ALLEN&HEATH

DX System Guide

Contents

Overview

The DX system enables engineers to increase analogue and AES3 digital I/O in dLive and SQ systems via the use of DX Expanders and DX Distribution options.

The DX protocol carries 32x32 channels of 96kHz audio per DX connection. Each DX connection can accommodate 1x DX32 or up to 2x DX168/DX164-W expanders.

Multiple DX connections can be present in a dLive or SQ system to massively expand the system analogue I/O.

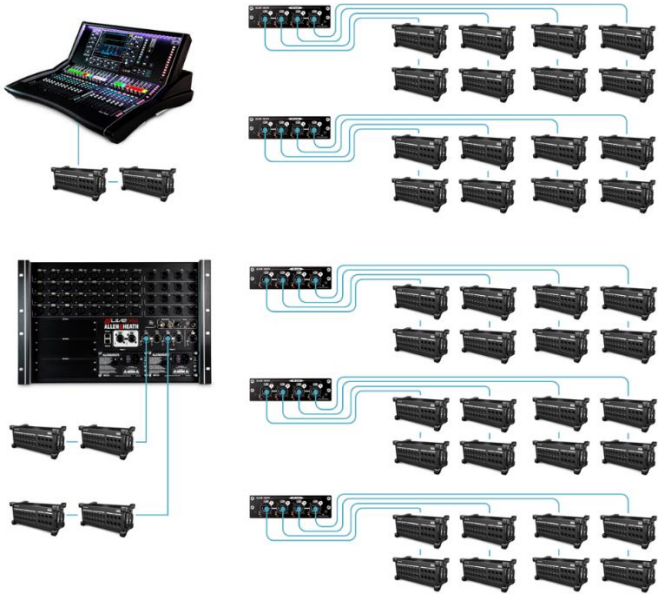
dLive & DX

All dLive Surfaces and MixRacks benefit from integrated DX sockets - dLive Surfaces offer 1x DX connection and dLive MixRacks offer 2x DX connections with redundant sockets for dual-cable connection available on S Class hardware.

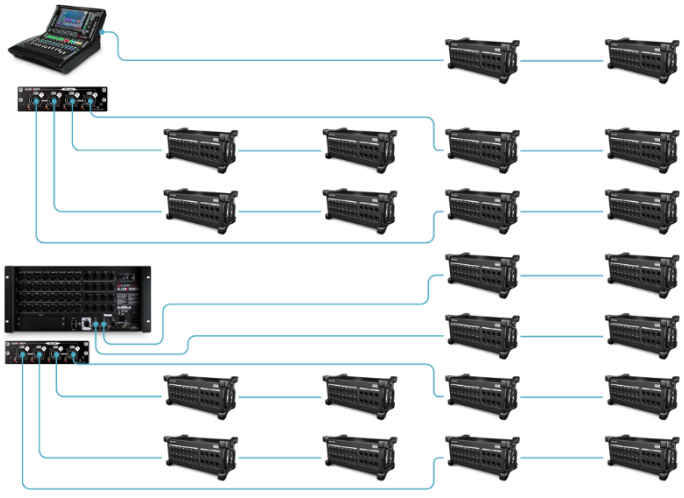
If further DX expanders are required, DX Link I/O modules and DX Hub remote hubs can be added to the system. Both provide 4x DX connections.

ⓘ A gigaACE I/O module is required for DX Hub connection

A fully expanded S Class system with 5x DX Hub/DX Link and 46x DX168 would add 736 inputs and 368 outputs to the system (DX Link shown in diagram)



A fully expanded C Class system with 2x DX Hub/DX Link and 22x DX168 would add 352 inputs and 176 outputs to the system (DX Link shown in diagram)

