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1 Introduction

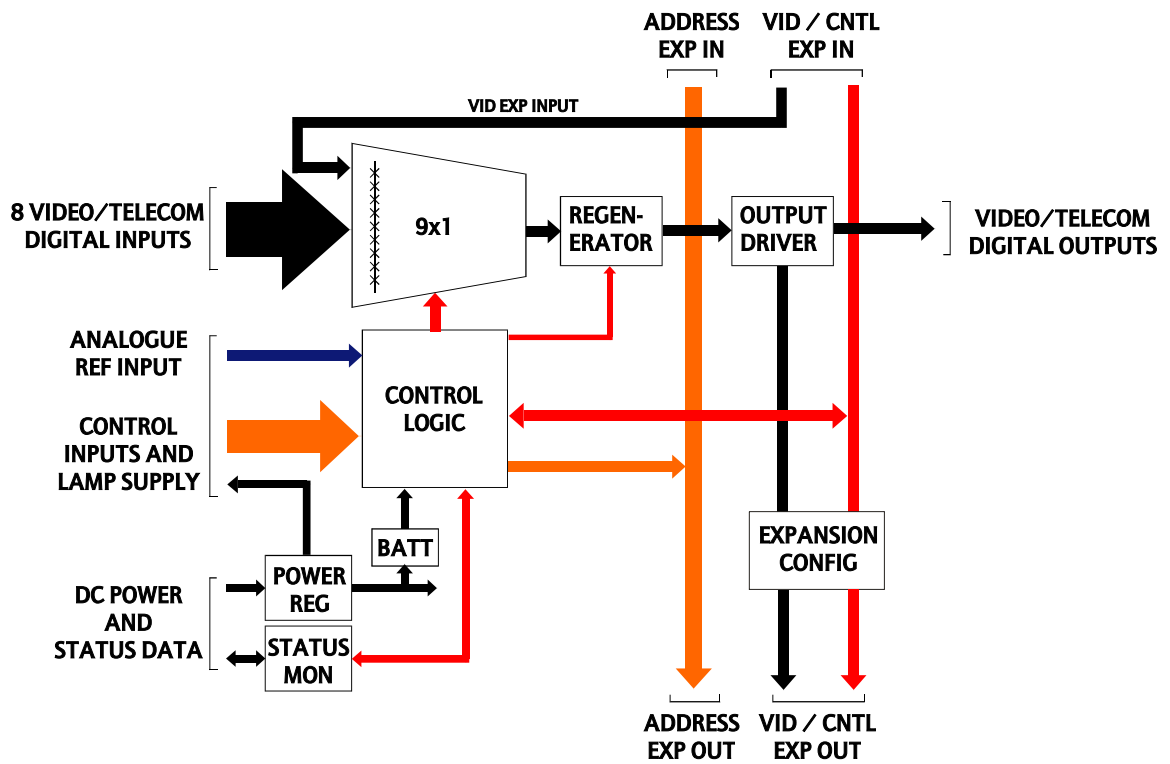
The 3408 is an eight input, one output serial digital video/telecom switcher intended for use with all composite and component serial digital video and telecom signals between 139 and 360 Mbit/s. The switcher has been designed to fit in either the 1U 1051 or 3U 1050 Pro-Bel modular product rackframes. In the 1050 frame the module occupies 30mm of rack space. It 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 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 module are:

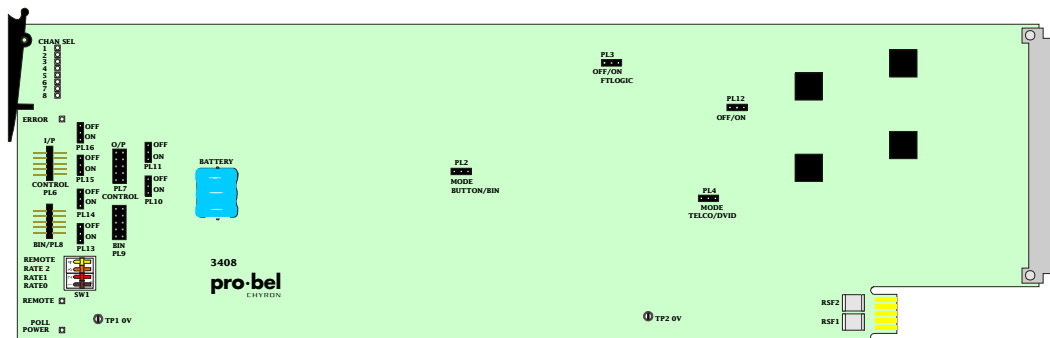
- easy expansion up to 64 inputs
- output regeneration (re-clocking)
- flexible control, with button per crosspoint or binary addressing
- black and burst reference input
- wide selection of data rates: serial digital video - 143, 177, 270 and 360Mbit/s, DVB-ASI @ 270Mbit/s, telecom - 139 (PDH) and 155(SDH)
- crosspoint memory via battery backup
- front mounted crosspoint tally display
- compatible with Pro-Bel COSMOS status monitoring



3408 8x1 digital video/telecom switcher

2 Installation

The 8x1 digital video/telecom video switcher consists of a 3408 ICON module which uses the 30mm K3408.3 rear connector. The rear connector occupies 30mm in a 3U 1050 ICON frame and one slot in the 1051 ICON frame.



The 3408 8x1 digital video switcher

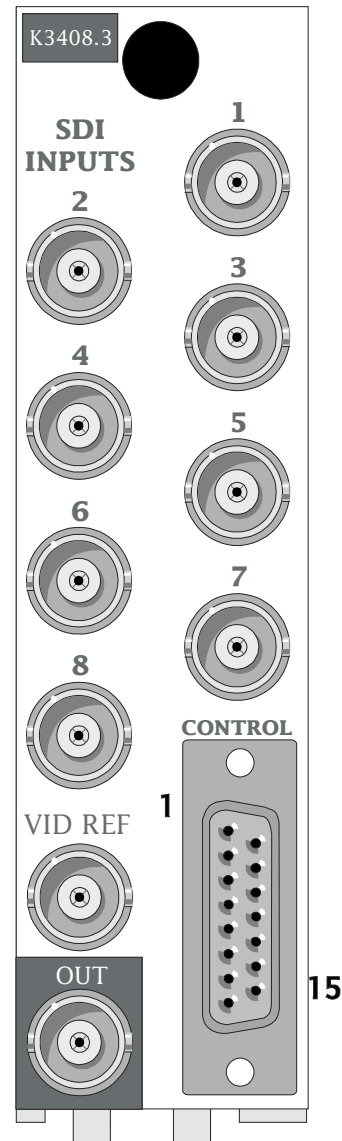
For module and rear connector installation instructions please refer to the appropriate ICON rackframe section of this manual.

2.1 Signal I/O and control pinout

The K3408.3 rear connector has ten BNC connections for signal I/O and one 15 way 'D' type socket for control

BNC input/output connectors	
BNC	Function
1	I/P 1
2	I/P 2
3	I/P 3
4	I/P 4
5	I/P 5
6	I/P 6
7	I/P 7
8	I/P 8
9	ANALOGUE REFERENCE
10	DIGITAL OUTPUT

