



## **DL451 Modular I/O Operator Manual**

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## IMPORTANT SAFETY INSTRUCTIONS



The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

- 1 Read these instructions.
- 2 Keep these instructions.
- 3 Heed all warnings.
- 4 Follow all instructions.
- 5 Do not use this apparatus near water.
- 6 Clean only with a dry cloth.
- 7 Do not block any of the ventilation openings. Install in accordance with the manufacturer's instructions.
- 8 Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- 9 Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- 10 Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.
- 11 Only use attachments/accessories specified by the manufacturer.
- 12 Unplug this apparatus during lightning storms or when unused for long periods of time.
- 13 Refer all servicing to qualified personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- 14 Use the mains plug to disconnect the apparatus from the mains.
- 15 **Warning: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.**
- 16 **Warning: Do not expose this equipment to dripping or splashing and ensure that no objects filled with liquids, such as vases, are placed on the equipment.**
- 17 **Warning: The mains plug of the power supply cord shall remain readily operable.**





**EC-Declaration of Conformity**

The undersigned, representing the following manufacturer

**Manufacturer:**

Midas Klark Teknik Ltd.

**Address:**

Klark Industrial Park, Walter Nash Road,  
Kidderminster. Worcestershire. DY11 7HJ.

hereby declares that the following product

Product Type Number	Product Description	Nominal Voltage(s)	Current	Freq.
DL451	Audio System Modular I/O	115V AC 230V AC	0.5A 0.3A	50/60Hz

is in conformity with the regulations of the following marked EC-directives and bears the CE-mark accordingly

reference number	title
2004/108/EC	EMC Directive (EMC)
2006/95/EC	Low-Voltage Directive (LVD)

The conformity of the product with EC Directives for use in environment E4 is provided by compliance with the following standards:

Standards/date:

*Applied Electrical Safety test standards:*

reference number	title
EN 60065:2002	Audio, video and similar electronic apparatus. Safety requirements

*Applied EMC emission test standards:*

ref. no.	title
EN 55103-1:1996 Class A	EN 55103-1 Annex A: Radiated magnetic disturbance, 50Hz-50kHz
	CISPR 22: Radiated disturbance, 30-1000MHz
	CISPR 22: Conducted disturbance, ac & signal ports
	CISPR 16: Discontinuous disturbance
	EN 61000-3-2:2000 Mains harmonics
	EN 61000-3-3:1995 Mains voltage flicker

*Applied EMC immunity test standards:*

ref. no.	title
EN 55103-2:1996 Class A	EN 61000-4-2:1995 Electrostatic discharge
	EN 61000-4-3:1996: Radiated RF disturbance, 80-1000MHz
	EN 55103-2 Annex A: Magnetic LF disturbance, 50Hz-10kHz
	EN 61000-4-4:1995: Fast transient bursts, ac & signal ports
	EN 61000-4-5:1995: Surge, ac port
	EN 61000-4-6:1996: Conducted RF field, ac & signal ports
	EN 61000-4-11:1994: Mains voltage dips and interruptions

**Place, date:** Kidderminster, UK  
15<sup>th</sup> April 2010



**General Manager**  
Printed name: John Oakley



**AVP, Product Development**  
Printed name: Alex Cooper



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## Precautions

**Before installing, setting up or operating this equipment, make sure that you have read and fully understand all of this section and the "IMPORTANT SAFETY INSTRUCTIONS" at the front of this manual.**

This equipment is supplied by a mains voltage that can cause electric shock injury!

The following must be observed in order to maintain safety and electromagnetic compatibility (EMC) performance.

### Safety warnings

**Signal 0V is connected internally to the chassis.**

**To electrically isolate the equipment, switch off the mains on/off switch at the rear of unit. Make sure that the power at the mains outlet is off, and then disconnect the mains cable from the mains outlet.**

**To avoid electrical shock do not remove covers.**

**The power supplies - even the DC ones - have a high current!**

### General precautions

In the event of ground loop problems, disconnect the signal screen at one end of the connecting cables. Note that this can only be done when the equipment is used within a balanced system.

Do not remove, hide or deface any warnings or cautions.

### Power

The power supplies contain LETHAL VOLTAGES greatly in excess of the mains voltage and that its rails can produce extremely large currents that could burn out equipment and wiring if shorted.

The internal power supplies are of the switch mode type that automatically senses the incoming mains voltage and will work where the nominal voltage is in the range 100VAC to 240VAC.

A mains inlet is provided on the rear panel. The correct lead for connection in the area to which the unit was shipped is supplied with the unit.

The equipment should only be plugged into the mains outlet using the supplied lead.

When removing the equipment's electric plug from the outlet, always hold the plug itself and not the cable. Pulling out the plug by the cable can damage it.

Never insert or remove an electric plug with wet hands.

### Handling the equipment

Completely isolate the equipment electrically and disconnect all cables from the equipment before moving it.

Take great care when lifting or moving the equipment and always take its size and weight into consideration.

Do not insert your fingers or hand in any gaps or openings on the equipment, for example, vents.

Avoid inserting or dropping foreign objects, such as paper, plastic, metal etc., into any gaps or openings on the equipment, for example, vents. If this happens, turn off the power immediately and unplug the power from the AC outlets. Then have the equipment inspected by the manufacturer's qualified service personnel.

### Installation

Before installing the equipment:

- Make sure the equipment is correctly connected to the protective earth conductor of the mains voltage supply of the system installation through the mains leads.
- Power to the equipment must be via a fused spur.
- Power plug must be inserted in a socket outlet provided with a protective earth

contact. The electrical supply at the socket outlet must provide appropriate over-current protection.

- Both the mains supply and the quality of earthing must be adequate for the equipment.
- Before connecting up the equipment, check that the mains power supply voltage rating corresponds with the local mains power supply. The rating of the mains power supply voltage is printed on the equipment.
- Mount in rack only.

## Location

- Ideally a cool area is preferred not in close proximity to power distribution equipment or other potential sources of interference.
- Do not install the equipment in places of poor ventilation.
- Do not install this equipment in a location subjected to excessive heat, dust or mechanical vibration. Allow for adequate ventilation around the equipment, making sure that its fans and vents are not obstructed. To prevent excessive heating of the equipment, avoid mounting it directly above power amplifiers or other devices that radiate significant amounts of heat such as, radiators and heaters. Keep the equipment out of direct sunlight.
- Do not place the equipment in an unstable condition where it might accidentally fall over.
- Make sure that the mains voltage and fuse rating information of the equipment will be visible after installation.

## Audio connections

To ensure the correct and reliable operation of the equipment, only high quality balanced, screened, twisted pair audio cable should be used.

XLR connector shells should be of metal construction so that they provide a screen when connected to the console and, where appropriate, they should have Pin 1 connected to the cable screen.

## Radio frequency interference – Class A device

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

## Electric fields

### Caution:

**In accordance with Part 15 of the FCC Rules & Regulations, "... changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment."**

Should this product be used in an electromagnetic field that is amplitude modulated by an audio frequency signal (20Hz to 20kHz), the signal to noise ratio may be degraded. Degradation of up to 60dB at a frequency corresponding to the modulation signal may be experienced under extreme conditions (3V/m, 90% modulation).

## Operation

To avoid electrical shock, never operate the equipment with the covers removed.

## Safety equipment

Never remove, for example, covers, housings or any other safety guards. Do not operate the equipment or any of its parts if safety guards are ineffective or their effectiveness has been reduced.

## Optional equipment

Unless advised otherwise, optional equipment must only be installed by service personnel and in accordance with the appropriate assembly and usage regulations.

## Special accessories

To comply with part 15 of the FCC Rules, any special accessories (that is, items that cannot be readily obtained from multiple retail outlets) supplied with this equipment must be used with this equipment; do not use any alternatives as they may not fulfil the RF requirement.



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## Chapter 1: Introduction

The DL451 Modular I/O is a three-unit (3U) high 19" rack unit that provides connection of up to 24 audio inputs/outputs. It has a user-configurable modular<sup>1</sup> 3x8 XLR format that can be configured as any combination of analogue mic/line in, analogue out and digital in/out (AES/EBU). Musical instrument digital interface (MIDI) and general purpose input/output (GPIO) connections are supplied as standard. The digital audio interface is via dual-redundant AES50 connections. Five DL451's are supplied with each XL8 Live Performance System.



Your DL451 Modular I/O was conceived by Midas to offer audio professionals high-performance audio equipment, designed to provide no-compromise sonic quality with a feature set that offers all essential facilities and functions. It represents the very best of British design and engineering combined with contemporary, efficient manufacturing methods, and will give you many years of reliable service.

So, to obtain the best results with a minimum of effort, please read this operator manual and, finally, enjoy your Midas DL451 Modular I/O!

## Features

The DL451 Modular I/O comprises:

- Up to 24 audio inputs and 24 audio outputs.
- Modular construction providing user-configurable 3x8 XLR format.
- Fully isolated GPIO connections supplied as standard.
- **in**, **out** and **thru** MIDI sockets supplied as standard.
- Dual redundant AES50 connections provided at the digital audio interface.

## Warranty and registration

Midas has total confidence in the quality and reliability of this product. To back this up, this product comes with the standard Midas and Klark Teknik three year warranty.

Please take the time to register your product by completing and returning the registration card or registering on our website at [www.midasconsoles.com](http://www.midasconsoles.com).

1. It is envisaged that new modules will be developed to service market requirements as they continue to evolve.

## About this manual

This is the operation manual for the DL451 Modular I/O. It is intended to help get your DL451 Modular I/O installed and in operation as quickly as possible by giving you unpacking, installation, connection, setting up and operating instructions. To help familiarise you with the DL451 Modular I/O there is a description of the front and rear panels, along with easy-to-follow user instructions.

The following chapter gives a brief overview of the XL8 Live Performance System and includes system interconnection details. However, if you want to learn more about the XL8 Live Performance System, please go on to read the XL8 Control Centre operator manual (part number DOC02-XL8), which provides a full and comprehensive guide.

## Intended readers

This manual is aimed at professionals, such as front of house (FOH) and monitor (MON) engineers who will be using this equipment in a live performance environment. It is assumed that the reader has prior experience of using professional audio equipment and has, most likely, undergone training on this system.

The DL451 Modular I/O forms an integral part of the XL8 Live Performance System. The appendices in this manual contain a brief overview of the XL8 Live Performance System and include system interconnection details. However, if you want to learn more about the XL8 Live Performance System, see the Owner's Manual (part number DOC02-XL8), which provides a full and comprehensive guide.

## Package contents/unpacking

Please retain the original packing for use should you need to transport or ship this unit.

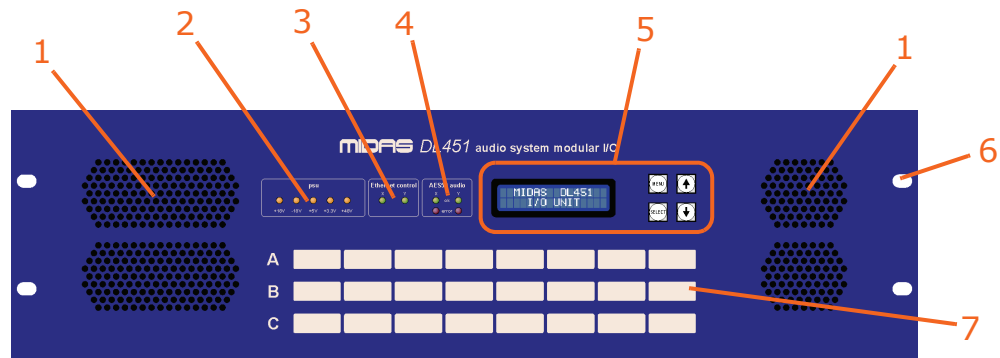
After unpacking, please inspect the unit carefully for any signs of damage that may have occurred in transit and notify the courier immediately if you feel that any damage has occurred.

The following items are included in the DL451 Modular I/O package:

- 1-off DL451 Modular I/O Safety Sheet (part number DOC04-DL451).
- 1-off warranty card (part number DOC04-WARRANTY).
- 1-off mains lead (part number PWR21-MAINSLEAD).

## Chapter 2: Front Panel

The front panel comprises various sections, as follows:



Item	Description
1	Air intakes for fan cooling. <b>Do not obstruct.</b>
2	<b>psu</b> power supply unit monitoring panel (see "psu panel" on page 4).
3	<b>Ethernet control</b> panel (see "Ethernet control panel" on page 4).
4	<b>AES50 audio</b> panel monitors (see "AES50 audio panel" on page 4).
5	Control panel containing LCD screen and four pushbuttons (see "Control panel" below).
6	Cut-outs for rack mounting fixings.
7	Three rows of eight write-on strips for manually marking the <b>A</b> , <b>B</b> or <b>C</b> module analogue/digital channel assignments.

### Control panel

The control panel is used for setting up the DL451 Modular I/O unit via a number of menus in programming mode, and comprises an LCD panel and four buttons.

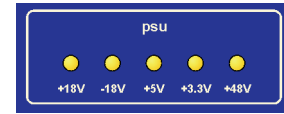


LCD screen has 32 characters (2 x 16), and is used with the adjacent programming buttons to program the DL451 Modular I/O (see "Menu navigation" on page 9). It also shows the default display during normal operation.

Each programming button illuminates with a blue backlight when pressed.

## psu panel

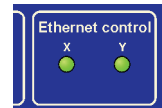
This panel monitors the supply voltage. The panel LEDs illuminate to show that the voltage rails are active. There are five yellow LEDs, each one representing a particular voltage supply, that is, +18V, -18V, +5V, +3.3V and +48V.



## Ethernet control panel

The Ethernet control panel has two green LEDs, **X** and **Y**, which have three states of illumination to indicate:

- **Flashing** - active master.
- **On** - connected.
- **Off** - not connected.



## AES50 audio panel

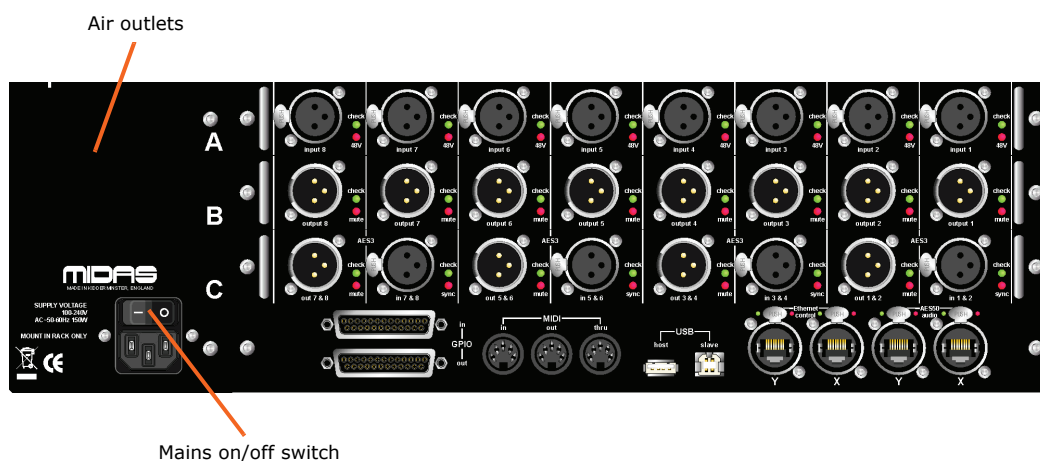
In the AES50 panel, each **X** and **Y** channel has a green **ok** LED and red **error** LED. These illuminate to indicate that the communications to these channels is ok or that there is an error.



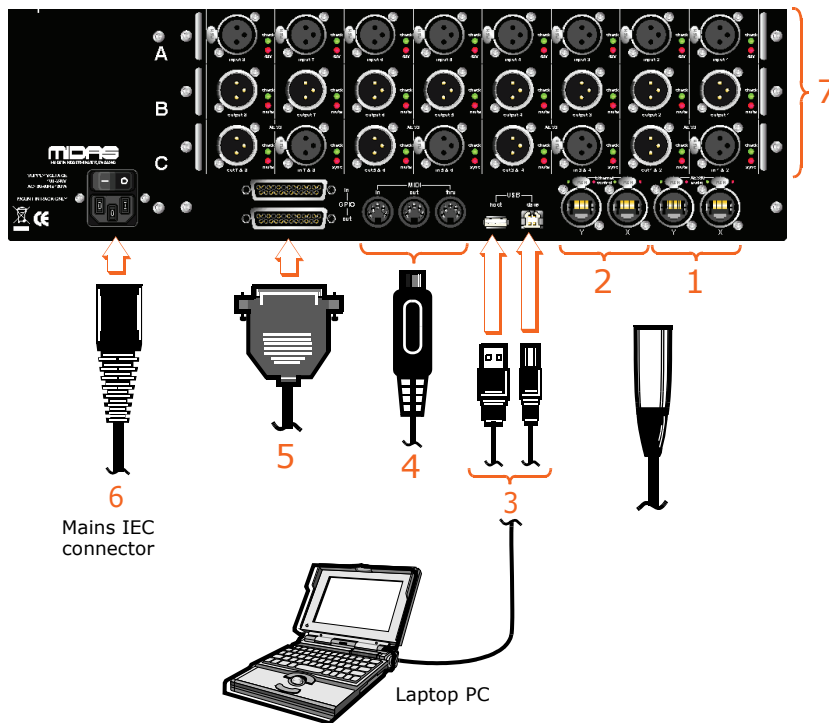
## Chapter 3: Rear Panel

The rear panel comprises the following:

- Three module slots, **A**, **B** and **C**, which can contain any combination of modules (see Appendix C "I/O Modules" on page 27).
- Two sets of Ethernet XLR X and Y sockets:
  - **Ethernet control.**
  - **AES50 audio.**
- Two USB connectors: **host** and **slave**.
- Three MIDI sockets: **in**, **out** and **thru**.
- Two GPIO sockets: **in** and **out**.
- Mains IEC socket and adjacent on/off switch.



## Rear panel connections



<i>Item</i>	<i>Description</i>
<b>1</b>	Y and X <b>AES50 audio</b> Ethernet sockets for passing audio and control data to/from router.
<b>2</b>	Y and X <b>Ethernet control</b> Ethernet sockets for connection of 'tunnelling' Ethernet.
<b>3</b>	<b>USB slave</b> (type B) and <b>host</b> (type A) sockets for connection of a laptop PC.
<b>4</b>	Three <b>MIDI</b> (musical instrument digital interface) sockets, <b>in</b> , <b>out</b> and <b>thru</b> for connection of a musical instrument, such as a synthesiser. <b>in</b> socket receives MIDI data. <b>thru</b> socket gives out the same MIDI data that is received by the <b>in</b> socket. <b>out</b> socket gives out MIDI data generated by the instrument itself.
<b>5</b>	Two <b>GPIO</b> 25-way connectors, <b>in</b> and <b>out</b> , for control of external devices.
<b>6</b>	Mains IEC socket with on/off switch.
<b>7</b>	Three user-configurable modules.



