A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

A·X·U·M the Facts

D&R
Smart in Solutions

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

Assemble a practical solution:

This brochure provides and outlines the technical information of the hardware components available for the AXUM platform. Use this information to help you select the hardware components you need for your application.

The system components communicate with each other using the MambaNet[TM] protocol. This protocol, (developed by D&R), can operate on different hardware and software layers (Ethernet, TCP/IP, CAN, RS232, Firewire, etc...).

The protocol is designed to be future proof and is open for customers and other manufacturers to add their own surfaces or processing to the Broadcast studio platform.
More information on MambaNet[TM] can be found in the MambaNet[TM] whitepaper.

Audio can be shared within your equipment setup by using a variety of I/O cards. For a networked audio solution we suggest using the rugged CobraNet[TM] audio network in combination with D&R's CobraNet Manager.

Using these networked solutions it is possible to have all your studio interconnections based on Ethernet (level 2). Your local audio equipment may be connected with all well known industry standards such as XLR's, ¼" Jacks, AES3 or to a network solution.

A·X·U·M – Digital Studio Platform
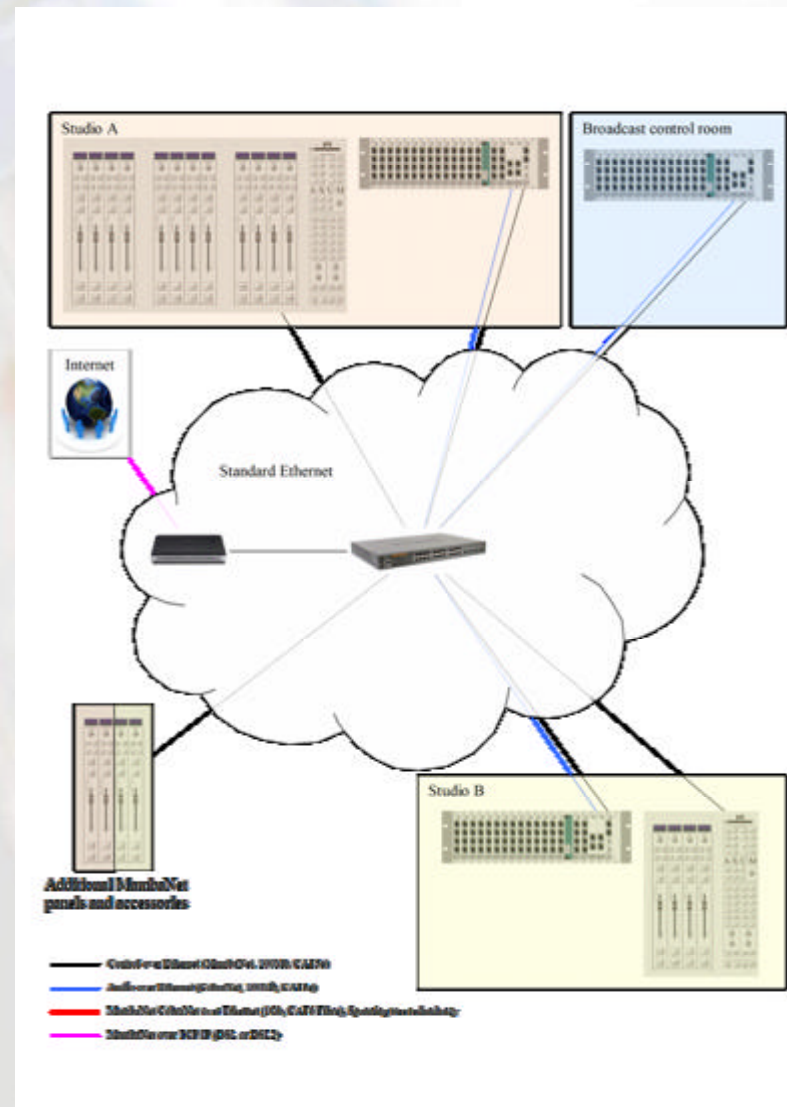## *Routing, Control & Mixing*

One network, many Control Surfaces

The concept of modular control surfaces fits perfectly in the virtual world of networking and MambaNet[TM]. You need only construct the 'perfect layout' for your studio by selecting the control surface modules required for your application.