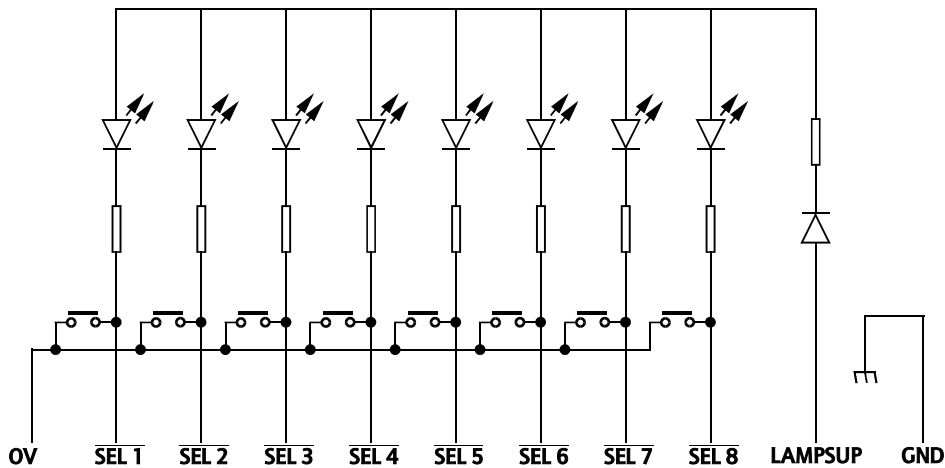
Control Pin outs			
Pin	Function	Pin	Function
1	SEL 1	9	A2EXT
2	SEL 2	10	A1EXT
3	SEL 3	11	A0EXT
4	SEL 4	12	A3EXT
5	SEL 5	13	LAMP SUP
6	SEL 6	14	OV
7	SEL 7	15	SCREEN
8	SEL 8		



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 K3048.3 rear panel and setting PL2 to 'Button'. Alternatively, custom button panels can be built using the following wiring diagram.



Example 8 way button panel wiring diagram

The 3408 switcher has priority switching built in. If two keys are pressed simultaneously, the higher numbered one will be selected. This feature allows '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 leftmost, viewed from the front of the cards.

Using binary control

To use binary control instead of a button panel, PL2 must be set to 'BIN'. Crosspoints may be selected by binary addressing according to the table below, using 12V CMOS levels using the Control socket on the rear connector.

Binary addressing				
I/P	A2 EXT	A1 EXT	A0 EXT	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

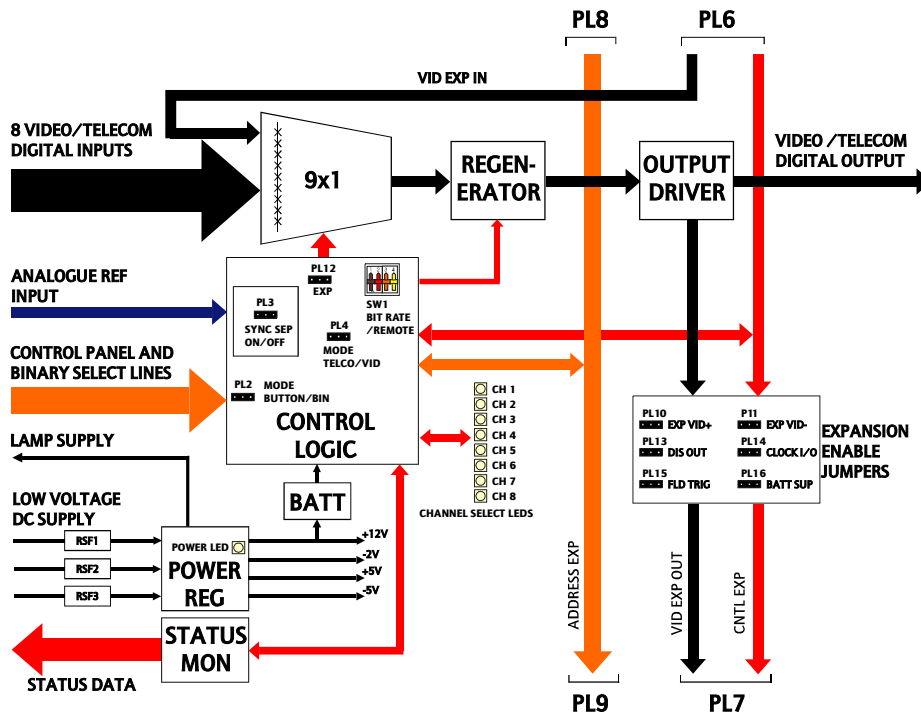
*Crosspoint output is tri-stated - used for system expansion.

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

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.