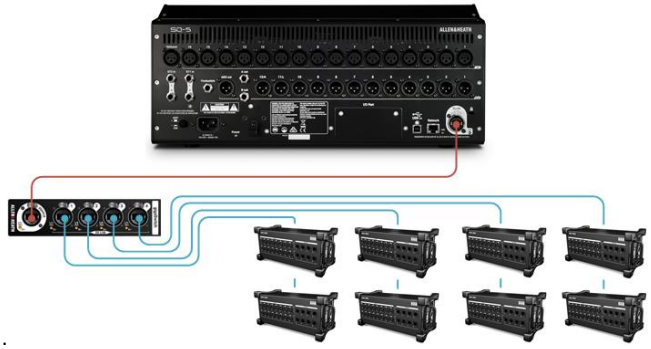


SQ & DX

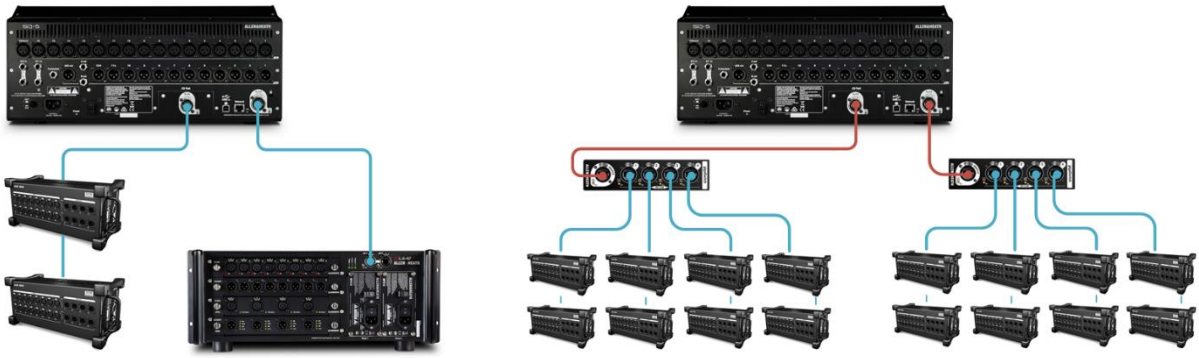
The integrated SLink port on SQ mixers allows the direct connection of 1x DX32 *or* up to 2x DX168/DX164-W expanders.

ⓘ DX32 is scheduled for support in SQ firmware V1.4

Alternatively, a DX Hub can be connected to the SLink port to provide 4x DX connections enabling the use of up to 8 DX expanders.



An optional SLink I/O module can be installed in the SQ I/O port to allow further DX connectivity.



ⓘ SQ does not support DX redundancy.

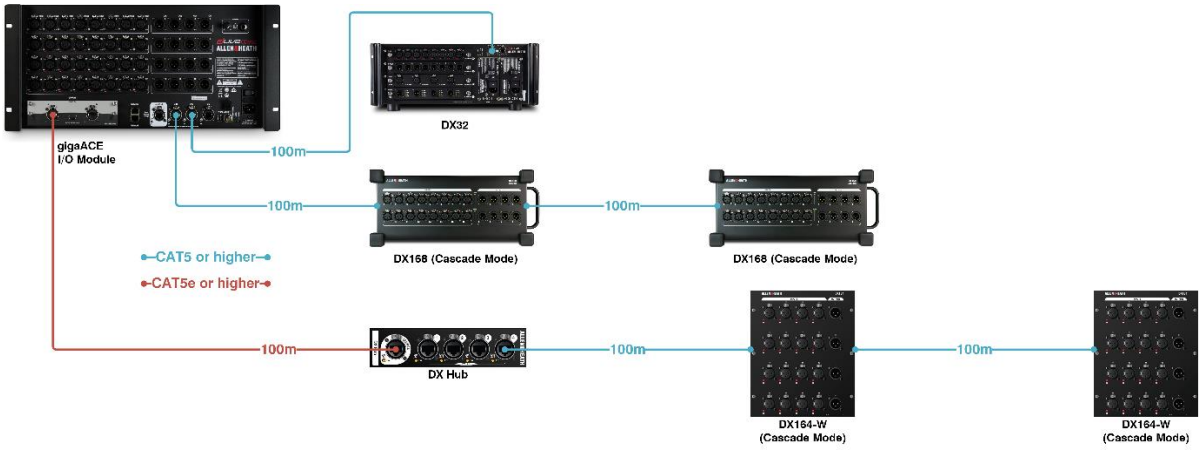
Cables

STP CAT5 (or higher) cables are required for connections to DX32, DX168 and DX164-W expanders.
STP CAT5e (or higher) cables are required for connections between DX Hub and gigaACE / Slink.

ⓘ UTP cables are not supported

The maximum length of each cable is 100m. With 2 DX expanders in Cascade mode this allows a distance of up to 200m between the MixRack and the second DX expander. Using a DX Hub allows for an additional 100m cable run between the gigaACE module/SQ and the DX Hub giving a maximum distance of 300m between the MixRack and the second DX expander.

