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REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary release reflecting firmware version 1v0 build 2	Dec 2006
0.2	Updated VistaLINK® description. Fixed Minor Typos.	Feb 2007
1.0	First Release	Nov 2007
1.1	Minor formatting updates	May 2009
1.2	Updated block diagram	July 2011

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1. OVERVIEW

The 7721AE8-DEE-HD audio and Dolby Metadata de-embedder and embedder encodes up to 8 channels of uncompressed PCM audio into one Dolby-E stream. It also functions as a 4-group embedder following SMPTE 299M for a 1.5 Gb/s serial HD-SDI input video signal or as defined by SMPTE 272M for a 270 Mb/s serial SD-SDI input video signal.

For lip sync cohesion and ease of editing, Dolby-E data is organized in blocks with lengths matching the associated video frame. The encoder will match the beginning of each output block with the start of video, or to the video reference input. The Dolby-E packet line location can be adjusted to accommodate other delays in the system.

An external colour-black reference is not necessarily required for this product. The Dolby-E encoder can be locked to output video. An external reference input is provided that can take bi-level or tri-level syncs to lock multiple units, or to phase Dolby-E packets with the 2-frame sequence of a progressive video standard such as 720p.

This module also handles Dolby-E Metadata. Metadata is optionally de-embedded from the Vertical Ancillary data (VANC) and can be provided to the Dolby-E encoder module via the serial communications port provided on a DB9 connector.

The 7721AE8-DEE-HD occupies two card slots in the 3RU frame (7700FR-C), which will hold up to 15 1-slot modules or one slot in the 1RU frame (7701FR), which will hold up to three modules. The 7721AE8-DEE-HD may also be used in a standalone unit (S7701FR).

The VistaLINK® Pro Network Management System (NMS) offers control and configuration capabilities via Simple Network Management Protocol (SNMP). This provides the flexibility to manage the module status monitoring and configuration from SNMP enabled control systems such as Evertz VistaLINK® Pro, locally or remotely.

Features:

- Dolby-E encoding modes available: 5.1+2, 5.1+2x1, 2x4, 4+2x2, 4+2+2x1, 4+4x1, 4x2, 3x2+2x1, 2x2+4x2, 2x2+4x1, 2+6x1, 8x1, 5.1, 5+2, 5+2x1, 3x2, 2x2+2x1, 2+4x1, 6x1, 4, 2x2, 2+2x1, 4x1, 7.1, and 7.1 screen
- Dolby-E encoding frame rates of 23.98, 24, 25, 29.97, and 30 frame/sec
- External colour-black reference *not required* for Dolby-E encoding
- Video reference input is still provided, and is compatible with bi-level and tri-level syncs
- Adjustable video delay to match Dolby encoder audio delay
- Dolby metadata is sourced from VANC or external RS-422 port (metadata authoring will be available in future releases)
- Dolby metadata monitoring and processing (dial norm adjustment) of any metadata input
- 8 AES inputs as well as 4 group de-embedder
- Two audio mixers, one for AES/embedded audio, another for Dolby-E encoding
- Headphone jack (on card edge) for monitoring any input source
- Card edge display
- Card edge LEDs for module status, video signal presence, selected audio group presence, Dolby Decoder status, Video Reference health/compatibility, and AES signal presence
- VistaLINK® enabled for remote monitoring and control via SNMP (using VistaLINK® PRO) when installed in the 3RU 7700FR-C frame with the 7700FC VistaLINK® Frame Controller module in slot 1 of the frame.

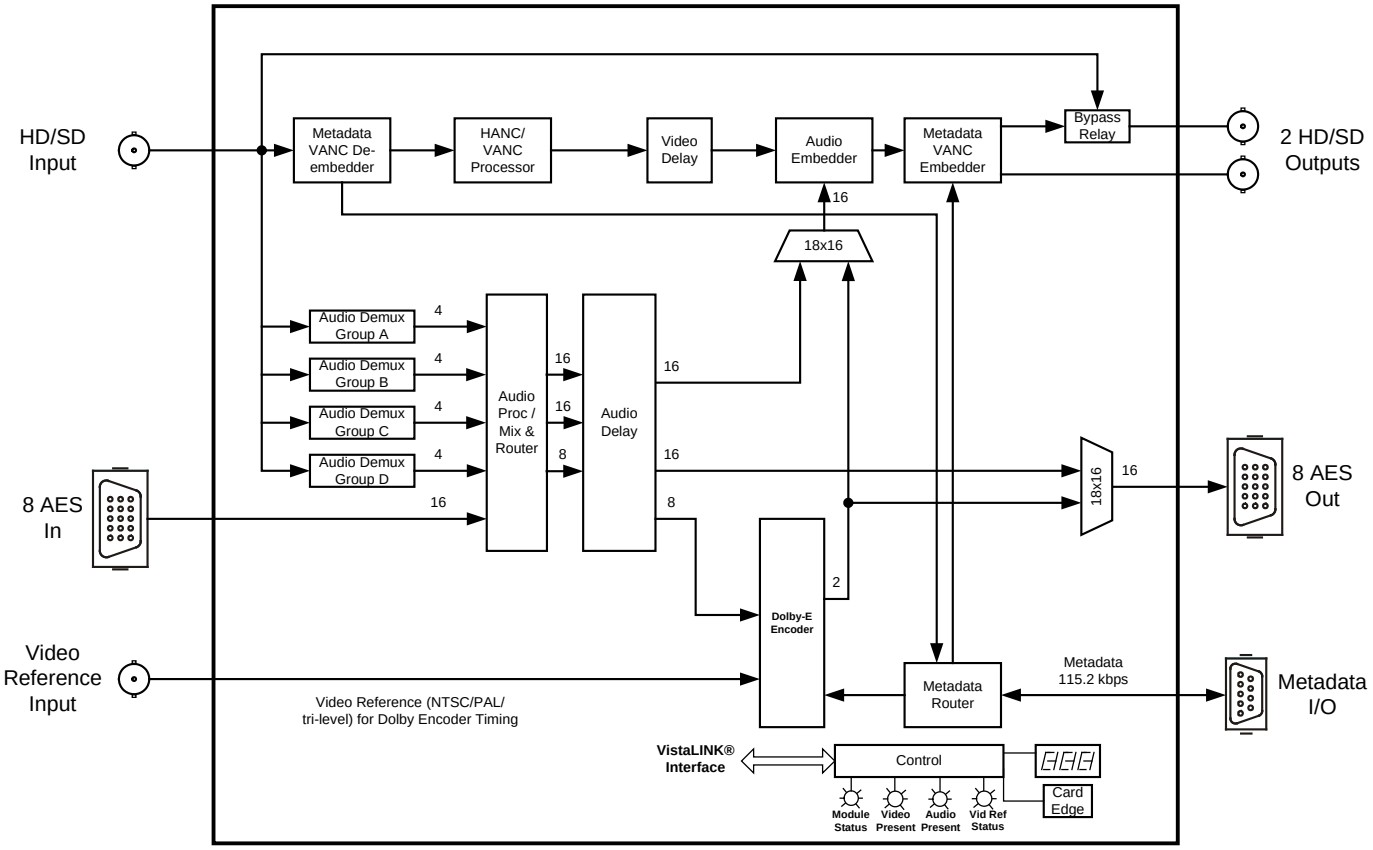


Figure 1-1: 7721AE8-DEE-HD Block Diagram

2. INSTALLATION

The 7721AE8-DEE-HD comes with a companion rear plate that occupies two slots in the frame. For information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.

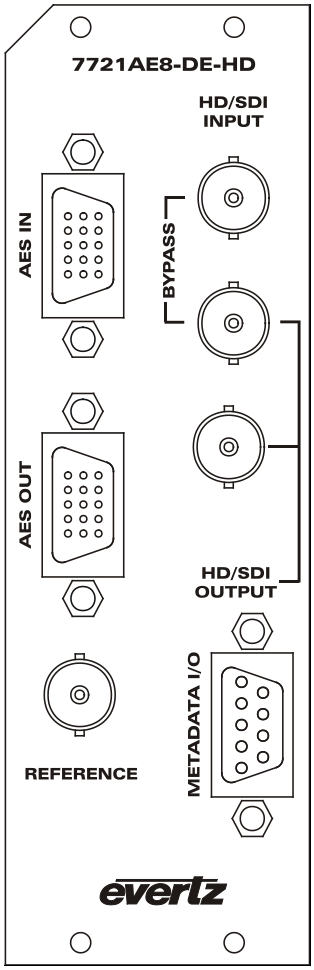


Figure 2-1: 7721AE8-DEE-HD Rear Panel

2.1. VIDEO CONNECTIONS

HD/SDI IN: This input BNC connector is used to accept 10-bit serial digital video signals compatible with the SMPTE 292M or the SMPTE 259M-C standard. The module can be set to a specific video standard or set to automatically detect.

HD/SDI OUT: This BNC connector is used to output the video as serial component video, compatible with the SMPTE 292M or SMPTE 259M-C standard (same as input).

BYPASS This BNC connector is used as program out bypass. The output signal is compatible with the SMPTE 292M or SMPTE 259M-C standard (same as input). In the event of a power or module failure, the bypass relay will be activated, maintaining the program video path.

2.2. VIDEO REFERENCE

The input video reference can be used to properly phase the Dolby-E output. For proper phasing of the Dolby Encoder, the video reference must be locked to the input video. The video reference should only be an interlaced reference, and the frame rates must also match with the input video. In the case of 720p input video, interlaced reference signals of half the frame rate can be used (for example, 720p/59.94 NTSC bi-level or 1080i/59.94 tri-level reference).

REFERENCE: This BNC is used for connecting a bi-level or tri-level sync reference and is auto-detected by the module. Jumper J5 selects whether the reference input is terminated to 75 ohms (default state) or high impedance (refer to section 7.3 for jumper location).

2.3. AES INPUT AND OUTPUT AUDIO CONNECTIONS

Eight unbalanced AES inputs and eight unbalanced AES outputs are provided on 8 BNC connectors on the two high density DB-15 connectors labelled **AES IN** and **AES OUT**. These inputs and outputs are used for unbalanced AES signals conforming to SMPTE 276M. The eight AES input channels can be used as inputs in addition to the de-embedded audio. Processed audio can be output as eight AES channels (refer to Table 2-1 and Table 2-2 for the DB-15 connector pin assignments).

Name	Description	DB-15 Pin
GPI2	Reserved for Future Use	1
	Reserved for Future Use	2
	Reserved for Future Use	3
	Reserved for Future Use	4
	Reserved for Future Use	5
	Reserved for Future Use	6
AES In 2	AES Input 2 - Unbalanced	7
GPI1	Reserved for Future Use	8
AES In 6	AES Input 6 – Unbalanced	9
AES In 5	AES Input 5 – Unbalanced	10
AES In 1	AES Input 1 - Unbalanced	11
AES In 8	AES Input 8 – Unbalanced	12
AES In 7	AES Input 7 – Unbalanced	13
AES In 4	AES Input 4- Unbalanced	14
AES In 3	AES Input 3- Unbalanced	15
GND	Ground	Shell

Table 2-1: AES IN Audio Connector Pin Assignments

Name	Description	DB-15 Pin
	Reserved for Future Use	1
	Reserved for Future Use	2
	Reserved for Future Use	3
	Reserved for Future Use	4
	Reserved for Future Use	5
	Reserved for Future Use	6
AES Out 2	AES Output 2 - Unbalanced	7
	Reserved for Future Use	8
AES Out 6	AES Output 6 – Unbalanced	9
AES Out 5	AES Output 5 – Unbalanced	10
AES Out 1	AES Output 1 - Unbalanced	11
AES Out 8	AES Output 8 – Unbalanced	12
AES Out 7	AES Output 7 – Unbalanced	13
AES Out 4	AES Output 4- Unbalanced	14
AES Out 3	AES Output 3- Unbalanced	15
GND	Ground	Shell

Table 2-2: AES OUT Audio Connector Pin Assignments

The 7721AE8-DEE-HD is shipped with two breakout cables for the DB-15 connector (Evertz Part # WPAES8-BNCM-6F), which can be used to facilitate wiring the audio and GPI connections (refer to Table 2-3 for the pin assignments of the AES audio breakout cable).

