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REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Preliminary Version	Jun 04
1.1	First Release	Nov 04
1.1	Manual Corrections	Feb 05
1.3	Added VID option to menu section	March 05
1.4	Changes to RS232 and RS422 configurations	April 05
1.5	Added +GPI option feature to the manual	Jan 06
1.6	Added SCTE 104 VistaLINK® controlled parameters	Oct 08
1.7	Added AFD and other new menu features	Apr 09
1.8	Added note regarding Dynamic GPI Control in section 5.3.3 Removed incorrect AFD Code selection in section 5.3.4	June 09

1. OVERVIEW

The 7721DE4-HD Quad Serial data embedder inserts 4 x RS-232 or RS-422 serial data streams and GPI contact closure information into a 270 Mb/s SD-SDI or 1.5Gb/s HD-SDI video signal. The RS-232/422 serial data and GPI information are first formatted into an AES audio signal, then embedded into the video stream according to SMPTE 272M-A for SD-SDI and SMPTE 292M for HD-SDI. A data error detection and correction scheme is also applied to maintain data integrity for the data de-embedder at the receiver end. At the embedded packet layer, data packets resemble and have the same group DIDs as embedded audio packets. The data is packetized and inserted into the AES sub-frame according to SMPTE 337M.

The 7721DE4-HD module also has the ability to insert Active Format Descriptor (AFD) packets into the VANC of the output video. This can be done in a static, pass-through check, or GPI controlled method or combination of these.

Adding the +GPI option to the encoder (model 7721DE4-HD+GPI) allows the user to encode remote control contact closure information in VITC (SD) or RP188 ATC (HD) user bits **instead of** encoding the GPI information into the AES embedded data stream. This feature allows the user to use the six parallel remote control inputs to set one of the six remote control user bit patterns. At the decoder end the model 7721DD4-HD+GPI Decoder module decodes the remote control user bits and outputs them on six open collector outputs.

The 7721DE4-HD series modules occupy one card slot in the 3RU frame (7700FR-C), which will hold up to 15 modules or one slot in the 1RU frame (7701FR), which will hold up to three modules. The 7721DE4-HD series modules may also be used in a standalone unit (S7701FR).

Features:

- Automatic detection of SD-SDI or HD-SDI video input
- 4 x RS-232/422 serial inputs with selectable baud rate
- Parity selection: none, even or odd
- Support serial input with BREAK character according to SMPTE 207M
- Packetize data into sub-frame AES format according to SMPTE 337M
- Share the same group DIDs as for embedded audio, selectable from group 1 to 4
- Group selection for mapping data into one of four Audio Groups
- Redundant data transmission to allow data error detection and correction at the receiver end
- Automatically remove the existing embedded packets when the conflict of group DID occurs
- Six GPI inputs to embed simple control information into the video input
- Card edge LEDs indicate video signal and data presence, cable equalization and module faults
- Smart AFD Insertion (SMPTE 2016)

Additional Features with +GPI Option Installed:

- Transmits remote control contact closure information in VITC or ATC user bits (instead of encoding the GPI information into AES data)

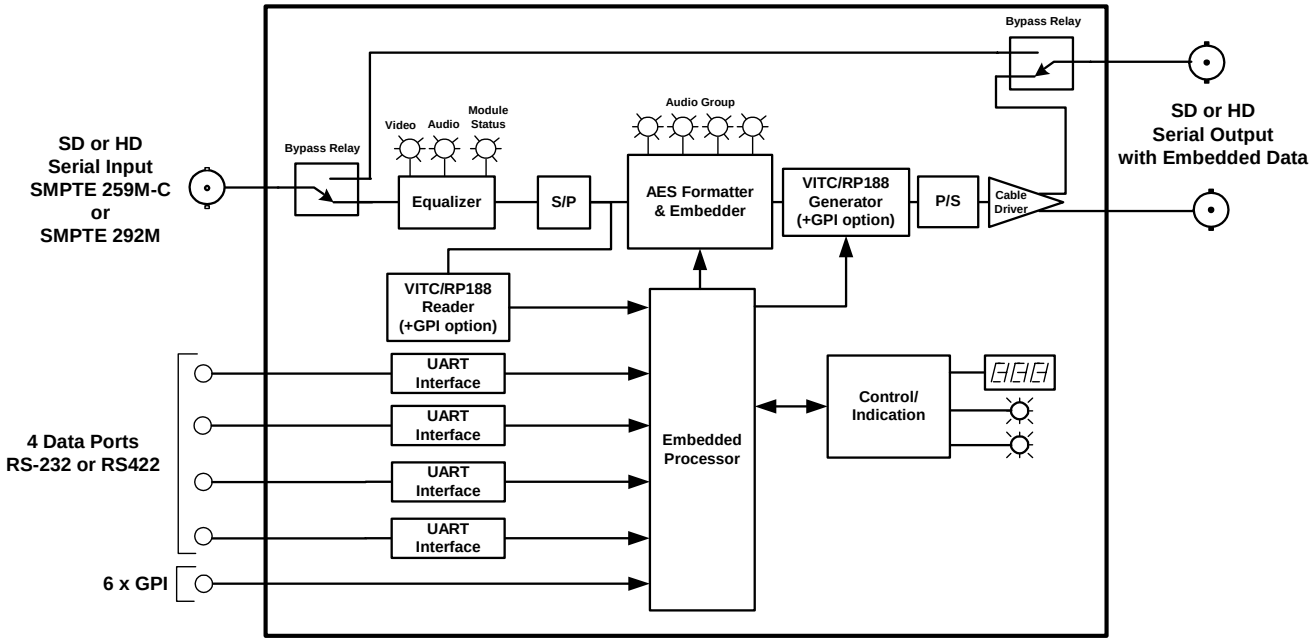

Figure 1-1: 7721DE4-HD-HD Block Diagram

2. INSTALLATION

The 7721DE4-HD module comes with a companion rear plate that has 3 BNCs and a 16 pin removable Terminal Strip Connector. For information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.

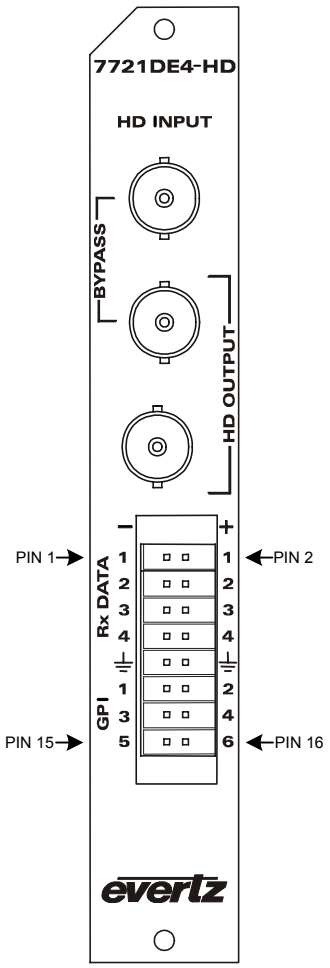

Figure 2-1: 7721DE4-HD Rear Panel

Some early versions of the 7721DE rear plate silkscreen were incorrect. Please compare your 7721DE4-HD rear plate to Figure 2-1. Ensure your Rx DATA Polarities on your rear plate (+ and -) are correct and match the above drawing. Negative (-) Polarity is the left set of pins and positive polarity (+) is the right set of pins. If polarities are reversed on your rear panel, silkscreen, please note and correct.

2.1. VIDEO INPUTS AND OUTPUTS

HD INPUT: Input BNC connector for 10-bit serial digital video signals compatible with the SMPTE 259M-C or SMPTE 292M standards.

HD OUTPUT: There are two BNC connectors with reclocked serial component video outputs, compatible with the SMPTE 259M and SMPTE 292M standard. These outputs contain the input video with the data from the RS-232/422 and GPI ports embedded in accordance with the SMPTE 337M. The top output is protected by a bypass relay, which will activate in the event of power loss to the module. The remaining output is not bypass protected.

