Contents

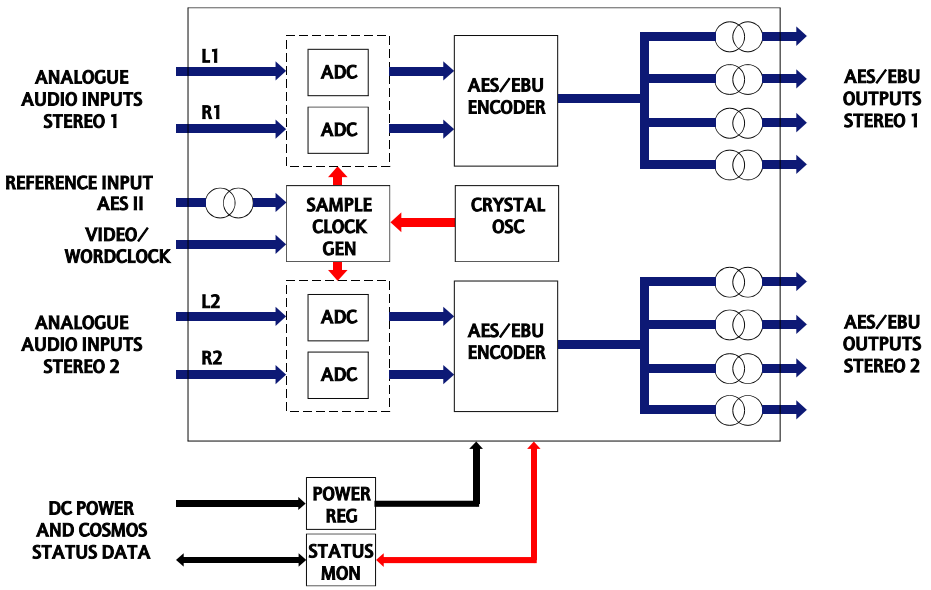
1 Introduction

The 4410 module is an audio analogue to digital converter which may be fitted with one or two stereo ADC sub-boards, each providing four balanced or unbalanced digital outputs to AES3-1992.

The digital outputs can be configured to lock to one of three references, video, wordclock or any valid balanced or unbalanced AES signal. Two rear connectors are available depending on the choice of balanced or unbalanced digital I/O. The module is designed to fit in the 1050 3U and 1051 1U Pro-Bel ICON modular product rackframes.

Characteristics of the 4410 module are:

- one or two stereo ADCs per module
- four balanced or unblanced AES outputs per ADC
- full 20 bit conversion
- AES 11, video and wordclock reference inputs or free-run on internal crystal oscillator
- digital peak level adjustable for EBU or SMPTE standards
- 32, 44.1 and 48 kHz sample rates
- compatible with COSMOS, Pro-Bel status monitoring



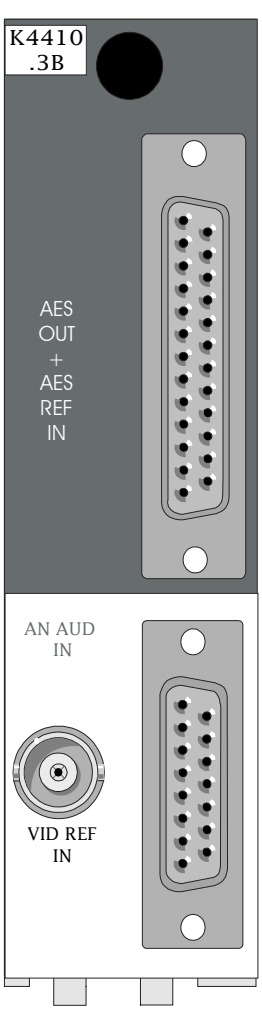
The 4410 audio analogue to digital converter

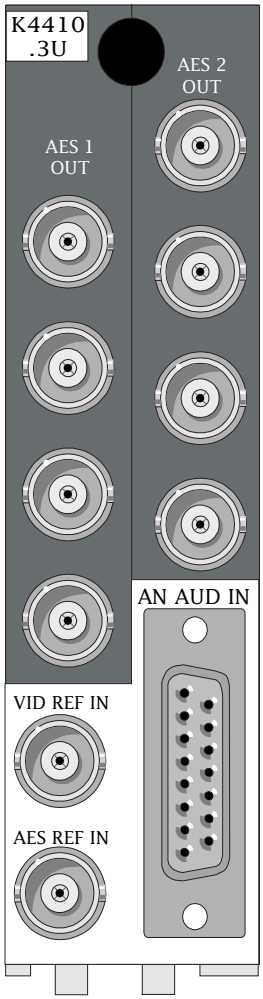
2 Installation

For module installation instructions please refer to the appropriate ICON rack frame section of the manual

2.1 Selecting a rear connector

There are two alternative rear connectors provided. The K4410.3B is used for balanced signals, whilst the K4410.3U is used for unbalanced signals. Both occupy 30mm of rack width in the 1050 3U Icon rack frame.