DB-15 PIN	Wire	Ground/Shield Connection	Label Name	Connector Type	AES IN FUNCTION	AES OUT FUNCTION
1	Red		W1 RED	WIRE	GPI2	X
2	Green		W2 GREEN	WIRE	X	X
3	Blue		W3 BLUE	WIRE	X	X
4	(not used)		(not used)		X	X
5	(not used)		(not used)		X	X
6	White		W4 WHITE	WIRE	X	X
7	Coax	DB15 Shell	AES A2	BNC MALE	AES In 2	AES Out 2
8	Yellow		W5 YELLOW	WIRE	GPI1	X
9	Coax	DB15 Shell	AES B2	BNC MALE	AES In 6	AES Out 6
10	Coax	DB15 Shell	AES B1	BNC MALE	AES In 5	AES Out 5
11	Coax	DB15 Shell	AES A1	BNC MALE	AES In 1	AES Out 1
12	Coax	DB15 Shell	AES B4	BNC MALE	AES In 8	AES Out 8
13	Coax	DB15 Shell	AES B3	BNC MALE	AES In 7	AES Out 7
14	Coax	DB15 Shell	AES A4	BNC MALE	AES In 4	AES Out 4
15	Coax	DB15 Shell	AES A3	BNC MALE	AES In 3	AES Out 3
Shell	Black		GND	WIRE	GND	GND

Table 2-3: AES Audio Breakout Cable (Evertz Part # WPAES8-BNCM-6F) Pin Assignments

2.4. METADATA I/O

The 7721AE8-DEE-HD provides a DB-9 connector for the handling of metadata. The 7721AE8-DEE-HD can transmit Metadata; receive Metadata or both, depending on the application.

For the cases where the module is either transmitting or receiving metadata, a typical 9-pin serial cable (not provided) can be used to connect the modules to a Dolby device, such as the Dolby DP570 (refer to Table 2-4 for the pin assignments of the DB-9 connector).

PIN Number on Connector	"TxRx" Module Operation (see section 6.11.2 for settings) equivalent to metadata input port on DP570	"RxTx" Module Operation (see section 6.11.2 for settings) equivalent to metadata output port on DP570
1	Shield	Shield
2	TX A asynchronous out -	RX A asynchronous out -
3	RX B asynchronous out +	TX B asynchronous out +
4	Ground	Ground
5	NC	NC
6	Ground	Ground
7	TX B asynchronous out +	RX B asynchronous out +
8	RX A asynchronous out -	TX A asynchronous out -
9	Shield	Shield

Table 2-4: Metadata Transmit or Receive Pin Assignments

2.5. GENERAL PURPOSE INPUTS AND OUTPUTS

The 7721AE8-DEE-HD has 2 GPIs available on the **AES IN** port. Currently, the GPIs are not available and are reserved for future use. The 7721AE8-DEE-HD does not have any GPOs.

3. SPECIFICATIONS

3.1. SERIAL DIGITAL VIDEO INPUTS

Standards: STMPE 292M, (1080i/60, 1080i/59.94, 1080i/50, 1080p/24sF, 1080p/23.94, 720p/60, 720p/59.95, 720p/50, 1035i/59.94, 1035i/60, or 480p/59.94)
SMPTE 259M-C (270 Mb/s) 525 or 625 line component
Auto detectable and user settable.
Number of Inputs: 1
Connector: BNC per IEC 61169-8 Annex A
Input Equalization: Automatic to 125m @ 1.5Gb/s with Belden 1694 or equivalent cable.
Return Loss:
SD Standards: >15 dB up to 270Mb/s
HD Standards: >15 dB up to 1. 5Gb/s

3.1. SERIAL DIGITAL VIDEO OUTPUTS

Standard: same as input
Number of Outputs: 2
Connector: BNC per IEC 61169-8 Annex A
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: Per standard
Overshoot: <10% of amplitude
Wide Band Jitter:
HD Standards: < 0.16UI
SD Standards: < 0.10UI

3.2. VIDEO REFERENCE INPUT

Type: HD Tri-Level sync, NTSC or PAL Colour Black 1 V p-p (auto detect)
Connector: BNC per IEC 61169-8 Annex A
Termination: Hi-Z or 75 ohm (jumper selectable)
Return Loss: >40dB to 10 MHz

3.3. AES AUDIO INPUTS

Standard: SMPTE 276M, single ended synchronous or asynchronous AES
Number of Inputs: 8 unbalanced
Connectors: Female High Density DB-15, breakout cable to BNC connectors supplied
Input Level: 0.1 to 2.5 Vp-p (5Vp-p tolerant)
Input Impedance: 75 Ω
Return Loss: >25 dB 100 kHz to 6 MHz
Equalization: Automatic to 1000m with Belden 1694 or equivalent cable @ 48 kHz AES signal
Sampling Rate: 48 kHz ± 100 ppm

3.4. AES AUDIO OUTPUTS

Standard: SMPTE 276M, single ended synchronous AES
Number of Outputs: 8 unbalanced
Connectors: Female High Density DB-15, breakout cable to BNC connectors supplied
Sampling Rate: 48 kHz
Impedance: 75 Ω
Resolution: Up to 24-bit

3.5. METADATA INPUT/OUTPUT

Type: Dolby E Metadata
Connectors: Female DB-9
Baud Rate: 115200 baud

3.6. HEADPHONE AUDIO OUTPUTS

Number of Outputs: 1
Type: Stereo 3.5mm jack
Output Load: 32 Ω +
Signal Level: 100 mW max, soft adjustable over 40 dB range
THD+N: 1 %
SNR: 90 dB RMS, “A” weighted

3.7. DELAY

Dolby-E Encode Delay: 1 frame nominal
De-embedding Latency: 600 µs nominal
Additional Audio Delay: 0 to maximum video delay plus 1 frame (user programmable)
Additional Video Delay: 0 to 12 frames (interlaced) or 0 to 28 (720p) (user programmable)

3.8. ELECTRICAL

Voltage: +12VDC
Power: 21 Watts
EMI/RFI: Complies with FCC regulations for class A devices
Complies with EU EMC directive

3.9. PHYSICAL

Number of slots:
350FR: 2
7700FR-C: 2
7800FR: 2

4. STATUS INDICATORS

The 7721AE8-DEE-HD has 17 LED Status indicators on the front card edge to show operational status of the card at a glance (refer to Figure 4-1).

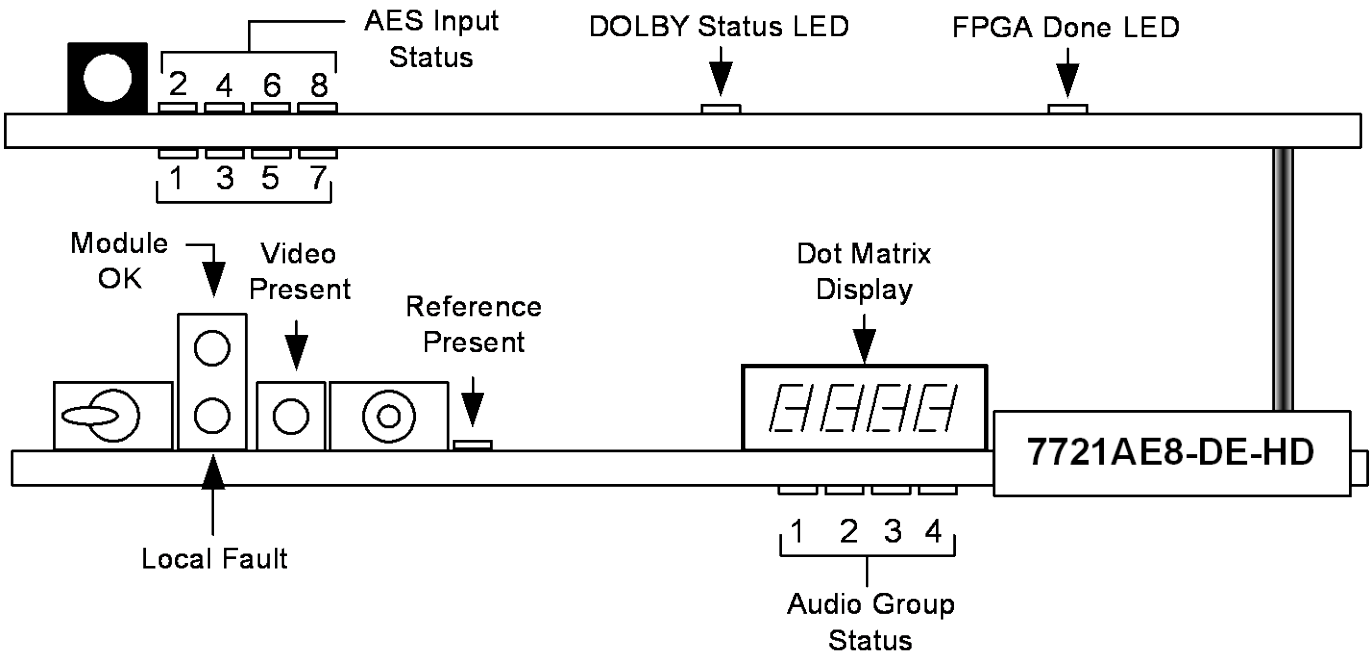


Figure 4-1: Status LED Locations

4.1. GENERAL LEDS

Three large LEDS on the front of the main board indicate the general health of the module.

LOCAL FAULT: This Red LED indicates poor module health and will be ON during the absence of a valid input signal, an invalid reference, or if a local input power fault exists (i.e.: a blown fuse). The LOCAL FAULT indication can also be reported to the frame through the FRAME STATUS jumper.

MODULE OK: This Green LED indicates good module health. It will be ON when a valid input signal is present, and the board power is good.

VIDEO PRESENT: This Green LED will be ON when there is a valid video signal present at the module input.

4.2. DIAGNOSTIC AND MENU LEDS

REFERENCE: This Green LED will be ON when there is a signal present at the module video reference input and it is locked and valid for the Dolby-E packet phasing. This LED will flash on and off if a reference is detected but is not locked or not applicable for the given input video.

DOLBY STATUS: This LED will be GREEN and ON when the Dolby Encoder is processing or active. The LED will be RED and ON if there is an error with the Dolby Encoder, including metadata. The LED is off when the Dolby Decoder is not active.

FPGA CONFIG: This LED will be RED and ON when the FPGA is loading on power up. The LED is OFF during normal module operation.

DOT MATRIX: This component will become active once power is applied to the card. This component is used to relay text-based information to the user. It will be used to scroll build and card information, or display the menu options to the user.

4.3. EMBEDDED AUDIO STATUS LEDS

Four LEDs located on the lower end of the main board of the module (near the card extractor) indicate which embedded audio groups are present in the input video. Audio Group LED 1 is located closest to the center of the module.

Audio Group LED	Colour	Audio Group Status
1	Off	No group 1 present on input video.
	Green	Group 1 present on input video.
2	Off	No group 2 present on input video.
	Green	Group 2 present on input video.
3	Off	No group 3 present on input video.
	Green	Group 3 present on input video.
4	Off	No group 4 present on input video.
	Green	Group 4 present on input video.

Table 4-1: Audio Group Status LEDs

These LEDs are primarily used to indicate what groups are embedded in the input video signal during normal operation. However, when navigating the card edge menu, these LEDs are used to indicate menu depth status. For example, when at the top-level menu, all the LEDs are OFF. When the user navigates into another menu (e.g. Video Control), Audio group 1 LED turns ON. Audio group LED 1 is located closest to the centre of the module. If the user enters a sub-menu (e.g. Video Control -> Video Standard Select), then both Audio Group LEDs 1 and 2 turn ON, indicating another depth within the menu system.

Eight LEDs located on the sub-card of the module indicate which AES input channels are present. AES input channel 1 is located top leftmost LED, and AES input channel 2 to the right.

AES Input Channel LED	Colour	AES Input Channel Status
1	Off	AES input channel 1 is not present
	Green	AES input channel 1 is present.
	Yellow	AES input channel 1 is present with encoded Dolby.
2	Off	AES input channel 2 is not present
	Green	AES input channel 2 is present.
	Yellow	AES input channel 2 is present with encoded Dolby.
3	Off	AES input channel 3 is not present
	Green	AES input channel 3 is present.
	Yellow	AES input channel 3 is present with encoded Dolby.
4	Off	AES input channel 4 is not present
	Green	AES input channel 4 is present.
	Yellow	AES input channel 4 is present with encoded Dolby.
5	Off	AES input channel 5 is not present
	Green	AES input channel 5 is present.
	Yellow	AES input channel 5 is present with encoded Dolby.
6	Off	AES input channel 6 is not present
	Green	AES input channel 6 is present.
	Yellow	AES input channel 6 is present with encoded Dolby.
7	Off	AES input channel 7 is not present
	Green	AES input channel 7 is present.
	Yellow	AES input channel 7 is present with encoded Dolby.
8	Off	AES input channel 8 is not present
	Green	AES input channel 8 is present.
	Yellow	AES input channel 8 is present with encoded Dolby.

Table 4-2: AES Input Channel Presence LEDs

5. CARD EDGE CONTROLS

The 7721AE8-DEE-HD can be configured by the card edge controls. There are some key control components that can be found at the card edge (refer to Figure 5-1).