When the +GPI option is installed, these outputs will also have ATC (HD) or VITC (SD) time code inserted with GPI information encoded into the user bits.

2.2. TERMINAL STRIP INPUTS

The 7721DE4-HD modules have a 16 pin terminal block containing 4 serial data port inputs and six GPI inputs. The input cables can be secured into the removable portion of the terminal strips using a small screwdriver. The removable part of the terminal strip is then inserted into the rear panel.

Table 2-1 shows the pin out of the Terminal Block labeled **RX DATA.** Note the location of pins shown in Figure 2-1.

Pin Number	Rear Panel Reference	RS-422 IN	Description	RS-232 IN	Description
1	RX Data - 1	DATA 1 IN 422	Receive Data -	DATA 1 IN 232	RXD for UART 1
2	RX Data + 1	DATA 1 IN 422	Receive Data +		
3	RX Data - 2	DATA 2 IN 422	Receive Data -	DATA 2 IN 232	RXD for UART 2
4	RX Data + 2	DATA 2 IN 422	Receive Data +		
5	RX Data - 3	DATA 3 IN 422	Receive Data -	DATA 3 IN 232	RXD for UART 3
6	RX Data + 3	DATA 3 IN 422	Receive Data +		
7	RX Data - 4	DATA 4 IN 422	Receive Data -	DATA 4 IN 232	RXD for UART 4
8	RX Data + 4	DATA 4 IN 422	Receive Data +		
9	⏚	Digital Ground			
10	⏚	Digital Ground			
11	GPI 1	General Purpose Input 1			
12	GPI 2	General Purpose Input 2			
13	GPI 3	General Purpose Input 3			
14	GPI 4	General Purpose Input 4			
15	GPI 5	General Purpose Input 5			
16	GPI 6	General Purpose Input 6			

Table 2-1: RX DATA Terminal Block Input

The RS-232 or RS-422 inputs are located on pins 1 through 8. Common digital grounds are shared for all the Data Inputs, located at Pins 9 and 10.

Some early versions of the 7721DE rear plate silkscreen were incorrect. Please compare your 7721DE4-HD rear plate to Figure 2-1. Ensure your Rx DATA Polarities on your rear plate (+ and -) are correct and match the above drawing. Negative (-) Polarity is the left set of pins and positive polarity (+) is the right set of pins. If polarities are reversed on your rear panel silkscreen, please note and correct.

2.2.1. RS232 Data Ports

To transfer RS-232 data, first set jumper J33 to RS-232 mode. Connect your RS-232 TX signal to the pin marked RX DATA - #. See Table 2-1 as reference. Connect the ground signal from your RS-232 source to GROUND pins 9 or 10. Configure the Port settings via the card edge menu. (See Section 5.12.)

2.2.2. RS422 Data Ports

To transfer RS-422 data, first set jumper J33 to RS-422 mode. Connect your RS-422 TXD + and TXD - source signals to RX DATA + and RX DATA - # pins. See Table 2-1 as reference. Connect the ground signal from your RS-422 source to GROUND Pins 9 or 10. Configure the Port settings via the card edge menu. (See Section 5.12.)

2.2.3. General Purpose Inputs

The user can activate GPIs simply by connecting the GPI input pins (PINS 11-16) to Ground. This can be done with a button, switch, relay or an open collector transistor. On the standard version, the GPI information is embedded into the data stream and will activate the corresponding GPO outputs on the 7721DD4-HD Data De-embedder. They can be used to pass simple contact closure information along with the video signal.

When the +GPI option is fitted the GPI information is encoded in VITC (for SD inputs) or RP188 ATC (for HD inputs) user bits instead of encoding the GPI information into the AES embedded data stream. See section 5.12.

When using the GPI's to control AFD insertion, they can be configured to be active low or active hi (+5 or 12 V). See section 5.3.

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT

Standard: SMPTE 259M C, SMPTE 292M
Connector: BNC per IEC 169-8
Equalization: Automatic 300m @ 270 Mb/s, 100m @1.5Gb/s with Belden 1694A or equivalent cable
Return Loss: > 15 dB up to 1.5Gb/s

3.2. SERIAL VIDEO OUTPUTS WITH EMBEDDED DATA

Number of Outputs: 2 output (bypass relay protected)
Standard: same as input
Connectors: BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 600ps nominal SD-SDI, 200ps nominal HD-SDI
Overshoot: <10% of amplitude
Return Loss: > 15 dB up to 1.5Gb/s (Relay Protected)
> 10 dB up to 1.5Gb/s
Wide Band Jitter: < 0.2 UI

3.3. DATA INPUT

Standard: 4 x RS-232 or RS-422
Connector: Terminal Block
Baud Rate: 110, 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, or 115200
Format: 8 bits, parity (none, even or odd), 1 or 2 stop bit

3.4. GENERAL PURPOSE INPUTS

Number of Inputs: 6
Type: Opto-isolated, active low (or active high configurable in AFD mode)
Connector: Terminal Block
Signal Level: pull up to +5V or +12V nominal (jumper selectable)

3.5. TIME CODE (+GPI OPTION ONLY)

3.5.1. Ancillary Time Code Generator/Reader (ATC) - HD video Standards only

Standard: SMPTE RP188
Generator Lines: VITC packets – Line 9, 571; LTC packets – Line 10 as per RP188
Reader Line: Autodetect

3.5.2. Vertical Interval Time Code Generator/Reader (VITC) - SD video Standards only

Standard: SMPTE 12M, SMPTE 266M D-VITC
Line Range:
525i/59.94: 10 to 21
625i/50: 6 to 22
Generator Lines: Follows input VITC or user selectable when no input VITC
Reader Line: Autodetect or user selectable

3.6. EMBEDDING DELAY

3.6.1. Video I/O Delay

The video I/O delay is approximately 12µs

3.6.2. Data Embedding Delay – Serial Ports

Average Latency: 1200µs +/- 20% (All Baud rates)

3.6.3. Delay For Data Embedding - GPI signals

Average Latency: 20µs +/- 10%

3.6.4. Delay For Time Code Embedding - GPI signals (+GPI option only)

Encoding Latency: 1 frame plus GPI sampling delay
(GPI inputs sampled once per frame at beginning of field 1)

3.7. ELECTRICAL

Voltage: + 12VDC
Power: 12 Watts
EMI/RFI: Complies with FCC Part 15, class A and EU EMC directive

3.8. PHYSICAL

7700 or 7701 frame mounting:
Number of slots: 1

Stand Alone Enclosure:
Dimensions: 14 " L x 4.5 " W x 1.9 " H
(355 mm L x 114 mm W x 48 mm H)
Weight: approx. 1.5 lbs. (0.7 Kg)

4. STATUS INDICATORS

The location of the status LEDs is shown in Figure 6-1.

4.1. MODULE STATUS LEDS

MODULE OK: This Green LED will be On when the module is operating properly.

LOCAL FAULT: This Red LED makes it easy to identify one module in a frame that is missing an essential input or has another fault.

The LED will blink on and off if the microprocessor is not running.

The LED will be on solid when input video is missing or audio is missing from both AES inputs or there is a fault in the module power supply.

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

AUDIO: This Green LED will be On when there is embedded audio/data present.

4.2. AUDIO/DATA GROUP STATUS LEDS

Four LEDs located on the lower end of the module (opposite the Card Edge Display) indicate the status of the audio/data groups. Group LED 1 is located closest to the center of the module.

Data LED	Colour	Group Status
1	Off	There is no group 1 data present on the input port
	On/Pulse	Group 1 data is being encoded/decoded
2	Off	There is no group 2 data present on the input port
	On/Pulse	Group 2 data is being encoded/decoded
3	Off	There is no group 3 data present on the input port
	On/Pulse	Group 3 data is being encoded/decoded
4	Off	There is no group 4 data present on the input port
	On/Pulse	Group 4 data is being encoded/decoded

Table 4-1: Data Status LEDs

5. CARD EDGE MENU SYSTEM

5.1. 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 push up on 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 menu item you are setting (the display shows the parameter name you were setting). To change 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 you to the previous menu (the one that was used to get into the current menu). On the main menu, *BACK* will both take the user to the normal operating mode (indicated by the moving line on the card edge display).

