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1 Introduction

The 4438 is an eight input, one output analogue audio switcher. It is designed to fit in the 1050 3U and 1051 1U ICON modular product rackframes. In the 1050 frame the module occupies 20mm of rack width.

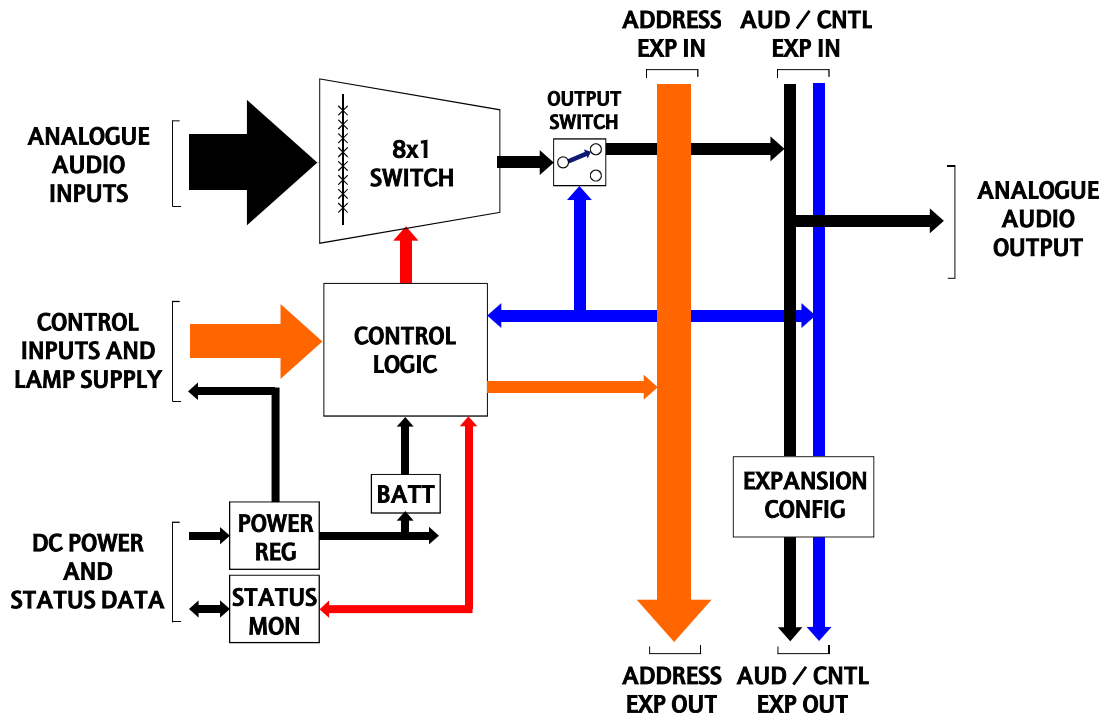
The switcher provides a solution for small ancillary or monitoring matrices with the benefit of simple button per crosspoint control.

The architecture of the modules allow crosspoint outputs to be bussed together to allow switchers above eight inputs to be built. In addition the analogue audio switcher may be configured with other modules in the Pro-Bel range to form married multi-level matrices.

An onboard rechargeable battery provides retention of crosspoint settings after power loss.

Characteristics of the 4438 module are:

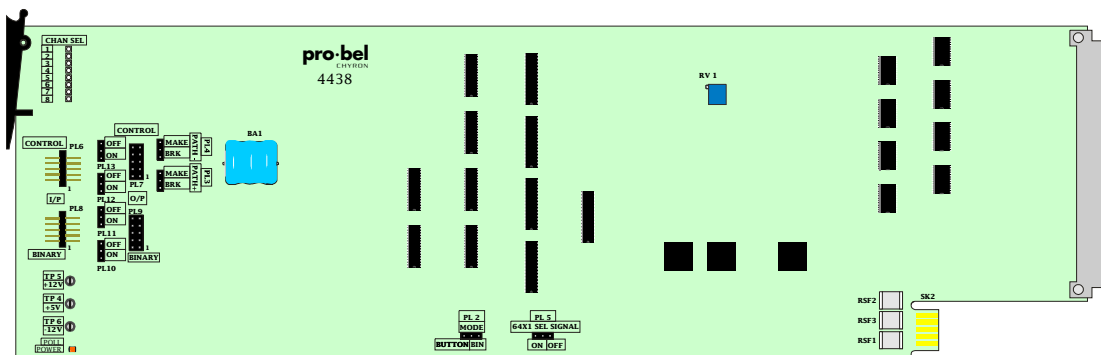
- easy expansion up to 64 inputs
- flexible control, with button per crosspoint or binary addressing
- synchronised switching via an external video field pulse
- standalone and master slave configuration
- adjustable gain
- crosspoint memory via battery backup
- card edge yellow LED crosspoint tally display
- compatible with Pro-Bel COSMOS status monitoring



The 4438 audio switch

2 Installation

The 8x1 analogue audio switch consists of an 4438 ICON module which fits in either a 1U 1051 or a 3U 1050 ICON Pro-Bel modular rackframe. It uses the K4438.2B 20mm rear connector.

