacity for XS Servers’ on page 11.

Avid DNxHD® & Apple ProRes 422 at 50Hz ("PAL")

Codec	Video Bitrate	Fields /Block	Actual Bandwidth (MB/s)	Max. RT Channels ([1])	Max. RT Channels ([2])	XS (SCSI) 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	13.13	17.94	6.34	13.20	27.37	5.36	11.24	17.11	22.48
Avid DNxHD®	100 Mbps	30	13.33	11.25	15.38	5.38	11.26	23.41	4.48	9.46	14.44	19.32
Avid DNxHD® Apple ProRes 422	120 Mbps	26	15.38	9.75	13.33	4.53	9.54	20.31	4.09	8.28	12.46	16.56
Avid DNxHD® Apple ProRes 422 HQ	185 Mbps	17	23.53	6.38	8.71	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 (MB/s)	Max. RT Channels (1)	Max. RT Channels (2)	XS (SCSI) 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	4.50	6.15	2.15	4.34	9.28	1.55	3.54	5.53	7.48
Avid DNxHD®	100 Mbps	10	40.00	3.75	5.13	1.53	3.48	7.53	1.36	3.15	4.54	6.30
Avid DNxHD® Apple ProRes 422	120 Mbps	9	44.44	3.38	4.61	1.41	3.26	7.06	1.26	2.56	4.25	5.52
Avid DNxHD® Apple ProRes 422 HQ	185 Mbps	5	66.67	2.25	3.08	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 (MB/s)	Max. RT Channels (1)	Max. RT Channels (2)	XS (SCSI) 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	13.14	6.15	6.29	13.21	27.39	5.36	11.24	17.12	22.48
Avid DNxHD®	100 Mbps	36	13.32	11.26	5.13	5.38	11.27	23.42	4.48	9.47	14.45	19.34
Avid DNxHD® Apple ProRes 422	145 Mbps	26	18.44	8.13	4.61	4.04	8.16	17.07	3.28	7.03	10.39	14.06
Avid DNxHD® Apple ProRes 422 HQ	220 Mbps	17	28.21	5.32	3.08	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 (MB/s)	Max. RT Channels (1)	Max. RT Channels (2)	XS (SCSI) 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	4.69	6.41	2.21	4.46	9.52	2.00	4.04	6.09	8.08
Avid DNxHD®	100 Mbps	12	39.96	3.75	5.13	1.53	3.49	7.54	1.36	3.15	4.55	6.30
Avid DNxHD® Apple ProRes 422	145 Mbps	9	53.28	2.82	3.85	1.24	2.51	5.55	1.12	2.26	3.41	4.52
Avid DNxHD® Apple ProRes 422 HQ	220 Mbps	6	79.92	1.88	2.57	0.56	1.54	3.57	0.48	1.38	2.27	3.16

[1] SCSI disks
[2] SAS disks

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 XS 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 XS 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 XS 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 allocates between 3.75 and 6 times more bandwidth to backup session than to restore session.

1.7.8 RAID LEVEL: 3

The Video Raid uses striping process across 5 SCSI disk drives or across 5 or 6 SAS disk drives. With SCSI disks, the video and audio data is striped over the first 4 drives while the parity information is saved on the fifth drive. With SAS disks, the video and audio data is striped over the first 4 or 5 drives while the parity information is saved on the fifth or sixth drive. If one drive is damaged, the Video Raid can use the parity information to recover the missing information, so that operation can continue seamlessly without bandwidth loss.

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

1.7.9 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 and 1080p).

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

The original video signal:

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

The output video signal at 50% speed:

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

The output video signal at 33% speed:

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

The output video signal at 25% speed :

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

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

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

2-LINE INTERPOLATOR

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

4-LINE INTERPOLATOR

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

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

EVS use the same techniques with the Super Slow Motion disk recorder, working with all models of Super Motion cameras (150/180 Hz). The only difference

between the processing of Super Motion and normal scan (50/60 Hz) signals is that the interpolator is always disabled at 33% playback speed, because the Super Motion signal does not cause parity violation at this particular speed.

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

Note

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

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

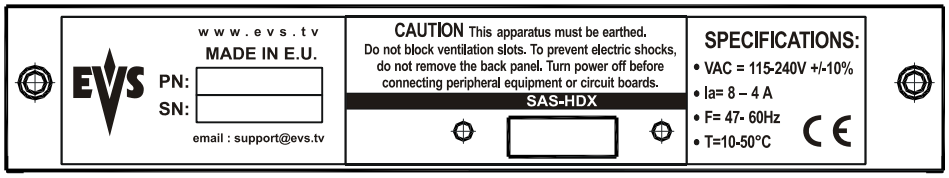
2. Cabling

2.1 XS REAR PANEL

The following drawings show the various possible configurations of an XS server.

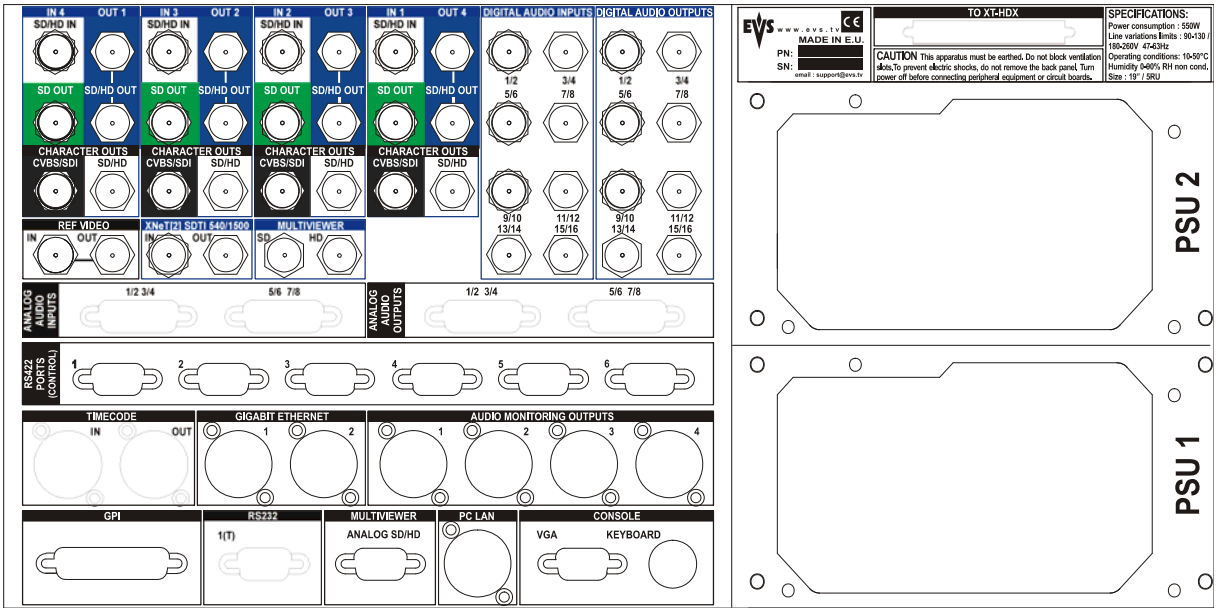
Note

An XS 'SAS' rear panel will differ in the SAS-HDX connector on the upper right corner:

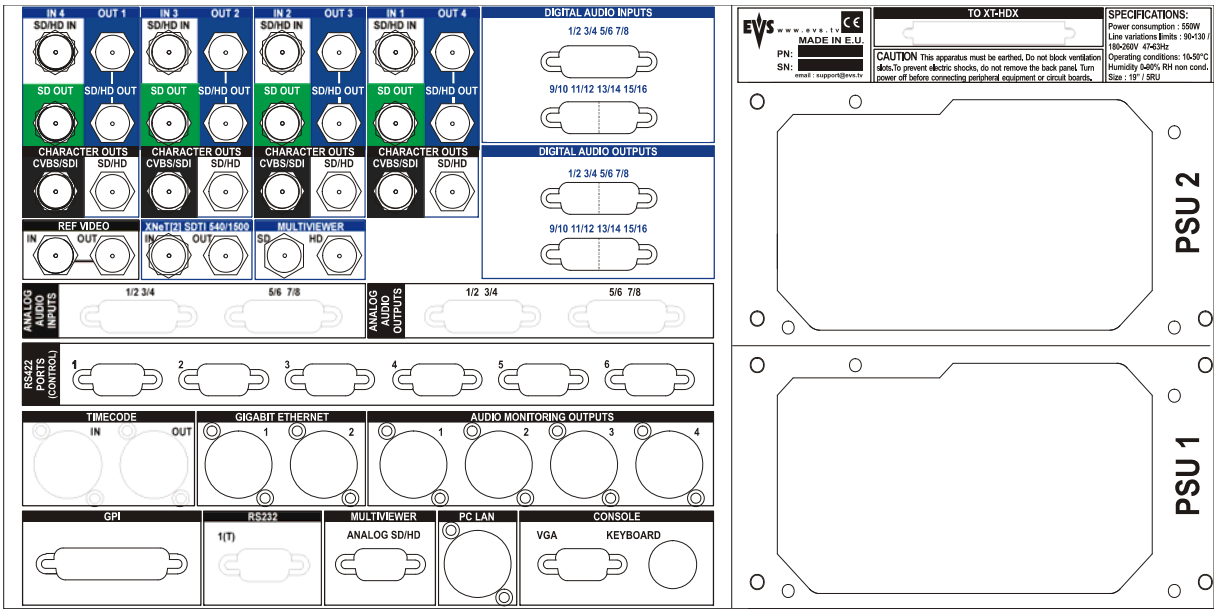


2.1.1 OPEN CONFIGURATION

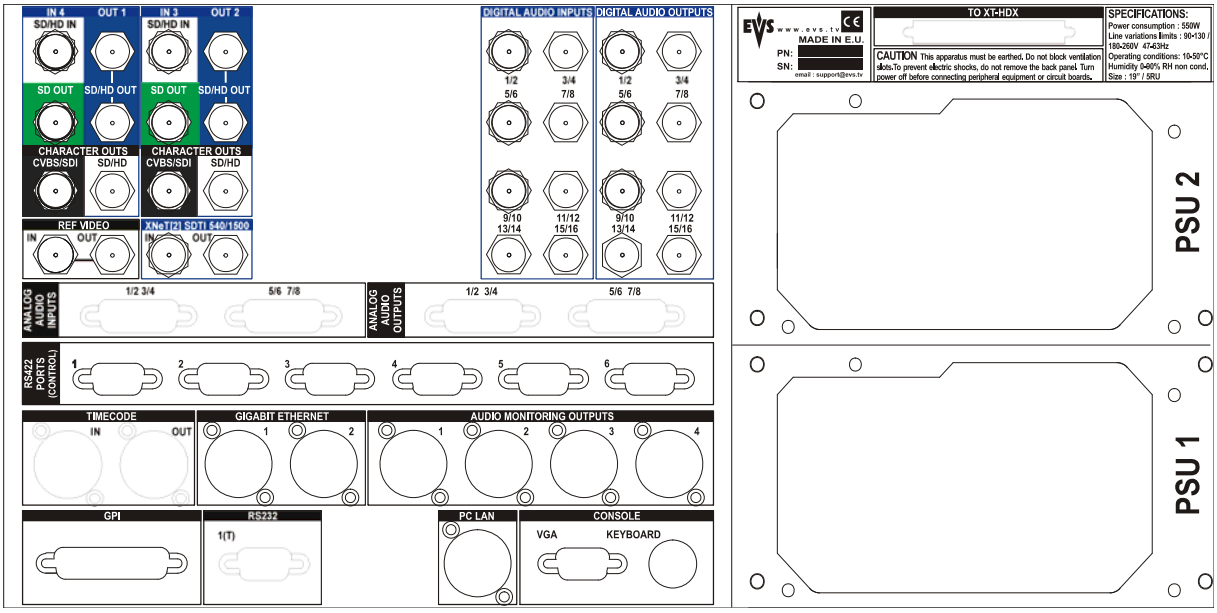
(XS 5U-444 CONFIG) SHOWN WITH OPTIONAL AES ON BNC CONNECTOR OPTION



