

# IQBAIR AES/EBU Audio Inserter



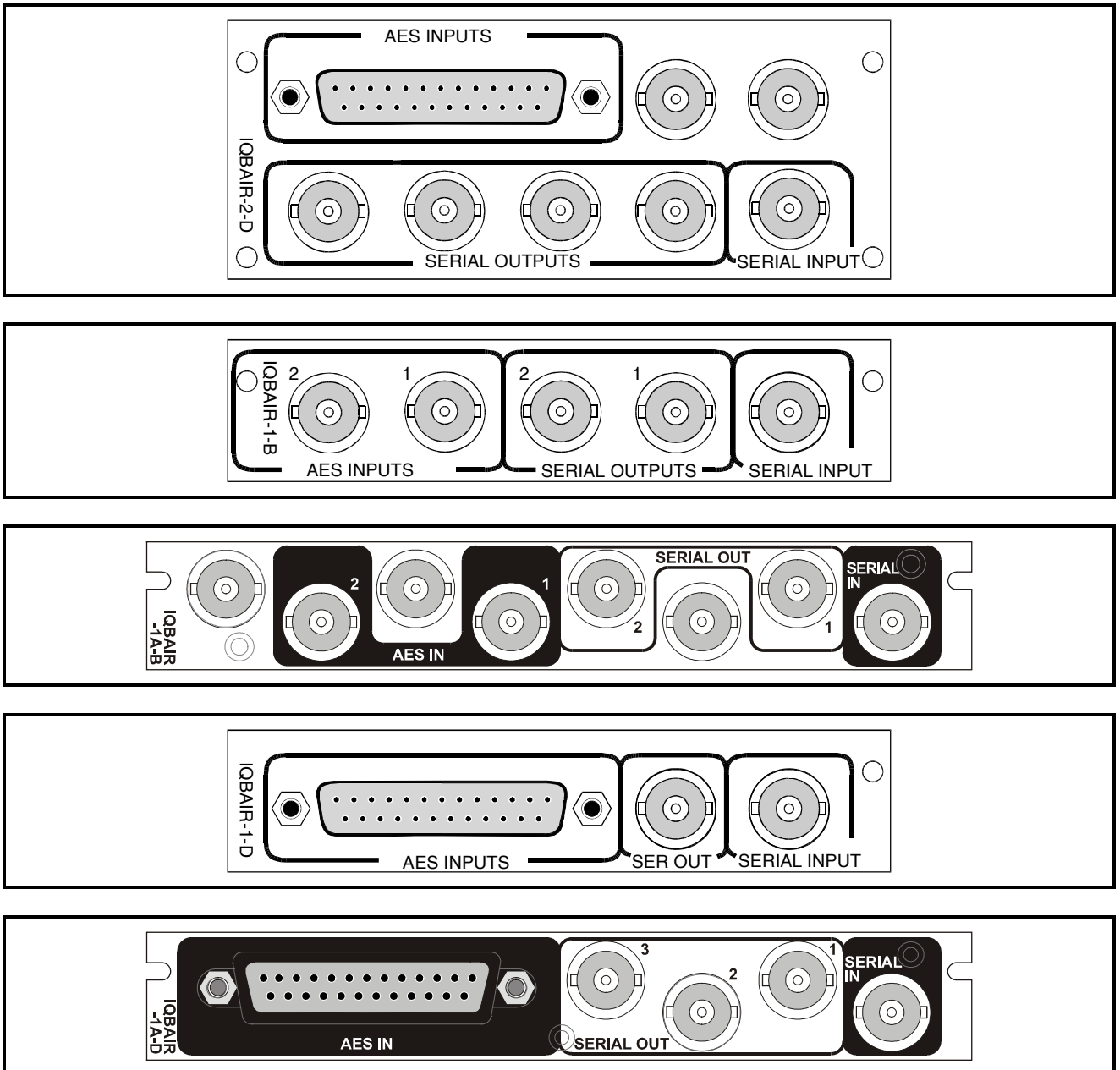
## Module Description

The IQBAIR embeds up to two AES/EBU streams into a serial 4:2:2 video stream. Four cards may be cascaded to cater for all 16 mono channels if required. Serial 4:2:2 video outputs provide regenerated copies of the input serial 4:2:2 video stream, and EDH checking and checksum re-insertion is to SMPTE RP 165.

The IQBAIR examines the SDI video input and reports EDH errors and audio data presence. If the

selected audio group is not present on upstream serial digital video, the unit will add it, otherwise it will flash a warning LED and not perform insertion. SDI video outputs provide regenerated copies of the input SDI video stream and EDH checking and checksum re-insertion is to SMPTE RP 165. Four cards may be cascaded to cater for all 16 mono channels that can be embedded. Control may be by card edge controls or via the RollCall™ remote control system

## REAR PANEL VIEWS



Versions of the module cards available are:

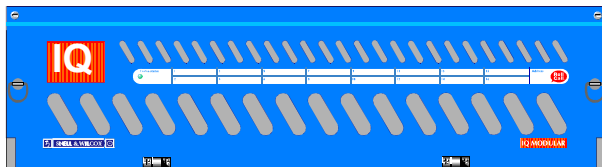
IQBAIR-2-D	Double width module	Balanced AES inputs
IQBAIR-1-B	Single width module	Unbalanced AES inputs
IQBAIR-1A-B	Single width module	Unbalanced AES inputs
IQBAIR-1-D	Single width module	Balanced AES inputs
IQBAIR-1A-D	Single width module	Balanced AES inputs

**Note that this product is no longer available.**

**Note that there are two styles of rear panels available. They are not interchangeable between the two styles of enclosures. However, the cards may be fitted into any style of enclosure.**

**'A' Style Enclosure**

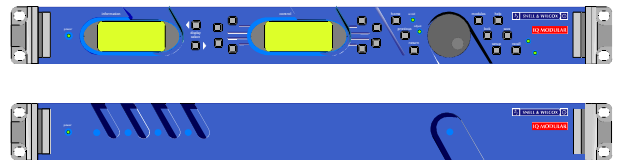
Rear panels **with** the suffix A may only be fitted into the 'A' style enclosure shown below.



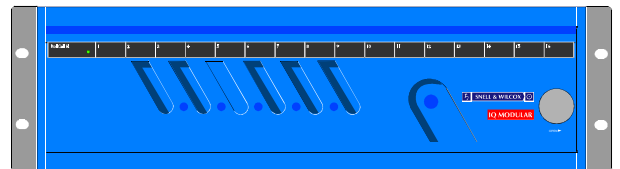
(Enclosure order codes IQH3A-E-O, IQH3A-E-P, IQH3A-N-O, IQH3A-N-P)

**'O' Style Enclosures**

Rear panels **without** the suffix A may only be fitted into the 'O' style enclosures shown below.



