

# Contents

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# 1 Introduction

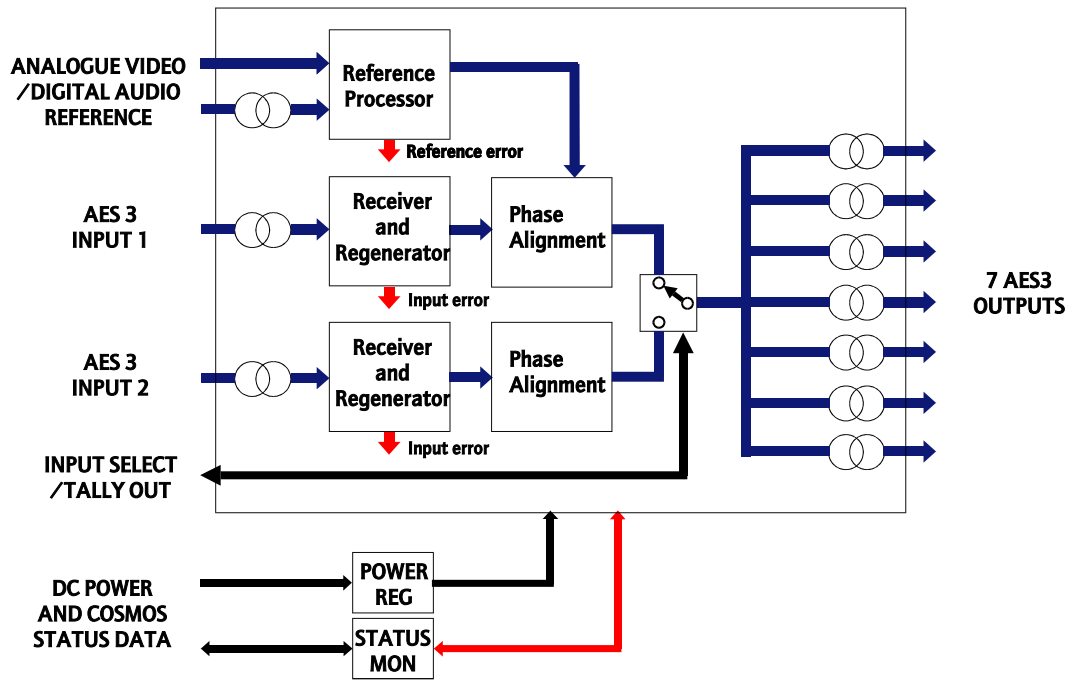
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The 4405 is a seven output AES3 digital audio reframer and 2x1 switch. It is designed to operate as a 2x1 synchronous switch when locked to a AES11 or video reference. Facilities are provided to regenerate bitstreams to prevent invalid data from affecting downstream equipment. It may be used in the 1050 3U and 1051 1U ICON modular product rackframes with a choice of balanced or unbalanced rear connectors.

Characteristics of the 4405 are:

- seven outputs
- two switchable inputs
- synchronous switching when inputs and module are locked to AES11 or video reference.
- analogue video and AES11 reference inputs
- input select with tally output
- silent legal AES3 output with no input
- sample mute and repeat options during data error conditions
- compatible with Pro-Bel COSMOS status monitoring

The reframing function realigns the sample phase of input AES3 data streams with that of the reference to provide a fully synchronous and stable output. This correction is applicable to sources which are synchronous in clock frequency but not in sample phase. For sources with different or unlocked clock frequencies the Sample Rate Synchroniser/Converter, type 4407, is required.