3 Configuration

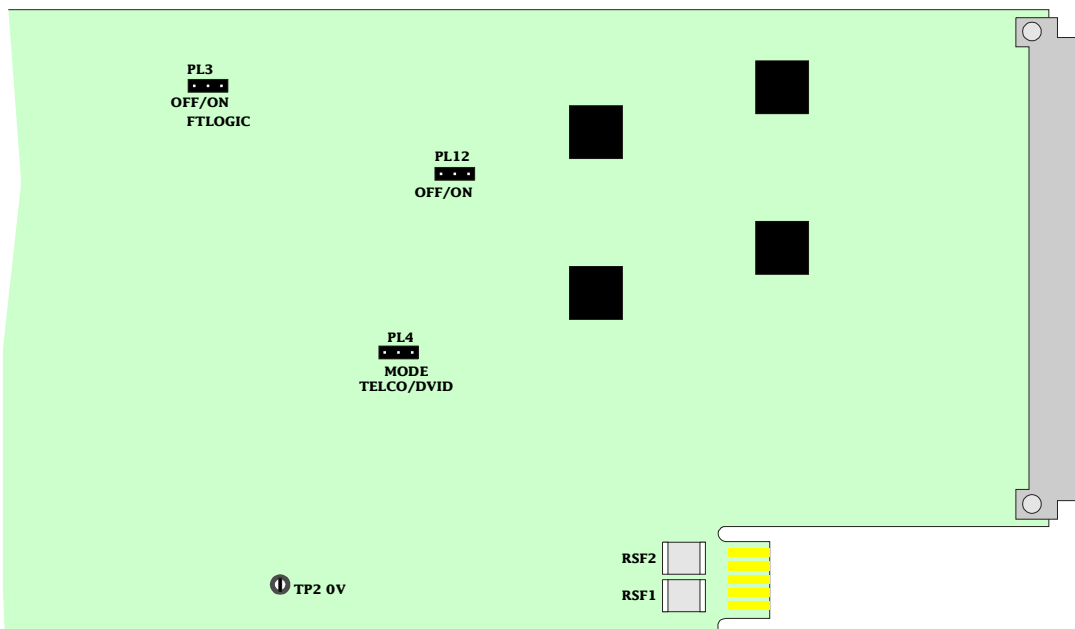
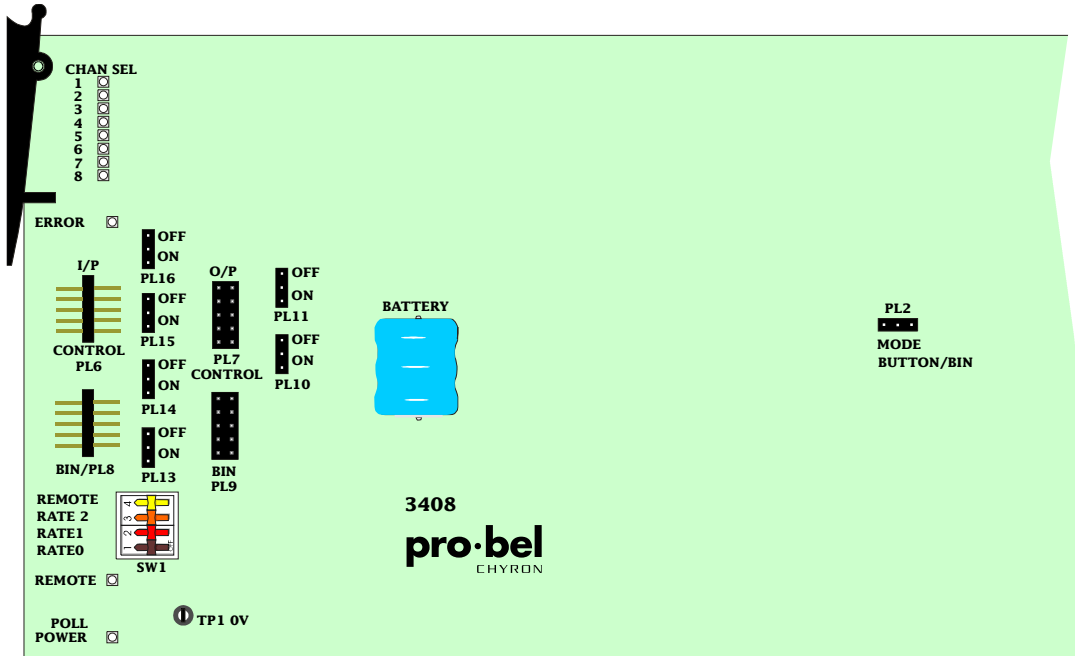
The module is easy to configure and build into expanded systems using configuration jumpers.



