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IRT Eurocard

Type DAI-3206

Digital Audio Inserter for 270Mb/s SDI

Designed and manufactured in Australia

IRT can be found on the Internet at:
http://www.irtelectronics.com

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Revision History

Revision	Date	By	Change Description	Applicable to:
1	20/03/2001	AL	Original Issue.	S/N: ≥ 0110001
2	03/12/2001	SH	Cleanup and update of spec sheet before release.	S/N: ≥ 0110001
3	16/02/2004	AL	Update with balanced/unbalanced common rear assembly.	S/N: ≥ 0307001
4	22/07/2004	AL	Corrections to configuration adjustments – RV1 to RV4 and SW2, and addition of “MODE” descriptions.	S/N: ≥ 0307001
5	12/01/2011	AL	Configuration LK1 link position stipulated to be in OUT position only.	S/N: ≥ 0307001
6	03/05/2011	AL	Equalisation specification corrected to > 250m.	S/N: ≥ 0307001

IRT Eurocard

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Instruction Book

Table of Contents

This instruction book applies to units later than S/N 0307001.

Operational Safety:

WARNING

Operation of electronic equipment involves the use of voltages and currents that may be dangerous to human life. Note that under certain conditions dangerous potentials may exist in some circuits when power controls are in the **OFF** position. Maintenance personnel should observe all safety regulations.

Do not make any adjustments inside equipment with power **ON** unless proper precautions are observed. All internal adjustments should only be made by suitably qualified personnel. All operational adjustments are available externally without the need for removing covers or use of extender cards.

IRT Eurocard

Type DAI-3206

Digital Audio Inserter for 270Mb/s SDI

General Description

The DAI-3206 is intended as a high performance audio embedder for 270 Mbit SDI video signals.

A typical SDI signal may contain up to eight audio pairs arranged in four groups although only one group is normally required for program distribution.

2 AES signals, 4 analogue audio signals, or a combination of 1 AES and 2 analogue audio signals may be inserted into an existing SDI video stream.

Each DAI-3206 is capable of inserting one audio group (2 AES signals – 4 channels). Group position selection is made by the front panel local control.

Regenerated SDI outputs are provided to allow connection of more modules if additional channels are required.

The DAI-3206 supports AES/EBU synchronous / asynchronous audio at 48 kHz, 20-bit audio data packets.

An audio presence indicator is provided for each input. Depending on the mode selected, if one AES audio pair is missing then those particular channels are set to zero. If both AES pairs are missing then no packets are inserted.

The DAI-3206 complements the DAX-3206 audio extractor.

Front panel LED's indicate a loss of SDI input and the presence of AES1 and AES2 signals. An external relay alarm is also provided on the rear assembly.

The DAI-3206 is fabricated in IRT's standard Eurocard format and may be housed in a variety of IRT Eurocard frames alongside other standard modules.

Standard features:

- **Standard 75 Ω 270 Mbit/s video input.**
- **Inserts audio - either 2 AES signals containing 2 channels each, 4 analogue channels or a combination of AES and analogue pairs.**
- **Selectable re-sampled or non re-sampled modes.**
- **Supports SMPTE 272M-A Synchronous 48 kHz Insertion (re-sampled mode).**
- **Supports SMPTE 272M-AD Asynchronous 48 kHz Insertion (non re-sampled mode).**
- **20 bit audio supported.**
- **Z, C, U data preserved (non re-sampled mode).**
- **Select between AES & Analogue audio inputs.**
- **Automatic EDH correction and / or insertion.**
- **Ability to replace existing embedded audio.**
- **Automatic selection between 525 & 625 line formats.**
- **Indicators / external alarms for loss of carrier & audio.**
- **Automatic input equaliser to >250 m.**
- **Two 270 Mbit/s SDI outputs for loop through to additional units.**

Technical Specifications

IRT Eurocard module
Type DAI-3206

SDI input:

Number	1 (BNC).
Impedance	75Ω terminated.
Equalisation	Automatic for cables lengths > 250 m (Belden 8281).
Format	270 Mbit/s video with or without embedded audio serial data to SMPTE 259M-A/D.

SDI outputs:

Number	2 (BNC).
Type	75Ω sourced.
Format	Regenerated and re-clocked.

