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# 1 Introduction

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The Axis router family addresses the need for smaller utility routers, by providing a range of compact, 1U, 16x16 self contained routing switchers for SDI and HD video, analogue video, balanced or unbalanced AES digital audio and stereo analogue audio signal formats.

Axis routers can be supplied in either Master or Slave frame configurations permitting multilevel routing systems with up to eight levels to be constructed. Increasing the flexibility of the system further, Master frames are supplied with an internal control module and contain an editable database.

The system supports a wide range of standard Pro-Bel control panels, however Master frames can also be supplied with an integral 16x16 X-Y control panel, permitting 'plug and play' operation straight from the box.

It should be noted that Axis frames contain no user serviceable parts, therefore should this product require servicing, you should refer to Pro-Bel or your local distributor.

## 2 Installation

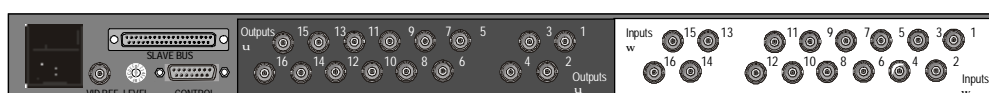
The Axis range of self-contained routing switchers are supplied as fixed frame units and therefore do not contain any user serviceable parts.

Should you experience any difficulties with any Axis frame, please refer first to Chapter 7 – Trouble Shooting, and then if you are still having difficulties contact customer support as detailed in Chapter 9 of this handbook.

### 2.1 Rear panel layouts

The layout for the rear of each Axis frame variant is shown below.

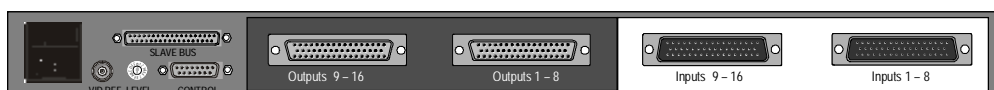
#### 2.1.1 Digital/ Analogue Video and Unbalanced Digital Audio



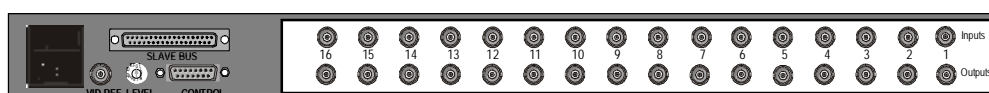
#### 2.1.2 Balanced Digital Audio



#### 2.1.3 Analogue Audio



#### 2.1.4 HD Digital Video

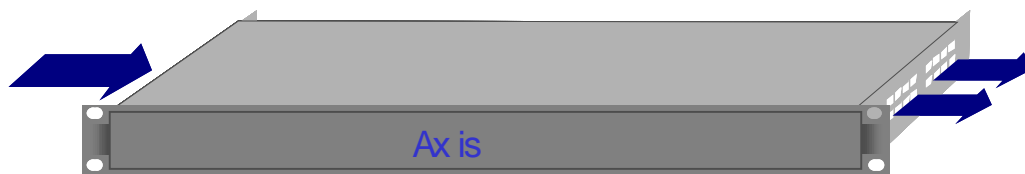


## 2.2 Ventilation

Each frame employs an internal fan assembly providing horizontal cross ventilation to maintain a cool, internal, air temperature. Frames may therefore be mounted directly on top of each other, or other equipment, without the need for vertical separation. Care should however be taken when mounting frames directly above other equipment to ensure that they are not subjected to excessive heat from that equipment, and that cooling vents in equipment directly above or below them are not obstructed.

It is therefore essential during the installation process to observe the following points:

- Do not obstruct the vents on the unit to allow cooling to take place, allow at least 40mm free space on each side of the frame
- Ensure that both the fans and vents have access to the ambient temperature room air
- Do not obstruct cooling vents in equipment directly above or below the frame.

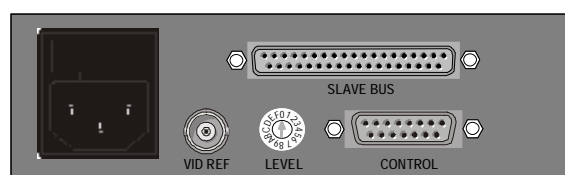


Axis horizontal cross ventilation

## 2.3 Power supplies

Axis frames are fitted with a single, auto-sensing, power supply unit and will operate from mains voltages between 100 and 230 Vac, with frequencies of 47 to 63Hz. These PSU's automatically adapt to the supplied mains (line) input voltage, therefore no user adjustment of the PSU is required

The mains (line) input to each Axis unit should be connected via the IEC connector fitted on the rear of the frame at the left hand side. For additional safety, the IEC connector is fitted with an integrated fuse holder.



For EMC and safety reasons the mains, chassis and signal earths are permanently connected together within the frame.

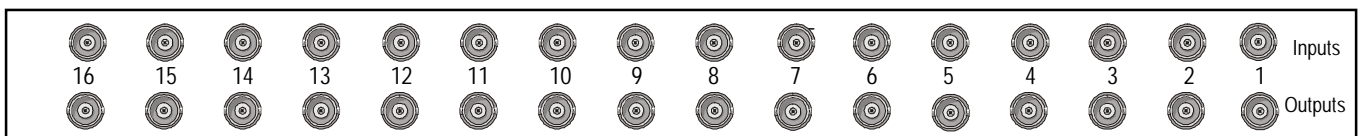
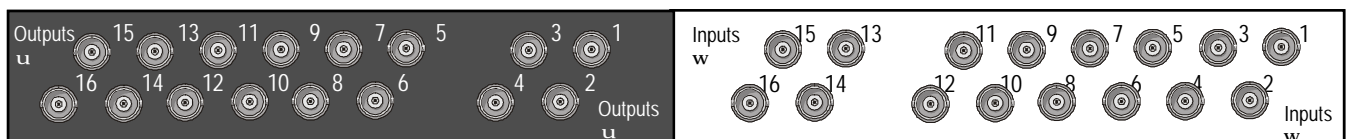
Axis slave frames, and Master frames without an integral panel, are fitted with a power present LED (V) on the front panel indicating that power is present on the router module. For systems fitted with an integral panel, the fact that the panel illuminates indicates that power is present in the unit.



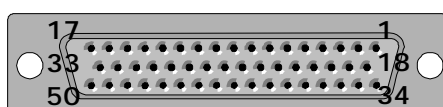
Power present LED

## 2.4 Signal connections

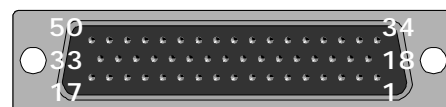
### 2.4.1 Analogue/ digital video, unbalanced digital audio and HD digital video



## 2.4.2 Digital audio (balanced) connector pinout



Output connector  
50 way 'D' type socket (female)



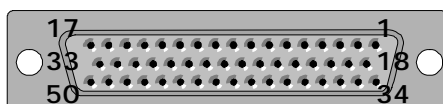
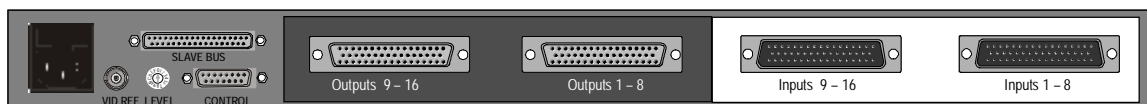
Input connector  
50 way 'D' type plug (male)

| Channel | Function    | Pin |
|---------|-------------|-----|
| 1       | Signal +    | 18  |
|         | Signal -    | 2   |
|         | Signal GND  | 34  |
| 2       | Signal +    | 35  |
|         | Signal -    | 19  |
|         | Signal GND  | 3   |
| 3       | Signal +    | 20  |
|         | Signal -    | 4   |
|         | Signal GND  | 36  |
| 4       | Signal +    | 37  |
|         | Signal -    | 21  |
|         | Signal GND  | 5   |
| 5       | Signal +    | 22  |
|         | Signal -    | 6   |
|         | Signal GND  | 38  |
| 6       | Signal +    | 39  |
|         | Signal -    | 23  |
|         | Signal GND  | 7   |
| 7       | Signal +    | 24  |
|         | Signal -    | 8   |
|         | Signal GND  | 40  |
| 8       | Signal +    | 41  |
|         | Signal -    | 25  |
|         | Signal GND  | 9   |
| Screen  | Chassis GND | 1   |

| Channel | Function    | Pin |
|---------|-------------|-----|
| 9       | Signal +    | 26  |
|         | Signal -    | 10  |
|         | Signal GND  | 42  |
| 10      | Signal +    | 43  |
|         | Signal -    | 27  |
|         | Signal GND  | 11  |
| 11      | Signal +    | 28  |
|         | Signal -    | 12  |
|         | Signal GND  | 44  |
| 12      | Signal +    | 45  |
|         | Signal -    | 29  |
|         | Signal GND  | 13  |
| 13      | Signal +    | 30  |
|         | Signal -    | 14  |
|         | Signal GND  | 46  |
| 14      | Signal +    | 47  |
|         | Signal -    | 31  |
|         | Signal GND  | 15  |
| 15      | Signal +    | 32  |
|         | Signal -    | 16  |
|         | Signal GND  | 48  |
| 16      | Signal +    | 49  |
|         | Signal -    | 33  |
|         | Signal GND  | 17  |
| Screen  | Chassis GND | 50  |



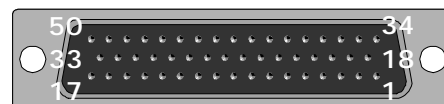
## 2.4.3 Analogue audio connector pinout



Output connector

50 way 'D' type socket (female)

| Channel | Function    | Pin |
|---------|-------------|-----|
| 1L/9L   | Signal +    | 18  |
|         | Signal -    | 2   |
|         | Signal GND  | 34  |
| 1R/9R   | Signal +    | 35  |
|         | Signal -    | 19  |
|         | Signal GND  | 3   |
| 2L/10L  | Signal +    | 20  |
|         | Signal -    | 4   |
|         | Signal GND  | 36  |
| 2R/10R  | Signal +    | 37  |
|         | Signal -    | 21  |
|         | Signal GND  | 5   |
| 3L/11L  | Signal +    | 22  |
|         | Signal -    | 6   |
|         | Signal GND  | 38  |
| 3R/11R  | Signal +    | 39  |
|         | Signal -    | 23  |
|         | Signal GND  | 7   |
| 4L/12L  | Signal +    | 24  |
|         | Signal -    | 8   |
|         | Signal GND  | 40  |
| 4R/12R  | Signal +    | 41  |
|         | Signal -    | 25  |
|         | Signal GND  | 9   |
| Screen  | Chassis GND | 1   |

