ALLEN HEATH AHM-16 Audio Matrix Processor User Guide

Contents

ALLEN&HEATH

ALLEN HEATH AHM-16 Audio Matrix Processor

Getting Started Guide

- Before starting please check **www.allen-heath.com** for the latest firmware and documentation.

Limited Three Years Manufacturer's Warranty

- Allen & Heath warrants this Allen &Heath -branded hardware product and accessories contained in the original packaging ("Allen & Heath Product") against defects in materials and workmanship when used in accordance with Allen & Heath's user manuals, technical specifications and other Allen & Heath product published guidelines for a period of THREE (3) YEARS from the date of original purchase by the end-user purchaser ("Warranty Period").
- This warranty does not apply to any non-Allen & Heath branded hardware products or any software, even if packaged or sold with Allen & Heath hardware.
- Please refer to the licensing agreement accompanying the software for details of your rights with respect to the use of software/firmware ("EULA").
- Details of the EULA, warranty policy and other useful information can be found on the Allen & Heath website: **www.allen-heath.com/legal**.
- Repair or replacement under the terms of the warranty does not provide right to extension or renewal of the warranty period. Repair or direct replacement of the product under the terms of this warranty may be fulfilled with functionally equivalent service exchange units.
- This warranty is not transferable. This warranty will be the purchaser's sole and exclusive remedy and neither Allen & Heath nor its approved Service Centres shall be liable for any incidental or consequential damages or breach of any express or implied warranty of this product.

Conditions Of Warranty

- The equipment has not been subject to misuse either intended or accidental, neglect, or alteration other than as described in the User Guide or Service Manual, or approved by Allen & Heath.
- Any necessary adjustment, alteration or repair has been carried out by an authorized Allen & Heath distributor or agent.
- The defective unit is to be returned carriage prepaid to the place of purchase, an authorized Allen & Heath distributor or agent with proof of purchase. Please discuss this with the distributor or the agent before shipping. Units returned should be packed in the original carton to avoid transit damage.
- **DISCLAIMER:** Allen & Heath shall not be liable for the loss of any saved/stored data in products that are either repaired or replaced.
  Check with your Allen & Heath distributor or agent for any additional warranty information which may apply. If further assistance is required please contact Allen & Heath Ltd.

- Allen & Heath Limited, Kernick Industrial Estate, Penryn, Cornwall, TR10 9LU, UK
- **http://www.allen-heath.com**

IMPORTANT – Read before starting

- **Safety instructions**

Before starting, read the Important Safety Instructions printed on the sheet supplied with the equipment. For your own safety and that of the operator, technical crew and performers, follow all instructions and heed all warnings printed on the sheet and on the equipment panels.

- **System operating firmware**
  The function of AHM processor is determined by the firmware (operating software) that runs it. Firmware is updated regularly as new features are added and improvements made.
  - Check **www.allen-heath.com** for the latest version of firmware.
- **Software licence agreement**
  By using this Allen & Heath product and the software within it you agree to be bound by the terms of the relevant End User Licence Agreement (EULA), a copy of which can be found at **www.allen-heath.com/legal**. You agree to be bound by the terms of the EULA by installing, copying, or using the software.
- **Further information**
  Please refer to the Allen & Heath website for further information, knowledgebase and technical support. For more information on AHM setup and functions please refer to the AHM System Manager Help.
  - Check for the latest version of this Getting Started Guide.
- **General precautions**
  - Protect the equipment from damage through liquid or dust contamination.
  - If the equipment has been stored in sub-zero temperatures allow time for it to reach normal operating temperature before use at the venue.
  - Avoid using the equipment in extreme heat and direct sunlight. Make sure the ventilation slots are not obstructed and that there is adequate air movement around the equipment.
  - Clean the equipment with a soft brush and dry lint-free cloth. Do not use chemicals, abrasives or solvents.
  - It is recommended that servicing is carried out only by an authorized Allen & Heath agent. Contact details for your local distributor can be found on the Allen & Heath website. Allen & Heath do not accept liability for damage caused by maintenance, repair or modification by unauthorized personnel.
- **Register your product**
  Register your product online at **www.allen-heath.com/register**.

Packed items

Check you have received the following:

- AHM matrix processor
- This Getting Started Guide
- Safety Sheet
- IEC mains lead
- Phoenix connectors with strain relief – 1x 10-pin, 16x 3-pin (AHM-16), 24x 3-pin (AHM-32)

Introduction

- AHM-16 and AHM-32 are audio matrix processors for sound management and installation. They are designed for audio distribution, paging, conferencing, speaker processing in a multitude of environments including corporate, hospitality, education, event and multi-purpose venues, retail, theatres, cruise ships, sports venues.

- The AHM processor is complemented by an extended ecosystem of remote audio expanders, remote controllers, interfaces, apps and software. A family of portable, rack-mountable or wall-mount audio expanders is available with a choice of proprietary point-to-point Layer-2 or Dante transport protocols.
- A range of IP remote controllers is available for volume control, music source selection, preset recall and more. AHM can also integrate with third party devices over GPIO, TCP/IP, or industry standard control systems. The Custom Control editor and app from Allen & Heath offer more control options and custom user interfaces for multiple users and device types, with kiosk and BYOD capability.

AHM-16 features

AHM-16 features at a glance:

- 16×16 processing matrix
- 8×8 local analogue I/O
- I/O Port for expansion or audio networking, up to 128×128
- Dante 96kHz optional cards (AES67 and DDM ready)
- 16 configurable processing outputs – up to 16 mono / 8 stereo zones
- Sound management tools
    - Automatic Mic Mixer
    - ANC (Ambient Noise Compensation)
    - Priority ducking
    - 8-band PEQ, dynamics and delay on every input and zone
    - Speaker processing with x-over filter, delay, limiter and PEQ
- 96kHz FPGA core with ultra-low latency
- Compatible with Allen & Heath IP1, IP6, IP8 remote controllers
- 2×2 local GPIO plus networkable GPIO interface
- Front panel screen and 4x programmable SoftKeys
- 4 user profiles
- Event scheduler

AHM-32 features at a glance:

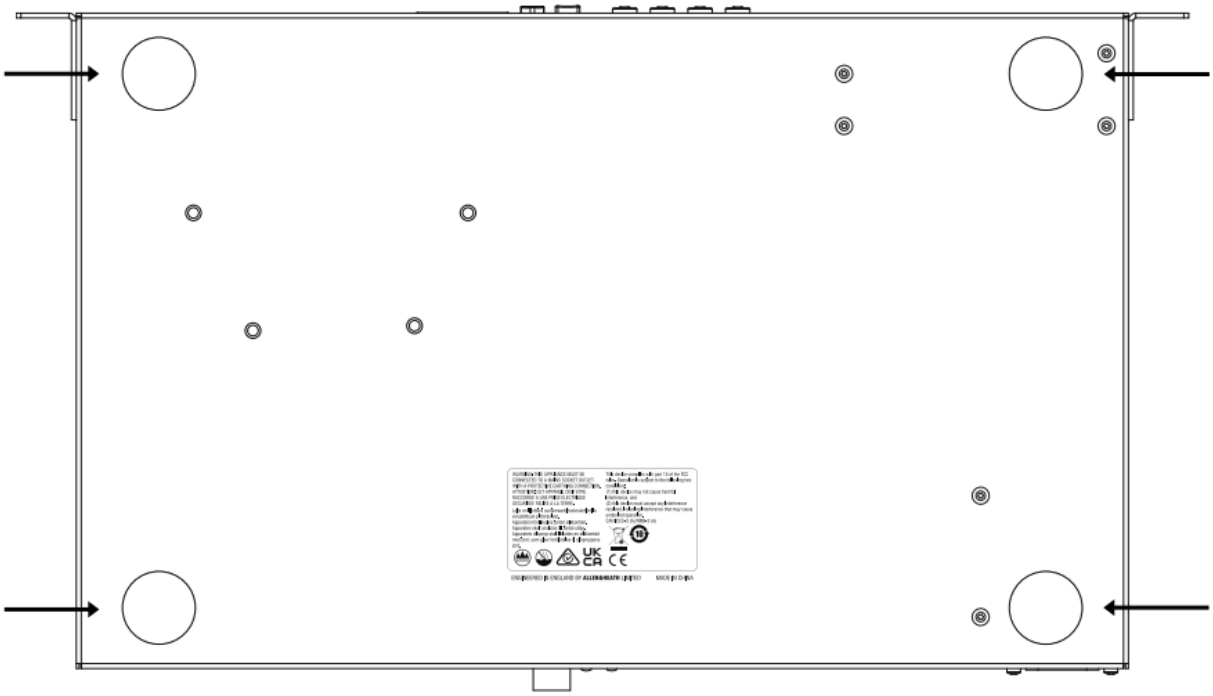
- 32×32 processing matrix
- 12×12 local analogue I/O
- I/O Port for expansion or audio networking, up to 128×128
- Dante 96kHz optional cards (AES67 and DDM ready)
- 32 configurable processing outputs – up to 32 mono / 16 stereo zones
- Sound management tools
    - 4x Automatic Mic Mixer
    - AEC (Acoustic Echo Cancellation)*
    - ANC (Ambient Noise Compensation)
    - Priority ducking
    - 8-band PEQ, dynamics and delay on every input and zone
    - Speaker processing with x-over filter, delay, limiter and PEQ * with optional module

- 96kHz FPGA core with ultra-low latency
- Compatible with Allen & Heath IP1, IP6, IP8 remote controllers
- 2×2 local GPIO plus networkable GPIO interface
- Front panel screen and 8x programmable SoftKeys
- 16 user profiles
- Event scheduler

Installing AHM-16 / AHM-32

Free standing

- For free standing or shelf operation, apply the adhesive plastic feet to the positions indicated below.

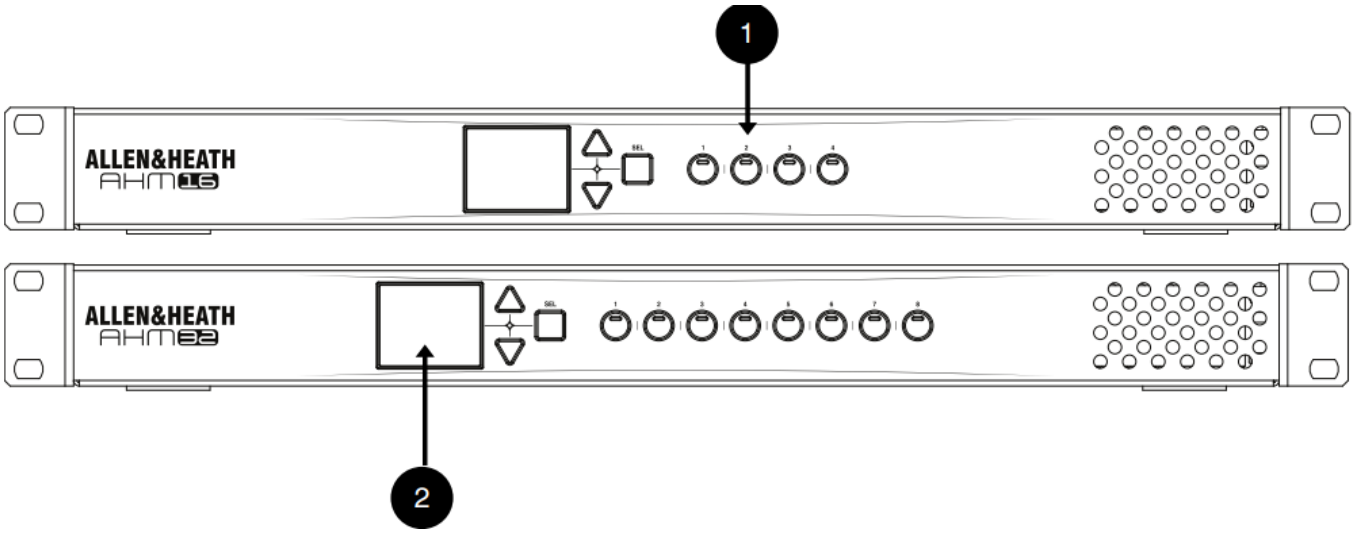


- Ensure adequate air flow around the unit. It must not be covered in any way. Always stand the unit on a firm flat surface away from any soft furnishings or carpet.