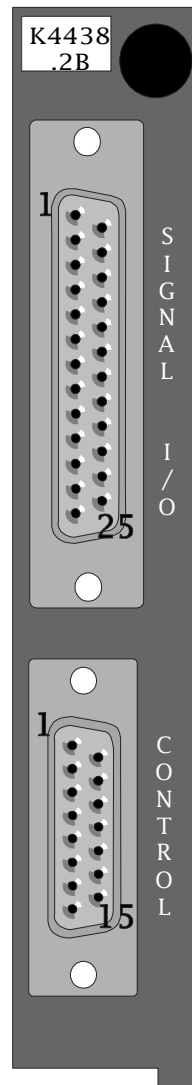


The 4438 analogue audio 8x1 switch

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

2.1 Signal I/O and control pinout

The K4438.2B rear connector has one 25 way 'D' female socket for signal I/O and one 15 way 'D' type socket for control.



Signal I/O			
Pin	Function	Pin	Function
1	IP3-	14	IP7-
2	IP3+	15	IP7+
3	GND	16	GND
4	IP4-	17	IP8-
5	IP4+	18	IP8+
6	OP-	19	N/C
7	OP+	20	N/C
8	GND	21	IP5-
9	IP1-	22	IP5+
10	IP1+	23	GND
11	GND	24	IP6-
12	IP2-	25	IP6+
13	IP2+		

Control Pin outs			
Pin	Function	Pin	Function
1	$\overline{\text{SEL}} 1$	9	A0EXT
2	$\overline{\text{SEL}} 2$	10	A1EXT
3	$\overline{\text{SEL}} 3$	11	A2EXT
4	$\overline{\text{SEL}} 4$	12	A3EXT/64x1
5	$\overline{\text{SEL}} 5$	13	LAMP SUP
6	$\overline{\text{SEL}} 6$	14	OV
7	$\overline{\text{SEL}} 7$	15	SCREEN
8	$\overline{\text{SEL}} 8$		

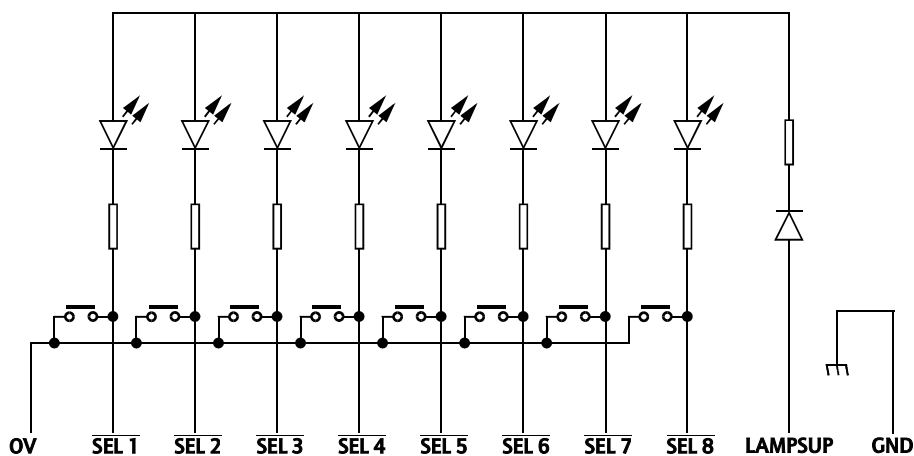
2.2 Crosspoint control

Connecting button panels

Crosspoints may be selected by connecting a button panel (eg. Pro-Bel's 8 button 6200 or 16 button 6202) to the control socket on the K4438.3B rear panel and setting PL2 to 'BUTTON'.

The analogue audio switcher card has priority switching built in. If two keys are pressed simultaneously, the higher numbered one will be selected. This feature allows signal 'line up' to be performed quickly. To achieve this, one key must be held down and a higher numbered key pushed and released. Each time the higher numbered key is pushed and released that source will be selected, as long as the button is held down. Once the button is released, the previous source is selected again.

Two 8x1 modules may be independently controlled from a 16 button panel, such as the Pro-Bel 6202. This particular panel has two separate connectors to plug into the control socket on each module, simplifying the installation. If the internal expansion cables are fitted (see Source expansion), priority switching can be performed across several modules. The highest priority module will always be the left most, viewed from the front of the cards.



Example 8 way button panel wiring

Using binary control

To use binary control instead of a button panel, PL2 must be set to 'BIN'. Crosspoints may be then selected by binary addressing using 12V CMOS levels.

Binary addressing				
I/P	A2EXT	A1EXT	A0EXT	A3EXT
1	0	0	0	0
2	0	0	1	0
3	0	1	0	0
4	0	1	1	0
5	1	0	0	0
6	1	0	1	0
7	1	1	0	0
8	1	1	1	0
*	X	X	X	1

* Crosspoint output is tri-stated - used for system expansion.