5.2. TOP LEVEL MENU STRUCTURE

Table 5-1 gives 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 5.12.1 to 5.16.

AFD	Configures Active Format Descriptor (AFD) parameters.
GPIL	Embedded LTC GPI Option.
GPIV	Embedded VITC GPI Option.
PRST	Performs a factory reset.
DSPL	Controls the display orientation.
LOV	Controls the loss of video mode.
ABIT	Sets the audio bit resolution encoding.
VDUR	Sets the duration of VITC loss for alarming.
R188	Controls which RP188 timecode is used.
DLAY	Configures the delay between incoming GPIs. (+GPI option)
VGLN	Sets the lines for generated VITC lines. (+GPI option)
VRLN	Sets the range for read VITC lines. (+GPI option)
VID	Sets the input video standard.
EMB	Enables or disables the data embedders.
HANC	Allows the user to Clean or Pass upstream HANC data.
PRT1	Allows the user to configure the settings for Port 1.
PRT2	Allows the user to configure the settings for Port 2.
PRT3	Allows the user to configure the settings for Port 3.
PRT4	Allows the user to configure the settings for Port 4.

Table 5-1: Top End Menu Structure

5.3. ACTIVE FORMAT DESCRIPTOR (AFD) CONTROL

Active Format Description (AFD) is intended to guide downstream equipment regarding the display of aspect ratio. It is implemented as an embedded packet within the video stream. This packet contains information such as the aspect ratio formatting of the original material, how the material is currently formatted and the primary and secondary ways that the video is best displayed. This information determines whether the video should be *letterboxed*, *pillarboxed*, *4:3* or *16:9*.

MODE	Sets the AFD Embedding Mode.
LINE	Sets what line AFD codes will be embedded on.
GPI	Loads the GPI to be configured by the following six menu items.
CODE	Sets the AFD code to be embedded.
AR	Sets the aspect ratio of the source frame.
BARS	Sets the bar data bar type.
BAR1	Sets the first bar data value.
BAR2	Sets the second bar data value.
GPIM	Controls the GPI active condition.

Table 5-2: **AFD Menu Control**

5.3.1. Configuring AFD Embedding Mode

AFD
MODE
PASS
BLCK
FI
CI
G_FI
G_CI

This parameter sets the AFD embedding mode.

Selecting PASS will pass through existing AFD codes.

Selecting BLCK will erase any incoming AFD codes.

Selecting FI will allow static AFD insertion while block incoming AFD.

Selecting CI will perform a check and insert. If AFD is present, it will be passed through. If it is not present, then a static AFD code will be inserted.

Selecting G_FI or G_CI will perform GPI controlled functionality of the FI or CI commands respectively. When the GPI is active, the commands will be the same as the FI or CI commands. When it is inactive, incoming AFD will be passed-through.

5.3.2. Configuring the AFD Line number

AFD
LINE
7-24 (12)

This parameter sets which line AFD packets will be embedded on.

5.3.3. Configuring Dynamic GPI Control

AFD
GPI
NONE
1-6

This parameter sets which GPI will be configured by the remaining menu settings. GPI 1-6 can be selected corresponding to the physical GPI inputs.

A selection of NONE control static GPI insertion.

Once the *Dynamic GPI Control* is configured (i.e. GPI 1), the remaining AFD parameters will apply to the selected GPI.

5.3.4. Configuring the AFD Insertion Code

AFD	
CODE	Sets the AFD code that is inserted. Refer to Figure 5-1 for a visualization of each code. These codes are used in conjunction with the AR parameter.
0	0000
2	0010
3	0011
4	0100
8	1000
9	1001
10	1010
11	1011
13	1101
14	1110
15	1111

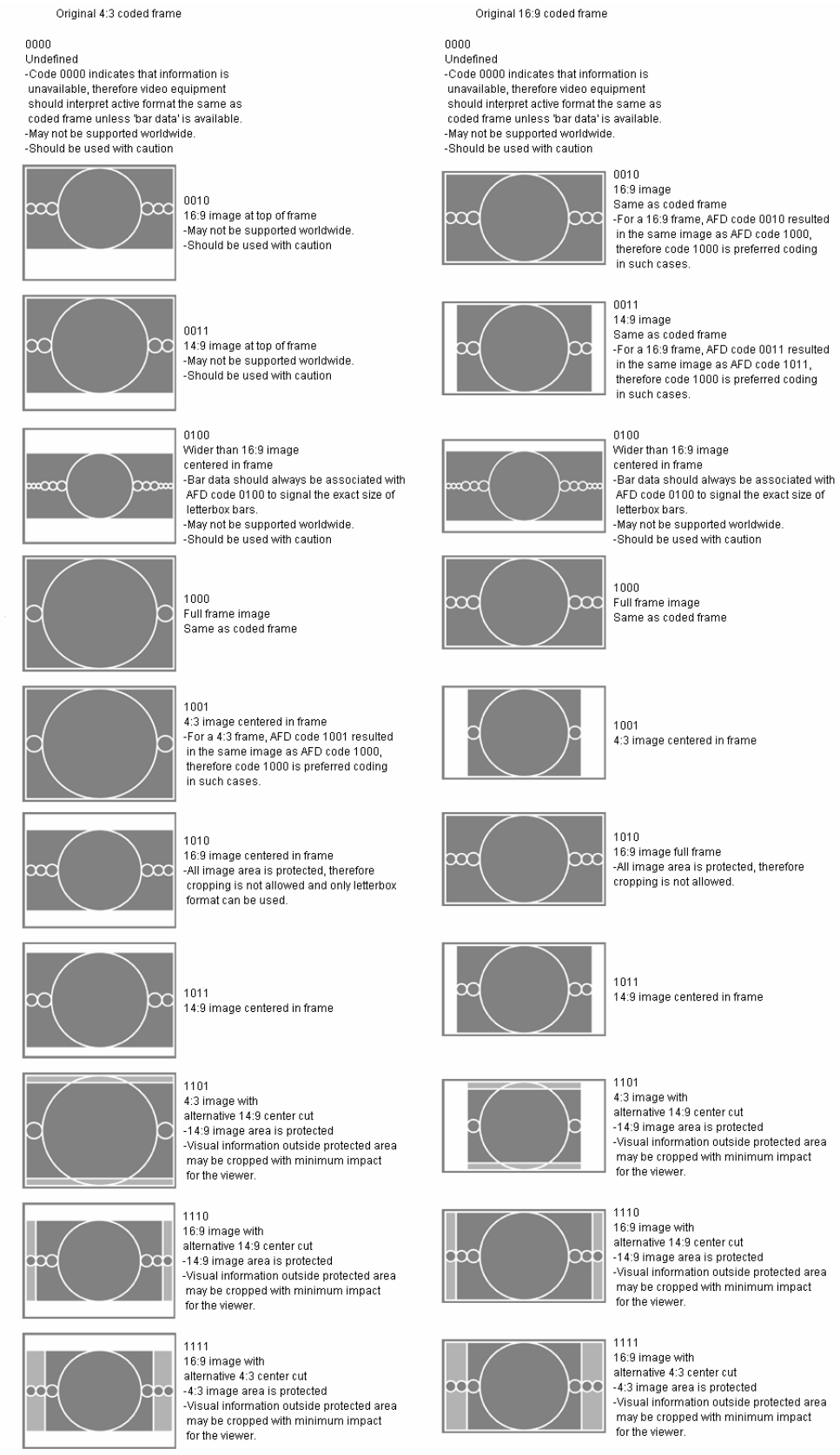

Figure 5-1: AFD Control Codes

5.3.5. Configuring the Aspect Ratio of the AFD Code

AFD	AR	
		4x3
		16x9

This parameter sets whether the original frame is 4:3 or 16:9 aspect ratio coded.

A selection of 4x3 will choose AFD codes from the 4:3 selections.