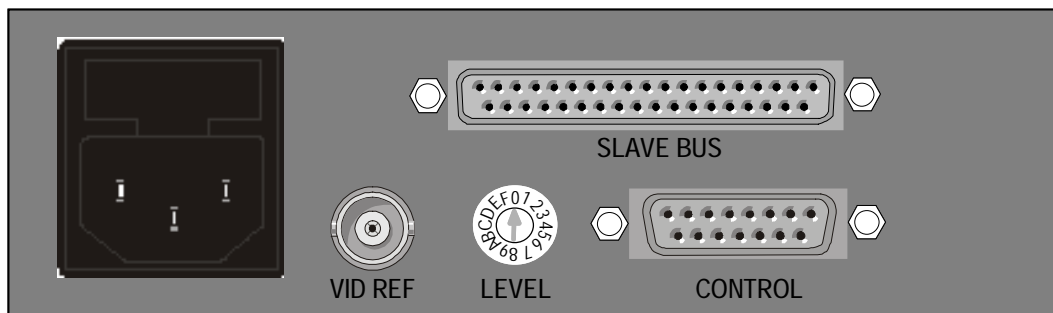


Input connector

50 way 'D' type plug (male)

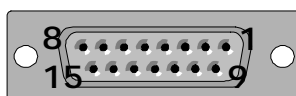
| Channel | Function    | Pin |
|---------|-------------|-----|
| 5L/13L  | Signal +    | 26  |
|         | Signal -    | 10  |
|         | Signal GND  | 42  |
| 5R/13R  | Signal +    | 43  |
|         | Signal -    | 27  |
|         | Signal GND  | 11  |
| 6L/14L  | Signal +    | 28  |
|         | Signal -    | 12  |
|         | Signal GND  | 44  |
| 6R/14R  | Signal +    | 45  |
|         | Signal -    | 29  |
|         | Signal GND  | 13  |
| 7L/15L  | Signal +    | 30  |
|         | Signal -    | 14  |
|         | Signal GND  | 46  |
| 7R/15R  | Signal +    | 47  |
|         | Signal -    | 31  |
|         | Signal GND  | 15  |
| 8L/16L  | Signal +    | 32  |
|         | Signal -    | 16  |
|         | Signal GND  | 48  |
| 8R/16R  | Signal +    | 49  |
|         | Signal -    | 33  |
|         | Signal GND  | 17  |
| Screen  | Chassis GND | 50  |

## 2.5 Control connections



### 2.5.1 Serial control connector

The control port is only active on Master Axis frames and, depending upon the database option fitted, provides either two or three serial ports. The following table details the pin out for the 15 way connector carrying these control connections.

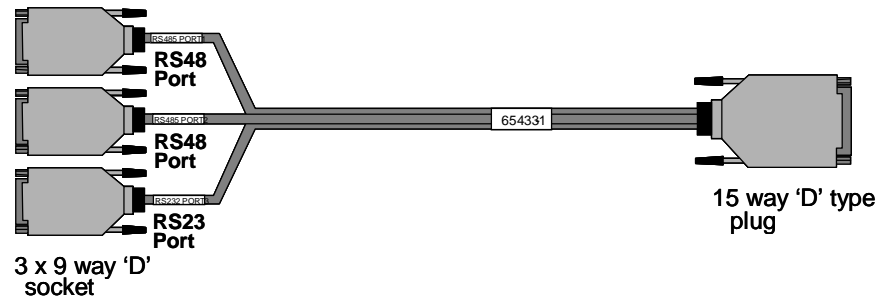


15 way 'D' type socket (female)

| Pin | Function | Port                   |
|-----|----------|------------------------|
| 1   | GND      |                        |
| 2   | TX 1-    | RS 485 Port 1          |
| 3   | RX 1+    | RS 485 Port 1          |
| 4   | TX 2-    | RS 485 Port 2          |
| 5   | RX 2+    | RS 485 Port 2          |
| 6   | GND      |                        |
| 7   | TX       | RS232 Port 3 (Editor)* |
| 8   | RX       | RS232 Port 3 (Editor)* |
| 9   | GND      |                        |
| 10  | TX 1+    | RS 485 Port 1          |
| 11  | RX 1-    | RS 485 Port 1          |
| 12  | TX 2+    | RS 485 Port 2          |
| 13  | RX 2-    | RS 485 Port 2          |
| 14  | CTS      | RS232 Port 3 (Editor)* |
| 15  | RTS      | RS232 Port 3 (Editor)* |

\*The Editor port function is only available on Axis frames with the configurable database option fitted.

Each Master Axis frame is supplied with a 0.5 metre breakout cable, detailed below, to facilitate easy connection to the system control ports. The cable permits Pro-Bel control panels to be connected to the unit using a pin-to-pin cable.

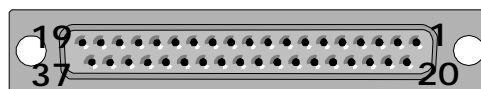


| 9 Way Sockets |          | 15 Way plug |               |
|---------------|----------|-------------|---------------|
| Port 1 - Pin  | Function | Pin         | Function      |
| 1             | GND*     | 1           | GND (Port 1)  |
| 2             | TX –     | 2           | TX – (Port 1) |
| 3             | RX +     | 3           | RX + (Port 1) |
| 4             | GND*     |             |               |
| 5             | N/C      |             |               |
| 6             | GND*     |             |               |
| 7             | TX +     | 10          | TX + (Port 1) |
| 8             | RX –     | 11          | RX – (Port 1) |
| 9             | GND*     |             |               |
| Port 2 - Pin  | Function |             |               |
| 1             | GND*     | 9           | GND (Port 2)  |
| 2             | TX –     | 4           | TX – (Port 2) |
| 3             | RX +     | 5           | RX + (Port 2) |
| 4             | GND*     |             |               |
| 5             | N/C      |             |               |
| 6             | GND*     |             |               |
| 7             | TX +     | 12          | TX + (Port 2) |
| 8             | RX –     | 13          | RX – (Port 2) |
| 9             | GND*     |             |               |
| Port 3 - Pin  | Function |             |               |
| 1             | N/C      |             |               |
| 2             | RX       | 7           | TX            |
| 3             | TX       | 8           | RX            |
| 4             | N/C      |             |               |
| 5             | GND*     | 6           | GND           |
| 6             | N/C      |             |               |
| 7             | RTS      | 14          | CTS           |
| 8             | CTS      | 15          | RTS           |
| 9             | N/C      |             |               |

\*All GND pins are connected together inside the connectors or equipment.

## 2.5.2 Parallel control connector

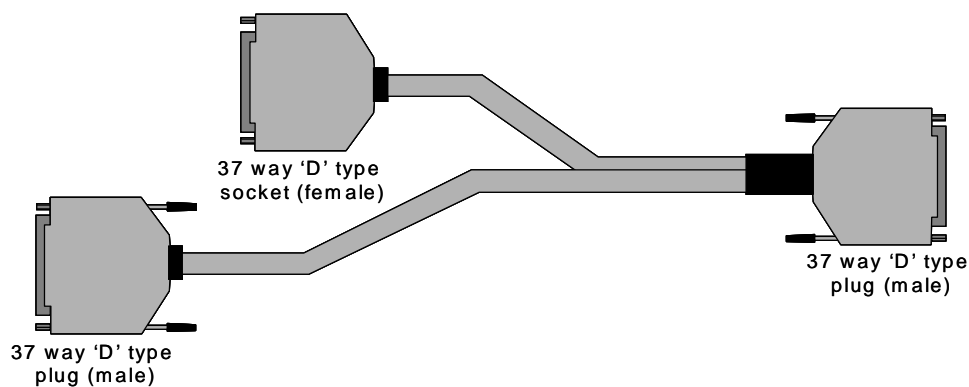
The Parallel control connector provided on both Master and Slave frames, labelled as 'SLAVE BUS', extends the internal crosspoint control bus to the rear of each frame. This permits slave frames to be interconnected using the three way control cable (shown below) supplied with them to construct multi-level routing switchers.



37 way 'D' type socket (female)

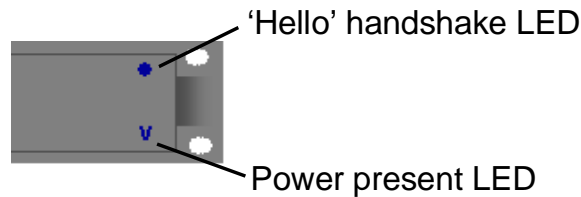
| Pin | Function  | Pin | Function  |
|-----|-----------|-----|-----------|
| 1   | Enable    | 20  | H/Shake   |
| 2   | Level A3  | 21  | Level A2  |
| 3   | Level A1  | 22  | Level A0  |
| 4   | Dest A6   | 23  | Dest A5   |
| 5   | Dest A4   | 24  | Dest A3   |
| 6   | Dest A2   | 25  | DestA1    |
| 7   | Dest A0   | 26  | A6 Source |
| 8   | A5 Source | 27  | A4 Source |
| 9   | A3 Source | 28  | A2 Source |
| 10  | A1 Source | 29  | A0 Source |
| 11  | Aud 0     | 30  | Aud 1     |
| 12  | Aud 2     | 31  | F/Sync    |
| 13  | Strobe    | 32  | N/C       |
| 14  | N/C       | 33  | N/C       |
| 15  | N/C       | 34  | N/C       |
| 16  | N/C       | 35  | N/C       |
| 17  | N/C       | 36  | N/C       |
| 18  | N/C       | 37  | Chassis   |
| 19  | Chassis   |     |           |

SLAVE bus expansion cable



## 2.6 LED indicators

Slave frames, and Master frames without integral control panels are fitted with two front mounted blue LED's, one is a power present indicator and the other, a 'hello' or handshake indicator.

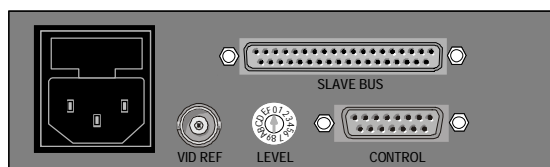


The power present LED indicates that power is present on the router module. Systems fitted with an integral panel do not have these indicators, however the fact that the panel illuminates indicates that power is present in the unit.

The 'Hello' LED is useful to determine whether the control system has spoken to, or can 'see' a particular router frame/ level. When the controller sends a command, for example in response to a button push, the appropriate part of the router responds, depending on how the level address switches are set. If all frames are set as level 1, the 'Hello' LED on every frame will flash when a crosspoint command is sent from the controller in the master frame. If however the router is set up as a multilevel system, and a crosspoint command is sent for a route on one level – only that frame will respond.

## 2.7 Video reference

While every Axis frame is supplied with a terminating video reference input, it is only necessary to provide a reference signal, ideally colour black or any stable analogue video signal, to the Master frame within the system.



Because Axis routers can operate with signals of either 525/60 or 625/50 standards, the video reference input automatically adapts to the standard of the reference applied to it. From this signal, the controller housed in the Master unit generates a field pulse 'strobe'

which is fed to all slave frames in the system via the SLAVE BUS in order to ensure vertical interval switching.