Rack mounting

- AHM-16 and AHM-32 are 19-inch rack mountable and occupy 1U of rack space. The plastic feet may need to be removed before rack mounting; retain them for future use.
    - Ensure natural convection of airflow around the unit by allowing good ventilation in front of and behind the unit. Rack equipment known to produce a significant amount of heat should not be mounted directly above or below the unit. Forced convection by means of a rack mounted fan-tray may be desirable in situations where space is restricted, and the ambient air temperature is high.

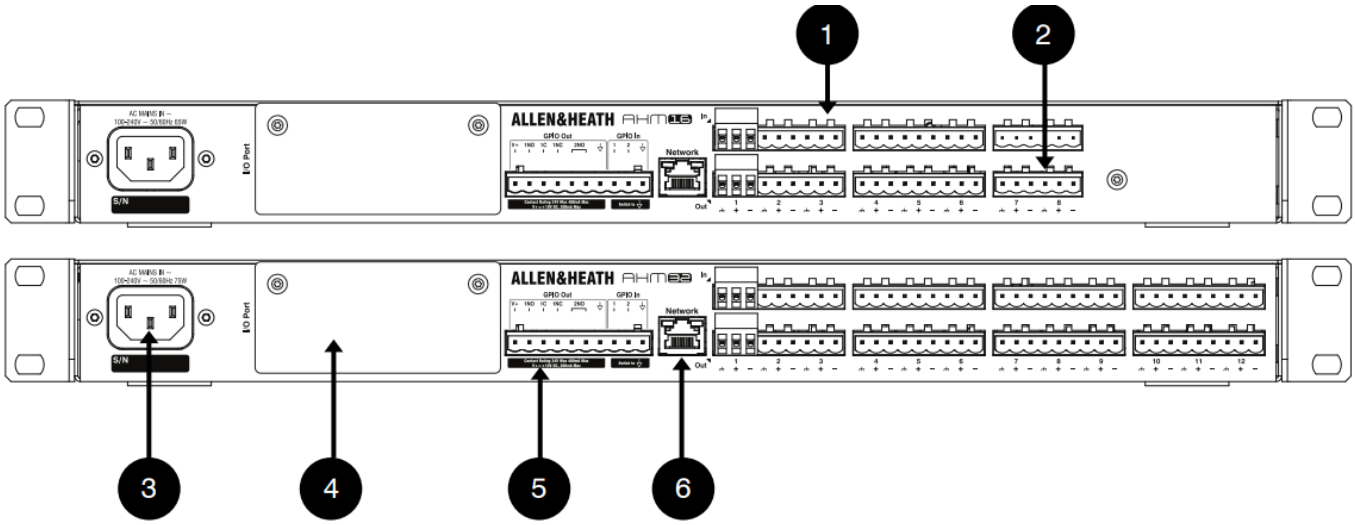
Front Panel



1. **Softkeys**
   Programmable SoftKeys for local user control. Functions are assigned by the AHM System Manager software and include Input / Zone / Crosspoint Mute, Level, Preset Recall, Preset Select, Paging, Zone Source Select.
2. **LCD Screen and Select buttons**
   The LCD screen displays information about the unit or the function selected by the front panel SoftKeys.
   A splash screen is displayed at power up. Use the arrow keys to sequence through information screens such as firmware version, network settings and diagnostics. This can be useful to identify the unit IP address before connecting.

- **Level** When a front panel SoftKey assigned to a Level is pressed, the screen will display the Input / Zone name, level and meter. Use the arrow keys to control the level. Source Select When a front panel SoftKey assigned to a Zone Source Selector is pressed, the screen will display a list of available sources as configured in
- **AHM** System Manager. Use the arrow keys to select the source and press Sel to confirm.
  The screen will then display the active source and the Zone name, level and meter. Use the arrow keys to control the level of the Zone. Press Sel again to select another source. Press the SoftKey again to exit Source Select mode.
- **Preset Select** When a front panel SoftKey assigned to Preset Select is pressed, the screen will display a list of available Presets as configured in AHM System
- **Manager.** Use the arrow keys to select the Preset and press Sel to recall.
  The screen will then display the active Preset. Press Sel again to select another Preset. Press the SoftKey again to exit Preset Select mode.

Rear Panel



1. **Mic/Line Inputs**

   Recallable preamps on Phoenix connectors, for balanced or unbalanced microphone and line level signals. Gain, Pad and 48V are digitally controlled within the preamp. Any socket can be patched to any of the Input Channels.

   Use the provided 3-pin Phoenix connectors with strain relief for optimal cable management.

2. **Line Outputs**

   Assignable line level, balanced outputs on Phoenix connectors. Nominal level +4dBu. The outputs are relay protected to prevent power on or off thumps.

   Use the provided 3-pin Phoenix connectors with strain relief for optimal cable management.