A selection of 16x9 will choose AFD codes from the 16:9 selections.

5.3.6. Configuring the Bar Type For Bar Data

AFD	BARS	
		PLLR
		LTTR

This parameter sets the type of bars that are on the picture when using bar data.

A selection of PLLR will be valid for video that has bars on the sides (pillarboxed).

A selection of LTTR will be valid for video that has bars on the top and bottom (letterboxed).

5.3.7. Configuring the Aspect Ratio of the AFD Code

AFD	BAR1

This parameter sets the size of the first bar, as selected under Bar Type.

The values available in this field will depend on the input video format.

5.3.8. Configuring the Aspect Ratio of the AFD Code

AFD	BAR2

This parameter sets the size of the second bar, as selected under Bar Type.

The values available in this field will depend on the input video format.

5.3.9. Configuring the Aspect Ratio of the AFD Code

AFD	GPIM	
		NONE
		LOW
		HIGH

This parameter sets the GPI active condition for the selected GPI.

A selection of NONE will disable the GPI for AFD insertion.

A selection of LOW will make the GPI active LO.

A selection if HIGH will make the GPI active HI (+5 or 12 V, jumper selectable).

5.4. EMBEDDED LTC GPI CONTROL

GPIL
NONE
UPSG
COMG
LCLG

This parameter sets how GPIs will be inserted into incoming LTC timecode. This menu option will only be available if LTC or BOTH are selected under RP188.

A selection of NONE will send out LTC timecode with no GPIs encoded.

A selection of UPSG will send out LTC time code with previously upstream GPIs.

A selection of COMG will combine local and upstream GPIs in the LTC.

A selection of LCLG will encode only local GPIs in LTC.

5.5. EMBEDDED VITC GPI CONTROL

GPIV
NONE
UPSG
COMG
LCLG

This parameter sets how GPIs will be inserted into incoming VITC timecode. This menu option will only be available if VITC or BOTH are selected under RP188.

A selection of NONE will send out VITC timecode withy no GPI's encoded.

A selection of UPSG will send out VITC time code with previously upstream GPIs.

A selection of COMG will combine local and upstream GPI's in the VITC.

A selection of LCLG will encode only local GPIs in VITC.

5.6. FACTORY RESET CONTROL

PRST
0000
FACT

This parameter will perform a factory reset, when FACT is selected, all parameters will be restored to a preset default.

5.7. CARD-EDGE DISPLAY CONTROL

DSPL
VERT
HORZ

This parameter sets how the card-edge LED display is oriented.

Selecting VERT will cause it to be displayed vertically. (Suited for insertion in a standard 3RU frame).

Selecting HORZ will cause it to be displayed horizontally. (Suited for insertion in a 1RU or standalone frame).

5.8. LOSS OF VIDEO MODE CONTROL

LOV
BLUE
BLCK

This parameter sets the output display when no video is applied on the input. Note that the module will always have a video output, therefore GPIs, and data, etc. are always passed through.

5.9. AUDIO BIT ENCODING CONTROL

ABIT
AUTO
16BT
20BT
24BT

This parameter sets the resolution of audio bit encoding.

5.10. VITC LOSS FRAME DURATION

VDUR
0001-0060

This parameter sets how many frames will pass without VITC present before a VITC loss alarm is raised.

5.11. RP188 TIME CODE CONTROL

R188
VITC
LTC
BOTH

This parameter sets which RP188 time code will be used for GPI insertion.

A selection of BOTH will find valid time code in either VITC or LTC, and use that for GPI insertion.

5.12. GPI USER BIT REMOTE CONTROL OPTION (+GPI OPTION)

When the +GPI option is fitted, the 7721DE4-HD+GPI allows the user to encode remote control contact closure information in VITC (for SD inputs) or RP188 ATC (for HD inputs) user bits instead of encoding the GPI information into the AES embedded data stream. Incoming timecode (VITC or ATC) will be passed through with the user bits modified. If there is no incoming timecode, then the 7721DE4-HD+GPI will generate VITC or ATC depending on the video format. This feature allows the user to use the six parallel remote control inputs on the 7721DE4-HD+GPI to set one of the six remote control user bit patterns. At the decoder end the 7721DD4-HD+GPI ATC GPI Decoder module decodes the remote control user bits and outputs them on six open collector outputs.

The User bit remote control works on one of two modes. In immediate mode, the GPI1 to GPI6 inputs are used to set special codes in the timecode user bits as long as the GPI is closed to ground. When the 7721DD4-HD+GPI decodes these special user bit codes it closes the corresponding GPO output. In deferred GPI mode the GPI input to the encoder card occurs a fixed number of frames (user programmable on the encoder using the *DLAY* menu item) before the user actually wants the GPO Output to occur at the decoder. When the GPI input occurs at the encoder, a special code is sent in the user bits indicating the amount of delay and which GPI should activate. When the decoder receives this code, instead of outputting the GPO immediately, it will start a countdown timer and output the GPO at the delayed time. In addition, the encoder will output a second user bit code at the delayed time. The decoder will receive this code at the same time as its countdown reaches zero and output a GPO based on one or the other or both of these codes. This redundancy provides protection for lost contact closure data due to breakups in the video path between the encoder and decoder.

When the 7721DE4-HD+GPI is operated in immediate mode with standard definition video, its VITC GPI encoding may be decoded with the 7721DD4-HD+GPI as well as the 7721GPI-D VITC GPI decoder modules. When you are using deferred mode you must use the 7721DD4-HD+GPI as a decoder.

When the 7721DE4-HD+GPI is operated with high definition video, its ATC GPI encoding may be decoded with the 7721DD4-HD+GPI (in immediate or deferred mode) decoder modules. If the video is downconverted using a 7710DCDA or similar downconverter that passes the timecode through to the downconverted output, the encoded GPI signals can be decoded by the 7721GPI-D SDI decoder, in immediate mode only. When you are using deferred mode you must use the 7721DD4-HD+GPI as a decoder.

When the 7721DD4-HD+GPI is operated with high definition video, its ATC GPI decoder is compatible with the 7721DE4-HD+GPI (in immediate or deferred mode) as well as the HD9010TM.

The parallel port pin designations for the various encoders are shown in Table 5-3. Table 5-3 also shows the corresponding output pins of the various decoders and the user bits that control them.

GPI	HD9010TM PIN (IN)	7721DE4-HD+GPI PIN (IN)	7721DD4-HD+GPI PIN (OUT)	7721GPI-D PIN (OUT)	User Bit Data byte 1
1	1	11	11	4	81
2	8	12	12	8	82
3	4	13	13	3	84
4	9	14	14	1	88
5	5	15	15	13	90
6	2	16	16	14**	A0

Table 5-3: **GPI I/O Mapping (+GPI option installed)**

The menu items described in sections 5.12.1 to 5.12.3 are used to configure the GPI functions of the embedder when the +GPI option is fitted. These menu items are not available in the standard version.

5.12.1. Configuring the GPI Delay

DLAY
- *0000*
- *0000 to 1023*

The *DLAY* menu is used to configure the delay (in frames) between GPIs that are transmitted over VITC. The range of the parameter is 0 to 1023 frames.

The default value is 0 frames of delay between GPIs.

5.12.2. Setting the VITC Generator Lines

The *VGLN* menu sets the lines to generate VITC for standard definition video formats. The chart below shows the items available in the *VGLN* menu. Sections 5.12.2.1 to 5.12.2.2 give detailed information about each of the menu items.

LN 1	Sets the value for first line to generate VITC on.
LN 2	Sets the value for second line to generate VITC on.

5.12.2.1. Setting the First Line to Generate VITC

VGLN
- *LN 1*
  - *0010 to 0032 (525)*
  - *006 to 0032 (625)*

This parameter allows the user to set the first line to generate VITC when there is no incoming VITC.

For 525i/59.94 video, the range is line 10 to line 32 and the default value is line 14.

For 625i/50 video, the range is line 6 to line 32 and the default value is line 19.