LOGIC 1 = +12V, LOGIC 0 = 0V

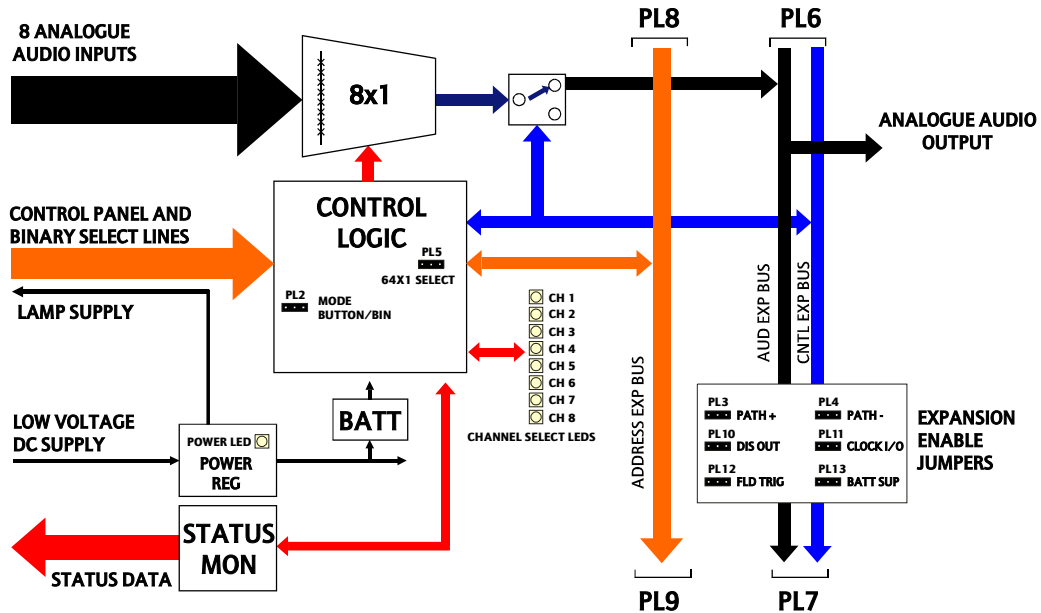
For externally supplied binary signals wiring must be made to the 4438 rear panel. To select an input the correct binary address is needed and A3EXT must be logic 0. For source expansion, all other modules whose inputs are not selected, A3EXT must be at logic 1.

Binary control signals can be generated by one 8x1 module and fed to another, to create a master slave configuration. To achieve this, the lower expansion cable on the front of the cards must be fitted, and all slave modules set to binary mode. The master module can be set to button mode and conveniently driven from a button panel.

Note: The A3 EXT line (input) becomes the 64x1 select line (output) for systems expanded to 64x1 with PL5 in the ON position.

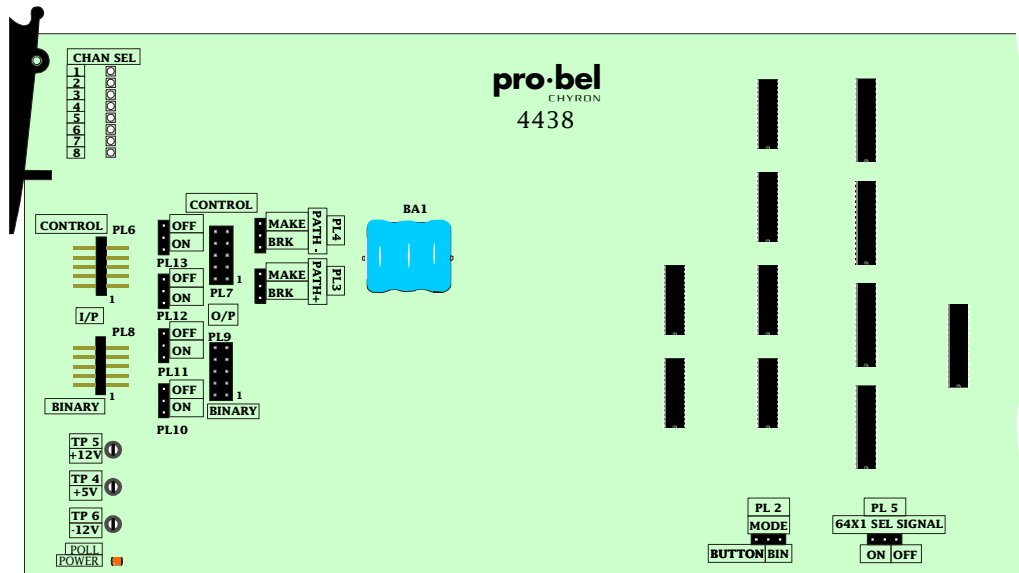
3 Configuration

The module is easy to configure and build into expanded systems using expansion cables and jumpers.