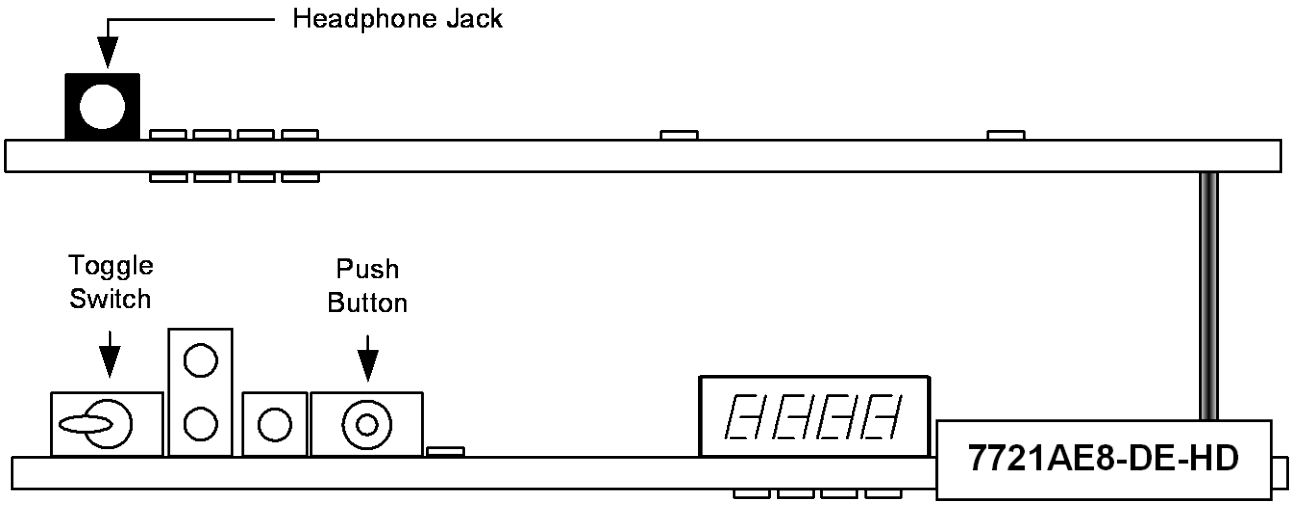


Figure 5-1: Card Edge Controls

TOGGLE SWITCH: This component will become active once the card has completed booting. Its primary function is to navigate through the menu system.

PUSH BUTTON: This component will become active once the card has completed booting. It is primarily used for navigating through the menu system.

When navigating the card edge menu system, when all the Audio LEDs are OFF the user is at the Top Level menu.

The 7721AE8-DEE-HD module is also equipped with an 8-position DIP switch, which can be found directly behind the Dot Matrix Display component. Currently, the DIP switch has no functionality and is reserved for future use.

6. CARD EDGE MENU SYSTEM

6.1. NAVIGATING THE MENU SYSTEM

You can use the toggle switch to move up and down the list of available parameters to adjust. To adjust any parameter, use the toggle switch to move up or down to the desired parameter and press the pushbutton. Using the toggle switch, adjust the parameter to its desired value. If the parameter is a numerical value, the number will increase if you lift the toggle switch and decrease if you push down on the toggle switch. If the parameter contains a list of choices, you can cycle through the list by pressing the toggle switch in either direction. The parameter values are changed as you cycle through the list.

When you have stopped at the desired value, depress the pushbutton. This will return to the parameter, select the menu item you are setting (the display shows the parameter name you were setting). To change to another parameter, use the toggle switch to select other parameters. If neither the toggle switch nor pushbutton is operated for several seconds the card edge control will exit the menu system and return to an idle state.

On all menus, there is an extra selectable item: *BACK*. Selecting *BACK* will take the user to the previous menu (the one that was used to get into the current menu). On the main menu, *BACK* will take the user to the normal operating mode (indicated by the moving line on the card edge display).

6.2. TOP LEVEL MENU STRUCTURE

Table 6-1 provides a brief description of the top level of the menu tree that appears when you enter the card edge menu system. Selecting one of these items will take you down into the next menu level to set the value of that parameter. The details of the each of the menu items are described in sections 6.3 to 6.13.

VCTR	Video Control	Sets the video standard that the module will operate in, timing offset of the video output, and loss of video mode.
ACTR	Audio Control	Sets audio controls for the module such as: Coarse and fine audio delays; Sample Rate Converter mode; C-bit control; Embedder Group enable; and Demux loss of video mode.
VP	Video Proc Control	Sets the black, luma, and chroma levels. Also, adjusts hue for SD video standards.
AP	Audio Proc Control	Sets the audio processor and router controls.
HEAD	Headphone Monitor	Sets the headphone volume level and selects the source for headphone monitoring.
DLBY	Dolby Decoder Control	Sets the controls for the Dolby Encoder.
META	Metadata	Sets the Metadata VANC Mux and demux settings and configures the DB-9 Metadata I/O.
STAT	Status	Reports the status of the firmware, FPGA revisions, input video standard, operating standard, audio group detection, AES Input presence, and Dolby Status.
MISC	Miscellaneous	Enables VistaLINK®, sets display orientation, and performs factory reset.

Table 6-1: Top Level Menu Structure

The parameter adjustments are REAL TIME ADJUSTMENTS and will affect the output video/audio immediately. These settings should not be adjusted when the output video/audio is in the broadcast chain.

6.3. CONFIGURING THE VIDEO CONTROLS

The *Video Control* menus are used to configure parameters associated with the module's operating standards, output video timing and loss of video mode. The chart below shows the items available in the *Video Control* menus. Sections 6.3.1 to 6.3.5 provide detailed information about each of the menu items.

VSTD	Video Standard Select	Sets the video standard that the module will operate in.
VDLY	Vertical Phase	Sets the vertical delay of the output video.
HDLY	Horizontal Phase	Sets horizontal delay of the output video.
FDLY	Frame Phase	Sets frame delay of the output video.
LOVM	Freeze Mode	Sets module action when input video is lost.

Table 6-2: Video Controls Menu

6.3.1. Setting the Video Standard

Video Control	
VSTD	
Auto detect	*AUTO*
625i/50	*PALB*
525i/59.94	*NTSC*
1080i/50	*1I50*
1080i/59.94	*1I59*
1080i/60	*1I60*
720p/59.94	*7P59*
720p/60	*7P60*
1080p/23.98sF	*1S23*
1080p/24sF	*1S24*
1035i/59.94	*3I59*
1035i/60	*3I60*
720p/50	*7P50*

This control selects the operating standard that the module will operate in. The internal timing of the module will be based on this standard. If the operating standard is set to *Auto detect*, then the module will operate based on the input video standard.

If the operating standard is set to a specific value (e.g. 525i/59.94), then regardless of the input video standard, the module will operate in 525i/59.94.

The output video standard will always be the same as the operating standard. However, NO format or standard conversion will occur.

This control is NOT a LIVE control. The parameter will change once the pushbutton is pressed.

6.3.2. Setting the Vertical Phase

Video Control
VDLY
0 to Max
0

This control selects the vertical delay of the output video signal in respect to the input video. The range of values is based on the operating standard of the module.

6.3.3. Setting the Horizontal Phase

Video Control
HDLY
0 to Max
0

This control selects the horizontal delay of the output video signal in respect to the input video. The range of values is based on the operating standard of the module.

6.3.4. Setting the Frame Phase

Video Control
FDLY
0 to Max
1

This control selects the frame delay of the output video signal in respect to the input video. The range of values is based on the operating standard of the module. *Max* will be 12 for interlaced standards and 28 for progressive standards.

6.3.5. Setting the Action to Take When Input Video is Missing

Video Control	
LOVM	
Frame	FRM BLK
Black	FLD2
Field 2	FLD1
Field 1	PASS
Pass	

This control allows the user to set which action should be taken when the input video is missing: the output to go to black, freeze on the good frame only, freeze on field 1 of last good frame, freeze on field 2 of last good frame or pass the input with this control.

When set to *Black*, the output video will be black.

When set to *Frame*, the output video will show the last good frame.

When set to *Field 1*, the output video will show the first field of the last good frame.

When set to *Field 2*, the output video will show the second field of the last good frame.

When set to *Pass* the output video may be incoherent when the video input standard mismatches the video output standard. If input video is completely unlocked, video output is frozen.

6.4. CONFIGURING THE AUDIO CONTROLS

The *Audio Control* menus are used to configure the coarse and fine audio delay; the mode of the sample rate converter, C-bit control, which embedded group to enable, and the demux behaviour with a loss of video. Table 6-3 below shows the items available in the *Audio Control* menus. Sections 6.4.1 to 6.4.6 provide detailed information about each of the menu items.

ADLY	Coarse Audio Delay	Sets audio delay in frame of video increments (coarse).
ASDL	Fine Audio Delay	Sets audio delay displayed in milliseconds (in 1 sample increments)
SRC	SRC Mode	Sets the audio sample rate converter bypass mode.
CBIT	C-Bit Control	Sets the AES channel status bit handling.
EMB1	Embedder Group 1 Enable	Enables audio embedder for group 1.
EMB2	Embedder Group 2 Enable	Enables audio embedder for group 2.
EMB3	Embedder Group 3 Enable	Enables audio embedder for group 3.
EMB4	Embedder Group 4 Enable	Enables audio embedder for group 4.
DLVM	Demux Loss of Video Mode	Sets the action of the audio demux in case of input video loss.

Table 6-3: Audio Controls Menu

6.4.1. Setting the Coarse Audio Delay

Audio Control
- *ADLY*
  - *0*
  - *0 to Max*

This control adjusts the audio delay in terms of video frames (coarsely). The delay is respective of the input video. The range of the parameter is based on the operating standard of the module, since this parameter follows the video frame phase.

6.4.2. Setting the Fine Audio Delay

Audio Control
- *ASDL*
  - *-33ms to +33ms*
  - *0*

This control adjusts the audio delay (finely). This parameter is displayed in milliseconds and adjusted in approximate sample increments (approximately 20.83µs).

If *ADLY* (see section 6.4.1) is set to 0, then the parameter range is 0 to 33ms.

Otherwise, fine audio delay ranges from –33ms to +33ms.

6.4.3. Setting the SRC Mode

Audio Control	
SRC	
Enable	*ON*
Bypass	*BYPS*
Automatic	*AUTO*

This sets the bypass mode of the audio sample rate converter.

When *Enabled*, audio is sample rate converted at 48 kHz that is synchronous to the input video. Audio can be either synchronous or asynchronous to the video source.

When in *Bypass* mode, the content of the audio is preserved without any loss, and directly embedded into the input video. Audio must be synchronous to the video source. If not, there may be samples that are dropped or repeated.

When set to *Automatic*, the sample rate converter will be automatically enabled when the module detects a PCM signal. It will also bypass the SRC, if Dolby E is detected.

6.4.4. Setting the C-bit Control

Audio Control	
CBIT	
Preserve	*PRO*
Replace	*STMP*

This control determines how the AES channel status bits are handled when being routed from input to output. When set to *preserve*, the module will preserve as many bits as possible, but always change to professional 48 kHz. When set to *replace*, all the C-bit will be replaced with a static channel status message that reads professional 48 kHz.

6.4.5. Enabling the Audio Embedders

There are four menu items used to enable embedder groups. The menu item for each embedder group component works in the same way; therefore, for simplicity, only the menu item for *Embedder Group* 1 will be shown in the manual.

Audio Control	
EMB1	
Enable	*ON*
Disable	*OFF*

This control enables or disables audio embedder for group 1.

When *Enable* is selected, Group 1 will be embedded into the output video signal.

When *Disable* is selected, Group 1 will not be embedded into the output video signal.

The default setting for EMB2, EMB3, and EMB4 is *Disable*. Some legacy SD equipment does not function correctly with more than 1 embedded audio group. Therefore, by default ONLY EMB1 is enabled.

6.4.6. Setting the Demux Loss of Video Mode

Audio Control	
DLVM	
Mute	*MUTE*
Pass AES	*AES*

This sets the demux action in the event of input video loss.

When *Mute* is selected, the module will *mute* the outputs.

When *Pass AES* is selected, the module routes AES inputs as a backup.

6.5. CONFIGURING THE VIDEO PROCESSING FUNCTIONS

The *Video Processor* menus are used to configure parameters associated with the video processing functions. Table 6-4 below shows the items available in the *Video Processor* menu. Sections 6.5.1 to 6.5.4 provide detailed information about each of the menu items.

BLVL	Black Level Adjust	Sets the black level of the output video (brightness).
Y_GN	Luma Gain Adjust	Sets the luma gain of the output video (contrast).
C_GN	Chroma Gain Adjust	Sets the chroma gain of the output video (saturation).
HUE	Hue Control	Adjusts the hue of the output SD signal.

Table 6-4: Video Processor Menu

6.5.1. Setting the Black Level

Video Processor
BLVL
-7.3 to 7.3 IRE
0

With this control, the user can adjust the black level of the output video. For no offset of the black level, set the control to 0. The adjustment range is +/- 7 IRE with ½ IRE resolution.