5.12.2.2. Setting the Second Line to Generate VITC

VGLN
LN 2
0010 to 0032 (525) 006 to 0032 (625)

This parameter allows the user to set the second line to generate VITC when there is no incoming VITC. To generate VITC on only one line set this parameter to the same value as the *LN 1* menu item.

For 525i/59.94 video, the range is line 10 to line 32 and the default value is line 16.

For 625i/50 video, the range is line 6 to line 32 and the default value is line 21.

5.12.3. Setting the VITC Reader Lines

The *VRLN* menu sets the range of VITC lines to look for incoming VITC for standard definition video formats. The chart below shows the items available in the *VRLN* menu. Sections 5.12.3.1 to 5.12.3.2 give detailed information about each of the menu items.

STRT	Sets the beginning of the VITC reader range.
END	Sets the end of the VITC reader range.

5.12.3.1. Setting the Start Line of the VITC Reader Range

VRLN
STRT
0010 to 0032 (525) 006 to 0032 (625)

This parameter allows the user to set the first line to look for VITC on the incoming video.

For 525i/59.94 video, the range is line 10 to line 32 and the default value is line 10.

For 625i/50 video the range is line 6 to line 32 and the default value is line 6.

5.12.3.2. Setting the End of the VITC range

VRLN
END
0010 to 0032 (525) 006 to 0032 (625)

This parameter allows the user to set the last line to look for VITC on the incoming video.

For 525i/59.94 video, the range is line 10 to line 32 and the default value is line 20.

For 625i/50 video, the range is line 6 to line 32 and the default value is line 21.

The 7721DE4-HD+GPI will NOT allow the user to select values where the START line is greater than the END line. If the user selects a START line greater than the END line, the module will automatically move the END line to another valid value.

5.13. SETTING THE INPUT VIDEO STANDARD

VID	
AUTO	Auto detect
3I60	1035i/60
3I59	1035i/59.94
1P30	1080p/30
1P29	1080p/29.97
1P25	1080p/25
1P24	1080p/24
1P23	1080p/23.98
7P60	720p/60
7P59	720p/59.94
1I60	1080i/60 (1080p/30sF)
1I59	1080i/59.94 (1080p/29.97sF)
1I50	1080i/50 (1080p/25sF)
1S24	1080p/24sF
1S23	1080p/23.98sF
5I59	525i/59.94 Note some firmware versions may show *NTSC*
6I50	625i/50 Note some firmware versions may show *PALB*

Sets the input video standard.

5.14. ENABLING THE DATA EMBEDDER

EMB
On
Off

The *EMB* function allows the user to enable or disable the embedding of the data.

Setting the *EMB* to *On* will enable the embedding of data into the audio group.

Setting the *EMB* to *Off* will disable the embedding of data.

5.15. SETTING THE HANDLING OF INCOMING HANC DATA

HANC
PASS
CLN

The *HANC* menu allows the user to pass or remove HANC audio data from the incoming video feed. The RS232/422 data sent from the 7721DE4-HD is preserved, but all audio in the HANC can be removed.

Selecting *PASS* will pass all upstream audio in the HANC.

Select *CLN* to remove all upstream audio.

5.16. CONFIGURING THE SERIAL PORTS

The *PRT1*, *PRT2*, *PRT3*, and *PRT4* menus allow the user to configure port settings to transfer data from the 7721DE4-HD to the 7721DD4-HD. The user will also be allowed to configure which audio group and channel to embed for each port. Sections 5.16.1 to 5.16.8 will describe the various parameters ports.

BAUD	Configures the Baud rate of the port.
STOP	Configures the Port Stop bits.
PRTY	Configures the parity setting of the Port
DATA	Configures the data length of the Port
LOOP	Configures the Loopback status of the UART for the Port
UART	Configures the status of the UART for the Port
GRP	Sets the audio group to de-embed to the Port
CHNL	Sets the audio channel to de-embed to the Port

Table 5-4: Port Menu Structure

The parameters are the same for all four ports. For simplicity sake, only the parameters for *PRT1*, will be described.

The following Port settings can be configured by the 7721DE4-HD ONLY and are transmitted within Control packets to the downstream 7721DD4-HD. The 7721DD4-HD will automatically configure itself to the same parameters and allows the user to MONITOR the parameters.

5.16.1. Configuring the Baud Rate of Port 1

- *PRT1*
  - *BAUD*
    - *110*
    - *300*
    - *600*
    - *1200*
    - *2400*
    - *4800*
    - *9600*
    - *14400*
    - *19200*
    - *38400*
    - *57600*
    - *115200*

The Baud setting allows the user to monitor the baud rate of the data sent from the 7721DE4-HD to the 7721DD4-HD.

5.16.2. Configuring the Stop Bits of Port 1

- *PRT1*
  - *STOP*
    - *1*
    - *2*

Allows the user to set the number of stop bits.

5.16.3. Configuring the Parity Setting of Port 1

PRT1
PRTY
None
Even
Odd

Allows the user to set the parity of the port.

5.16.4. Configuring the Data Length of Port 1

PRT1
DATA
5
6
7
8
None

Allows the user to set the data length of the packets being sent.

5.16.5. Configuring the Loopback Status of the UART for Port 1

PRT1
LOOP
On
Off

This sets the Loopback status of the UART for Port 1.

When *On* is displayed, the loopback function of the UART for the port is enabled.

When *Off* is displayed, the loopback function is disabled.

5.16.6. Configuring the Status of the UART for the Transmit Port 1

PRT1
UART
On
Off

This sets the status of the UART for Port 1.

When *On* is displayed, the port is enabled and ready to transmit data.

When *Off* is displayed, the port is disabled.

5.16.7. Setting the Audio Group to Embed for Port 1

PRT1
GRP
GRP1
GRP2
GRP3
GRP4

This parameter allows the user to select which audio group the Port 1 data will be embedded into.

Note: The user CANNOT set the same Audio Group and Channel to more than ONE transmit port.

5.16.8. Setting the Audio Channel to Embed for Port 1

PRT1
CHNL
CH 1
CH 2
CH 3
CH 4

This parameter allows the user to select which audio channel within the group set by the *GRP* menu item the Port 1 data will be embedded into.

Note: The user CANNOT set the same Audio Group and Channel to more than ONE transmit port.

6. JUMPERS AND USER ADJUSTMENTS

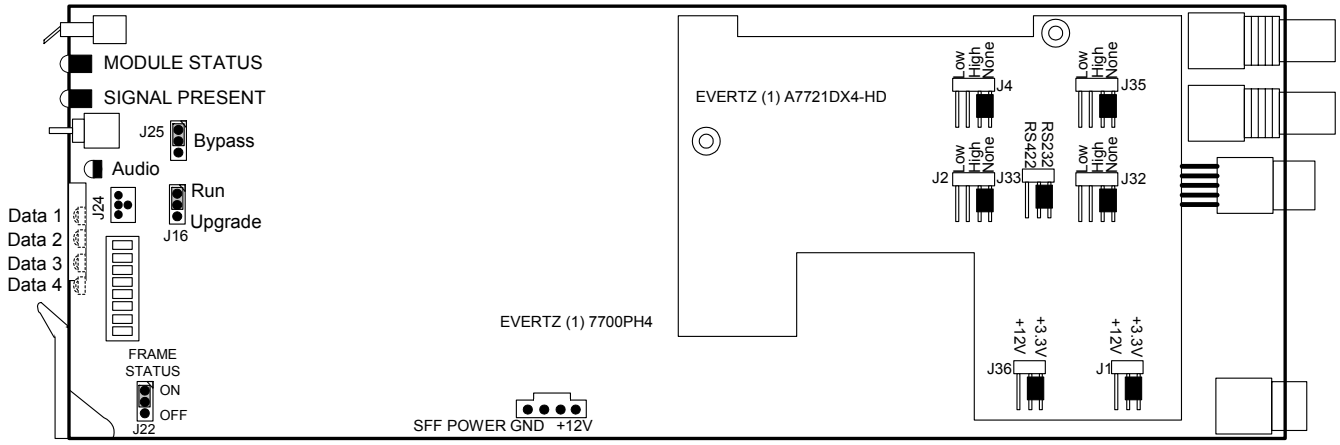

Figure 6-1: Location of Jumpers (Rev 1 Submodule)