(Enclosure order codes IQH1S-RC-O, IQH1S-RC-AP, IQH1U-RC-O, IQH1U-RC-AP, Kudos Plus Products)

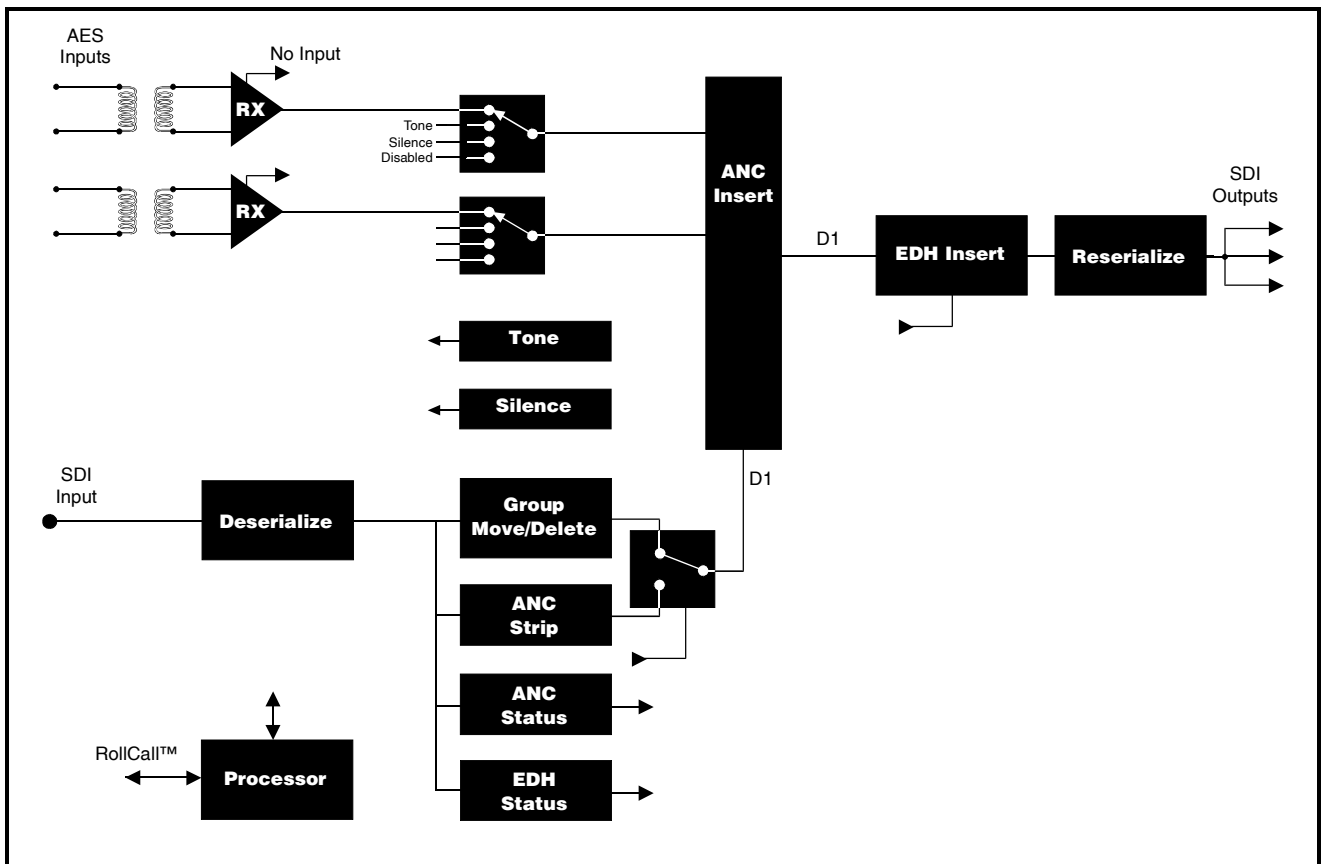


(Enclosure order codes IQH3N-O, IQH3N-P)



(Enclosure order codes IQH3U-RC-O, IQH3U-RC-P)

## BLOCK DIAGRAM



## Features

Multiplexes two AES/EBU streams into a serial 4:2:2 video stream

- Existing data may be moved or tagged for deletion, or globally stripped
- Optional stripping of all ancillary data prior to insertion
- Two 48 kHz synchronous-to-video AES-3 balanced inputs, independently assignable
- Automatic 525 and 625 line operation
- Up to 3 regenerated serial 4:2:2 outputs
- EDH monitoring and Insertion
- Test-tone/silence insertion capability
- Balanced and unbalanced AES/EBU input versions available

TECHNICAL PROFILE

Features

**Signal Inputs**

Digital..... 1 Serial Digital 4:2:2  
 AES Audio ..... 2 Stereo pairs (4 channels)  
 Standards ..... SMPTE 259M-C-1997, SMPTE  
 272M-A-1994, AES3-1992

**Signal Outputs**

Digital..... Up to 3 Serial Digital  
 Standards ..... SMPTE 259M-C-1997, SMPTE  
 272M-A-1994

**Card Edge Controls (also available via RollCall)**

Input Assign..... Assign AES or tone/silence to pair  
 address  
 Strip ANC Data ..... Remove all ancillary Data prior to  
 insertion  
 EDH Reset..... Clear EDH error history

Select Tone/Silence Insertion

Select Test Tone or Silence for  
 Insertion as required

Local/Remote Control Select

Local operation or via RollCall™  
 remote control

**Functions Available via RollCall™ Only**

Naming ..... Naming of each audio channel  
 (for User reference only)  
 Input Assignment ..... Assignment of the input  
 channel-pairs (1-8)  
 Moving/Delete ..... Moving/deletion of existing audio  
 stereo pairs  
 EDH Error History ..... Errors & time since last reset  
 Line Standard..... Report 525 or 625  
 Audio Data Channels ..... Report Presence  
 Attempted Insertion Failure Report Failures

Specifications

Serial Input Return Loss..... Better than 20 dB to 270 MHz  
 Serial Input Receive length >200 m  
 Serial Output Return Loss.. Better than 20 dB to 270 MHz  
 AES Audio Inputs..... 110 ohms balanced (Transformer  
 Coupled) via 25 way `D' connector  
 Inputs reclocked for > 100 m  
 twisted pair AES/EBU cable  
 75 ohms unbalanced via BNC  
 connectors.  
 Inputs reclocked for >500 m of  
 good quality coaxial cable  
 Audio Delay ..... 1.0 ms  
 Video Delay ..... 0.75 µs  
 Sample Rate 48 kHz synchronous to D1 video stream