Allen & Heath can supply a number of network cables - details available on our website.



Networking and Fibre Optics

The DX protocol is a Fast Ethernet point-to-point connection (100BASE-TX, IEEE 802.3u) and is Layer 2 compliant.
gigaACE, used by DX Hub, is a Gigabit Ethernet point-to-point connection (1000BASE-T, IEEE 802.3ab), Layer 2 compliant.

Layer 2 network switches and media converters can be used, provided they support Fast Ethernet (100Base-TX) connections.

Layer 3 & 4 protocols including Spanning Tree, Tagged Egress Packets, and Broadcast Storm Protection can cause interruption to audio data or audible clicks. Smart / managed switches may allow turning off Layer 3 or 4 functions, but as a general rule we recommend using Layer 2 devices only.

Note that no other network device should be plugged into a switch carrying gigaACE or DX audio unless a dedicated VLAN is set up.

Parallel connection of multiple DX Expanders on a switch is not possible.

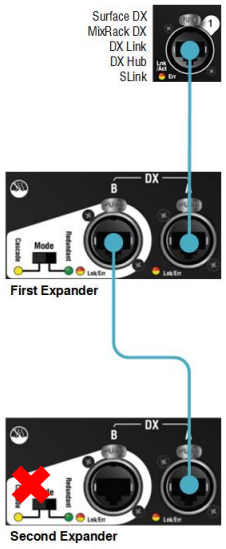
When using an Ethernet switch or media converter, we suggest you check for errors and test for functionality and reliability before putting your system into service.

Most standard CAT5 to Fibre Optic converters will work, provided they support the required connection type / speed.

Cascade Mode

The DX168 and DX164-W both feature Cascade mode which allows 2 expanders to be daisy chained together on a single DX or SLink connection.

Any combination of two DX168/DX164-W expanders is supported per socket in Cascade mode with all inputs and outputs accessible to the mix engine.



DX Expander 1

Mode = Cascade
DX A = Connect to the **Surface**, **MixRack**, **SQ**, **DX Link** or **DX Hub** device
DX B = Connect to the second **DX168** or **DX164-W** expander

DX Expander 2

Mode = Cascade
DX A = Connect to the first **DX168** or **DX164-W** expander
DX B = Disabled

Please refer to the table below for channel mapping when using DX Expanders in Cascade mode.

DX Expander 1				DX Expander 2		
	IN	**OUT**			**IN**	**OUT**
DX168	1-16	1-8		DX168	17-32	9-16
DX164-W	1-16	1-4		DX164-W	17-32	9-12

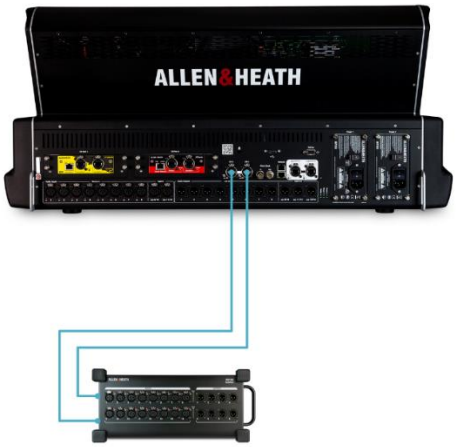
ⓘ Each cable can be 100m allowing 200m between DX socket and 2nd device.
ⓘ DX32 Expanders do not support Cascade mode.
ⓘ Redundancy is not possible for DX Expanders in Cascade mode.

Redundancy

All DX Expanders can be connected in dual-cable redundant mode (32x32) to compatible hardware.

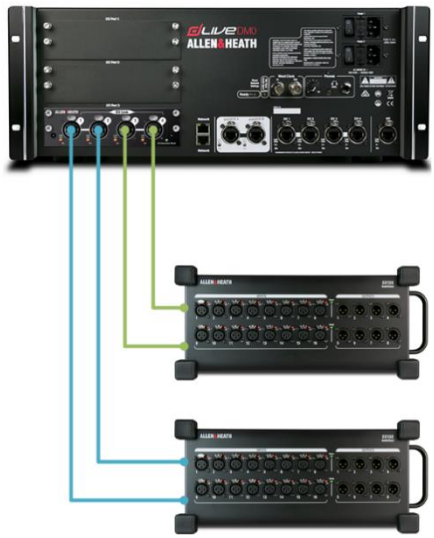
ⓘ SQ does not support DX redundancy.

dLive S Class Surfaces and MixRacks have integrated redundant DX sockets; DX1/2 & DX3/4 on the MixRack and DX5/6 on the Surface. They can also be used with DX Link and/or DX Hub options to add further redundant DX expanders.