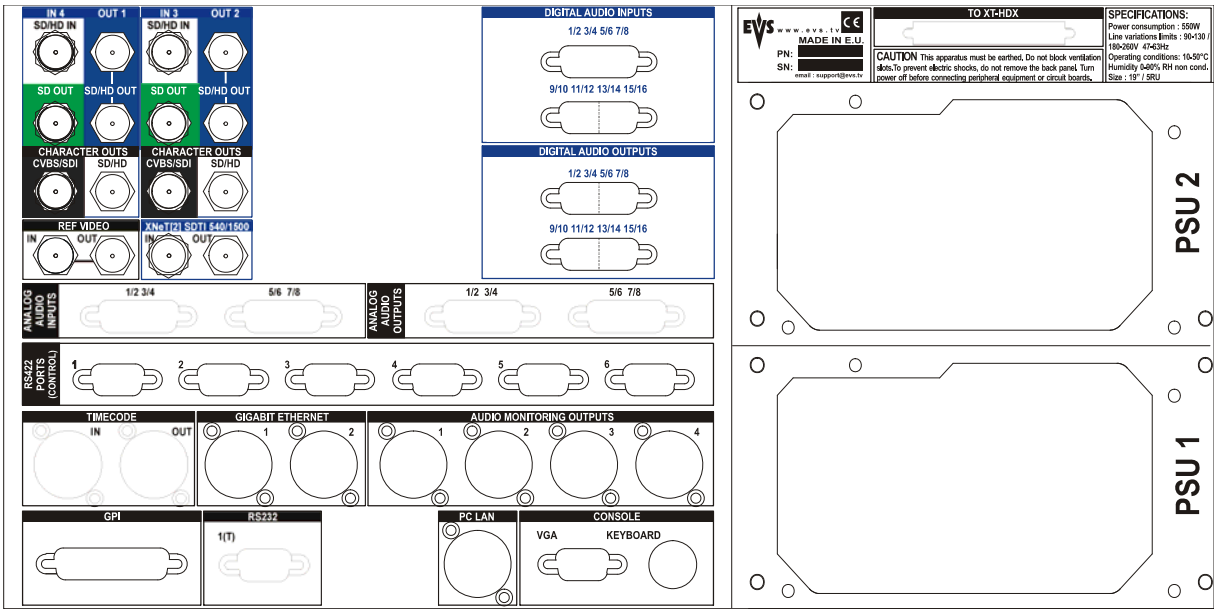
(XS 5U-444 CONFIG) SHOWN WITH OPTIONAL AES ON MULTI-PIN CONNECTOR OPTION



(XS 5U-222 CONFIG) SHOWN WITH OPTIONAL AES ON BNC CONNECTOR OPTION

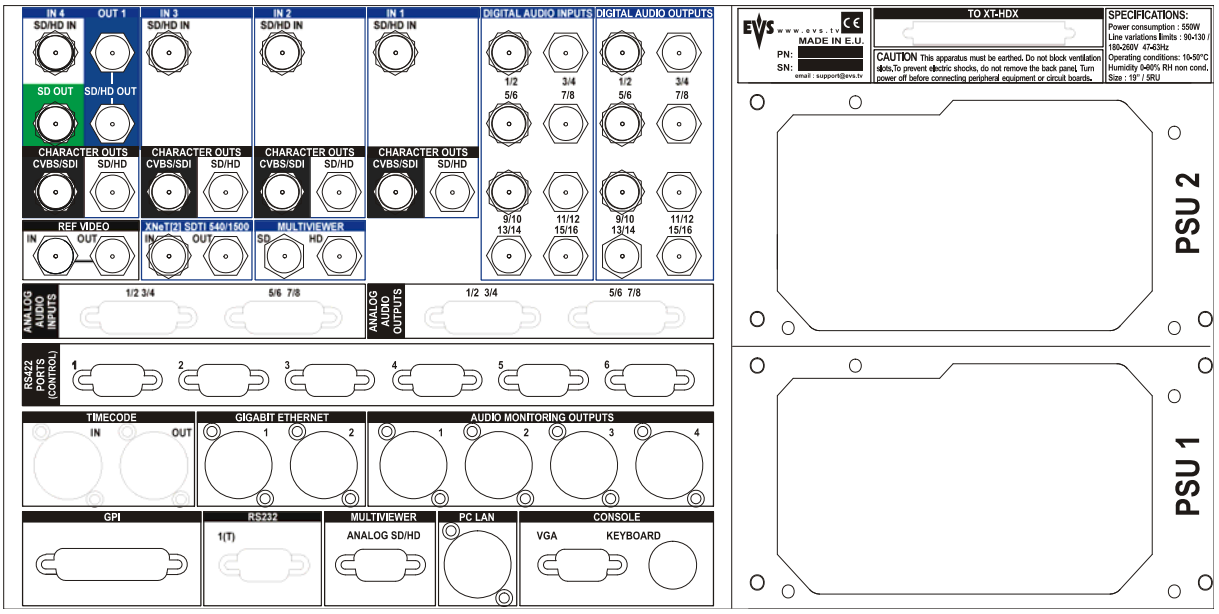


(XS 5U-222 CONFIG) SHOWN WITH OPTIONAL AES ON MULTI-PIN CONNECTOR OPTION

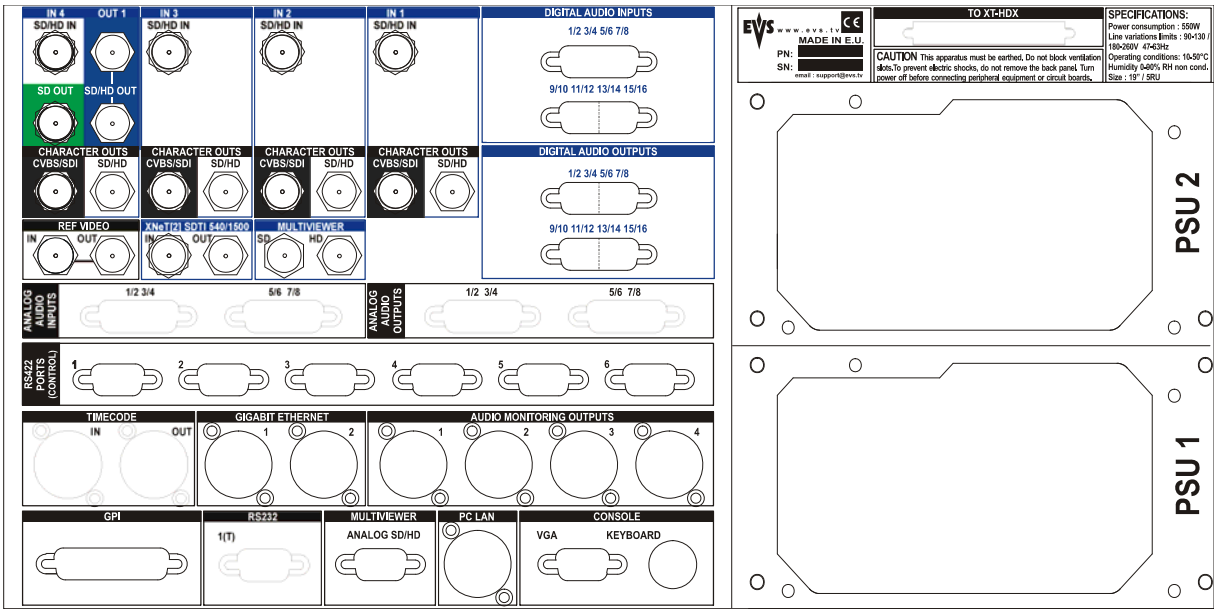


2.1.2 INGEST CONFIGURATION (XS 5U-441 CONFIG)

SHOWN WITH OPTIONAL AES ON BNC CONNECTOR OPTION

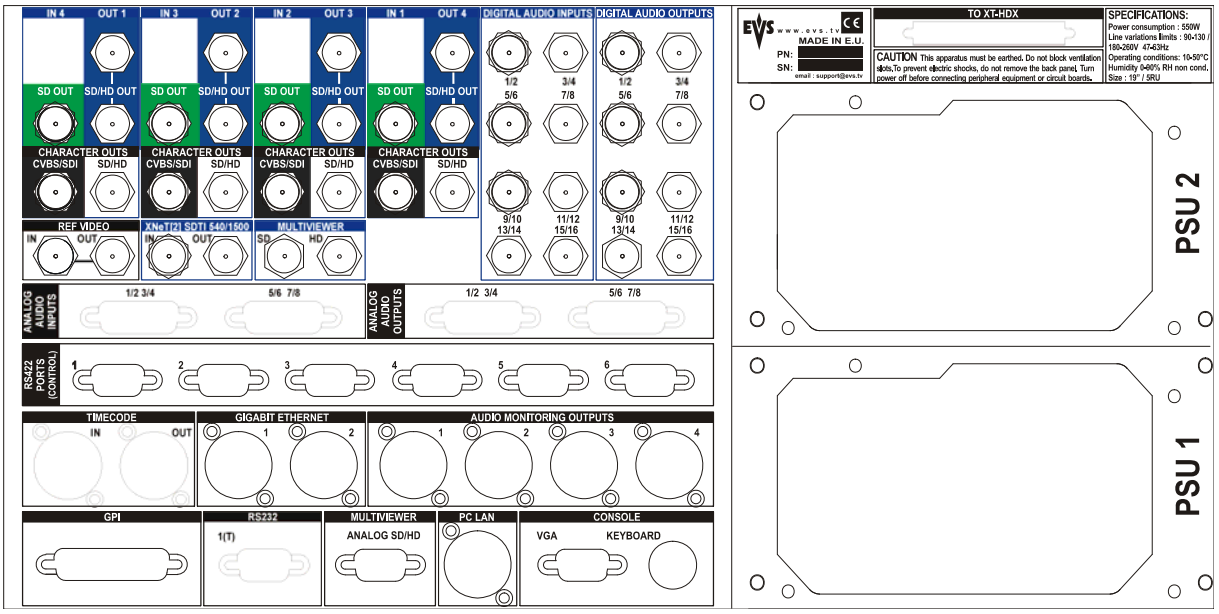


SHOWN WITH OPTIONAL AES ON MULTI-PIN CONNECTOR OPTION

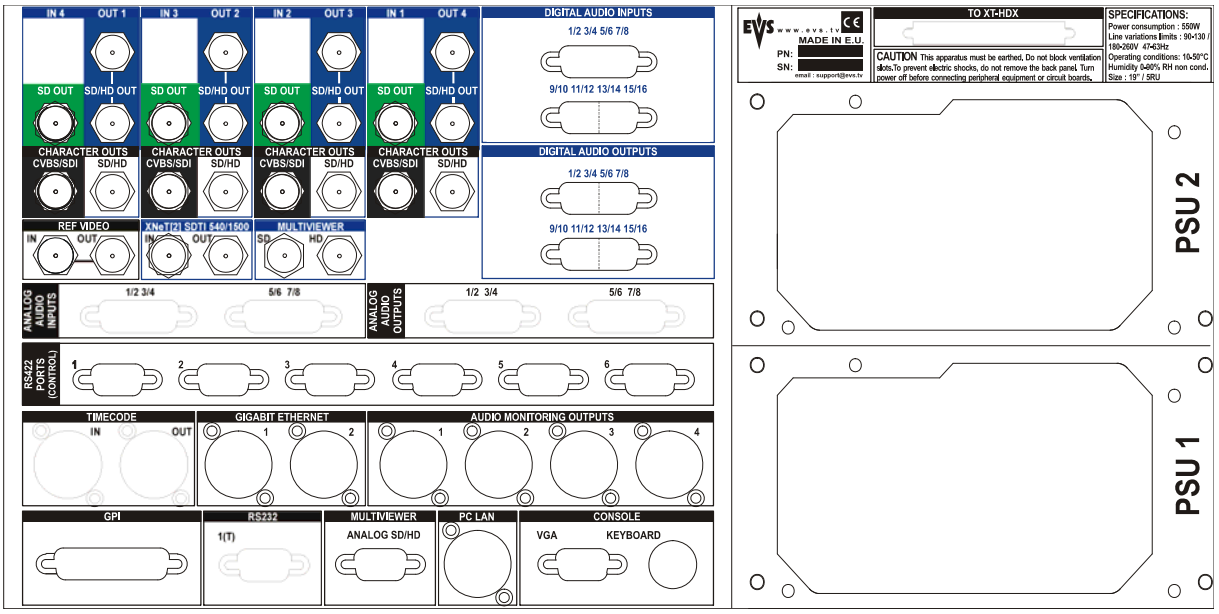


2.1.3 PLAYOUT CONFIGURATION (XS 5U-414 CONFIG)

SHOWN WITH OPTIONAL AES ON BNC CONNECTOR OPTION



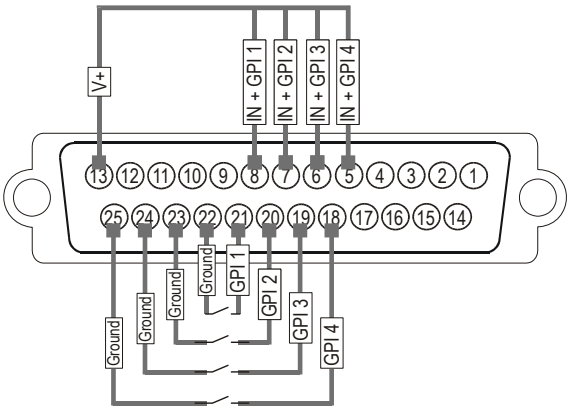
SHOWN WITH OPTIONAL AES ON MULTI-PIN CONNECTOR OPTION



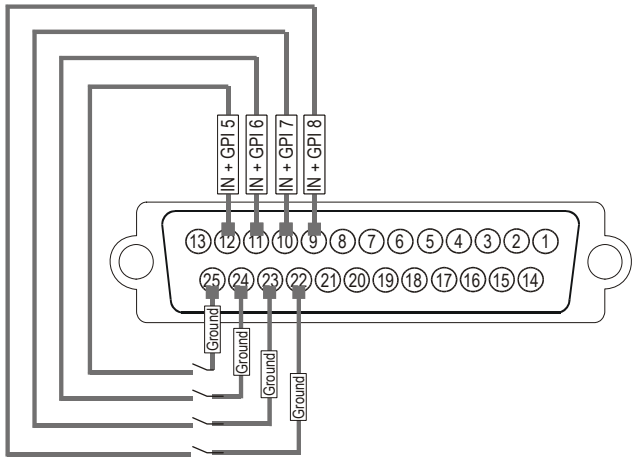
2.2 GPI IN CONNECTIONS

On XS servers, GPI triggers are available. Refer to the Multicam or AirBox user manuals for GPI allocation.

2.2.1 RELAY → OPTO INPUTS ON THE XS SERVER (GPI INPUTS 1, 2, 3, 4)

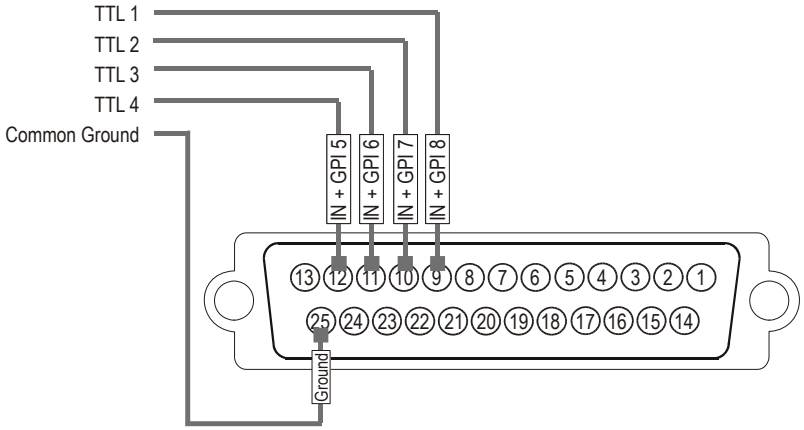


2.2.2 RELAY → TTL INPUTS ON THE XS SERVER (GPI INPUTS 5, 6, 7, 8)



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

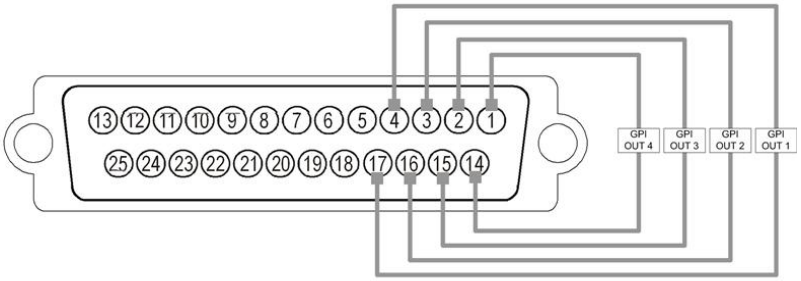
2.2.3 TTL → TTL INPUTS ON THE XS SERVER (GPI INPUT 5, 6, 7, 8)



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 XS and the external device.

2.3 GPI OUT SETTINGS

The user can define the functions, types and settings associated to the GPI outs in IP Director settings (GPI and Auxiliary Track tab).



2.4 MTPC GPIO CONNECTOR 15/10/02

2.4.1 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.		

