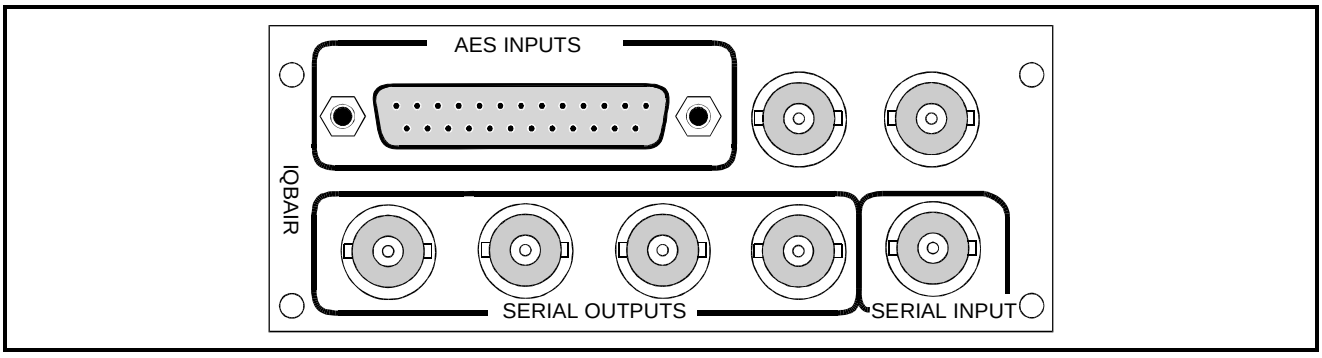
IQBAIRS AES/EBU Audio Inserter

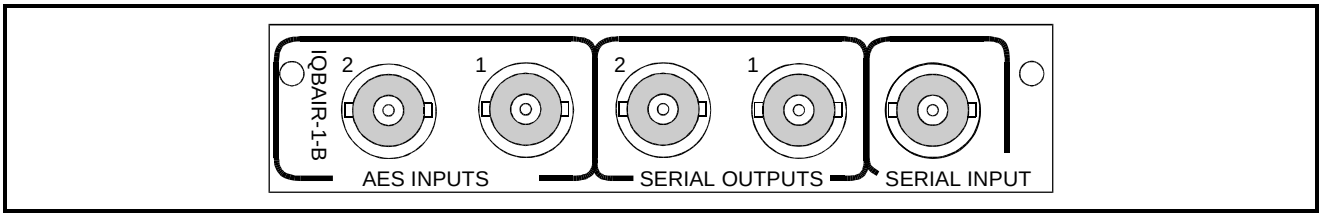
Module Description

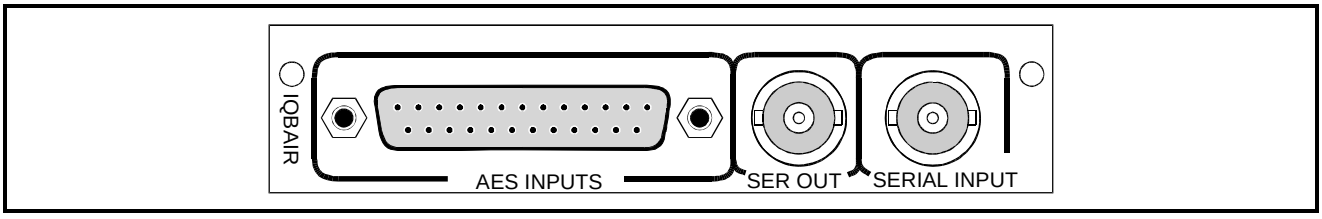
The IQBAIRS embeds up to two AES/EBU (four mono) audio pairs in a component serial digital video stream.