Configuration jumpers

Jumper	Condition	Function
PL2	BUTTON BIN	Simple button per crosspoint control Binary control, used in expanding systems and computer control
PL3	OFF or ON	Internal field trigger, $\overline{FTLOGIC}$ connection
PL10 & PL11	OFF or ON	Digital video signal expansion bus, used when expanding sources
PL4	OFF or ON	Telco/Video mode select
PL12	OFF or ON	Expansion input enable
PL13	OFF or ON	DISOUT, used to disable downstream cards when expanding sources
PL14	OFF or ON	CLKI/O, output clock for downstream cards when expanding sources
PL15	OFF or ON	FTLEXT, external $\overline{FTLOGIC}$ connection, used to distribute the field trigger to downstream cards for synchronous switching
PL16	OFF or ON	Common battery supply line, used to distribute 3.6V crosspoint retention power to other boards in a system

The physical location of these jumpers is indicated below.



Configuration jumper locations

3.1 Selecting the signal type

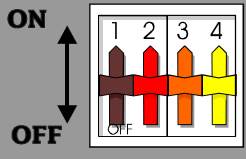
To use the switcher in either telecom or serial digital video mode the correct data rate and O/P level must be selected.

The operating mode is selected by setting jumper PL4 and switch SW1 on the card.

Serial digital video and DVB-ASI modes

PL4 must be set to 'DVID' and switch SW1 is set according to the following data rate table:

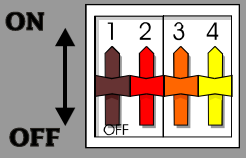
Data rate in SDI and DVB-ASI mode				
1=ON, 0=OFF				
RATE 0 SW1-1	RATE 1 SW1-2	RATE 2 SW1-3	Data rate Mbit/s	Mode
0	0	1	360	Component EDTV
1	0	1	270	Component 625/525
0	1	1	177	Composite 625
1	1	1	143	Composite 525



Telecom mode

PL4 must be set to 'TELCO' and switch SW1 is set according to the following data rate table:

Data rate in Telco mode				
1=ON, 0=OFF				
RATE 0 SW1-1	RATE 1 SW1-2	RATE 2 SW1-3	Data rate Mbit/s	Mode
1	1	0	139.264	PDH
0	1	0	155.520	SDH

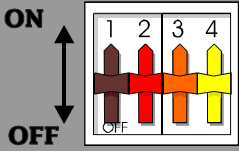


3.2 Setting the local/remote mode

The control of data rate selection can be transferred to the COSMOS status monitoring system with SW1-4.

Assigning data rate control

1=ON, 0=OFF



SW1-4	Control mode	Notes
0	Local	Use SW1, 1-3 for data rate
1	Remote	COSMOS controls data rate, local control disabled


The yellow remote LED will illuminate when the remote mode is selected.

3.3 Configuring an 8x1 switcher

The method of crosspoint selection is set by PL2.