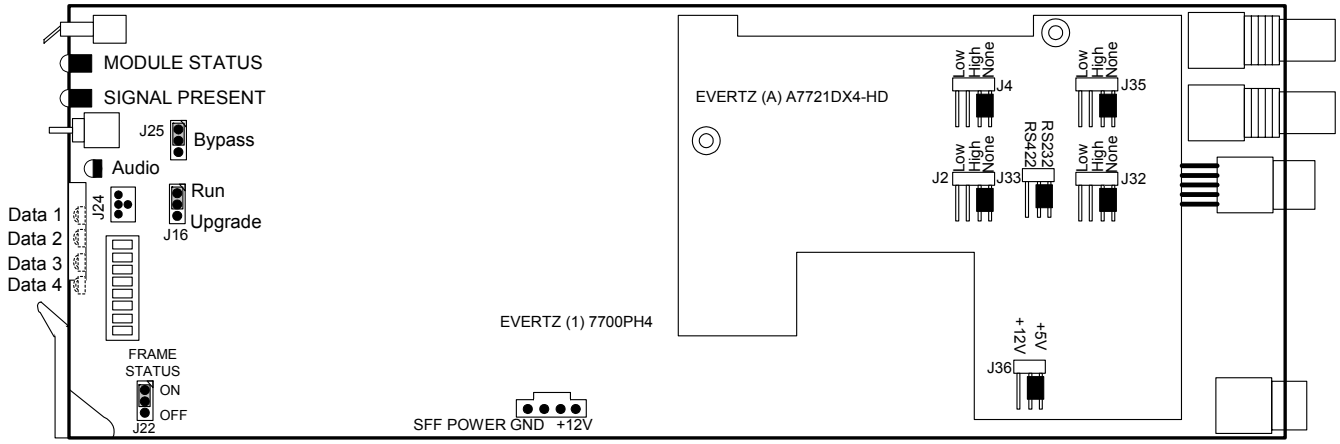

Figure 6-2: Location of Jumpers (Rev A Submodule)

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

FRAME STATUS: The FRAME STATUS jumper located at the front of the 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 input) 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.

6.2. SETTING THE BYPASS RELAY JUMPER

BYPASS: The BYPASS jumper J25 controls the Bypass relay functionality.

Set the jumper to the top 2 pins to allow the Bypass relay to only activate when the card loses power. The relay will allow video to pass through the card when it is powered up.

Set the jumper to the bottom 2 pins to activate Bypass relay all the time. The video will not pass through the card. The non-bypassed video output will not have video available.

6.3. SELECTING THE DATA COMMUNICATIONS STANDARD (RS-232 OR RS-422)

232/422: The 232/422 jumper J33 selects whether the serial ports will be configured for RS-232 data or RS-422 data. See section 2.2 for information on connecting the serial ports and section 5.16 for the menu settings to configure the ports.

Set the jumper to the 2 pins on the left to configure the serial ports for RS-422 voltage levels.

Set the Jumper on the 2 pins on the right to configure the serial ports for RS-232 voltage levels.

6.3.1. Configuring RS422 Device Communication between a Controller and Tributary

SMPTE Standard 207M defines the electrical and mechanical characteristics of the device interface used in transferring data and control signals between production and post-production equipment. Each interface system consists of a single bus-controller and one or more tributaries. The bus-controller controls the communication flow to all tributaries connected to it, while a tributary transmits data to an operational device.

Two 7721DE4-HD/7721DD4-HD pairs can be configured to interface between a bus controller and a tributary if configured as follows:

Controller DB9 PIN #	7721DE4-HD Connections
8 (Tx -)	Rx -
3 (Tx+)	Rx +

⇒

7721DD4-HD Connections	Tributary DB9 PIN #
Tx -	8 (Rx -)
Tx +	3 (Rx+)

	7721DD4-HD Connections
2 (Rx -)	Tx -
7 (Rx+)	Tx +

⇐

7721DE4-HD Connections	
Rx -	2 (Tx -)
Rx +	7 (Tx+)

Figure 6-3: SMPTE 207M RS422 Controller/Tributary Wiring

6.4. SELECTING THE DEFAULT BEHAVIOUR OF THE SERIAL PORT INPUTS WHEN THERE IS NO SIGNAL CONNECTED

The BIAS jumpers J32, J35, J2 and J4 located on the A7721DX4-HD sub-module control the behaviour of the RS-422 inputs for ports 1, 2, 3, and 4 respectively when there is no signal connected. This is not critical for most applications, and the setting will not typically affect performance. Figure 6-4 shows a simple schematic of the receiver input.

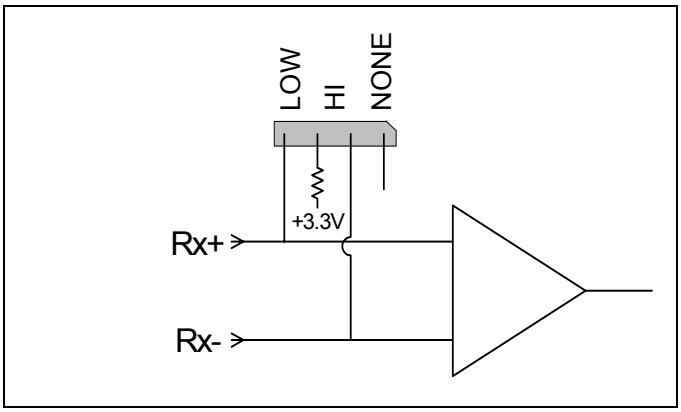

Figure 6-4: Receiver Input Pull-up Configuration

The RS-422 receiver device has a pulldown to ground on the Rx+ input and a pullup to +5v on the Rx- input. If you want to override the default pull-ups set the appropriate jumper as shown in the chart below.

Label	Jumper on pins	Function
NONE	1 & 2	Default pull-ups (Rx+ low, Rx- high)
HI	2 & 3	Rx- pulled up to +3.3 volts, Rx+ default (low)
LOW	3 & 4	Rx+ pulled up to + 3.3 volts, Rx- default (high)

6.5. SETTING THE GPI INPUT PULLUP VOLTAGE

On Rev 1 of the A7721Dx4-HD submodule, jumpers J36 and J1 are used to select the GPI input pullup voltage as either +12V or +3.3V. Jumper J36 sets the pullup voltage for GPI 1 to 4 and J1 sets the pullup voltage for GPI 5 and 6. (See Figure 6-1)

On Rev A of the A7721Dx4-HD submodule, jumper J36 is used to select the GPI input pullup voltage for all six GPIs as either +12V or +5V nominal. Note that the circuit board silkscreen on Rev A boards may incorrectly show 3.3 volts but it is actually +5 volts as shown in Figure 6-2.

6.6. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE: The UPGRADE jumper J5 is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. See the *Upgrading Firmware* section in the front of this manual binder for more information.

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

7. VistaLINK® REMOTE MONITORING/CONTROL

7.1. 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 the frame synchronizers), 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.