The IQBAIRS examines the SDI video input and reports EDH errors and audio data presence. The two embedders can be independently addressed to any of the eight possible pair locations. If the selected audio pair location is vacant on the upstream serial digital video, the unit will add it, otherwise it will flash a warning LED and not embed. SDI video outputs provide regenerated copies of the input SDI video stream. EDH checking and checksum re-insertion is to SMPTE RP 165. Four cards may be cascaded to cater for all 16 mono channels (8 pairs) that can embedded. Control may be by card edge controls or via the RollCall™ remote control system

REAR PANEL VIEWS



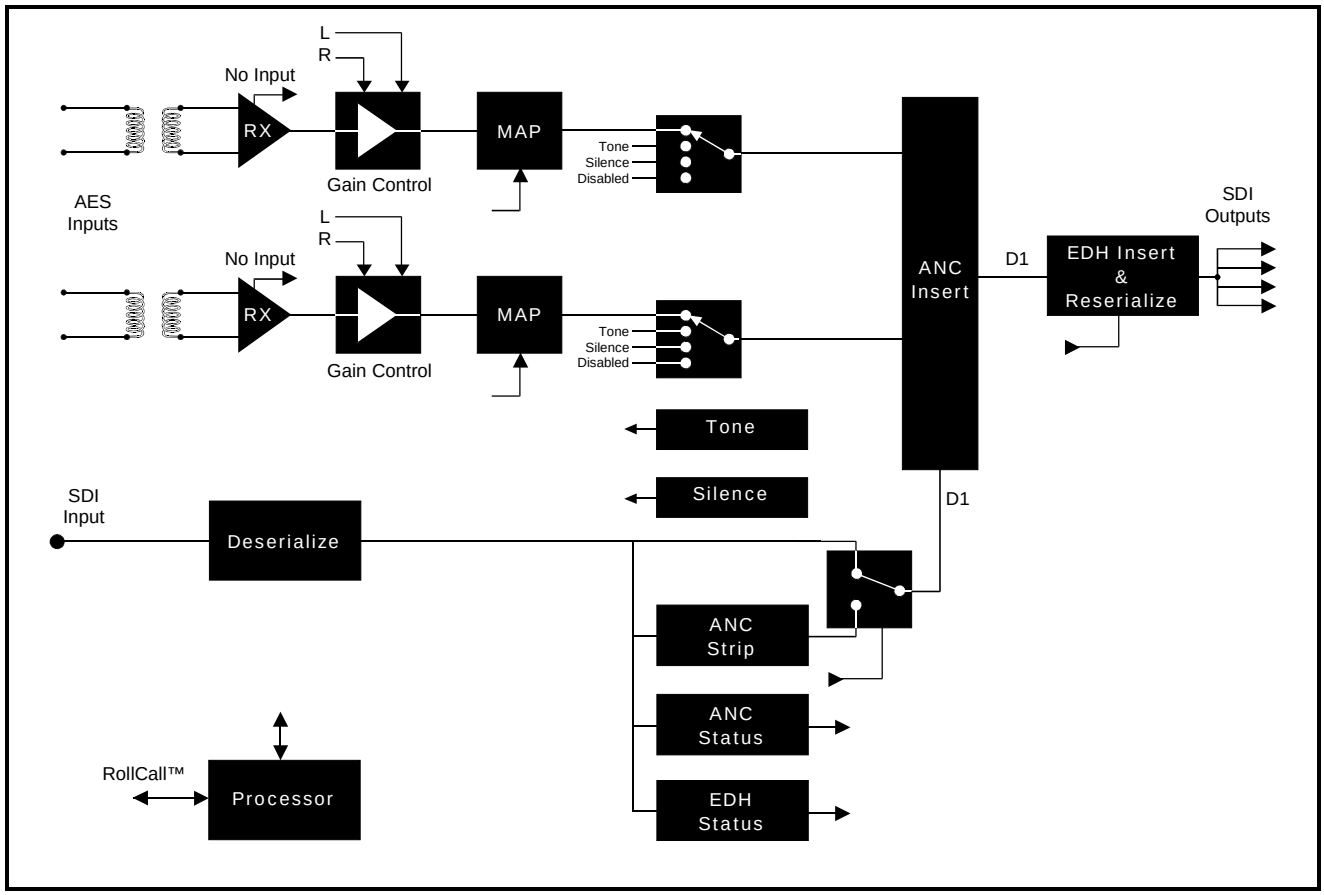




Versions of the module cards available are:

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

BLOCK DIAGRAM



Features

- Automatic 525 and 625 line operation
- All versions incorporate EDH reporting and re-insertion to SMPTE RP165
- Regenerated serial 4:2:2 outputs
- Test-tone/ silence insertion capability
- Optional stripping of all ancillary data prior to insertion
- Two 48 kHz synchronous-to-video AES-3 inputs, independently assignable
- Independent Left/Right gain control for each input
- Subframe mapping
- Balanced and unbalanced AES/EBU input versions available

TECHNICAL PROFILE

Features

Signal Inputs

Digital	1 Serial Digital 4:2:2 Input
AES Audio	2 Stereo pairs (4 channels)

Signal Outputs

Digital	Serial Digital Outputs 4 (-2-D), 2 (-1-B) and 1 (-1-D)

Preset Controls

Input Assign	Assign AES or tone/silence to stereo pair
Strip ANC Data	Remove all ANC Data prior to insertion
Select Tone/Silence Insertion	Select Test Tone or Silence for Insertion as required
Local/Remote Control Select	Local operation or via RollCall™ remote control
EDH Reset	Clear EDH error history

Additional Controls via RollCall™ Remote Control System

Naming	Naming of each audio channel (for User reference only)
Input Assignment	Assignment of the input channel-pairs (1..8)
EDH Error History Reporting	Report History
Line Standard Reporting	Report 525 or 625
Audio Data Channels Present Reporting	Report Presence
Attempted Insertion Failure Reporting	Report Failure
Polarity Invert	
Gain Control	Left and Right for each AES Input range ±6 dB in 0.25 dB steps

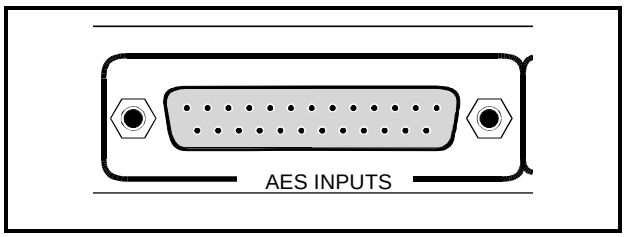
Specifications

Serial Input Return Loss	Better than18 dB to 270 MHz Receive length >200 m
Serial Output Return Loss	Better than 20dB 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
Sample Rate	48 kHz synchronous to D1 video stream

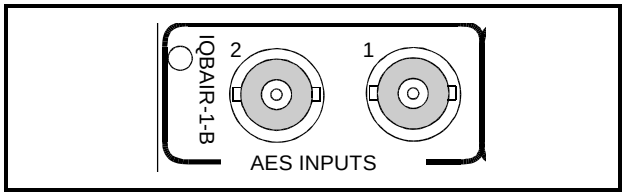
INPUTS

Balanced AES audio input connections are made via this 25 way female D-type connector. (-2-D and –1-D versions)

For connection data consult the tables on page 5.

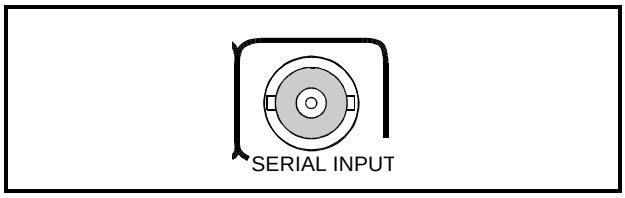


Unbalanced AES inputs are made via these BNC connectors. (-1-B version)



Serial Digital Video Input

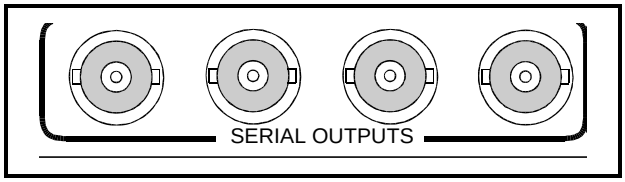
The serial digital input to the unit is made via this BNC connector which terminates in 75 Ohms.