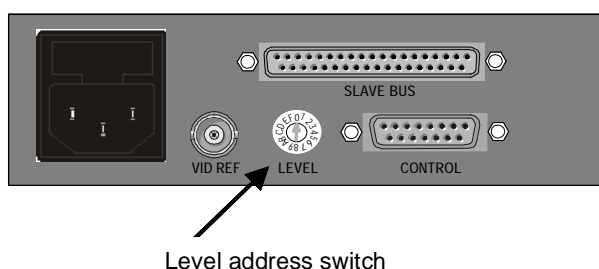
## 2.8 AES reference

There is no dedicated AES reference input, however the AES router derives its reference from the signal present on input 1. For correct operation it is important that input 1 has a valid AES signal present at all times.

## 2.9 Setting the level switches

Each Axis frame, whether it is a Master or Slave variant, must have its address set from the rear panel.

In order to provide a system offering multilevel breakaway, each frame must have a *unique* address. For routers where it is desirable to switch all levels at the same time, such as YUV routers, the same address can be used across all three frames.



The following table details the switch setting required for each available level address.

| Switch position | Router level |
|-----------------|--------------|
| 0               | Level 1      |
| 1               | Level 2      |
| 2               | Level 3      |
| 3               | Level 4      |
| 4               | Level 5*     |
| 5               | Level 6*     |
| 6               | Level 7*     |
| 7               | Level 8*     |
| 8 to F          | Unused       |

\* Levels 5 to 8 are only available in systems fitted with the editable database option.

## 3 Hardware configuration

### 3.1 Router details

#### 3.1.1 Master frames

Master frames are supplied with an internal control module and are available with either a fixed or editable database. This controller can be used either as a system controller, providing control for a standalone Axis routing system with up to eight breakaway levels, or to accept control from an external system controller allowing the frame to operate as a standalone router.

The controller, offering extensive facilities, supports up to 32 panels or under monitor displays with the editable database option. Axis supports the following panels from the standard Pro-Bel panel range;

- 6276 X-Y
- 6277 multibus
- 6700 Series button panels

The system is further enhanced, by utilising the Freeway editor to provide extensive system database configuration facilities. Editable features include; source/ destination names and associations, programmable salvos, route inhibits, audio channel configurations and joystick overrides. Full details of the Axis control system and database configuration can be found in Chapters 4 to 6 of this user guide.

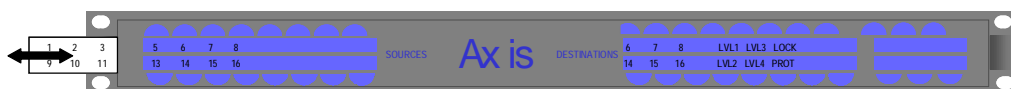
##### 3.1.1.1 Integral control panel

Master frames can be supplied with an integral 16x16 X-Y control panel, enabling 'plug and play' operation - straight from the box.



### 3.1.2 Inserting and removing the legend strip

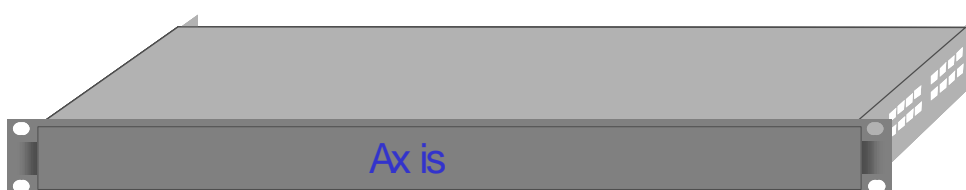
The legend strip used in the integral X-Y control panel can be simply removed and replaced by sliding it from underneath the front panel membrane from either end of the panel.



Replacement legend strips can easily be made using either a word processor or spreadsheet, then printing onto transparent film using a laser printer. As the legend strip is approximately 460mmx19mm, it may be necessary to make two shorter strips that can be inserted from either end of the control panel (as shown below). A template for the panel legend strip, in Microsoft Excel format, can be downloaded from the Pro-Bel website at [www.pro-bel.com/support/documentation/templates/6700 series BPX label strip](http://www.pro-bel.com/support/documentation/templates/6700%20series%20BPX%20label%20strip).

[illegible]

### 3.1.3 Slave frames



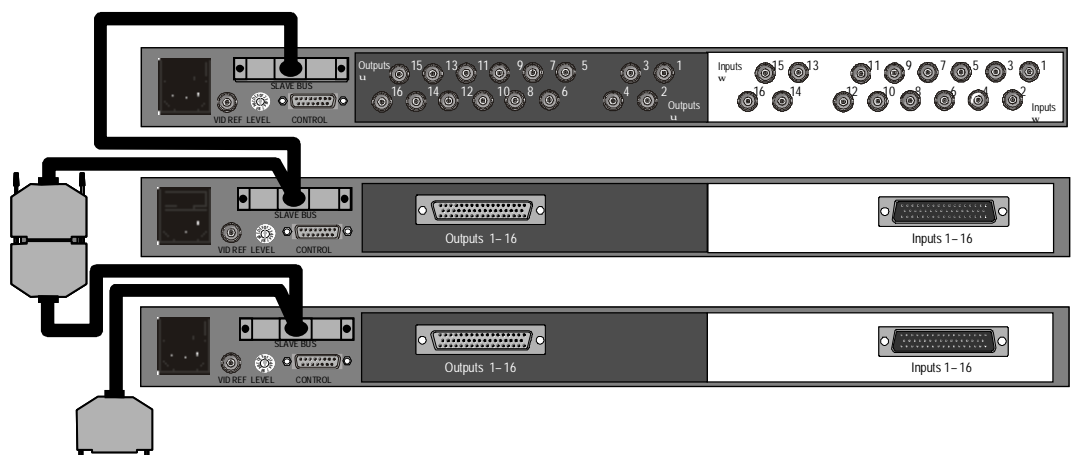
Slave frames are fitted with a parallel control port enabling them to be connected to a Master frame as part of a multilevel routing system. Because Axis frames utilise the same control pin out as the Freeway control bus, they can also be connected to Freeway systems and controlled as additional router levels.



## 3.2 System interconnections

### 3.2.1 Multilevel systems

Multilevel Axis systems can be constructed by interconnecting Slave frames to a Master frame using the SLAVE bus expansion cable as shown in the diagram below.



While multilevel routers with up to eight independent breakaway levels can be built in this way, it is possible to interconnect a maximum of twelve frames using this method. Typical applications for systems built in this way could include YUV routers, where three video levels can share the same level address making them permanently married.

### 3.2.2 Control panel interconnection

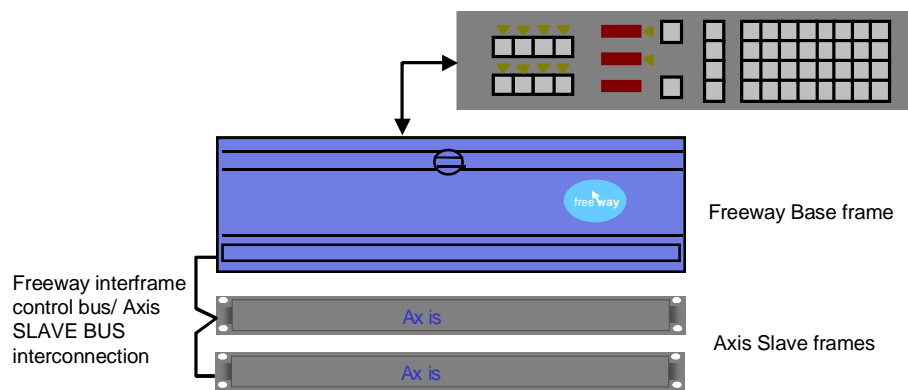
Pro-Bel's range of standard control panels connect to the Master frame via an RS485, multidrop control port. The control 'break out' cable supplied with Master frames, presents the control port ready to simply connect to the panels using a simple pin-to-pin cable. Full details of setting up control panels and their control connection pin outs can be found in the relevant control panel handbook. Where an Axis frame is supplied with a front mounted control panel, it forms an integral part of the Axis housing and therefore should not be removed from the frame.

## 3.2.3 Other control options

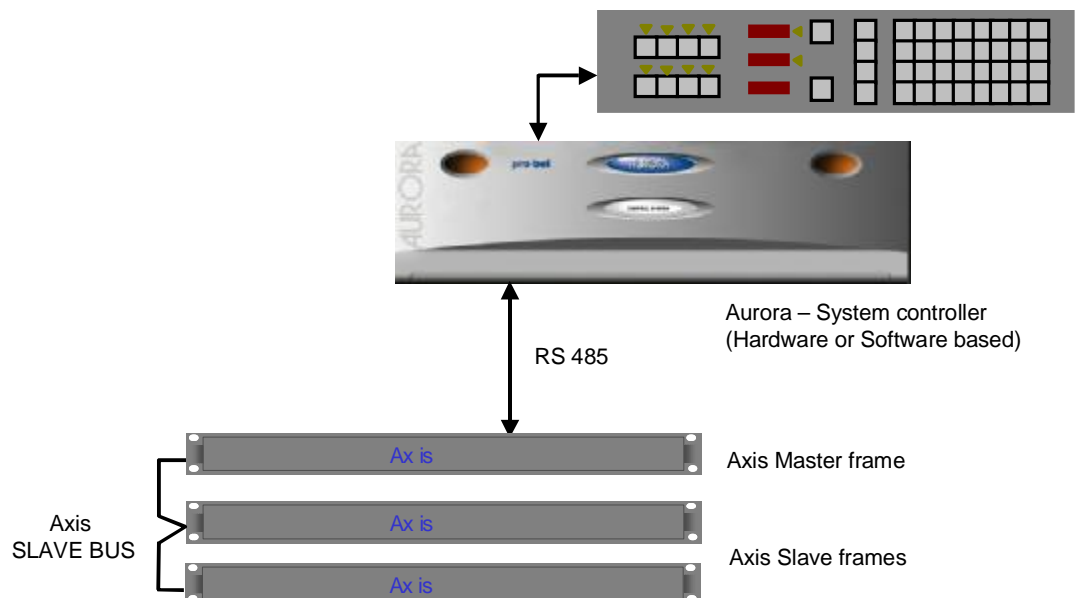
Full control compatibility of the 'SLAVE BUS' with the Freeway, interframe, parallel control bus and the use of Pro-Bel general switcher protocol on the remote control port, ensures seamless operation of Axis frames with all Pro-Bel control systems.

Axis Slave frames may be used within Freeway routing systems, providing additional, smaller router levels working alongside base router frames.

- Freeway/ Axis control interconnection



- Aurora/ Axis control interconnection



## 4 Fixed database systems

Systems supplied with a fixed database contain a single, non-editable, database. In these systems, the editor port – port 3 is disabled and does not therefore permit any system changes to be made. This section details the database settings and control panels that can be used.