PL2 Crosspoint control

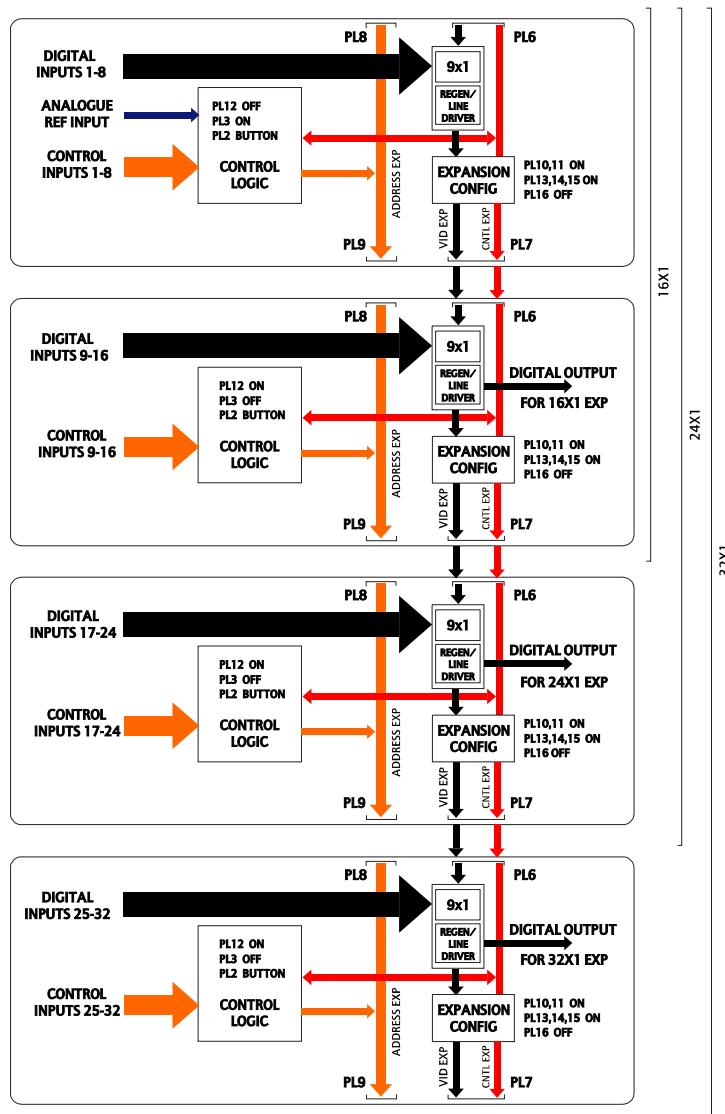
Position	Function
BUTTON	Crosspoint selection using a button panel
BIN	Crosspoint selection using binary control



Configuration changes are accomplished by pulling the jumper (the shaded area above) from its current position on the header pin block and moving it to the alternate position on the same block. Normally, the jumper should make contact with two pins

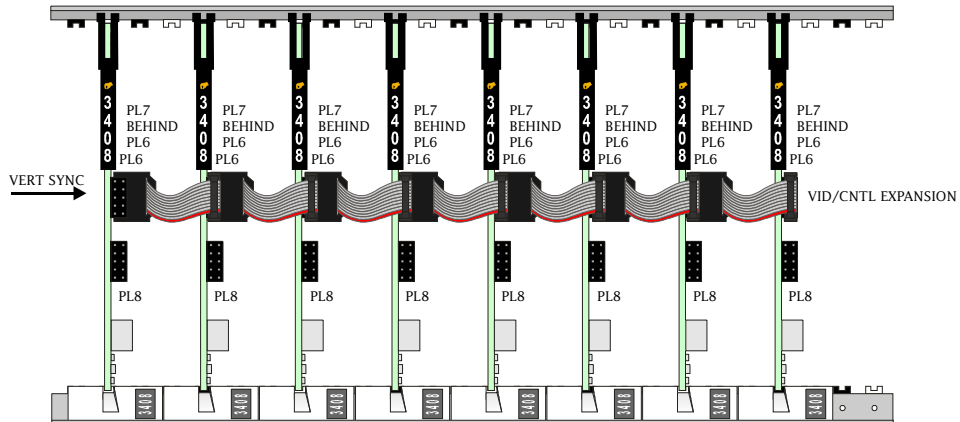
3.4 Source expansion

Several 3408 cards can be linked to make larger switchers up to 64x1. Expansion employs the front of card connectors together with the ribbon cable supplied with the card. The output is always taken from the last downstream card.