AES/EBU inputs:

Number	2 x 48 kHz synchronous/ asynchronous, 20-bit audio data packets.
Impedance	75 Ω unbalanced, solder link selectable 110 Ω balanced, standard

Analogue Audio inputs:

Number	4 (Left 1/Right 1, Left 2/Right 2)
Type	Balanced Phoenix plug in terminal blocks.
Input level	+24 dBu at Full Scale
Impedance	10 kΩ

Alarm output: N/C Relay contacts

Other:

Power requirements		28 Vac CT (14-0-14) or ± 16 Vdc.
Power consumption		<7 VA.
Temperature range		0 - 50° C ambient.
Mechanical		Suitable for mounting in IRT 19" rack chassis with input output and power connections on the rear panel.
Finish:	Front panel	Grey background, black lettering & red IRT logo.
	Rear assembly	Detachable silk-screened PCB with direct mount connectors to Eurocard and external signals.
Dimensions		30 mm x 3 U x 220 mm IRT Eurocard.
Accessories supplied with module		Rear connector assembly including matching connectors for audio and alarms.
Related Modules		DAX-3206 digital and analogue audio extractor.

Due to our policy of continuing development, these specifications are subject to change without notice.

Technical Description

Audio Packet Distribution

Groups are embedded in non-switching lines with each group residing in a fixed number of bytes from the End of Active Video (EAV) flag. Each group contains either 3 or 4 AES words in length. Preserving this distribution simplifies insertion or removal of audio groups. Other manufacturers support this method.

In the non-resampled mode, each of the two channels within the AES group must be the same data rate. If both channels are present, input one is deemed master and the packet distribution is performed according to its input rate.

Input 1 corresponds to channels 1 & 2 of the audio group while Input 2 corresponds to channels 3 & 4. Note that in the non-resampled mode, Input 2 may experience clicks or pops and C channel errors if asynchronous to Input 1.

If Input 1 is not present then Input 2 becomes master. If neither is present then no audio packets are embedded.

If both a combination of one AES and one analogue audio pair are used, then the AES input becomes master if present, else the analogue sampling rate is locked to the SDI clock rate. This is true for the non-resampled mode.

In the resampled mode, both AES and Audio are locked to video.

If both analogue audio pairs are used, the analogue sampling rate is locked to the SDI clock rate.

Group 1	Immediately after EAV.
Group 2	64 bytes after EAV.
Group 3	128 bytes after EAV.
Group 4	192 bytes after EAV.

Configuration

Adjustments:

RV1	Left 2	analogue audio input level adjustment
RV2	Right 2	analogue audio input level adjustment
RV3	Left 1	analogue audio input level adjustment
RV4	Right 1	analogue audio input level adjustment

Links:

	Link	Normal	Function
	LK 1	IN:	Not Used (Leave OUT).
		OUT:	Remove existing embedded data (Default position).
	LK 9 (when LK 1 out)	IN:	Erase selected embedded data.
		OUT:	Erase all embedded data.
*	LK 11	IN:	Don't insert control packet.
		OUT:	Insert control packet.

Switches:

Sw 1 Front panel: Group selection 1 – 4.

Sw 2 Mode (Position)

0	Insert	AES 1	&	AES 2	
1	Insert	AES 1	&	AUDIO 2	- (Analogue Audio 2 locked to AES1, if present, else locked to video).
2	Insert	AUDIO 1	&	AES 2	- (Analogue Audio 1 locked to AES2, if present, else locked to video).
3	Insert	AUDIO 1	&	AUDIO 2	- (Analogue Audio 1 & 2 locked to video).
4	Insert	resampled AES1	&	resampled AES2	} Locked to video, Synchronous.
5	Insert	resampled AES1	&	Analogue 2	
6	Insert	AUDIO 1	&	resampled AES2	
7	Insert	AUDIO 1	&	AUDIO 2	

All other switches are unused.

*** NOTE:**

LK 11:

LK 11 is used to control the insertion of Audio Control Packets. Audio Control Packets are used to tell the decoder the format of the embedded audio, parameters such as synchronous or asynchronous, sampling rate 32 kHz, 44.1 kHz, 48 kHz etc. are defined.

Each group must have a control packet except in the case of 48 kHz synchronous operation when the Audio Control Packet is defined as OPTIONAL. In the absence of an Audio Control Packet, 48 kHz synchronous operation is assumed.