### 4.1 Database settings

The following table details the default settings for the database. It should be noted that the maximum number of levels that can be independently controlled in this configuration is four.

| Item                             | Configuration details                        |
|----------------------------------|--|
| Maximum number of levels         | 4  |
| Maximum number of control panels | 16 (including the integral panel if fitted)  |
| Control ports                    | 2 (1x Panel port and 1x Remote control port) |
| Route Inhibits                   | None   |
| Salvo's                          | None   |
| Source Associations              | One to one across all levels                 |
| Destination Associations         | One to one across all levels                 |
| Trigger method per source        | With respect to the applied video reference  |
| Source Audio parameters          | Not available                                |
| Destination Audio parameters     | Not available                                |

The database within a fixed configuration system is pre-configured to permit operation as a multi-level router. The system supports up to fifteen button per crosspoint panels, each controlling a single, dedicated output; plus a master X-Y panel with access to all sources and destinations. This X-Y panel can be either the integral – front mounted panel or a discrete unit.

It is essential, in order for the system to function correctly, that each panel used on the system should be configured with a unique address matching the one set for it in the system database. This address, in the case of a fixed configuration system, corresponds to the destination being controlled, where the panel set to address 1 controls destination 1; address 2 controls destination 2 etc. right through to panel 15 with address 15. The following table summarises the control panel types, their address, controlled destination(s), the number of levels controllable and their name in the database.

| Port 1 - Fixed database configuration |            |            |                         |                    |                  |                   |
|---------------------------------------|------------|------------|-------------------------|--------------------|------------------|-------------------|
| Panel Address                         | Panel Name | Panel type | Controlled Destinations | Controlled Sources | Override Sources | Controlled Levels |
| 1                                     | PNL 1-1    | 6709-BPX   | 1                       | 1 to 16            | 1 to 8           | 4                 |
| 2                                     | PNL 1-2    | 6709-BPX   | 2                       | 1 to 16            | 1 to 8           | 4                 |
| 3                                     | PNL 1-3    | 6709-BPX   | 3                       | 1 to 16            | 1 to 8           | 4                 |
| 4                                     | PNL 1-4    | 6709-BPX   | 4                       | 1 to 16            | 1 to 8           | 4                 |
| 5                                     | PNL 1-5    | 6709-BPX   | 5                       | 1 to 16            | 1 to 8           | 4                 |
| 6                                     | PNL 1-6    | 6709-BPX   | 6                       | 1 to 16            | 1 to 8           | 4                 |
| 7                                     | PNL 1-7    | 6709-BPX   | 7                       | 1 to 16            | 1 to 8           | 4                 |
| 8                                     | PNL 1-8    | 6709-BPX   | 8                       | 1 to 16            | 1 to 8           | 4                 |
| 9                                     | PNL 1-9    | 6709-BPX   | 9                       | 1 to 16            | 1 to 8           | 4                 |
| 10                                    | PNL 1-10   | 6709-BPX   | 10                      | 1 to 16            | 1 to 8           | 4                 |
| 11                                    | PNL 1-11   | 6709-BPX   | 11                      | 1 to 16            | 1 to 8           | 4                 |
| 12                                    | PNL 1-12   | 6709-BPX   | 12                      | 1 to 16            | 1 to 8           | 4                 |
| 13                                    | PNL 1-13   | 6709-BPX   | 13                      | 1 to 16            | 1 to 8           | 4                 |
| 14                                    | PNL 1-14   | 6709-BPX   | 14                      | 1 to 16            | 1 to 8           | 4                 |
| 15                                    | PNL 1-15   | 6709-BPX   | 15                      | 1 to 16            | 1 to 8           | 4                 |
| 16                                    | PNL 1-16   | 6707-X-Y*  | 1 to 16                 | 1 to 16            | None             | 4                 |

\* Only one X-Y panel (Type 6707) can be used with a fixed database system – this can be either the front mounted panel or a discrete unit.

## 4.2 Panel details

Panels available for use in the fixed database system are limited to the 6709, sixteen way button per crosspoint and the 6706, 16x16 X-Y versions. Full details for configuring these panels can be found in the 6700 series control panel user guide, however it is important to ensure that the panel is configured for both the correct control system and panel operation. The following table details the switch settings required for each panel type to provide correct operation with an Axis system.

| Panel type    | Operation | Switch settings |   |     |     |   |   |   |   |
|---------------|-----------|-----------------|---|-----|-----|---|---|---|---|
|               |           | 1               | 2 | 3   | 4   | 5 | 6 | 7 | 8 |
| 6709 BPX      | BPX       | 0               | 0 | N/U | N/U | 0 | 0 | 0 | 0 |
| 6707 16x16 XY | X-Y       | 0               | 0 | N/U | N/U | 0 | 1 | 1 | 1 |

In addition it is important to ensure that each control panel connected to the system has a

*unique* panel address set, that corresponds to the one required for that panel type in the database.

## 4.3 Remote control options

Because Axis level types are entered into the database as Freeway 64 level types, the destination offset for the next level when controlling the system remotely (using Pro-Bel general switcher protocol - SW-P-02) is 64 and NOT 16.

| LEVEL | DEST RANGE | SOURCE RANGE |
|-------|------------|--------------|
| 1     | 0 to 15    | 0 to 15      |
| 2     | 64 to 80   | 0 to 15      |
| 3     | 128 to 143 | 0 to 15      |
| 4     | 196 to 211 | 0 to 15      |
| 5     | 256 to 271 | 0 to 15      |
| 6     | 320 to 335 | 0 to 15      |
| 7     | 384 to 399 | 0 to 15      |
| 8     | 448 to 463 | 0 to 15      |

## 4.4 Port definitions

Master Axis frames with fixed databases have 2 RS485 control ports available. Their operation is defined as shown below:

- 1 x Remote control port using SW-P-02 Pro-Bel General Switcher Protocol<sup>1</sup>
- 1 x Device port for up to 16 control panels using SW-P-06 Multi-drop Communications Protocol<sup>2</sup>

<sup>1</sup> This protocol is described in section 3.4.2. below. Full details of the command set are available on request from Pro-Bel.

<sup>2</sup> This is a proprietary protocol, used by Pro-Bel control panels and under monitor displays.

### 4.4.1 Port characteristics

The characteristics for each port are defined in the table below:

| Port Name               | Standard | Protocol | Baud rate | Data bits | Parity | Stop bits |
|-------------------------|----------|----------|-----------|-----------|--------|-----------|
| Device port (port 1)    | RS485    | SW-P-06  | 38400     | 8         | N      | 1         |
| Remote control (port 2) | RS485    | SW-P-02  | 38400     | 8         | E      | 1         |

## 4.4.2 Pro-Bel General Switcher Protocol (SW-P-02)

Pro-Bel General Switcher Communication Protocol is a robust, asynchronous method of controlling routing switchers. It is the preferred method of controlling Pro-Bel routers.

The normal electrical parameters of the interface are:

- RS485
- 8 bit data
- 1 stop bit
- EVEN parity
- 38.4K baud

However the interface can be set to operate with any common RS485 parameters.

The message format protocol is standard, and always conforms to the following format:

|     |         |         |          |
|-----|---------|---------|----------|
| SOM | COMMAND | MESSAGE | CHECKSUM |
|-----|---------|---------|----------|

Where:

|          |   |   |          |
|----------|---|---|----------|
| SOM      | = | Start of message  | = FF Hex |
| COMMAND  | = | Command byte, which also defines message length               |          |
| MESSAGE  | = | May be zero or more bytes                                     |          |
| CHECKSUM | = | 7 bit, 2s compliment sum of command and message field (msb=0) |          |

## 5 Editable database systems

Axis systems utilise the Pro-Bel Router Editor to program the system database, and also have the ability to provide many of the advanced operations available to Freeway systems, such as audio modify for the analogue audio level. This section details pertinent points that should be noted when configuring an Axis database.

### 5.1 Level types

The following table details the correct Freeway level type to use in the database editor for each available Axis level.

| AXIS level type         | Equivalent Freeway level type | Audio Parameters | Max. source & dest size |
|-------------------------|-------------------------------|------------------|-------------------------|
| Analogue Video          | 32/64 – Analogue Video        | N/A              | 16                      |
| SDV or HD               | 32/64 – SDV                   | N/A              | 16                      |
| AES                     | 32/64 – AES                   | N/A              | 16                      |
| Analogue Audio          | 32/64 – Analogue Audio        | Disabled         | 16                      |
| Analogue Audio          | 32/64 – Analogue Audio        | Enabled          | 16                      |
| Dual – Analogue Video   | 32/64 Dual – Analogue Video   | N/A              | 8                       |
| Dual – SDV or HD        | 32/64 Dual – SDV              | N/A              | 8                       |
| Dual – AES              | 32/64 Dual – AES              | N/A              | 8                       |
| Dual – Analogue Audio   | 32/64 Dual – Analogue Audio   | Disabled         | 8                       |
| Dual – Analogue Audio   | 32/64 Dual – Analogue Audio   | Enabled          | 8                       |
| Quad – Analogue Video   | 32/64 Quad – Analogue Video   | N/A              | 4                       |
| Quad – SDV or HD        | 32/64 Quad – SDV              | N/A              | 4                       |
| Quad – AES              | 32/64 Quad – AES              | N/A              | 4                       |
| Quad – Analogue Audio   | 32/64 Quad – Analogue Audio   | Disabled         | 4                       |
| Quad – Analogue Audio   | 32/64 Quad – Analogue Audio   | Enabled          | 4                       |
| Triple – Analogue Video | 32/64 Triple – Analogue Video | N/A              | 5                       |
| Triple – SDV or HD      | 32/64 Triple – SDV            | N/A              | 5                       |
| Triple – AES            | 32/64 Triple – AES            | N/A              | 5                       |
| Triple – Analogue Audio | 32/64 Triple – Analogue Audio | Disabled         | 5                       |
| Triple – Analogue Audio | 32/64 Triple – Analogue Audio | Enabled          | 5                       |

## 5.2 Panel details

This section details the functional and operational aspects of the panels supported by the editable database version of Axis.

### 5.2.1 Supported Devices

The Panels and Undermonitor displays (UMD's) supported by the editable database version are listed below;

| Part Number   | Description                           |
|---------------|---------------------------------------|
| RCP-100N-1600 | 6709, 16 way single bus control panel |
| RCP-100N-1616 | 6707, Dual 16 way button panel        |
| 6726-00       | 6276, X-Y control panel               |
| 6277-80       | 6277, 8 bus control panel             |
| 6277-60       | 6277, 6 bus control panel             |
| 6277-40       | 6277, 4 bus control panel             |
| 6277-20       | 6277, 2 bus control panel             |
| 6140          | 8 character UMD- Red                  |
| 6141          | 8 character UMD- Green                |
| 6143          | Dual 8 character UMD- Red             |
| 6144          | Dual 8 character UMD- Green           |

Full details for configuring these panels can be found in the relevant control panel user guide, however it is important to ensure that each panel is configured for both the correct control system and panel operation. The following table details the switch settings required for each panel type to provide correct operation with an Axis system.

| Panel type | Operation  | Switch settings |      |      |      |      |      |      |      |
|------------|------------|-----------------|------|------|------|------|------|------|------|
|            |            | 1               | 2    | 3    | 4    | 5    | 6    | 7    | 8    |
| 6709       | BPX        | 0               | 0    | N/U  | N/U  | 0    | 0    | 0    | 0    |
| 6707       | X-Y        | 0               | 0    | N/U  | N/U  | 0    | 1    | 1    | 1    |
| 6276       | X-Y        | Up              | Up   | Up   | Down | Down | Down | Down | *    |
| 6277       | 2 to 8 bus | Up              | Up   | Up   | Down | Down | Up   | Down | *    |
| 6140/1/3/4 | UMD        | Down            | Down | Down | Down | Up   | Down | Up   | Down |

\* Set switch 8 'Up' for panels with addresses in the range 1-15 and down for panels with address 16.