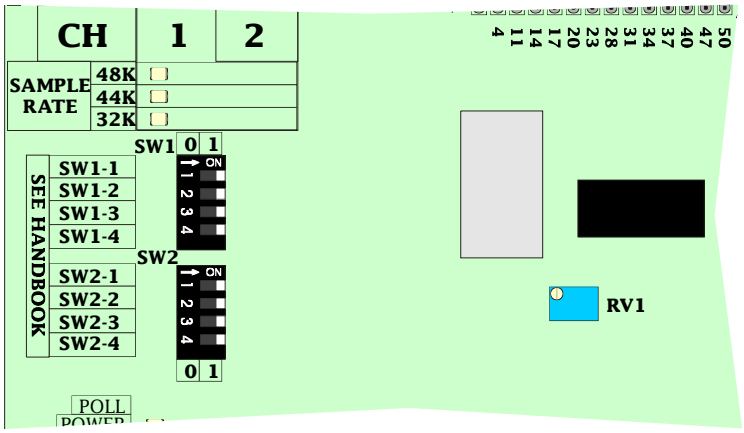
AES out/AES ref in			
Pin	Function	Pin	Function
1	OP1-	14	OP2-
2	OP1-+	15	OP2+
3	GND	16	GND
4	OP1-	17	OP2-
5	OP1+	18	OP2+
6	Not used	19	AES REF IP -
7	Not used	20	AES REF IP+
8	GND	21	OP2-
9	OP1-	22	OP2+
10	OP1+	23	GND
11	GND	24	OP2-
12	OP1-	25	OP2+
13	OP1+		

Analogue audio in			
Pin	Function	Pin	Function
1	AUDL1+	9	AUDL1-
2	GND	10	AUDR1+
3	AUDR1-	11	GND
4	Not used	12	Not used
5	GND	13	AUDL2+
6	AUDL2-	14	GND
7	AUDR2+	15	AUDR2-
8	GND		

3 Configuration

3.1 Setting reference options

The 4410 digital audio encoder may be locked to one of three types of reference signal, analogue video, wordclock or any valid AES 11 signal. When locked to video, the line standard may be selected for 525 or 625 lines. In addition, the sample rate may be selected as 32kHz, 44.1kHz and 48kHz. The selections are made using SW1 and SW2 on the front edge of the module.



Setting reference options

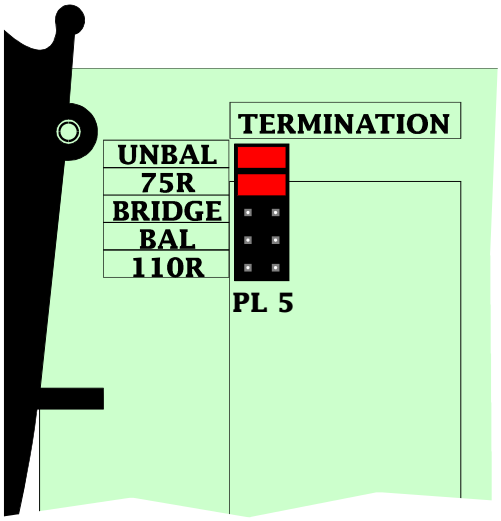
Dip Switch	Setting	Function
SW1-4	0	Wordclock reference on VID REF input
	1	AES reference on AES REF input
SW2-4	0	AES/wordclock reference
	1	Video reference
SW2-3	0	525/60 line standard
	1	625/50 line standard

SW2-4 takes precedence over SW1-4

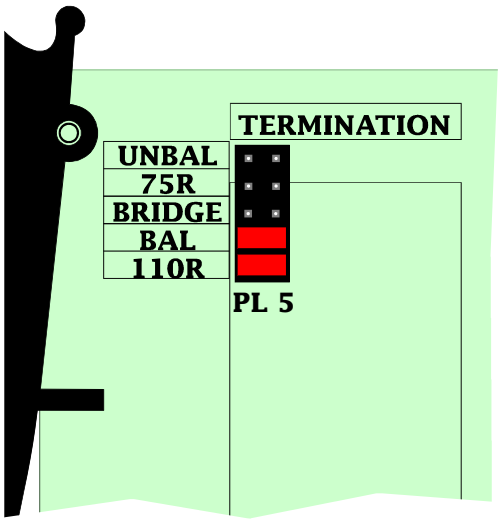
Only one of the three possible references should be connected at any one time. In the absence of a reference the module will free-run from an on-board crystal oscillator.