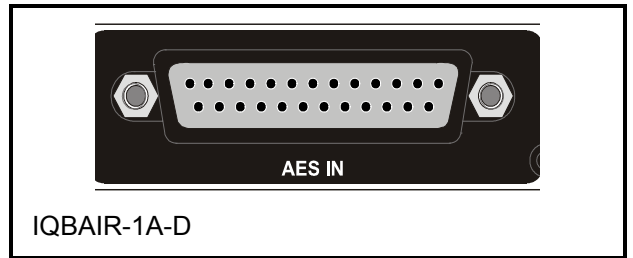
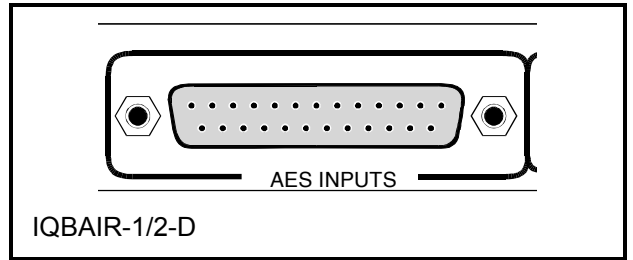
**Power Consumption**

Module Power Consumption  
 5.7 W max

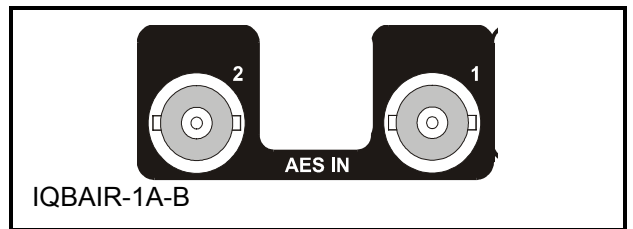
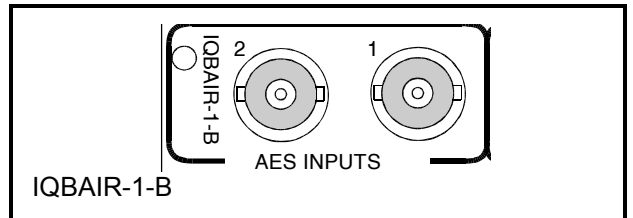
INPUTS

Balanced AES audio input connections are made via this 25 way female D-type connector. (-D versions)

For connection data consult the tables on page 5.

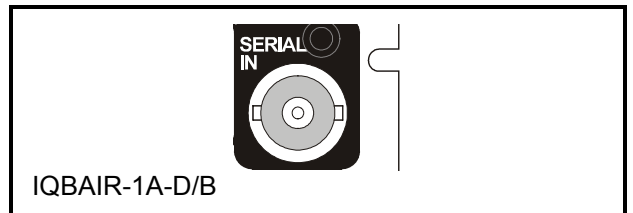
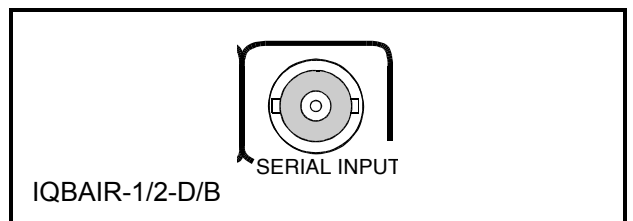


Unbalanced AES inputs are made via these BNC connectors. (-B versions)



Serial Digital Video Input

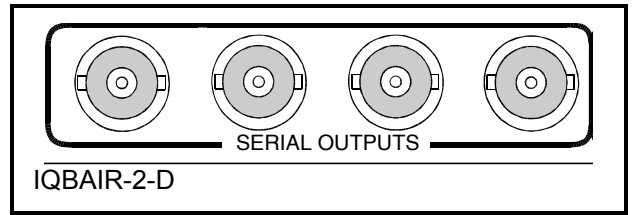
The serial digital input to the unit is made via this BNC connector which terminates in 75 Ohms.



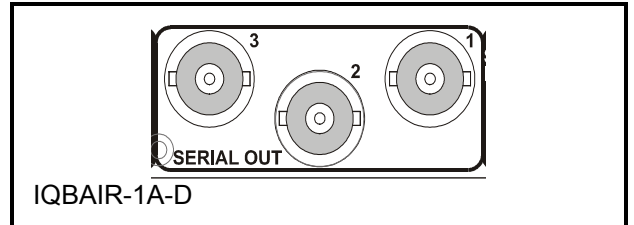
OUTPUTS

Serial Digital Video Outputs

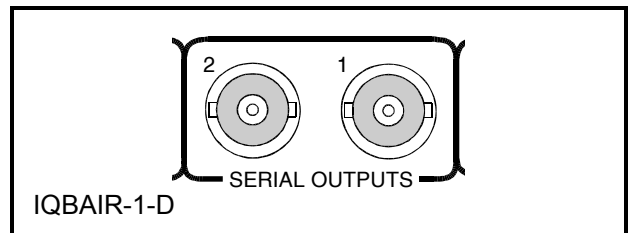
These are the four (-2-D), three (-1A-D), two (-1-D), two (-1A-B) or one (-1-B) isolated Serial Digital outputs of the unit via BNC connectors for 75 Ohms.