In addition it is important to ensure that each control panel connected to the system has a *unique* panel address set, that corresponds to the one required for that panel type in the



database.

## 5.2.2 General panel details

An Axis router can drive up to sixteen multi-dropped panels from each of the two RS485 General Remote ports.

Each panel on the same RS485 port must be set, according to its handbook, to have a unique multi-drop address. For this port and address, the database should be configured (if applicable) with the:

- Panel type
- Source keypad
- Destination keypad
- Controllable destination
- Controllable levels and brightness
- Override sources
- Panel name

## 5.2.3 Panel features

This section describes the various features encountered across the range of panel types.

### 5.2.3.1 Protect

The protect function prevents other control devices connected to Axis, including devices attached to the remote ports, from setting crosspoints on a particular destination. Until the destination has been unprotected by the device that protected it originally, or from the panel designated as master.

Protect operates on the destination assigned to each level for the destination association that was protected.

If a control device attached to the multi-drop device ports attempts to set crosspoints on a protected destination then an error message will be displayed on control devices with displays. See 'Panels with displays' section for display messages.

Setting a protected destination causes protect button LEDS on other BPX type panels to flash - if they are assigned to the same destination.

## 5.2.3.2 Line-up

This is a continuous toggle of preset and program sources allowing easier alignment of sources on a matrix level. Line-up of sources is selected as follows:

- Route source to be aligned to desired destination.
- Make sure the level of the sources to be aligned is the most significant active level.
- Select reference source as the preset source.
- Press <LINE-UP> button on panel. The LED associated with the <LINE-UP> button will light to show the <LINE-UP> button has been pressed.
- Press <TAKE> button of desired destination. The source routed will toggle between the reference source and the source to be aligned.
- Line-up of sources on a destination is cancelled by pressing the <LINE-UP> button again. This cancels line-up altogether on the control device.
- The source being aligned is returned as the source routed to the destination being used and also the LED associated with the <LINE-UP> button will be extinguished.
- Pressing another <TAKE> button on the same panel will cause the original source to be routed to the previous destination and then start the line-up sequence on the new destination.

N.B. All control devices will power-up with line-up *inactive*.

## 5.2.3.3 Decrement and increment

Each time the <DECREMENT> or <INCREMENT> button is pressed, the source or destination association number selected, depending on the active keypad, is decremented/incremented with the panel displays being updated accordingly. When decrementing/incrementing source associations, only levels that are active are changed with the most significant active level's source association as the association to change.

## 5.2.3.4 Alt-dest

Each time the <ALT-DEST> button is pressed, the panel changes control to the alternate set of assigned destination associations. When the LED to the left of the <ALT-DEST> button is illuminated, the panel is then controlling the second set of destination associations

assigned to the panel. This function is typically used with multi-output panels.

## 5.2.3.5 Dest-ident

The <DEST-IDENT> button is used to identify the destination associations assigned to the <TAKE> buttons on multi-bus panels. Pressing and holding down the <DEST-IDENT> button changes the 'STATUS' displays to show the 8 character name for the assigned destination association for the current set of destination associations.

By pressing the <ALT-DEST> button, the other set of destinations can be identified by pressing and holding the <DEST-IDENT> button again. This function is typically used with multi-output panels.

## 5.2.3.6 Level buttons and controllable levels

A 'married' source refers to situations where, having selected or routed a source on one level, a user would automatically expect other levels to be married to it (i.e. associated with it). Level buttons allow the user to 'breakaway' selections from this marriage.

Each button operates in a toggle on/off manner with the level active indicated by an illuminated button. Unless otherwise stated each button toggles the state of one level only. Only levels that are controllable can be toggled on or off.

On occasions when more controllable levels are assigned to a panel than there are level buttons then the last level button controls the excess levels, i.e. if the controllable levels for a 4 level button panel were defined as 1, 2, 3, 4, 5, 6 then level 1 to 3 would be assigned to first three level buttons respectively, and the fourth level button would control levels 4, 5 and 6.

Single levels or all levels can be turned off, if required, via the editor terminal.

## 5.2.3.7 Alt-lev

The Alternate level shift function is used on panels with only four level buttons, allowing individual control of all eight levels. It operates in a toggle on/off manner with an LED used to indicate the level shift - when the LED is off then levels 1 to 4 are controllable and when the LED is on levels 5 to 8 are controllable.

The level shift function is button programmable on all panel types (BPX and X-Y). Any source or destination button can be configured as a level shift button.

## 5.2.3.8 Clear

This key is used as a source preset or destination clear key and is generally assigned to the bottom right key on a keypad.

## 5.2.3.9 Controllable destinations

This applies to X-Y panels only. The user can configure any destination association to be controllable from a given X-Y type panel.

## 5.2.3.10 Destination buttons

Button per destination type keypads and dial up keypads (multiple button presses) are available.

Pressing a destination button or a sequence of destination buttons selects a destination association index, which references one destination per level. This gives the user the opportunity to make selections on different destinations.

The pressed button will either illuminate if it has a valid associated destination association index, or have alphanumeric displays to show the name of the selected destination association.

On power-up no destination button is selected so all destination buttons are extinguished and any destination displays on X-Y panels are blanked.

## 5.2.3.11 Source buttons

Button per source type keypads and dial up keypads are available.

Pressing a source button or a sequence of these buttons, routes sources on the active and controllable levels only.

The source buttons on some panels are used to preselect sources not route them. These panels have <TAKE> buttons to make the selections.

## 5.2.3.12 Panel swap mode

Panel Swap Mode is a panel assignable feature which swaps pre-select and source routed on <TAKE>, otherwise the pre-select does not change.

## 5.2.3.13 Display AUD parameters

This is an assignable feature to the special function buttons on 6276 X-Y and 6277 multi-bus panels only. When enabled this feature displays source and destination AUD parameters in the eighth character of the displays for the most significant stereo Analogue Audio level in the system.

## 5.2.3.14 Configure AUD parameters

This is an assignable feature to the special function buttons on 6276 X-Y and 6277 multi-bus only. When enabled this feature allows pre-selection of destination AUD parameters for stereo analogue audio levels. If panel is a Master 6276 X-Y then enabling this feature allows AUD parameters to be assigned to sources and destinations and allows trigger type to be assigned to sources. Enabling this feature automatically enables the 'display AUD parameters' feature.

## 5.2.3.15 Override inputs

Some panels allow a number of override inputs to momentarily override the current source routed to a destination with another source.

When all overrides are released the original source that was routed before any overrides were activated is restored. Shorting an override input pin to 0V, activates the override.

Each override input can have any source assigned to it and can be assigned to operate on any level.

If more than one override input is active on a panel, then the lowest number override will take priority.

When a destination is overridden no other crosspoint can be set on that destination by any means unless it is a higher priority override.

The maximum number of overrides available to any panel is 16.

## 5.2.3.16 Keyswitch input

6276 and 6277 panels have the software ability to accept a keyswitch input to inhibit the <TAKE> and source keypads. The default condition is <TAKE> button enabled (keyswitch on). If the keyswitch is disabled then the source 'PRESET' display indicates ' LOCKED '.

To disable the <TAKE> button and source keypad pin 1 of the AUX input on the rear of the panel needs to be connected to 0V.

## 5.2.3.17 Making selections

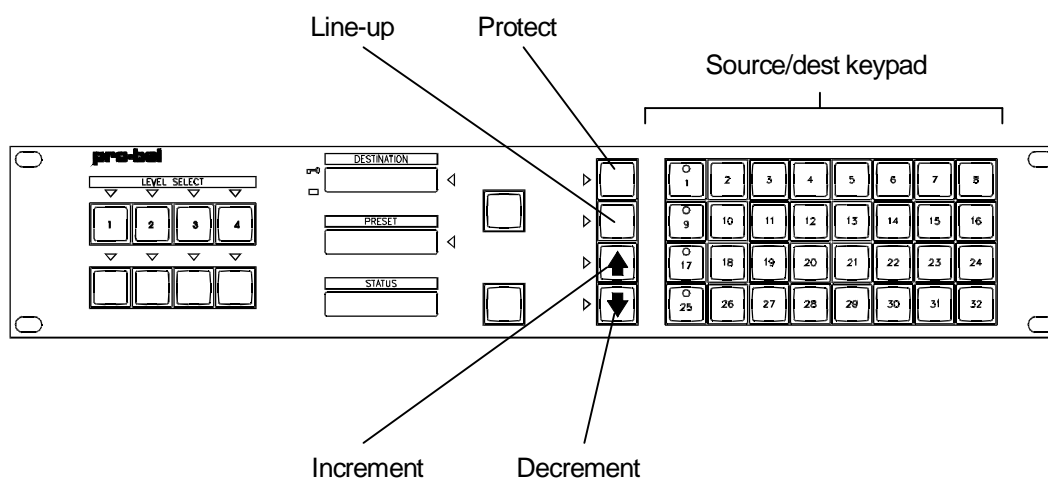
'Crosspoint' selections (or routes) are made provided:

- The destination and source are valid for the level
- The destination is controllable
- The level is active and controllable
- The route is not inhibited
- Destination is not protected
- An override is not active on this destination unless the source is a higher priority override

The router is recognised as present by the Axis control card.

## 5.2.3.18 Special Function Keys

6276 and 6277 type panels have 4 special function keys arranged in a vertical line of 4 buttons to the left of the source/dest keypad. These keys can each be assigned a different function as illustrated in the example below. See individual panel types for special functions supported.