3.2 Configuring the AES reference

Jumper block PL5 is provided to set the AES reference termination value and select balanced or unbalanced operation.



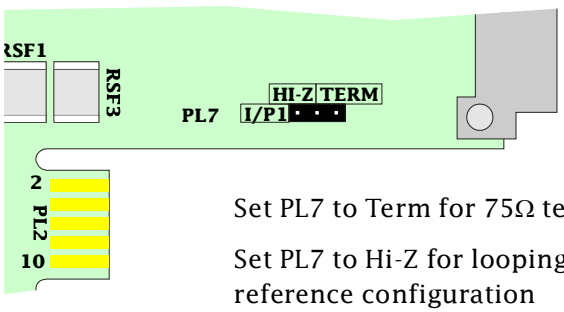
Example termination for unbalanced 75 Ω AES reference



Example termination for balanced 110 Ω AES reference

3.3 Configuring Video/Wordclock references

The analogue video reference input also doubles as an input for a wordclock reference. Jumper PL7 is used to terminate this input with 75 Ω, however this termination will need to be removed for bridging or looping purposes.



Set PL7 to Term for 75Ω termination

Set PL7 to Hi-Z for looping or bridging reference configuration

3.4 Setting the sample rate

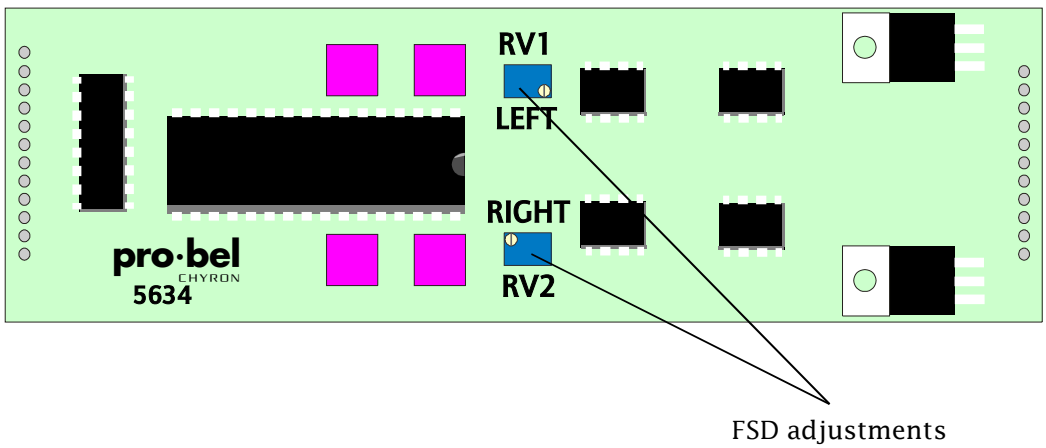
The sample rate may be selected as 32kHz, 44.1kHz or 48kHz by using front edge mounted switch SW2. The appropriate card edge sample rate LEDs will illuminate (green) to confirm the selection.