SCTE 104 Settings	
Reserved	This parameter is a fixed value and cannot be modified. The reserved parameter is two-byte field and is fixed to a value of 0xFFFF. It will be inserted as the first word in the SCTE 104 packet.
messsageSize	The *messageSize* parameter defines the size of the entire *single_operation_message()* structure in bytes. This parameter is a read-only parameter and the 7721DE4-HD+SCTE104 generates its value internally and dynamically.
protocol_version	The *protocol_version* is an 8-bit unsigned integer field whose function is to allow, in the future, this message type to carry parameters that may be structured differently than those defined in the current SCTE 104 protocol. It shall be zero (0x00). Non-zero values of *protocol_version* may be used by future versions of the SCTE 104 standard to indicate structurally different messages. This parameter is a fixed value and cannot be modified.
AS_Index	The *AS_index* uniquely identifies the source of the message (since it is possible to have several automation systems active at once). The number ranges from 0 to 255 and shall be zero if this index is not required. If non-zero, AS_index shall be unique within a single digital compression system.
message_number	The *message_number* can be any number in the range 0 to 255 and must be unique for the life of a message. The *message_number* is used to identify an individual request. This parameter is a read-only parameter and the 7721DE4-HD+SCTE104 generates its value internally and dynamically. Each time a new message is injected, the message number will increment.
DPI_PID_index	The DPI_PID_index specifies the index to the DPI PID, which will carry the splice_info_sections. The number ranges from 0 to 65535. DPI_PID_index shall be zero if not required by the system architecture. This two-byte control is defined as a text entry box with a maximum possible value of 65535.
SCTE35_protocol_ version	An 8-bit unsigned integer field whose function is to allow, in the future, this message type to carry parameters that may be structured differently than those defined in the current protocol. It shall be zero (0x00). Non-zero values of *protocol_version* may be used by a future version of the SCTE 104 standard to indicate structurally different messages. This parameter is a fixed value and cannot be modified.
Timestamp	This field delivers the exact time to process all of the requests in the injected message. The *time_type* field may be zero, indicating the messages are processed immediately. The 7721DE4-HD+SCTE104 injects a fixed value of 0x00, thereby instructing immediate processing.
num_ops	This field defines an integer value that indicates the number of requests contained within the data packet. This parameter has a fixed value of 0x01, indicating a single data table embedded in the packet. This data table is the Splice Request Data table.
opID	The opID is an integer value that indicates what request is being sent. This parameter is fixed to a value of 0x0101, indicating that the *splice_request_data()* table is transmitted. This value is fixed and cannot be modified.
Data_length	The *data_length* is the size of the data() field being sent in bytes. This parameter is a read-only parameter and the 7721DE4-HD+SCTE104 generates its value internally and dynamically.

GPI Mode	The GPI mode defines what state the GPI will be considered active when triggered. This parameter has two states: Active Low and Active High. When set to Active Low, the 7721DE4-HD +SCTE104 will consider a GPI triggered when the voltage level drops from the internal +5V to ground. When set to Active High, the 7721DE4-HD+SCTE104 will consider a GPI triggered when the voltage level transitions from ground to +5V.
Upstream Pass Mode	This parameter defines the behaviour of the 7721DE4-HD +SCTE104 if SCTE 104 packets detected on the input. This parameter has two states: Pass Through and Pass Remap. If the value is set to Pass Through and a SCTE 104 packet is detected on the input, they are directly passed to the output on the same detected line. If the value is set to Pass Remap, then the original detected packets are marked for deletion as per SMPTE 291M and re-inserted onto a new line defined by the Upstream Line Remap Control.
Upstream Line Remap	This parameter defines which line to re-insert detected SCTE 104 packets. This parameter is only used when the Upstream Pass Mode parameter is set to a value of Pass Remap and has a valid range from lines 6 to 29 for both SD-SDI and HD-SDI type signals.
GPI Triggering	This parameter enables and disables the GPI processor. There are 3 possible values; disable, GPI 1, and GPI 2. To completely disengage the GPI processor set the value of this parameter to disable. When set to disable, any GPI triggering activity will be ignored. To use GPI 1 as the SCTE 104 insertion trigger, set this parameter to a value of GPI 1, and to use GPI 2 as the SCTE 104 insertion trigger, set this parameter to a value of GPI 2. Upon each successful SCTE 104 insertion the 7721DE4-HD+SCTE104 will send an SNMP trap alarm and also illuminate the card edge LED's for a period of approximately 5 seconds.
DPI Filter	This parameter is used to disable or enable upstream DPI filtering. To filter out any detected upstream SCTE 104 messages, set this value to enable. To allow upstream SCTE 104 message to pass through the 7721DE4-HD+SCTE104 module, then set this value to disable. When set to disable the Upstream Pass Mode will be used to define the pass through behaviour.
Line Select	When inserting SCTE 104 messages, this parameter is used to define the insertion line and has a valid range from lines 6 to 29 for both SD-SDI and HD-SDI type signals.
Manual DPI Insert	This parameter is used primarily as a test and debug control. When set to a value of *enable*, the 7721DE4-HD+SCTE104 will insert a SCTE 104 message once every 10 seconds. Upon each successful insertion the 7721DE4-HD+SCTE104 will send an SNMP trap alarm and also illuminate the card edge LED's for a period of approximately 5 seconds.

splice_insert_type	The *splice_insert_type* parameter is an 8-bit unsigned integer defining the type of insertion operation desired. This parameter has 5 possible states: *spliceStart_normal*, *spliceStart_immediate*, *spliceEnd_normal*, *sliceEnd_immediate*, and *splice_cancel*. Please refer to SCTE 104 for clarification of the inferred values. *spliceStart_normal* section(s) occur at least once before a splice point. This interval should match the requirements of SCTE 35 and serve to set up the actual insertion. It is recommended that if sufficient pre-roll time is given by the AS, the Injector sends several succeeding SCTE 35 *splice_info_section*() sections (per SCTE 35 and SCTE 67) in response to a single *splice_request* message with a *spliceStart_normal* *splice_insert_type* value. *spliceStart_immediate* sections may come once at the splice point's exact location. The Injector shall set the *splice_immediate_flag* to 1 and the *out_of_network_indicator* to 1 in the resulting SCTE 35 *splice_info_section*() section. Usage of "immediate mode" signaling is not recommended by SCTE 35 and may result in inaccurate splices. *spliceEnd_normal* sections come to terminate a splice done without a duration specified. They may also be sent to ensure a splice has terminated on schedule. The Injector sets the *out_of_network_indicator* to 0. If they are to terminate a *spliceStart_normal* with no duration specified, they should be sent prior to the minimum interval before the return point and carry a value for *pre_roll_time*, especially if terminating a long form insertion. *spliceEnd_immediate* sections come to terminate a current splice before the splice point, or a splice in process earlier than expected. The Injector sets the *out_of_network_indicator* to 0 and the *splice_immediate_flag* to 1. The value of *pre_roll_time* is ignored. *splice_cancel* sections come to cancel a recently sent *spliceStart_normal* section. The AS must supply the correct value of *splice_event_id* for the section to be cancelled. The Injector shall set the splice_event_cancel_indicator to 1.
splice_event_ source	The *splice_event_source* is a user assigned number for the source of a cue message. There are four possible values: 0, 4, 8 and 12. A value of 0 indicates that the source of the cue message is a cue embedded in the original source material. A value of 4 indicates a cue created by automation system switching. A value of 8 defines a cue created by a live event trigger system, and a value of 12 indicates a cue created by a local content replacement system. The *splice_event_source* and the *splice_event_number* together define the *splice_event_id* parameter that is inserted into the SCTE 104 message.
splice_event_ number	The *splice_event_number* is the number chosen by the event source to identify an instance of the cue message. Its value is automatically calculated by the 7721DE4-HD+SCTE104 and makes up the lower 28 bits of the *splice_event_id*.
unique_program_id	This parameter is defined as a two-byte parameter and has a possible range of 0 to 65535. According to SCTE 104, the use of this field by servers and splicers is unknown at this time.

pre_roll_time (ms)	The *pre_roll_time* parameter is a 16-bit field giving the time to the insertion point in milliseconds. This parameter has a possible range of 0 to 65535. This field is ignored for *splice_insert_type* values other than *spliceStart_normal* and *spliceEnd_normal*.
break_duration (tenths)	The *break_duration* parameter is a 16-bit field giving the duration of the insertion in tenths of seconds. This parameter has a possible range of 0 to 65535. This field is ignored for *splice_insert_type* values other than *spliceStart_normal* and *spliceStart_immediate*.
avail_num	This parameter is an 8-bit field giving identification for a specific avail within the current *unique_program_id*. The value follows the semantics specified in SCTE 35 for this field. It may be zero to indicate its non-usage. This parameter has a possible range of 0 to 255.
avails_expected	This parameter is an 8-bit field giving a count of the expected number of individual avails within the current viewing event. If zero, it indicates that *avail_num* has no meaning. This parameter has a possible range of 0 to 255.
auto_return_flag	If this field is non-zero and a non-zero value of *break_duration* is present, then the *auto_return* field in the resulting SCTE 35 section will be set to one. This field is ignored for *splice_insert_type* values other than *spliceStart_normal* and *spliceStart_immediate*. Within this implementation this field is fixed to 0x00 and cannot be modified.