## Chapter 4: Getting Started

This section shows you how to connect up, switch on, set up and configure the DL451 Modular I/O unit.

### Connecting up

Connect up the following, as appropriate, to the rear panel of your DL451 Modular I/O unit:

- **Inputs/outputs** - connect up modules in slots **A**, **B** and **C**. These can be any combination of modules DL441, DL442 and DL452; see page 5 in Chapter 3 "Rear Panel".
- **AES50** - connect the **AES50 audio** X and Y sockets to the appropriate **AES50 audio** sockets on the X and Y routers.
- **Ethernet** - connect the **Ethernet control** X and Y sockets to the appropriate **Ethernet control** sockets on the X and Y routers.
- **MIDI** - connect the three MIDI 5-pin DIN connectors, if required.
- **GPIO** - connect the 25-way D-type connectors, if required.
- **USB** - connect a laptop/PC, if required.
- **Mains power supply** - insert the IEC connector of the mains cable into the rear of the unit and then plug it into the mains power outlet.

### Switching the unit on/off

After you have connected up your DL451 Modular I/O, it is ready to be switched on. To do this, switch on the mains on/off switch on the rear of the unit.



To switch off the DL451 Modular I/O unit, press the mains on/off switch.

## Setting up

Initial setting up of the DL451 Modular I/O involves allocating an ID for it within the XL8 network system environment (see "To set up the ID of the unit" on page 14).

## Configuration

Configure the DL451 Modular I/O unit to suit your operating requirements (see Chapter 5 "Programming Mode").





## Chapter 5: Programming Mode

This chapter describes the programming mode of the DL451 Modular I/O.

In programming mode the four programming buttons in the control panel are used to navigate and select options from a number of menus (see "Menus" on page 14), which let you set up the unit and view information.

### Menu navigation

The four programming buttons in the control panel have the following functions.

<b>Navigation buttons</b>	<b>Usage</b>
	Moves up a menu level. Exits programming mode, depending on the current menu level.
	Moves down a menu level or selects the current option.
	Scrolls through the current level of menus/options.
	Scrolls through the current level of menus/options in the opposite direction to the up arrow button.

The menu flowchart (see "Menu flowchart (options 1 to 4)" on page 10 and "Menu flowchart (option 5)" on page 12) gives an overview of all the menus and their options, and shows you how to navigate your way around them. In the diagram the menus are shown on the left, and each subsequent lower level is to the right. Also, non-flashing options are the ones currently selected.

#### >> To enter/exit programming mode

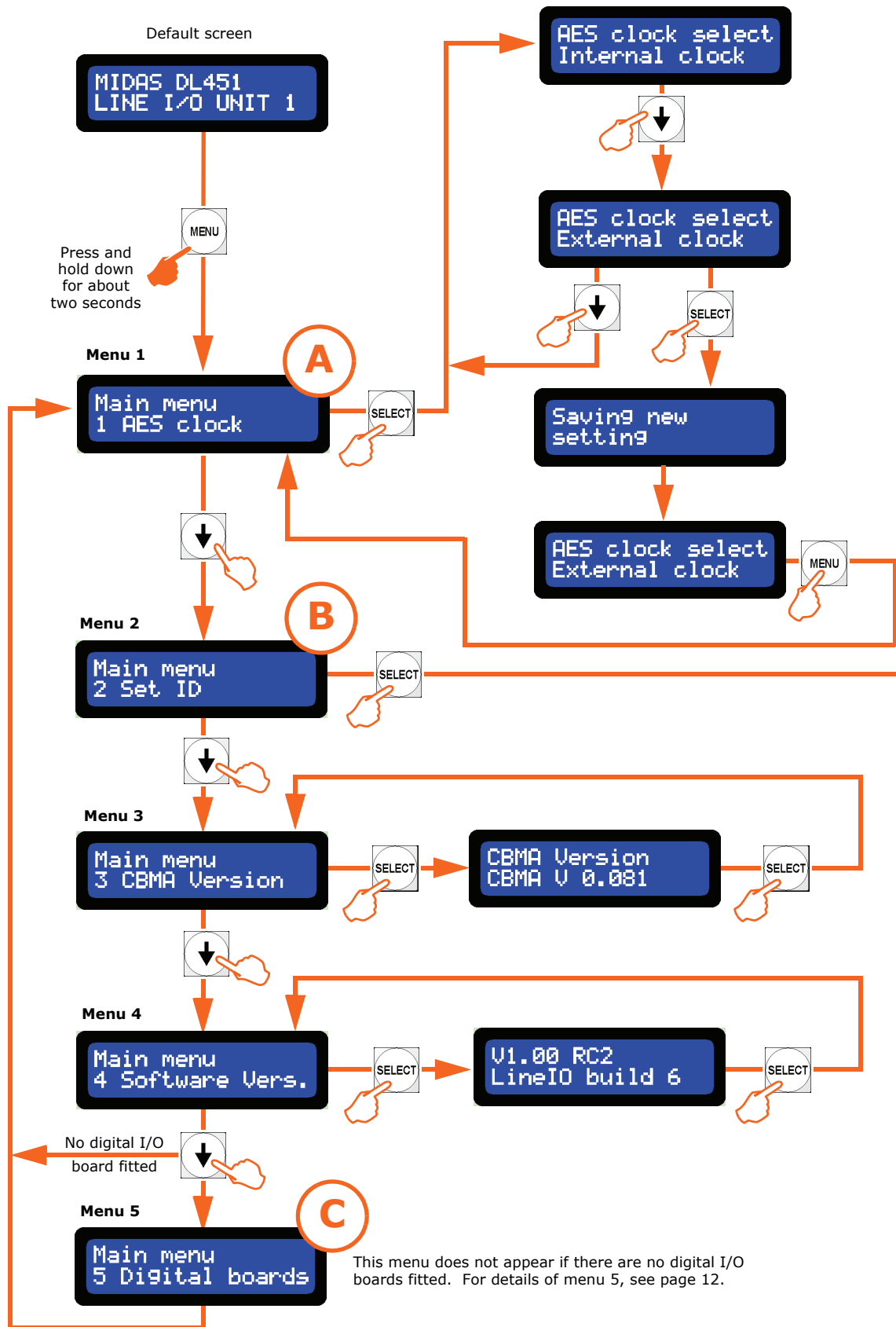
To enter programming mode, press the **MENU** button and hold down for approximately two seconds; the default display will change to the "Main menu" display for the first option (see display **A** on page 10).

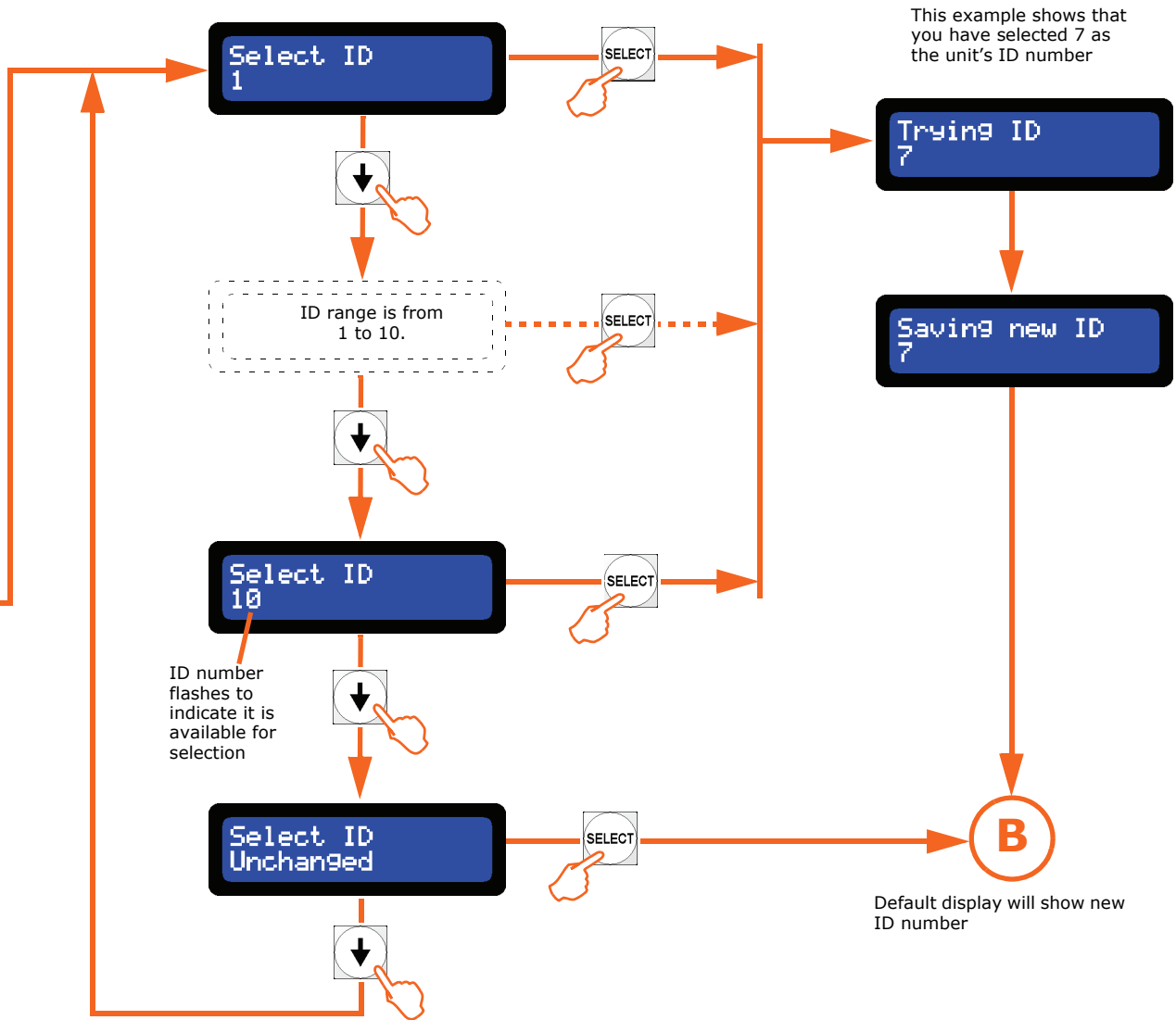
To exit programming mode from any menu display screen, press **MENU** repeatedly until you reach the default screen. The DL451 Modular I/O will exit programming mode automatically after about 20 seconds of inactivity, that is, if none of the programming buttons are pressed within that time.

#### >> To select a menu

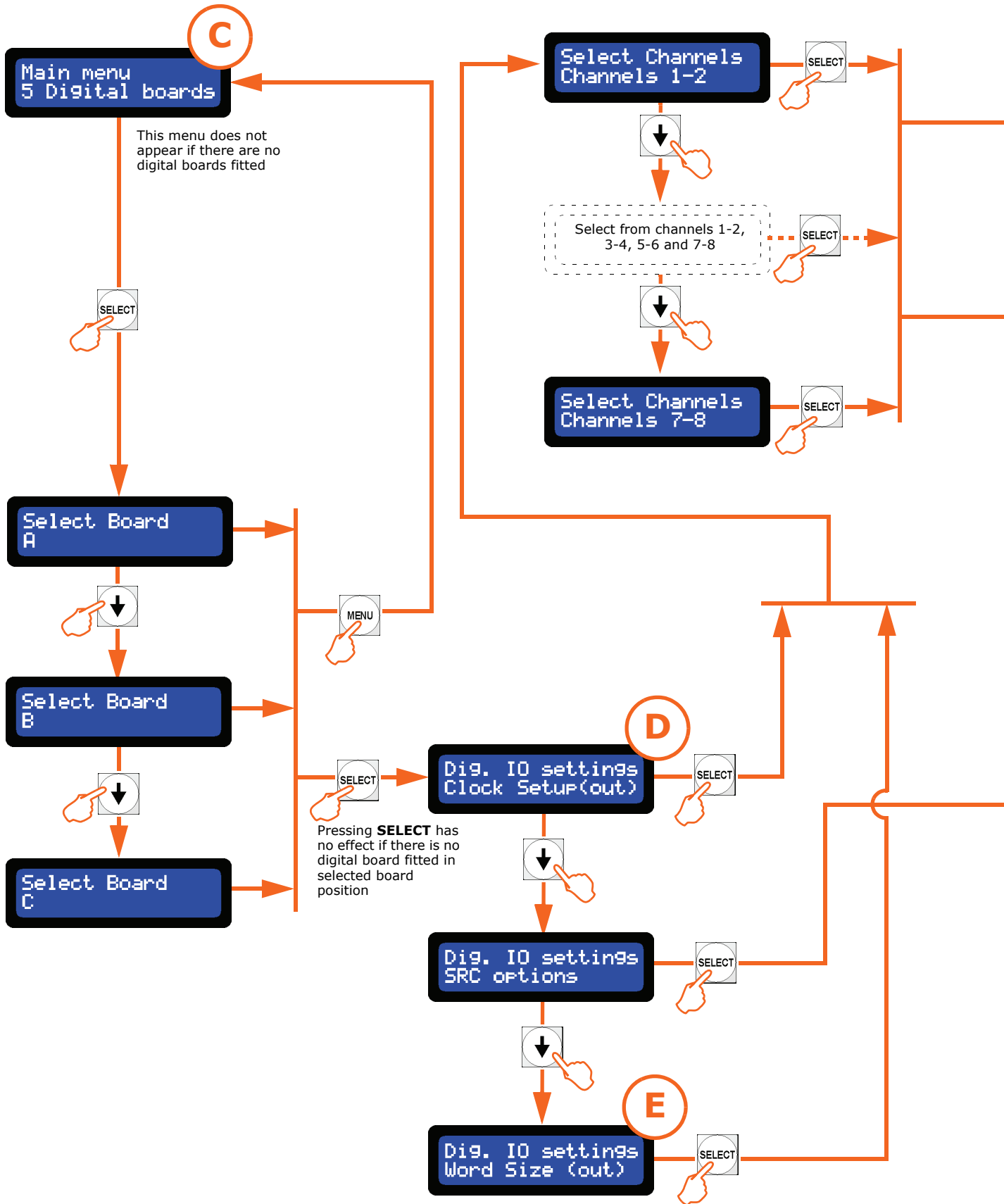
In programming mode, scroll to the menu you want by using the up/down arrow buttons. Then, press **SELECT**.

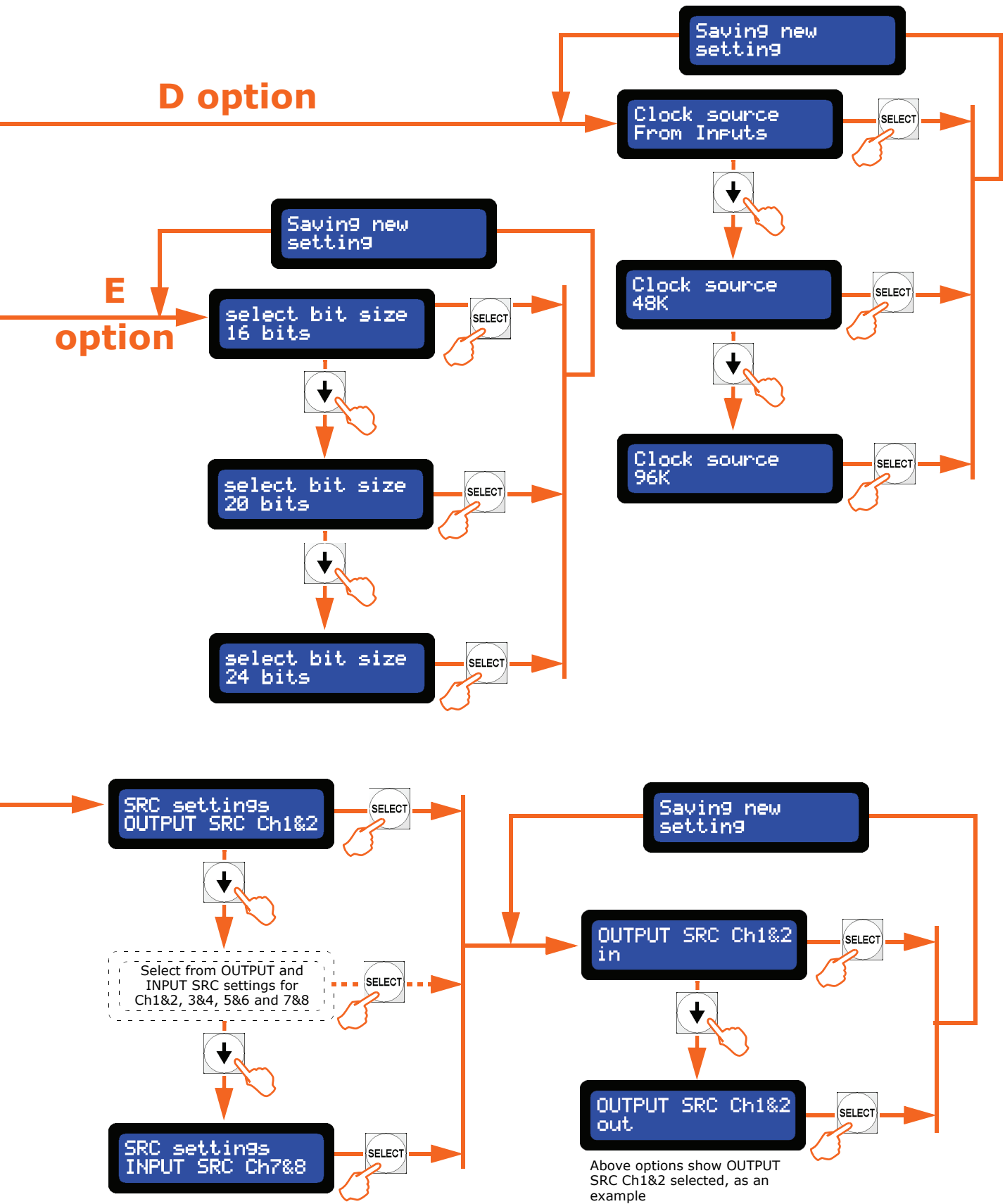
### Menu flowchart (options 1 to 4)





### Menu flowchart (option 5)





## Menus

The five menus in programming mode are as follows:

- **1 AES clock** — for selecting the method for synchronising the AES50 (see “1 AES clock menu” below).
- **2 Set ID** — for setting up the DL451 Modular I/O’s network unit ID (see “2 Set ID menu” below).
- **3 CBMA Version** — for viewing the unit’s CBMA version number.
- **4 Software Vers.** — for viewing the unit’s software version number.
- **5 Digital boards** — for setting up the digital I/O board(s) of the DL451 Modular I/O unit, if fitted (see “5 Digital boards menu” on page 15).

### 1 AES clock menu

This menu lets you set up the clock source of the DL451 Modular I/O, as internal or external, for AES synchronisation.