6.5.2. Setting the Luma Gain

Video Processor
Y_GN
-6.02 to 5.99 dB
0

With this control, the user can adjust the gain of luminance channel of the output video (contrast). For unity gain, set this value to 0. The adjustment range is +/- 6 dB.

6.5.3. Setting the Chroma Gain

Video Processor
C_GN
-6.02 to 5.99 dB
0

With this control, the user can adjust the gain on the Cb and Cr channels of the output video (saturation). For unity gain, set this value to 0. The adjustment range is +/- 6 dB.

6.5.4. Setting the Hue

Video Processor
HUE
-20 to +20 deg.
0

With this control the user can adjust the Hue or color of components. The hue adjustment is applied to SD output video signals only. For unity gain, set this value to 0. The adjustment range is +/- 20 degrees, in 0.1-degree steps.

6.6. UNDERSTANDING THE AUDIO PROCESSOR

In order to understand the parameters of the Audio Processor on the 7721AE8-DEE-HD, this section provides a brief description of each of the major components that comprise the Audio Processor. This section is meant to aid the user when configuring the Audio Processor (sections 6.7 to 6.9). There are two audio mixers in this product. "Mixer A" is used for the AES/embedded audio outputs; "Mixer B" is used for the Dolby-E encoder. Any of the AES/embedded outputs can be substituted with the Dolby-E encoder output.

6.6.1. Single Mixer

This is the basic building block of the Audio Processor. There are two mixers on the 7721AE8-DEE-HD module. The AES/embedded mixer 16-output channels, the Dolby-E mixer has 8 output channels. Figure 6-1 describes one stage for a mixer output channel. The user can mix two sources, adjust the gain and inversion of each source, and output them.

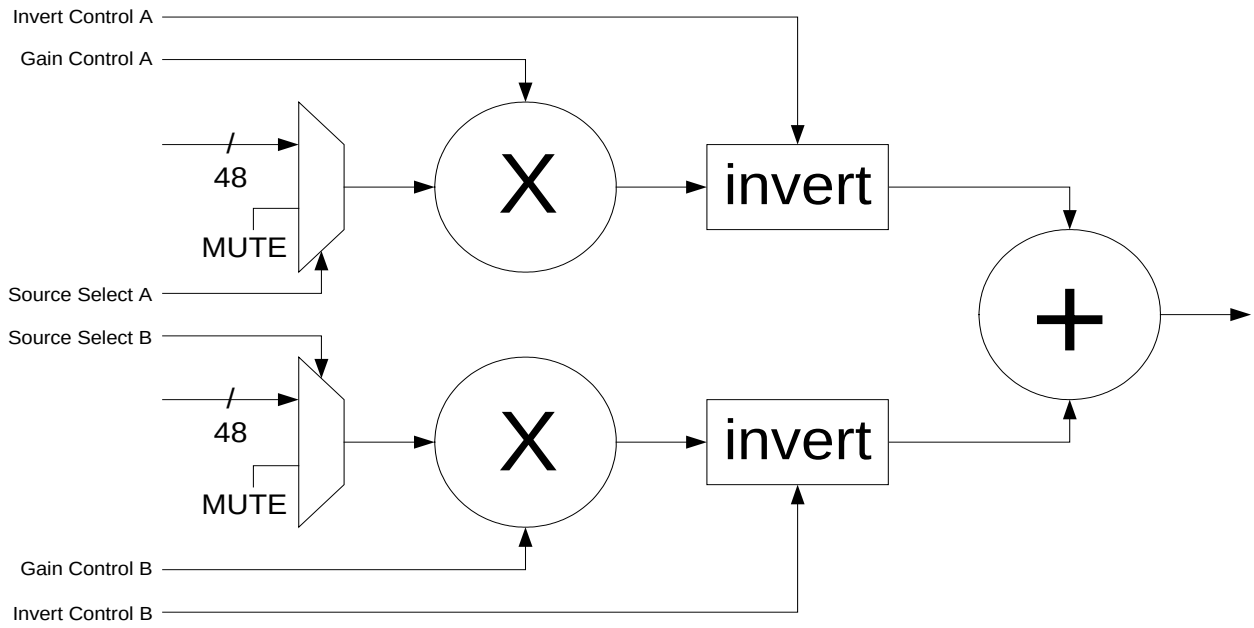


Figure 6-1: Single Mixer Stage

6.6.2. Full Mixer

Figure 6-2 shows all the mixer stages for the AES/embedded mixer on the 7721AE8-DEE-HD module. The figure shows how the user can map mix any input sources to the 16 output channels of the mixer.

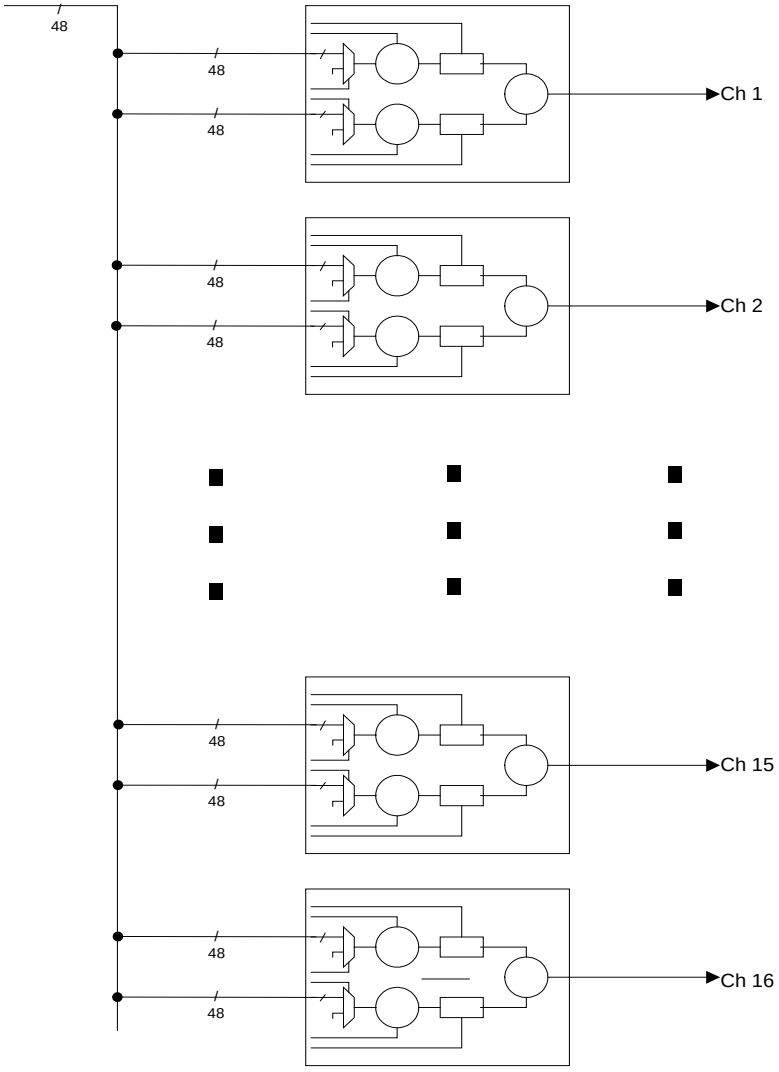
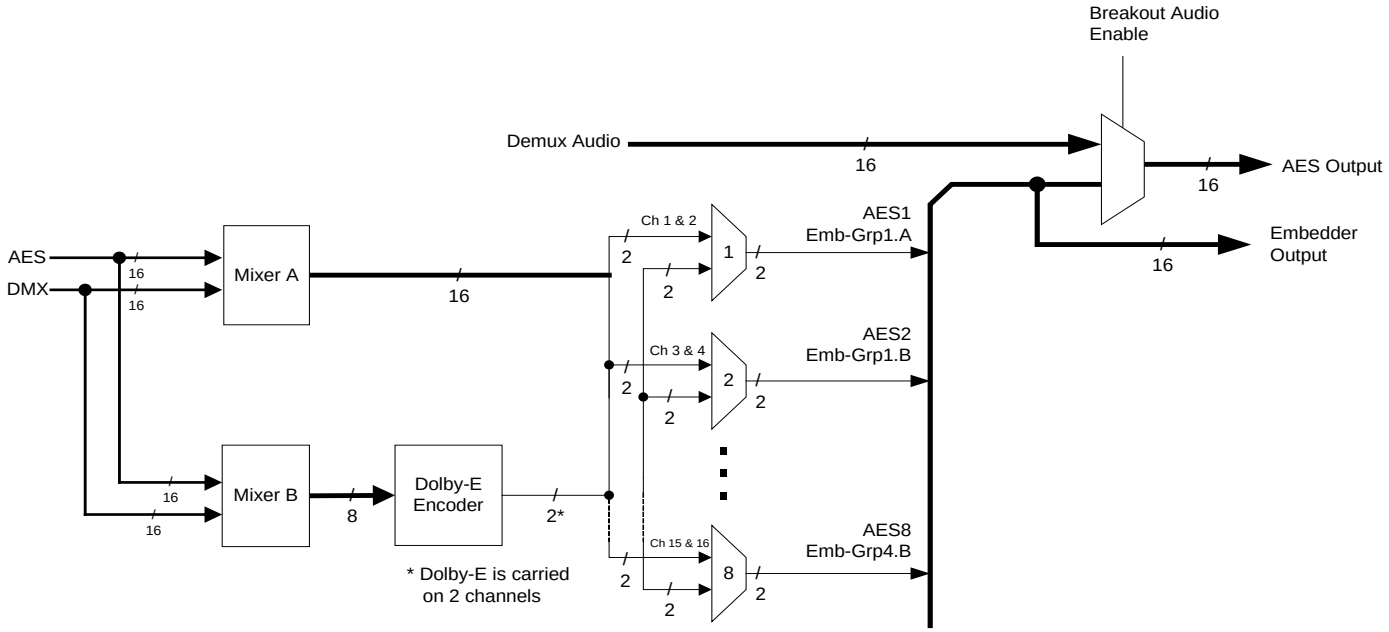


Figure 6-2: Full Mixer

6.6.3. Mixer A, B and Dolby-E encoder

Figure 6-3 shows how the two mixers on the 7721AE8-DEE-HD are used to embed the audio onto the output video.



Channel = 1 mono channel
A single AES consists of 2 channels
A single embedded group consists of 4 channels, or 2 AES

Figure 6-3: Mixer A and B and Dolby-E Encoder Routing

6.6.4. Mono Mixer

Figure 6-4 describes how the mono-mixers are used to provide mono down mixes as input sources for the two mixers.

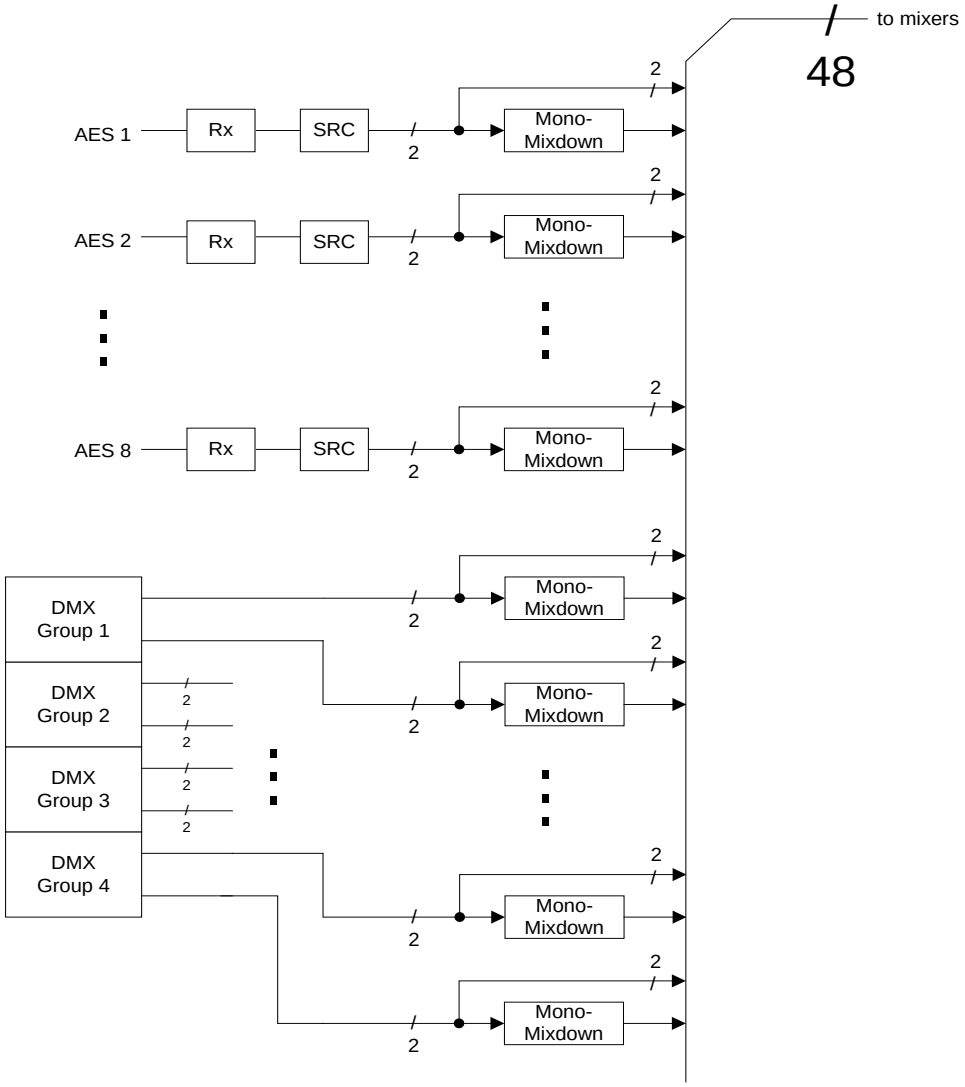


Figure 6-4: Mono-Mixers

6.6.5. Headphone Monitoring

Figure 6-5 describes which sources are available to the user for monitoring through the card edge headphone jack.

