

ALLEN & HEATH



DX & GX System Guide



Overview

The DX & GX systems enable engineers to increase analogue and AES3 digital I/O in dLive, Avantis, AHM and SQ systems via the use of DX Expanders, GX Expanders and DX Distribution options.

Protocols

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/DX012 expanders.

The **GX** and **gigaACE** protocols carry 128x128 channels of 96kHz audio per connection.

Each GX connection can accommodate 1x GX4816 expander, and additionally up to 2x DX32, or up to 4x DX168/DX164-W/DX012 expanders connected to the GX4816.

The **ME** and **dSnake** protocols carry 0x40 and 40x40 channels respectively of 48kHz audio per connection.

Each ME connection can accommodate an unlimited number of ME devices, via daisy chaining and/or a ME-U or PoE hub.

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

SLink

The **SLink** port, found on SQ, Avantis and AHM mixers, is a multi-protocol port which supports connection via **DX**, **GX**, **gigaACE**, **ME** and **dSnake**.

① AHM does not support ME connections.

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 firmware V1.4 or higher required for DX32 support

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)
- **M-DX32-INPR** – Premium 8 channel microphone preamp
- **M-DX32-OUTPR** - Premium 8 channel line-output

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

DX168 / DX164-W / DX012

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.

The **DX012** is a fixed format expander offering 12-16 outputs (depending on configuration) in a 1u rack mountable format .

Connection Options

Mode = Cascade

DX A **Surface or MixRack or SLink or DX Link or DX Hub** (if 1st device) (32x32)
 DX168/DX164-W/DX012 (if 2nd device) (32x32)

DX B **DX168/DX164-W/DX012** (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/>

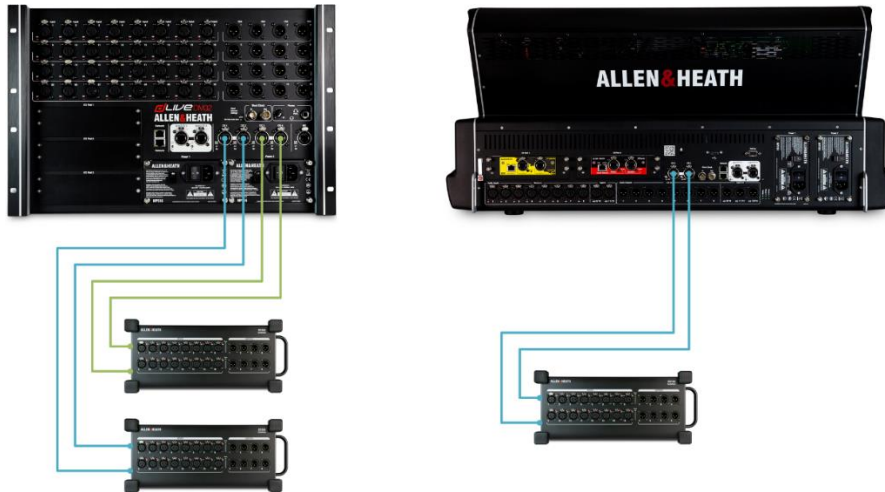


DX Redundancy

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

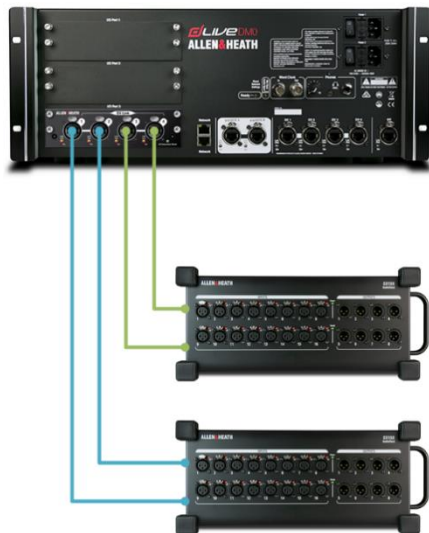
❗ SQ and AHM don't support DX redundancy.