4438 8x1 switch schematic view

Configuration jumpers		
Jumper	Condition	Function
PL2	BUTTON	Simple button per crosspoint control
	BIN	Binary control, used in expanded systems and computer control
PL3&PL4	OFF or ON	Audio expansion bus, used when expanding sources
PL5	OFF or ON	64x1 select, modifies binary addressing when expanding above 32x1
PL10	OFF or ON	DIS OUT, used to disable downstream cards when expanding sources
PL11	OFF or ON	CLOCK I/O, output clock for downstream cards when expanding sources
PL12	OFF or ON	FIELD TRIGGER, used to distribute to downstream cards for synchronous switching
PL13	OFF or ON	Battery supply, used to distribute 3.6V crosspoint retention power to other boards in a system



Jumper locations

3.1 Configuring an 8x1 switcher

The simplest configuration is a single 8x1 module without expansion.

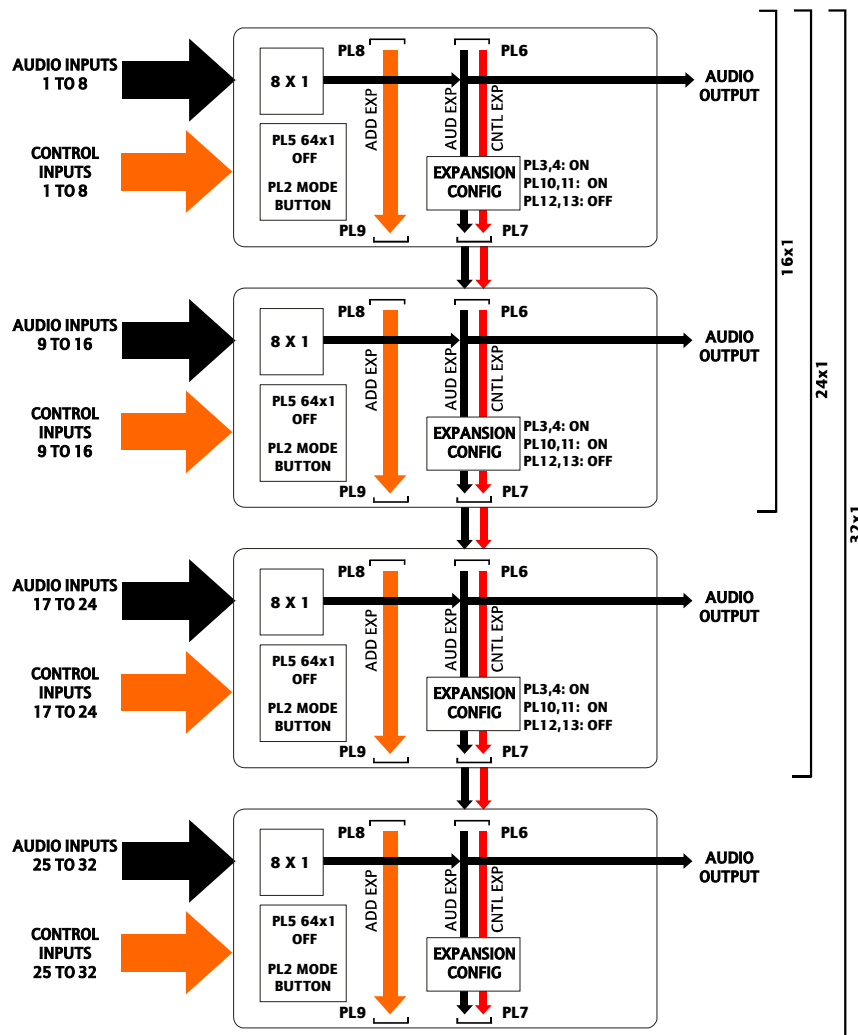
Control of the switcher may be from either a simple control panel or in binary form from a more complex control system such as a computer. PL2 is used to establish the method of crosspoint control. All other jumpers positions can be ignored since they only affect expansion.

PL2 Crosspoint control mode		
Position	Function	BUTTON BIN
BUTTON	Crosspoint selection using a button panel	
BIN	Crosspoint selection using binary control	

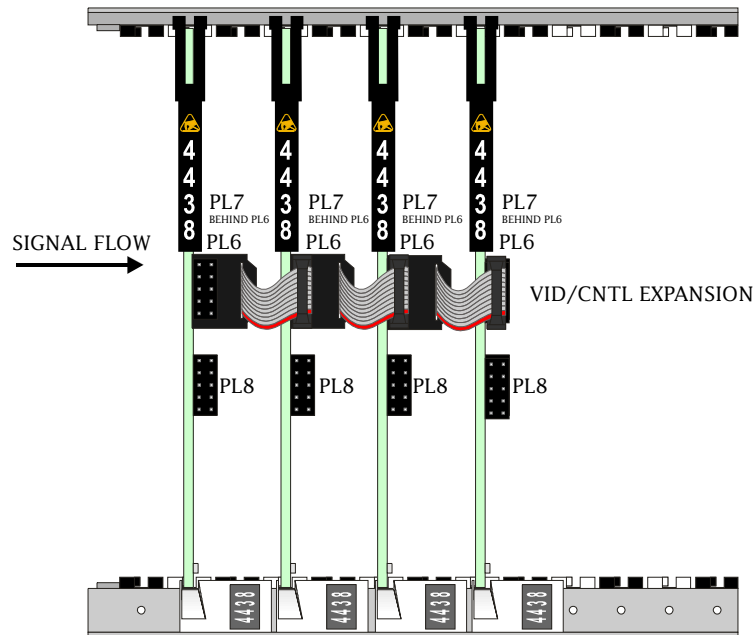
Configuration changes are accomplished by pulling the jumper (the shaded area above) from its current position on the header pins and moving it to the alternate position desired. The jumper must make electrical contact with at least two pins.