2.4.2 GPIO HARDWARE SPECIFICATIONS

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:

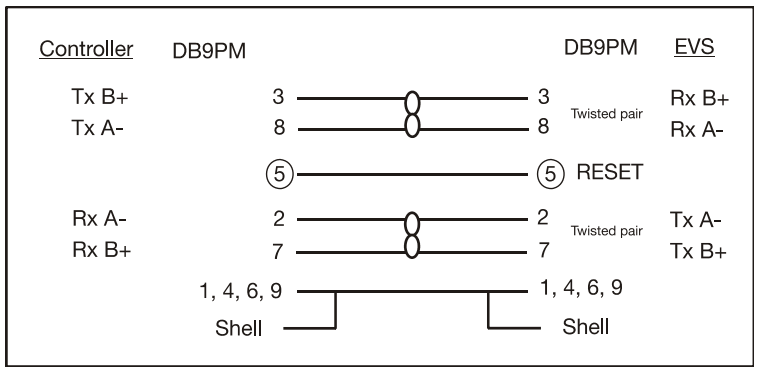
- The input consists in an opto diode (VF @ 1.1 Volt) in series with a 470 ohm resistor).
- Typical switching point @ 1.4 mA, for secure operation:
  - i=0 to 0.5 mA -> opto OFF
  - i=2.5 to 30 mA -> opto ON
  - imax= 30 mA
- Direct connection to a TTL/CMOS signal possible (pin opto - to GND and pin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

2.5 RS422 CONNECTOR



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

Important

If a Reset command can be 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 67 of this manual).

The technical specifications for the RS422 connector are the following:

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

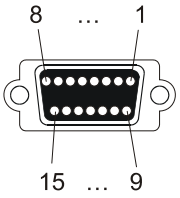
2.6 AUDIO CONFIGURATIONS

2.6.1 CODA FOR XS

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

- Embedded Audio 64 channels (input or output)
- AES/EBU Audio 16 inputs + 16 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 8 inputs + 8 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)

2.6.2 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 -

2.7 CONNECTING MULTIPLE EVS VIDEO SERVERS ON XNET

The XNet network may be composed by several EVS video servers all connected with a 75-Ohm coaxial cable (BNC).

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

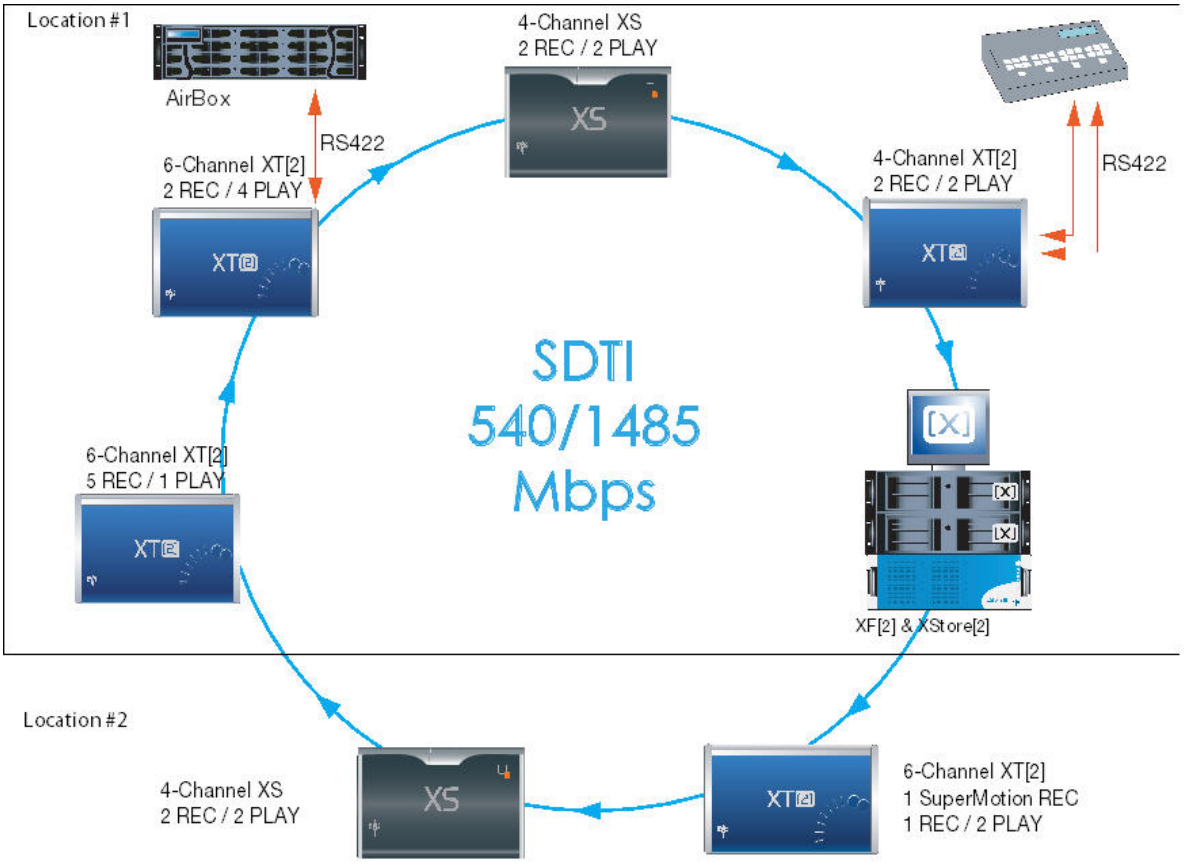
On XS servers there is one pair of SDTI connectors: XNet[2] Non-Relay connectors that can be used at 540 or 1485 Mbps.