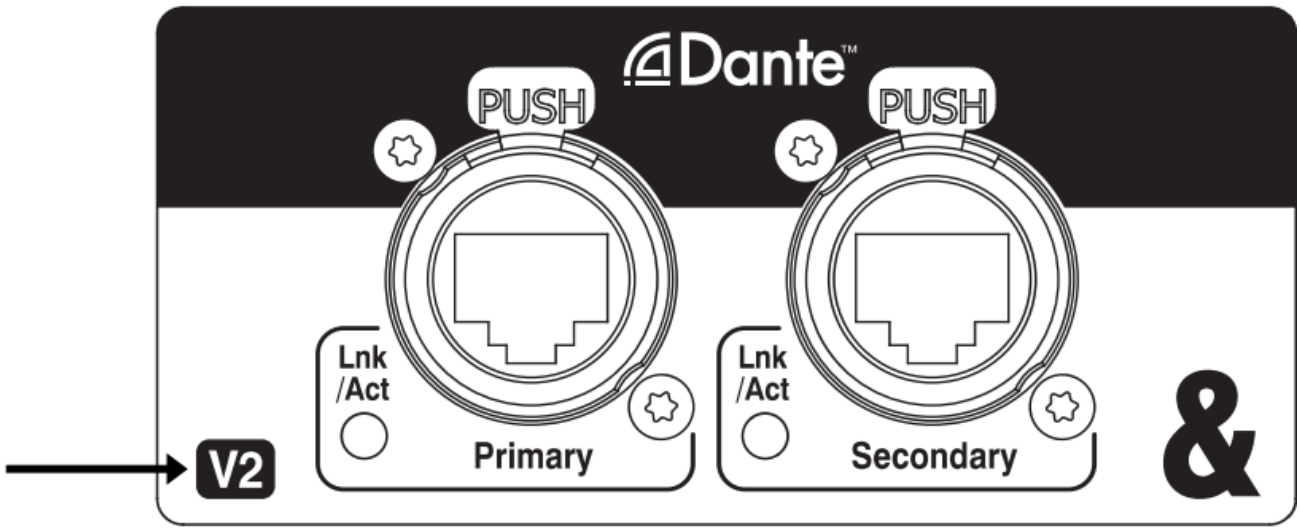
3. **Mains**

   IEC inlet with universal power supply (100-240V AC, 50-60Hz).

4. **I/O Port**

   Audio interface port providing up to 128×128 I/O. Fit one of the option cards available for system expansion, distributed audio networking or system integration. Refer to www.allen-heath.com for a list of available option cards.

   For Dante audio networking, use the M-SQ-DANT32 or M-SQ-DANT64 (SQ Dante V2) card, not the original M-SQ-DANTE card.



   The I/O Port panel is also used to access DIP switch 6 for network reset of the unit to default settings. Reset occurs with switch 6 in the On position at power up. After 10 seconds, turn off the unit and move the switch back to the Off position. Do not alter the position of the other DIP switches.

5. GPIO

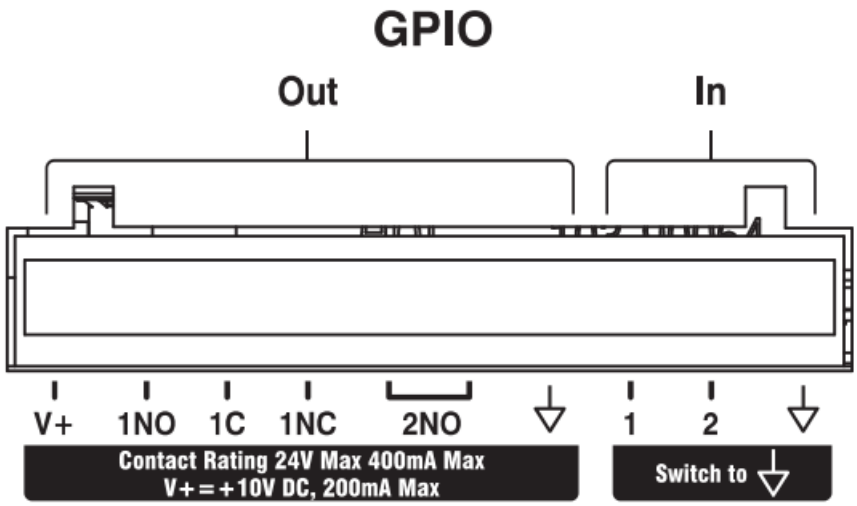
   General purpose interface for control integration with third party hardware. Offers 2x inputs switching to ground, and 2x relay outputs on Phoenix connectors, in addition to a +10V DC output.

   Maximum current drawn from the +10V supply for all outputs combined must not exceed 200mA

   Output 1 can be wired as normally closed or normally open. Output 2 is normally open.

   For higher current or voltage applications, an external DC power supply may be used. This also provides total isolation between the AHM processor and external equipment.

   Maximum external supply voltage must not exceed +24V DC. Maximum current sink through any open collector output must not exceed 400mA.



   Use the provided 10-pin Phoenix connector with strain relief for optimal cable management.

6. **Control Network**

   RJ45 Gigabit Ethernet port. Connect a laptop, wireless router or switch to use with the AHM System Manager, IP remote controllers, Custom Control app or TCP control. All devices on the network must have compatible IP addresses.

   To reset the network settings to factory default, see DIP switch settings in the I/O Port paragraph above.

AHM-32 Processing Expansion Module

- A processing expansion module can be fitted in the AHM-32 for applications like AEC (Acoustic Echo Cancelling). Refer to **www.allen-heath.com** for a list of available modules. Follow the fitting instructions of the optional module for installation.

  Installation of any optional module must only be carried out by technically skilled personnel.

6. Connections – Audio

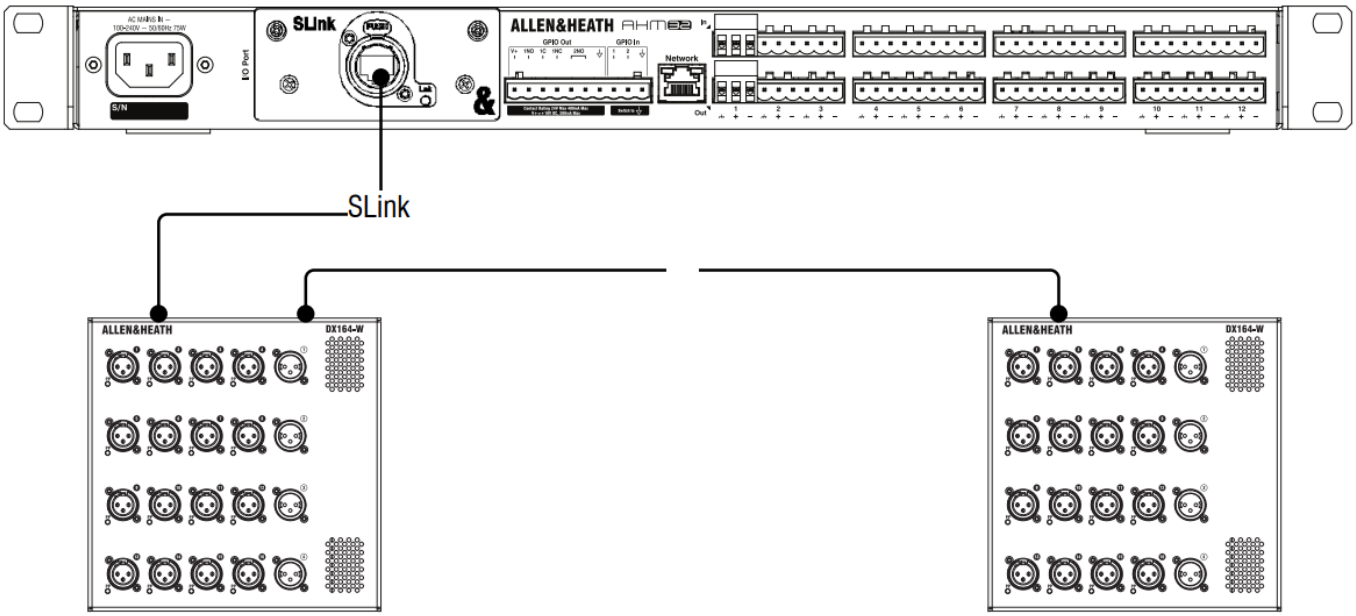
- For all audio connections, use CAT5e (or higher specification) STP cables up to 100m long.
  - Refer to **www.allen-heath.com** for cable requirements, recommendations, and a list of CAT cables available to order.