3.2 Source expansion

Several analogue audio switcher cards can be linked to make larger switchers up to 64x1. For switchers up to 32x1, only 4 modules are needed. Larger switchers need an extra 4438 as a combiner module. Expansion employs the front of card connectors together with the ribbon cable supplied with the card.



Expanding to 16, 24 and 32 x 1



Expansion cabling for an asynchronous system

Source expansion jumper settings with button control and asynchronous switching

Jumper	Setting	Function
PL2	BUTTON	Control mode
PL3 & PL4	ON	Analogue audio signal expansion O/P
PL5	OFF	64x1 select signal
PL10	ON	DIS OUT priority switching signal
PL11	ON	Output clock
PL12	OFF	Synchronous switching mode
PL13	OFF	Common battery supply line

Synchronous switching

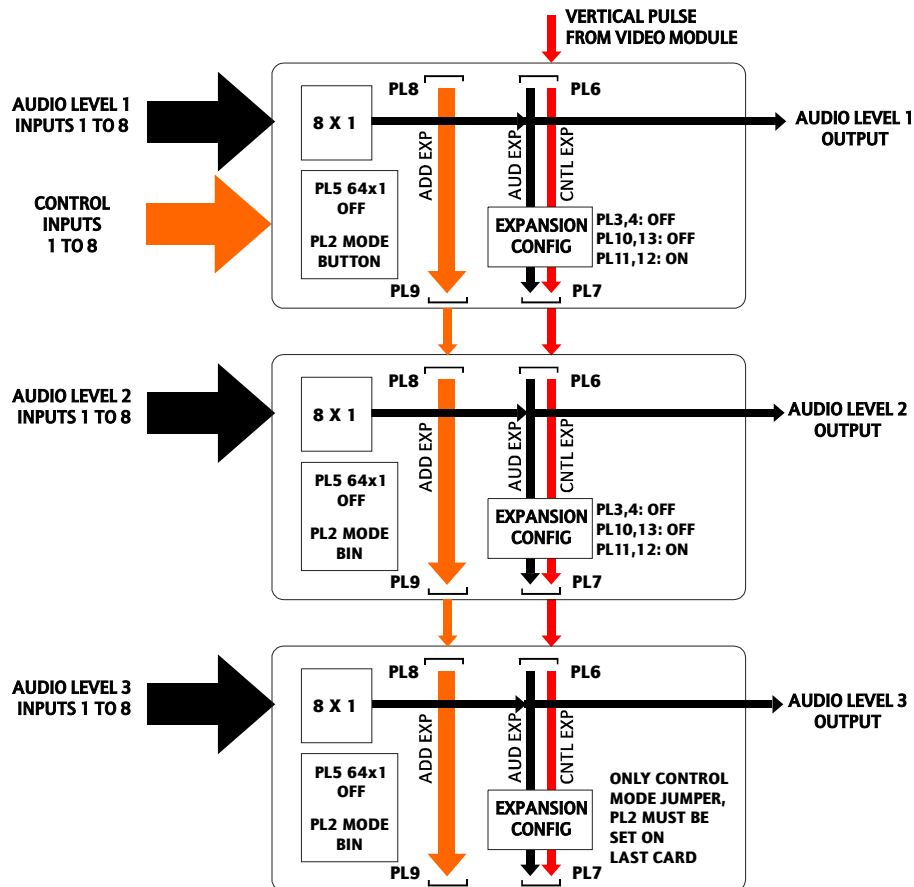
If synchronous switching using a video field timing pulse is required. This may be provided by an extra module such as a 3408 digital video 8x1 switch or a 3438 analogue video 8x1 switch with a 2315 sync separator.

In addition, a ribbon cable from PL7 on the 3408/3438, should be connected to PL 6 on the upstream (left most) 4438 in a system. The 3438 should be jumpered to provide the vertical timing pulse on the control bus.

3.3 Level expansion

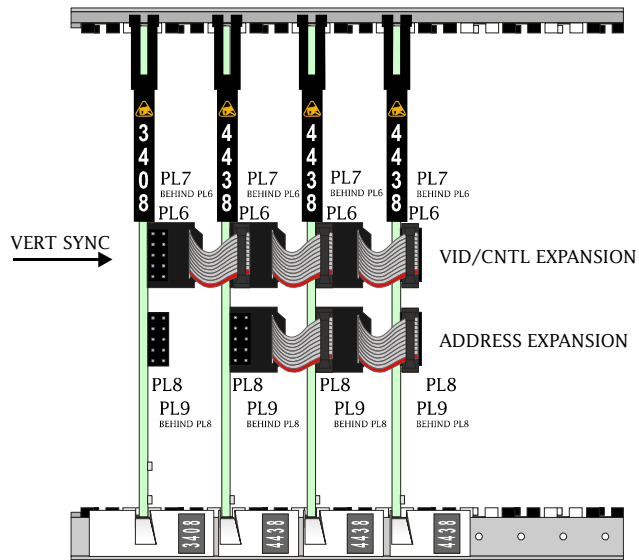
It may be useful in some applications for one card to control the input selection of other cards to create a multi-level switcher. This mode is called master/slave and utilises the binary control interconnections.