Expanding to 16,24 and 32 x 1

Expansion to 40, 48, 56 and 64 x1 simply requires further modules added to the expansion chain using the ribbon cables provided.



Source expansion to 64x1 with 8 modules

Synchronous source expansion with button panel control			
Jumper	Card 1	Card 2-8	Function
PL2	BUTTON	BUTTON	Control mode
PL3	ON	OFF	Internal $\overline{FTLOGIC}$ connection
PL10 & PL11	ON	ON	Digital video signal expansion O/P
PL12	OFF	ON	Expansion input enable
PL13	ON	ON	DISOUT, priority switching signal
PL14	ON	ON	CLKI/O, module selector signal
PL15	ON	ON	FTLEXT, external $\overline{FTLOGIC}$ connection
PL16	OFF	OFF	Common battery supply line

The following rules apply to source expansion from 16x1 to 64x1 under button control:

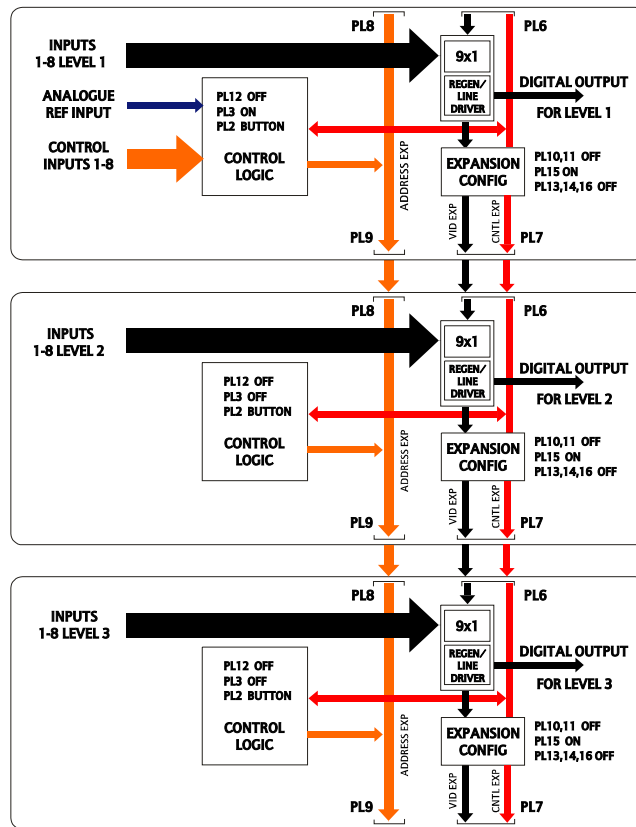
- only video/control expansion bus used
- each card requires unique eight button control
- expansion output taken from last card in chain
- sync separator field trigger enabled on first card in chain
- synchronous switching between video sources is only possible if all sources are already synchronised to one reference

Note: Set PL3 and PL15 to OFF for asynchronous switching (crash mode)

3.5 Level expansion

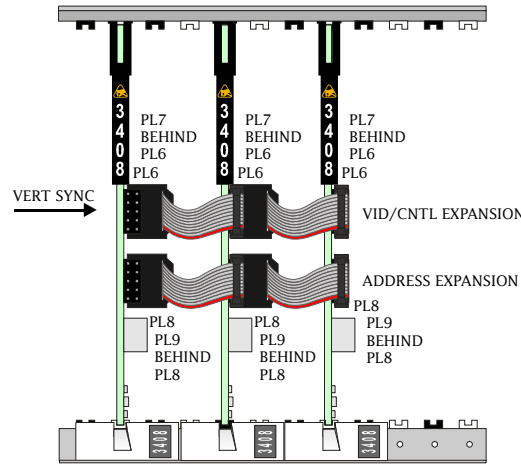
It may be useful in some applications for one card to control the input selection of other cards to create a multi-level switcher. This mode is called master/slave and utilises the binary address interconnections.