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.

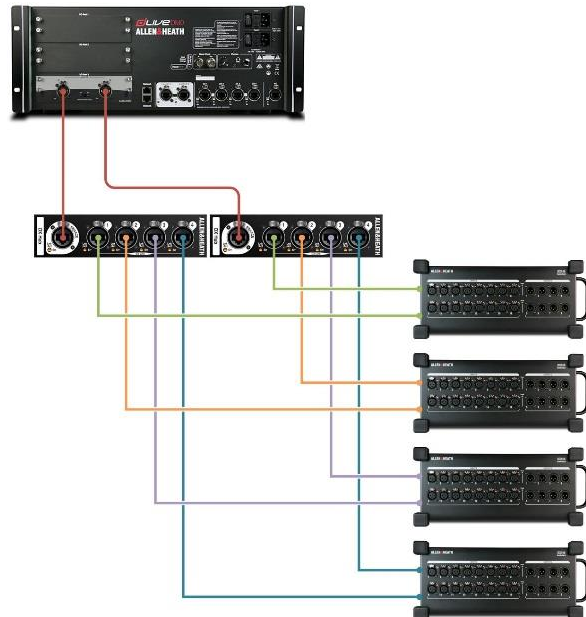


dLive C Class Surfaces, C Class MixRacks and Avantis mixers can benefit from DX redundancy via the use of DX Link and/or DX Hub options.

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 in a dLive or Avantis system:

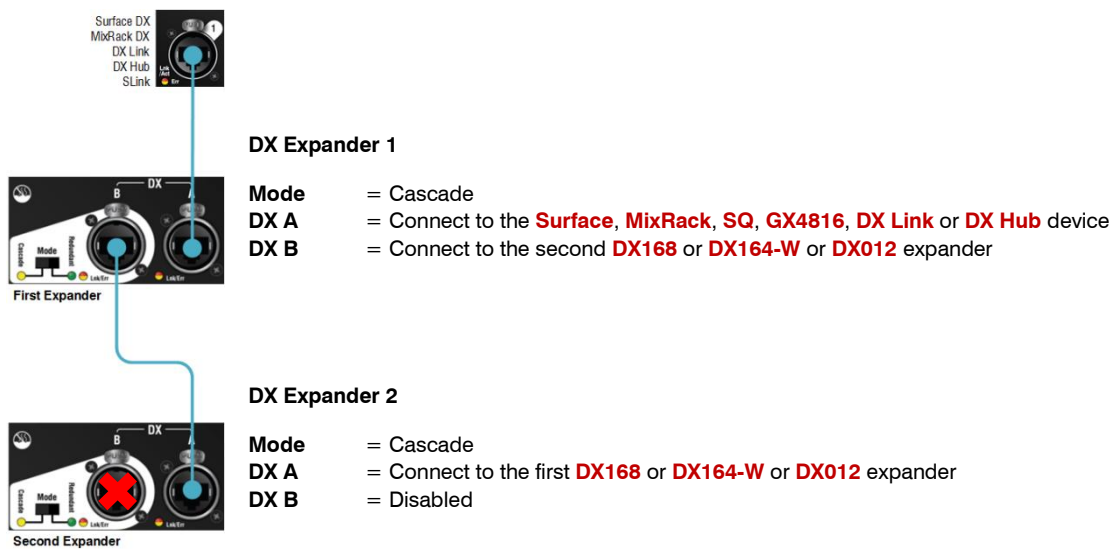


DX Cascade Mode

The **DX168**, **DX164-W** and **DX012** all 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/DX012 expanders is supported per socket in Cascade mode, with all inputs and outputs accessible to the mix engine.