The master card can be driven from a button panel and all other cards by binary addressing using the lower expansion connectors PL8-PL9 on the front of the card.



Example of level expansion:
synchronous three level audio 8x1 switcher

In this example of a synchronous three level audio switcher, both address and control/audio expansion bus connectors are used. It may be desirable to distribute a vertical interval trigger signal from an external card to ensure switching during line six of a reference video field. This is why the aud/cntl ribbon is used. However, the AUD expansion jumpers PL3 and PL4 must be off on all cards.



Example of three level expansion wiring

Configuring level expansion with synchronous switching			
Jumper	Master card	Slave cards	Function
PL2	BUTTON	BIN	Control mode
PL3 & PL4	OFF	OFF	Analogue audio signal expansion O/P
PL5	OFF or ON	OFF or ON	64x1 select signal
PL10	OFF	OFF	DISOUT, priority switching signal
PL11	ON	ON	CLK I/O, output clock
PL12	ON	ON	Field trigger, crash/sync switching mode
PL13	OFF	OFF	Common battery supply

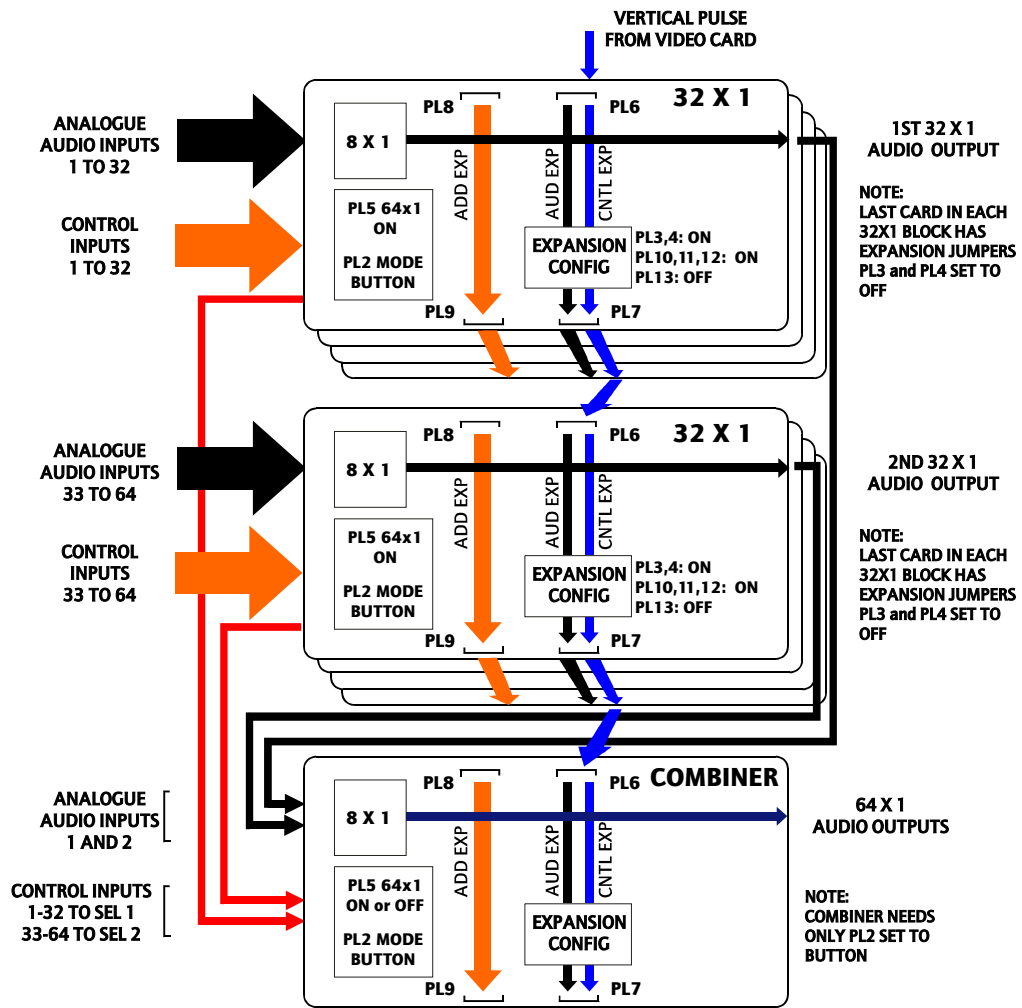
The following rules apply to synchronous level expansion

- Address and control expansion buses used
- Expansion jumpers not needed on last card in chain
- Synchronous switching between audio sources is only possible if all sources are already synchronised to one reference

Note: For asynchronous level expansion only the address expansion cabling is required and PL12 should be OFF on all cards.