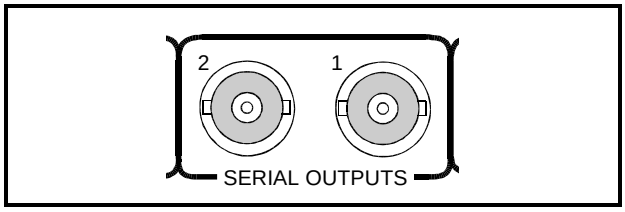


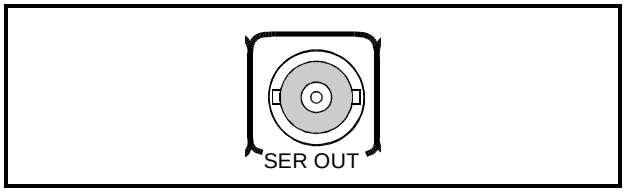
OUTPUTS

Serial Digital Video Outputs

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



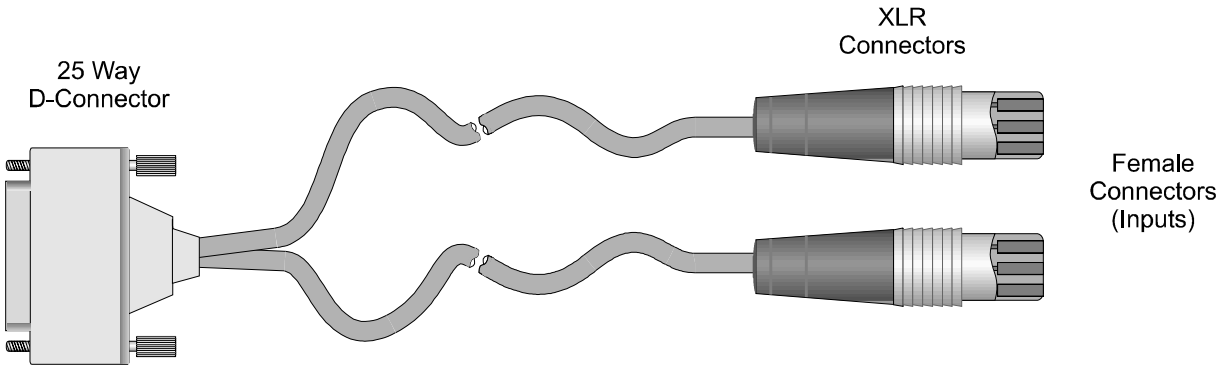


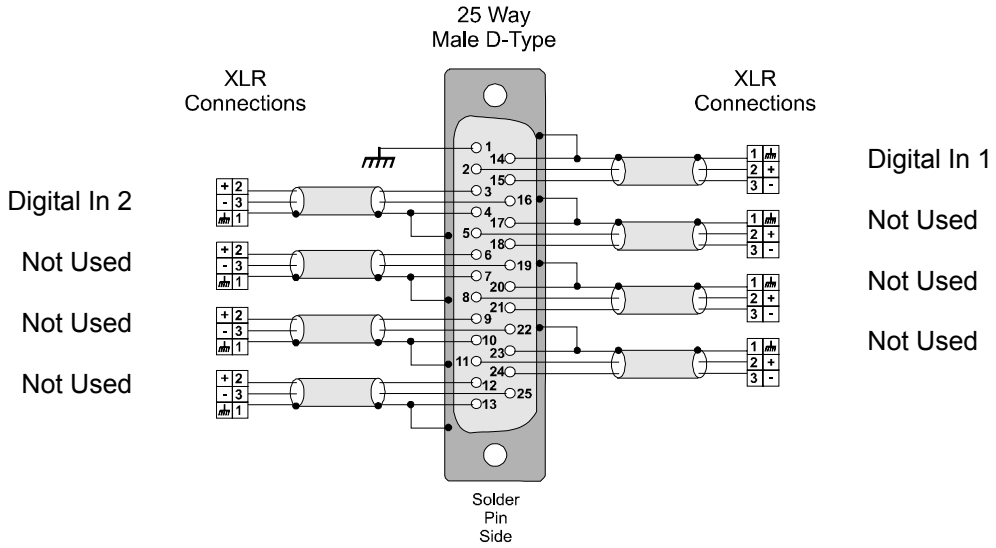


Connection Details (Balanced AES input versions)