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.

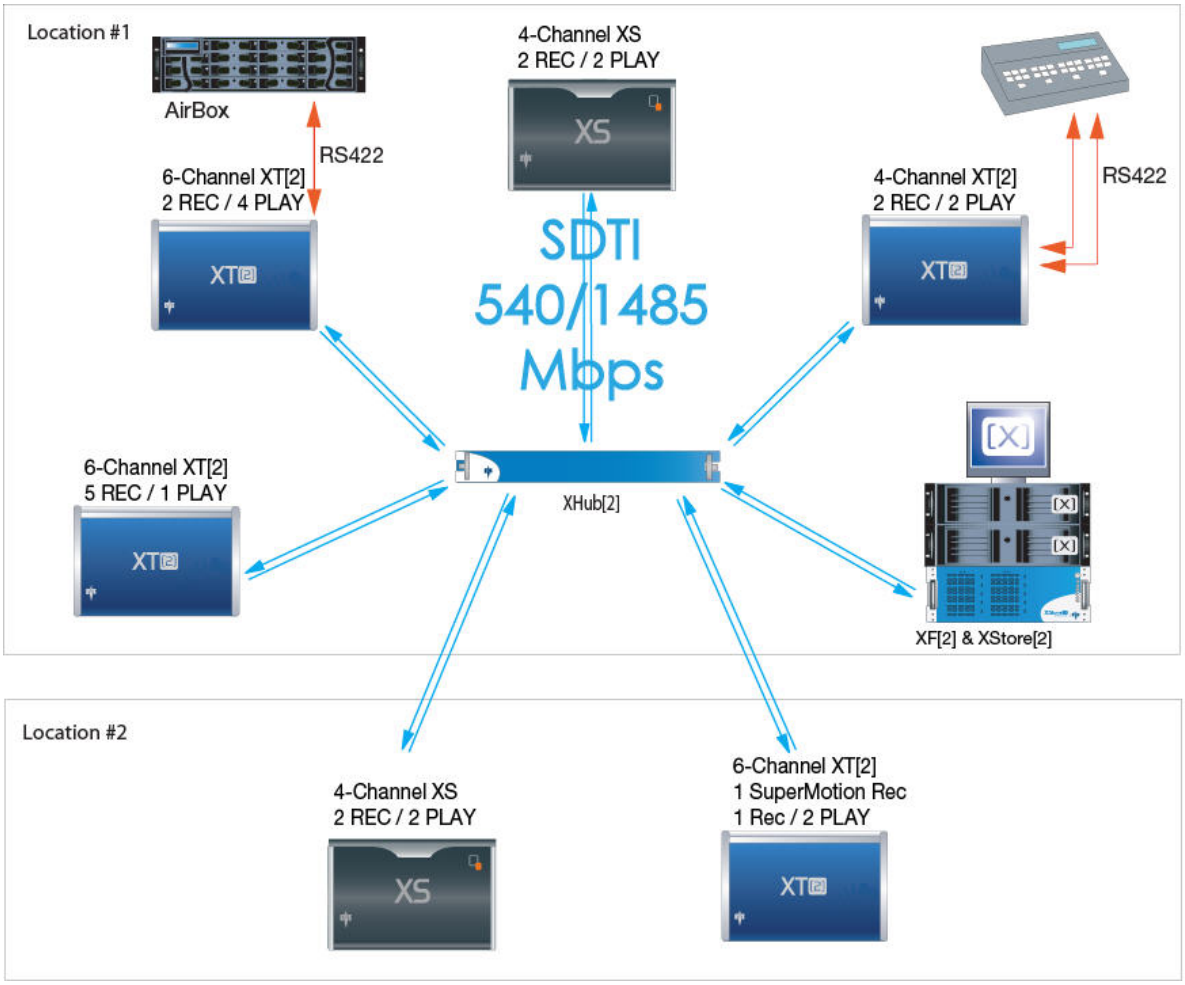
Note

If an XS 'SAS' must be connected to other XT2 or XS servers with SCSI disks, these servers must run at least Multicam version 10.01.67.

2.7.1 CONNECTION DIAGRAM WITHOUT EVS XNET HUB



2.7.2 CONNECTION DIAGRAM WITH EVS XHUB[2] XNET HUB



2.7.3 REQUIRED CONDITIONS TO SET UP AND RUN XNET

1. All systems on the network must be XT[2], XT[2]+, XS, 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 EVS video server 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 EVS video server (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 EVS video server 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 EVS video servers must be connected with a good quality BNC 75Ohm cable to form a closed loop. Connect the SDTI OUT connector of the first EVS video server to the SDTI IN connector of the second one, etc until the loop is closed by connecting the SDTI OUT connector of the last EVS video server to the SDTI IN connector of the first one. The SDTI loop must be closed at all times during network operation. If for any reason the loop is open, all network communication will be interrupted and all systems will automatically switch to stand-alone mode. When the loop is closed again, network operation will resume automatically. This problem can be avoided or limited using 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.

2.7.4 STARTING XNET

1. When all above conditions are fulfilled, turn on the “Server” EVS video server and start the Multicam application.
2. Turn on all “Masters” and “Clients” EVS video servers, and make sure the Multicam application is started on all of them. They should see the “Server” on the network and they will connect automatically. Connection takes a few seconds (usually between 2 and 5 sec) for each EVS video server.

2.7.5 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 load.

   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 EVS video server where the clips are stored. If the EVS video server "owning" the clips is doing multiple playbacks at the same time, freezes can occur on the remote EVS video server 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 EVS video servers 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. The next machine to be automatically assigned as new network server is the one with the highest serial number in the SDTI network.

2.8 GIGABIT NETWORK

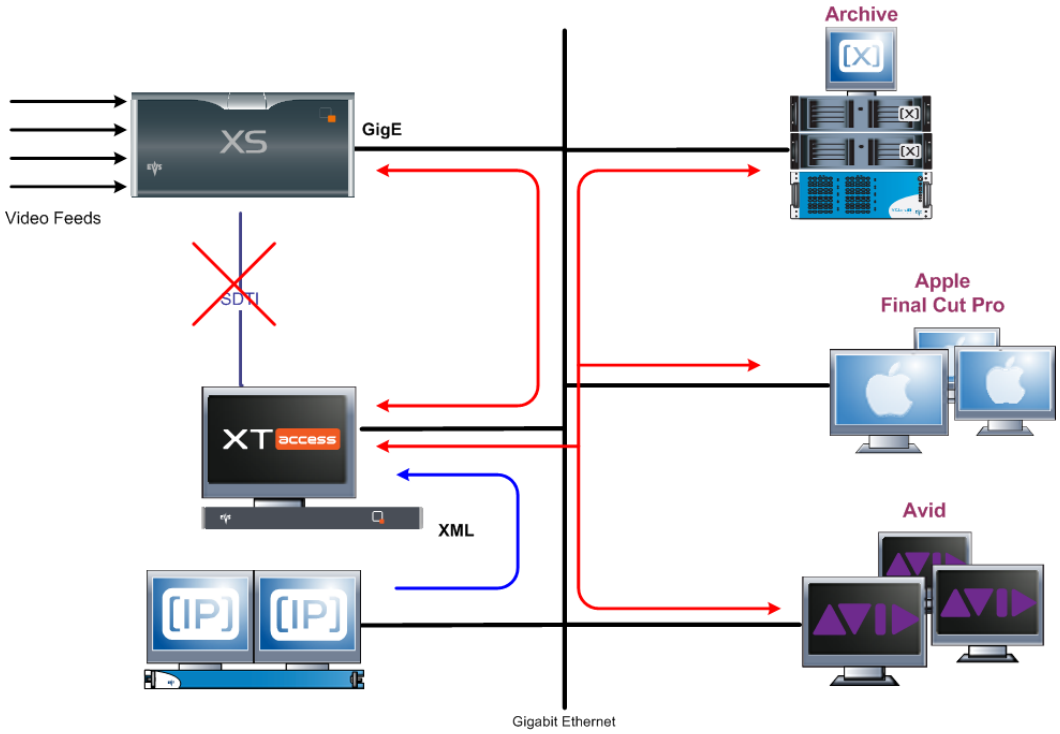
2.8.1 FUNCTIONAL OVERVIEW

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

However, the external systems cannot read the raw files coming from the XS servers. For this reason, XTAccess is used as a "gateway" between the XS 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.



XTAccess is directly connected to the XS 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.

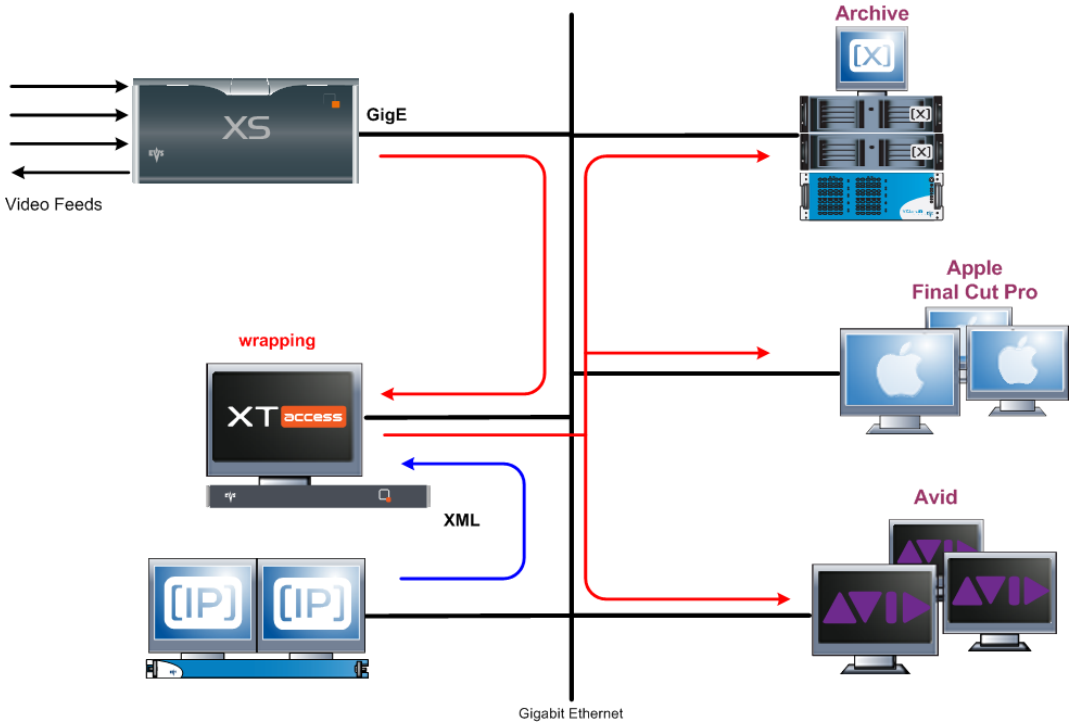
The Gigabit connection fulfills the following functions in relation with the XS servers:

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

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

2.8.2 BACKUP OF CLIPS

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



Workflow

1. An external system, for example IP Director, sends an XML file to XTAccess to request the backup of a given clip created on an XS server.
2. XTAccess processes the XML file:
   a. It gets the clip content that has to be backed up from the XS 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, AVI, Avid MXF OPAtom, MXF OP-1A, Quick Time, Quick Time Ref (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.