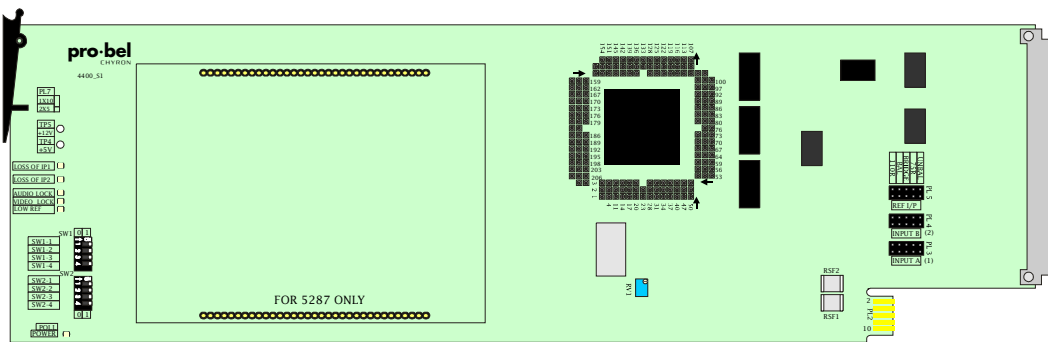


The 4405 digital audio reframer

## 2 Installation

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The 4405 seven output digital audio reframer and 2x1 switch may be used in the 1050 3U and 1051 1U ICON modular product rackframes. It is used with either the K4405.3B 30mm rear panel for balanced digital audio I/O or the K4405.3U 30mm rear panel for unbalanced digital audio I/O.

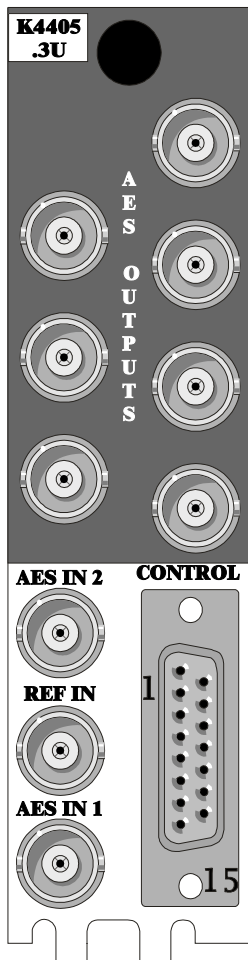


**The 4405 digital audio reframer**

For module and rear connector installation please refer to the appropriate ICON rackframe section of the manual.

## 2.1 Signal I/O

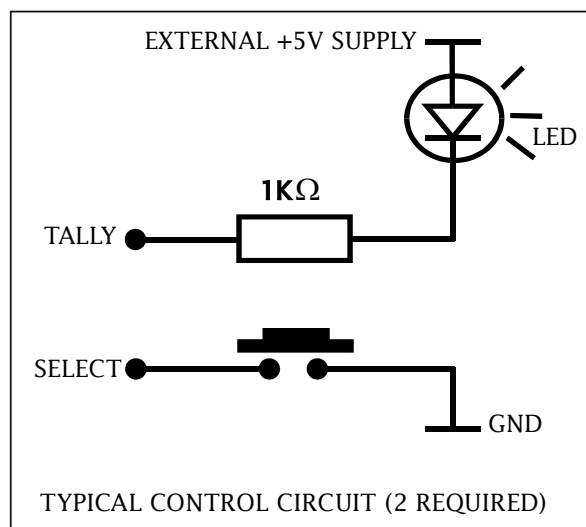
The K4405.3U panel is equipped with BNC connectors for unbalanced digital audio, whilst the K4405.3B panel is equipped with a 25 way 'D' type connector. Both panels have a 15 way 'D' connector for control and in the case of K4405.3B, AES3 reference inputs. Both analogue video and AES11 digital audio references are supported.

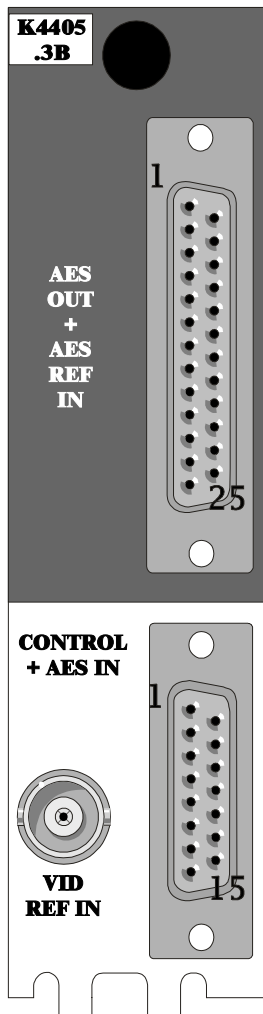


The K4405.3U rear panel for unbalanced I/O

Control Pin outs			
Pin	Function	Pin	Function
1	SELECT 1	9	SELECT 2
2	GND	10	TALLY 2
3	TALLY 1	11	GND
4	N/C	12	N/C
5	GND	13	*
6	*	14	GND
7	*	15	*
8	N/C		