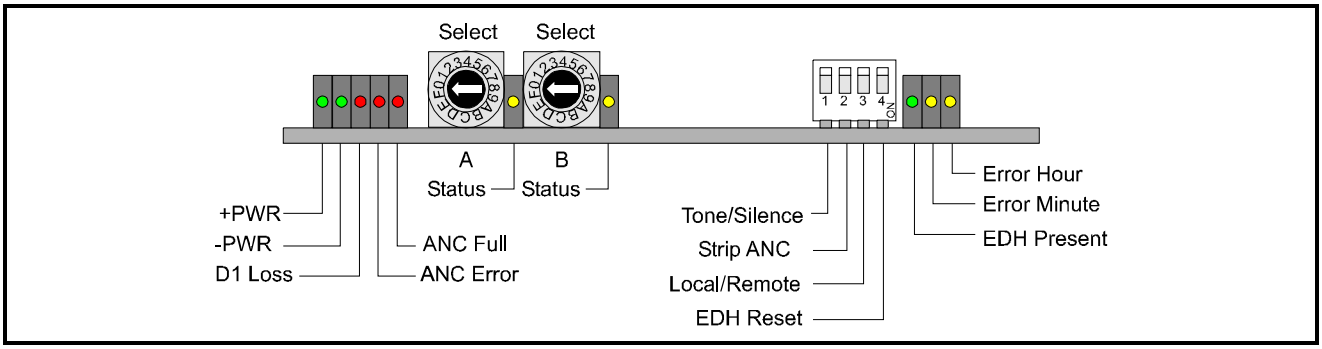
25 Way D Connector Pin Number	Description	Ribbon Cable Strand Number	Standard Pin Assignment
1	Chassis	1	CHASSIS
14	AES GND	2	GND1
2	AES IN 1 +	3	1+
15	AES IN 1 -	4	1-
3	AES IN 2 +	5	2+
16	AES IN 2 -	6	2-
4	AES GND 2	7	GND2
17		8	GND3
5		9	3+
18		10	3-
6		11	4+
19		12	4-
7		13	GND4 (CH)
20		14	GND5
8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





CARD EDGE CONTROLS



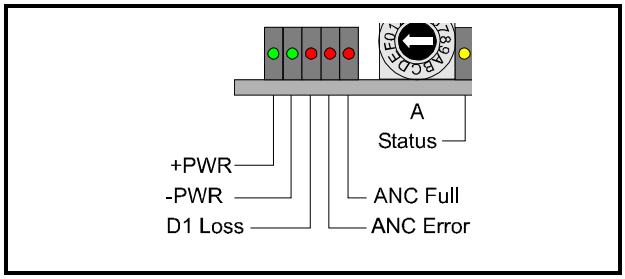
Note that the unit will respond to both local and remote control, one system overriding the settings of the other For cards using the RollCall™ remote control system, activating these switches will override the remote control settings. The RollCall™control panel will then follow these settings.

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 used.

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 a short interval 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.

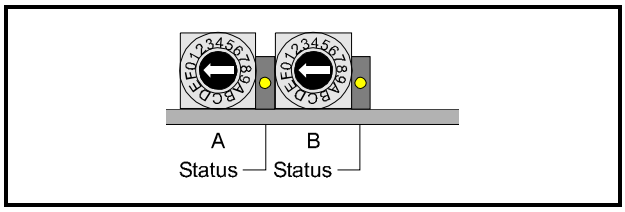
STATUS LED's

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/slence inserted)
or
(9...0) has no input AES (inserter disabled)
or
selected destination is already occupied (inserter disabled)
or
insufficient ANC space (inserter disabled)