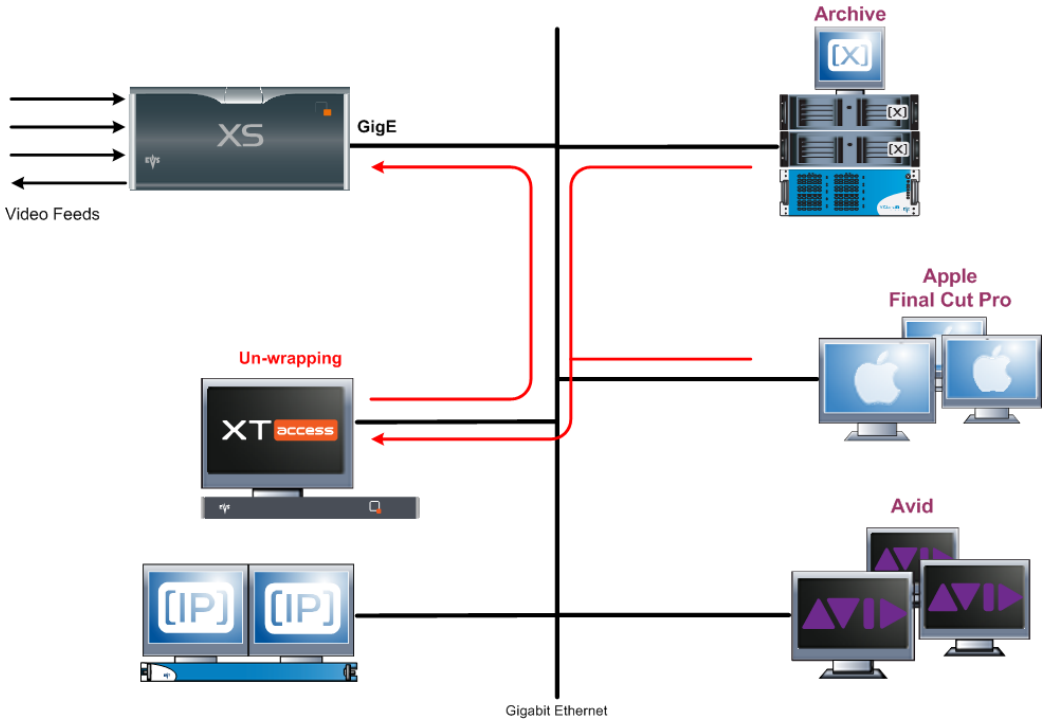
2.8.3 RESTORE OF CLIPS

Only clips having one of the following formats can be restored: 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 XTAccess:



Workflow (Restore via XML File)

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

Workflow (Restore via Folder Scan)

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

   The restored clip receives a new UmID and LSM ID:

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

2.8.4 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 Ethernet ports of the XS servers or/and several ports on the XF[2] are often used to increase the bandwidth or to allow redundancy. Since both Ethernet ports of an XS 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.

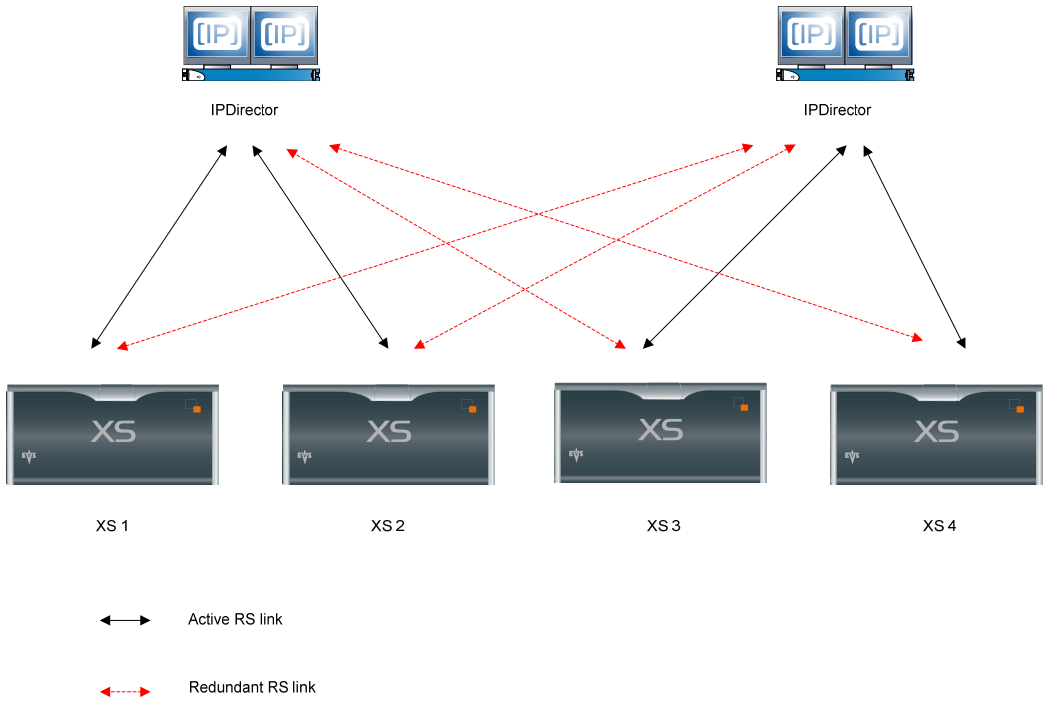
The stacking possibilities of the Cisco 3750E series permit to have fully active LACP teams for redundancy to the hosts.

2.9 REDUNDANT IPDP SERIAL LINK

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

To ensure the failover, the backup links between IPDirector workstations and the XS 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. A single board configuration is available: 5U Frame

Slot #	XS SD, HD or HD/SD
6	Disk Array
5	HCTX
4	CODA (XS Audio Codec)
3	XS COHX (SD, HD or SD/HD) #2
2	XS COHX GLK (SD, HD or SD/HD) #1 Genlock
1	MTPC

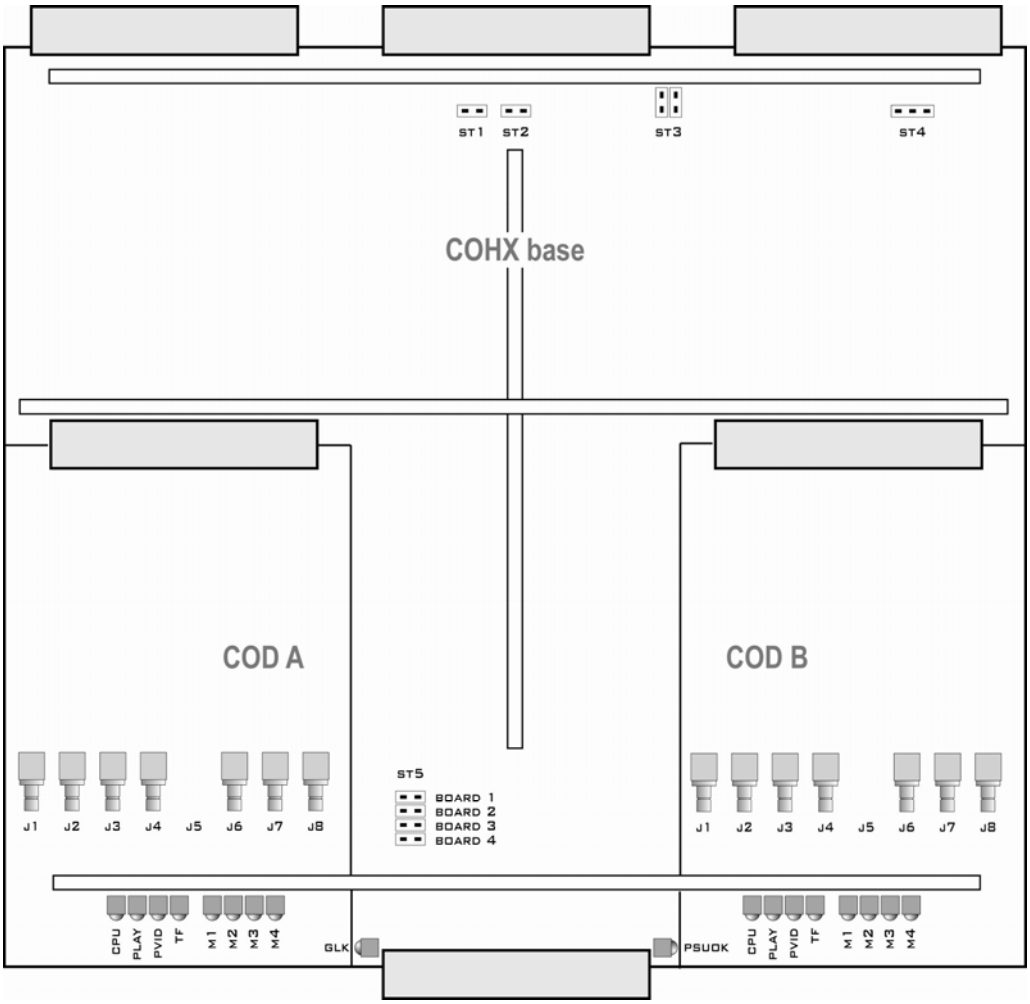
3.2 VIDEO AND REFERENCE BOARDS

3.2.1 XS COHX BOARD

The XS 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 XS system. A COHX board with genlock can never be installed in any other slot, and thus cannot be used instead of COHX #2. Doing so will result in conflicting electrical signals inside the system.