Description of DAI-3206 Modes:

Overview:
The DAI-3206 supports several insertion modes to provide flexibility in the studio environment. These modes determine the input (AES or Analogue audio) and sampling reference. The DAI-3206 was originally designed to support the new compressed digital audio formats such as Dolby-E, which must pass unchanged from origin to destination. This required that the DAI-3206 supported asynchronous 48K plus associated control packet. This control packet is only optional for synchronous 48kHz mode.

It was also decided that the channel pairs might be either both AES, Analogue or a combination of the two. In the combined AES/analogue case, the analogue audio is locked to the AES if present of locked to video if the AES is lost.

AES audio can be resampled to become synchronous with the video, however, a small but measurable degradation of performance occurs, which in almost all cases is insignificant. Additionally, the channel data is destroyed and subsequently partially rebuilt. However, performing this resampling allows the audio data to become 48K synchronous and more flexible when used with other studio equipment.

MODE 0 (Asynchronous AES1 & AES2)
This mode is used when perfect AES transfer is required. This is most useful for Dolby-E type applications, otherwise MODE 4 is recommended. In this mode the data is asynchronously distributed which is not compatible with synchronous decoders unless the AES is already synchronized to video at the AES encoder. Additionally, some AES decoders employ a minimal sample buffer implementation; this is done for several reasons, primarily in tape recorders, which try to minimize coding delay. This delay accumulates over multiple play modify and record operations which may finally result in annoying lip sync.

MODE 1&2 (Asynchronous AES & Analogue Audio)
This mode is used when perfect AES transfer is required. The analogue audio is sampled using the AES input as a reference. If the AES is missing, then the analogue audio is synchronous to the video. However, this distribution is even and no attempt to compensate (pre-load the receiver buffer) for the absence of audio packets during in the vertical interval is performed. Most receivers such as the DAX-3206 contain a buffer structure that easily handles this distribution. You may be aware of the audio packet distribution differences between the SMPTE & SONY formats. The DAX-3206 was designed with a buffer capable of tolerating either distribution.

MODE 3 (Synchronous Analogue Audio)
This mode is probably the most confusing and it is not recommended in favour of MODE 7. This was the original distribution mode of the DAI-3206. In this mode the audio is synchronous to the video, however, no attempt to compensate (pre-load the receiver buffer) for the absence of audio packets during in the vertical interval is performed. The DAX-3206 was designed with a buffer capable of tolerating many sample distributions.

MODE 4 (Resampled AES1 & AES2)
With the advent of high performance digital audio receivers many synchronization issues can be eliminated. The advantage is that the audio is now synchronized to the video with little loss of performance. The disadvantage is the channel data is lost and is therefore rebuilt. This is not an issue in practice and is mentioned for completeness. To fully complement minimal buffer management practices in some studio video recorders, the packet distribution has been completely changed from previously described distributions. A fixed packet distribution is generated that is identical to SDI test signal generators known to be acceptable to studio VCRs. This distribution compensates for the absence of audio packets in the vertical switching region.

MODE 5&6 (Asynchronous AES & Analogue Audio)
This mode treats the AES as in MODE 4, with the analogue audio following the sample fixed distribution.

MODE 7 (Synchronous Analogue Audio)
This is the recommended analogue input mode that uses the same fixed distribution as described in MODE 4.

Installation

Pre-installation:

Handling:

This equipment may contain or be connected to static sensitive devices and proper static free handling precautions should be observed.

Where individual circuit cards are stored, they should be placed in antistatic bags. Proper antistatic procedures should be followed when inserting or removing cards from these bags.

Power:

AC mains supply: Ensure that operating voltage of unit and local supply voltage match and that correct rating fuse is installed for local supply.

DC supply: Ensure that the correct polarity is observed and that DC supply voltage is maintained within the operating range specified.

Earthing:

The earth path is dependent on the type of frame selected. In every case particular care should be taken to ensure that the frame is connected to earth for safety reasons. See frame manual for details.

Signal earth: For safety reasons a connection is made between signal earth and chassis earth. No attempt should be made to break this connection.

Installation in frame or chassis:

See details in separate manual for selected frame type.