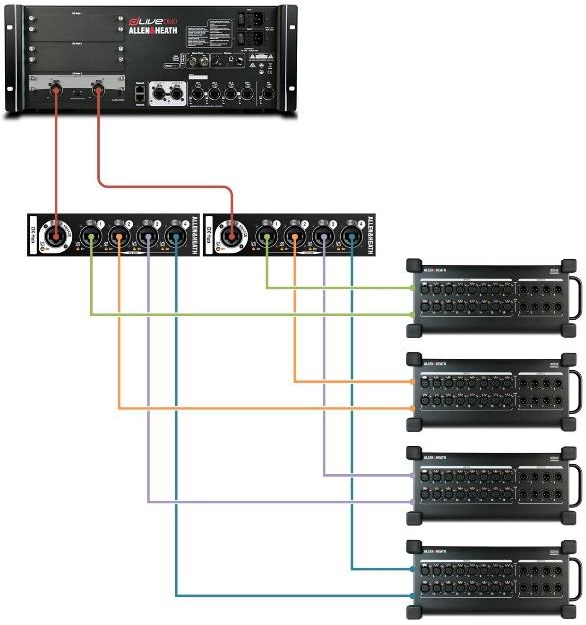


dLive C Class Surfaces and MixRacks can benefit from DX redundancy via the use of DX Link and/or DX Hub options.

DX Link features a Global Redundancy setting which allows 2x redundant DX streams (DX1/2 & DX3/4) per module.



Two DX Hub units can be used to achieve DX redundancy for up to 4 DX expanders. Both DX Hub units connect to a single gigaACE I/O module.



dLive S Class Hardware Connectivity

DM0/DM32/DM48/DM64

Up to **448x448** channels of DX expansion

Socket:	Connects to:	
DX 1	**DX32** *or* **DX168** *and/or* **DX164-W**	(32x32)
DX 2	Redundant connection for DX 1 only	(32x32)
DX 3	**DX32** *or* **DX168** *and/or* **DX164-W**	(32x32)
DX 4	Redundant connection for DX 3 only	(32x32)
I/O Port 1	**DX Link** *or* **gigaACE→DX Hub**	(128x128)
I/O Port 2	**DX Link** *or* **gigaACE→DX Hub**	(128x128)
I/O Port 3	**DX Link** *or* **gigaACE→DX Hub**	(128x128)

S3000 / S5000 / S7000

Up to **288x288** channels of DX expansion

Socket:	Connects to:	
DX 5	**DX32** *or* **DX168** *and/or* **DX164-W**	(32x32)
DX 6	Redundant connection for DX 5 only	(32x32)
I/O Port 4	**DX Link** *or* **gigaACE→DX Hub**	(128x128)
I/O Port 5	**DX Link** *or* **gigaACE→DX Hub**	(128x128)

dLive C Class Hardware Connectivity

CDM32 / CDM48 / CDM64

Up to **192x192** channels of DX expansion

Socket:	Connects to:	
DX 1	**DX32** *or* **DX168** *and/or* **DX164-W**	(32x32)
DX 3	**DX32** *or* **DX168** *and/or* **DX164-W**	(32x32)
I/O Port 1	**DX Link** *or* **gigaACE→DX Hub**	(128x128)

C1500 / C2500 / C3500

Up to **160x160** channels of DX expansion

Socket:	Connects to:	
DX 5	**DX32** *or* **DX168** *and/or* **DX164-W**	(32x32)
I/O Port 4	**DX Link** *or* **gigaACE→DX Hub**	(128x128)

ⓘ For DX redundancy with C Class hardware use **DX Hub** or **DX Link** options

SQ Hardware Connectivity

SQ-5 / SQ-6 / SQ-7

Up to **256x256** channels of DX expansion

Socket:	Connects to:	
SLink	**DX32** *or* **DX168** *and/or* **DX164-W**	(32x32)
	DX Hub	(128x128)
I/O Port	**SLink I/O Module→DX32** *or* **DX168** *and/or* **DX164-W**	(32x32)
	SLink I/O Module→DX Hub	(128x128)

ⓘ DX32 is scheduled for support in SQ firmware V1.4

DX Expander Connectivity

DX32

The **DX32** is a modular expander offering 4x 8 channels slots to fit a selection of analogue or AES3 digital I/O.