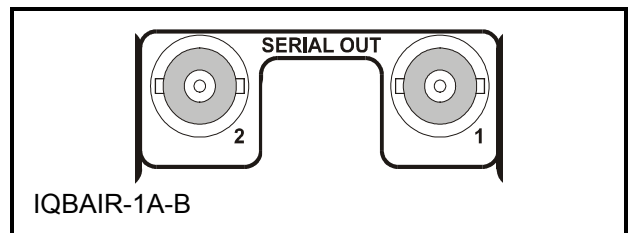
IQBAIR-2-D



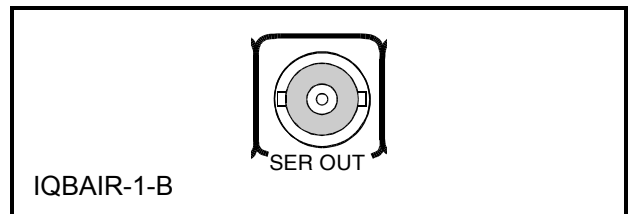
IQBAIR-1A-D



IQBAIR-1-D



IQBAIR-1A-B

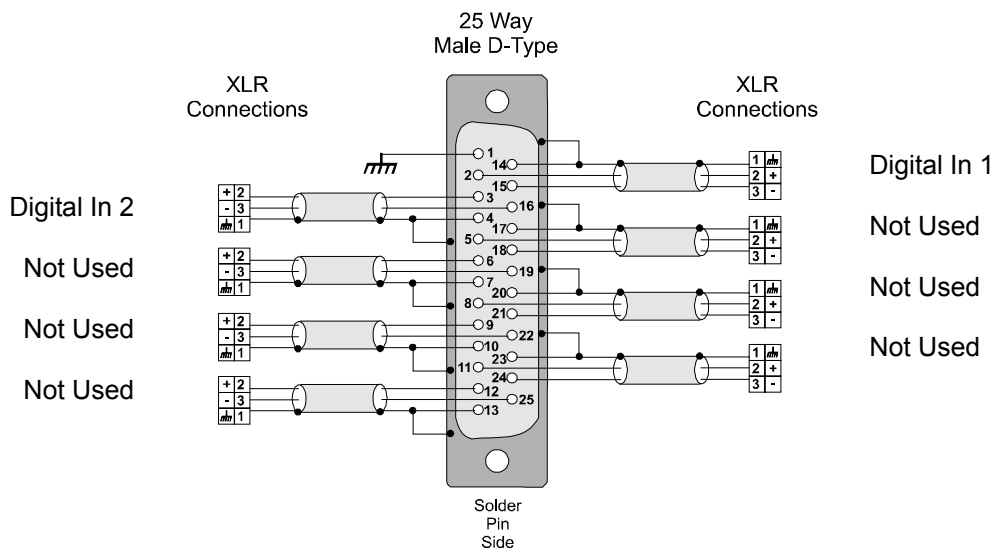
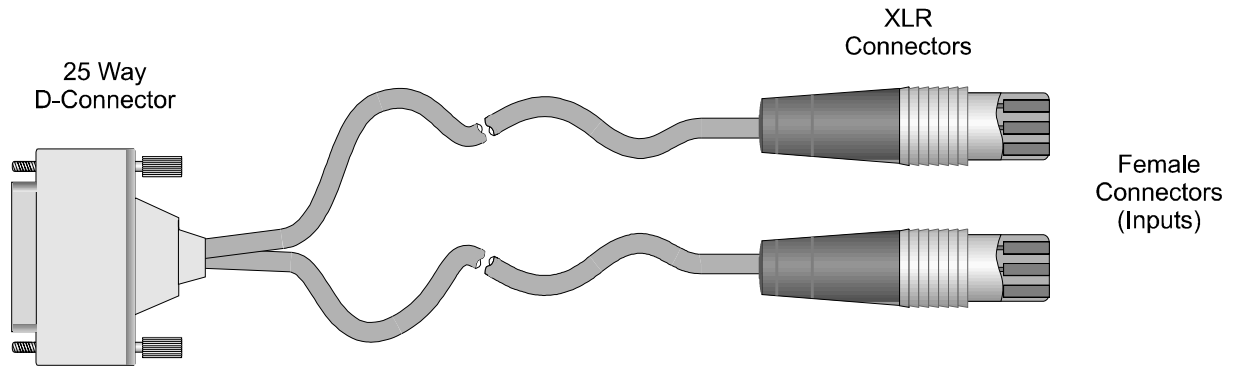


IQBAIR-1-B

## Connection Details (Balanced AES input versions)

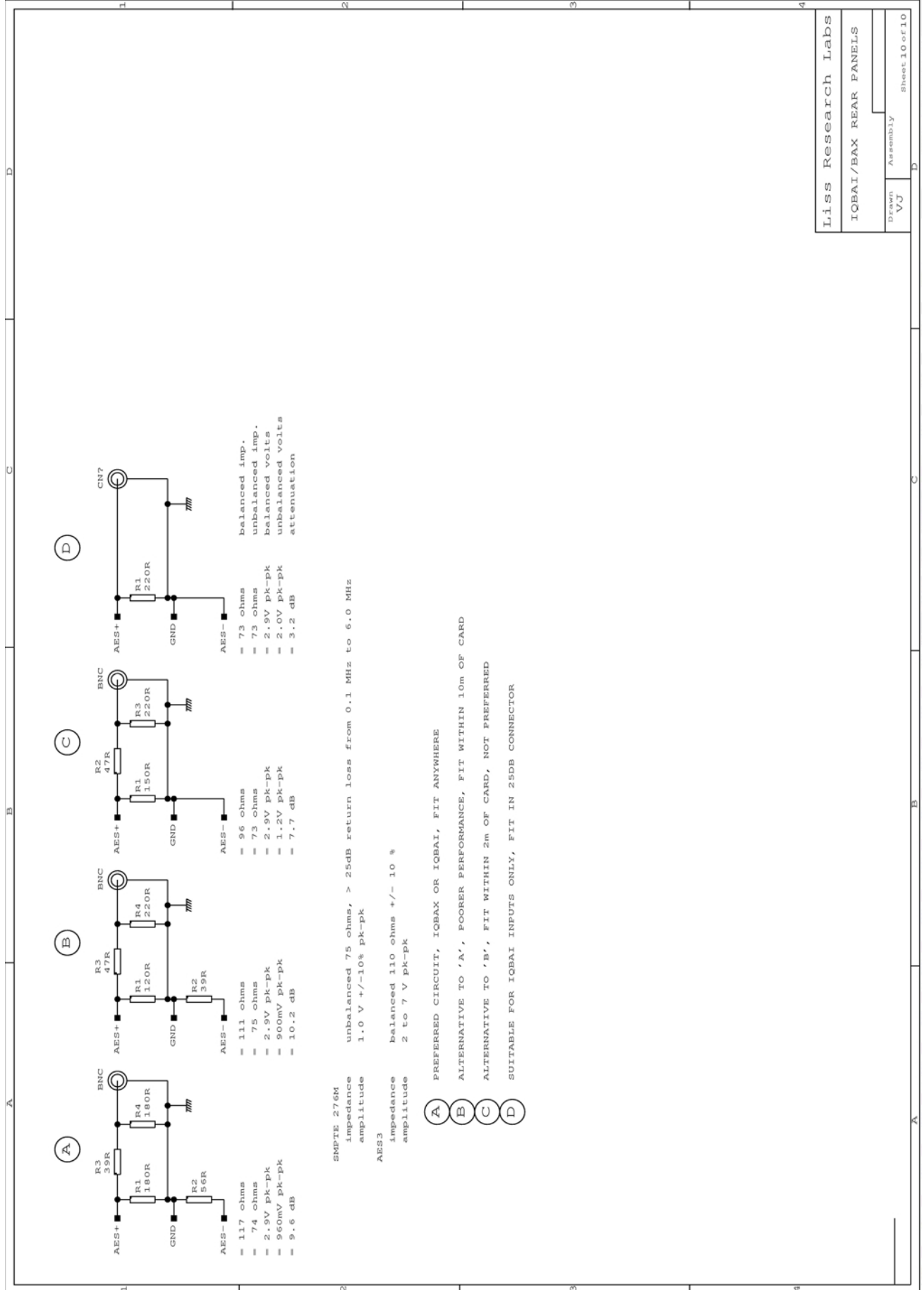
25 Way D Connector Pin Number	Description	Ribbon Cable Strand Number	Standard Pin Assignment
1	Chassis	1	CHASSIS
14	AES GND	2	GND1
2	AES IN 1 +	3	1+
15	AES IN 1 -	4	1-
3	AES IN 2 +	5	2+
16	AES IN 2 -	6	2-
4	AES GND 2	7	GND2
17		8	GND3
5		9	3+
18		10	3-
6		11	4+
19		12	4-
7		13	GND4 (CH)
20		14	GND5
8		15	5+
21		16	5-
9		17	6+
22		18	6-
10		19	GND6
23		20	GND7
11		21	7+
24		22	7-
12		23	8+
25		24	8-
13		25	GND8