Connections:

Controls

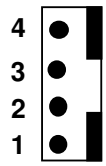
- Group select (1,2,3 or 4) – Front panel switch SW1
- Channel pair select (1&2 or 3&4) – Internal rotary switch SW2

Indicators and alarms

The alarm output on the rear of the DAI-3206 indicates a loss of 270 Mb/s data or power failure. The alarm state is indicated by a contact closure, which is available on J3A of the rear assembly.

J2 alarm connectors on rear panel:

Pin 4	Relay COM
Pin 3	Relay N/C
Pin 2	Not Used
Pin 1	Ground



LED's on the front panel indicate:

Loss of carrier
Presence of Audio 1
Presence of Audio 2
DC power

SDI Video:

Input:

The SDI input is a single BNC connector terminated in 75 Ohms.

The input equaliser compensates automatically for losses of up to 250 metres of high quality 75 Ohm coaxial cable. Performance tests are made using Belden 8281 cable as a reference. Actual results and bit error rates will depend on the quality of the cable and the noise environment as well as the quality of the originating equipment.

Outputs:

Two SDI outputs are provided. These are equalised and reclocked outputs and so will exhibit a small time delay with respect to the input. This may need to be taken into account if they are to be used for other than monitoring purposes.

These outputs are matched 75 Ohm impedance and should only be used with 75 Ohm coaxial cable. They must be 75 Ohm terminated at the destination in order to obtain correct levels and performance.

AES Audio:

AES audio inputs are provided in either balanced (standard) or unbalanced (solder link selectable on rear assembly) formats. The AES signals are encoded as stereo and therefore does not require separate connections for 'Left' and 'Right' channels. 2 input AES signals may be inserted into the one group.

Analogue channels are mapped Left1, Right1, Left2, Right2 to channels 1,2,3,4 using consumer mode.

The unbalanced BNC input connectors, on the 75 Ohm rear connector unit, should only be used with 75 Ohm coaxial cable and must be 75 Ohm terminated at the source in order to obtain correct levels and performance.

The balanced inputs, on the 110 Ohm rear connector unit, should be used with high quality twisted pair shielded cable and terminated in a balanced configuration of 110 Ohms at the source. This format is not polarity (phase) conscious, but +ve and -ve marks are provided beside the output connector for consistency in wiring. However, it is important that the cable lengths and losses of the pair be the same. In particular, patch bays can introduce these problems, resulting in distorted eye patterns and thus, high bit error rates.

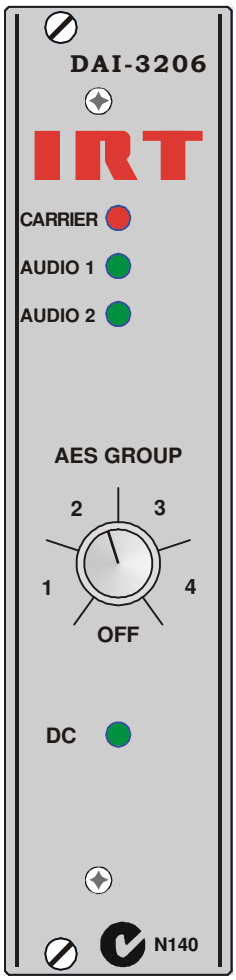
This format is not generally suited to long cable runs. For these applications the unbalanced 75 Ohm input should be used.

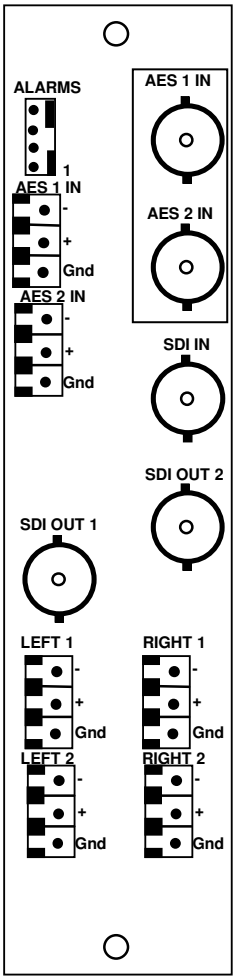
AES Digital Input Configuration:

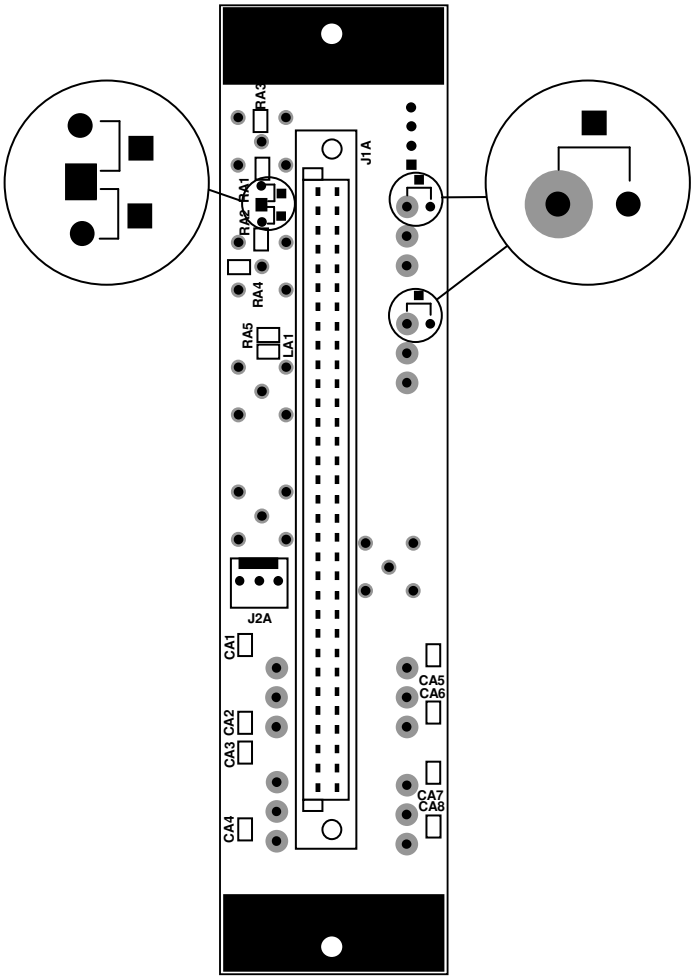
There are four pairs of pads on the reverse side of the rear assembly marked ■. To convert a rear assembly from 110Ω balanced to 75Ω unbalanced connect each pair of pads together.

Front & rear panel connector diagrams

The following front panel and rear assembly drawings are not to scale and are intended to show connection order and approximate layout only.







Underside of rear assembly with areas marked with a ■ indicating where to connect together to convert to a 75 Ohm unbalanced AES input.

Maintenance & Storage

Maintenance:

No regular maintenance is required.

Care however should be taken to ensure that all connectors are kept clean and free from contamination of any kind. This is especially important in fibre optic equipment where cleanliness of optical connections is critical to performance.

Storage:

If the equipment is not to be used for an extended period, it is recommended the whole unit be placed in a sealed plastic bag to prevent dust contamination. In areas of high humidity a suitably sized bag of silica gel should be included to deter corrosion.

Where individual circuit cards are stored, they should be placed in antistatic bags. Proper antistatic procedures should be followed when inserting or removing cards from these bags.

Warranty & Service

Equipment is covered by a limited warranty period of three years from date of first delivery unless contrary conditions apply under a particular contract of supply. For situations when "No **Fault Found"** for repairs, a minimum charge of 1 hour's labour, at IRT's current labour charge rate, will apply, whether the equipment is within the warranty period or not.

Equipment warranty is limited to faults attributable to defects in original design or manufacture. Warranty on components shall be extended by IRT only to the extent obtainable from the component supplier.

Equipment return:

Before arranging service, ensure that the fault is in the unit to be serviced and not in associated equipment. If possible, confirm this by substitution.

Before returning equipment contact should be made with IRT or your local agent to determine whether the equipment can be serviced in the field or should be returned for repair.

The equipment should be properly packed for return observing antistatic procedures.

The following information should accompany the unit to be returned:

1. A fault report should be included indicating the nature of the fault
2. The operating conditions under which the fault initially occurred.
3. Any additional information, which may be of assistance in fault location and remedy.
4. A contact name and telephone and fax numbers.
5. Details of payment method for items not covered by warranty.
6. Full return address.
7. For situations when "No **Fault Found"** for repairs, a minimum charge of 1 hour's labour will apply, whether the equipment is within the warranty period or not. Contact IRT for current hourly rate.

Please note that all freight charges are the responsibility of the customer.

The equipment should be returned **to the agent who originally supplied the equipment** or, where this is not possible, to IRT direct as follows.

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