Socket:	Connects to:	
DX A	**Surface** *or* **MixRack** *or* **SLink** *or* **DX Link** *or* **DX Hub**	(32x32)
DX B	Redundant connection for DX A	(32x32)

ⓘ SQ DX32 support is scheduled for SQ firmware V1.2

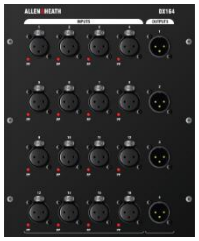
8 Channel Module Options

- **M-AIN** - 8 Recallable Preamps With XLR Connectors For Balanced Or Unbalanced Microphone And Line Level Signals. Gain, Pad And 48V Are Digitally Controlled Within The Preamp
- **M-AOUT** - Line Level, Balanced XLR Outputs. The Outputs Are Relay Protected To Prevent Power On Or Off Thumps
- **M-DIN** - 4x Stereo AES3 Inputs On XLR With SRC (32kHz – 192kHz Sampling Rate). Sample Rate Conversion Can Be Bypassed For 96kHz Operation
- **M-DOUT** - 4x Stereo AES3 Outputs On XLR (44.1kHz, 48kHz, 88.2kHz Or 96kHz Switchable)

http://www.allen-heath.com/ahproducts/dx32/

DX168 / DX164-W

The **DX168** is a fixed format expander offering 16 inputs and 8 outputs in a rugged stage box.
The **DX164-W** is a fixed format expander offering 16 inputs and 4 outputs in a wall mountable chassis.



Connection Options

Mode =	Cascade	
DX A	**Surface** *or* **MixRack** *or* **DX Link** *or* **DX Hub** (if 1st device)	(32x32)
	DX168/DX164-W (if 2nd device)	(32x32)
DX B	**DX168**/**DX164-W** (if 1st device)	(32x32)
	Not Used (if 2nd device)	(32x32)
Mode =	Redundant	
DX A	**Surface** *or* **MixRack** *or* **DX Link** *or* **DX Hub**	(32x32)
DX B	Redundant connection for DX 1	(32x32)

http://www.allen-heath.com/ahproducts/dx168/
http://www.allen-heath.com/ahproducts/dx164-w/

DX Distribution Connectivity

The DX Link and DX Hub both offer 128x128 channels of 96kHz audio via 4 DX sockets, each capable of 32x32 channels of audio.

DX Link

DX Link is ideal for live music and theatre applications as well as any environment where the DX expander(s) are located within 100m of the dLive Surface or MixRack.

- Installs into any I/O port in the system
- 4 DX Link sockets – 32x32 each
- Switchable redundant mode (1/2 & 3/4)
- Up to 5 DX Link in S Class systems
- Up to 3 DX Link in C Class systems
- 128x128 DX channels per DX Link module

Up to **128x128** channels of DX expansion

Socket:	Connects to:	
DX 1	**DX32** *or* **DX168** *or* **DX164-W**	(32x32)
DX 2	**DX32** *or* **DX168** *or* **DX164-W** *or* redundant DX1 connection	(32x32)
DX 3	**DX32** *or* **DX168** *or* **DX164-W**	(32x32)
DX 4	**DX32** *or* **DX168** *or* **DX164-W** *or* redundant DX3 connection	(32x32)

ⓘ Redundancy ON/OFF is global per DX Link module

http://www.allen-heath.com/ahproducts/dx-link/

DX Hub

DX Hub is particularly suited to Install and Commercial Audio applications and any environment where it is desirable to run a single “trunk” CAT5e cable to the DX Hub from the dLive or SQ system.