\* INTERNAL CONNECTION - DO NOT USE





The K4405.3B rear panel for balanced I/O

Signal I/O (K4405.3B)			
Pin	Function	Pin	Function
1	O/P1-	14	O/P5-
2	O/P1+	15	O/P5+
3	GND	16	GND
4	O/P2-	17	O/P6-
5	O/P2+	18	O/P6+
6	AES REF IN-	19	N/C
7	AES REF IN+	20	N/C
8	GND	21	O/P7-
9	O/P3-	22	O/P7+
10	O/P3+	23	GND
11	GND	24	N/C
12	O/P4-	25	N/C
13	O/P4+		

Control Pin outs			
Pin	Function	Pin	Function
1	SELECT 1	9	SELECT 2
2	GND	10	TALLY 2
3	TALLY 1	11	GND
4	N/C	12	N/C
5	GND	13	I/PA+
6	I/P1-	14	GND
7	I/P2+	15	I/PB-
8	N/C		



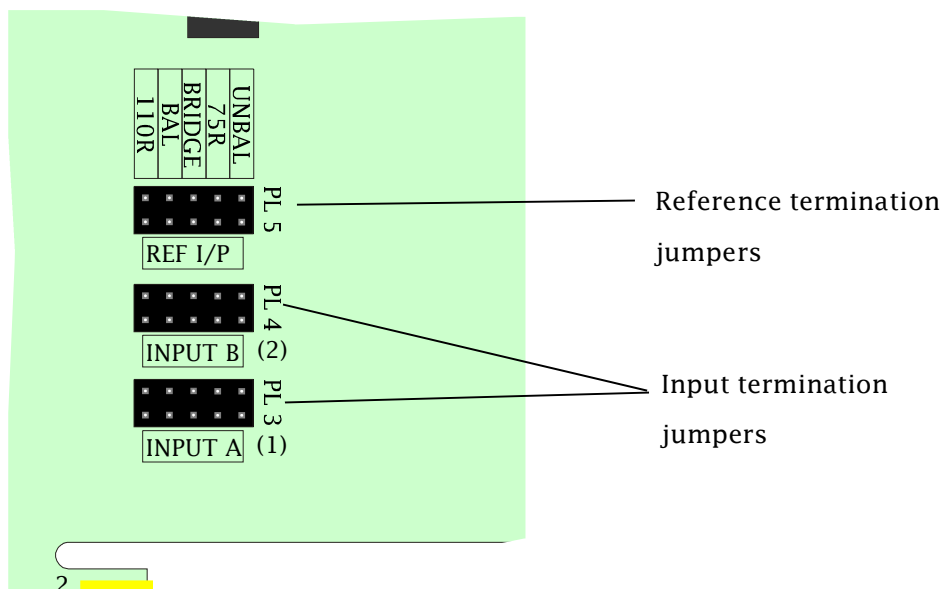
# 3 Configuration

The 4405 may be configured for different input termination options and to change regeneration and muting options during input error conditions. There is also a factory set-up adjustment for the re-clocking PLL, which should not require re-adjustment.

## 3.1 Setting the input mode

Use PL5 to change termination options for the AES or video reference and PL3 and PL4 to change termination options for module signal inputs.