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

DX Expander 1 (1-16)

	IN	OUT
DX168	1-16	1-8
DX164-W	1-16	1-4
DX012	n/a	1-16

DX Expander 2 (17-32)

	IN	OUT
DX168	17-32	17-24
DX164-W	17-32	17-20
DX012	n/a	17-32

- ① Each cable can be 100m allowing 200m between DX socket and 2nd device.
- ① DX32 Expanders do not support Cascade mode.
- ① Redundancy is not possible for DX Expanders in Cascade mode.

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, dLive MixRack or Avantis mixer.

- Installs into any I/O port in the system;
 - dLive Surface
 - dLive MixRack
 - Avantis Mixer
- 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
- Up to 2 DX Link in Avantis systems
- 128x128 DX channels per DX Link module



To DX Expanders

(32x32)
(32x32)
(32x32)
(32x32)

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

Socket:	Connects to:
DX 1	DX32 or up to 2 of DX168 / DX164-W / DX012
DX 2	DX32 or up to 2 of DX168 / DX164-W / DX012 or redundant DX1 connection
DX 3	DX32 or up to 2 of DX168 / DX164-W / DX012
DX 4	DX32 or up to 2 of DX168 / DX164-W / DX012 or redundant DX3 connection

ⓘ 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:
 - dLive via **gigaACE** I/O module in dLive MixRack or Surface
 - Avantis via **SLink** socket and/or **gigaACE** I/O module(s)
 - SQ / AHM via **SLink**
- 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 3 DX Hub in Avantis systems
- Up to 2 DX Hub in SQ systems
- Up to 2 DX Hub in AHM systems
- Use two DX Hubs for redundancy (dLive only)
- 128x128 DX channels per DX Hub module



To DX Expanders

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

Socket:	Connects to:	
gigaACE	gigaACE I/O Module / SLink socket	(128x128)
DX 1	DX32 or up to 2 of DX168 / DX164-W / DX012	(32x32)
DX 2	DX32 or up to 2 of DX168 / DX164-W / DX012	(32x32)
DX 3	DX32 or up to 2 of DX168 / DX164-W / DX012	(32x32)
DX 4	DX32 or up to 2 of DX168 / DX164-W / DX012	(32x32)

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



To DX Expanders

GX Expander Connectivity

GX4816

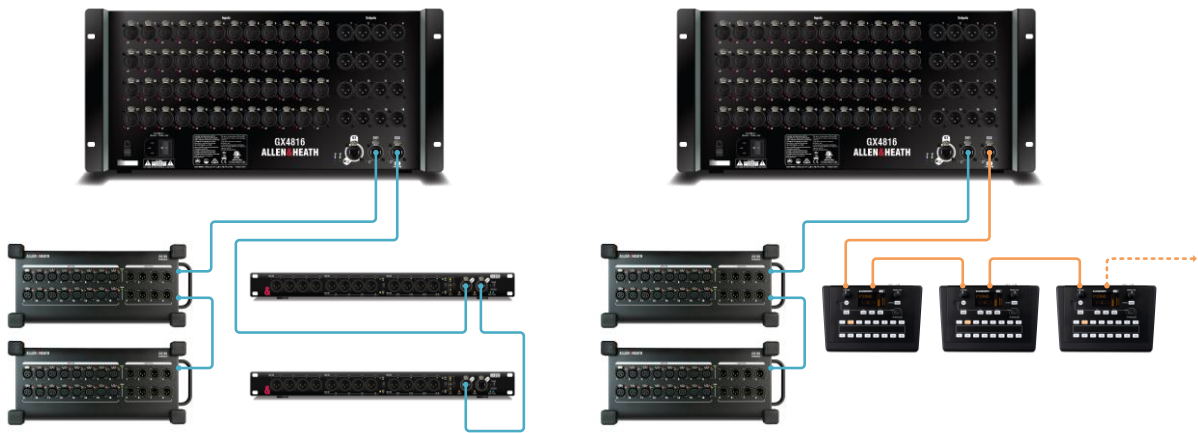
The **GX4816** is a fixed format expander offering 48 inputs and 16 outputs in a freestanding or rack-mountable chassis. In addition, 2x DX expansion ports are provided with the second DX port enabling ME Personal Mixing System compatibility.