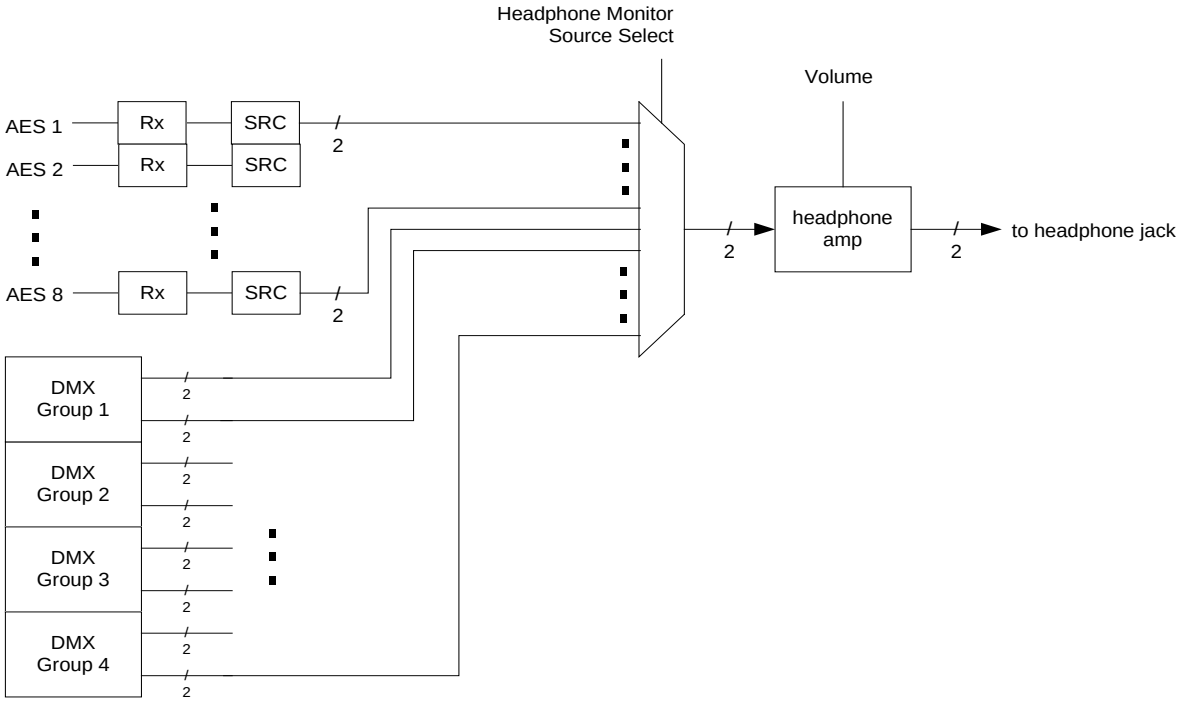


Figure 6-5: Headphone Monitoring

6.7. CONFIGURING THE AUDIO PROCESSING FUNCTIONS

The *Audio Processor* menus are used to configure parameters associated with the audio processing and routing functions of the 7721AE8-DEE-HD. The chart below shows the items available in the *Audio Processor* menu. Sections 6.7.1 up to and including section 6.7.4.1 provide detailed information about each of the menu items.

MASS	Mixer A Source Select	Selects the input source for Mixer A.
MAGC	Mixer A Gain Control	Sets the gain of the inputs for Mixer A.
MAIV	Mixer A Inversion Control	Sets the inversion control for the inputs for Mixer A.
MBSS	Mixer B Source Select	Selects the input source for Mixer B.
MBGC	Mixer B Gain Control	Sets the gain of the inputs for Mixer B.
MBIV	Mixer B Inversion Control	Sets the inversion control for the inputs for Mixer B.
DEAR	Dolby-E Encoder Output Routing	Selects if an AES/embedded output comes from Mixer A or the Dolby-E encoder.

Table 6-5: Audio Processor Menu

6.7.1. Selecting Input Source for Mixer A

The parameters for both Mixer A and B are the same. For the sake of simplicity in the manual, only the menus for Mixer A will be described. Please keep in mind "mixer B" only has 8 outputs, and is fed to the Dolby-E encoder.

Audio Processor	
MASS	
Ch1 A Source Select	*1AS*
Ch1 B Source Select	*1BS*
Ch2 A Source Select	*2AS*
Ch2 B Source Select	*2BS*
Ch3 A Source Select	*3AS*
Ch3 B Source Select	*3BS*
Ch4 A Source Select	*4AS*
Ch4 B Source Select	*4BS*
Ch5 A Source Select	*5AS*
Ch5 B Source Select	*5BS*
Ch6 A Source Select	*6AS*
Ch6 B Source Select	*6BS*
Ch7 A Source Select	*7AS*
Ch7 B Source Select	*7BS*
Ch8 A Source Select	*8AS*
Ch8 B Source Select	*8BS*
Ch9 A Source Select	*9AS*
Ch9 B Source Select	*9BS*
Ch10 A Source Select	*AAS*
Ch10 B Source Select	*ABS*
Ch11 A Source Select	*BAS*
Ch11 B Source Select	*BBS*
Ch12 A Source Select	*CAS*
Ch12 B Source Select	*CBS*
Ch13 A Source Select	*DAS*
Ch13 B Source Select	*DBS*
Ch14 A Source Select	*EAS*
Ch14 B Source Select	*EBS*
Ch15 A Source Select	*FAS*
Ch15 B Source Select	*FBS*
Ch16 A Source Select	*GAS*
Ch16 B Source Select	*GBS*

This control allows the user to specify what is the input source for each pair (A and B) of the 16 channels of Mixer A.

The following are the default values for each of the input sources (same for MBSS):

1AS = AES1
1BS = MUTE
2AS = AES2
2BS = MUTE
3AS = AES3
3BS = MUTE
4AS = AES4
4BS = MUTE
5AS = AES5
5BS = MUTE
6AS = AES6
6BS = MUTE
7AS = AES7
7BS = MUTE
8AS = AES8
8BS = MUTE
9AS = AES9
9BS = MUTE
AAS = AESA
ABS = MUTE
BAS = AESB
BBS = MUTE
CAS = AESC
CBS = MUTE
DAS = AESD
DBS = MUTE
EAS = AESE
EBS = MUTE
FAS = AESF
FBS = MUTE
GAS = AESG
GBS = MUTE

6.7.1.1. Selecting the Source for Channel 1 A of Mixer A

The parameters for each pair (A and B) for all 16 channels are the same. For the sake of simplicity in the manual only the menus for Channel 1 A for Mixer A will be described.

Audio Processor	
MASS	
1AS	
AES 1A (Ch. 1)	*AE1A*
AES 1B (Ch. 2)	*AE1B*
AES 2A (Ch. 3)	*AE2A*
AES 2B (Ch. 4)	*AE2B*
AES 3A (Ch. 5)	*AE3A*
AES 3B (Ch. 6)	*AE3B*
AES 4A (Ch. 7)	*AE4A*
AES 4B (Ch. 8)	*AE4B*
AES 5A (Ch. 9)	*AE5A*
AES 5B (Ch. 10)	*AE5B*
AES 6A (Ch. 11)	*AE6A*
AES 6B (Ch. 12)	*AE6B*
AES 7A (Ch. 13)	*AE7A*
AES 7B (Ch. 14)	*AE7B*
AES 8A (Ch. 15)	*AE8A*
AES 8B (Ch. 16)	*AE8B*
DMX Ch. 1	*DMX1*
DMX Ch. 2	*DMX2*
…	*…*
DMX Ch. 15	*DMXF*
DMX Ch. 16	*DMXG*
Mono Mix Ch. 1 & 2	*MM12*
Mono Mix Ch. 3 & 4	*MM34*
…	*…*
Mono Mix Ch. 13 & 14	*MMDE*
Mono Mix Ch. 15 & 16	*MMFG*
Mono Mix DMX Ch. 1 & 2	*MD12*
Mono Mix DMX Ch. 3 & 4	*MD34*
…	*…*
Mono Mix DMX Ch. 13 & 14	*MDDE*
Mono Mix DMX Ch. 15 & 16	*MDFG*
MUTE	*MUTE*

This parameter selects the source for Channel 1 A of Mixer A.

6.7.2. Setting the Gain of the Input Sources for Mixer A

Audio Processor	
MAGC	
Ch1 A Gain Control	*1AGC*
Ch1 B Gain Control	*1BGC*
Ch2 A Gain Control	*2AGC*
Ch2 B Gain Control	*2BGC*
Ch3 A Gain Control	*3AGC*
Ch3 B Gain Control	*3BGC*
Ch4 A Gain Control	*4AGC*
Ch4 B Gain Control	*4BGC*
Ch5 A Gain Control	*5AGC*
Ch5 B Gain Control	*5BGC*
Ch6 A Gain Control	*6AGC*
Ch6 B Gain Control	*6BGC*
Ch7 A Gain Control	*7AGC*
Ch7 B Gain Control	*7BGC*
Ch8 A Gain Control	*8AGC*
Ch8 B Gain Control	*8BGC*
Ch9 A Gain Control	*9AGC*
Ch9 B Gain Control	*9BGC*
Ch10 A Gain Control	*AAGC*
Ch10 B Gain Control	*ABGC*
Ch11 A Gain Control	*BAGC*
Ch11 B Gain Control	*BBGC*
Ch12 A Gain Control	*CAGC*
Ch12 B Gain Control	*CBGC*
Ch13 A Gain Control	*DAGC*
Ch13 B Gain Control	*DBGC*
Ch14 A Gain Control	*EAGC*
Ch14 B Gain Control	*EBGC*
Ch15 A Gain Control	*FAGC*
Ch15 B Gain Control	*FBGC*
Ch16 A Gain Control	*GAGC*
Ch16 B Gain Control	*GBGC*

This control allows the user to adjust the gain of the input sources for each pair (A and B) of the 16 channels of Mixer A.

6.7.2.1. Setting the Gain for Channel 1 A of Mixer A

The parameters for each pair (A and B) for all 16 channels are the same. For the sake of simplicity in the manual, only the menus for Channel 1 Input A for Mixer A will be described.

Audio Processor
MAGC
1AGC
-24 to +24 dB
0

This parameter sets the gain for Channel 1 A of Mixer A. For unity gain, set the parameter to 0. The adjustment range is +/- 24 dB, in increments of 0.1 dB.

For non-PCM data passing, the gain setting should be set to *0dB.*

6.7.3. Setting the Inversion Control of the Input Sources for Mixer A

Audio Processor	
MAIV	
Ch1 A Invert	*1AIV*
Ch1 B Invert	*1BIV*
Ch2 A Invert	*2AIV*
Ch2 B Invert	*2BIV*
Ch3 A Invert	*3AIV*
Ch3 B Invert	*3BIV*
Ch4 A Invert	*4AIV*
Ch4 B Invert	*4BIV*
Ch5 A Invert	*5AIV*
Ch5 B Invert	*5BIV*
Ch6 A Invert	*6AIV*
Ch6 B Invert	*6BIV*
Ch7 A Invert	*7AIV*
Ch7 B Invert	*7BIV*
Ch8 A Invert	*8AIV*
Ch8 B Invert	*8BIV*
Ch9 A Invert	*9AIV*
Ch9 B Invert	*9BIV*
Ch10 A Invert	*AAIV*
Ch10 B Invert	*ABIV*
Ch11 A Invert	*BAIV*
Ch11 B Invert	*BBIV*
Ch12 A Invert	*CAIV*
Ch12 B Invert	*CBIV*
Ch13 A Invert	*DAIV*
Ch13 B Invert	*DBIV*
Ch14 A Invert	*EAIV*
Ch14 B Invert	*EBIV*
Ch15 A Invert	*FAIV*
Ch15 B Invert	*FBIV*
Ch16 A Invert	*GAIV*
Ch16 B Invert	*GBIV*

This control allows the user to set the inversion control of the input sources for each pair (A and B) of the 16 channels of Mixer A.