Table 7-1: SCTE 104 Settings

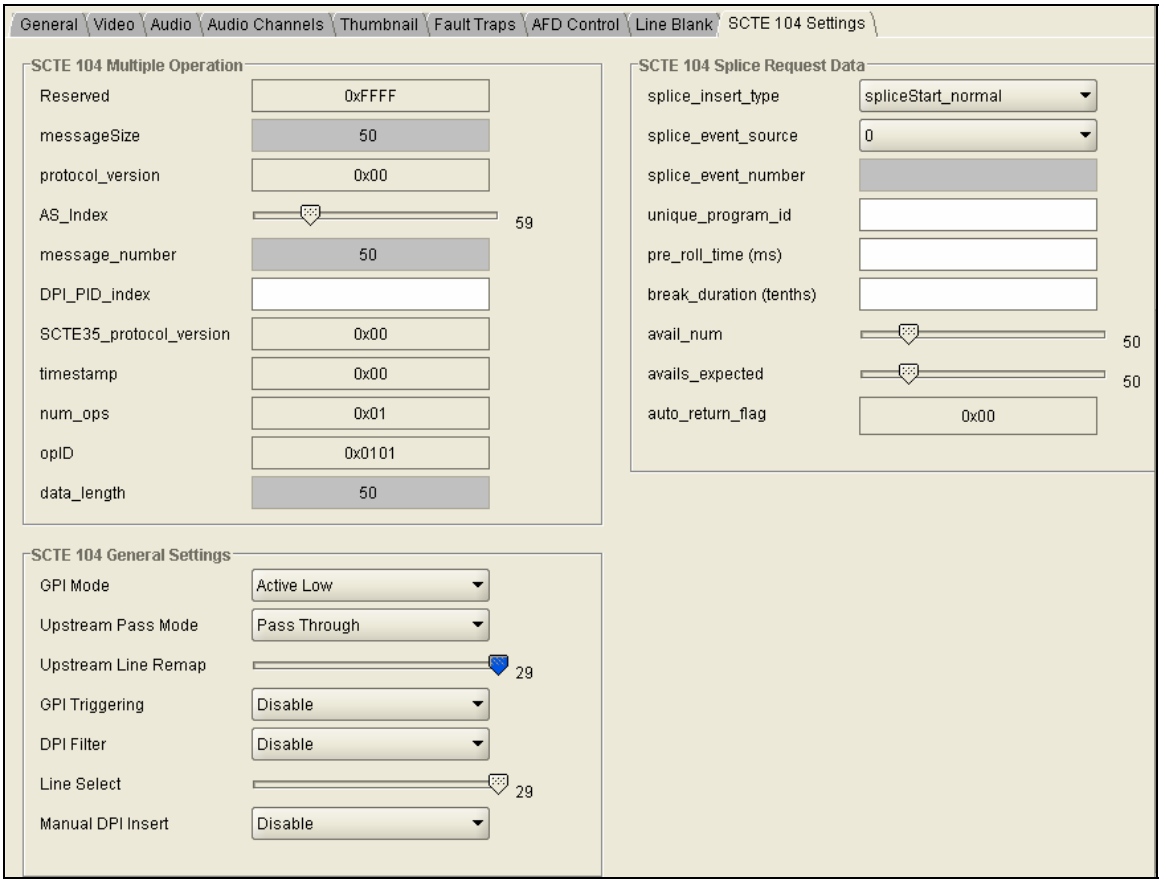

Figure 7-1: VistaLINK® 7721DE4-HD+SCTE104 Configuration View

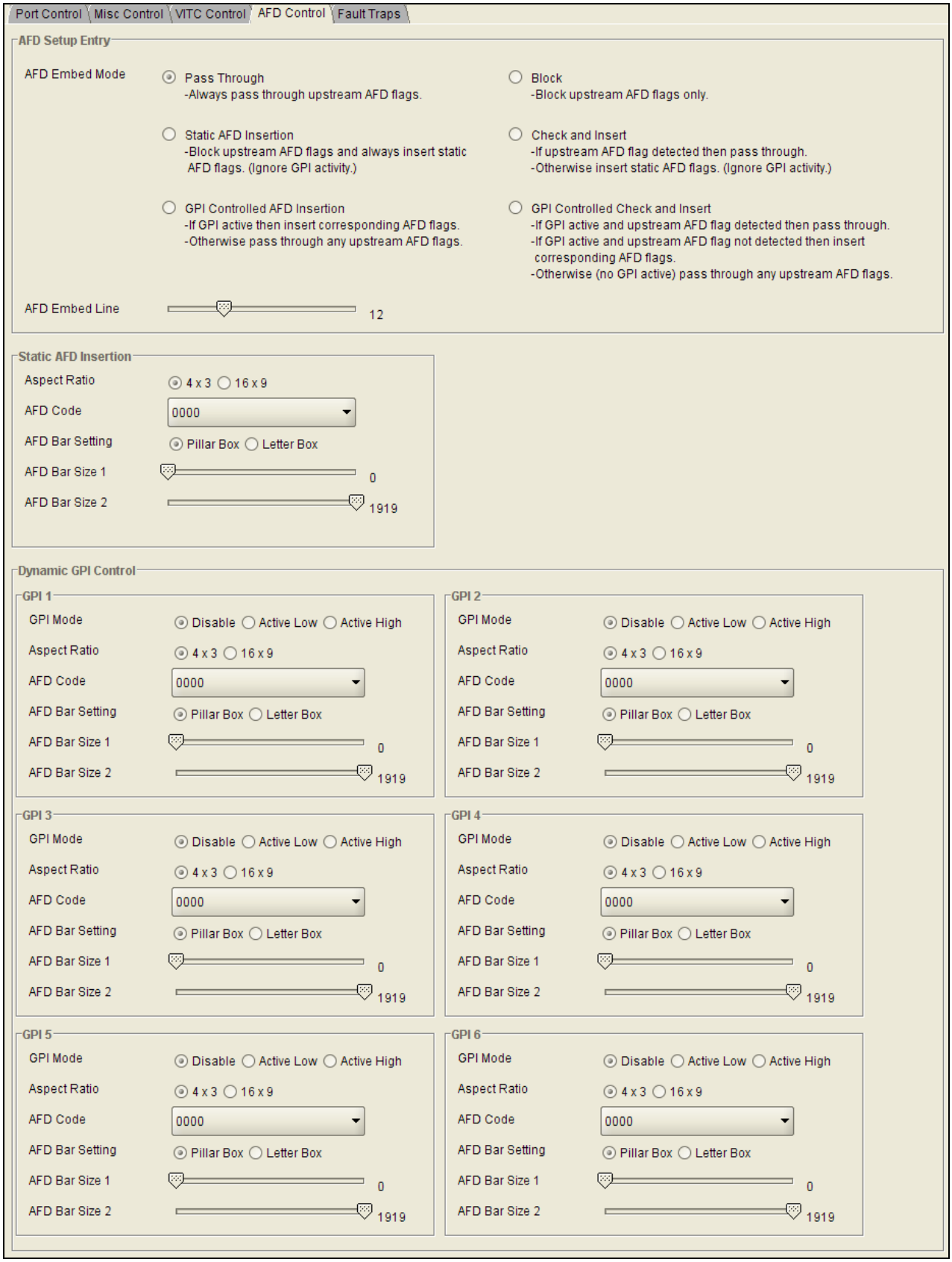

Figure 7-2: VistaLINK® 7721DE4-HD AFD Configuration View