It is possible to (re)configure your system's switches and knobs if needed when you connect the selected surfaces to the MambaNet[TM] network. Fixed workspace assignments are outdated these days.

A small 8 fader broadcast ON-Air control surface can be created in Frame-10 with 2x 4 fader sections and 1x Control Room section. Other configurations (also in a split version, left and right from a script space) can be put together by yourself or your dealer.

The platform's future use will be extended with other smaller and larger control surfaces under development for the AXUM platform.

A·X·U·M the Facts

D&R

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

4 Fader Broadcast Panel

Creating your own control surface layout is as easy as selecting different panels. The broadcast panel to the left contains 4 modules with faders and the AXUM frame allows you to add 4, 8, 12, 16 or optional more faders in a single control surface.

The modularity and power of MambaNet^{TM} makes it possible to have multiple frames connected to a single Engine (I/O rack). That makes it possible to have more surfaces controlling your engine. Following are the controls located on the 4 fader panel.

1) Display for module information

2) Encoder for data entry

3) Small switches (e.g. A/B select & routing)

4) Large switches (e.g. CUE, ON, START & STOP)

5) LEDs to indicate module settings.

6) Motorized Faders.

D&R
Smart in Solutions
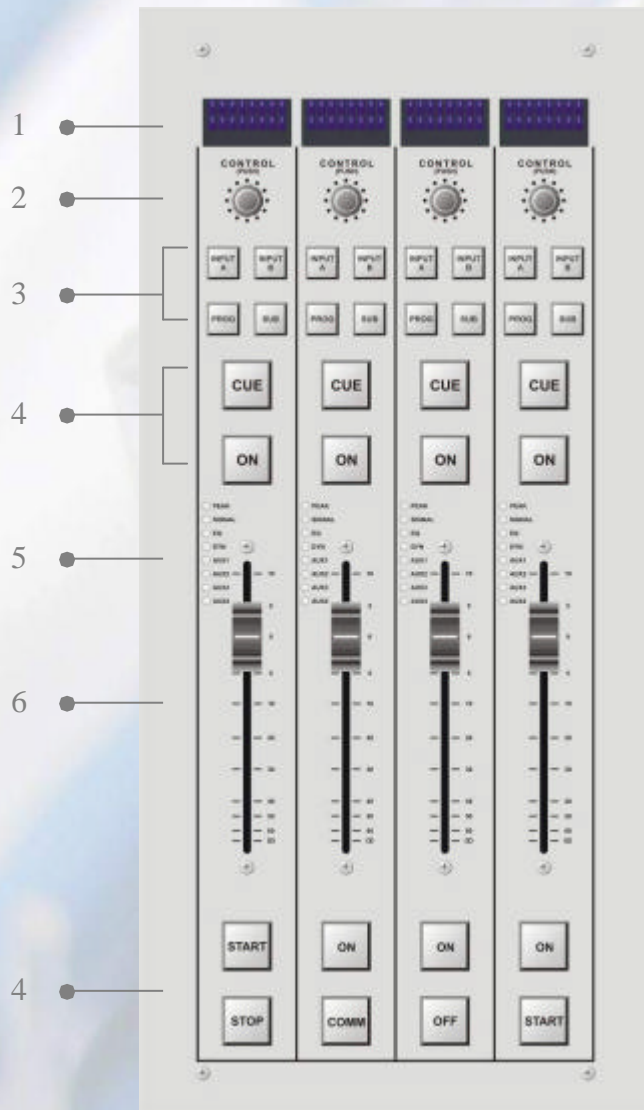
A·X·U·M – Digital Studio Platform
Routing, Control & Mixing
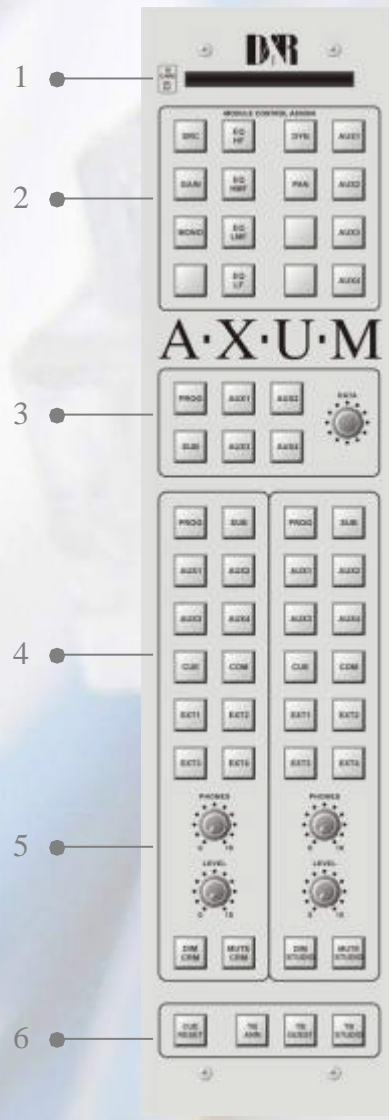
Control Room/Studio panel