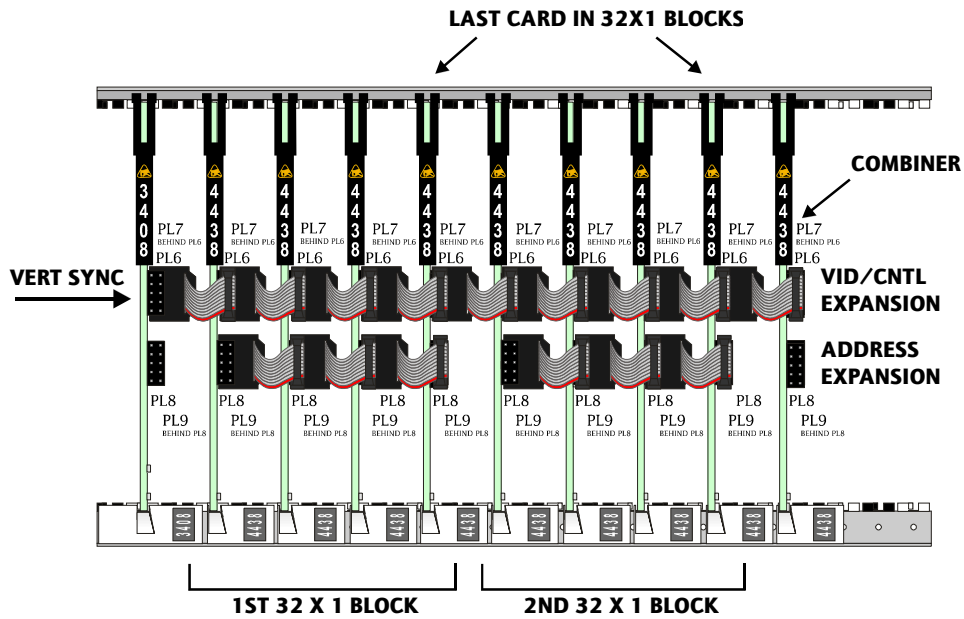
3.4 Building a 64 input switcher

To create a 64x1 an extra analogue audio switcher card is needed to act as a combiner module.



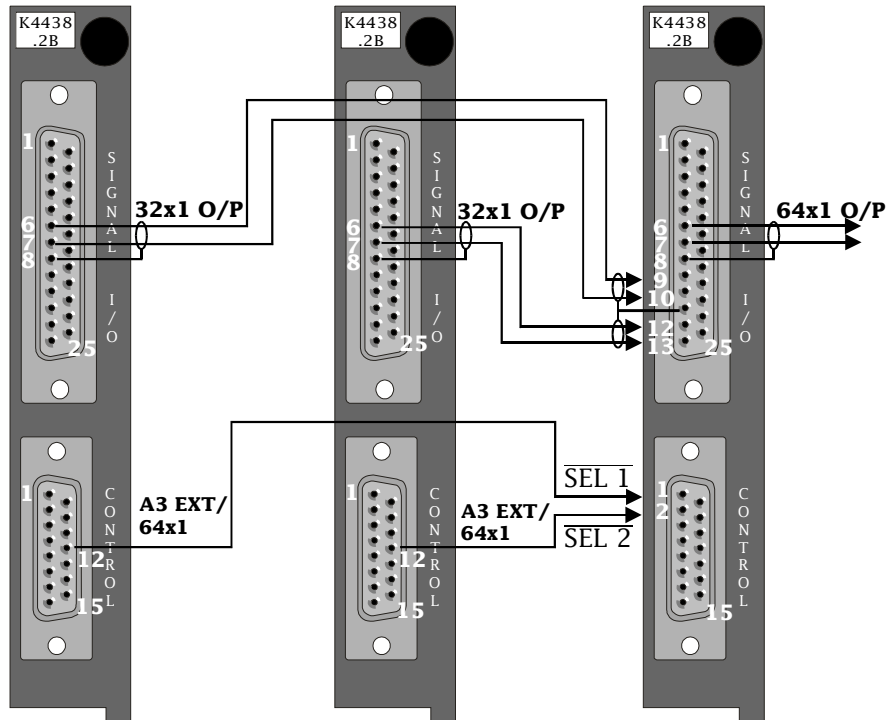
Building a synchronous 64x1 switch

Note: With PL5 set to ON, each card in each 32x1 block has the 64x1 SEL address lines bussed together using the address expansion connectors. The 64x1 SEL line is also brought to pin 12 of the control connector on each rear connector. This address line forms an active low select line for each 32x1 block, which then become the 2 channel select signals for combiner module by making external connections.