Signal and reference termination mode	
PL3,4 &5 settings	Description
UNBAL	Use for unbalanced signal
75R	Use with unbalanced input to terminate signal with 75 Ω
BRIDGE	Selects high impedance termination (Hi-Z)
BAL	Use with balanced input
110R	Use with balanced inputs to terminate signal with 110Ω





### 3.2 Selecting reference options

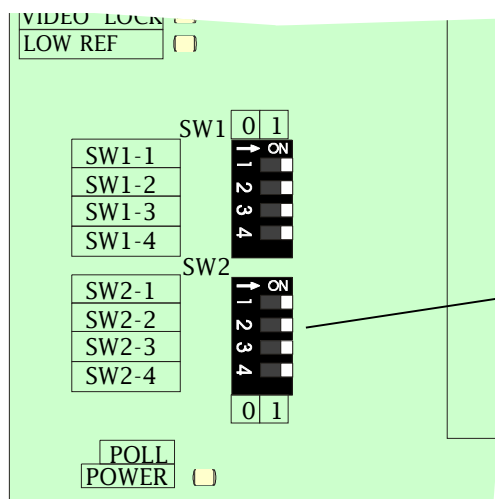
The output may be locked to an external AES reference or 525/625 video reference. The output sample rate may be configured for 32Khz, 44.1Khz or 48Khz. In the absence of an external reference the module PLL will free run.

If synchronous glitch-free switching between inputs is required, then use an external reference and ensure that both inputs are frequency locked to that reference.

Change reference and sample rate options with card edge switch SW2 as follows:

4405 reference options		
	Setting	Description
SW2-4	0	Use AES reference if present
	1	Use video reference if present
SW2-3	0	Video reference is 525
	1	Video reference is 625

4405 sample rate options		
SW2-2	SW2-1	S ample rate
0	0	44.1KHz
0	1	32KHz
1	0	48KHz
1	1	48KHz



Reference and sample rate options select switch  
 Note: Default is ON: switches away from card edge

### 3.3 Error handling

In its default mode this module will pass data transparently including the validity flag, unless an incoming error is detected, such as a crash switch, when it will repeat the last good sample in each channel. It will also set the validity flag to invalid if it detects that the relevant channel status flag indicates that the audio is not linear pcm.

Setting SW1-1 to OFF (0) changes the function so that the validity flag will also be set at the output if an incoming error is detected as above.

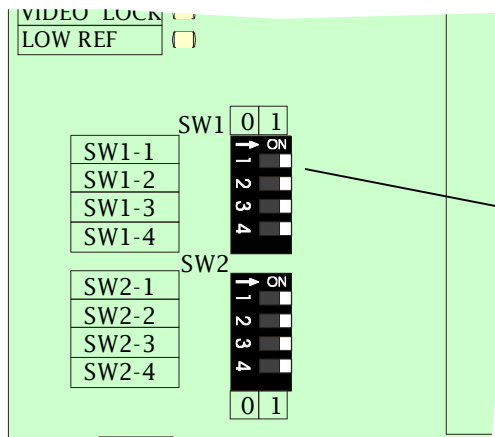
Setting SW1-2 to OFF (0) changes the function so that, when an incoming error is detected, samples with errors are muted rather than repeating earlier ones.

Setting SW1-4 to OFF (0) is used where a legacy system cannot handle compressed data and protects DACs from producing loud noises from such data by muting samples when that channel status flag which indicates that the audio is not linear pcm is detected.

Only one switch may be set to off. Any combination will cause the module to revert to default mode.

Note that the Validity flag is zero for normal operation. It is set to 1 to indicate that the sample is not fit for conversion to an analogue signal

Note: SW1-3 is currently unassigned



Validity and repeat/mute options select switch  
 Note: Default is all ON: all switches away from card edge



## 4 Status monitoring

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The status monitoring circuit, will provide the following information to the status monitoring controller:

- module present
- I/P 1 present
- I/P 2 present
- video standard
- video locked
- audio locked
- external video reference present
- external AES reference present
- tally 1 I/P 1 selected
- tally 2 I/P 2 selected
- SW1 status
- SW 2 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.