- ❗ DX1 and DX2 on the GX4816 cannot be used for redundant connections to DX expanders.
- ❗ When connected to a ME-U, ME-1 or ME-500, the DX2 port is self-configured as a 40ch, 48kHz output only port for the ME personal mixing system. Channel names and stereo links are communicated to connected ME systems. The ME patch in SQ or Avantis will be automatically sent to this port and will override any output patch to DX2.
- ❗ ME connection via DX2 is not supported when connected to a dLive or AHM system.
- ❗ dLive compatibility with GX4816 requires firmware V1.86 or higher

<https://www.allen-heath.com/ahproducts/io-gx4816/>



Socket:	Connects to:	
GX	gigaACE I/O Module / SLink socket on SQ/Avantis/AHM	(128x128)
DX 1	DX32 or up to 2 of DX168 / DX164-W / DX012	(32x32)
DX 2	DX32 or up to 2 of DX168 / DX164-W / DX012	(32x32)
<i>or</i>		
DX 2	ME Personal Mixing System	(0x40)
	(not supported when connected to dLive or AHM)	



Connecting to Avantis

Avantis



Up to **384x384** channels of DX/GX expansion

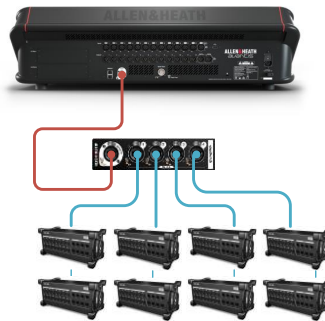
Socket:	Connects to:	
SLink	DX32 or up to 2 of DX168 / DX164-W / DX012	(32x32)
	DX Hub	(128x128)
	GX4816	(128x128)
I/O Port 1	DX Link	(128x128)
	gigaACE→DX Hub	(128x128)
	gigaACE→GX4816	(128x128)
I/O Port 2	DX Link	(128x128)
	gigaACE→DX Hub	(128x128)
	gigaACE→GX4816	(128x128)

Avantis & DX

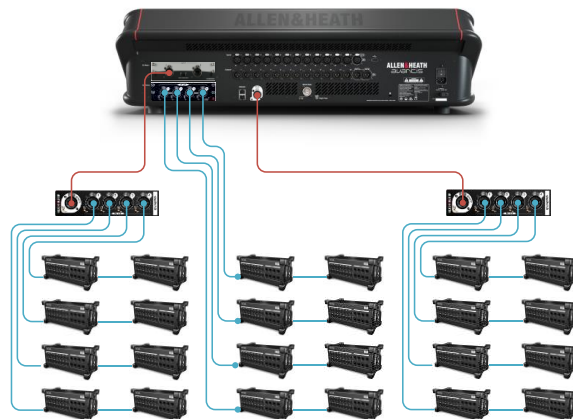
The integrated SLink port on Avantis allows the direct connection of 1x DX32 or up to 2x DX168/DX164-W/DX012 expanders.



Alternatively, a DX Hub can be connected to the SLink port, or a gigaACE I/O module, to provide 4x DX connections enabling the use of up to 8 DX expanders.