#### >> To set up the unit’s clock source

- 1** In programming mode, select menu 1 (see “To select a menu” on page 9). The current clock source is shown on the bottom line of the display, for example, “Internal clock”.
- 2** Use the down arrow to select the AES clock source you want, for example, “External clock”. The bottom line will flash to show that this option is not currently selected.
- 3** Press **SELECT**. The bottom line will stop flashing to show that this option has been selected.
- 4** Press **MENU**.

```
AES clock select
Internal clock
```

```
AES clock select
External clock
```

```
Main menu
1 AES clock
```

### 2 Set ID menu

This menu lets you set up the network ID of the DL451 Modular I/O, which can be any number from 1 to 10.

#### >> To set up the ID of the unit

- 1** In programming mode, select menu 2 (see “To select a menu” on page 9). The current ID is shown on the bottom line of the display, for example, “1”.
- 2** Use the down arrow to go to the ID you want, for example, “7”. The ID will flash to indicate that it is not currently selected.

```
Select ID
1
```

```
Select ID
7
```

If you don’t want to change the ID number, go to the “Unchanged” option, which is between “10” and “1”.



- 3** Press **SELECT**.

```
Trying ID
7
```



```
Saving new ID
7
```



```
Main menu
2 Set ID
```

- 4** Press **MENU**.

```
Main menu
1 AES clock
```

- 5** To exit programming mode, press **MENU**. The default display will now show the newly configured ID number at the end of the bottom line.

```
MIDAS DL451
LINE I/O UNIT 7
```

## 5 Digital boards menu

This menu lets you set up the following for any digital I/O board(s) fitted in the unit:

- **Clock source** — synchronise the digital outputs from the inputs or set them at 48k or 96k.
- **Sample rate converter (SRC)** — switch the SRC on/off for each input/output channel pair. As this option is 'intelligent' it may be disabled, depending on the other settings.
- **Word size** — set up the word size for the digital outputs as 16, 20 or 24 bits.

This menu has three boards to choose from — A, B and C — representing the module slot positions printed on the rear panel.

**Note:** *If there are no digital I/O boards fitted, this menu does not appear.*

### >> To set up the clock source for the digital outputs

- 1** In programming mode, select menu 5 (see "To select a menu" on page 9).

```
Main menu
5 Digital boards
```

- 2** Press **MENU**.

```
Select Board
A
```

- 3** Use the down arrow button to go to the board you want to set up. For example, board "C".

```
Select Board
C
```

- 4** Press **SELECT**.

```
Dig. IO settings
Clock Setup(out)
```

- 5 At the "Clock Setup(out)" option, press **SELECT**.

```
Select Channels
Channels 1-2
```

- 6 Use the up/down arrow buttons to go to the desired pair of output channels. For example, "Channels 7-8".

```
Select Channels
Channels 7-8
```

- 7 Press **SELECT**.

```
Clock source
From Inputs
```

- 8 Use the down arrow button to go to the desired option. For example, "48K".

```
Clock source
48K
```

- 9 Press **SELECT**.

```
Saving new
setting
```



```
Clock source
From Inputs
```

- 10 Use the **MENU** button to exit.

>> **To set up the SRC setting**

- 1 In programming mode, select menu 5 (see "To select a menu" on page 9).

```
Main menu
5 Digital boards
```

- 2 Press **MENU**.

```
Select Board
A
```

- 3 Use the down arrow button to go to the board you want to set up. For example, board "C".

```
Select Board
C
```

- 4 Press **SELECT**.

```
Dig. IO settings
Clock Setup(out)
```

- 5 Use the down arrow button to go to the "SRC options" option.

```
Dig. IO settings
SRC options
```

- 6 Press **SELECT**.

```
SRC settings
OUTPUT SRC Ch1&2
```

- 7 Use the down arrow button to go to the desired pair of input or output channels. For example, "INPUT SRC Ch3&4".
- 8 Press **SELECT**. The bottom line of the display will show you whether the channel pair is on/off (default is on).
- 9 If you want to change the setting, press the down arrow button. Otherwise, take no action and go to the next step.
- 10 Press **SELECT**.
- 11 Use the **MENU** button to exit.

SRC settings  
INPUT SRC Ch3&4

INPUT SRC Ch3&4  
on

INPUT SRC Ch3&4  
off

Saving new  
setting



INPUT SRC Ch3&4  
off

>> **To set up the word size for the digital outputs**

- 1 In programming mode, select menu 5 (see "To select a menu" on page 9).
- 2 Press **MENU**.
- 3 Use the down arrow button to go to the board you want to set up. For example, board "C".
- 4 Press **SELECT**.
- 5 Use the down arrow button to go to the "Word Size (out)" option.
- 6 Press **SELECT**.
- 7 Use the down arrow button to go to the desired pair of output channels. For example, "Channels 7-8".
- 8 Press **SELECT**. The bottom line of the display will show the currently selected bit size.

Main menu  
5 Digital boards

Select Board  
A

Select Board  
C

Dig. IO settings  
Clock Setup(out)

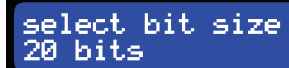
Dig. IO settings  
Word Size (out)

Select Channels  
Channels 1-2

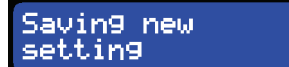
Select Channels  
Channels 7-8

select bit size  
16 bits

- 9 Use the down arrow button to go to the desired bit size. For example, "20 bits".
- 10 Press **SELECT**.
- 11 Use the **MENU** button to exit.



```
select bit size
20 bits
```



```
Saving new
setting
```



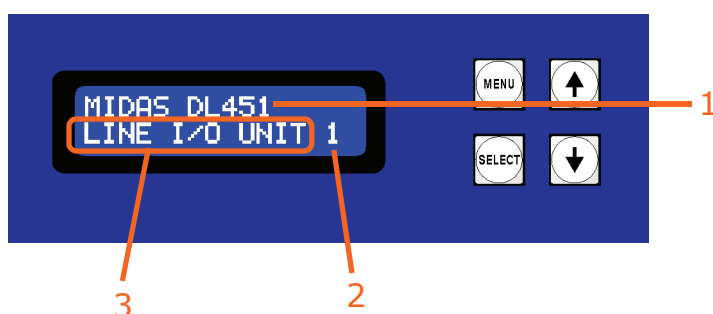
```
select bit size
20 bits
```

## Chapter 6: Operation

This chapter explains the default display, describes how to replace a module and provides routine service information. There are no operating procedures associated with the DL451 Modular I/O, as it is operated solely from the XL8 Control Centre. For more information, see the XL8 Live Performance System Owner's Manual (part number DOC02-XL8).

### Default display

The default display appears after the unit has been switched on and has powered up. The following diagram shows a typical default display.



<b>Item</b>	<b>Description</b>
<b>1</b>	The first line of text displays the manufacturer and model number of the unit.
<b>2</b>	Unit ID number.
<b>3</b>	Description of unit.

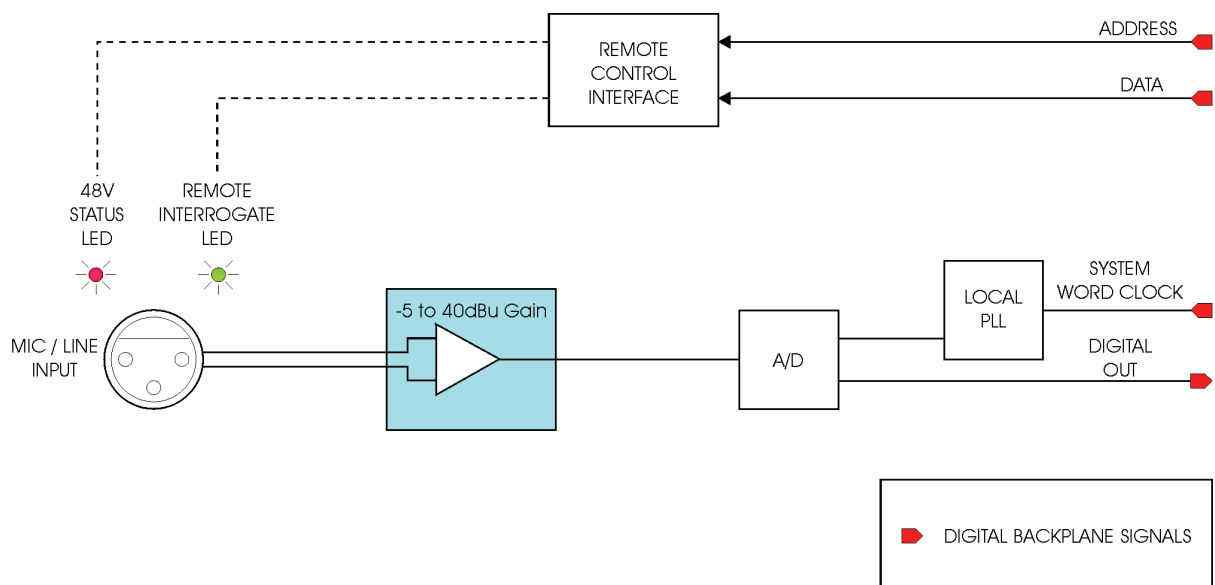


# Appendix A: Functional Block Diagrams

This appendix contains a functional block diagram for each module.

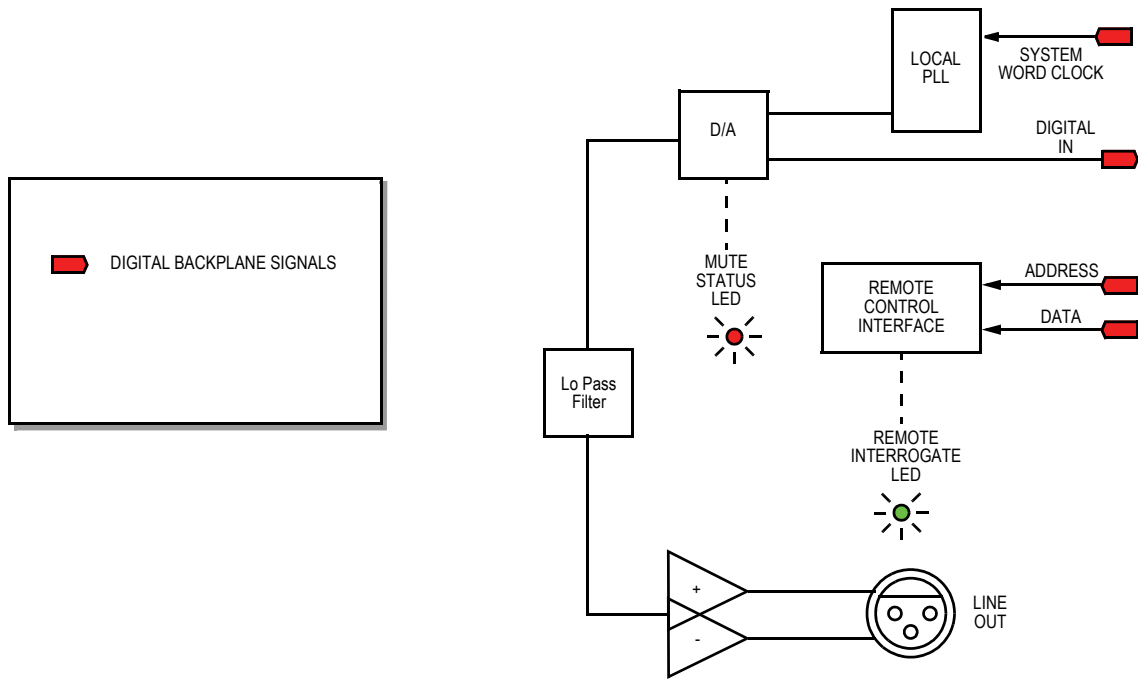
## Analogue input module (DL441)

Line/mic board details.



### Analogue output module (DL442)

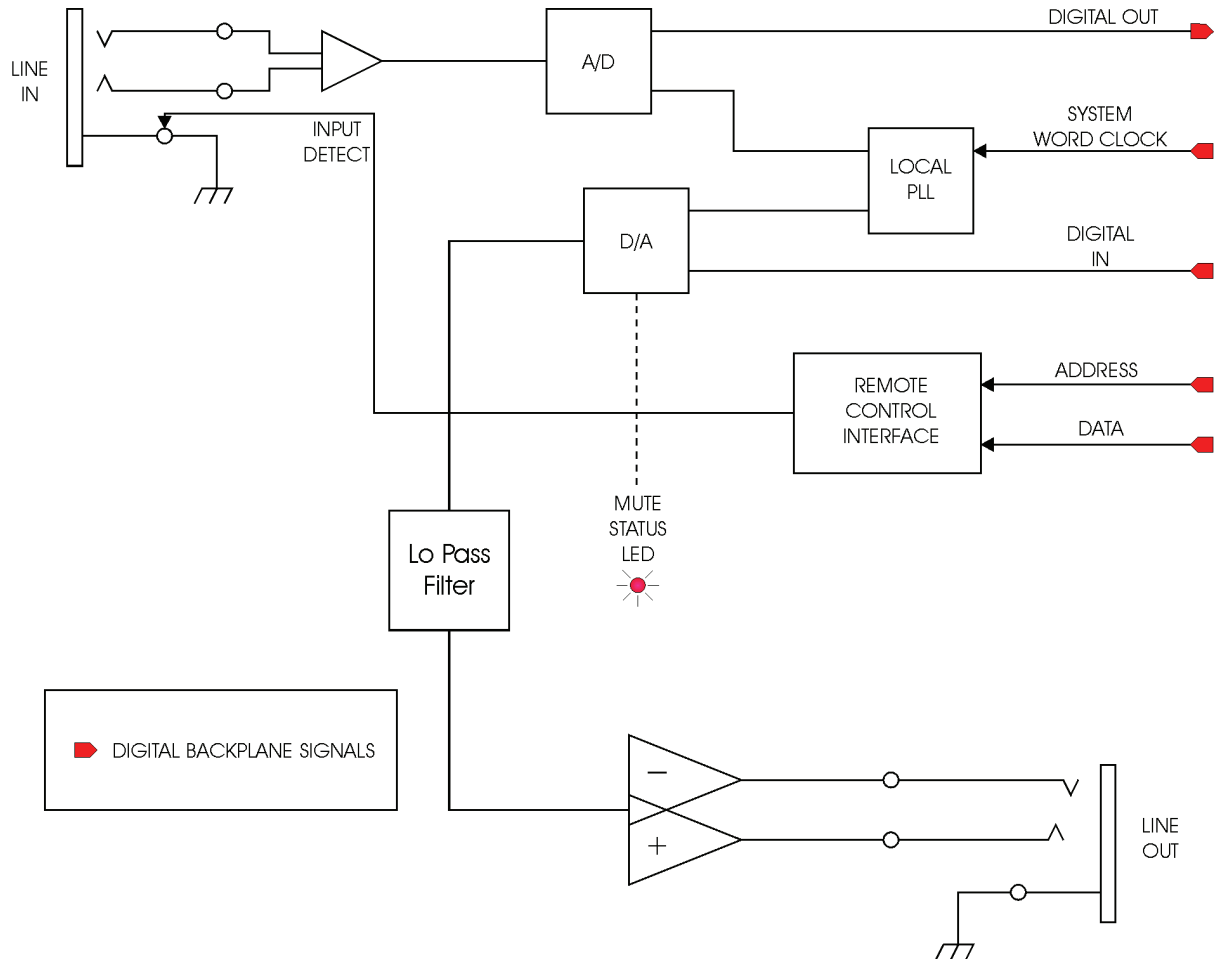
Line out board details.



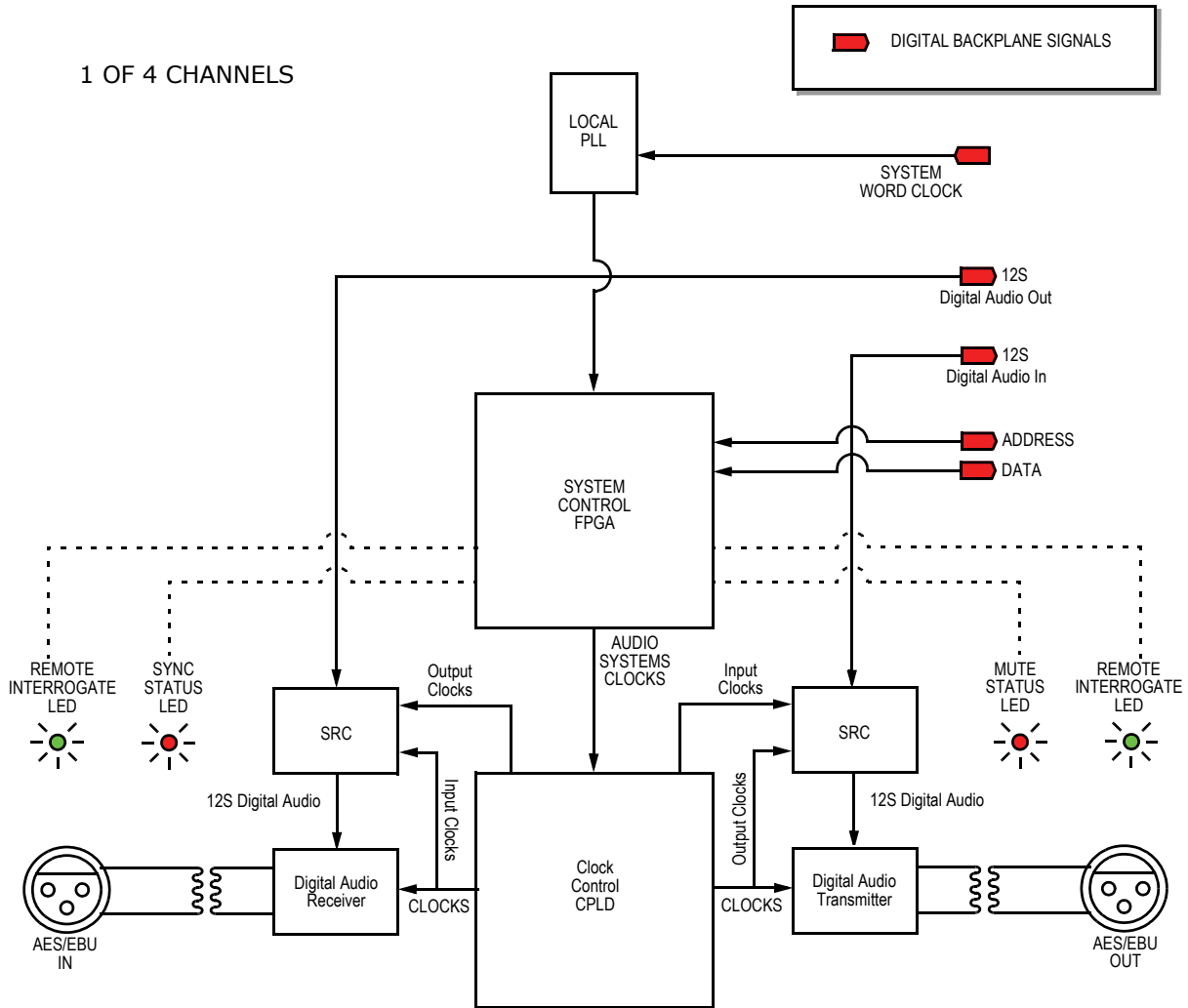
1 OF 8 CHANNEL PATHS



### Analogue Jack I/O module (DL443)



### AES/EBU digital I/O module (DL452)



## Appendix B: Technical Specification

This appendix contains the technical specifications specific to the DL451 Modular I/O. For system related XL8 Control Centre specifications and for full technical specifications for the XL8 Live Performance System, refer to its Owner's Manual (part number DOC02-XL8).