## 5.2.3.19 Keypads

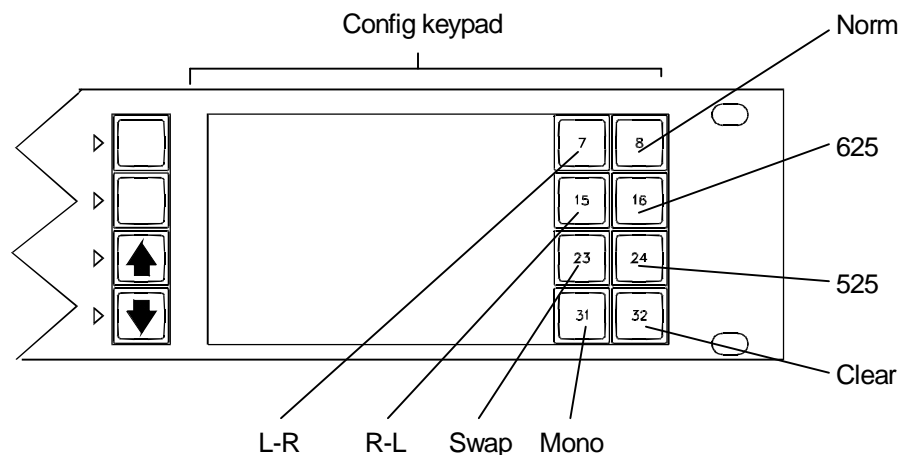
There are 32 assignable button per source keypads each with 64 source buttons (this allows each panel to have a different keypad) and 8 dial-up type source keypads for use on 8 character display panels.

There are 32 assignable button per destination keypads each with 36 destination buttons (this allows each panel to have a different keypad) and 8 dial-up type destination keypads for use on 8 character display panels.

The dial-up keypads allow a maximum of four button presses per source or destination selection.

Dial-up keypads can be used on display panels that need to access more sources or destinations than there are direct entry keys on the keypad. They can be assigned to the panel instead of the default button per source/destination keypad.

There is also an AUD config keypad used to assign AUD parameters on a button per parameter basis. It is used with 6276 and 6277 panels and is illustrated below. This keypad will only be active if <CONFIG AUD> assigned to one of the special function keys.



## 5.2.3.20 Panels with displays

These panels have alphanumeric displays for 8 character messages. The table below defines warning messages used throughout the range.

Valid source selections are shown on 'PRESET' or 'STATUS' displays as defined by the user. These will be shown as:

- 'SSSSSSSS' for 8 character.
- 'PRESET' warning messages are enclosed by ?....?
- 'STATUS' warning messages are enclosed by <.....>

| Message    | Explanation   |
|------------|---|
| '<No Dst>' | No destination association selected   |
| '<No Src>' | No source selected because no destination assigned for any level in destination association   |
| '<↓↓↓↓↓>'  | No destination assigned in the selected destination association on the most significant active level but there are destinations on the lower levels                                 |
| '<↑↑↑↑>'   | No destination assigned in the selected destination association on the most significant active level but there are destinations on the upper levels                                 |
| '<↑↑↓↓>'   | No destination assigned in the selected destination association on the most significant active level but there are destinations on the upper and lower levels                       |
| '?No Src?' | Source association with no sources on any level has been selected   |
| '*LOCKED*' | Panel <TAKE> button and source buttons are disabled via keyswitch input   |
| '**PROT**' | Source cannot be routed as destination is protected. After a few seconds the panel name is displayed before reverting back to showing the current source routed a few seconds later |
| 'PROTECT?' | When flashing indicates that destination will be protected on next take   |



|              |   |
|--------------|---|
| '*OVERRIDE*' | Source cannot be routed as destination has overridden source routed. After a few seconds the name of the device responsible for the override is displayed before reverting back to showing the current source routed or preset a few seconds later. |
| 'ROUTE INH'  | Source cannot be routed as route inhibited. Displayed in Preset display   |
| '?↓↓↓↓↓?'    | No source preselected on the most significant active level but there are sources preselected on the lower levels  |
| '?↑↑↑↑↑?'    | No source preselected on the most significant active level but there are sources preselected on the upper levels  |
| '?↑↑↓↓↓?'    | No source preselected on the most significant active level but there are sources preselected on the higher and lower levels   |
| 'SALVO'      | Displayed in STATUS or IN-USE displays to indicate that a salvo has been preselected.   |
| 'NO XPT!'    | Error message displayed in STATUS or IN-USE to indicate that a crosspoint cannot be set as card not present.  |
| 'LEV CON'    | Error message displayed in STATUS or IN-USE to indicate that a crosspoint was not made on a level because the level was not controllable from that panel.   |
| 'DST CON'    | Error message displayed in STATUS or IN-USE to indicate that a crosspoint was not made because the X-Y panel attempting to set it is not allowed to control the destination.  |

The brightness of the displays on applicable panels may be changed by reconfiguring the database. It is not possible to have different brightness levels for different displays on the same panel.

The following table defines the AUD parameter symbols used on UMDS and panels with 8 character displays when the 'display AUD parameters' feature is enabled on a level.

| Symbol                | Description  |
|-----------------------|--|
| Space                 | Indicates normal source or destination   |
| Steady 'S'            | Indicates destination is Swapped   |
| Steady 'M'            | Indicates destination is Mono  |
| Flash 'N' and '?'     | Normal destination pre-selected  |
| Flash 'S' and '?'     | Swapped destination pre-selected   |
| Flash 'M' and '?'     | Mono destination pre-selected  |
| Flashing 'L'          | Left channel of source routed to both channels   |
| Flashing 'R'          | Right channel of source routed to both channels  |
| Flashing 'S'          | Left and right channels swapped  |
| NRM or NRM?           | Source is Normal or pre-selected to be Normal  |
| L-R or L-R?           | Source is L-R or pre-selected to be L-R  |
| R-L or R-L?           | Source is R-L or pre-selected to be R-L.   |
| SWP or SWP?           | Source L/R swapped or pre-selected to be L/R swapped   |
| 525 or 525?           | Source using 525 trigger or pre-selected to use 525  |
| 625 or 625?           | Source using 625 trigger or pre-selected to use 625  |
| Steady '→'            | No audio parameters on current most significant active level but other levels configured with audio parameters.                  |
| Flashing '→' with '?' | No audio parameters pre-selected on most significant active level but other levels configured with audio parameter pre-selected. |
| TRG?                  | No source pre-select on level thus unknown trigger.  |
| AUP?                  | No source pre-select on level thus unknown audio parameter.  |

## 5.2.4 Assigning Audio parameters from panels

This section details the operation of: the Normal 6276 X-Y; Generic Multi-Output and 6276 X-Y Master panels with regards to: assignment of audio parameters for Analogue Audio sources and destinations; assignment of trigger type to sources.

The four special function buttons are assignable, however two new special function buttons are required:-

- <DISPLAY AUDIO> enable/disable display of AUD parameter indication.
- <CONFIG AUDIO> enable/disable configuration of AUD parameters

### Common rules

While 'config AUD parameters' is enabled then only AUD parameters can be pre-selected (i.e. sources and destinations cannot be dialled up). Pressing <CLEAR>, while in this mode, will result in the panel returning to its previous state.

If the 'display audio parameters' function is disabled then full 8 character names will be displayed with no AUD parameter, even if the first level is Axis Analogue Audio.

Selecting 'display audio' function results in the 8th character of the displays showing the AUD parameter assigned for the most significant active level.

Assuming 'display audio parameters' is enabled then:-

The 8th character in PRESET and STATUS displays is:-

- Steady (non-flashing) when source AUD parameter is NORMAL
- Flashing when source AUD parameter is NOT NORMAL, i.e. SWAP

8th character in PRESET window shows AUD parameter of the pre-selected source displayed for the most significant active level in the system.

8th character in STATUS displays shows AUD parameter of combined source and destination taken for the most significant active level.

8th character in DESTINATION displays shows the destination AUD parameter of the destination displayed for the most significant active level in the system.

If <CONFIG AUDIO> pressed to enable configuration of AUD parameters and no buttons are pressed within a 1 minute timeout period then this function is automatically disabled and the panel is returned to its previous state.

Enabling configuration of audio parameters always results in 'display audio parameters' being enabled.

The 'N' character to denote Normal is only used in AUD parameter pre-selecting. Usually

8th character is left blank to denote Normal.

If pre-selected route is found to be inhibited (from either editable route inhibit table or internal system inhibit table) then the destination AUD parameter pre-selected will be thrown away.

If a route is protected then AUD parameters and trigger type cannot be changed.

## 5.2.4.1 Normal 6276 X-Y

### Rules

Only Destination AUD parameters can be assigned from this panel type.

8th character in DESTINATION display is also used to show the pre-selected destination AUD parameter when character alternating with '?'.  
8th character in DESTINATION display is also used to show the pre-selected destination AUD parameter when character alternating with '?'.

Enabling configuration of AUD parameters by pressing <CONFIG AUDIO> will always result in selector LED being lit against DESTINATION display.

### Operation 1

Press <DISPLAY AUDIO> to enable audio parameters to be displayed (optional).

Select DESTINATION display.

Dial up destination (e.g. VT 3)

Press <CONFIG AUDIO> (selector LED lit against DESTINATION display) followed by the required AUD parameter. The pre-selected AUD parameter is displayed (flashing alternately with '?') in the 8th character of the DESTINATION display.

Press <TAKE> to:-

- Assign AUD parameter to destination
- Update 8th character of DESTINATION display to indicate new AUD parameter
- Update 8th character of STATUS display with combined source and destination AUD parameter.
- Auto cancel 'config AUD parameters' mode

### Operation 2

Press <DISPLAY AUDIO> to enable audio parameters to be displayed (optional).

Select DESTINATION display (selector LED lit against DESTINATION display)

Dial up destination (e.g. VT 3)

Select PRESET display (selector LED lit against PRESET display)

Dial up a source (e.g. VT 7)

Press <CONFIG AUDIO> (selector LED lit against DESTINATION display) followed by an AUD parameter. The pre-selected AUD parameter is displayed (flashing alternately with '?') in the 8th character of the DESTINATION display.

Press <TAKE> to:-

- Assign AUD parameter to destination
- Update 8th character of DESTINATION display to indicate new AUD parameter
- Update 8th character of STATUS display with combined source and destination AUD parameter
- Auto cancel 'config AUD parameters' mode

## 5.2.4.2 Generic multi-output panels

### Rules

Only Destination AUD parameters can be assigned from this panel type.

When DEST-IDENT activated the 8th character in STATUS displays shows AUD parameter of the destination for the most significant active level in the system.

8th character in PRESET display normally shows AUD parameter of the pre-selected source displayed for the most significant active level in the system. It is also used to show the pre-selected destination AUD parameter.

### Operation 1

Press <DISPLAY AUDIO> to enable audio parameters to be displayed (optional).

Clear PRESET display.

Press <CONFIG AUDIO> and select an AUD parameter. An 8 character name is displayed in the PRESET display to indicate destination AUD parameter pre-selected.

Press <TAKE> to:-

- Assign AUD parameter to destination
- Update 8th character of STATUS display with combined source and destination AUD parameter
- Auto cancel 'config AUD parameters' mode and blank PRESET display

## Operation 2

Press <DISPLAY AUDIO> to enable audio parameters to be displayed (optional).