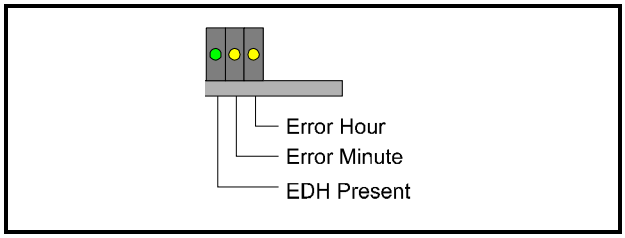
3. **Will not be illuminated** if the inserter channel is embedding AES at selected destinations (1....8)



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.

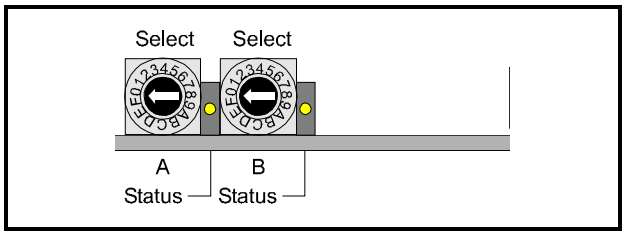


EDH MIN / HOUR

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 it 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 provided input AES is present

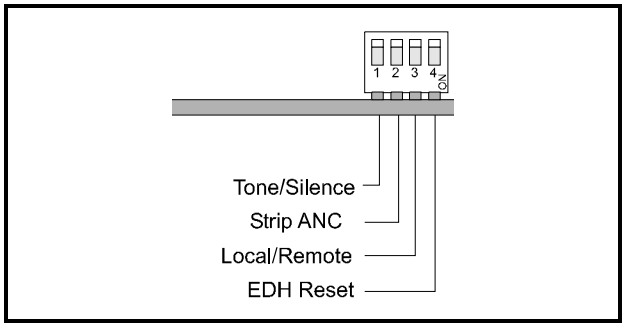
NOTE: the two inserter channel assignments MUST be exclusive !

If both inserter channels are assigned the same target address one will be are 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*™ network. To cure this problem the user must either reassign the data (HEX switch selection), 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 temporally override these settings.

EDH RESET

When enabled this will clear EDH error history.