- Connects to **gigaACE** I/O module in dLive MixRack or Surface
- Connects to **SLink** socket on SQ
- 4 DX Link sockets - 32x32 each
- Up to 5 DX Hub in S Class systems
- Up to 3 DX Hub in C Class systems
  Up to 2 DX Hub in SQ systems
- Use two DX Hubs for redundancy (dLive only)
- 128x128 DX channels per DX Hub module

Up to **128x128** channels of DX expansion

Socket:	Connects to:	
gigaACE	**gigaACE** I/O Module / **SLink** socket on SQ	(128x128)
DX 1	**DX32** *or* **DX168** *or* **DX164-W**	(32x32)
DX 2	**DX32** *or* **DX168** *or* **DX164-W**	(32x32)
DX 3	**DX32** *or* **DX168** *or* **DX164-W**	(32x32)
DX 4	**DX32** *or* **DX168** *or* **DX164-W**	(32x32)

http://www.allen-heath.com/ahproducts/dx-hub/

Channel Mapping – DX Link and DX Hub

Please refer to the table below for channel mapping when using DX Expanders in conjunction with **DX Link** or **DX Hub** hardware.

On **dLive**, DX Hub & DX Link patching is performed on the **I/O page** under the appropriate **I/O Port** tab.
On **SQ**, DX Hub patching is performed on the **I/O page** under the **SLink (gigaACE)** or **I/O Port (gigaACE)** tab.

DX168 Non-Redundant

		IN	OUT
Link 1	DX1	1-16	1-8
	DX1 (Cascade)	17-32	17-24
Link 2	DX2	33-48	33-40
	DX2 (Cascade)	49-64	49-56
Link 3	DX3	65-80	65-72
	DX3 (Cascade)	81-96	81-88
Link 4	DX4	97-112	97-104
	DX4 (Cascade)	113-128	113-120

DX164-W Non-Redundant

		IN	OUT
Link 1	DX1	1-16	1-4
	DX1 (Cascade)	17-32	17-20
Link 2	DX2	33-48	33-36
	DX2 (Cascade)	49-64	49-52
Link 3	DX3	65-80	65-68
	DX3 (Cascade)	81-96	81-84
Link 4	DX4	97-112	97-100
	DX4 (Cascade)	113-128	113-116

DX32 Non-Redundant

		IN	OUT
Link 1	DX32-1 card 1	1-8	1-8
	DX32-1 card 2	9-16	9-16
	DX32-1 card 3	17-24	17-24
	DX32-1 card 4	25-32	25-32
Link 2	DX32-2 card 1	33-40	33-40
	DX32-2 card 2	41-48	41-48
	DX32-2 card 3	49-56	49-56
	DX32-2 card 4	57-64	57-64
Link 3	DX32-3 card 1	65-72	65-72
	DX32-3 card 2	73-80	73-80
	DX32-3 card 3	81-88	81-88
	DX32-3 card 4	89-96	89-96
Link 4	DX32-4 card 1	97-104	97-104
	DX32-4 card 2	105-112	105-112
	DX32-4 card 3	113-120	113-120
	DX32-4 card 4	121-128	121-128

Mixed Devices Non-Redundant Example

		IN	OUT
Link 1	DX32-1 card 1	1-8	1-8
	DX32-1 card 2	9-16	9-16
	DX32-1 card 3	17-24	17-24
	DX32-1 card 4	25-32	25-32
Link 2	DX168	33-48	33-40
	DX164-W (Cascade)	49-64	49-52
Link 3	DX164-W	65-80	65-68
	DX168 (Cascade)	81-96	81-88
Link 4	DX32-4 card 1	97-104	97-104
	DX32-4 card 2	105-112	105-112
	DX32-4 card 3	113-120	113-120
	DX32-4 card 4	121-128	121-128

DX168 Redundant

		IN	OUT
Link 1/2	DX1	1-16	1-8
Link 3/4	DX3	65-80	65-72

DX164-W Redundant

		IN	OUT
Link 1/2	DX1	1-16	1-4
Link 3/4	DX3	65-80	65-68

DX32 Redundant

		IN	OUT
Link 1/2	DX32-1 card 1	1-8	1-8
	DX32-1 card 2	9-16	9-16
	DX32-1 card 3	17-24	17-24
	DX32-1 card 4	25-32	25-32
Link 3/4	DX32-3 card 1	65-72	65-72
	DX32-3 card 2	73-80	73-80
	DX32-3 card 3	81-88	81-88
	DX32-3 card 4	89-96	89-96

Mixed Devices Redundant Example

		IN	OUT
Link 1/2	DX168	1-16	1-8
Link 3/4	DX32-3 card 1	65-72	65-72
	DX32-3 card 2	73-80	73-80
	DX32-3 card 3	81-88	81-88
	DX32-3 card 4	89-96	89-96