Due to a policy of continual improvement, Midas reserves the right to alter the function or specification at any time without notice.

### General specifications

<b>Dimensions</b>	3U x 410 mm deep
<b>Net weight</b>	12.6 kg
<b>Power requirements</b>	100V to 240V, 50 to 60Hz
<b>Operating temperature range</b>	+5°C to +40°C
<b>Storage temperature range</b>	-20°C to +60°C

### Inputs and outputs

#### Analogue inputs

<b>Connector</b>	3-pin XLR balanced
<b>A/D converter</b>	24-bit, 96k and 128 times over sampling

#### Analogue outputs

<b>Connector</b>	3-pin XLR balanced
<b>D/A converter</b>	24-bit, 96k and 128 times over sampling

#### Digital inputs

<b>Connector</b>	AES3 (two channels of digital audio) on 3-pin XLR
<b>Sample rates</b>	Accepts any frequency between 32k to 96k
<b>Bypass</b>	Sample rate converter can be bypassed

**Digital outputs**

<b>Connector</b>	AES3 (two channels of digital audio) on 3-pin XLR
<b>Sample rates</b>	48k, 96k or auto tracking to inputs
<b>Bypass</b>	Sample rate converter can be bypassed
<b>Word length</b>	16-, 20- or 24-bit

**MIDI and GPIO**

<b>MIDI connector</b>	In, out and through on 5-pin DIN
<b>GPIO IN connector</b>	25-pin D-type (opto isolated)
<b>GPIO OUT connector</b>	25-pin D-type (opto isolated)

**Digital system inputs and outputs**

<b>System connector</b>	AES50 (24 channels of bi-directional digital audio) on Ethercon XLR
<b>Duplicate connector</b>	AES50 (24 channels of bi-directional digital audio) on Ethercon XLR providing dual redundant back up of channels

## Appendix C: I/O Modules

This appendix provides instructions on replacing a module on the rear panel of the DL451 Modular I/O.

The DL451 Modular I/O has three module slots into which any combination of the following modules can be fitted:

- DL441 analogue input module (see "DL441 analogue input module" on page 28).
- DL442 analogue output module (see "DL442 analogue output module" on page 29).
- DL443 analogue insert input/output module (see "DL443 analogue Jack I/O module" on page 30).
- DL452 digital in/out (AES/EBU) module (see "DL452 digital I/O module" on page 31).

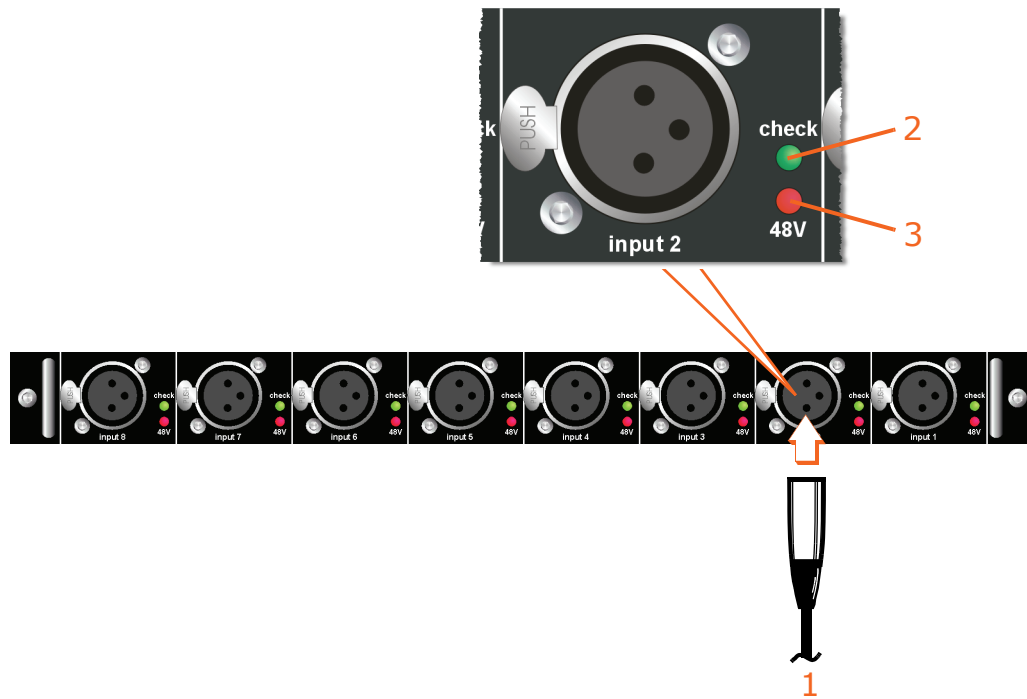
Details of how to replace a module can be found in Appendix D "Replacing An I/O Module" on page 33.

## DL441 analogue input module

The DL441 analogue input module provides eight balanced line (or mic) inputs. Its rear panel houses eight input XLRs, each having **check** and **48V** LEDs.

The line inputs may be used as simple unity gain inputs to the XL8, such as insert returns. However, there is also provision for gain adjustment in 5dB steps from -5dB to +40dB. This allows very high signal levels to enter the system and means that the same hardware can be used for mic inputs, if required by the system.

When used for microphones the input can also provide 48-volt phantom power.

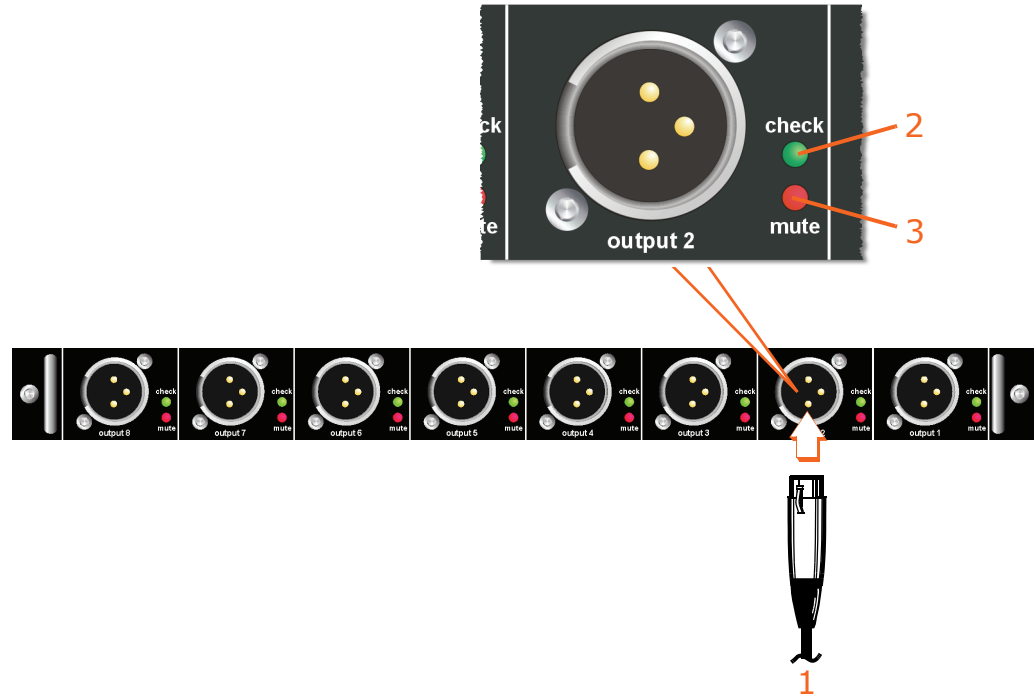


Item	Description
1	Eight XLR analogue mic/line inputs.
2	Green <b>check</b> LED illuminates to indicate when a channel is selected on a console. These are controlled by the console and used as a visual aid to locate specific connectors.
3	Red <b>48V</b> LED illuminates to indicate 48V phantom voltage is on.

## DL442 analogue output module

The DL442 analogue output module provides eight balanced line outputs. Its rear panel houses eight output XLRs, each having **check** and **mute** LEDs.

The line outputs have no analogue level adjustment.

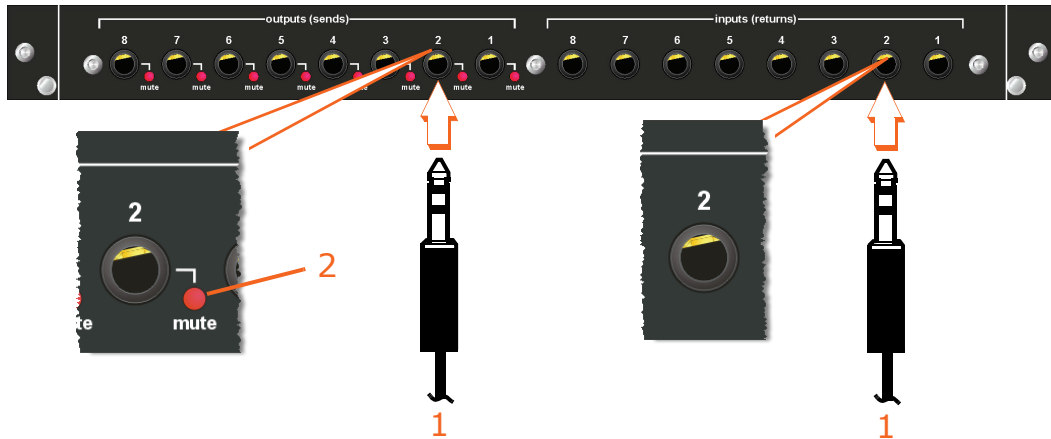


<b>Item</b>	<b>Description</b>
<b>1</b>	Eight XLR analogue outputs.
<b>2</b>	Green <b>check</b> LED illuminates to indicate when a channel is selected on a console. These are controlled by the console and used as a visual aid to locate specific connectors.
<b>3</b>	Red <b>Mute</b> LED illuminates to indicate that channel is muted.

## DL443 analogue Jack I/O module

The DL443 Jack I/O module provides a reliable, robust, high quality option where maximum connectivity is required at reduced cost. It has normalising and low latency, and is of robust construction.

The DL443 Jack I/O module has a total of 16 ¼" Jack sockets providing eight outputs (sends) and eight inputs (returns). Each output has a red **mute** status LED.



Item	Description
1	Eight jack sockets per <b>inputs (returns)</b> section and eight jack sockets per <b>outputs (sends)</b> section.
2	Red <b>mute</b> LED on each <b>outputs (sends)</b> jack socket illuminates to show when a channel is muted on the console.

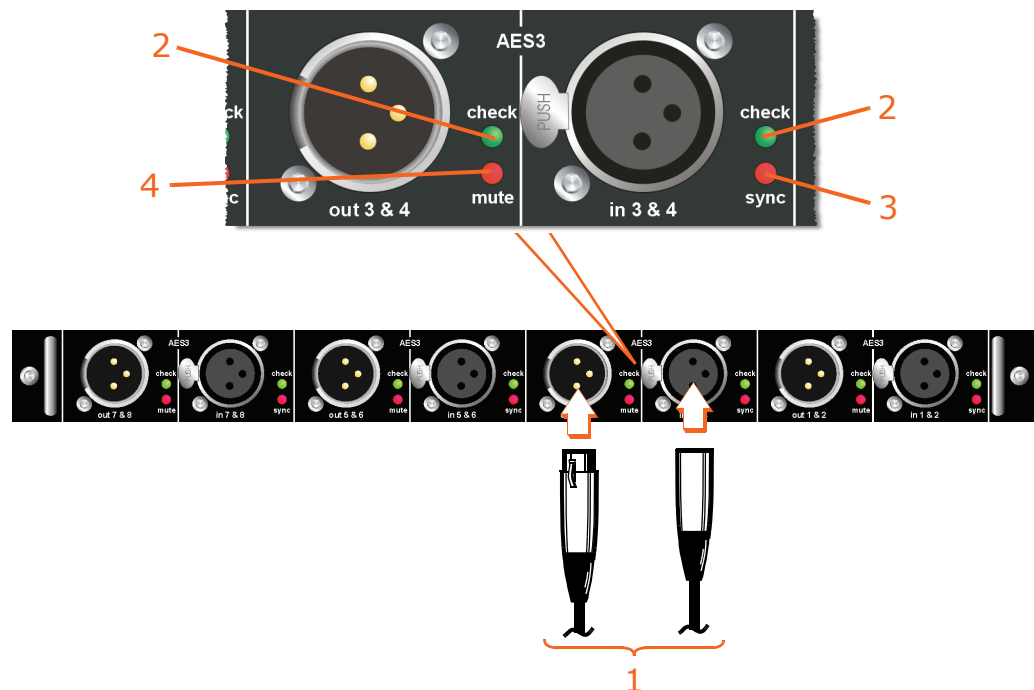


## DL452 digital I/O module

The DL452 digital I/O module provides four (stereo) AES/EBU inputs and outputs. Its rear panel houses these I/Os in four pairs. Each input has a **check** and a **sync** LED and each output has a **check** and a **mute** LED.

Each AES/EBU input can run at sample rates up to 96kHz (44.1kHz, 48kHz, 88.2kHz and 96kHz) using a sample rate converter (SRC). If the digital input is synchronous with the system clocks, the SRC can be bypassed to remove approximately 1ms of delay, which is inherent in the sample rate conversion process.

Each AES/EBU output can also run at sample rates up to 96kHz by using an (SRC). There are two potential clock sources for the digital outputs: the system and the coinciding digital input. When using the system to drive the digital outputs, the output SRC is bypassed and the sample rate of the output is matched to the system. When the digital input clocks are used to drive the digital outputs, the SRC is enabled and the audio output is converted from the sample rate of the system to the sample rate of the digital input.



Item	Description
1	Four pairs of digital <b>AES3</b> (AES/EBU) XLR inputs and outputs.
2	Green <b>check</b> LED illuminates to indicate when a channel is selected on a console. These are controlled by the console and used as a visual aid to locate specific connectors.
3	Red <b>sync</b> LED illuminates to indicate that a valid AES3 connection is present on the digital input.
4	Red <b>Mute</b> LED illuminates to indicate channel is muted.



## Appendix D: Replacing An I/O Module

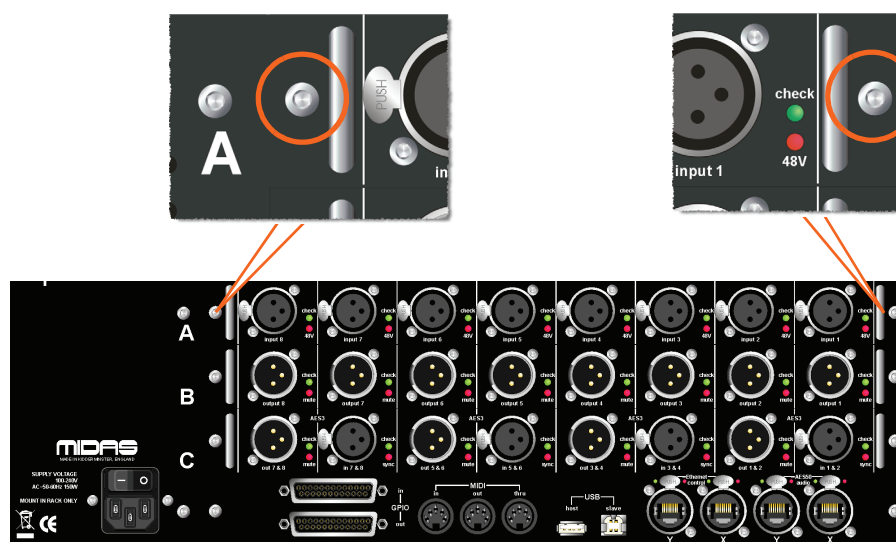
This appendix provides instructions on replacing a module on the rear panel of the DL451 Modular I/O.

### Replacing a module

The design of the DL451 Modular I/O makes module replacement very easy and straightforward. The unit has rack guides in each of the three module positions so that the modules can slide easily in and out. Each module is held in place by two screws, at the left and right sides. A short metal post (or stud) adjacent to each screw facilitates removal.

#### >> To remove a module

- 1 Switch off the unit and isolate it electrically from the mains power supply by switching off the mains power supply at the mains outlet and removing the mains power cable from the rear of the unit.
- 2 Unplug all cables from the rear of the unit.
- 3 On the module you are replacing, remove the two securing screws from its left and right sides on the rear panel (circled below).



- 4 Pull out the module using the two circular machined posts (fitted to rear of module panel, adjacent to the two securing screws).

#### >> To fit a module

Carefully insert the module into the empty module slot, ensuring the correct orientation, and secure the module in place using the two securing screws (left and right). Then, plug in all the cables to the rear panel of the unit. Finally, plug in the mains cable and switch the unit on.

The unit will recognise the type and position of the new module just fitted. However, you may need to configure some of its options (see Chapter 5 "Programming Mode").

## Appendix E: Service Information

This appendix gives you servicing information for your unit.

If you are in any doubt or have queries about any of the procedures in this appendix, contact Midas Technical Support. Contact details can be found at the front of this manual.

### Routine maintenance

To help keep your unit in good working order and to make sure it gives you optimum performance, we recommend that you carry out the following:

#### Monthly

- Clean the unit, as detailed in "Cleaning" below.
- Check all controls, such as pushbuttons, for freedom of operation.
- Check the functionality of all controls and indicators, such as LEDs.
- Check the functionality of the equipment.

#### Yearly

- Clean the internal fans, see "Cleaning the internal fans" below.

### Cleaning

**Switch off the unit and electrically isolate it from the mains *before* cleaning.**

Clean the unit using a dry, lint-free cloth. Don't use harsh abrasives or solvents. When cleaning the unit, take great care not to damage the controls or LCD screen.

#### Cleaning the LCD screen

Carefully wipe the surface of the LCD screen with a soft, lint-free cloth using ethanolic liquid, such as a screen cleaner for LCDs, or by using a screen wipe specially designed for the purpose. When cleaning the LCD screen, please take the following precautions:

- Don't use harsh abrasives, such as paper towels.
- Don't apply liquids directly to the screen.
- Don't use ammonia-based cleaners and solvents, such as acetone.