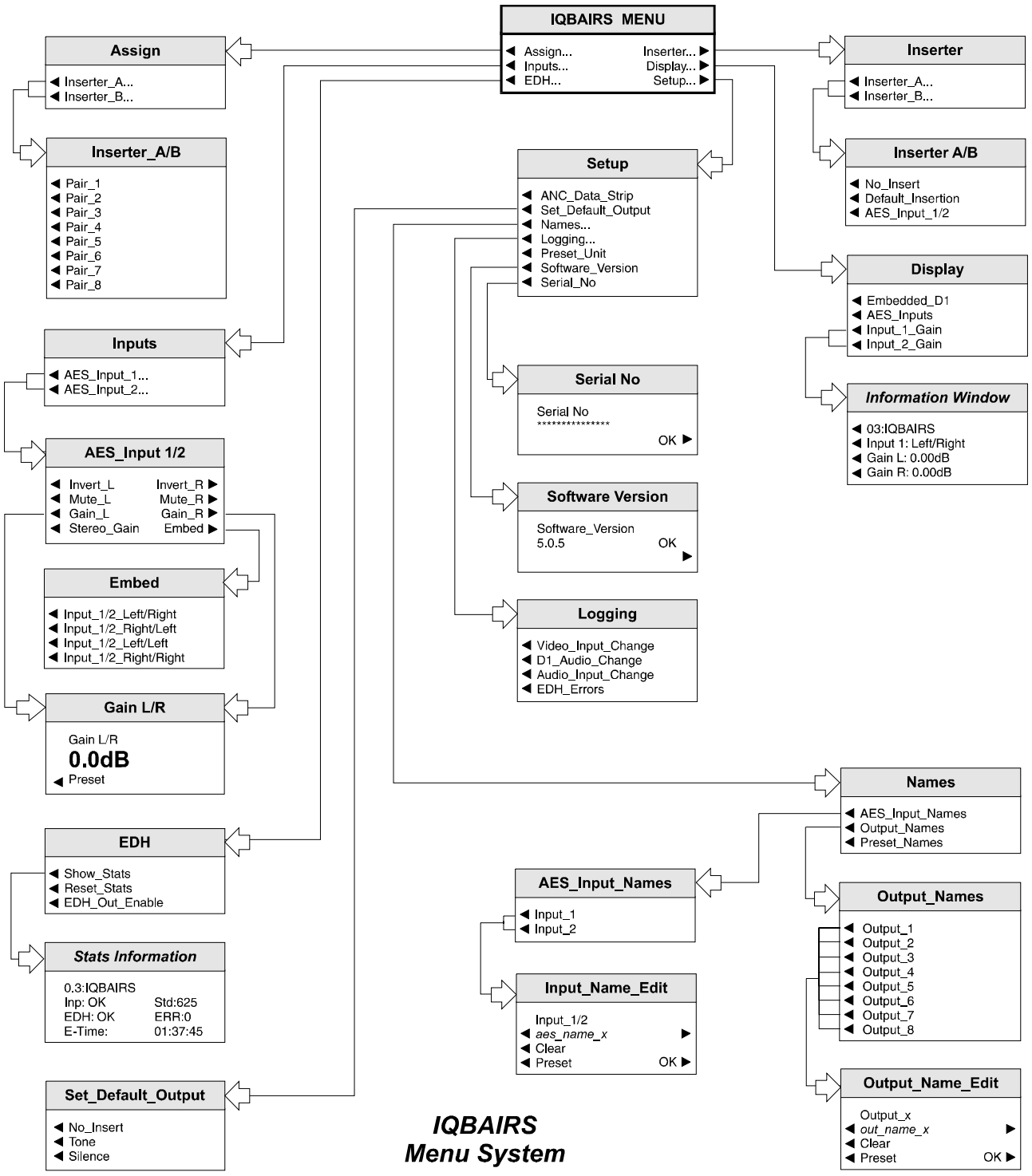
SMPTE 272M SUPPORT

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



IQBAIRS
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_A** 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

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 Invert_R ►

When enabled the polarity of the Left (or Right) signal will be inverted.

◄ Mute_L Mute_R ►

When enabled the Left (or Right) signal will be muted.

◄ Gain_L Gain_R ►

When enabled the gain of the Left (or Right) signal may be adjusted using the spinwheel over a range of ±6 dB in steps of 0.25 dB. Preset is to 0.00 dB

◄ Stereo_Gain

When this item is selected the Left and Right gain controls will be locked together (ganged) such that the gain of both channels will be adjusted together and by the same amount.

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 embeddded data positions.

◄ AES_Inputs

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

◄ Input_1/2_Gain

This allows information about Input 1 and Input 2 gain settings to be displayed in the information window.

Information Window
◄ 03:IQBAIRS ◄ Input 1: Left/Right ◄ Gain L: 0.00dB ◄ Gain R: 0.00dB

◄ 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.

◄ 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.

Embedder 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 IQBAIRS module is capable of inserting two pairs of audio data (four channels). Four IQBAIRS 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. Block numbering as defined in SMPTE-272M is not supported.

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

The embedders are given individual address assignments for destination stereo pair (1..8). 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 embedder control section looks for the first free space after EAV. Once found the embedding process is initiated with the first enabled embedder. However, before starting the embedding for either of the embedder streams the remaining data space is checked to ensure that there is enough room for the ancillary packet. If not, all embedders 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. If stripped, the card embedders will embed data immediately following the EAV markers, otherwise the existing ancillary data will be appended to, provided that there is sufficient room remaining.

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 IQBAIRS card. For example, if the data packets do not start immediately following the EAV marker the embedders 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.

If either embedder is active the IQBAIRS will blank out embedded data which does not comply with SMPTE291M.

Manual Revision Record

Date	Version No.	Issue No.	Change	Comments
230399	1	1		First Issue