Audio expanders with SLink card fitted

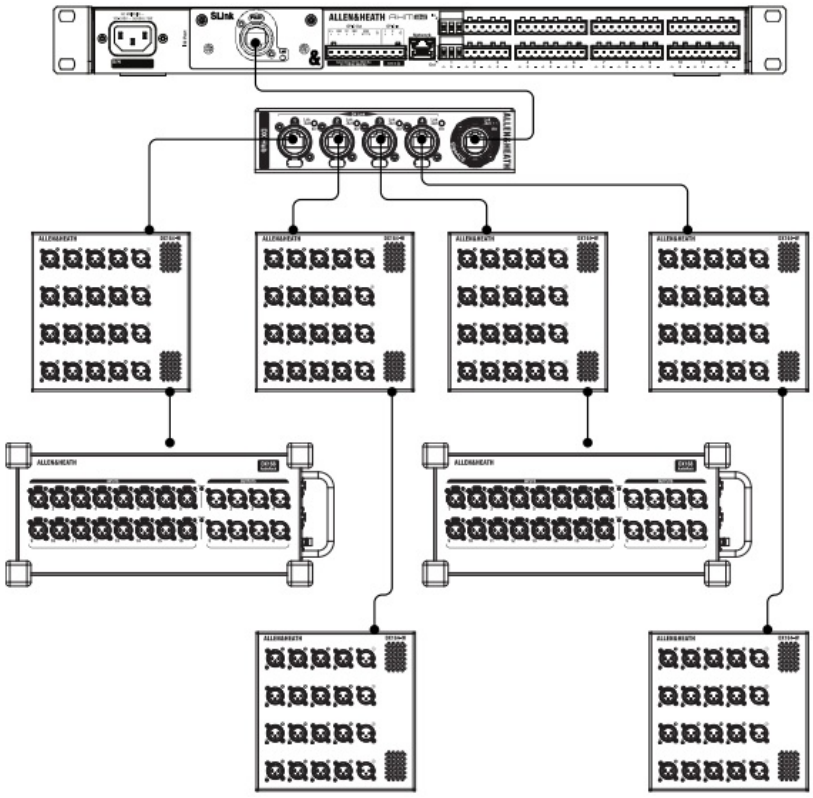
When an audio expander is connected, the SLink card detects the type of device and automatically switches to the relevant Allen & Heath protocol, sample rate and Ethernet speed. The table below lists compatible audio expanders. Visit **allen-heath.com/everything-io/** for more information on our range of expansion options.

	Sample Rate	Inputs	Outputs	Connection	Protocol	Ethernet speed
GX4816	96kHz	48	16	SLink port	gigaACE	Gigabit
DX32	96kHz	<32		SLink port or DX Hub	DX	Fast Ethernet
DX168	96kHz	16	8	SLink port or DX Hub	DX	Fast Ethernet
DX164-W	96kHz	16	4	SLink port or DX Hub	DX	Fast Ethernet
DX012	96kHz	0	12	SLink port or DX Hub	DX	Fast Ethernet
DX Hub	96kHz	128	128	SLink port	gigaACE	Gigabit
AR2412	48kHz	24	12	SLink port	dSnake	Fast Ethernet
AR84	48kHz	8	4	Slink port	dSnake	Fast Ethernet
AB168	48kHz	16	8	Slink port	dSnake	Fast Ethernet

- At connection or power up, the AHM processor will check the firmware version of the expander device and upgrade or downgrade the device to match the main unit firmware.
- Up to 2x dSnake 48kHz expanders can be daisy-chained over SLink, provided the first expander is an AR2412 or AB168, and the second expander is an AB168 or AR84. Connection of 2x AR2412 is not supported.
- Up to 2x DX168, DX164-W, DX012 expanders in any combination can be daisy-chained over SLink. AHM processors do not support redundant connection to DX expanders.



- A DX Hub can be connected to the SLink card for further expansion with up to 8 DX expanders. It also enables a single cable link to the AHM processor in cases where multiple expanders are located on a different floor, area or building.