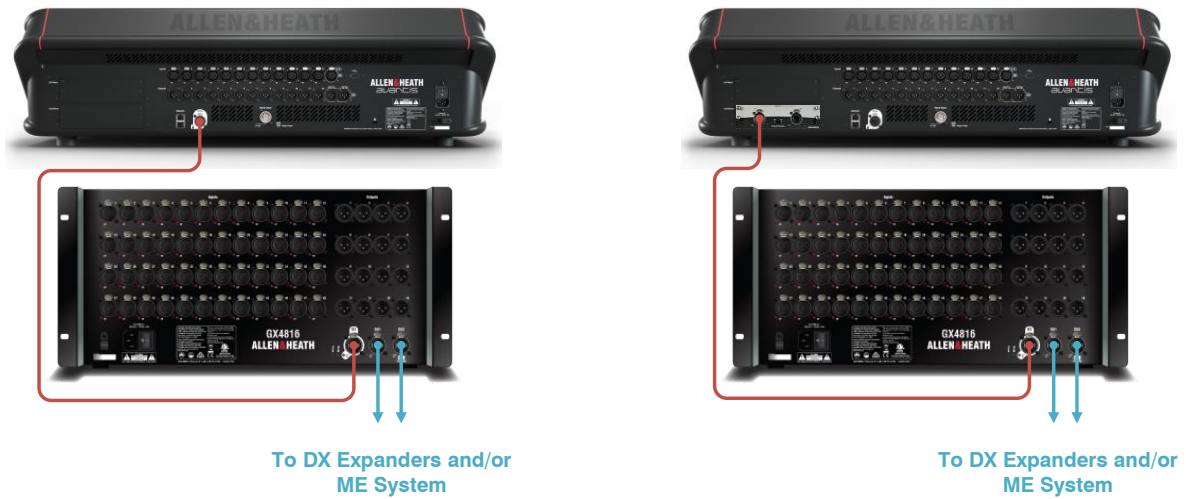


Up to 2x DX Link I/O modules, or gigaACE+DX Hub combinations, can be installed in the I/O ports to further expand DX connectivity up to a maximum of 24x DX Expanders



Avantis & GX

The integrated SLink port on Avantis allows the direct connection of 1x GX4816. An optional gigaACE I/O card can also be used for direct connection to a GX4816.



Connection of up to 3x GX4816s is supported via the use of both the internal SLink port and up to 2x gigaACE I/O modules.



① For information on supported DX and ME connections to a GX, please see the [GX Expander Connectivity](#) section.

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.

dLive & Avantis: DX Hub & DX Link patching is performed on the **I/O page** under the appropriate **I/O Port** tab.

SQ: DX Hub patching is performed on the **I/O page** under the **SLink** or **I/O Port** tab.

AHM: DX Hub patching is performed on the **Assign page** under the **I/O Patchbay** 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

DX012 Non-Redundant

		IN	OUT
Link 1	DX1	n/a	1-16
	DX1 (Cascade)	n/a	17-32
Link 2	DX2	n/a	33-48
	DX2 (Cascade)	n/a	49-64
Link 3	DX3	n/a	65-80
	DX3 (Cascade)	n/a	81-96
Link 4	DX4	n/a	97-112
	DX4 (Cascade)	n/a	113-128

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

DX012 Redundant Example

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

GX4816 – DX/ME Sockets

Please refer to the table below for channel mapping when using DX Expanders in conjunction with a GX4816.

dLive: GX4816 patching is performed on the **I/O page** under the appropriate **I/O Port** tab.

Avantis & SQ: GX4816 patching is performed on the **I/O page** under the **SLink** or **I/O Port** tab.

AHM: GX4816 patching is performed on the **Assign page** under the **I/O Patchbay** tab.

① If a ME Personal Mixing system is connected to the DX2 socket on the GX4816, patching to the ME system is performed on the **I/O page** under the **ME** tab (all mixers).

① Connection of a ME system via DX2 is not supported on dLive and AHM systems.