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 or 2 if there are respectively 1 or 2 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 XS 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 » 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, M3, M4	not yet used

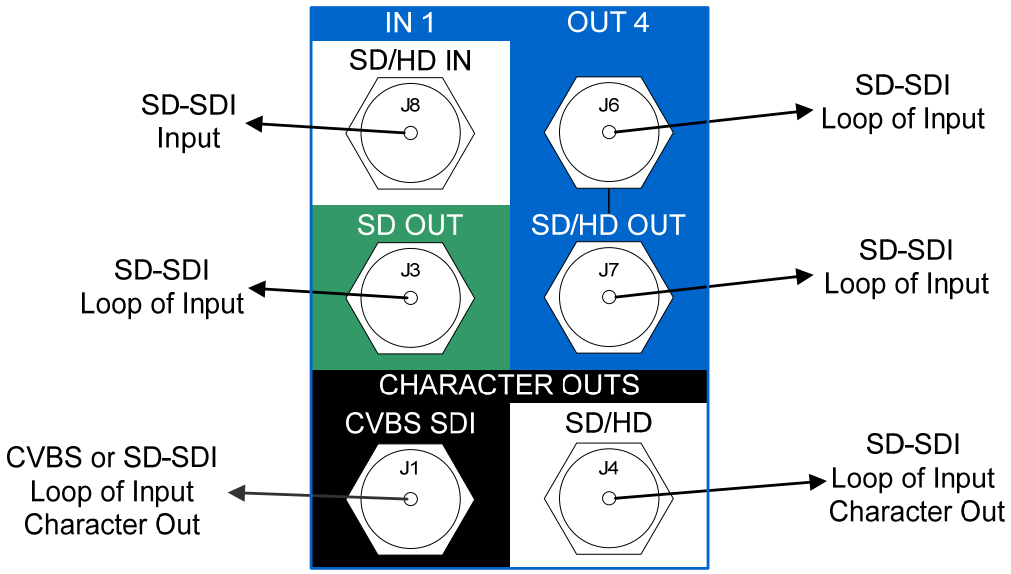
CONNECTORS ON THE COD A AND COD B MODULES

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)	Used for multiviewer input
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

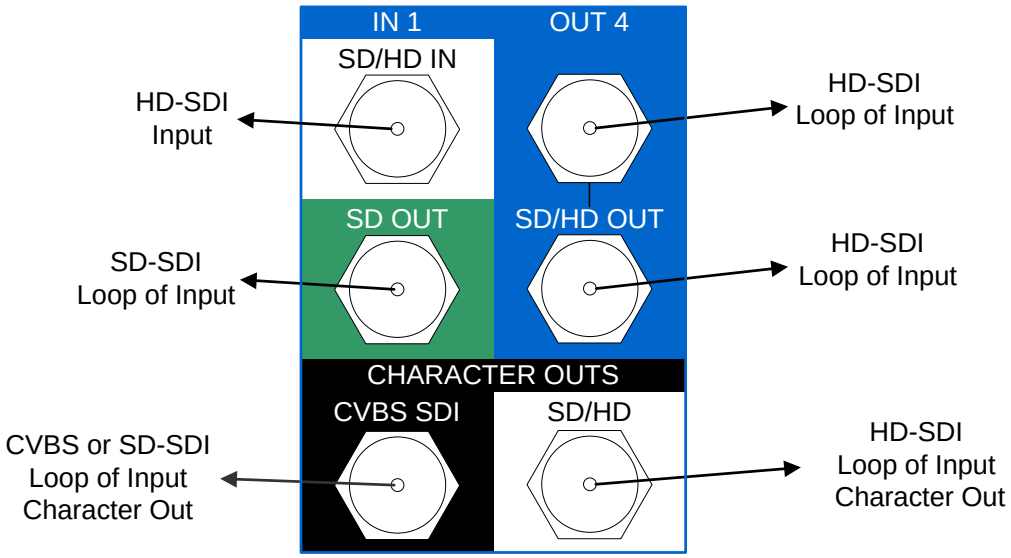
(*) The switch between SDI and CVBS on J1 is done by a software setting in the EVS Configuration menu.

The following drawings show the connector positions:

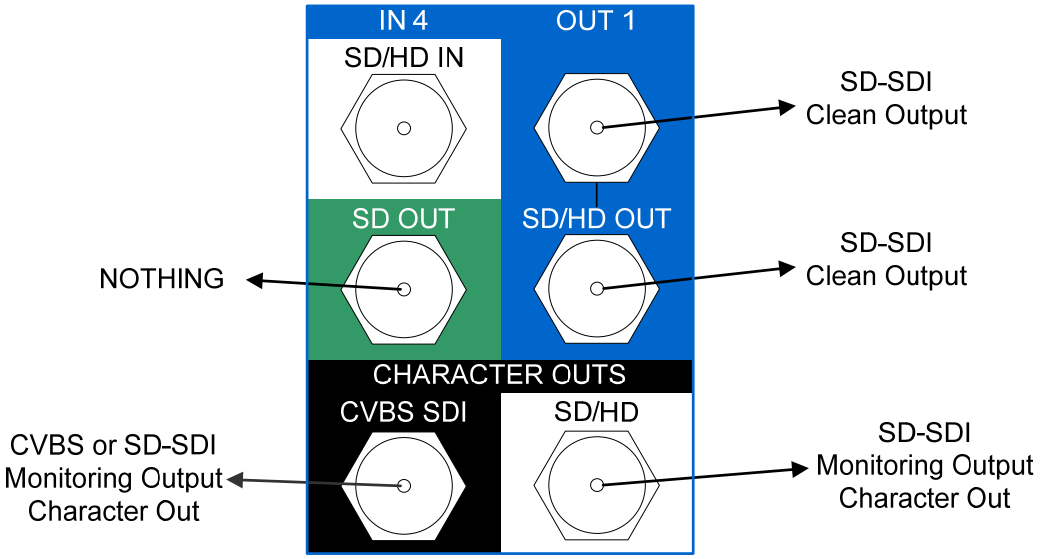
SD Mode – Input



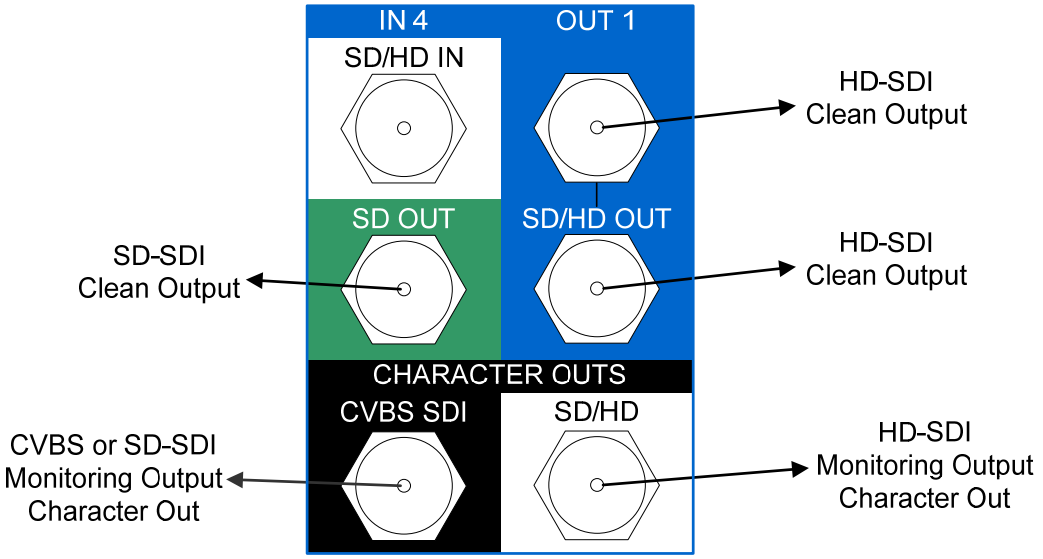
HD Mode – Input



SD Mode – Output



HD Mode - Output



Note

Only front backplanes labelled BKP7 are compatible with COHX boards (4 slots for 5U frames). The BKP7 backplanes (compatible with XS 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 XS Server

Lower Codec (SLOT 2)

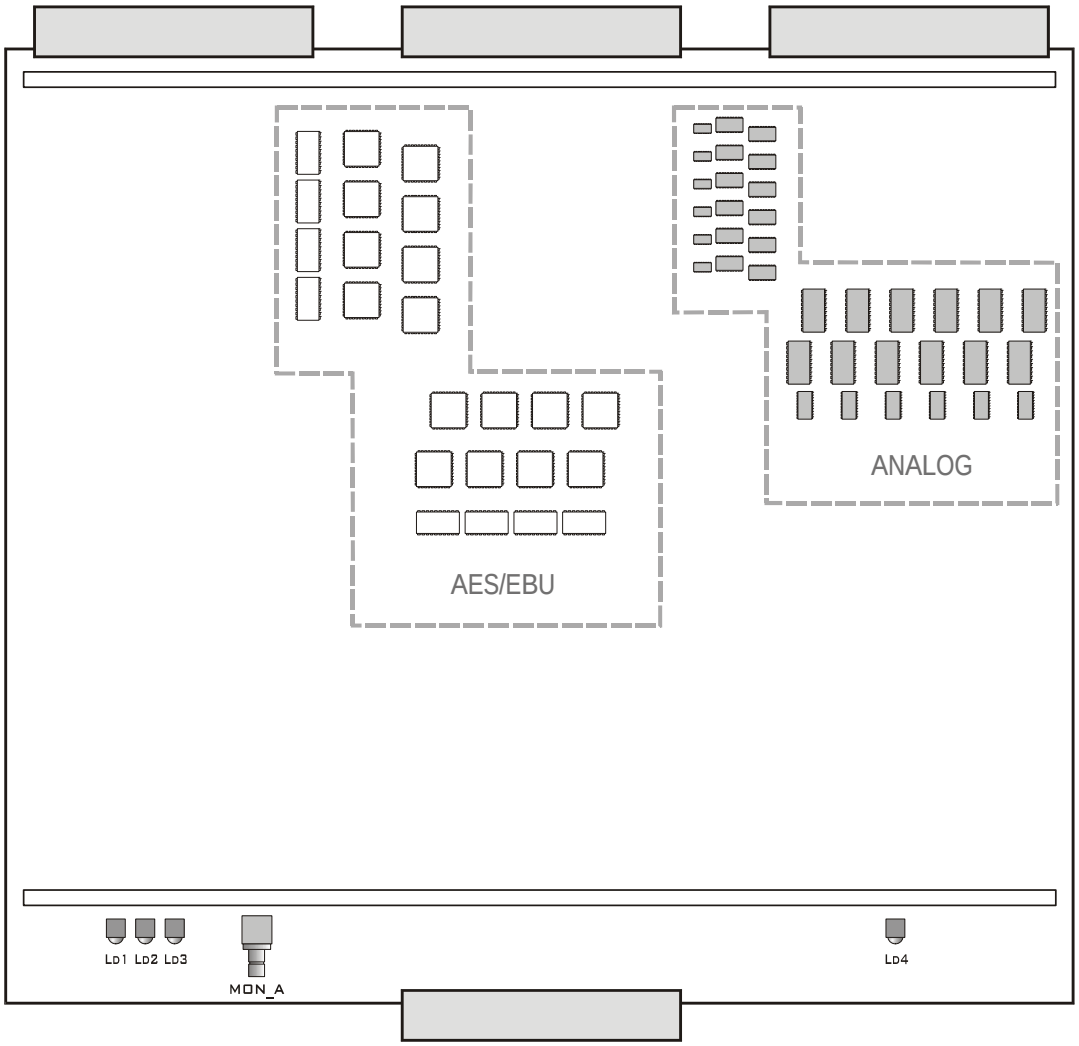
4-ch XS Server

Upper Codec (SLOT 3)

Lower Codec (SLOT 2)

3.3 XS AUDIO CODEC BOARD

The XS AUDIO CODEC board is the audio interface between the COHX boards and the HCTX board. VIDEO CODEC and AUDIO CODEC boards 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 section 2.6 ‘Audio configurations’ on page 33 for details.