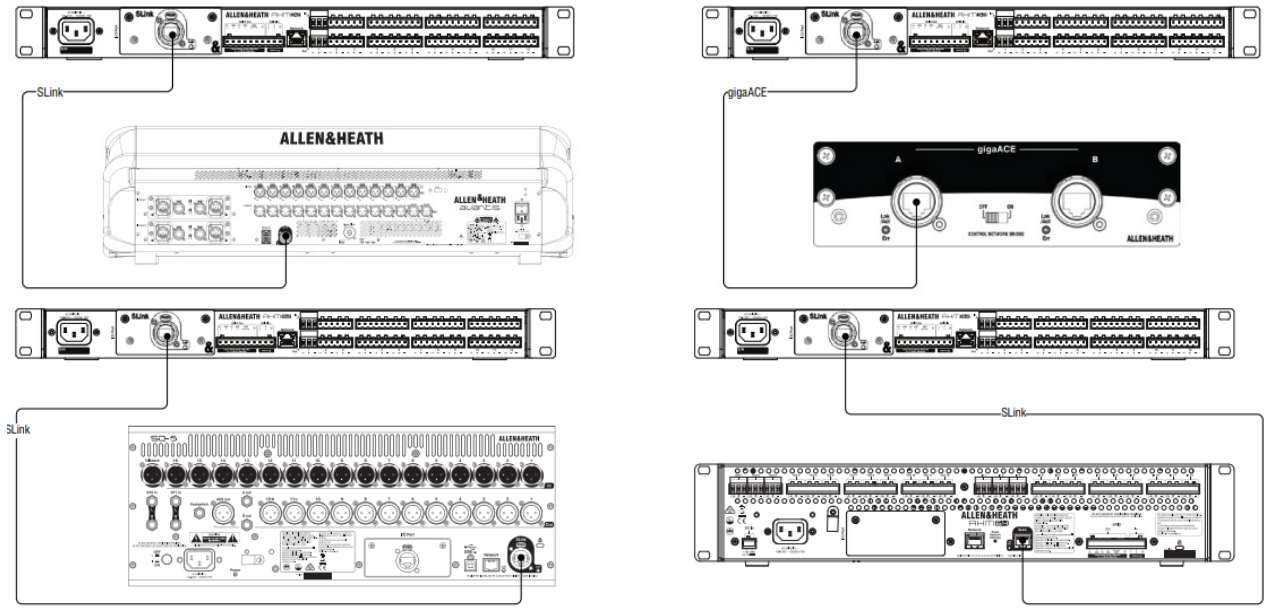


Audio expanders and Ethernet

- All protocols listed above are point-to-point connections, Ethernet Layer 2 compliant. gigaACE operates at Gigabit Ethernet speed (1000BASE-T, IEEE 802.3ab). DX and dSnake operate at Fast Ethernet speed (100BASE-TX, IEEE 802.3u).
- Layer 2 network devices and media converters can be used, provided they support the correct link speed. Typical applications include conversion to fibre optic for
- longer cable runs, or integration within an existing Ethernet infrastructure. Refer to the following guidelines and always test the network for functionality and reliability before putting into service. Further advice and notes on VLANs, TCP ports and bandwidth are available on the online Allen & Heath Knowledgebase and website.
    - 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 device should be plugged into a switch carrying gigaACE, dSnake or DX audio. Parallel connection of multiple expanders on the same switch is not possible.

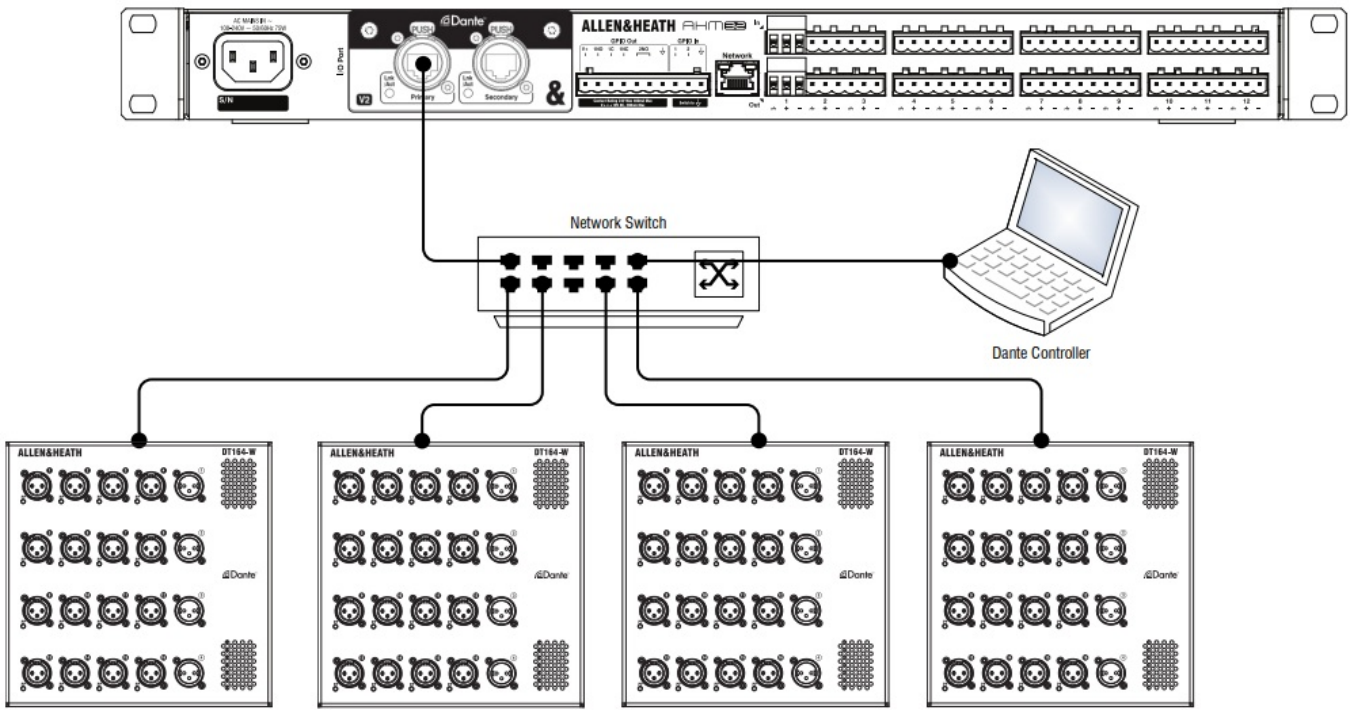
Other SLink connections

- The SLink card can be connected directly to another AHM processor, an SLink enabled Allen & Heath mixer such as SQ or Avantis, or a dLive system fitted with a gigaACE card. This connection enables 128×128 channels of audio.
    - Set the Audio Sync options so that one device is the clock leader (set to ‘Internal’) and the other device is a clock follower (sync from SLink or I/O Port as appropriate).
    - The SLink port does not tunnel control network data. Use the Network port to connect multiple AHM processors or other Allen & Heath mixers for control purposes, for example for Embedded Scene Recalls or System Manager operation.