#### Cleaning the internal fans

The unit's internal fans need to be cleaned regularly to remove the build of dust, dirt etc. We recommend that they are cleaned at least once a year, provided the unit has been operated under normal conditions. However, if the operating conditions are more adverse or extreme, for example, if the unit is operated in the vicinity of smoke machines, new carpets etc., this frequency should be increased accordingly.

**This procedure must be carried out by a fully qualified service engineer.**

## Equipment disposal

When this equipment has come to the end of its useful life, its disposal may come under the DIRECTIVE 2002/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on waste electrical and electronic equipment (WEEE).

Hazardous substances in WEEE contaminate water, soil and air and ultimately put at risk our environment and health. The directive aims to minimize the impacts of WEEE on the environment during their life times and when they become waste.

The WEEE directive addresses the disposal of products when they have reached the end of their life and contributes to the reduction of wasteful consumption of natural resources. This will help to reduce pollution, and protect the environment and ourselves.



If this equipment carries a 'crossed-out wheellie bin' (shown left), please do not dispose of WEEE as unsorted municipal waste but collect and dispose of in accordance with local WEEE legislation. The horizontal bar underneath indicates that the product was placed on the EU market after 13th August 2005.

For WEEE disposal, see our website at [www.midasconsoles.com](http://www.midasconsoles.com) for information.

## Appendix F: XL8 Live Performance System

The XL8 Live Performance System is a very powerful and flexible audio processing system that provides a complete solution for any audio mixing and signal distribution application in a live sound environment.

The standard XL8 system offers 96 channel inputs, 51 outputs, 51 buses (32 auxes/groups, 16 matrices and three masters), 16 on-board effects processors, PEQs (four-band on inputs and six-band on outputs), up to 48 assignable GEQs (if all stereo effects units are being used), 16 configurable stereo effects (from eight options), surround panning (5.1, LCRS and quad) and comprehensive, easy-to-use routing. XL8 automation provides up to 1,000 scenes with snapshot save/recall capability and global edit, presets and show file archiving.

The XL8 Control Centre forms the core of the XL8 Live Performance System, which also includes a number of 19" rack modules that are interconnected by a networked data system. The network carries both proprietary control data and open architecture AES50 digital audio, and uses readily available standard cabling and connectors. The XL8 uses the proven stable Linux operating system. Third party hardware and software (and plug-ins) can be easily integrated into the system.

Included with the XL8 Control Centre are four mic splitters, five I/O units, 10 DSP units, two routers and a Klark Teknik DN9331 RAPIDE that, collectively, form the standard XL8 Live Performance System configuration.

The XL8 Live Performance System is tolerant of any single failure of hardware *or software*. To achieve this the system employs dual redundancy, where a key component has an identical redundant spare that is ready to take over should it fail. Other failure scenarios are managed by the N+1 principle, where redundant components form an acceptable fraction of the system, for example, one of the DSP units in the rack is a redundant spare.

### Features

Please remember, the XL8 is not just a console, it's a LIVE PERFORMANCE SYSTEM!

#### **Concert sound**

The standard XL8 system, which provides the full 96 inputs and 51 outputs, comprises:

- 1-off XL8-5BCC (flight-cased, five-bay control centre).
- 4-off XL8 stage box (DL431).
- 5-off XL8 I/O box (DL451).
- 10-off XL8 DSP units (DL471).
- 2-off XL8 router units (DL461).
- All interconnecting cables (Cat 5e and Cat 6).

#### **Install**

The XL8 is flexible and the system can be customised with the needs of the install.

**Configuration**

- All outputs have six-band parametric EQ and five-mode compressor styles.
- Up to 16 stereo FX units.
- Up to 48 assignable GEQs (16 if all 16 stereo FX units are being used).
  - Control from RAPIDE.

**Showfiles**

- USB connectors for show archiving.
- Showfiles are both forward and backward compatible.

**Warranty**

Three years.

**Audio quality**

- Three mic pre amps per input FOH, monitor and broadcast.
- Midas EQ (sound quality and 'feel').
  - Four filters.
- Midas dynamics.
  - Four styles (five on outputs).
- Midas quality input and output.
- Midas and Klark Teknik FX processing.

**User interface - speed and feel**

- VCA groups.
  - Console comes to you!
- POP groups.
  - Console comes to you!
- Muscle memory.
  - E-zone on channel strip.
  - D-zone on channel strip.
  - Paged controls do not change function.
- Fast zone.
- Electronic colour coding.
- Dedicated motorised output faders.
- Klark Teknik RAPIDE.



***User interface - status visibility***

- Daylight-visible screens.
- Metering.
  - 63 discrete 20-segment LED meters.
  - Discrete metering for dynamics and direct outputs.
  - "All the meters all of the time".
- "ST" assign switch.
- Eight channels of key data plus single channel strip per input screen.

***Dual operators - perfect for festival situations***

- Modular control centre with multiple input areas.
- Area A and Area B assignment.
- Discrete dual solo systems.

***Automation - developed in conjunction with Broadway sound designers and engineers***

- Cross-scene global edit capability.
- Showfiles on earlier and later versions of firmware.

***System design and network - ground-breaking***

- Integrated analogue mic splits with local control and monitoring.
- Integrated open-architecture AES50 digital audio distribution.
- Fully duplicated network for redundancy.
- Up to 100 metres of dual redundant connectivity between hardware elements (copper); up to 500 metres using optical fibre.
- Automatic integral delay management system - audio outputs time and phase coherent.
- Flexible, expandible hardware system.
- Ethernet TCP-IP and USB tunnelling for third parties.
- KVM (keyboard, video and mouse) switching on control centre.

***Reliability***

- Failure-tolerant of any single failure of hardware or software.
- Proven, stable Linux operating system.
- Duplicated master controllers.
- Control centre has five multiple-redundant power supplies.
- Stage box has integral dual power supplies.

***Service and support***

- 24/7 global telephone support.
- Service/support centres in US, UK and Singapore.

## System components (standard supply)

The standard XL8 Live Performance System comprises the following equipment:

- **XL8 Control Centre (1-off):**

Comprises five discrete, independent bays, each with its own power supply, surface modules, surface processor, GUI processor and GUI screen. The standard five-bay control centre has three bay types, input (3-off), mix (1-off) and output (1-off).



- **DL431 Mic Splitter (4-off):** 6U 19" rack unit that provides 24 mic/line inputs.



- **DL451 Modular I/O (5-off):** 3U 19" rack unit that provides a maximum of 24 audio inputs and 24 audio outputs.



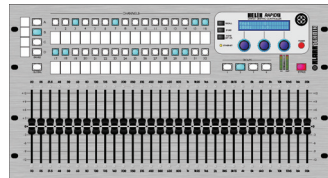
- **DL471 DSP (10-off):** 1U 19" rack unit that forms part of the modular DSP engine.



- **DL461 Router (2-off):** 3U 19" rack unit that provides the on-stage Cat 5e interconnectivity and the stage-to-FOH link via a single 'snake', which can be copper cable or a fibre optic link.



- **Klark Teknik DN9331 RAPIDE (1-off):** 6U 19" rack unit that is a motorised fader remote control for the onboard graphic EQs of the XL8.



- **Snakes and main cables etc.**

To provide a complete audio system, the only other equipment required are mics, amplifiers and loudspeakers.

## System interconnections

Figure 1 shows basic system interconnectivity and indicates where the XL8 Control Centre (highlighted in red) sits within the system. This figure also illustrates redundancy by showing that the two halves of the system - left and right - are identical (ignoring the DN9331 RAPIDE).

The XL8 Control Centre, which forms the core of the XL8 Live Performance System, is directly connected to the local I/O units, DN9331 RAPIDE and routers (via the 'snake'). Each router acts as a hub and is connected to the mic splitters I/O units and DSPs, which are common to both halves of system. The network carries both proprietary control data and open architecture AES50 digital audio, and uses readily available standard Cat 5e, Cat6/fibre optic cabling and connectors.

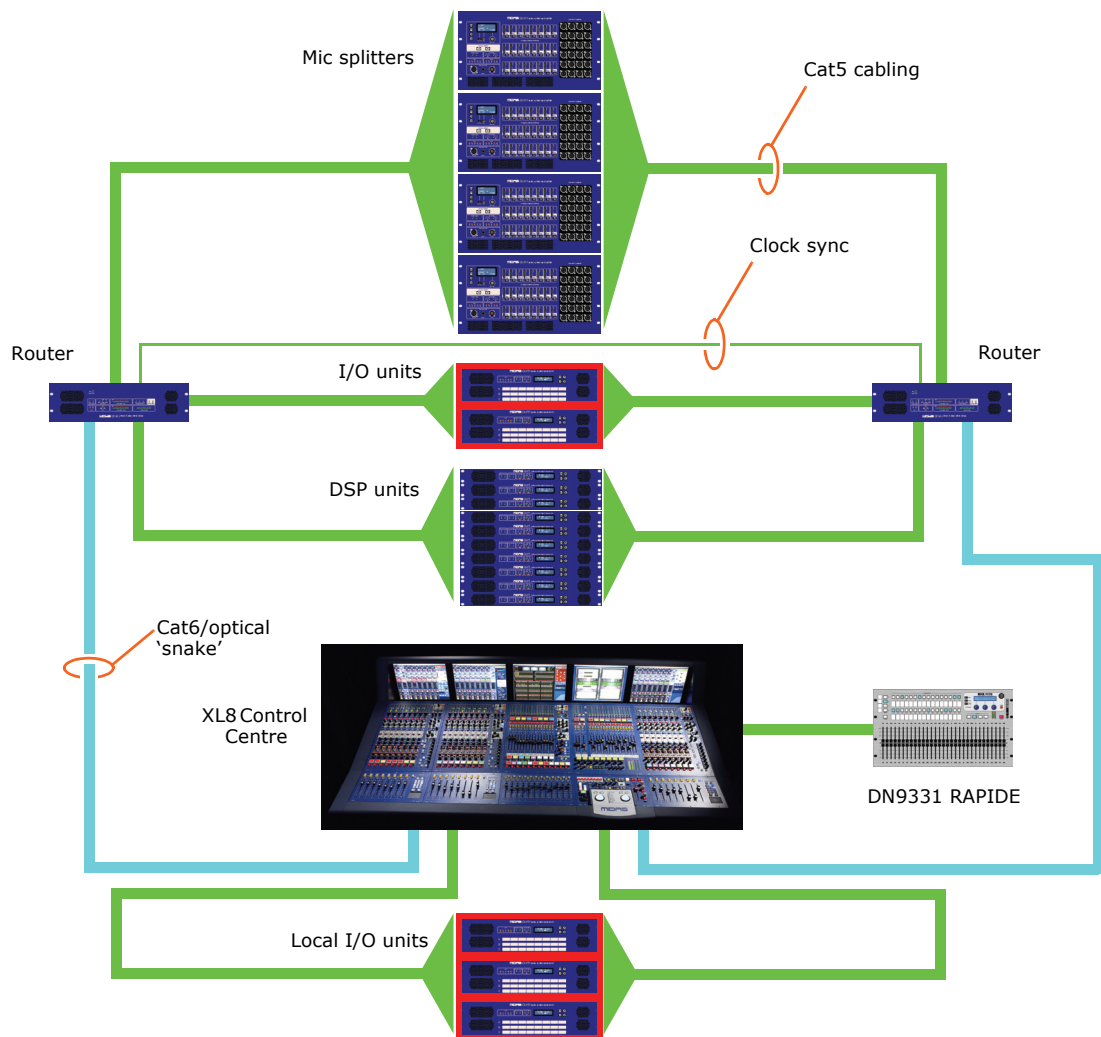


Figure 1: Basic interconnectivity of a standard XL8 Live Performance System

## FOH and MON

The XL8 Live Performance System can be used as a front of house (FOH) or stage monitor (MON) system. Also, by sharing the four mic splitters, these two types of system can be used in tandem, as shown in Figure 2 on page 42.

Figure 4 on page 49 shows in more detail the interconnections between each unit in a typical XL8 Live Performance System FOH and MON set up. In particular, it shows the how the FOH and MON sections are connected up; notice that the mic splitters are shared between them.

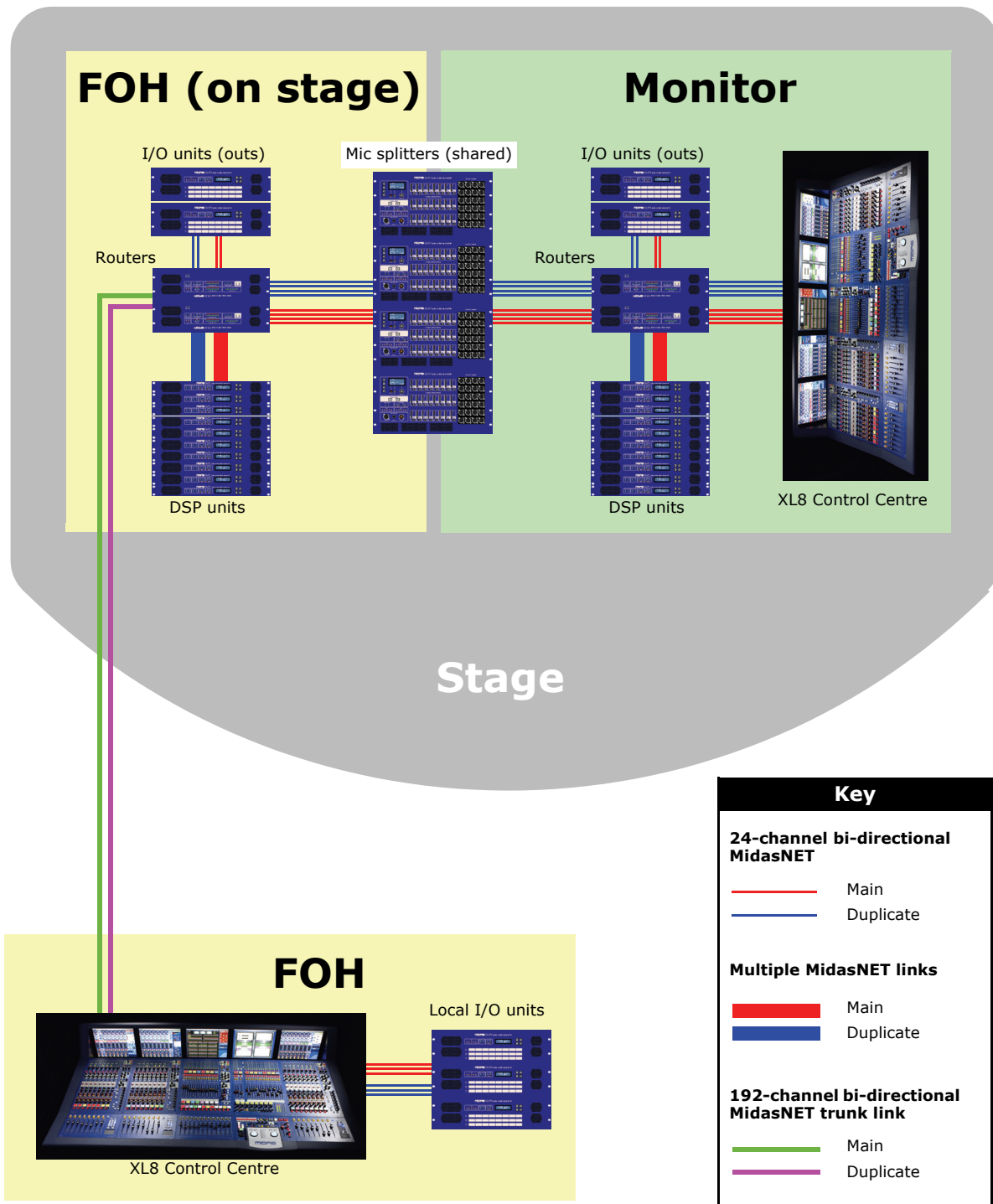
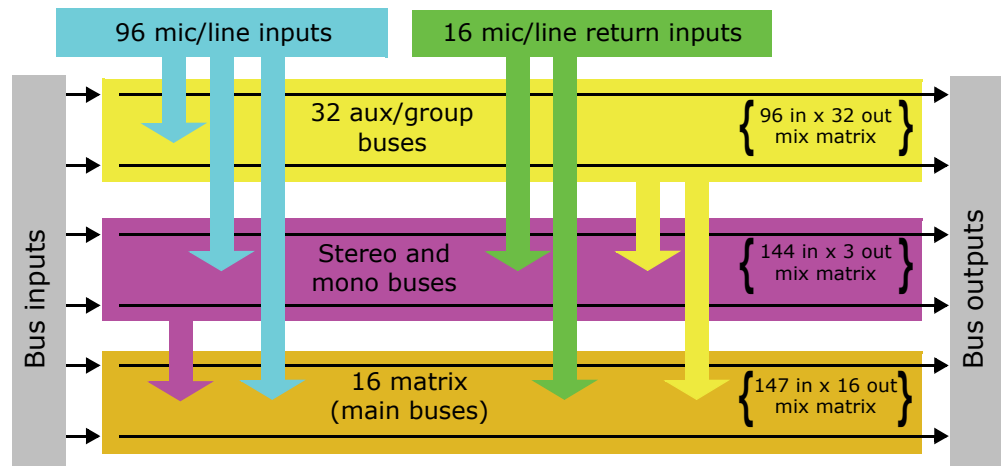


Figure 2: Typical XL8 Live Performance System FOH and MON set-up

## Mix matrix

Ultimately, the mix matrix defines the XL8 Control Centre's capability. Probably the best way to imagine the mix matrix is to think of an analogue console layout, where inputs run vertically and buses run horizontally. A mix matrix is usually defined as the number of buses and the quantity of simultaneously-mixable inputs there are per bus. The following diagram illustrates the capability within the control centre.



## Processing

Although the control centre system allows for considerable insertion of external processing it also embodies more than enough internal high quality processing to eliminate the need for this.

### Input channel processing

Each of the 96 full-function input channels has:

- Analogue and digital gain.
- Phase reverse switch.
- Input delay.
- Swept high pass filter with choice of two filter slopes.
- Swept low pass filter with choice of two filter slopes.
- Frequency-conscious compressor with choice of four compression styles.
- Frequency-conscious noise gate with external side chain.
- Insert point.
- Treble EQ filter with choice of four filter types.
- Parametric hi-mid EQ filter.
- Parametric lo-mid EQ filter.
- Bass EQ filter with choice of four filter types.
- Routing via level controls to 48 mix buses.
- Routing via pan control to left and right master buses.
- Routing to mono master bus.
- Panpot (SIS™).
- Direct output.

Each of the 16 auxiliary inputs has:

- Input gain.
- Source from internal FX or external pool input.
- Fader.
- Panpot (SIS™).
- Routing via level controls to the 16 matrix buses.
- Routing via pan control to the left, right and mono master buses.