This allows the user to invert audio pairs if desired. This control is useful in cases of analog wiring errors, etc.

6.7.3.1. Setting the Inversion Control for Channel 1 A of Mixer A

The parameters for each pair (A and B) for all 16 channels are the same. For the sake of simplicity in the manual only the menus for Channel 1 Input A for Mixer A will be described.

Audio Processor	
MAIV	
1AIV	
Normal	*NRML*
Invert	*INVT*

This parameter sets the inversion control for Channel 1 Input A of Mixer A. When set to *Normal*, the pairs will remain as is. When set to *Invert*, the pairs will be inverted.

For passing non-PCM data, this control must be set to *Normal.*

6.7.4. Dolby-E Encoder Output Routing

These parameters select whether the AES/embedded output will come from "Mixer A" or the Dolby-E encoder output. This allows the Dolby-E output to be copied to multiple AES outputs.

Audio Processor	
DEAR	
Output 1 Selection	*OUT1*
Output 2 Selection	*OUT2*
Output 3 Selection	*OUT3*
Output 4 Selection	*OUT4*
Output 5 Selection	*OUT5*
Output 6 Selection	*OUT6*
Output 7 Selection	*OUT7*
Output 8 Selection	*OUT8*

The following are the default values for each of the input sources:

OUT1 = Ch 1&2
OUT2 = Ch 3&4
OUT3 = Ch 5&6
OUT4 = Ch 7&8
OUT5 = Ch 9&10
OUT6 = Ch 11&12
OUT7 = Ch 13&14
OUT8 = Ch 15&16

6.7.4.1. Output Selection Control

Selects Mixer A output or Dolby-E output.

Audio Processor	
DEAR	
OUT1	
Ch1&2	*CH12*
Dolby-E Encoder	*DE*

For simplicity, only OUT1 is shown.

For OUT2 selections are CH34 (Ch 3 & 4) or DE (Dolby-E)
For OUT3 selections are CH56 (Ch 5 & 6) or DE
For OUT4 selections are CH78 (Ch 7 & 8) or DE
For OUT5 selections are CH9A (Ch 9 & 10) or DE
For OUT6 selections are CHBC (Ch 11&12) or DE
For OUT7 selections are CHDE (Ch 13&14) or DE
For OUT8 selections are CHFG (Ch 15&16) or DE

6.8. CONFIGURING THE HEADPHONE MONITOR

The *Headphone Monitor* menus are used to configure parameters associated with the headphone jack on the module. The chart below shows the items available in the *Headphone Monitor* menu. Sections 6.8.1 to 6.8.2 provide detailed information about each of the menu items.

HVOL	Headphone volume	Sets the volume for the headphone.
HSRC	Headphone source	Selects the source for the headphone monitoring

6.8.1. Setting the Headphone Volume

Headphone Monitor
HVOL
HV00 to HV15

With this control you can set the headphone volume to one of 16 levels.

Total adjustment range is over 50 dB. Level 00 is the lowest volume and is effectively mute.

Please be aware that if the headphone source is compressed Dolby E/AC3, the output will be full scale. Adjust headphone volume controls accordingly.

6.8.2. Selecting the Source for the Headphone Monitoring

Headphone Monitor	
HSRC	
Channel 1 & 2	*AES1*
Channel 3 & 4	*AES2*
Channel 5 & 6	*AES3*
Channel 7 & 8	*AES4*
Channel 9 & 10	*AES5*
Channel 11 & 12	*AES6*
Channel 13 & 14	*AES7*
Channel 15 & 16	*AES8*
DMX Ch. 1 & 2	*DMX1*
DMX Ch. 3 & 4	*DMX2*
DMX Ch. 5 & 6	*DMX3*
DMX Ch. 7 & 8	*DMX4*
DMX Ch. 9 & 10	*DMX5*
DMX Ch. 11 & 12	*DMX6*
DMX Ch. 13 & 14	*DMX7*
DMX Ch. 15 & 16	*DMX8*

This selects the audio source for the headphone monitoring.

If the parameter is set to *AES1* to *AES8*, then the headphone will be monitoring the external discrete AES inputs.

If the parameter is set to *DMX1* to *DMX8*, then the headphone will be monitoring the incoming embedded audio.

6.9. UNDERSTANDING THE DOLBY ENCODER ON THIS PRODUCT

The 7721AE8-DEE-HD will derive the required timing from the input video to encode Dolby-E. An external video reference input is not required, but can be used in substitution for the input video timing, or be used to help with 720p Dolby-E frame phasing.

6.9.1. Understanding Dolby-E Program Configuration

The Dolby-E encoder compresses up to 4 AES (8 channels) into 1 AES.

This module is capable of encoding in the following Dolby-E program configurations:

- 5.1+2
- 5.1+2x1 (5.1+1+1)
- 2x4 (4+4)
- 4+2x2 (4+2+2)
- 4+2+2x1 (4+2+1+1)
- 4+4x1 (4+1+1+1+1)
- 4x2 (2+2+2+2)
- 3x2+2x1 (2+2+2+1+1)
- 2x2+4x1 (2+2+1+1+1+1)
- 2+6x1 (2+1+1+1+1+1+1)
- 8x1 (1+1+1+1+1+1+1+1)
- 5.1
- 4+2
- 4+2x1 (4+1+1)
- 3x2 (2+2+2)
- 2x2+2x1 (2+2+1+1)
- 2+4x1 (2+1+1+1+1)
- 6x1 (1+1+1+1+1+1)
- 4
- 2x2 (2+2)
- 2+2x1 (2+1+1)
- 4x1 (1+1+1+1)
- 7.1
- 7.1screen

The program configuration-encoding mode of this product depends on the metadata information provided to it. This metadata information can be de-embedded from VANC, received serially over the RS-422 DB-9 connector (i.e. from a Dolby DP570), sourced from the module's metadata processor, or automatically by selecting a preset program configuration.

The automatic preset program configurations available include:

- 5.1+2
- 5.1
- 5.1+2x1 (5.1+1+1)
- 4x2 (2+2+2+2)
- 3x2 (2+2+2)
- 8x1 (1+1+1+1+1+1+1+1)
- 6x1 (1+1+1+1+1+1)

Mixer-B is used to route and adjust any input audio from AES or embedded source sends it to the Dolby-E encoder. Each of the 8 outputs of Mixer-B is mapped directly to the 8 inputs of the Dolby-E encoder.

Program Config	# Programs	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8
5.1+2	2	0.L	0.R	0.C	0.LFE	0.Ls	0.Rs	1.L	1.R
5.1+2x1	3	0.L	0.R	0.C	0.LFE	0.Ls	0.Rs	1.C	2.C
2x4	2	0.L	0.R	0.C	0.S	1.L	1.R	1.C	1.S
4+2x2	3	0.L	0.R	0.C	0.S	2.L	2.R	1.L	1.R
4+2+2x1	4	0.L	0.R	0.C	0.S	2.C	3.C	1.L	1.R
4+4x1	5	0.L	0.R	0.C	0.S	3.C	4.C	1.C	2.C
4x2	4	0.L	0.R	2.L	2.R	3.L	3.R	1.L	1.R
3x2+2x1	5	0.L	0.R	2.L	2.R	3.C	4.C	1.L	1.R
2x2+4x1	6	0.L	0.R	2.C	3.C	4.C	5.C	1.L	1.R
2+6x1	7	0.L	0.R	3.C	4.C	5.C	6.C	1.C	2.C
8x1	8	0.C	1.C	2.C	3.C	4.C	5.C	6.C	7.C
5.1	1	0.L	0.R	0.C	0.LFE	0.Ls	0.Rs		
4+2	2	0.L	0.R	0.C	0.S			1.L	1.R
4+2x1	3	0.L	0.R	0.C	0.S			1.C	2.C
3x2	3	0.L	0.R	2.L	2.R			1.L	1.R
2x2+2x1	4	0.L	0.R	2.C	3.C			1.L	1.R
2+4x1	5	0.L	0.R	3.C	4.C			1.C	2.C
6x1	6	0.L	1.C	2.C	3.C	4.C	5.C		
4	1	0.L	0.R	0.C	0.S				
2x2	2	0.L	0.R					1.L	1.R
2+2x1	3	0.L	0.R					1.C	2.C
4x1	4	0.C	1.C	2.C	3.C				
7.1	1	0.L	0.R	0.C	0.LFE	0.Ls	0.Rs	0.BSL	0.BSR
7.1 screen	1	0.L	0.R	0.C	0.LFE	0.Ls	0.Rs	0.LE	0.RE

Table 6-6: Channel Mappings and Program Configurations

(Channel naming convention #.AAA where: # represents the program, and AAA represents L=left R=right C=center LFE=low frequency effects (subwoofer) Ls=left surround, Rs=right surround, BSL=back left surround, BSR=back right surround, LE=left extra RE=right extra)

LFE channels have a low pass filter applied to them.

6.9.2. Understanding Dolby-E Frame Rates & Packet Phasing

Dolby-E packets are aligned with video frames. Dolby-E has similar options for frame rates as video. This module currently supports frame rates of 23.98, 24, 25, 29.97, and 30 fps. For interlaced video standards such as 525i/59.94 and 1080i/59.94, a Dolby-E frame will span 1 frame, or two fields. For progressive standards such as 720p/59.94, a Dolby-E frame will span 2 frames.

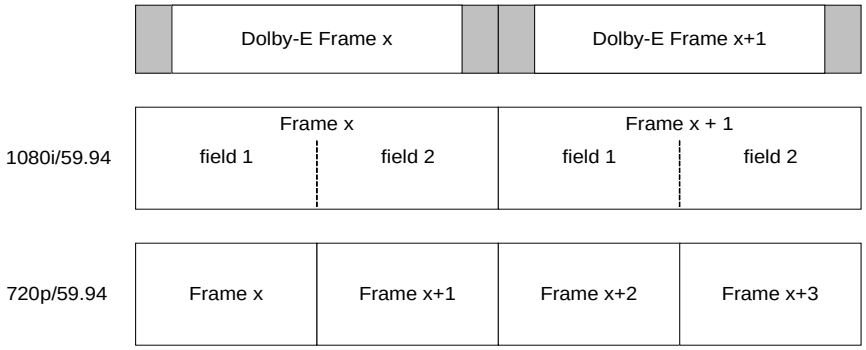


Figure 6-6: Dolby-E Frame Alignment

The 7721AE8-DEE-HD can synchronize the Dolby-E packet's start position to output video, or an external video reference. The start position (also known as the Dolby-E packet phase) can be adjusted using the "Dolby Line Phase Adjust" control.

Locking to video poses no problems for interlaced video standards.
On the other hand, with progressive video standards, synching to video only can produce a phase error between two physically separate Dolby-E encoders (since the Dolby-E frame spans two frames in progressive video standard) even if video is locked. This may be undesirable in certain operational situations.