GX4816 Local I/O

	IN	OUT
Analogue	1-48	1-16

DX168 Non-Redundant

		IN	OUT
DX 1	DX1	65-80	65-72
	DX2 (Cascade)	81-96	81-88
DX 2	DX2	97-112	97-104
	DX2 (Cascade)	113-128	113-120

DX164-W Non-Redundant

		IN	OUT
DX 1	DX1	65-80	65-68
	DX1 (Cascade)	81-96	81-84
DX 2	DX2	97-112	97-100
	DX2 (Cascade)	113-128	113-116

DX32 Non-Redundant

		IN	OUT
DX 1	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
DX 2	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

DX012 Non-Redundant

		IN	OUT
DX 1	DX1	n/a	65-80
	DX1 (Cascade)	n/a	81-96
DX 2	DX2	n/a	97-112
	DX2 (Cascade)	n/a	113-128

Networking

The **DX** protocol is a Fast Ethernet point-to-point connection (100BASE-TX, IEEE 802.3u) and is Layer 2 compliant. Layer 2 network switches and media converters can be used, provided they support Fast Ethernet connections.

gigaACE, utilised by DX Hub and GX4816, 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 Gigabit Ethernet connections.

General Rules

Layer 2.5 and higher 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.

Cables

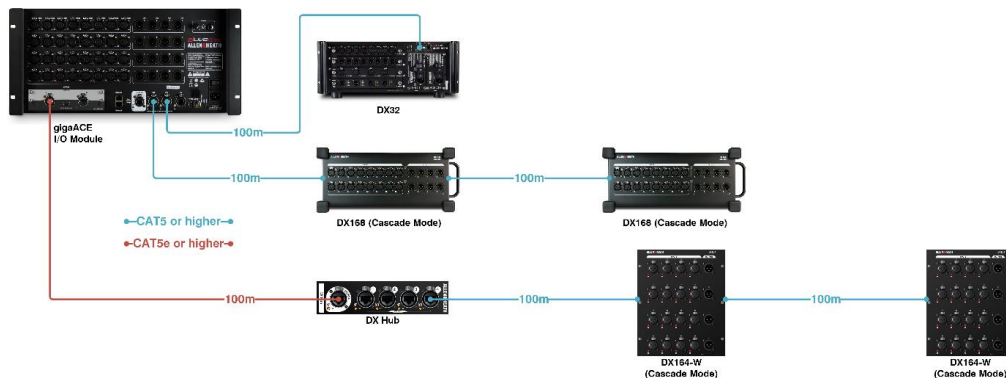
STP CAT5 (or higher) cables are required for connections to DX expanders.

STP CAT5e (or higher) cables are required for connections to DX Hub and GX4816

ⓘ 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 SQ/Avantis/dLive 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](#).



VLANs

It takes some trial and error to configure a VLAN for use with DX or gigaACE, and the actual configuration depends on the specific switch in use. **In our tests, we also found that many switches do not handle the gigaACE / DX packets with the time accuracy our clock requires**, particularly over trunk lines and SFP modules, resulting in sync errors and in some cases, audible glitches. Thus, use of VLANs is not officially supported and the notes below are given as a guideline only.

One VLAN is needed for each point-to-point connection i.e. you cannot have more than two DX / gigaACE devices on the same VLAN. No other traffic should be present on this VLAN.

The ports should be forced to 100Mbps (Fast Ethernet) for DX / ACE / dSNAKE, or Gigabit Ethernet for gigaACE - we had mixed experiences with auto-negotiating ports. The ports need full 100Mbps / 1000Mbps bandwidth. This means that, in order to have a gigaACE VLAN on a switch, the trunk between switches must be higher than Gigabit (10 Gigabit recommended).

ALL Layer 2.5 and higher protocols must be disabled, as mentioned above. Essentially any packet on the VLAN other than audio transport is likely to cause audible glitches. The VLAN should be fully transparent to Layer 2 traffic, with no extra packet. Also note that dLive firmware prior to V1.8 had gigaACE fixed to VLAN 1, which would often conflict with the management VLAN on some switches. The VLAN tag was removed in V1.8 allowing user tagging of gigaACE traffic.

Fibre optics

Most standard Cat5 to F.O. converters will work, provided they support the required connection type / speed (see above).