## 5 **Trouble shooting**

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### **There is no output signal**

- ensure that the green power LED on the front of the card is lit
- 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
- check that the red LOSS OF INPUT LEDs are not lit

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

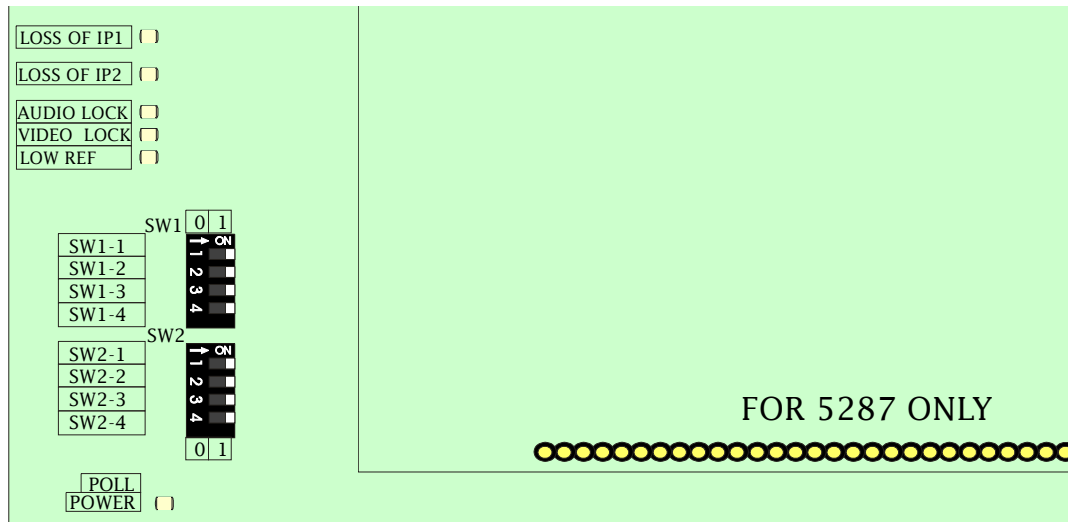
### **The output signal is corrupted**

- check the quality of the input signal(s)
- check that a valid video or AES reference is present at the rear connector and that SW2 options are selected correctly for the chosen reference
- if an AES reference is used, check that the green AUDIO LOCK LED is lit
- if an analogue video reference is used check that the green VIDEO LOCK LED is lit
- check that the red LOW REF LED is not lit
- check that the appropriate termination has been set
- check that the appropriate video standard has been selected
- check that the appropriate sample rate has been selected

### **The output signal causes pops and clicks in downstream equipment**

- check the validity and audio mute/repeat settings (SW1)
- check that the reference used has the same 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 4405 should meet the timing requirements of AES11 under these conditions.



Status indicators	
LED label	Meaning when lit
LOW REF	Lights red to show that reference level is too low - check termination value
VIDEO LOCK	Lights green to show that audio clock is locked to video reference
AUDIO LOCK	Lights green to show that audio clock is locked to AES reference
LOSS OF I/P 1	Lights red when I/P 1 is not present or when channel 1 error flag (ERF) is set
LOSS OF I/P 2	Lights red when I/P 2 is not present or when channel 2 error flag (ERF) is set
POWER	Lights green if all voltage rails present

4405 status indicator assignments

## 6 Specification

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### Inputs (signal)

Number and type: 2, balanced, transformer coupled to AES3-1992 or unbalanced to AES3-id (on SPDIF)

Termination: High, 75 $\Omega$  or 110 $\Omega$

### Inputs (reference)

Number and type: 1, balanced, transformer coupled to AES11-1997 or unbalanced to AES3-id or 1 analogue video, 525/625 1V pp

Termination: High, 75 $\Omega$  or 110 $\Omega$

### Outputs

Number and type: 7, transformer coupled, balanced to AES3-1992 or unbalanced to AES3-id

### Performance

Bitstream integrity: Transparent to all AES/EBU parameters

Sample rate: 32, 44.1 or 48kHz

### Control

Select 1 Ground (0V) for input 1

Select 2 Ground (0V) for input 2

Tally output 1 Open collector 5V max, low for ON

Tally output 2 Open collector 5V max, low for ON

### Temperature range

Operating: 0° to +40°C

Storage: -10°C to +70°C