### Mix channel processing

Each of the 32 auxiliary mix buses has:

- Subgroup, auxiliary or mix minus modes.
- Dual mono or stereo pair modes.
- Six-band PEQ.
- Optional 31-band GEQ (replaces PEQ).
- Frequency-conscious compressor with soft clip limiter and choice of five compression styles.
- Insert point.
- Routing via level controls to the 16 matrix buses.
- Routing via pan control to the left, right and mono master buses.
- Direct input.

Each of the 16 matrix buses has:

- Six-band PEQ.
- Optional 31-band GEQ (replaces PEQ).
- Five-mode frequency-conscious compressor with soft clip limiter and external side chain.
- Insert point.
- Direct input.

### Output channel processing

Each of the 16 matrix buses has:

- Six-band PEQ.
- Optional 31-band GEQ (replaces PEQ).
- Five-mode frequency-conscious compressor with soft clip limiter and external side chain.
- Insert point.
- Direct input.

Each of the three master output buses has:

- Six-band PEQ.
- Optional 31-band GEQ (replaces PEQ).
- Five-mode frequency-conscious compressor with soft clip limiter and external side chain.
- Insert point.
- Direct input.

## Effects processing and GEQs

The XL8 contains 16 mono Klark Teknik (KT) GEQs and 16 effects processors as standard.

The 16 effects processors can be freely chosen from:

- Delay.
- KT DN780 reverb.
- Flanger.
- Phaser.
- Stereo Graphic EQ.
- Pitch shifter.
- Square ONE Dynamics.
- 3-band compressor.

The 16 mono KT GEQs can be patched into any output. There are many patching options for the effects processors:

- Assign to any insert send/return.
- Assign to any pool, in or out.
- Assign FX out to aux return.
- Assign FX in to aux send (post-fade).
- Assign FX out to bus direct in.
- Assign FX in to channel direct out.

Every XL8 comes supplied with a KT DN9331 RAPIDE motorised fader GEQ controller. This unit provides rapid adjustments of the graphics with real hardware, and not a mouse and screen. The graphic channel is selected either by the control centre's SOLO button (solo tracking system (STS)) or by buttons on the RAPIDE itself.

## Audio physical connections

The total number of audio connections, that is, the XLR count, for a standard XL8 Live Performance System is 504. This comprises of both dedicated and configurable XLR connections.

The dedicated XLR connections are on the DL431 mic splitter and comprise:

- 96-off mic/line inputs.
- 2 x 96-off analogue mic splits with variable gain.
- 96-off transformer isolated analogue 'broadcast' mic splits (fixed gain).

All of the configurable connections are on the five DL451 I/O units, which can be freely located at the FOH or on stage. Three banks of sockets (eight XLRs each) are available for:

- 8-off analogue mic/line inputs.
- 8-off analogue outputs.
- 8-off AES/EBU XLRs providing eight digital inputs and eight digital outputs per module.

## Uses of the configurable audio connections

The standard XL8 Live Performance System has a total configurable audio channel count (on the DL451 I/O units) of between 120 and 240, depending on the mix of analogue and digital I/O (excluding the non-configurable 96 mic inputs on the DL431 mic splitter).

Typically, the allocation would be:

- 16-off mic/line auxiliary inputs (giving a total of 112 mic inputs as standard).
- 32-off aux/group bus outputs.
- 16-off matrix (main) outputs.
- 1-off stereo main output.
- 1-off mono main output.
- 2-off stereo local monitor outputs.

This gives a total of 71 audio connections, leaving a further 169 (with everything digital) or 49 (with everything analogue) audio connections. These can be used for insert sends, insert returns, direct outputs, bus direct inputs and side chain connections.

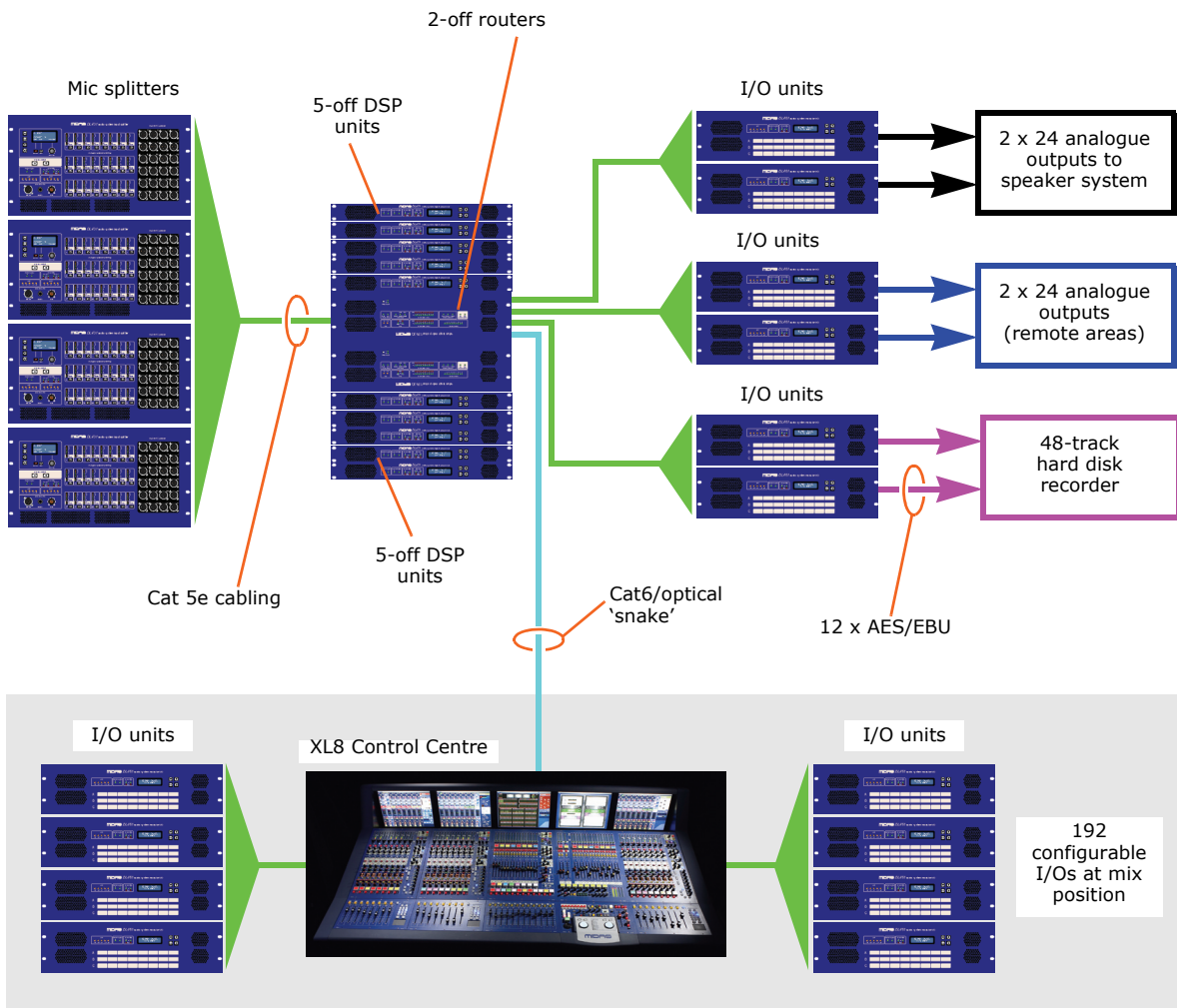


Figure 3: XL8 maximum system capacity (112 mic inputs)



The maximum count of any one type of connection is:

- 96-off input insert sends.
- 96-off input insert returns.
- 96-off input compressor external side chain connections.
- 96-off input noise gate external side chain connections.
- 96-off input direct outputs.
- 51-off mix bus insert sends.
- 51-off mix bus insert returns.
- 51-off mix bus direct inputs.
- 1-off talk mic input.

However, the XL8 can have much more than the standard connectivity by adding DL451 I/O units. As there are nine AES50 connections<sup>1</sup> (fully redundant) available, potentially, another 432 audio connections can be achieved (subject to other system limits). This gives a maximum XLR count of 720. Figure 3 shows a system configuration containing the extra nine DL451 I/O units, but does not show the redundant duplicated network.

All connectivity is controlled via the GUI.

## Surround capabilities

Theatres and broadcast have differing requirements for surround, and both are catered for in the XL8.

Conventional stereo and SIS™ panning is assignable on a channel by channel basis (channel one can be in stereo while channel two can be in SIS™), as follows:

- Stereo left–right routing to master buses.
- SIS™ left–right–centre routing to master buses.

Three additional surround modes operate as follows:

- Quad (left, right, LS and RS).
- Surround (left, right, centre, surround).
- 5.1 surround (left, right, centre, subwoofer, LS and RS).

## Network

The XL8's digital audio network utilises the physical connectivity of Ethernet (EtherCon® connectors and Cat 5e/Cat6 cable), but replaces its data protocol with AES50 protocol (implemented as SuperMAC) and the HyperMAC high capacity system, which are more suited to high quality, low latency audio distribution. The use of the AES standard allows straightforward interfacing with any third party hardware that also utilises this connection.

AES50 and HyperMAC connections carry digital audio, control data and standard Ethernet traffic bi-directionally down a single cable. Cat 5e cable is used for the 'local' (24-channel) connections and the single digital 'snake'<sup>2</sup> — between control centre and router — is either Cat 5e/Cat6 or fibre optic. The combination of audio, control, clock and third party Ethernet data in a single network means that the hardware interfaces on a single RJ45 connection.

1. These spare AES50 ports can also be used to directly connect any AES50 equipped units, such as a hard disk recorder.
2. The digital snake is equivalent to a 384-channel analogue multi-core cable (192 channels in each direction).

All system connections are duplicated for full dual redundancy.

## Resilience to failure (redundancy)

The XL8 Live Performance System is tolerant of any single failure of hardware *or software*. To achieve this the system employs dual-redundancy, where a key component has an identical redundant spare that is ready to take over should it fail. Other failure scenarios are managed by the N+1 principle, where redundant components form an acceptable fraction of the system; for example, one of the DSP units in the rack is a redundant spare (see Figure 4 on page 49).

The control surface can tolerate multiple hardware failures without the operator losing control of the audio. Any of the five GUI screens can be used to operate the whole control centre, *even if no control surface hardware is working*.

The system includes diagnostic tools that give advance warning of any poor connectivity (high error rates), internal temperatures and voltages etc. The system instantly alerts the operator in the event of any hardware, software or connection failures, and indicates the location of the fault. The system asks the operator what action to take, but doesn't automatically reconfigure. This is so that if, for example, the band is near the end of a song and the audio is still alright, the mix engineer carry out corrective action at a more opportune time.

Figure 5 on page 50 shows that even when all of one half of the system is down (the greyed out portion) it will still function as normal. Although, in practise, it is highly unlikely that this will ever happen.

Figure 6 on page 51 illustrates what happens when a router fails. Once again, the system functions perfectly normally.