Connection Details to XLR Female Connectors (for Balanced AES input versions)



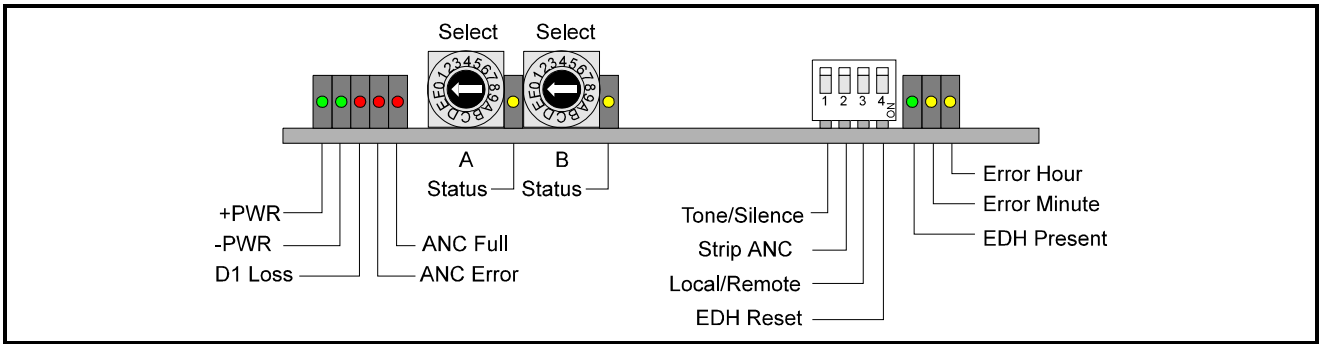


RESISTIVE IMPEDANCE MATCHING FOR CONVERTING BETWEEN 110 OHM AND 75 OHM



Liss Research Labs	
IQBAI/BAX REAR PANELS	
Drawn VJ	Assembly Sheet 10 of 10

CARD EDGE CONTROLS



Note that the unit will respond to both local and remote control, one system overriding the settings of the other. For cards using the RollCall™ remote control system, activating these switches will override the remote control settings. The RollCall™ control panel will then follow these settings.

Note that in Main-frames where RollCall™ is not available the DIL switch position 3, located at the front of the card, should be set to the OFF (UP) position. This ensures that when the unit is powered-up the factory default settings of parameters not available as card edge adjustments, are loaded. With the switch in ON (DOWN) position card will power-up with the last settings sent by the remote control panel.

LED INDICATORS

Power

These two PWR indicators are illuminated when the positive and negative supplies are present.

D1 (Serial Video) Loss

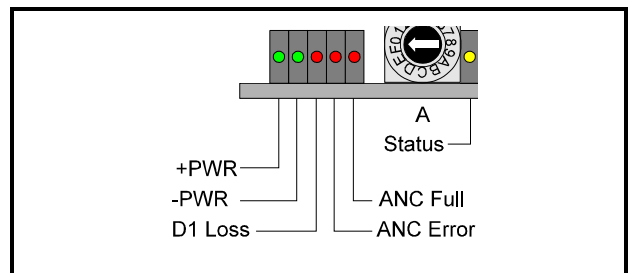
This LED will become illuminated when there is no 4:2:2 input.

ANC ERROR

This LED will become illuminated for approximately 1 minute each time a checksum error is detected in the embedded ancillary data packets.

ANC FULL

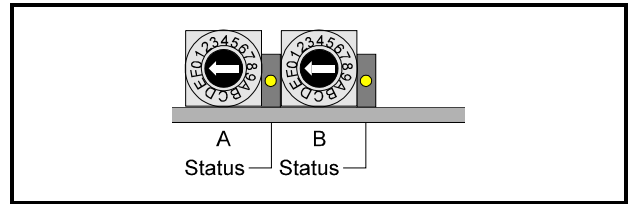
This LED will become illuminated when insufficient ancillary data space for audio insertion remains or for attempted insertion over existing audio.



STATUS LED's

These LED's will

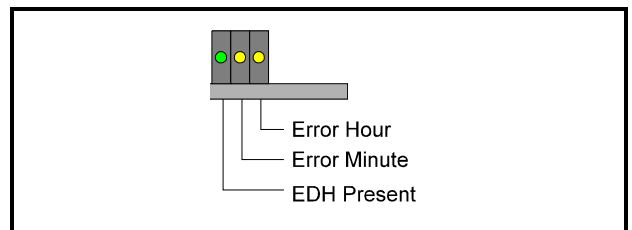
1. **Become illuminated** when tone/silence is embedded at selected destinations (9....0)
2. **Flash** if (1...8) has no input AES (tone/silence inserted) or selected destination is already occupied (inserter disabled) or insufficient ANC space left (inserter disabled)
3. **Will not be illuminated** if the inserter channel is embedding AES at selected destinations (1....8)



EDH PRESENT / ERROR

This LED will become illuminated if the input D1 video has embedded EDH data.

This LED will also briefly blink off whenever the EDH checksum errors are detected.



EDH MIN / HOUR

These LED's provide the EDH error minute & hour history, indicating occurrence of errors within their respective time periods.

These LED's will remain OFF if no errors have occurred within their time period, or if the incoming D1 video does not contain EDH data.

## HEX SELECT SWITCHES

These switches assign embedding addresses to the inserter channels, and enable tone or silence insertion.

Settings are as follows:

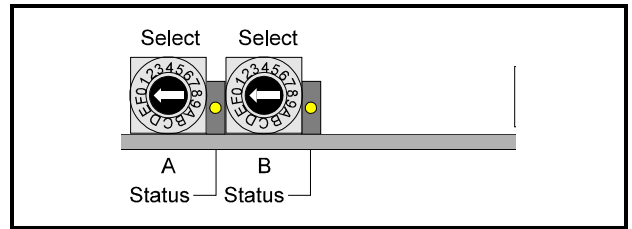
- |        |  |
|--------|--|
| 1 to 8 | channel-pair assign  |
| 1      | Pair 1   |
| 2      | Pair 2   |
| 3      | Pair 3   |
| 4      | Pair 4   |
| 5      | Pair 5   |
| 6      | Pair 6   |
| 7      | Pair 7   |
| 8      | Pair 8   |
| 9 to 0 | insert test-tone or silence, assignments as for 1 to 8 above |

**NOTE:** the two inserter channel assignments **MUST** be exclusive!

If both inserter channels are assigned the same target address, A will be disabled and its respective 'STATUS' LED will flash.

If an inserter is given the same address as audio data already present on the input D1 video and the 'STRIP ANC' switch is not set the inserter will be disabled, its status LED will flash, and the 'ANC FULL' LED will illuminate.