Dante expanders with Dante card fitted

- Control of the DT168 or DT164-W expanders requires an M-SQ-DANT32 or M-SQ-DANT64 (SQ Dante V2) card fitted in the I/O Port.
- Use Dante Controller to patch signals between Dante devices. When a valid DT168 or DT164-W socket is routed to the AHM processor, and patched to an Input channel, System Manager will present preamp gain, +48V and Pad controls for the socket.
- DT expanders should always be clock followers on the Dante network, with the AHM-64 processor typically set to ‘Preferred Leader’ and ‘Enable Sync to External’.
    - Refer to the DT expander Getting Started Guide at www.allen-heath.com for further information.



Connections – Control

- A computer, wireless router or switch can be connected to the Network port to use with the AHM System

Manager, IP remote controllers, Custom Control app or TCP control.

- For all connections, use CAT5e (or higher specification) cables up to 100m long.
    - Refer to **www.allen-heath.com** for cable requirements, recommendations, and a list of CAT cables available to order.

      AHM processors communicate over TCP/IP. All devices on the network must have compatible IP addresses. Factory defaults for AHM-16 and AHM-32 are:
        - **IP Address**
            - 192.168.1.91
        - **Subnet Mask**
            - 255.255.255.0
        - **Gateway**
            - 192.168.1.254

              AHM processors support up to 100 TCP connections. These include any IP controller, GPIO interface, System Manager or Custom Control instance. More information is available on the online Allen & Heath Knowledgebase.

Software and apps

- For direct, wired laptop connection using System Manager or the Custom Control editor, set the laptop to a static, compatible IP address, for example 192.168.1.10.
  For LAN or wireless connections, including Custom Control apps, set the router / access point to a compatible IP address, for example 192.168.1.254, and its DHCP range to a compatible range of addresses, for example 192.168.1.100 to 192.168.1.200. Set any laptop, tablet or mobile device to DHCP / 'obtain an IP address automatically'.

IP Controllers

- AHM processors are compatible with the remote controllers and GPIO interfaces listed below. All devices listed here can be set to DHCP if required.

	Description	Default IP	PoE
IP1	Wall mount remote controller with dual-function rotary encoder.	192.168.1.74	802.3af
IP6	Remote controller with 6 push-and-turn rotary encoders.	192.168.1.72	802.3af
IP8	Remote controller with 8 motorized faders.	192.168.1.73	802.3at
GPIO	8×8 general purpose interface for control integration.	192.168.1.75	802.3af

- The function of the IP controllers and GPIO is configured via the AHM System Manager.
  At connection or power up, the AHM processor will check the firmware version of the IP controllers and GPIO and upgrade or downgrade the device to match the main unit firmware.

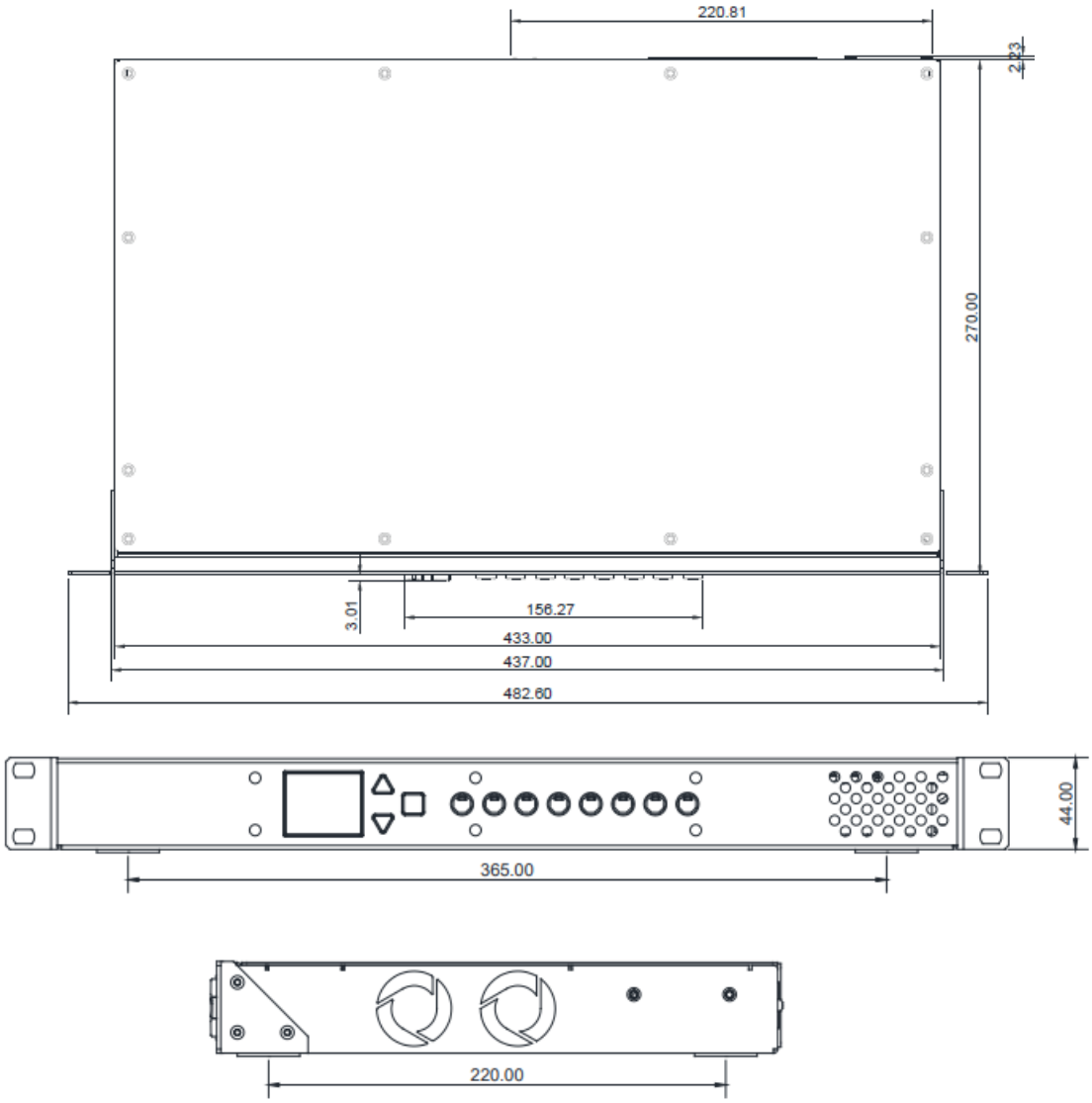
Connection over WAN

- For connection of System Manager or Custom Control over a WAN, TCP port 51321 and UDP port 51324 should be forwarded by the NAT to the IP address of the AHM processor.
    - We strongly recommend using a secure VPN to access the local network. When connecting directly over the Internet, use a good quality firewall and NAT to block ports when not in use.