LED INFORMATION AND CONNECTOR

LD 1-3: Internal EVS information only

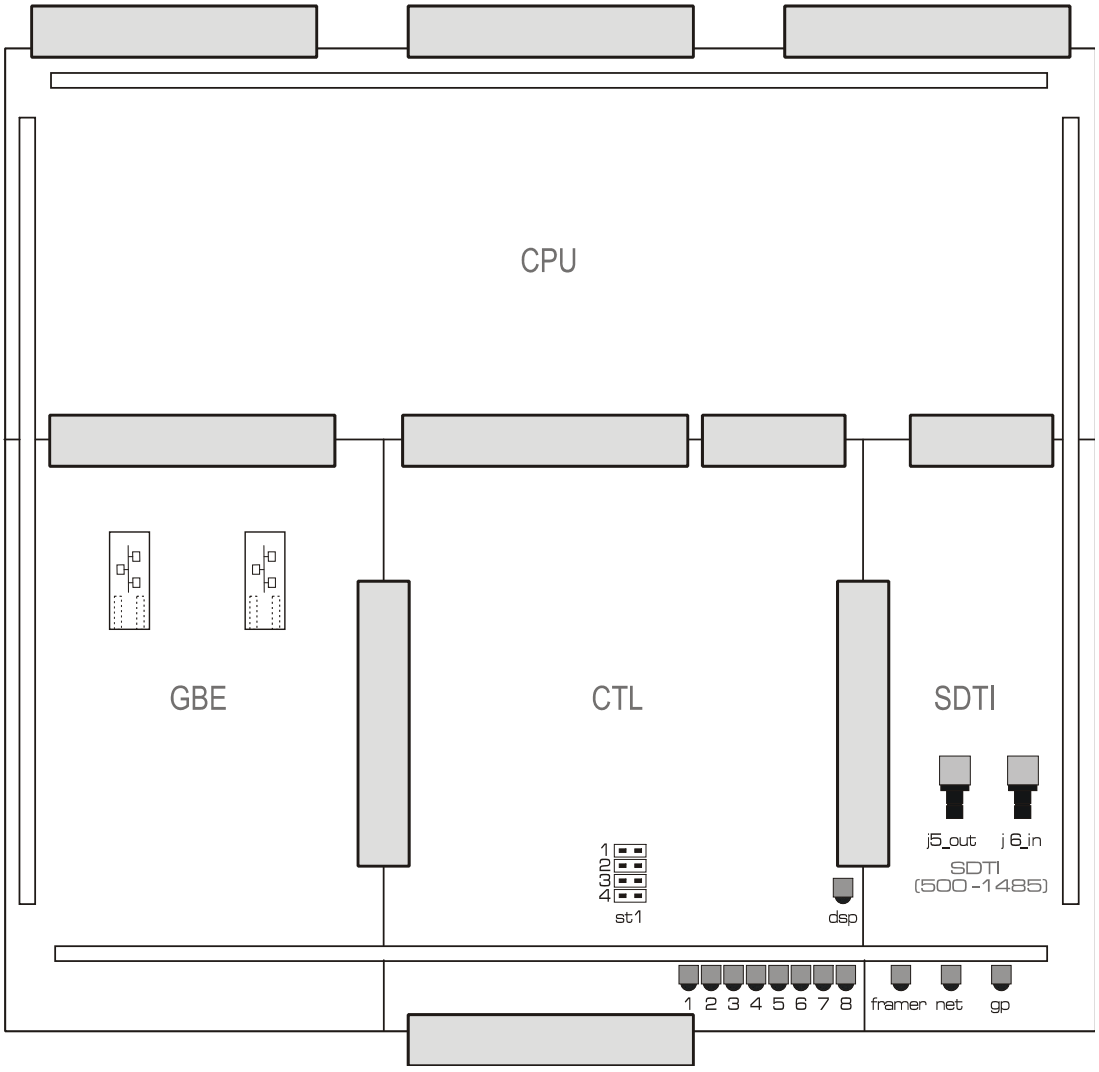
LD4: transfer activity to/from the HCTX board

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). 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.

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) :

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

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 switches belongs to the Cisco 3750 G family, for example the WS-C3750G-24T-S.

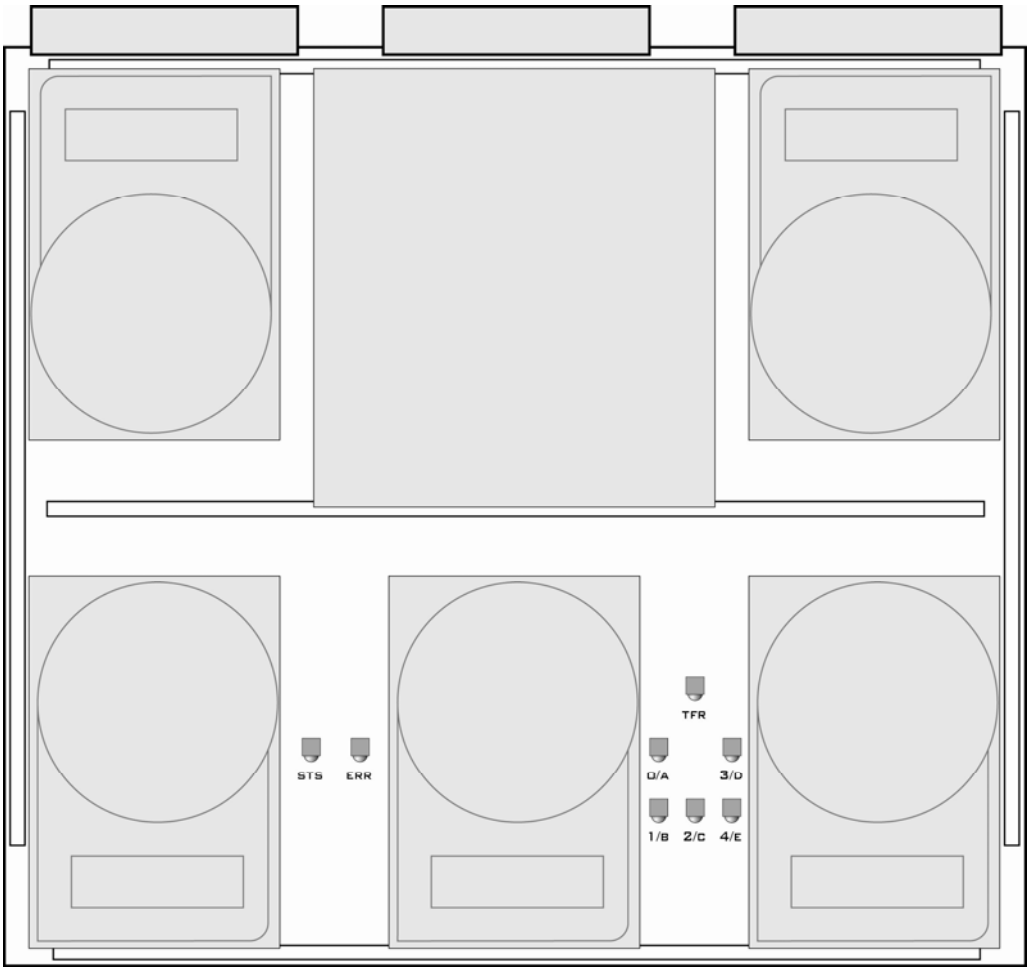
For more information, refer to the Multicam Configuration manual for setting up the IP addresses.

3.4.2 RCTL BOARD ON DISK ARRAY (WITH HCTX)

XS server can be provided in two versions: with SCSI disks or SAS disks.

SCSI DISK ARRAY

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 RCTL 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.

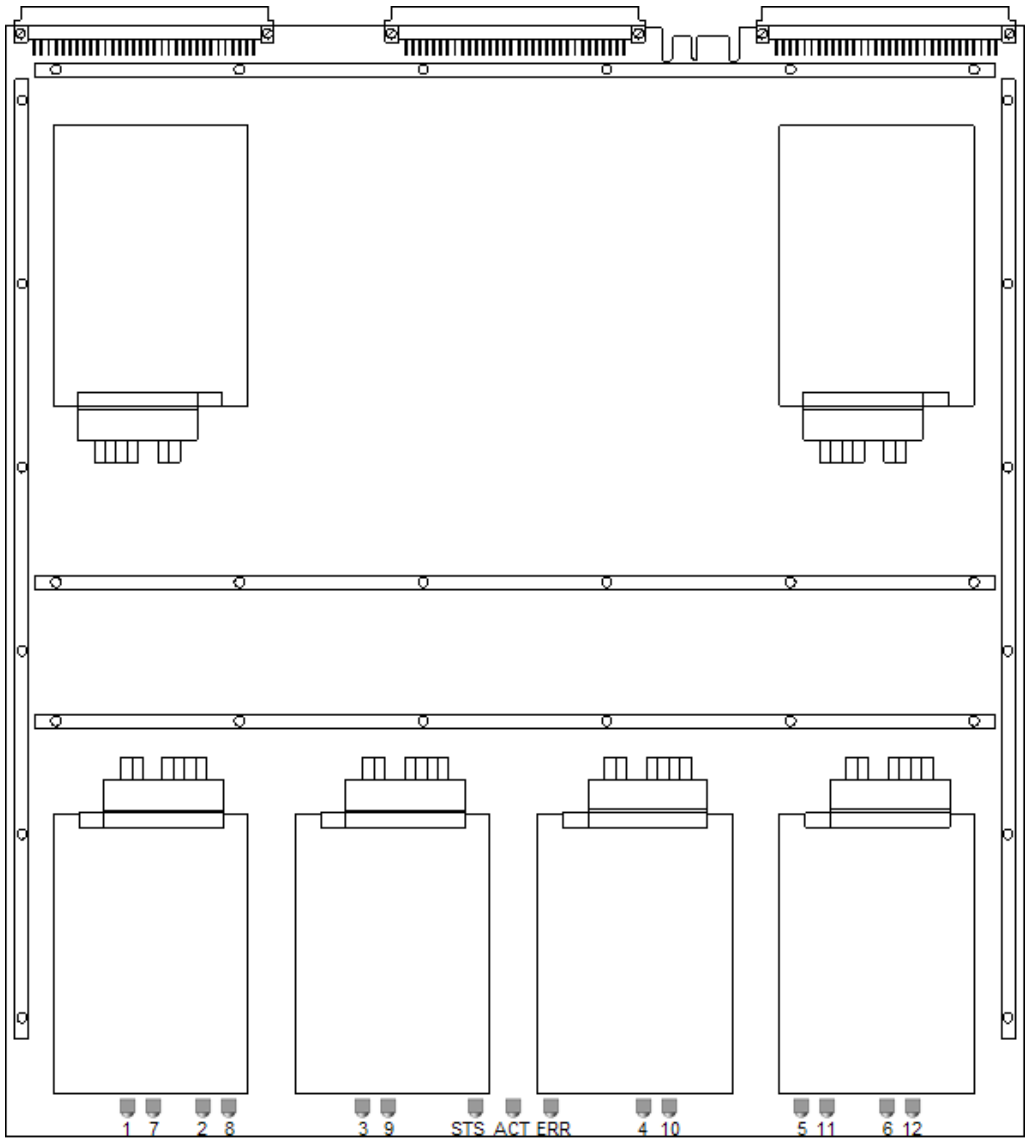
ERR (next to STS) :

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

SAS DISK ARRAY

Different configurations can be used

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



LEDs on Internal Array

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

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

LEDs correspond to the disks as schematized as followed:

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

Disk LEDs

off	the corresponding disk is not started (not spinning)
on, fast blinking (green)	the corresponding disk is starting (spinning)
on, steady (green)	the corresponding disk is started and used in the RAID array
on, slowly blinking (green)	the corresponding disk is started but not used in the RAID array

STS

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

ERR

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

3.4.3 EXTERNAL RAID ARRAY FOR XS SERVERS

Two types of external RAID array can be used according to the model of internal disks which equip the XS server:

- XT-HDX array for SCSI disks
- SAS-HDX for SAS disks.