This situation is also reported over the *RollCall*<sup>™</sup> network. To cure this problem the user must either reassign the data (HEX switch selection), move (*RollCall*<sup>™</sup> only) the existing data, or strip all existing ancillary data.



## 4-WAY DIP SWITCH

Setting to the DOWN (ON) position enables the function.

## STRIP ANCILLARY DATA

Removes all ANC data prior to insertion

## TONE / SILENCE

Selects tone (down) or silence (up) for insertion.  
(9 to 0 on the Hex switches)

## REMOTE / LOCAL

Selects *RollCall™* control, or local operation of the card

UP= local      DOWN = remote

In remote mode the card will use settings saved in the non-volatile memory and follow *RollCall™* commands.

In local mode the card will follow its switch settings on power-up, *RollCall™* can still temporarily override these settings.

## EDH RESET

When toggled this will clear EDH and ancillary error history LED's.

## SMPTE 272M SUPPORT

The cards conform to SMPTE 272M-A

A synchronous audio at 48 kHz; 20-bit audio data packets

The cards do not support SMPTE 272M-B, C, D, E, F, G, H, I, J

B synchronous audio for composite video

C 48 kHz synchronous, with audio & extended data packets

D asynchronous audio

E 44.1 kHz audio

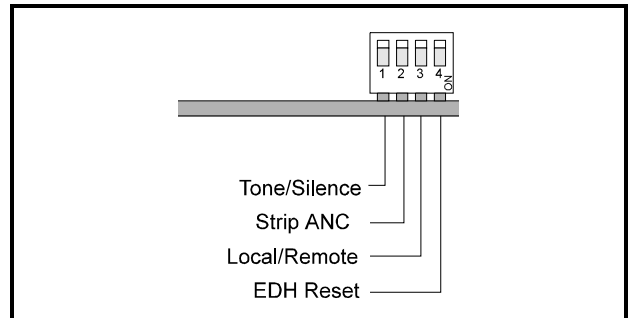
F 32 kHz audio

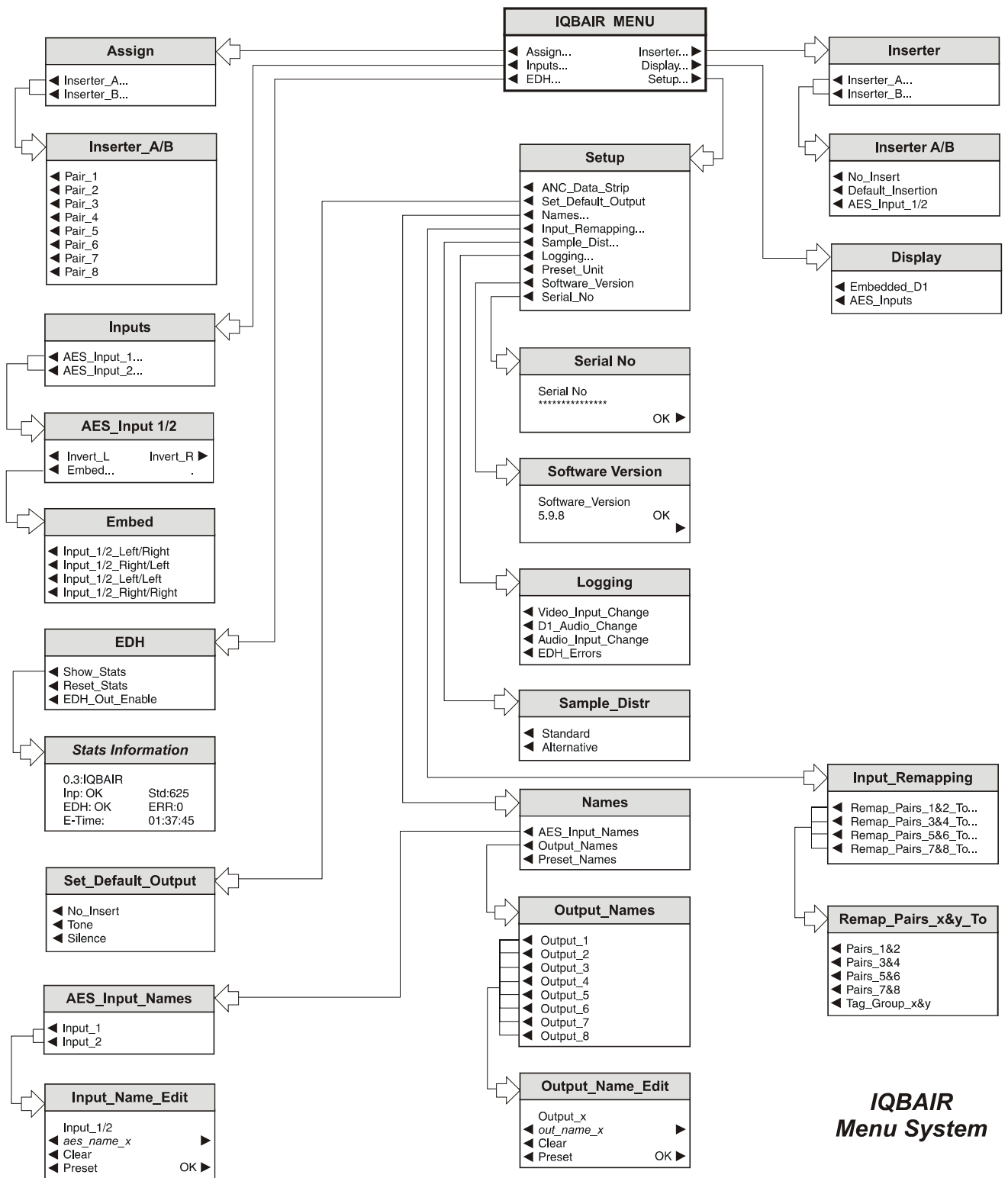
G 32 kHz to 48 kHz continuous sampling rate range

H audio frame sequence

I time delay tracking (monitor only)

J non-coincident 'Z' bits in a channel pair





***IQBAIR  
Menu System***

## OPERATION FROM AN ACTIVE CONTROL PANEL

The card may be operated with an active control panel via the RollCall™ network.

The menus available for this card are shown on page opposite and will appear in the Control display window.

Operational details for the remote control panel will be found in SECTION 1 of the Modular System Operator's Manual.

**MENU DETAILS**

(see IQ Menu System Opposite)

**MAIN MENU**

The main or top level menu allows various sub-menus to be selected by pressing the button adjacent to the required text line.

Note that where a menu item is followed by three dots (...) this indicates that a further sub-menu may be selected.

Whenever a menu item is selected the parameters of that selection will be displayed in the Information window of the front panel. Where the selection is purely a mode selection and does not enable a sub-menu, the text will become reversed (white-on-black) indicating that the mode is active. If the mode is not available for selection the text will remain normal.

**◀ Assign**

This menu sets the embedding addresses for the input AES data.