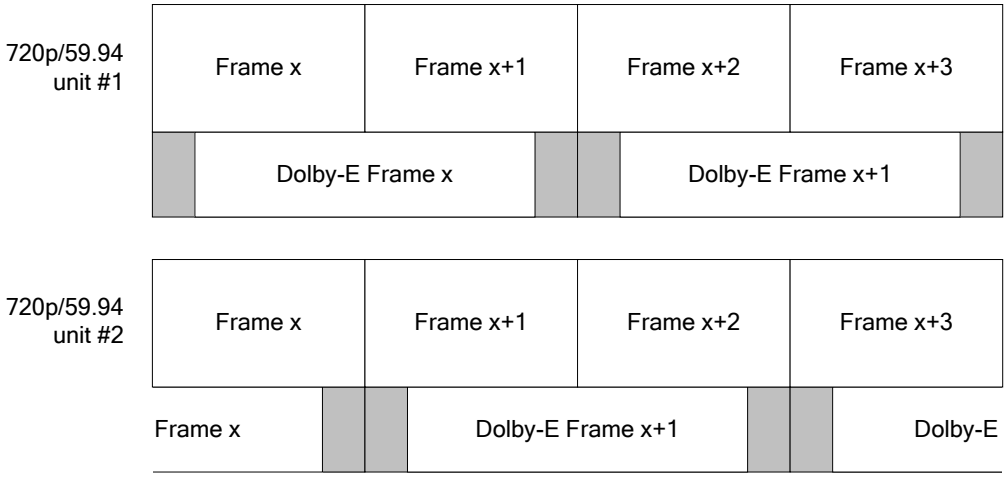
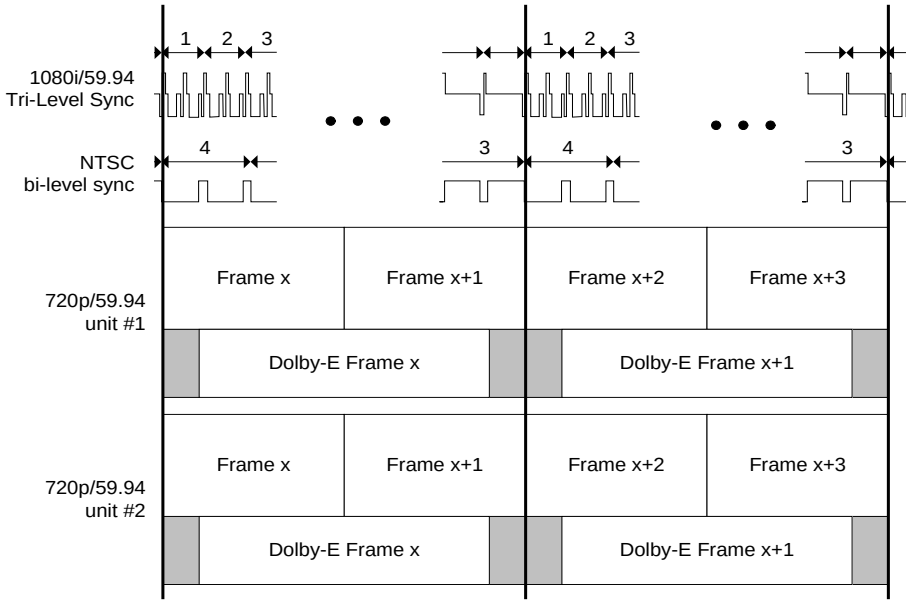


Figure 6-7: Dolby-E Frame Alignment and 720p Video without Reference

As mentioned, the 7721AE8-DEE-HD can also lock to an external video reference. The video reference input is provided to allow the Dolby-E packet to be phased to an external source, be it colour black (bi-level reference) or tri-level reference.

When choosing to use the video reference input, the reference must be locked to input video and must be interlaced. If input video is interlaced as well, then the frame rate of the reference input must be the same. For progressive input video, the reference must be half the frame rate of video. The video reference input is especially useful for phasing up multiple Dolby-E encoders running in 720p video standards where the Dolby-E frame spans 2 frames.



(NB: sync not to scale, Dolby-E packet actually starts at line 14 of NTSC bi-level sync)

Figure 6-8: Dolby-E Frame Alignment and 720p Video with reference

6.10. CONFIGURING THE DOLBY ENCODER

The *Dolby Encoder* menus are used to configure parameters associated with the Dolby Encoder on the module. The chart below shows the items available in the *Dolby Encoder* menu. Sections 0 up to and including section 6.10.1.3 provide detailed information about each of the menu items.

DE_A	Dolby Encoder A	Sets the controls for Dolby Encoder A.

6.10.1. Setting the Controls for Dolby Decoder A

Dolby Encoder	
DE_A	
Auto Program Config	*DEAP*
Video Sync Source Select	*DEAS*
Line Phase Adjustment	*DEAL*

This sets the controls for the Dolby Encoder. These controls will determine the operating mode of the encoder as well as the output phase with respect to video.

6.10.1.1. Dolby Encoder Automatic Program Configuration Selection

Dolby Encoder	
DE_A	
DEAP	
5.1+2	51+2
5.1	_5.1
5.1+2x1	5111
4x2	2222
3x2	_222
8x1	_8x1
6x1	_6x1

This control selects the program configuration for the automatic operating mode of the Dolby-E encoder.

The control allows the selection of the most commonly used program configurations and enables the module to generate a default metadata BSI in the Dolby-E stream.

This control is only effective when "AUTO" is selected for the metadata source.

6.10.1.2. Dolby-E Encoder Video Sync Source Select

Dolby Encoder	
DE_A	
DEAS	
Output Video	VOUT
Reference	VREF

With this control you can select the source of sync for the Dolby Encoder.

Select *VREF* to use the video input reference as the source of sync.

Select *VOUT* to use the video output as the source of sync.

6.10.1.3. Dolby-E Output Line Phase Adjust

Dolby Encoder
DE_A
DEAL
-262 to 262
0

This control adjusts the output line phase of the Dolby-E encoder with respect to the input video sync source.

Adjustments are in increments of 1 line of the sync source.

6.11. CONFIGURING THE METADATA

The *Metadata* menu is used to configure the parameters related to the Dolby Metadata VANC embedding and external I/O. The chart below shows the items available in the *Metadata* menu. Sections 6.11.1 to 6.11.2 provide detailed information about each of the menu items.

MD_A	Metadata Controls	Sets the controls for Metadata.
DB9C	DB-9 Configuration	Sets the behaviour of the DB-9 Metadata I/O.

6.11.1. Setting the Controls for Metadata

Metadata	
MD_A	
Output Source Select	*METO*
Embed Source Select	*METV*
De-embed Line	*VADL*
De-embed DID	*VADI*
De-embed SID	*VADS*
Pass Existing Metadata	*VAKL*
Embed Line	*VAEL*
Embed DID	*VAEI*
Embed SID	*VAES*
Embed Enable	*VAEN*
Encoder Source Select	*DEAM*

This sets the controls for the Metadata Decoder A.

METO specifies the output of the Metadata.

METV specifies the type of Metadata that is inserted in VANC.

VADL selects the input VANC line for de-embedding.

VADI selects the VANC Data ID.

VADS selects the VANC Secondary Data ID.

VAKL selects whether to delete specified VANC packets.

VAEL selects the output VANC for embedding.

VAEI selects the output VANC Data ID.

VAES selects the output VANC Secondary Data ID.

VAEN selects whether VANC will be embedding on the output video.

DEAM selects the source of metadata for the Dolby-E encoder.

6.11.1.1. Selecting the Type of Metadata that is Output from Metadata Decoder A

Metadata	
MD_A	
METO	
VANC A	*VNCA*
External A	*EXTA*
Processed	*PROC*
Metadata Authoring	*MAUT*

With this control you can set the type of Metadata output.

Select *VNCA* to output Metadata from the input VANC packets.

Select *EXTA* to output Metadata from the external META input.

Select MAUT to output Metadata from the metadata-authoring module.

6.11.1.2. Selecting the Type of Metadata that is inserted into VANC

Metadata	
MD_A	
METV	
VANC A	*VNCA*
External A	*EXTA*
Processed	*PROC*
Metadata Authoring	*MAUT*

With this control you can set the type of Metadata that is inserted into VANC data by the embedder when *VAEN* menu item is set to *ON.*

Select *VNCA* to insert Metadata from the input VANC packets.

Select *EXTA* to insert Metadata from the external META input.

Select MAUT to output Metadata from the metadata-authoring module.

6.11.1.3. Configuring the VANC Metadata De-Embedder

Metadata
MD_A
VADL
2 to 31
10

With this control you can set the line for de-embedding VANC Metadata packets from the input video.

Metadata
MD_A
VADI
0x45
0x50 to 0x5F
0xC0 to 0xCF (hex)

With this control you can set the Data ID for de-embedding VANC Metadata packets*.* Normally you should not have to change this from the default value. The values shown are expressed as hexadecimal numbers.
The default value of data ID 45 corresponds to the latest proposals of SMPTE RP291

Metadata
MD_A
VADS
0x01
0x0 to 0xFF (hex)

With this control you can set the Secondary Data ID for de-embedding VANC Metadata packets*.* Normally you should not have to change this from the default value. The values shown are expressed as hexadecimal numbers. When the *VADI* menu item is set to values in the range of *C0 to CF*, type 1 Metadata packets will be de-embedded and the *VADS* menu item is not relevant as dictated by SMPTE 291M.

Metadata	
MD_A	
VAKL	
Remove and Clean	*KILL*
Pass	*PASS*

With this control you can set whether the VANC packets matching the *VADI* and *VADS* menu item values will be removed from the video or passed through to the output*.*

Select *KILL* to remove and Clean the VANC packets.

Select *PASS* to pass the packets through to the output video.

6.11.1.4. Configuring the VANC Metadata Embedder

There are four menu items used to configure the input VANC embedder.

Metadata
MD_A
VAEL
2 to 31
<u>10</u>

With this control you can set the line for embedding VANC Metadata packets onto the output video.

Metadata
MD_A
VAEI
<u>0x45</u>
0x50 to 0x5F
0xC0 to 0xCF (hex)

With this control you can set the Data ID for embedding VANC Metadata packets. Normally you should not have to change this from the default value. The values shown are expressed as hexadecimal numbers.

Metadata
MD_A
VAES
<u>0x01</u>
0x0 to 0xFF (hex)

With this control you can set the Secondary Data ID for embedding VANC Metadata packets. Normally you should not have to change this from the default value. The values shown are expressed as hexadecimal numbers. When the *VAEI* menu item is set to values in the range of *C0 to CF*, type 1 metadata packets will be generated and the *VADS* menu item is not relevant as dictated by SMPTE 291M.

Metadata	
MD_A	
VAEN	
On	ON
<u>Off</u>	<u>OFF</u>

With this control you can select whether the VANC packets will be embedded onto the output video or not.

Select *ON* to insert VANC Metadata packets on the output video. The input source of Metadata for the VANC packets is set by the *METV* menu item. See section 6.11.1.2.

Select *OFF* to disable VANC insertion.

6.11.2. Configuring the External Metadata I/O

Metadata	
DB9C	
Tx Primary/ Rx Secondary	*TXRX*
Rx Primary/Tx Secondary	*RXTX*

This configures the external Metadata I/O DB-9 connection.

TXRX configures the Metadata I/O to receive from a metadata transmitting device (such as a Dolby DP570 unit) with the following pin out:

Pin#	7721AE8-DEE-HD (Rx)	transmitting device
2	Tx A-	Rx A-
3	Rx B+	Tx B+
7	Tx B+	Rx B+
8	Rx A-	Tx A-

RXTX configures the Metadata I/O to transmit to a metadata receiving device (such as a Dolby DP570) with the following pin out:

Pin#	7721AE8-DEE-HD (Tx)	Receiving device
2	Rx A-	Tx A-
3	Tx B+	Rx B+
7	Rx B+	Tx B+
8	Tx A-	Rx A-

6.11.2.1. Selecting Metadata source for Dolby-E encoder

Metadata	
MD_A	
DEAM	
VANC A	*VNCA*
External A	*EXTA*
Processed	*PROC*
Automatic	*AUTO*

With this control you can set which metadata source you wish to provide to the Dolby-E encoder.

The source of metadata controls the encoding format of the Dolby-E encoder module.

Select *VNCA* to take the metadata from the input VANC packets.

Select *EXTA* to take the metadata from the external META input.

Select PROC to take the metadata from the metadata processor.

Selecting AUTO will automatically generate a default metadata message based on the “Dolby Encoder automatic program configuration selection” (refer to section 9 for the default metadata parameter settings).

6.12. DISPLAYING THE MODULE STATUS

The *Status* menus are used to show the status of various parameters of the 7721AE8-DEE-HD. The chart below shows the items available in the *Status* menu. Sections 6.12.1 to 6.12.5 provide detailed information about each of the menu items.

UPRV	Module Firmware	Displays the firmware revision of the module.
F1RV	FPGA1 Revision	Displays the FPGA revision of the module's main board.
F2RV	FPGA2 Revision	Displays the FPGA revision of the module's sub board.
IVSD	Input Video Standard	Displays the detected input video standard.
OVSD	Operating Standard	Displays the operating standard of the module.

Table 6-7: Status Menu Parameters

6.12.1. Checking the Module Firmware

Status
UPRV
Eg. "V1.0 BUILD 100"

The status parameter will report the firmware version that is operating on the module.

6.12.2. Checking FPGA 1 Revision

Status
F1RV
Eg. "7"

The status parameter will report the revision of FPGA 1 on the module.

6.12.3. Checking FPGA 2 Revision

Status
F2RV
Eg. "8"

The status parameter will report the revision of FPGA 2 on the module.

6.12.4. Checking the Input Video Standard

Status
IVSD
Eg. "1I59"

The status parameter will report the input video standard. See section 6.3.1 for supported standards.

6.12.5. Checking the Output Video Standard

Status
OVSD
Eg. "1I59"

The status parameter will report the output video standard. See section 6.3.1 for supported standards.

6.13. CONFIGURING MISCELLANEOUS PARAMETERS

The *Miscellaneous* menu is used to configure miscellaneous parameters to enable VistaLINK® control, to display orientation, and to perform a factory reset. The chart below shows the items available in the *Closed Captioning* menu. Sections 6.13.1 to 6.13.3 provide detailed information about each of the parameters.