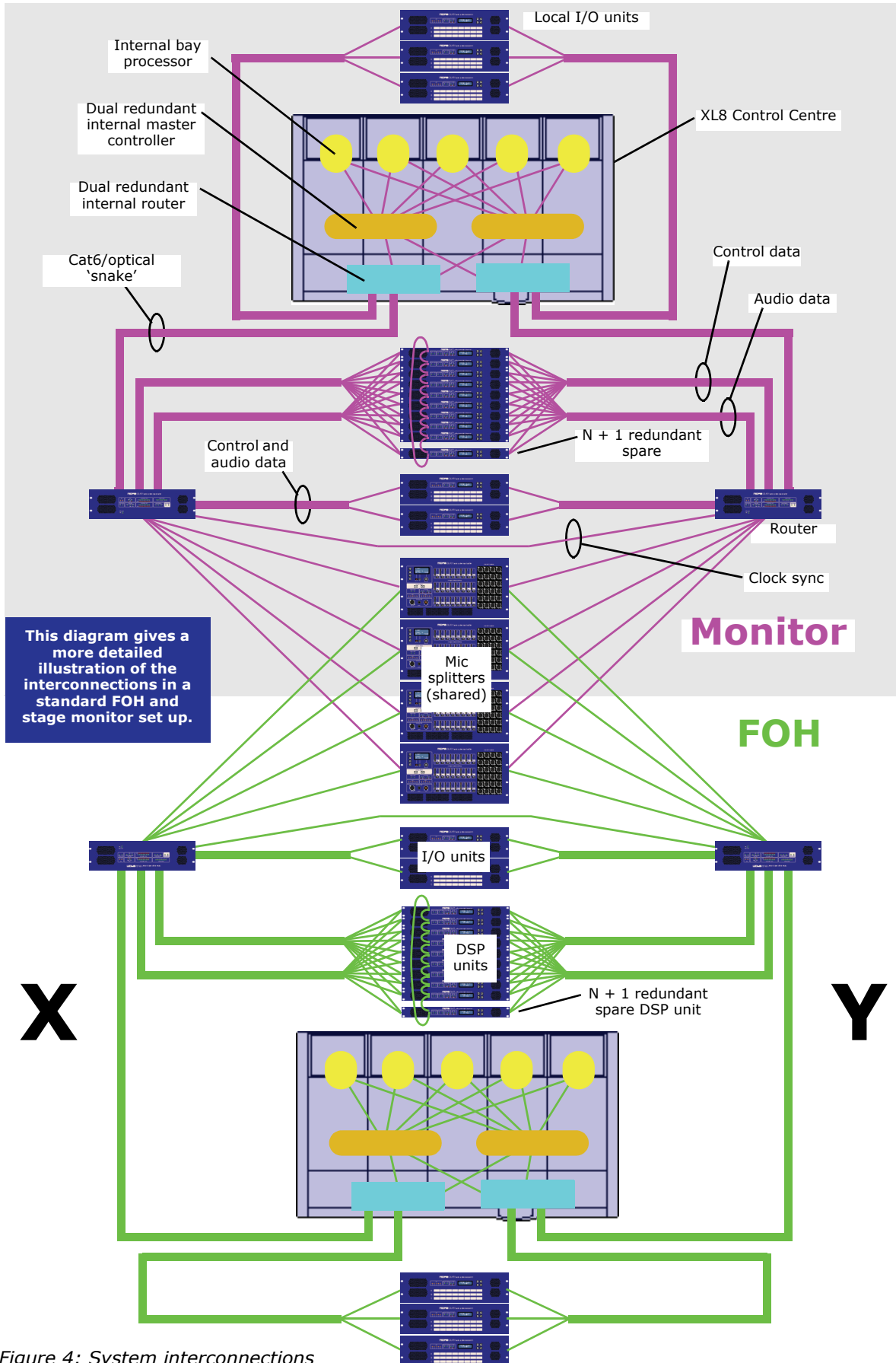


Figure 4: System interconnections

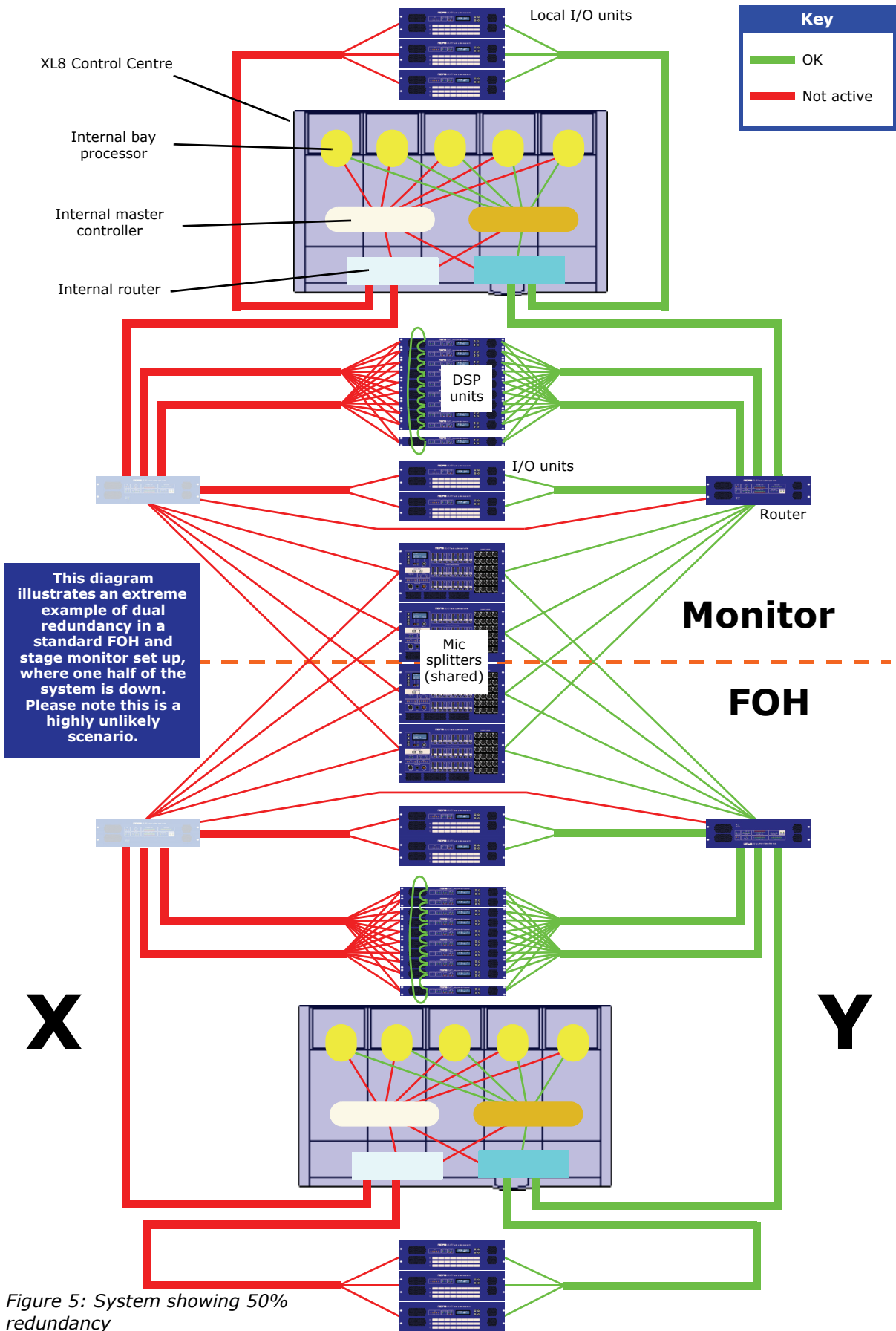


Figure 5: System showing 50% redundancy

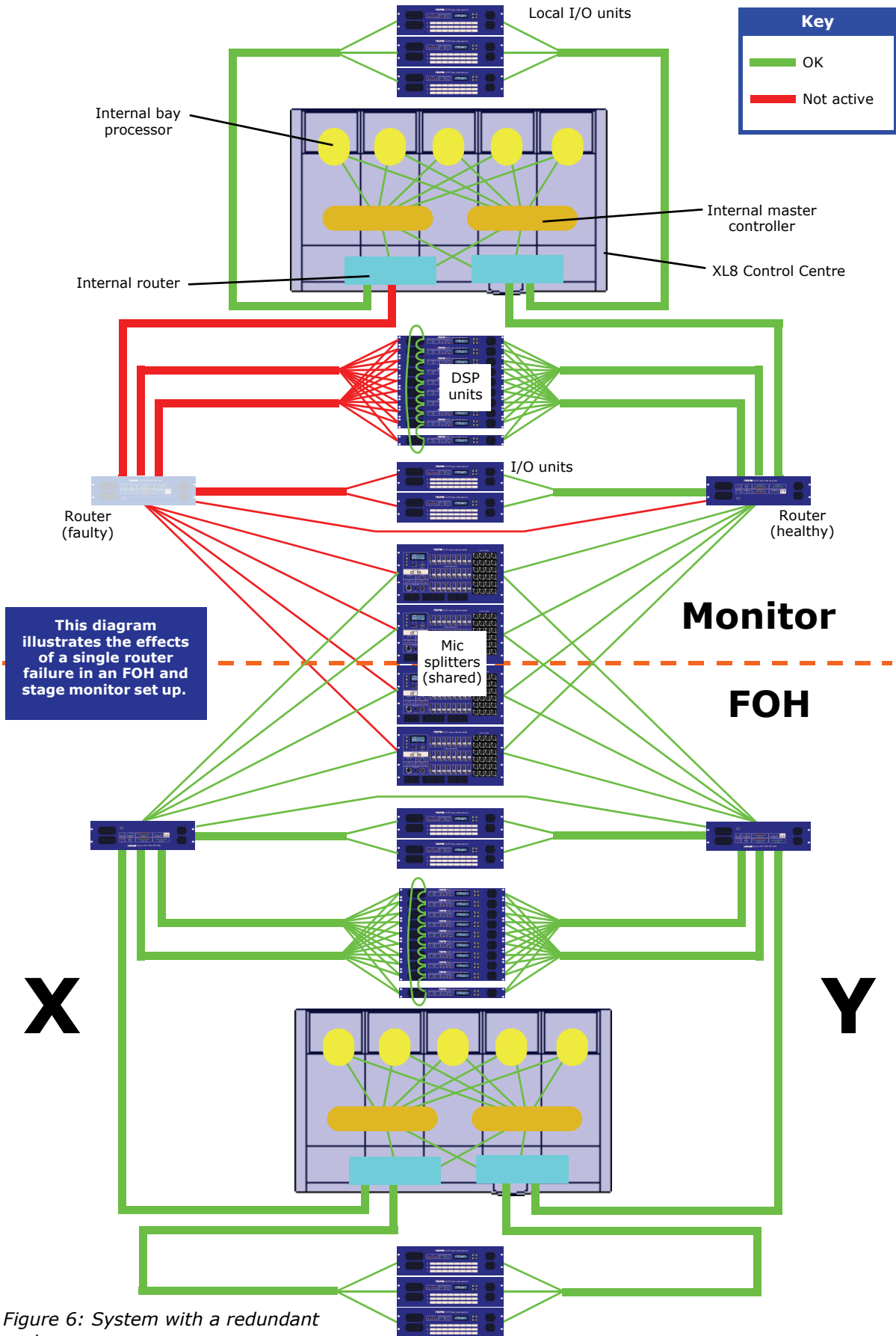


Figure 6: System with a redundant router

## Control software

The XL8's operating system is Linux, which is an open-source, stable, proven operating system (OS). Linux is used in many mission-critical applications worldwide and has allowed Midas' software engineers to write a ground-up system that contains no 'hidden' or unused code. This has resulted in an efficient, compact application, which is quick in operation, quick booting and comparatively easy to debug.

Two copies of the master control software run on separate processors to provide resilience to failure.

## GUI

The XL8 has five, daylight-viewable, TFT screens that provide overview and detail status indication. Any screen can display any information but, in the standard configuration, screen information relates to module location. So, the input module screens display their module's input status, the mix module screen displays the overview status screen ('all the meters all the time') and the output module screen display is used for general use, such as automation, effects, GEQs, third party screens etc. This is dependent on the current application (concerts will probably be different to theatre) and also operator preference.

The screens are controlled via the navigation zones at the front of the modules. In the output module's primary navigation zone, two trackballs control the output module (right trackball) and the mix module (left trackball). The equivalent on each input module is a dedicated glidepad. A keyboard slides out from underneath the output module to provide further control, such as inserting text. USB **keyboard** input sockets at the front of the control centre (under the left and right modules) allow the input and mix screens to be controlled via an external keyboard should the output module screen fail.

## Console linking

Two XL8 Control Centres can be linked together, as you can with Heritage consoles. The bus outputs from one control centre feeds the bus inputs of the other, which is done using AES50 links.

## Integration of third party software

The XL8 network includes the capability to interface any third party hardware that uses AES/EBU or AES50 digital audio, or a standard analogue audio interface.

Each XL8 AES/EBU input and output has a sample rate converter. Synchronisation to external AES3 interfaces can be:

- Global - via inputs on the routers.
- Local to each input.
- Local to each output (synchronisation to adjacent local output).

Multiple local connections can be at different sample rates.

The use of the AES50 protocol for the transmission of digital audio means that any third party digital audio hardware that features this connection can be connected to the Midas network, and will transfer audio to and from the Midas hardware without any additional interfaces or converters (provided it runs in TDM 96kHz mode). This will be particularly useful as the protocol gains acceptance with recording and playback devices, loudspeaker controllers, audio networking systems, digital amplifiers etc.

PC or MAC computers can use the Ethernet tunnel in the MidasNET system, and can communicate with other computers on the network.

The XL8 Control Centre features a four-way KVM switch on the output module screen, as well as external video IN and OUT for each of the five screens. Control centre views can be routed to external monitors, and external video sources can be displayed on the control centre's screens.

The KVM switch facilitates the control of three external computers from the screen, trackball and keyboard of the control centre. This is hugely important and means that third party systems can be controlled from within the XL8 without having to move your head to look at screens placed off to one side. *It also means that there is no need to find somewhere to put multiple keyboards and mice.* Examples are:

- ProTools. Right in the middle of the XL8! Link ProTools and XL8 audio digitally and use any ProTools plug-in as an insert to the XL8!
- Netmax (AES/EBU audio link initially and Cobranet when the 48kHz I/O module is available on XL8).
- IRIS (for example, for RL amps).
- KT Elgar (via Ethernet tunnel from FOH to stage).
- Wireless mic controllers.
- Your email.
- DVD movies.





## Appendix G: Setting Up An XL8 System

This chapter shows you how to set up an XL8 Live Performance System to its default configuration.

**Note:** *If you want to set up the XL8 Live Performance System using a configuration other than the default, please contact Midas Technical Support for details.*

### Initial set-up procedure

Initial system set-up basically comprises:

- **Unpacking and checking the equipment** — see “Unpacking the equipment” below.
- **Making up the racks** — see “Making up the racks” below.
- **Connecting up the equipment** — see “Wiring instructions” on page 57 and “XL8 system interconnections” on page 60.
- **Powering the equipment** — see “Powering the XL8 system” on page 63.
- **Initial patching:**
  - **Configure the type of snake** — see “Configuring the XL8 with the snake type” on page 30. **It is important to configure the XL8 with the correct type of snake connected in the system.**
  - **Setting up the I/O rack devices** — see “Configuring the devices” on page 29.
  - **Configuring the DL4n1 units** — see “Setting up the ID of the DL4n1 units” on page 65.

### Unpacking the equipment

After carefully unpacking the equipment, check it against the packing list shown in “System components (standard supply)” on page 40.

Save all packing materials, as they will prove useful if you need to transport the equipment later.

Inspect the equipment carefully for any sign of damage incurred during transportation. It has undergone stringent quality control inspection and tests prior to packing and was in perfect condition when it left the factory. However, if the equipment shows any signs of damage, notify the transportation company without delay. Only you, the consignee, may institute a claim against the carrier for damage during transportation.

### Making up the racks

After you have unpacked the XL8 Live Performance System and made sure everything is there, make up the racks. In the default set up there are three stage rack units and one FOH rack unit, which should be set up as shown in “XL8 system interconnections” on page 60.

Although rack unit set-up is fairly straightforward, there are careful considerations to be addressed beforehand, which are outlined in the following subsections.

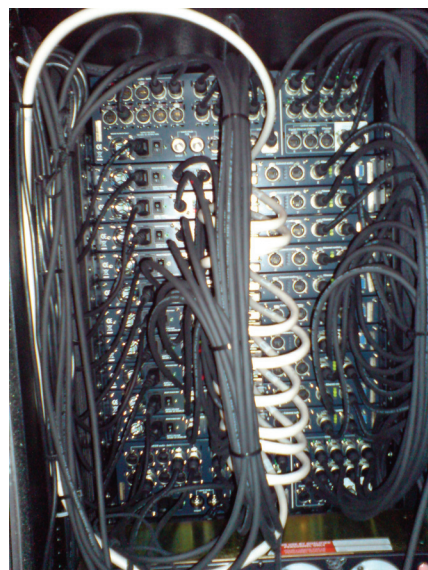
## Outboard equipment racks

To ensure the correct installation and function of the outboard equipment, such as the DL4n1 units and DN9696 recorder, the racks must meet the following general requirements.

- **Shock mounting (for non-installation environments):** The racks must provide adequate shock protection of the units they house by incorporating appropriately-designed shock protection methods, for example, a foam-suspended rack or a frame suspended on anti-vibration mounts etc.
- **Ventilation:** The XL8 rack units have been designed such that their internal ventilation airflow is drawn in through the front of the unit and expelled through the rear. To facilitate this, rack design must ensure that cool air can flow freely through the rack in the same direction, that is, in through the front of the rack and out through the rear. Situations where the air flows in a circular direction around and through an XL8 unit **must** be prevented. Midas recommends that racks with fully opening front and rear doors are used.

***Note:** Never combine units in the same rack that have been designed for a ventilation air flow direction other than that for the XL8 units. To avoid this, we recommend that any non-XL8 units are housed separately.*

- **Rack mount supports:** Always secure the rear of the XL8 units to the rack via their rear rack mount support brackets. These brackets are fitted to every XL8 unit and are recommended for use in touring applications. The rack mount support fixing hole centres are at a depth of approximately 395 mm from the front panel (this dimension may differ slightly on the DN9696).
- **Handles on rack case:** You must ensure that there are sufficient external handles fitted to the rack casing to enable the rack to be manoeuvred easily and safely, and by the amount of personnel suitable for the task. Also, these handles must be fit for purpose.
- **DSP rack only:** Midas strongly recommends that the DSPs and routers are housed in a single rack, that is, stage rack 2 (see "Stage rack 2" on page 57). This rack can be either a 16U high (minimum) rack or configured as an 8U double rack.
- **Clearance at rear of units:** To ensure an adequate clearance at the rear of the units, we recommend that the rack depth, that is, the distance from the front rack strip to the rear of the rack, is a minimum of 700 mm. This is to provide sufficient free space to enable the DSP link cables to achieve their minimum bend radius.
- **Securing the cables:** We recommend that the cables at the rear of the units be tidied using lacing bars and cable ties. This should provide optimum access to the rear of the units for connecting other cables, switching the units on/off etc., and give maximum visibility of the units' LEDs for determining communication status, link status, condition of audio etc. The picture (right) shows a good example of how this can be done. For more information on cabling, refer to "Stage rack 2" on page 57.



## Stage rack 2

Stage rack 2, also known as the "DL461/DL471 engine rack", contains the two routers and 10 DSP units.

**Important:**

**In general, the physical location of the hardware units within each rack is not critical, and alternative configurations are acceptable for different packaging preferences. However, best practice is to mount the DL471 units in numerical order, which will aid quick identification and fault finding.**

DL471 unit ID numbers are located on stickers on the top cover of each device and also on the carton. These must be noted prior to build-up and connected, as shown, in numerical sequence. Please note that once initially configured, the ID numbers are displayed on the *top* row of the DL471 screen and role numbers are on the *bottom* row. The role numbers are dynamic and, therefore, may change during system operation.

## Wiring instructions

This section gives the system cabling details for the XL8-specific equipment and, although it is laid out in recommended order, this order is not critical.

When making the connections, please make sure they match those in "XL8 system interconnections" on page 60. Further details are shown in "Cable type and function" on page 62.

### >> To connect both routers together

**Important:**

**Without this connection system snake redundancy will be compromised.**

Connect the routers via their **Ethernet** socket of the **control expansion** section on each router's rear panel (see "System interconnection panel" on page 253).

### >> To connect the XL8 to the routers

Connect the 'snake' (optical or copper) from the X **snake** socket on the rear of the XL8 Control Centre to the appropriate **snake** socket on the X Router. Repeat for the Y Router using the Y socket on the XL8 Control Centre.

### >> To connect the routers to the DSPs (Stage rack 2)

- In **AES50 audio - bank 0** on the X router, connect the 10 sockets to the **AES50 audio** X socket on the DSP units. Repeat for the Y router, using the equivalent Y sockets.
- In **Ethernet control** bank on the X router, connect the 10 sockets to the **Ethernet control** X socket on the DSP units. Repeat for the Y router, using the equivalent Y sockets.

### >> To connect the routers to the Stage rack 1 units

- **Mic splitters:** In **AES50 audio - bank 1** on the X router, connect sockets 1 and 2 to the **AES50 audio - A** X sockets on the Mic Splitters. Repeat for Y router, using the mic splitters' Y sockets.
- **Line I/O units:** In **AES50 audio - bank 1** on the X router, connect sockets 5 and 6 to the **AES50 audio** X sockets on the line I/O units. Repeat for Y router, using the line I/O units' equivalent Y sockets.

### >> To connect the routers to the Stage rack 3 units

- **Mic splitters:** In **AES50 audio - bank 1** on the X router, connect sockets 3 and 4 to the **AES50 audio - A** X sockets on the mic splitters. Repeat for the Y router, using the mic splitters' Y sockets.
- **Line I/O unit:** In **AES50 audio - bank 1** on the X router, connect socket 6 to the **AES50 audio** X socket on the line I/O unit. Repeat for the Y router, using the line I/O units' equivalent Y socket.

### >> To connect the XL8 to the line I/O units (FOH rack)

Connect the **AES50 audio** X sockets on the rear of the XL8 Control Centre to the **AES50 audio** X socket on both of the line I/O units in the FOH rack. Repeat for the Y sockets.

### >> To connect the XL8 to the RAPIDE

Connect one of the eight **ETHERNET** (EtherCon® XLR) sockets on the rear of the RAPIDE unit to the **Ethernet control 1** socket of the active network (X or Y) on the rear of the XL8 Control Centre (see "XL8 system interconnections" on page 60).

### >> To daisy chain the DSP units

#### **Important Note:**

**Do not connect a cable to like numbered sockets, that is, "0" to "0" or "1" to "1", as the DSPs will not work; socket numbers are printed to the right of each socket.**

There are two default configurations available, depending on the lengths of the interconnecting DSP cables supplied, that is, 0.25 m cables or 0.5 m cables. Both options contain a long cable for connecting the top and bottom units, and the 0.25 m option has an additional long cable for connecting units AMU 2 and AMU 9.



*A cable's length (cm) can be determined from a three-digit number contained within its part number (printed on a label attached to the cable). For example, in a part number of "14150-EZBB-050-0LC 060425TD" the "-050-" indicates a length of 50 cm.*

Connect the DSPs together as shown in the following diagram, according to the cables supplied with your system. (In the diagram, the cables are coloured and the sockets numbered to help distinguish them.)

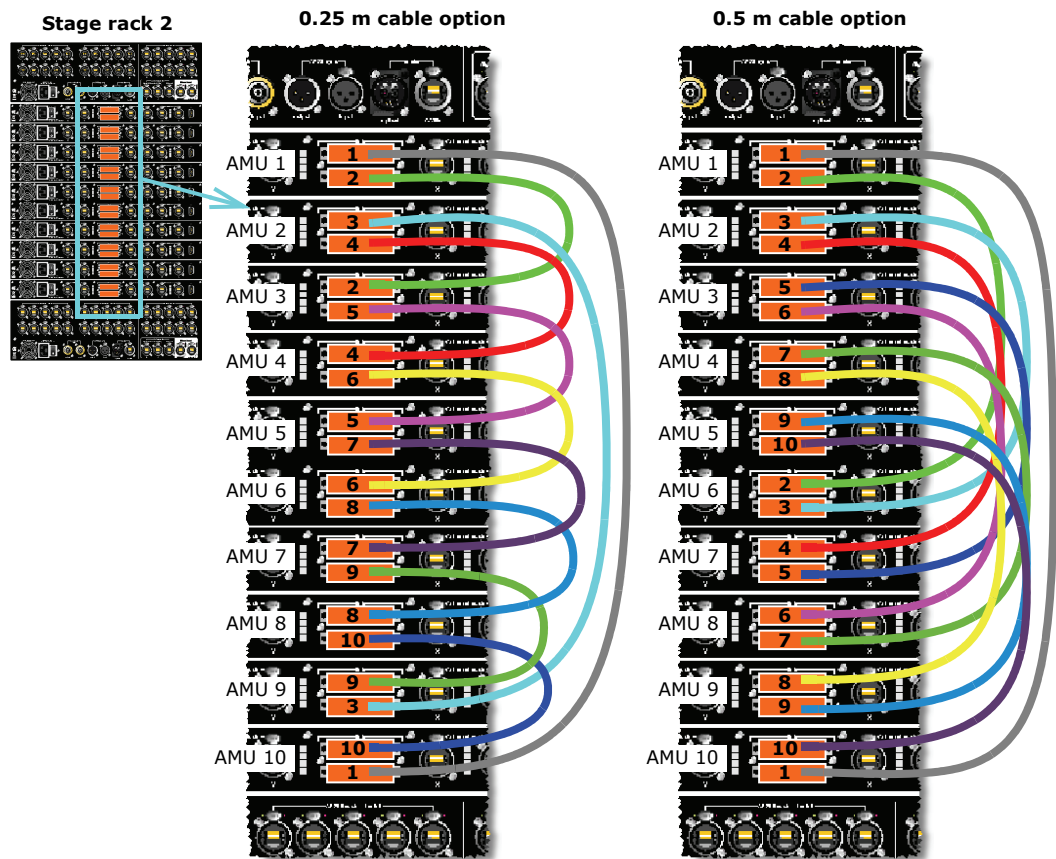
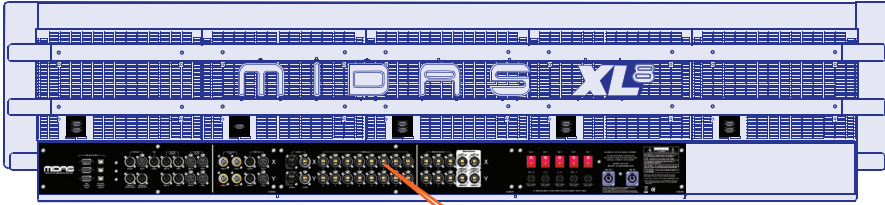


Figure 7: Stage rack 2 - DSP wiring options

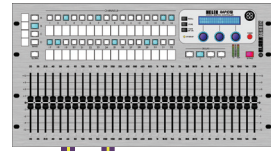
# XL8 system interconnections

This diagram shows the network interconnections for a typical FOH XL8 system.