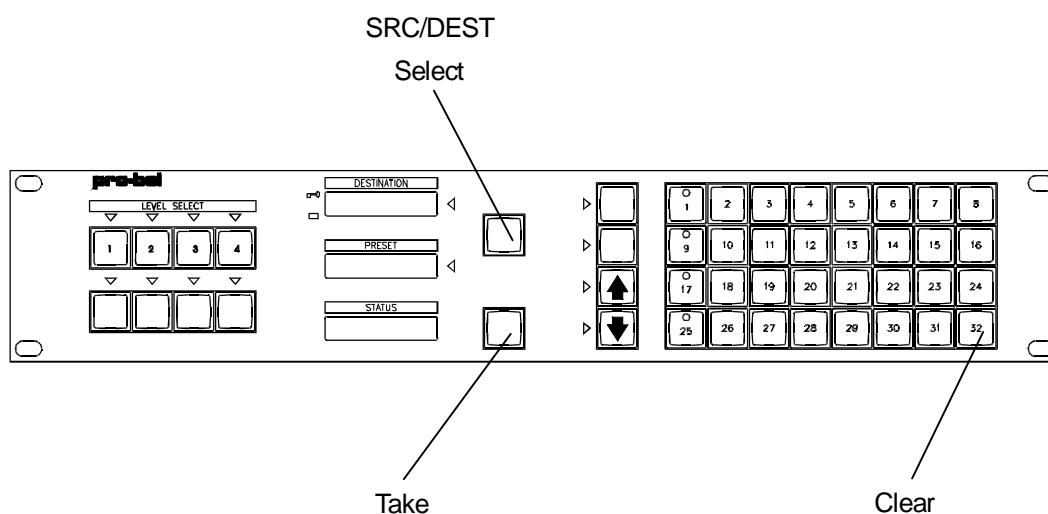
Dial up source in PRESET display.

Press <CONFIG AUDIO> and select an AUD parameter. The pre-selected AUD parameter is displayed (flashing alternately with '?') in the 8th character of the PRESET display.

Press <TAKE> to:-

- Assign AUD parameter to destination
- Update 8th character of STATUS display with combined source and destination AUD parameter
- Revert to showing source AUD parameter in 8th character of PRESET display
- Auto cancel 'config AUD parameters' mode

### 5.2.4.3 Master 6276 X-Y panel



The operation of this panel is identical to that of a Normal 6276 X-Y panel but has the option of being able to configure AUD parameters and trigger type for sources as well as being able to unprotect destinations set from another panel if <PROTECT> assigned.

To assign AUD parameters and trigger type to sources:-

Press <DISPLAY AUDIO> to enable audio parameters to be displayed.

Dial up source in PRESET display.

Press <CONFIG AUDIO> (DESTINATION display selector LED lights).

Press <S/D SELECT> to select PRESET display. N.B. There must be a source selected in the PRESET display before source AUD parameters can be changed.

DESTINATION display blanks and STATUS display shows 4 character name for trigger type assigned and 4 character name for AUD parameter assigned to source.

Pre-set AUD parameter and/or trigger type. STATUS display shows 3 character ident for trigger type and AUD parameter followed by '?' (e.g. '625 SWP?' - trigger type to remain unchanged but SWAP pre-selected as AUD parameter).

Press <TAKE> to:-

- Assign trigger type and AUD parameter to source
- Display new parameters in STATUS display for 2 seconds before reverting back to displaying source routed in STATUS display and destination in DESTINATION display.

auto cancel 'config audio parameters'

## 5.3 Remote control options

Because Axis level types are entered into the database as Freeway 64 level types, the destination offset for the next level when controlling the system remotely (using Pro-Bel general switcher protocol - SW-P-02) is 64 and NOT 16.

| LEVEL | DEST RANGE | SOURCE RANGE |
|-------|------------|--------------|
| 1     | 0 to 15    | 0 to 15      |
| 2     | 64 to 80   | 0 to 15      |
| 3     | 128 to 143 | 0 to 15      |
| 4     | 196 to 211 | 0 to 15      |
| 5     | 256 to 271 | 0 to 15      |
| 6     | 320 to 335 | 0 to 15      |
| 7     | 384 to 399 | 0 to 15      |
| 8     | 448 to 463 | 0 to 15      |

## 5.4 Port definitions

Master Axis frames with configurable databases have 3 control ports available. These are defined below:

- 2 x RS485 ports
- 1 x RS232 Editor port.

The database editor can configure each of the RS485 ports to support one of a number of protocols from the following list:

- SW-P-02 General Switcher Protocol<sup>1</sup>
- SW-P-06 Multi-drop Communications Protocol<sup>2</sup>
- SW-P-08 General Remote Control Protocol<sup>1</sup>

<sup>1</sup> These protocols are described in section 3.3.

<sup>2</sup> This is a proprietary protocol, used by Pro-Bel control panels and under monitor displays.

### 5.4.1 Port characteristics

The characteristics for each port are defined in the table below:

| Port Name     | Standard | Protocol                        | Baud rate | Data bits | Parity | Stop bits |
|---------------|----------|---------------------------------|-----------|-----------|--------|-----------|
| Gen Remote 1  | RS485    | Configurable<br>See Section 4.4 |           |           |        |           |
| Gen Remote 2  | RS485    |                                 |           |           |        |           |
| Editor/Config | RS232    | SW-P-08                         | 38400     | 8         | N      | 1         |

### 5.4.2 Pro-Bel General Switcher Protocol (SW-P-02)

Pro-Bel General Switcher Communication Protocol is a robust, asynchronous method of controlling routing switchers. It is the preferred method of controlling Pro-Bel routers.

The normal electrical parameters of the interface are:

- RS485
- 8 bit data
- 1 stop bit
- EVEN parity
- 38.4K baud

However the interface can be set to operate with any common RS485 parameters.



The message format protocol is standard, and always conforms to the following format:

|     |         |         |          |
|-----|---------|---------|----------|
| SOM | COMMAND | MESSAGE | CHECKSUM |
|-----|---------|---------|----------|

Where:

|          |   |  |          |
|----------|---|--|----------|
| SOM      | = | Start of message   | = FF Hex |
| COMMAND  | = | Command byte, which also defines message length                  |          |
| MESSAGE  | = | May be zero or more bytes  |          |
| CHECKSUM | = | 7 bit, 2s compliment sum of command and message field<br>(msb=0) |          |

### 5.4.3 Pro-Bel General Remote Control Protocol (SW-P-08)

This protocol has been developed to provide a common and robust method of interfacing Pro-Bel control systems to a variety of standard and custom applications. It is the standard protocol for interfacing a controller to a remote device.

## 6 Configuring the database

---

The following section describes the Axis control system. The control module supplied with Master Units provides the interfaces, database and operating software required to configure and control the Axis router family.

### 6.1 The Axis database editor

As described earlier in this guide, Axis uses the Freeway database editor program to edit the system database. When installing this program, it will refer to Freeway rather than Axis.

#### 6.1.1 Hardware requirements

Freeway Editors have been designed to run on the Microsoft Windows 95, or NT4 operating systems.

The editor and associated programs require around 3.2 Mbytes of hard drive space. Each saved database typically requires 1.3 Mbytes.

To use the editor 'On-Line', the PC must have an RS 232 port capable of operating at 38.4 Kbaud.

#### 6.1.2 Installing the Editors

The editor is supplied either on a CD ROM, Product number FRE-EDIT-WN32, or as an e-mail attachment.

To install from CD;

Insert the CD ROM into the PC's CD drive and either,

Click 'Start', then select Run from the start menu, then type D:Setup (where D is the drive letter for the CD ROM drive) and click OK, or

Run Explorer, view the contents of the CD ROM and select Setup.exe and follow the instructions on screen.

An HTML help file is provided with the editor package and is installed at the same time as the editors. A shortcut to these files can be found in the Start menu under Freeway Editor in the Programs folder.

## 6.2 Understanding the database

The editable database, which is held in non-volatile RAM in the Axis control card, determines the operation of the system and its associated panels.

To understand its use, a number of terms have to be defined:

- level - this term describes a type of router e.g. video or audio level.
- source - this term is used to describe an input of a router.
- destination - this term is used to describe an output of a router.

To configure a system the following parameters within the database must be considered:

- level type
- source and destination associations
- source names and destination association names
- route inhibit tables per level
- keypad and panel configuration
- general remote port configuration
- trigger method selection per source per level
- audio features per source per level

### 6.2.1 Level types

The level type within the Axis database defines the router type used on that level, permitting advanced features such as audio parameters to be used. It also defines the shape of a router level for example where it is used as a dual, triple or quad split for dual channel audio, YUV or RGBS operation.

### 6.2.2 Source and destination associations

This is a method of setting a group of associated sources on different levels to a group of associated destinations from a single button on a control panel. This is fundamental to the operation of the database.

For example, a destination association defines the destinations on each level that feed into a device, say a record VTR. Similarly, a source association defines the sources that originate from a device, say a playback VTR. An association is assigned a unique number, referred to as an index.

An example of this is:

|                        | Level Number |   |   |   |   |   |   |   |
|------------------------|--------------|---|---|---|---|---|---|---|
| Dest Association Index | 1            | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1                      | 1            | 1 | 1 | 1 | 1 | 1 | 1 | 3 |

Destination index 1 defines a set of destinations, one for each level, that comprises - levels 1 - 7 as dest 1 and level 8 as dest 3.

|                          | Level Number |   |   |   |   |   |   |   |
|--------------------------|--------------|---|---|---|---|---|---|---|
| Source Association Index | 1            | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 3                        | 4            | 4 | 3 | 3 | 3 | 3 | 1 | 1 |

Source index 3 defines a set of sources, one for each level, that comprises - levels 1 and 2 as source 4, levels 3 - 6 as source 3 and levels 7 and 8 as source 1.

Source and destination associations have different properties due to the distributive nature of the router i.e. one source may feed to many destinations but a destination may only have one source routed to it. One user may route the same source as another without affecting each other. However, routing a source to the same destination as another user obviously does affect each other. Therefore, a source association index may contain the same source number on a given level as another index but a destination association index should contain unique physical destination numbers. This avoids operational confusion as the system does not check or prevent this condition.

A user may require one button to set the sources across all the levels and another button to set only the audio sources. In order to do this special associations are used.

For example :

|                        | Level Number |   |   |   |   |   |   |   |
|------------------------|--------------|---|---|---|---|---|---|---|
| Dest Association Index | 1            | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 65                     | -            | 1 | 1 | 1 | - | - | - | - |

The level type assigned to level 1 is an Axis router that has 64 sources and 64 destinations. Special Associations therefore start from source index 65, and can be used to assign extra source combinations not defined in the standard association table, including those which have no source associated with level 1. In the example above, source index 65 is used to select source 1 from levels 2, 3 and 4 only. Special associations always start one index number greater than the size of the fully equipped level 1 router for sources and destinations.

Note: The normal associations i.e. 1-64 must contain source numbers for level 1,

corresponding to the association index numbers.

## 6.2.3 Source names

The Axis database allows the entry of 8 character alphanumeric names for each source on each level, some panel types display these names when sources are preset and as sources routed to a destination on selected levels.