◀ **Inserter\_A** and ◀ **Inserter\_B** may be selected.

The destination item should then be selected which allows the input destination to be assigned to a pair 1, 2, 3, 4, 5, 6, 7 or Pair 8.

The factory presets are:

#1: " **Inserter\_A**"

embedded destination: Pair 1

#2: " **Inserter\_B**"

embedded destination: Pair 2

*Note that in the event of an address clash the last inserter to be assigned will take precedence and the other inserter will be disabled.*

**Inserter ▶**

The inserters may be independently enabled or disabled, set to embed tone/silence, or allowed to embed the input AES data.

Either ◀ **Inserter\_A** or ◀ **Inserter\_B** may be selected and the sub-menu will then allow the following options to be enabled:

- ◀ No\_Insert
- ◀ Default\_Insertion
- ◀ Input\_A/B

The factory preset configuration is as follows:

Inserter A:Input 1

Inserter B:Input 2

**◀ Inputs**

This item allows the signal polarity to be inverted and embedding settings made for both

◀ **AES\_Input\_1** and ◀ **AES\_Input\_2**

◀ Invert\_L

When enabled the polarity of the Left signal will be reversed (phase inverted)

Invert\_R ▶

When enabled the polarity of the Right signal will be reversed (phase inverted)

◀ Embed

Input 1 or Input 2 may be embedded as follows:

- ◀ Input\_1/2\_Left/Right
- ◀ Input\_1/2\_Right/Left
- ◀ Input\_1/2\_Left/Left
- ◀ Input\_1/2\_Right/Right

**DISPLAY ►**

This menu allows information about the input to be displayed in the LCD window.

**◀ Embedded\_D1**

This selection displays the embedded data present on the input D1 stream, the audio group remapping, and the output D1 embedded data positions.

**◀ AES\_Inputs**

This selection displays the status of the inputs, their target embedded destinations, and the inserter status.

**◀ EDH**

The input 4:2:2 stream is continuously monitored for EDH errors. Basic information on this can be monitored and/or reset here.

The following functions may be selected:

**◀ Show\_Stats**            The information will be displayed in the LCD window

**◀ Reset\_Stats**            Data will be reset

A regenerated EDH packet would normally be inserted on the output 4:2:2 stream but this can be disabled to aid in system / installation debugging.

Factory preset is to Show\_Stats.

**◀ EDH\_Out\_Enable**

A regenerated EDH packet would normally be inserted on the output 4:2:2 stream but this can be disabled to aid in system / installation debugging by deactivating this function.

Preset is to ON (activated)

**SETUP ►**

This selection reveals a sub-menu that allows various functions to be set

**◀ ANC\_Data\_Strip**

When set (text highlighted) this toggle function will result in the stripping of all embedded ancillary data on the input D1 stream.

**◀ Set\_Default\_Output**

When the AES input to an inserter is absent the output is set to this default signal.

This menu function defines this default signal to be either inserting an internally generated **Tone** or **Silence** at the selected address, or to disable the inserter (**No\_Insert**) operation.

The factory preset is to silence.



### ◀ Names

The inputs and the eight possible embedded audio addresses have default names that do little more than describe their relationships to each other and the D1 video stream.

For convenience the inputs and destinations can be given names more meaningful to the equipment installation.

To edit a name, select either

◀ AES\_Input\_Names

or

◀ Output\_Names

◀ AES\_Input\_Names will reveal a menu that allows an input to be selected.

◀ Input\_1

◀ Input\_2

To compile/edit the text the right ▶ and left ◀ buttons adjacent to the upper text line in the menu should be used to select the character position in the text and the spinwheel used to select the character.

The ◀ **Clear** function blanks out the selected character.

The ◀ **Preset** function loads the default text.

**O.K.** ▶ saves the caption text and returns to the main menu.

◀ Output\_Names will reveal a menu that allows an output to be selected.

To compile/edit the text the right ▶ and left ◀ buttons adjacent to the upper text line in the menu should be used to select the character position in the text and the spinwheel used to select the character.

The ◀ **Clear** function blanks out the selected character.

The ◀ **Preset** function loads the default text.

**O.K.** ▶ saves the caption text and returns to the main menu.

◀ Preset\_Names

This function returns all names to the factory defaults.

### ◀ Input\_Remapping

Embedded data cannot be destroyed accidentally, but if it is required that an inserter embed audio at an occupied address the data already present can be either moved to another address or deleted.

This function reveals sub-menus that allow the remapping to be carried out by selecting items from the following list:

◀ Remap\_Pairs\_1&2\_To

◀ Remap\_Pairs\_3&4\_To

◀ Remap\_Pairs\_5&6\_To

◀ Remap\_Pairs\_7&8\_To

and

◀ Pairs\_1&2

◀ Pairs\_3&4

◀ Pairs\_5&6

◀ Pairs\_7&8

◀ Tag\_Group\_x&y

◀ Tag\_Group\_x&y

At an occupied address the data already present can be deleted.

The factory preset setting is as follows:

Remapping: one-to-one (Pairs 1&2 to Pairs 1&2 etc.)

Tagging (deletion): none

### ◀ Sample\_Dis(tribution)

Embedded digital audio shares the SDI-D1 horizontal ancillary data space with other data packets.

Generally the positions of ancillary packets follow SMPTE-272 and can appear on any line, but there are industry-standard specifications and recommendations for some types.

The EDH packet, for example, must be on specific lines (5 & 318 for 625-lines, 9 & 272 for 525-lines) at specific positions within the data space.

Lines 6 & 319 (625, 10 & 273 for 525) are designated positions for SDI routers to switch streams.

Doing so will render the following ancillary space (next line) unusable due to the receiving SDI de-serialisers having to resynchronise to the new stream.

Lines 8 & 321 (625, 12 & 275 for 525) are the designated locations for the 'Audio Control' data packets, required if the embedded audio sample rate is anything other than video clock-synchronous

48 ksp. While these are quite small they do consume valuable ancillary space on these lines.

Embedders must avoid using the ancillary space following the SDI switch point. The presence of EDH data in a non-SMPTE272 standard position and the possible 'audio control' packets can also prove problematic for embedders since additional precautions have to be taken to avoid the possibility of corrupting horizontal ancillary space or even destroying the SDI-D1 format.

The IQBAIR module has two packet distribution schemes, selectable via RollCall.

#### ◀ Standard

The Standard packet distribution does not use lines 5,6,7,8,318,319,320 and 321 for 625-lines and 9,10,11,12,272,273,274 and 275 for 525-lines. In this way it avoids problems with SDI switching, EDH packets, and audio control packets. However, the lack of audio samples for four consecutive lines each field does require that any subsequent de-embedders have sufficient FIFO buffer memory. For the 'standard' IQBAIR distribution scheme a de-embedder must buffer a minimum of 14 samples. The SMPTE-272 recommendation is for de-embedders to have a buffer of 40 samples but many designs will have less. Some may even not have enough buffer space for this sample distribution so an alternative scheme is available.