XT-HDX EXTERNAL RAID ARRAY

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

Necessary equipment

- XS with XT-HDX connector on the back plane and MT5D_LNK board
- XT-HDX external disk storage

Important

An XS server cannot work simultaneously with an internal RAID array (MT5D) and an external RAID array (XT-HDX). When an XS 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.

Installation and operation

1. Both the XS 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 XS 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 XS server.

Disk organization

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

The disks are organized in the following way:

1 XT-HDX : 15 Disks													
RAID 0 - Disk 0	RAID 1 - Disk 0	RAID 2 - Disk 0	RAID 0 - Disk 1	RAID 1 - Disk 1	RAID 2 - Disk 1	RAID 0 - Disk 2	RAID 1 - Disk 2	RAID 2 - Disk 2	RAID 0 - Disk 3	RAID 1 - Disk 3	RAID 2 - Disk 3	RAID 0 - Disk 4	RAID 1 - Disk 4	RAID 2 - Disk 4

RAID #0
RAID #1
RAID #2

LED Status

LEDs on the disk canisters

No color	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 XS 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.

SAS-HDX EXTERNAL RAID ARRAY

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

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

Necessary equipment:

- XS with SAS-HDX connector on the rear panel.
- Multicam version 10.03 or later
- SAS-HDX external disk storage

LEDS on External Array

For each disk, a blue LED and a red LED are present.

Disk LEDs

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

Note 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 some disks depending on how much material (clips and record trains) is stored on the server.

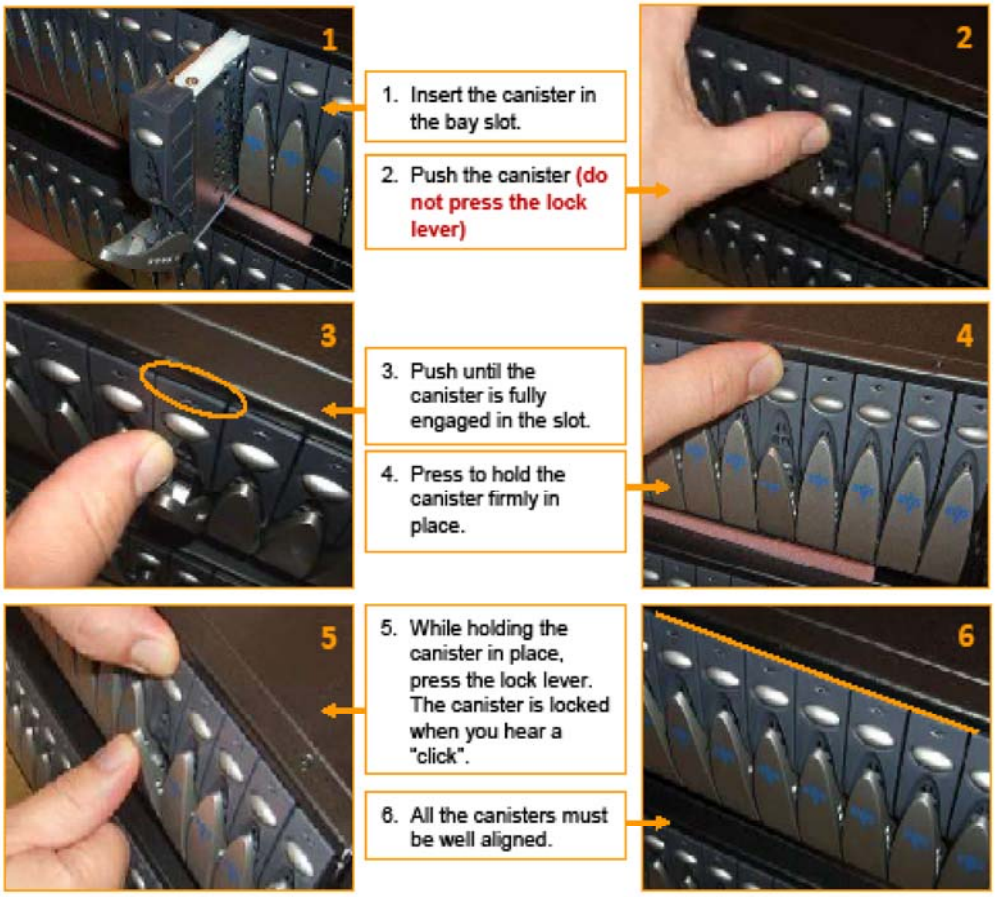
Sound Alert on External Array

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

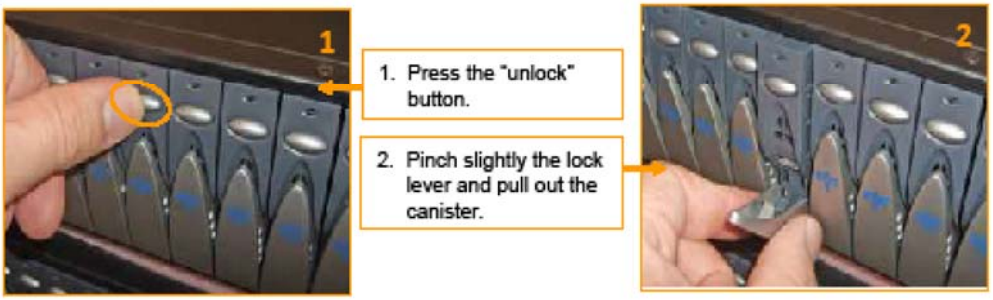
Disk Insertion and Removal

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

1. **How to insert**



2. **How to remove**



3.5 MTPC BOARD

3.5.1 INTRODUCTION

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

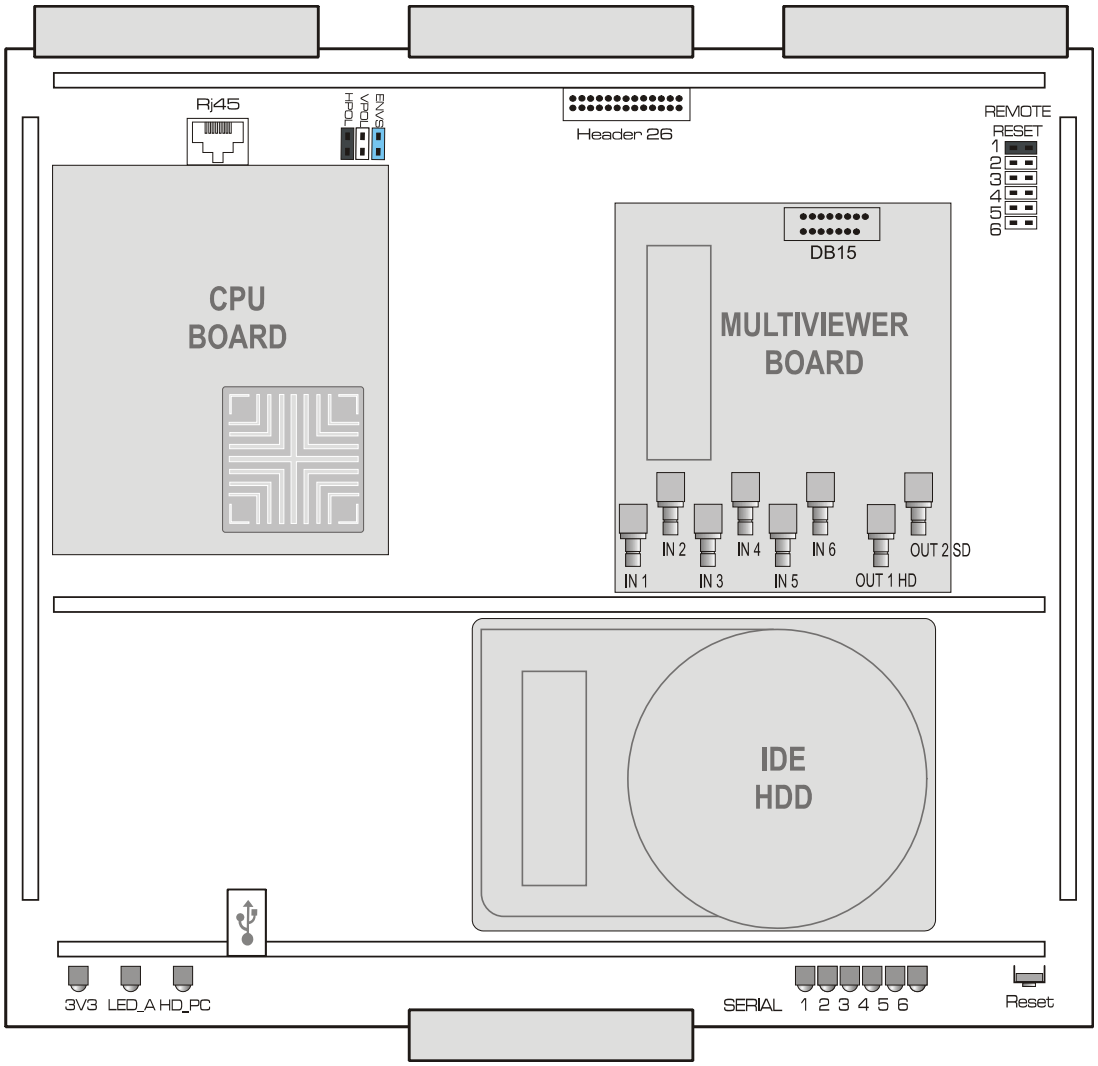
One type of MTPC board can be used:

- **Revision A2/A4** with COMMEL HS870 motherboard.

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/A4 BOARD



MULTIVIEWER

The multiviewer board is an option on XS servers.

Connectors

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

Connectors	
DB15	The DB15 connector of the multiviewer board is connected to the MULTI DB15 connector on the rear panel of the server.

LED INFORMATION

Internal EVS information

BOARD CONFIGURATION

HPOL, VPOL and ENVS are used to configure the composite sync generator used in TV mode (no effect if XS 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).

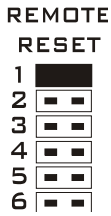
The VPOL jumper can be used to invert or not the VGA VS signal (Vertical Sync) to generate the composite output signal (TV mode).

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

With MTPC board 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.

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 XS 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.

Notes:

Regional Contacts

AMERICA (NORTH & LATIN)		
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