## 6.2.4 Destination association names

Some control panels control more than one destination and have 8 character alphanumeric displays to show the controllable destination. However, for space and operational reasons there is only one display so that each destination association index can be assigned a name and NOT each destination per level.

## 6.2.5 Route inhibits

This is a method of preventing sources from being set to certain destinations.

## 6.2.6 Salvos

Salvos are groups of crosspoints that are set altogether from a preset and take operation on a control panel. A salvo is preselected and routed in a similar manner as normal crosspoints.

## 6.2.7 Configuring source keypads

A keypad is a collection of buttons arranged on a panel. The database contains a number of logical keypads that may be assigned to a physical keypad on a panel. Two types of source keypads are available - button per source and dial-up keypads.

Button per source keypads operate in a single push to select a source association whilst the dial up keypad allows a sequence of up to four button presses to select a source association.

For example, the 6276 X-Y panel may have a dial up source keypad as follows:-

|       |    |     |      |       |           |            |            |
|-------|----|-----|------|-------|-----------|------------|------------|
| MON   | QC | VTR | CAM  | STUDO | TEST<br>7 | BLACK<br>8 | BARS<br>9  |
| MAINT |    | KEY | EDIT |       | 4         | PBOX<br>5  | HARRY<br>6 |
| TX    |    | PGM | PST  |       | 1         | 2          | 3          |

|  |  |     |     |      |              |   |       |
|--|--|-----|-----|------|--------------|---|-------|
|  |  | DAT | SIL | TONE | DEST<br>SRCE | 0 | CLEAR |
|--|--|-----|-----|------|--------------|---|-------|

Pressing <VTR> followed by <1> may select source VT1. Pressing <1> again may select VT11. In this way, multiple button sequences can be used to select different sources.

Configuring a source keypad involves assigning a source association to a button or a sequence of button presses.

## 6.2.8 Configuring destination keypad

Like the source keypads there are destination per button and dial up keypads. Configuring a destination keypad involves assigning a destination association to a button with a sequence of button presses.

## 6.2.9 Assigning panel types and keypads

This is a method of assigning different panel types and keypads to the sixteen panels on each of the two ports.

## 6.2.10 Assigning source overrides

Some panels are equipped with joystick override inputs which, when pulled low, replace the current source to a destination with a defined source. On releasing the override the original source is restored.

## 6.2.11 Assigning controllable destination association indices

This is a method of setting which destination association indices can be controlled by a given panel or a given port that uses a common keypad.

## 6.2.12 Assigning controllable levels/brightness

This is a method of setting the levels controllable from a given panel on a given port. In addition, the brightness of the alphanumeric displays on some panels may also be adjusted.

## 6.2.13 Configuring port characteristics

This is a method of setting the protocols and transmission characteristics of the RS485 General Remote ports and RS232 Remote Control port.

## 6.2.14 Audio features

This is a method to independently configure any audio source on any level to switch in one of the following ways:

- Channel swap



- Left to both
- Right to both
- Summation

## 7 Troubleshooting

---

The following information is intended as a brief guide for diagnosing faults associated with an Axis router.

It should be noted that Axis frames contain no user serviceable parts, therefore should this product require servicing, you should refer to Pro-Bel or your local distributor.

The power LED on the front of the Axis router is off

- Check that mains is connected to the unit
- Check the fuse in the mains socket on the rear of the unit.

There is no communication with the Editor PC on the RS232 port?

- Check that the Axis unit has the editable database option fitted
- Check the power to the router
- Check that the router is receiving valid data from the controller - Either the integral panel allows routes to be made or the 'Hello' LED on the front of the unit flashes
- Ensure that PC is connected to the 'EDITOR' port on the 'MASTER' router
- Check cable interconnections
- Ensure that the electrical parameters of the serial port are set up correctly
- Check that the correct COM port is being used on the PC

There is no communication with external controllers on RS485 ports?

- Check power
- Ensure the router is receiving valid data from the controller - Either the integral panel allows routes to be made or the 'Hello' LED on the front of the unit flashes
- Check cable interconnections
- Check electrical characteristics and protocol of controlling device are compatible with that configured into the database



The control panels are in self test mode (button lamps sequencing)

- Check power to the router frame
- Ensure the router is receiving valid data from the controller - Either the integral panel allows routes to be made or the 'Hello' LED on the front of the unit flashes
- Check that the port on the control card is configured in the database for peripheral mode operation
- Check cable interconnections between the Master frame and the panels

The panel is communicating but there are no (or incorrect) responses to button presses - panels not in self-test

- Check cable interconnections
- Check that the panel has been configured in the database as the correct type
- Ensure that each panel on the multidrop chain has a unique serial address
- Check that the panel configuration switches are set correctly

The panel controls the wrong destination

- Check that the panel is assigned correctly in database
- Check the panel is set to the correct address

The panel cannot select a crosspoint?

- Check database for:
  - panel assignment
  - level active
  - route not inhibited
  - no override active
  - level controllable
- Check router level address

The Master unit is switching but Slave levels are not following

- Ensure that the SLAVE bus cable is fitted correctly
- Check that the Master and Slave routers have unique level addresses (try setting them the same and see if the routes are made)
- Check the database is set up for a multi-level system

## 8 Specification

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### 8.1 General

#### 8.1.1 Control

Fixed Configuration Master frames

RS485 ports: 2; 1 configured to drive one chain of 16 panels and 1 for external control

Parallel ports: 1, for control of slave AXIS router levels

Editable Configuration Master frames

RS485 ports: 2; independently configurable for either; driving chains of 16 multidrop devices (panels/under monitor displays) OR for external control

RS232 ports: 1; for system database configuration

Parallel ports 1; for control of slave AXIS routers

#### 8.1.2 Power supplies

Supply: 90Vac to 240Vac auto sensing

Power: 20W nominal

#### 8.1.3 General

Frame size: 1U x 19' rack mounting x 340mm deep

Weight: 4Kg (typical)

#### 8.1.4 Temperature range

Operating: 0°C to +40°C

Storage: -10°C to +70°C

## 8.2 Performance

### 8.2.1 Digital Video

#### Inputs

|                  |   |
|------------------|---|
| Number and type: | 16 serial to EBU Tech 3276E, SMPTE 259M                         |
| Data rate:       | 140Mbit/s to 360Mbit/s  |
| Impedance:       | 75Ω   |
| Return Loss:     | >15dB 10MHz to 300MHz   |
| Equalisation:    | 250 metres low loss video cable (typ. Belden 8281 or PSF 1 / 2) |
| Reference:       | Analogue video, 75Ω Terminating                                 |

#### Outputs

|                  |   |
|------------------|---|
| Number and type: | 16 serial to EBU Tech 3276E, SMPTE 259M |
| Data rate:       | 140Mbit/s to 360Mbit/s                  |
| Impedance:       | 75Ω                                     |
| Return Loss:     | >15dB 10MHz to 300MHz                   |

#### Performance

|                     |   |
|---------------------|---|
| Clock regeneration: | On inputs                                     |
| Reclocking:         | On outputs                                    |
| Transition timing:  | 525 operation, Line 10; 625 operation, Line 6 |

### 8.2.2 HD/SD Digital Video

#### Inputs

|                  |                         |
|------------------|-------------------------|
| Number and type: | 16, to SMPTE 292M       |
| Data rate:       | 140Mbit/s to 1.485GB/s  |
| Equalisation:    | 100 metres Belden 1694A |

#### Outputs

|                  |  |
|------------------|--|
| Number and type: | 16 to SMPTE 292M, reclocked<br>or to SMPTE 259M, reclocked |
|------------------|--|

## 8.2.3 Analogue video

### Inputs

|                  |                                    |
|------------------|------------------------------------|
| Number and type: | 16, 1V p-p nominal, analogue video |
| Impedance:       | 75Ω                                |
| Return Loss:     | >46dB to 4.43MHz                   |
| Superimposed DC: | ±2V maximum                        |
| Reference:       | Analogue video, 75Ω Terminating    |

### Outputs

|                  |                                    |
|------------------|------------------------------------|
| Number and type: | 16, 1V p-p nominal, analogue video |
| Impedance:       | 75Ω                                |
| Return Loss:     | >36dB to 4.43MHz                   |
| Superimposed DC: | ±30mV                              |

### Performance

|                        |  |
|------------------------|--|
| Gain:                  | 0dB ±0.05dB  |
| Gain stability:        | <±0.05dB   |
| Headroom:              | +3dB   |
| Frequency response:    | ±0.1dB to 8MHz,<br>±0.15dB to 15MHz,<br>+0.25dB, -3dB to 30MHz |
| Differential phase:    | <0.1°  |
| Differential gain:     | <0.1%  |
| 2T pulse/bar response: | <0.2%K   |
| 50Hz squarewave tilt:  | <0.2%K   |
| C/L gain inequality:   | <±0.5%   |
| C/L delay inequality:  | <±0.5ns  |
| Group delay variation: | <2ns 50Hz to 15MHz   |
| Crosstalk:             | -63dB (single adjacent)<br>-60dB (all hostile) @ 4.43MHz       |

## 8.2.4 Digital audio (Balanced and Unbalanced)

### Inputs

|                  |                                     |
|------------------|-------------------------------------|
| Number and type: | 16 serial to AES 3 - 1992           |
| Impedance:       | 110Ω - balanced or 75Ω – unbalanced |
| Reference:       | Analogue video, 75Ω Terminating     |

### Outputs

|                  |                                     |
|------------------|-------------------------------------|
| Number and type: | 16 serial to AES 3 - 1992           |
| Impedance:       | 110Ω - balanced or 75Ω – unbalanced |

### Performance

|               |                               |
|---------------|-------------------------------|
| Re-clocking:  | On inputs                     |
| Path delay:   | 600ns (approx.)               |
| Transparency: | All paths totally transparent |

## 8.2.5 Analogue audio

### Inputs

|                  |   |
|------------------|---|
| Number and type: | 16, electronically balanced, analogue audio |
| Impedance:       | >10kΩ balanced, 20Hz to 20kHz               |
| Max level        | +24dBu                                      |

### Outputs

|                  |   |
|------------------|---|
| Number and type: | 16, electronically balanced, analogue audio |
| Impedance:       | <100 Ω                                      |
| Max level        | +24dBu (not achievable into a 600Ω load)    |

### Performance

|                       |   |
|-----------------------|---|
| Gain stability        | ± 0.1dB/24 hours  |
| Frequency response    | ± 1dB 20Hz to 22kHz   |
| THD + N               | < 0.1% at 1kHz, +18dBu<br>< 0.1% at 1kHz, 0dBu                    |
| Dynamic range         | >100dB: THD+N on -60dBFS tone referred to full scale (AES17-1991) |
| Signal to noise ratio | >100dB (gate operative)   |
| Crosstalk             | <-90dB all hostile at 10kHz                                       |
| Transients            | No audible clicks   |