TCP Protocol

- A TCP Protocol for control and interrogation of AHM parameters is available and documented at www.allen-heath.com. Clients should be configured to use TCP port 51325 (unsecured) or the TLS/TCP port 51327 depending on the External Control security options set with AHM System Manager.
    - Check www.allen-heath.com for drivers or project templates for leading control systems such as Crestron or AMX.

Dimensions



Technical Specs

Inputs

Mic/Line Inputs	Balanced, +48V phantom power
Mic/Line Preamp	Fully recallable
Input Sensitivity	-60 to +15dBu
Analogue Gain	+5 to +60dB, 1dB steps
Pad	-20dB Active PAD
Maximum Input Level	+30dBu (PAD in)
Input Impedance	>3kΩ (Pad out), >8kΩ (Pad in)
Mic EIN	-127dB with 150Ω source

Outputs

Analogue Outputs	Balanced, Relay protected
Output Impedance	<75Ω
Nominal Output	+4dBu = 0dB meter reading
Maximum Output Level	+21dBu
Residual Output Noise	-92dBu (muted, 22-22kHz)

System

Measured balanced XLR in to XLR out, 20-20kHz, +5dB Gain, Pad out, signal @ 0dB (meter)

Dynamic Range	108dB
System Signal to Noise	-92dB
Frequency Response	20Hz - 20kHz +0/-0.5dB
THD+N (analogue in to out)	0.005% @ +16dBu output, 1kHz +5dB gain
Headroom	+18dB
Sampling Rate	96kHz +/- 20 PPM

Playback

Internal Storage	~2.6GB
File types	Mono/stereo .WAV (16/24bit, 44.1/48/96kHz), MP3

Dimensions and Weights

Unboxed	Width x Depth x Height x Weight
AHM-32	482.6mm x 270mm x 44mm x 4kg (19" x 10.6" x 1.7" x 8.8lbs)
AHM-16	482.6mm x 270mm x 44mm x 3.8kg (19" x 10.6" x 1.7" x 8.4lbs)
Boxed	
AHM-32	555 x 405 x 150 mm x 5.65kg (21.8" x 15.9" x 5.9" x 12.5lbs)
AHM-16	555 x 405 x 150 mm x 5.45kg (21.8" x 15.9" x 5.9" x 12lbs)

Operating Temperature Range	0 deg C to 40 deg C (32 deg F to 104 deg F)
Mains Power (AHM-32)	100-240V AC, 50-60Hz, 70W max
Mains Power (AHM-16)	100-240V AC, 50-60Hz, 65W max

Processing Specs

Input Processing

16/32 Input Channels	Configurable mono or stereo
Trim	+/-24dB digital trim
Polarity	Normal/Reverse
Stereo Width Control	L/R, R/L, L -Pol/R, R -Pol/L, Mono, L/L, R,R, M/S
Gate	
Sidechain	Self-key or source selectable, with 12dB/octave Lo-Pass and Hi-Pass
Threshold	-72dBu to +12dBu
Depth	0 to 60 dB
Attack	50us to 300ms
Hold	10ms to 5s
Release	10ms to 1s
Insert	In/Out, +4dBu/-10dBV level
PEQ	
Type	8-Band fully parametric, +/-15dB
Band 1 - 8	Selectable LF/HF Shelving, Bell (variable or constant Q), Hi-Pass / Lo-Pass
Bell Width	0.50 – 6.00 Q
Shelving Type	Classic Baxandall
Hi-Pass, Lo-Pass Filter	12dB/octave
Compressor	Peak or RMS sensing
Sidechain	Self-key or source selectable, with 12dB/octave Lo-Pass and Hi-Pass
Threshold	-46dBu to 18dBu
Compressor parameters	Threshold, Ratio, Attack, Release
Delay	Up to 683ms

Zone Processing

Up to 16/32 Zones	Configurable mono or stereo
Source Selector	Up to 20 sources, variable level, Fade In and Fade Out time <20s
Insert	In/Out, +4dBu/-10dBV level
GEQ	28 bands 31Hz -16kHz, +/-12dB, constant-Q
PEQ	See Input Processing
Compressor	See Input Processing
Delay	Up to 683ms
ANC	
Ambient Level	Selectable source and metering point, Gain Differential -18dB to 40dB
Gap	Selectable source and metering point, Threshold -62dB to -20dB, Time 0-5000ms
Gain Element	Min / Max Gain, Rate 0-30dB/s
Limiter	Variable Threshold, Attack and Release

Speaker Processing

Crossovers	Configurable 2, 3, 4 way
Filters	Asymmetrical, selectable 1st order, Butterworth 12/18/24 db/octave, LR 12/24 dB/octave
EQ	4-Band fully parametric, or 28 band GEQ
Delay	Up to 683ms
Limiter	See Zone Processing

AMM

Channels (AHM-16)	1x16
Channels (AHM-32)	1x32, 2x 16 or 4x 8
Modes	D-Classic gain sharing or NOM

Documents / Resources

	ALLEN HEATH AHM-16 Audio Matrix Processor [pdf] User Guide AHM-16, AHM-32, AHM-16 Audio Matrix Processor, Audio Matrix Processor, Matrix Processor, Processor

References

- & Allen & Heath - Heard Everywhere
- & Legal - Allen & Heath
- & Register a Product - Allen & Heath
- & Everything I/O - Allen & Heath
- User Manual