#### ◀ Alternative

The Alternative distribution scheme is less secure in that it uses the lines defined as the locations for the audio control packets.

While the integrity of ancillary space and the SDI format will not be compromised there will be less space for audio data packets on these lines if the control packets are present

If the horizontal ancillary space is heavily loaded the embedder may not have enough space to insert all of its data. The 'alternative' scheme does not use lines 5,7,318,320 for 625-lines (9,11,272,274 for 525-lines). For this packing distribution a de-embedder must buffer a minimum of 6 samples.

◀ Standard distribution is the default setting

#### ◀ Logging

If a logging device is attached to the RollCall™ network, information about various parameters will be reported to the logging device assigned in the Remote Control Interface system. (See Section 1, The RCIF Menu System)

The logging sub-menu allows the following information to be made available for logging:

- ◀ Video\_Input\_Change
- ◀ D1\_Audio\_Change
- ◀ Audio\_Input\_Change
- ◀ EDH\_Errors

Factory preset is nothing enabled.

#### ◀ Preset\_Unit

Selecting this item sets all adjustment functions that include a preset facility, to their preset values. Note that this is a momentary action and the text will not become reversed

#### ◀ Software Version

Selecting this item reveals a display showing the version of the software fitted in the module. Select OK to return to the Setup Menu.

#### ◀ Serial Number

Selecting this item reveals a display showing the serial number of the module. Select OK to return to the Setup Menu.

## Insertion Operation

The SMPTE 272M standard specification allows for up to four groups of AES/EBU digital audio to be embedded in a component D1 digital video stream. Each group consists of two stereo pairs (four channels), giving a total of sixteen audio channels for all four groups.

A single IQBAIR module is capable of inserting two pairs of audio data (four channels). Four IQBAIR cards are required to embed all sixteen possible channels.

The input AES audio data must be sampled at 48 kHz, clock-synchronous to the video stream. Asynchronous operation is not supported.

A total of exactly 1920 audio samples occur within one frame of 625-line video. For 525-line video the relationship is 8008 audio samples over five video frames.

The audio data is distributed evenly throughout each video frame, situated in the non-active picture regions between the end of one line and the start of the next. The majority of lines contain three audio samples, some four, and a couple of reserved lines contain no samples.

Audio Control and Extended Data packets as defined in SMPTE-272M are not inserted, but are handled correctly by the 'remapping' and 'tagging' functions.

Block numbering as defined in SMPTE-272M is not supported.

The IQBAIR module contains two independent inserter streams that operate with either external AES digital audio inputs or internally generated tone or silence. They operate in sequence with stream A first and stream B second.

The inserter streams are given individual address assignments for destination group and stereo pair (1&2 or 3&4). Control software ensures that the addresses are mutually exclusive and do not clash with those of existing embedded audio data. In this way embedded data integrity is assured.

The SMPTE 291M standard defines the structure and space formatting for ancillary data within digital component or composite video streams. For D1 component data space ancillary packets follow immediately after the EAV (end of active video) and are contiguous with each other.

Complying with SMPTE 291M, the inserter control section looks for the first free space after EAV. Once found the embedding process is initiated with the first enabled inserter. However, before starting the embedding for any of the inserter streams the remaining data space is checked to ensure that there is enough room for the ancillary packet. If not, all inserters still waiting to be serviced are disabled to prevent corruption of the D1 video format or generation of invalid ancillary data packets. This situation is reported over the RollCall™ network and indicated on the card edge LEDs.

If desired, existing embedded ancillary data may be stripped off or 'renamed'. If stripped, the card inserters will embed data immediately following the EAV markers, otherwise the existing ancillary data will be appended to, provided that there is sufficient room remaining.

Each audio ancillary data packet contains an 'identity' word that indicates which group (1,2,3,4) the data belongs to. This address label can be altered for existing embedded audio data, thus 'renaming' the packets. For example, the group 1 audio data from a Digital Betacam VCR could become group 3 if the inserter assignments needed to be for group 1. Alternatively, the identity word can be changed to 'TAG'. This indicates that the ancillary packet is to be ignored by downstream equipment, or removed during a reformatting process. The packet cannot simply be blanked out because that would violate the SMPTE 291M requirement that ancillary packets be contiguous.

Embedded ancillary data which does not conform to the space formatting requirements of SMPTE 291M may not be recognised, and so could be destroyed by the IQBAIR card. For example, if the data packets do not start immediately following the EAV marker the inserters will overwrite the packets. Similarly, if a data packet does start in the correct place but a second packet does not immediately follow the first one the second packet will be overwritten.

The first situation above applies to the embedded audio data from the Tektronix TSG-422 pattern generator, where the packets do not start until four words after the EAV marker.

The second situation can occur where an upstream embedder puts particular groups in to specific positions in the ancillary space.

**Embedder Packet distribution (Standard)****D1 625:**

1 .. 4	4 lines	4 audio samples per packet
5 .. 8	4 lines	0 samples
9 .. 11	3 lines	4 samples
12 .. 308	297 lines	27 x [10 lines of 3 samples + 1 line of 4 samples]
309 .. 312	4 lines	3 samples
313 .. 317	5 lines	4 samples
318 .. 321	4 lines	0 samples
322 .. 324	3 lines	4 samples
325 .. 621	297 lines	27 x [10 lines of 3 samples + 1 line of 4 samples]
622 .. 625	4 lines	3 samples

Total samples = 1920 / frame

Max. buffer excursion = 13 samples

**D1 525:**

1 .. 3	3 lines	3 samples
4	1 line	4 samples on frames 1, 3, & 5 3 samples on frames 2 & 4 (5 frame sequence)
5 .. 8	4 lines	3 samples
9 .. 12	4 lines	0 samples
13 .. 21	9 lines	8 lines of 3 samples + 1 line of 4 samples
22 .. 261	240 lines	24 x [9 lines of 3 samples + 1 line of 4 samples]
262 .. 271	9 lines	3 samples
272 .. 275	4 lines	0 samples
276 .. 283	8 lines	7 lines of 3 samples + 1 line of 4 samples
284 .. 523	240 lines	24 x [9 lines of 3 samples + 1 line of 4 samples]
524 .. 525	2 lines	3 samples

Total samples = 8008 / 5 frames

Max. buffer excursion = 14 samples

**Manual Revision Record**

Date	Version No.	Issue No.	Change	Comments
270697	1	1		First Issue
290998	1	2	Changes ref VJ	New issue released
151298	1	3	Menu changes 1's to A etc.	New issue released
040601	1	4	Minor corrections and Force 291 removed. S/W to V5.9.8	New issue released
280302	1	5	Now includes information for the 3A enclosure module	New manual issued
010403	1	6	Power consumption added to techspec	New manual issued
240205	1	7	Not available note added	New manual issued