Setting the sample rate

Jumper SW2-1	SW2-2	Function
0	0	44.1 kHz
0	1	32 kHz
1	0	48 kHz
1	1	48 kHz

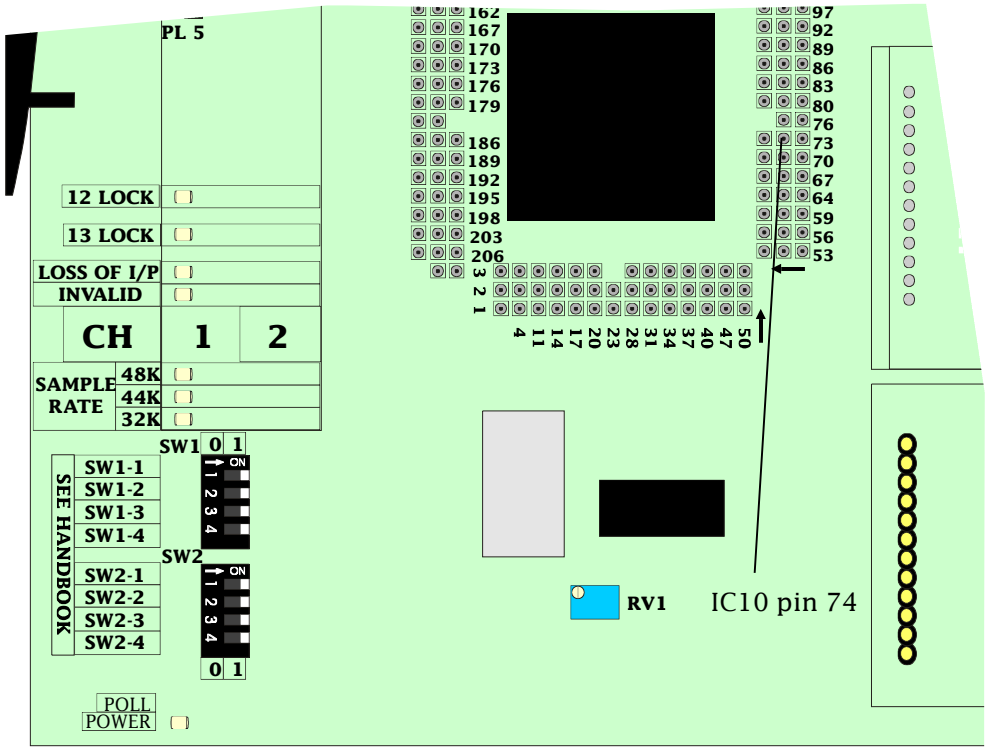
3.5 Setting Full Scale Digital Level

Full Scale Digital is the analogue audio level which corresponds to the largest possible digital value after conversion. Sufficient gain adjustment is provided to more than meet international recommendations. The adjustment range is +15dBu to +24dBu = 0dB,FSD. Standard factory setup is +18dBu=0dB, FSD for Europe and +24dBu=0dB, FSD for the US. See 'Ordering information' for the appropriate order codes for the two setup options.



3.6 Setting the reference oscillator

The free-run speed of the reference oscillator may be set with RV1 on the 4410 module.



Adjust RV1 as follows:

- set the card to operate from a video reference
- pull the reference from the module, and use it to trigger an oscilloscope
- display pin 74 of IC10, the large 208 pin EPF6106 chip on one channel of the scope
- adjust RV1 so that the display locks relative to the video reference trigger

4 Trouble shooting

There is no output signal

- ensure that the green power LED on the front of the card is lit

If not:

- check the resettable fuses protecting the card - do this by removing the power to the card for about 30 seconds then restore the power
- check the PSU indicators to confirm that there is power to the frame
- check that the inputs are connected to the rear panel and valid signals are present

Note: The card edge green power LED will only illuminate if all voltage rails regulated on the module are present.

The output signal is corrupted

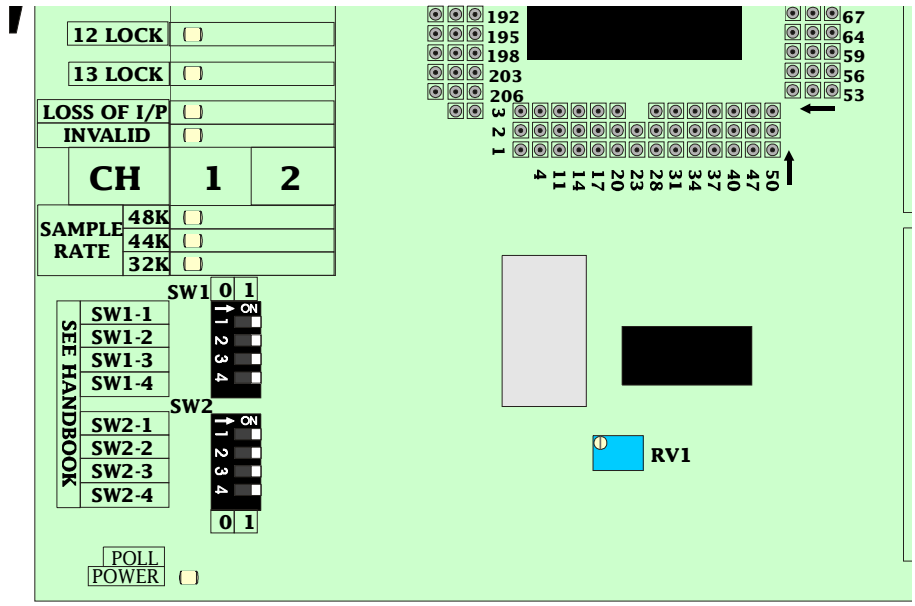
- check the quality of the input signal
- check that only one reference is present at the rear connector and that SW1 and SW2 are selected correctly for the chosen reference
- check that the green audio PLL lock LED is lit (12 LOCK)
- if an analogue video reference is used check that the green video PLL lock LED (13 LOCK) is lit
- check that the red loss of reference LED (Loss Of Input) is not lit
- if an AES 11 reference is used check that the red Invalid LED is not lit
- check that the appropriate termination has been set
- check that the appropriate line rate has been selected
- check that the appropriate sample rate has been selected