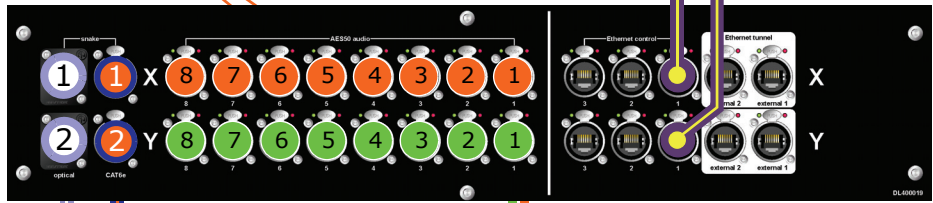
Rear of FOH XL8 Control Centre



RAPIDE

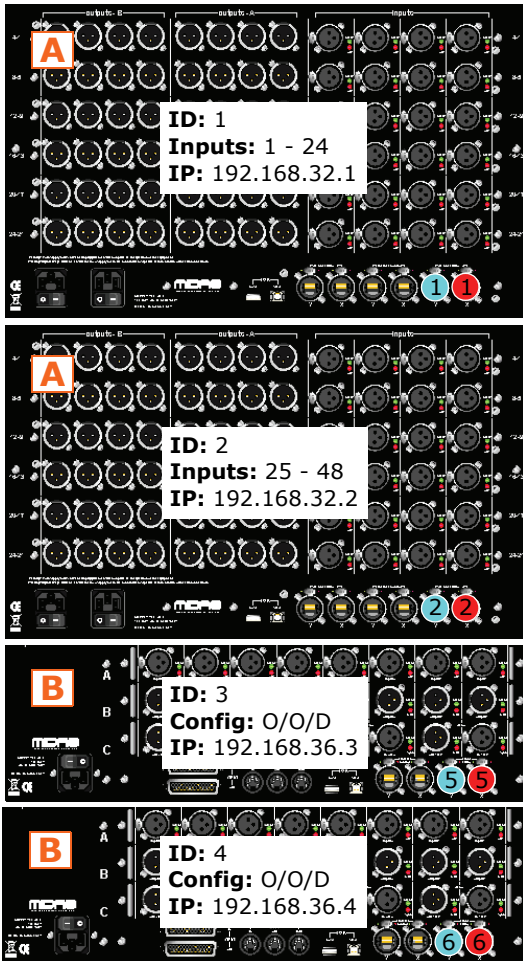


Connect to both X and Y networks

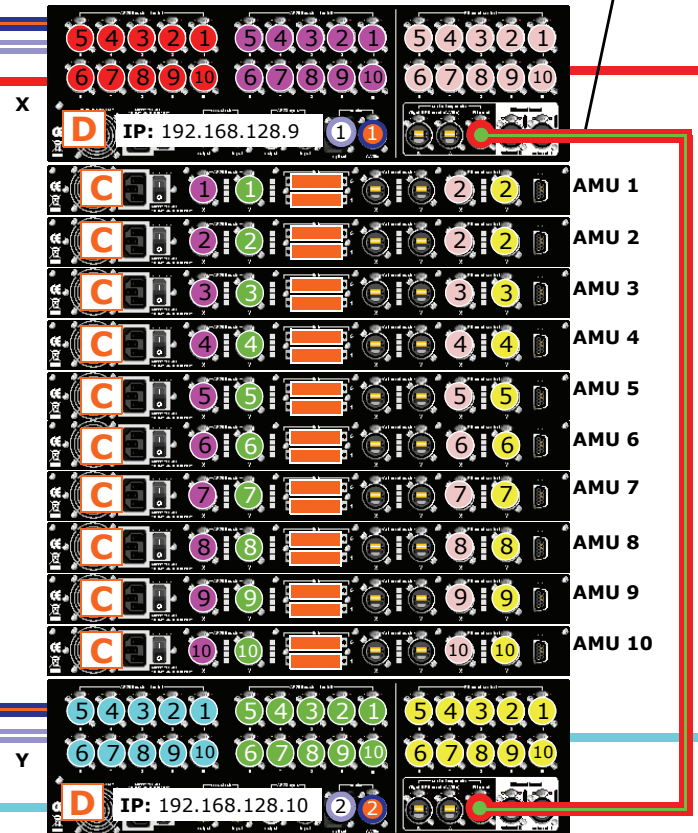


**Note:** All connections are dual redundant, so the system can operate quite normally using either the X or Y cables.

Stage rack 1



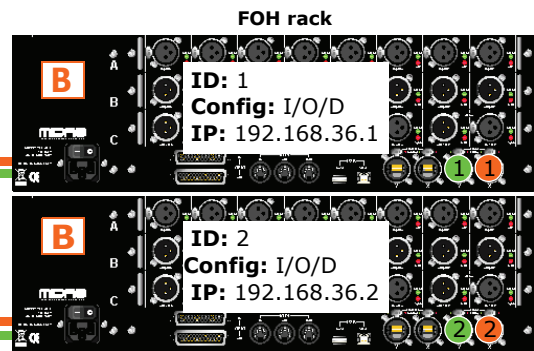
Stage rack 2



ID and IP numbers of the above DSPs run sequentially between AMU 1 and AMU 10:  
**ID:** AMU 1 = 11 through to AMU 10 = 20, inclusive.  
**IP:** AMU 1 = 192.168.20.11 through to AMU 10 = 192.168.20.20, inclusive.

**Note:** For connections specific to the 19" rack units, please refer to their respective operator manuals

**Caution!**  
 Don't forget the interconnection between the two routers, as system snake redundancy will be compromised without it.

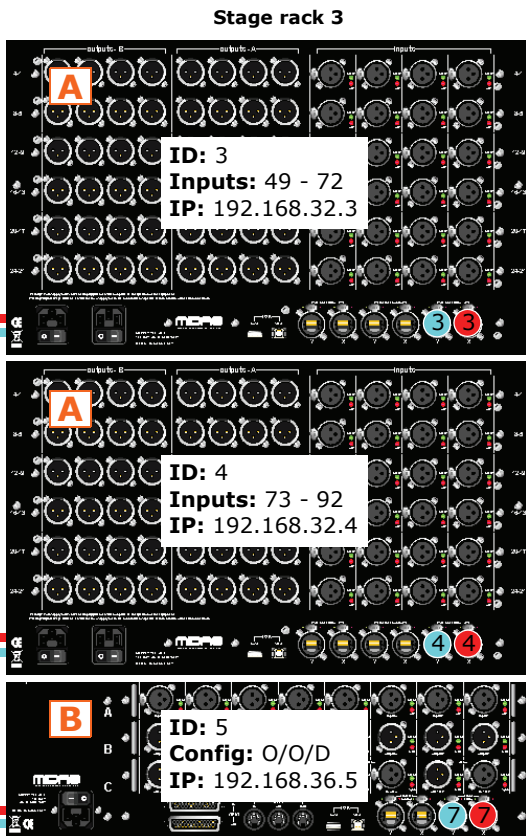


**Key**

- RAPIDE "ETHERNET" connector to **Ethernet control 1** connector on the control centre
- Router interconnection across **Ethernet** connectors (**control expansion** port). **System snake redundancy will be compromised without it!**
- Control centre **AES50 audio** X connectors to FOH rack line I/O unit **AES50 audio** X connectors
- Control centre **AES50 audio** Y connectors to FOH rack line I/O unit **AES50 audio** Y connectors
- Control centre **snake/optical** X and Y connectors to appropriate X or Y router's **snake/optical** connector
- Control centre **snake/CAT6e** X and Y connectors to appropriate X or Y router's **snake/CAT6e** connector
- X router's **AES50 audio - bank 0** connectors to **AES50 audio** X connector on DSP units
- Y router's **AES50 audio - bank 0** connectors to **AES50 audio** Y connector on DSP units
- X router's **Ethernet control** connectors to **Ethernet control** X connectors on DSP units
- Y router's **Ethernet control** connectors to **Ethernet control** Y connectors on DSP units
- Y router's **AES50 audio - bank 1** connectors to **AES50 audio - A** Y connector on mic splitters and **AES50 audio** Y connector on line I/O boxes
- X router's **AES50 audio - bank 1** connectors to **AES50 audio - A** X connector on mic splitters and **AES50 audio** X connector on line I/O boxes
- Link DSP backbone; see "To daisy chain the DSP units" on page 58














<b>A</b> Mic splitter	<b>C</b> DSP unit
<b>B</b> Line I/O box	<b>D</b> Router (X and Y)

ID = identification number  
 IP = internet protocol (that is, network address)  
 Config = configuration  
 I/O/D = input/output/digital  
 O/O/D = output/output/digital



### Cable type and function

The following table shows the type, terminations and function of the XL8 system's interconnecting cables. Please read the table in conjunction with the network interconnections diagram on page 60.

Key	Cable	From	To	Description
	Cat 5e with EtherCon® XLRs	X Router ( <b>Ethernet</b> connector in <b>expansion port</b> )	Y Router ( <b>Ethernet</b> connector in <b>expansion port</b> )	Carries redundancy information for the digital 'snake'.
	Cat 5e with EtherCon® XLRs	RAPIDE ( <b>ETHERNET n</b> connector)	Control centre ( <b>Ethernet control 1</b> connector)	Carries information on fader positions.
	Cat 5e with EtherCon® XLRs	Control centre ( <b>AES50 audio</b> X connector)	I/O unit ( <b>AES50 audio</b> X connector)	Carries a bi-directional combination of 24 channels of 96kHz audio plus 5Mbs of control data.
	Cat 5e with EtherCon® XLRs	Control centre ( <b>AES50 audio</b> Y connector)	I/O unit ( <b>AES50 audio</b> Y connector)	Carries a bi-directional combination of 24 channels of 96kHz audio plus 5Mbs of control data.
	Optical 'snake' with Neutrik OpticalCon® connectors	Control centre	X/Y Router	Carries a bi-directional combination of 192 channels of 96KHz audio plus 200Mbs of control data.
	Cat 6e 'snake' with EtherCon® XLRs	Control centre	Router	Carries a bi-directional combination of 192 channels of 96KHz audio plus 200Mbs of control data.
	Cat 5e with EtherCon® XLRs	X Router ( <b>AES50 audio bank 1</b> )	DSP (X)	Carries a bi-directional combination of 24 channels of 96kHz audio plus 5Mbs of control data.
	Cat 5e with EtherCon® XLRs	Y Router ( <b>AES50 audio bank 1</b> )	DSP (X)	Carries a bi-directional combination of 24 channels of 96kHz audio plus 5Mbs of control data.
	Cat 5e with EtherCon® XLRs	X Router ( <b>Ethernet control X</b> )	DSP (X)	Carries standard 100bs Fast Ethernet data.
	Cat 5e with EtherCon® XLRs	Y Router ( <b>Ethernet control X</b> )	DSP (Y)	Carries standard 100bs Fast Ethernet data.
	Cat 5e with EtherCon® XLRs	Y Router ( <b>AES50 audio bank 0</b> )	Mic splitter (Y)	Carries a bi-directional combination of 24 channels of 96kHz audio plus 5Mbs of control data.
	Cat 5e with EtherCon® XLRs	X Router ( <b>AES50 audio bank 0</b> )	Mic splitter (X)	Carries a bi-directional combination of 24 channels of 96kHz audio plus 5Mbs of control data.
	3M cable with 50-way connectors	DSP ( <b>link 0</b> )	DSP ( <b>link 0</b> )	Carries a proprietary data format for connecting the DSP units together to form the DSP loop.



## Powering the XL8 system

The following details the recommended power up and power down procedures for the XL8 system.

### >> To power up the XL8 system

**Important Note:**

**DO NOT switch on the speaker sub-system until after the start-up of the XL8 system has been completed.**

After all XL8 system interconnections have been made (see Chapter 30 "Panel Connections"), start up the XL8 system:

- 1** Make sure that all of the XL8 system equipment is switched off, that is, the XL8 Control Centre, speaker sub-system, DL431 mic splitters, DL451 modular line I/O units, DL461 routers and DL471 DSP units.
- 2** Switch on the XL8 Control Centre (see "To switch on the XL8 Control Centre" on page 64).
- 3** On the XL8 Control Centre, move all of the monitor and master channel faders to the minimum position and mute all of the master channels. The master channels can be found in the mix and output fast zones (see "XL8 control surface" on page 7).
- 4** Switch on the DL431 Mic Splitters.
- 5** Switch on the DL451 Modular I/O units.
- 6** Switch on the DL471 DSP units.
- 7** Switch on the DL461 Routers.
- 8** After the **status** LEDs (top of each GUI screen on the XL8 Control Centre) turn green, switch on the speaker sub-system.
- 9** Switch on the audio source and start playing the audio.
- 10** On the XL8 Control Centre, check that the audio inputs are routed to the master channels. Then, unmute the master channels and gradually increase their faders, while listening to the sound levels from the speakers.

If there are no sounds at all from the speakers when the faders are at maximum, move the faders to below the 0dB level and check if the audio is muted somewhere along the input paths and also check that the individual speakers are switched on. If there is still no sound from the speakers, contact Midas Technical Support.

### >> To power down the XL8 system

**Important Note:**

**BEFORE switching off any of the XL8 system components, make sure to mute the audio from the speakers and switch off the speaker sub-system.**

- 1** Mute the audio from the speakers and switch off the speaker sub-system.
- 2** Switch off the DL431 Mic Splitters.
- 3** Switch off the DL451 Modular I/O units.
- 4** Switch off the DL471 DSP units.
- 5** Switch off the DL461 Routers.
- 6** Switch off the XL8 Control Centre (see "To switch off the XL8 Control Centre" on page 65).

## Switching the XL8 Control Centre on/off

Carry out the following to switch the XL8 Control Centre on/off in a safe manner, observing all **WARNINGS** and **Cautions**.

### >> To switch on the XL8 Control Centre

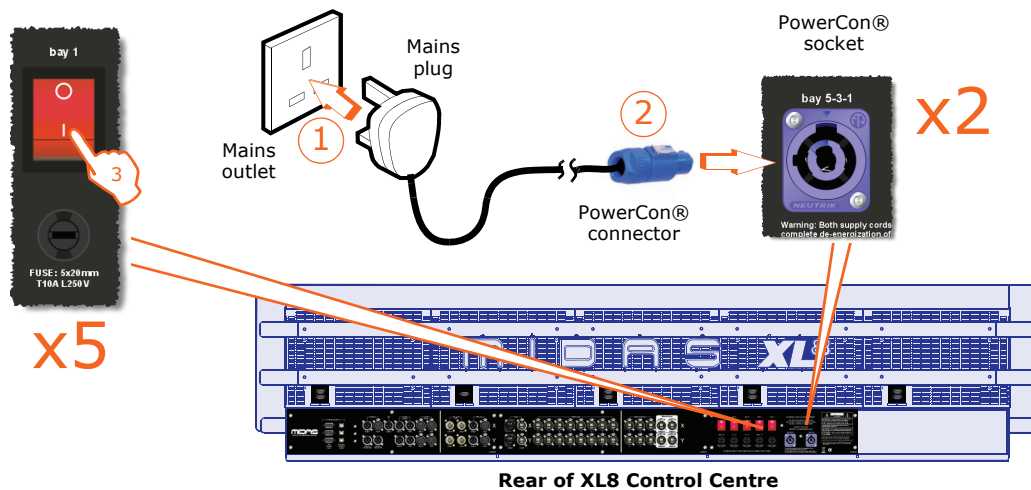


**WARNING!**  
**DO NOT INSERT OR REMOVE A POWERCON® CONNECTOR INTO/FROM REAR OF CONTROL CENTRE WITH MAINS POWER AND ANY OF THE MAINS BAY SWITCHES ON. YOU MUST MAKE SURE ALL MAINS BAY SWITCHES ARE OFF AND MAINS IS SWITCHED OFF AT THE POWER OUTLET(S) FIRST.**



**Caution!**  
**Before switching on, check that all monitor loudspeaker power amplifiers are turned off or muted.**

After connecting up the audio cables, carry out the following:



- 1** Plug the two control centre's mains PowerCon® cables into the mains power outlets.
- 2** Insert the two mains PowerCon® connectors into the PowerCon® sockets on rear of control centre, observing the **WARNING!** above. Then, lock each one by twisting the PowerCon® connector about 90° (1/4 turn) clockwise; you should hear a click when it has locked in place. Check that both PowerCon® connectors are securely fitted.
- 3** Observing the **Caution!** above, switch on all five bay mains on/off switches, one after the other. **It is important that you don't switch on two or more switches simultaneously.**
- 4** The control centre will power up; the GUI will display the default screens and all the controls will be set to default. You are now ready to start using the XL8 control centre.

**>> To switch off the XL8 Control Centre**

- 1** Make sure you have saved any shows, scenes or settings you require (see "Saving your show files to a USB memory stick" on page 56).
- 2** At the GUI, choose **home ▶ Preferences ▶ Shutdown System**.
- 3** At the **Shutdown ENTIRE system?** prompt, click **OK**. This initiates the shutdown down sequence.

During the shutdown sequence the GUI screens will shutdown and all of the LCD select buttons on the control surface will turn red. To inform you of the shutdown status, the LCD select buttons in the input bays and VCA/POP group sections will also display individual and contiguous text messages, respectively.

When the shutdown sequence has finished the LCD select buttons on the control surface will turn green, and the appropriate ones will also display text messages, accordingly.

**Important:**

**During the shutdown sequence, when the LCD select buttons on the control surface are red, do not switch off the mains power supply, and when they are green, it is OK to switch off the mains power supply.**

- 4** Make sure that the shutdown sequence has finished, and then switch off the five bay mains on/off isolator switches (rear of control centre), one at a time.
- 5** Disconnect the two mains PowerCon® connectors from the PowerCon® sockets on rear of XL8 Control Centre. To unlock them, twist by about 90° (1/4 turn) anti-clockwise.

**Setting up the ID of the DL4n1 units**

After connecting up your XL8 network system, you will need to set up the ID of the DL431 Mic Splitter, DL451 Modular I/O and DL471 DSP units (if they don't already have the ID you want). This is done via the control panel of the unit.



Thank you for reading through this Operator Manual.  
We hope you found it useful. Please feel free to send  
us your comments.

More detailed information on the XL8 can be found in  
the XL8 Live Performance System Owner's Manual  
(part number DOC02-XL8). This is available for  
download from our website.

Our contact details and website address can be found  
at the front of this document.



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