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



Level expansion with synchronous switching

In this example of a synchronous three level audio switcher, both address and control/video expansion bus connectors are used. It may be desirable to distribute a vertical trigger signal from the first card (leftmost) in the expansion to ensure switching during the correct line of a reference video field. This is why the vid/cntl ribbon is used. However, the video expansion jumpers 10 and 11 must be OFF on all cards.



Level expansion to three level switcher with three modules

level expansion with synchronous switching			
Jumper	Card 1	Card 2-3	Function
PL2	BUTTON	BIN	Control mode
PL3	ON	OFF	Internal FTLOGIC \bar{C} connection
PL10 & PL11	OFF	OFF	Digital video signal expansion O/P
PL12	OFF	OFF	Expansion input enable
PL13	OFF	OFF	DISOUT, priority switching signal
PL14	OFF	OFF	CLKI/O, module selector signal
PL15	ON	ON	FTLEXT, external FTLOGIC connection
PL16	OFF	OFF	Common battery supply

The following rules apply to synchronous level expansion

- address and video/control expansion buses used
- outputs taken from each card for each level
- maximum of four levels can be controlled
- levels may include mixed signal formats
- sync separator field trigger enabled on first card in chain
- synchronous switching between video sources is only possible if all sources are already synchronised to one reference

Note: Set PL3 and PL15 to OFF and PL 14 ON on all cards for asynchronous switching (crash mode)

4 **Trouble shooting**

The green card edge POWER LED is not lit

- check the PSU indicator to confirm that there is power to the frame
- if necessary examine the fusible resistors RSF1, RSF2 protecting the card to see if they have operated - turn the power off and wait for 30 seconds before 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 card edge POWER LED 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 as the CHAN SEL LED on the front of the 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 red error LED is lit (regenerator unlocked)

- check that SW1 and PL4 are set to the correct signal type and bit-rate

The output signal is corrupted

- check that the red error LED is not lit
- ensure all expansion cables are installed correctly

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
- input selected
- data rate selected
- remote/local mode
- module power LED status

The following module parameters may be controlled through the status monitoring system when remote operation is enabled:

- data rate selection

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, 75 Ω 270Mbit/s serial data to SMPTE 259M-ABCD
Return loss:	≥ 15 dB, 7 to 360MHz covers G703-9, G703-12 and SMPTE259M
Maximum cable length:	50m @ 270Mbit/s 25m @ 360Mbit/s 100m @ 177Mbit/s and 143Mbit/s 100m @ 155Mbit/s and 139Mbit/s

Reference input

Number and type:	1, 75 Ω composite video or black and burst
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Outputs

Number and type:	1, 75 Ω serial data to SMPTE 259M-ABCD
Return loss:	> 20 dB, 7 to 360MHz
Output level:	800mV \pm 80mV (serial digital video) 1V \pm 100mV (telecom) Telecom outputs to G703-9 and G703-12 (139Mbit/s and 155Mbit/s)
Over/undershoot:	$< \pm 5\%$
Rise/fall time:	Nominally < 600 ps difference between rise/fall times < 100 ps
DC offset:	$< \pm 0.5$ V

Indications

Power:	Green LED
Input selected:	8 x yellow LEDs
Error:	Red LED
Remote:	Yellow LED

Control

Battery supply voltage: (BATTSUP)	If supplied by external DC source +3.5V to +12V
External field trigger: (FTLOGIC Ext)	Allows switch transition to be synchronised to external source
Internal field trigger: (FTLOGIC Int)	Allows crosspoint changeover during line 6/319 of a PAL reference video signal and line 9/271 of an NTSC reference video signal
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
Card select (CLKI/O):	Disables other cards in an expanded system
Priority encoding: (DISIN/DISOUT)	Encodes switcher priority for expanded system

General

Power:	+5V DC, +/- 13.5V DC from ICON rackframe
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Temperature range

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

7 **Ordering Information**

ICO-3408-3000

SDI/Telecom 8x1 switch with 30mm rear panel