The output signal causes pops and clicks in downstream equipment

- check that the reference used has the correct phase and frequency as all other digital audio equipment used in the system

Note: It is recommended to employ a common station video reference or a common AES11 reference for all digital audio equipment if accurate phasing to station signals is required throughout a facility. The 4410 should meet the timing requirements of AES11 under these conditions.

Status indicators



Status indicators		
LED label	**4410 function**	**Meaning when lit**
12 LOCK	Audio PLL lock	Lights green to show that audio clocks are locked to either, video, AES11 or wordclock
13 LOCK	Video PLL lock	Lights green to show that audio clocks locked to video
LOSS OF I/P	Loss of reference	Lights red for loss of reference (video, AES 11 or wordclock depending on switch setting)
INVALID	Invalid reference	Lights red to Indicate invalid AES 11 reference
POWER	Power OK	Lights green if all voltage rails present
SAMPLE RATE	48K	48kHz sample rate selected
	44K	44.1kHz sample rate selected
	32K	32kHz sample rate selected

4410 status indicator assignments

5 COSMOS Status Monitoring

If the frame is equipped with a COSMOS controller card, the following parameters will be reported back to the COSMOS status monitoring system.

- module present
- reference video present
- reference video not locked
- AES 11 reference present
- AES 11 reference locked
- reference set up
- sample rate selected
- audio and video PLL lock status
- power OK

In addition, the module is programmed with the following information, which can be read by the status monitoring controller:

- Module type
- Module bar code
- Module issue no

For further details of the Pro-Bel status monitoring system please refer to the COSMOS status monitoring manual.

6 Specification

Inputs (per sub-module)

Number and type:	2, balanced, floating, analogue audio
Impedance:	20kΩ, 20Hz to 20 kHz (as per 5124)
Level for 0dB FSD:	+15dBu to +24dBu
Reference:	AES 11 1997, balanced or unbalanced or Analogue video, 525/626 1V pp or Wordclock 1V pp

Outputs (per sub-module)

Number and type:	4, transformer coupled, balanced AES3-1992 or unbalanced AES3-id, 75Ω
Channel status:	AES3, standard implementation, embedded

Performance

Sample rate:	48, 44.1 or 32kHz
Frequency response:	± 0.05dB 50Hz to 15kHz, ± 0.2dB 40Hz to 20kHz
THD+N:	<0.007% at 1kHz and -1dB FSD <0.1%, 50Hz to 15kHz, -28dB FSD
Noise (idle channel):	-96dB quasi-peak weighted (-78dBu for 0dB FSD=+18dBu)
Common mode rejection:	>60dB@ 1kHz, >46dB to 10kHz
Dynamic range:	107dB (measured)

Indicators

Power on:	Green LED
Loss of input:	Red LED
Reference video present:	Green LED
Video not locked:	Red LED AES 11 presentGreen LED
AES locked:	Green LED
Sample rate:	Yellow LEDs, 48, 44.1 and 32KHz

Temperature range

Operating:0° to +40°C

Storage:-10°C to +70°C

7 Ordering information

ICO-4410-3BHS:	Audio ADC with 30mm rear panel, balanced AES3 outputs, peak level +24dBu, single stereo converter
ICO-4410-3BHD:	Audio ADC with 30mm rear panel, balanced AES3 outputs, peak level +24dBu, dual stereo converter
ICO-4410-3BLS:	Audio ADC with 30mm rear panel, balanced AES3 outputs, peak level +18dBu, single stereo converter
ICO-4410-3BLD:	Audio ADC with 30mm rear panel, balanced AES3 outputs, peak level +18dBu, dual stereo converter
ICO-4410-3UHS:	Audio ADC with 30mm rear panel, unbalanced AES3 outputs, peak level +24dBu, single stereo converter
ICO-4410-3UHD:	Audio ADC with 30mm rear panel, unbalanced AES3 outputs, peak level +24dBu, dual stereo converter
ICO-4410-3ULS:	Audio ADC with 30mm rear panel, unbalanced AES3 outputs, peak level +18dBu, single stereo converter
ICO-4410-3ULD:	Audio ADC with 30mm rear panel, unbalanced AES3 outputs, peak level +18dBu, dual stereo converter