VLNK	VistaLINK® control enable	Enables the ability to control the module through VistaLINK®.
DISO	Display Orientation	Sets the orientation of the card edge dot matrix display.
FRST	Factory Resets	Resets various components of the module to their factory settings.

Table 6-8: Miscellaneous Menu Parameters

6.13.1. Enabling VistaLINK® Control of the Module

Miscellaneous	
VLNK	
Enable Remote Control	*RMTE*
Disable Remote Control	*LCAL*

This configures the VistaLINK® control of the module.

RMTE enables VistaLINK® control of the module. The user is able to use VistaLINK® to monitor and configure the module in addition to the card edge controls.

LCAL disables VistaLINK® control of the module. The user is only able to monitor and configure the module from the card edge controls.

6.13.2. Setting Card Edge Display Orientation

Miscellaneous	
DISO	
Horizontal	*HORZ*
Vertical	*VERT*

With this control you can select a horizontal or vertical orientation for the displays to accommodate mounting the module in the 3RU or 1RU frames.

6.13.3. Resetting the Module to its Factory Defaults

Miscellaneous	
FRST	
Reset All	*ALL*
Video Control Reset	*VCR*
Audio Control Reset	*ACR*
Video Proc Reset	*VPR*
Audio Proc Reset	*APR*
Mixer A Reset	*MAR*
Mixer B Reset	*MBR*
Dolby Decoder & Met A Reset	*DAR*

With this control you can reset the entire module or certain functional blocks to its factory default condition.

ALL will reset the entire module to the factory settings.

VCR will reset the Video Control only to factory settings. All the other module settings will remain the same.

ACR will reset the Audio Control only to factory settings. All the other module settings will remain the same.

VPR will reset the Video Proc only to factory settings. All the other module settings will remain the same.

APR will reset the Audio Proc only to factory settings. All the other module settings will remain the same.

MAR will reset the Mixer A only to factory settings. All the other module settings will remain the same.

MBR will reset the Mixer B only to factory settings. All the other module settings will remain the same.

DAR will reset the Dolby Decoder A and Metadata A only to factory settings. All the other module settings will remain the same.

6.13.3.1. Resetting the Module to Factory Settings

The resetting of the module and its components to factory settings behave the same way. For the sake of simplicity in the manual, only the reset menu for the *Reset All* will be described.

Miscellaneous	
FRST	
ALL	
Yes	*YES*
No	*NO*

With this control you can reset the entire module to the factory settings.

YES will reset the module to the factory settings.

NO will not reset the module to factory settings.

7. JUMPERS

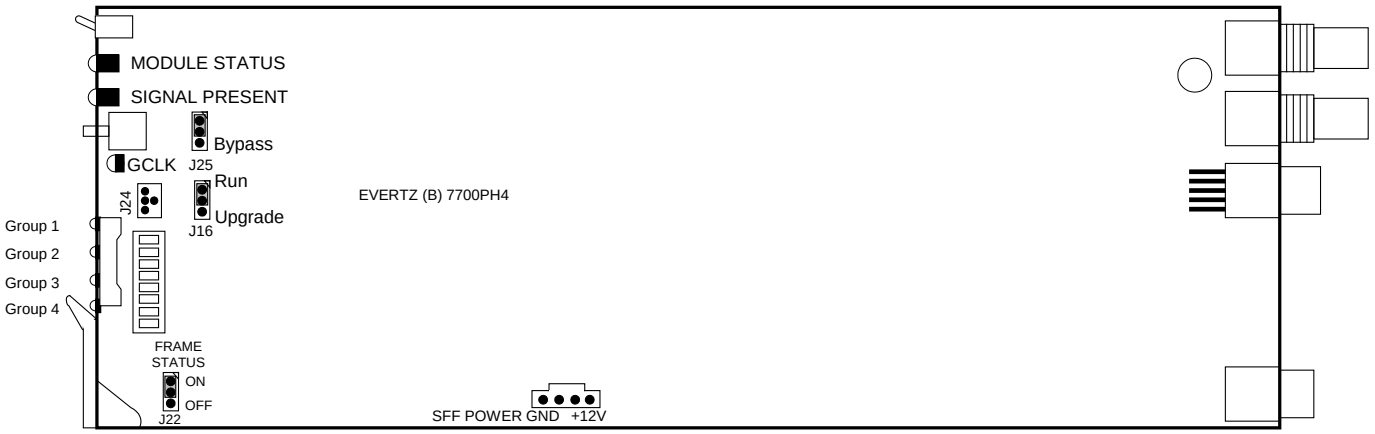


Figure 7-1: Location of Jumpers – Rev B Main Board

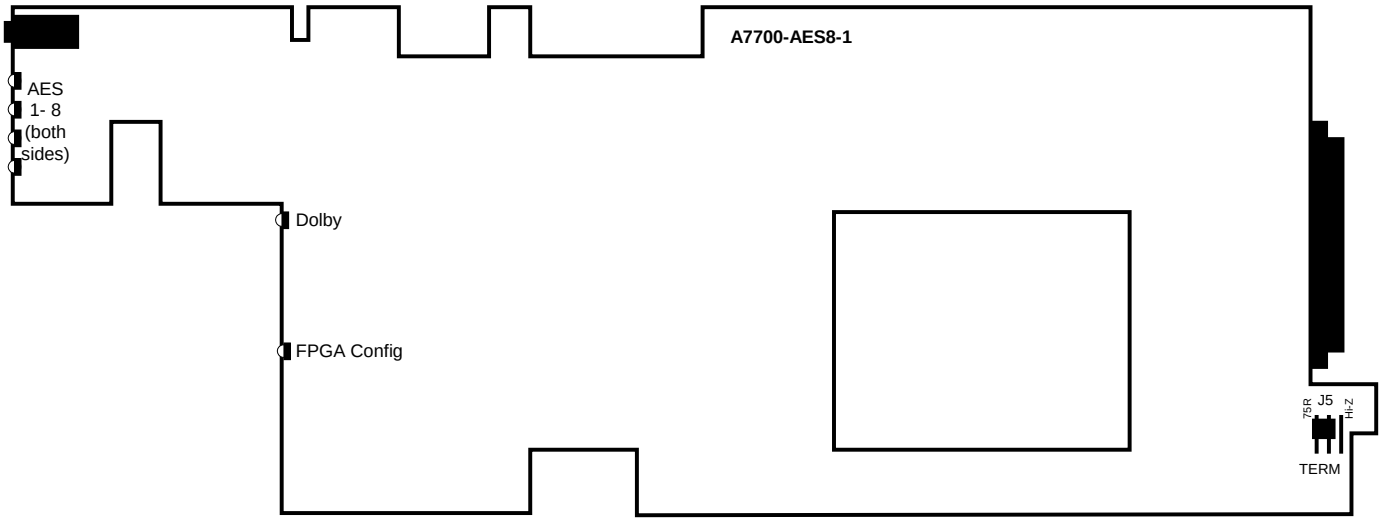


Figure 7-2: Location of Jumpers/LEDs – Rev. 1 Sub Board

7.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

FRAME STATUS: The FRAME STATUS jumper J22 located at the front of the main module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus.

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (Default)

When this jumper is installed in the Off position, local faults on this module will not be monitored.

7.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

Firmware updates can be performed using the **UPGRADE** jumper.

UPGRADE: The UPGRADE jumper is located at J16 jumper location on the front side of the main module and is used when firmware upgrades are being done to the module. For normal operation it should be switched to the *RUN* position as shown in the diagrams above. See the *Upgrading Firmware* chapter in the front of the binder for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. (Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in *Upgrading Firmware* chapter. Once the upgrade is completed, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

The Upgrade baud rate for the 7721AE8-DEE-HD module is 115,200 baud.

7.3. SELECTING WHETHER THE VIDEO REFERENCE INPUT IS TERMINATED

TERM: The TERM jumper J5 located at the rear of the sub board is used to terminate the video reference loop input. When in the 75R position, a 75 ohm terminating resistor will connect the input to ground. When in the HI-Z position, the reference input will be high impedance.

7.4. SELECTING WHETHER THE INPUT VIDEO IS BYPASS

BYPASS: The BYPASS jumper J25 is located at the front of the module. This jumper control is used to direct the video input directly to the video output, bypassing all processing.

8. VistaLINK® REMOTE MONITORING/CONTROL

8.1. WHAT IS VistaLINK®?

VistaLINK® is Evertz's remote monitoring and configuration platform which operates over an Ethernet network using Simple Network Management Protocol (SNMP). SNMP is a standard computer network protocol that enables different devices sharing the same network to communicate with each other. VistaLINK® provides centralized alarm management, which monitors, reports, and logs all incoming alarm events and dispatches alerts to all the VLPro Clients connected to the server. Card configuration through VistaLINK® PRO can be performed on an individual or multi-card basis using simple copy and paste routines, which reduces the time to configure each module separately. Finally, VistaLINK® enables the user to configure devices in the network from a central station and receive feedback that the configuration has been carried out.

There are 3 components of SNMP:

1. An SNMP manager, also known as a Network Management System (NMS), is a computer running special software that communicates with the devices in the network. Evertz VistaLINK® Pro Manager graphical user interface (GUI), third party or custom manager software may be used to monitor and control Evertz VistaLINK® enabled products.

2. Managed devices (such as 7721AE8-DEE-HD), each with a unique address (OID), communicate with the NMS through an SNMP Agent. Evertz VistaLINK® enabled 7700 series modules reside in the 3RU 7700FR-C MultiFrame and communicate with the manager via the 7700FC VistaLINK® frame controller module, which serves as the Agent.

3. A virtual database, known as the Management Information Base (MIB), lists all the variables being monitored, which both the Manager and Agent understand. Please contact Evertz for further information about obtaining a copy of the MIB for interfacing to a third party Manager/NMS.

For more information on connecting and configuring the VistaLINK® network, see the 7700FC Frame Controller chapter.

9. DEFAULT METADATA PARAMETERS

The following table lists the default values for the metadata generated when “auto” mode is selected (refer to the “DEAM” control defined in section 6.11.2.1).

Parameter Name	Value
Bitstream mode	Main Complete (CM)
Center downmix level	.707 (-3.0 dB)
Surround downmix level	.707 (-3.0 dB)
Dolby Surround Mode	not Dolby Surround
DC Filter	enabled
LFE Lowpass Filter	enabled
Lowpass Filter	enabled
Surround 3dB Atten	disabled
Surround Phase Shift	enabled
RF Overmod Protect	disabled
Dialogue Level	-27 dB
Audio Prod Info	no
Mixing Level	105 dB
Room Type	Not Indicated
Copyright	yes
Original Bitstream	yes
RF Mode Pro Film	Standard
Line Mode Pro Film	Standard
Extnd Bitstream	enabled
Pref Dwnmx	Lt/Rt
Lt/Rt C Dwnmx	.707 (-3.0 dB)
Lo/Ro C Dwnmx	.707 (-3.0 dB)
Lt/Rt S Dwnmx	.707 (-3.0 dB)
Lo/Ro S Dwnmx	.707 (-3.0 dB)
Dolby Srnd EX	not Surround EX
A/D Conv Type	Standard

Table 9-1: Default Metadata

Parameter Name	1 channel programs	2 channel programs	4 channel programs	6 channel programs	7.1 channel programs
Channel mode	1/0	2/0	3/1	3/2	3/2
LFE Channel	disabled	disabled	disabled	enabled	enabled

Table 9-2: Program Configuration Dependant Parameters

10. MENU QUICK REFERENCE

Video Control (VCTR)
- Video Standard Select
- Vertical Phase
- Horizontal Phase
- Frame Phase
- Freeze Mode

Video Proc Control (VP)
- Black Level Adjust
- Luma Gain Adjust
- Chroma Gain Adjust
- Hue Control

Headphone Monitor (HEAD)
- Headphone Volume
- Headphone Source

Status (STAT)
- Module Firmware
- FPGA1 Revision
- FPGA2 Revision
- Input Video Standard
- Operating Standard

Audio Control (ACTR)
- Coarse Audio Delay
- Fine Audio Delay
- SRC Mode
- C-Bit Control
- Embedded Group 1 Enable
- Embedded Group 2 Enable
- Embedded Group 3 Enable
- Embedded Group 4 Enable
- Demux Loss of Video Mode

Dolby Decoder Control (DLBY)
- Dolby Decoder A Control
- Dolby Decoder Loss of Signal

Miscellaneous (MISC)
- VistaLINK® Control Enable
- Display Orientation
- Factory Resets

Dobly Encoder
- Dolby Encoder A

Metadata (META)
- Metadata Decoder A
- DB-9 Configuration

Audio Proc Control (AP)
- Mixer A Source Select
- Mixer A Gain Control
- Mixer A Inversion Control
- Mixer B Source Select
- Mixer B Gain Control
- Mixer B Inversion Control
- Dolby-E Encoder Output Routing