Expansion wiring for synchronous 64 x 1

Building a 64x1 synchronous switch				
Jumper	1st 3 cards in 32x1 block	Last card in 32x1 block	Combiner	Function
PL2	BUTTON	BUTTON	BUTTON	Control mode
PL3 & PL4	ON	OFF	OFF	Analogue signal expansion O/P
PL5	ON	ON	ON or OFF	64X1 select signal
PL10	ON	OFF	OFF	DISOUT, priority switching signal
PL11	ON	OFF	OFF	CLK I/O, output clock
PL12	ON	ON	ON	$\overline{\text{FTLOGIC}}$, synchronous switching mode



Any card in 1st
32x1 block

Any card in 2nd
32x1 block

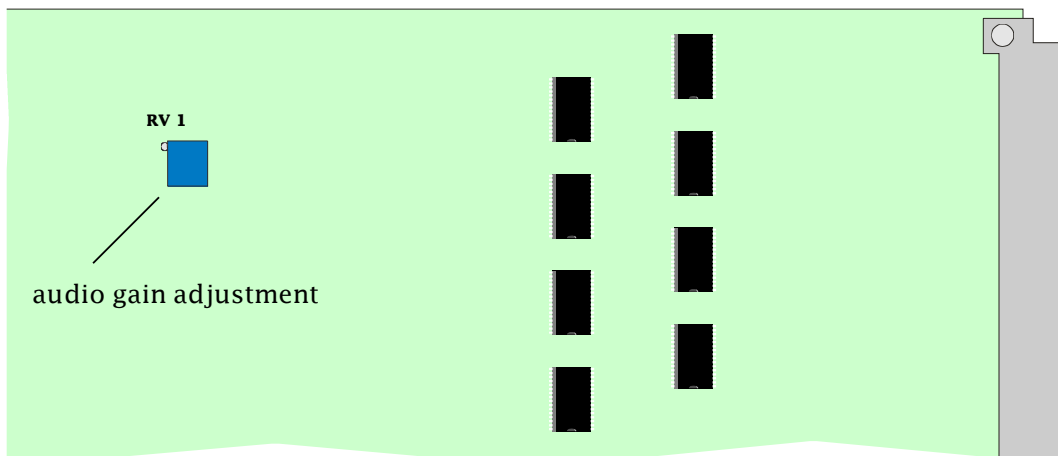
Combiner
I/O and CNTL

Combiner wiring for 64x1 expansion

3.5 Audio gain adjustment

The following adjustment is provided which is set at the factory and should not require re-adjustment.

Audio adjustment	
Circuit reference	Description
RV1	Audio gain





4 **Trouble shooting**

The green card edge POWER LED is not lit

- check the PSU indicators to confirm that there is power to the frame
- check the resettable fuses protecting the card - do this by removing the power to the card for about 30 seconds then restoring the power
- if necessary, refer to the power supply trouble shooting guide in the appropriate ICON rackframe manual section

There is no output signal

- ensure that the green power LED on the front of the card is lit
- check that the inputs are connected to the rear panel and a valid signal is present
- verify that the correct channel is selected - the LED on the button panel should show the same channel number as the CHAN SEL LED on the front of the 4438 module
- check the output connection from the rear panel to the monitoring device and the output cable
- ensure that the cable wiring and jumper link settings are correct for the configuration used

The button panel will not select a different input

- ensure that the jumper PL2 is correctly set to 'BUTTON' on all modules
- check that the expansion cables are correctly installed
- check that another, higher numbered, input is not permanently selected

The output signal is corrupted

- check that jumpers PL3 and PL4 are set correctly for the configuration
- ensure all expansion cables are installed correctly

In a 64x1 configuration, only half of the inputs are being routed

- check that the $\overline{64x1\ SEL}$ line (PL5 ON) from pin 12 of CNTL on the rear panel from each 32x1 block is properly connected to the SEL 1 and SEL 2 pins of the combiner CNTL connector
- Check that an audio output is connected from each 32x1 block to the first two combiner inputs



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
- power OK
- input selected

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

Number and type:	8, transformerless balanced analogue audio
Impedance:	>110k Ω , 20Hz to 20kHz

Outputs

Number and type:	1, transformerless, balanced
Max signal level:	+22dBu into 600 Ω
Impedance:	37 Ω \pm 2 Ω 20Hz to 20kHz

Performance

Gain (factory set by RV1):	0dB \pm 0.05dB into 600 Ω at 1kHz
Frequency response:	\pm 0.1dB 20Hz to 20kHz,
Distortion:	(+22dBu to -20dBu) <0.1% 20Hz to 20kHz
Noise:	CCIR 468-4 < -80dBu quasi-peak (unity gain, input terminated)
Common mode rejection:	> 40dB, 20Hz to 10kHz into 600 Ω

Control

Battery supply voltage: (BATTSUP)	If supplied by external DC source +3.5V to +12V
External field trigger: (FTLOGIC)	Allows switch transition to be synchronised to external source
BUTTON mode:	Max current sunk by select line 8mA for 24V external supply, 4mA for +12V on board supply. (LAMPSUP 12V @ 100mA maximum)
BINARY mode:	3 bit binary address, 12V CMOS positive logic convention

Indications

Power:	Green LED
Input selected:	8 x yellow LEDs



Temperature range

Operating:	0° to +40°C
Storage:	-10°C to +70°C

7 **Ordering Information**

ICO-4438-2B00

8x1 Analogue Audio Switch with 20mm rear panel