The following controls can be found on the Control Room / Studio panel.

1) Chip card reader to automatically logon to the control surface.

2) Switches that determine which function the channel encoder will perform.

3) Bus section to set specific buses on/off and adjust the level of the signal to the busses.

4) Control room speaker, phones level and source selection.

5) Studio room speaker, phones level and source selection.

6) CUE reset and talkback functions.

A·X·U·M the Facts

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

Define your I/O

The modular concept based on MambaNet™ is also found in the I/O rack. Each I/O card can be shared in or controlled from the network. The I/O cards in the rack are recognized in the network as inputs and outputs in a matrix. Mixing capabilities are available once one or more DSP cards are inserted.

In the next pages we will go through the I/O cards currently available for the AXUM platform.
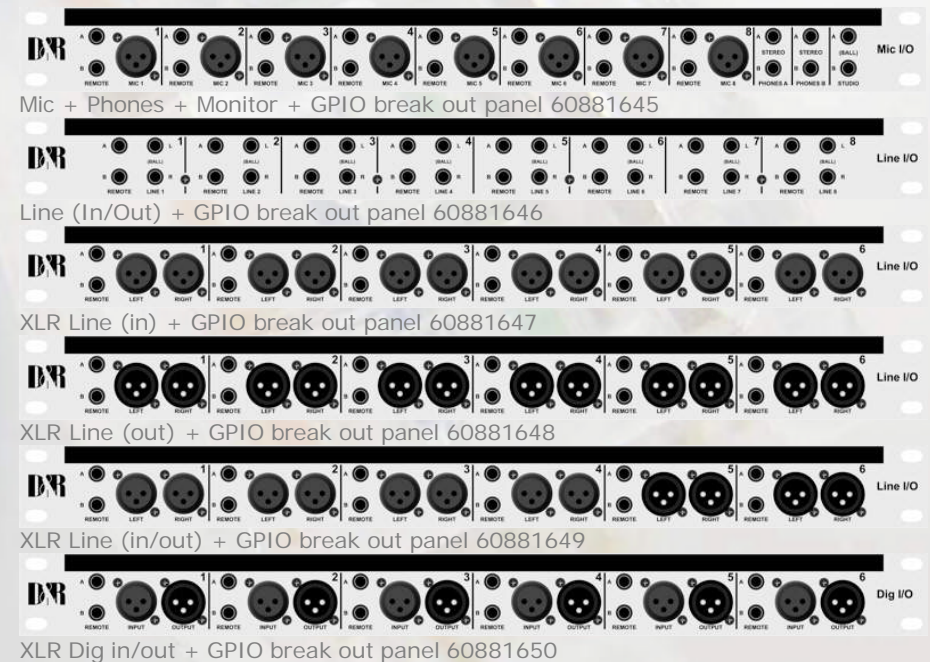
We will launch more I/O cards soon, so visit our website regularly.

Breakout system

The de facto standard for connecting audio connections to large I/O racks is RJ45 connectors with STP cable (Shielded twisted pair). D&R already uses this breakout system in the unique AirMax Broadcast analog console.
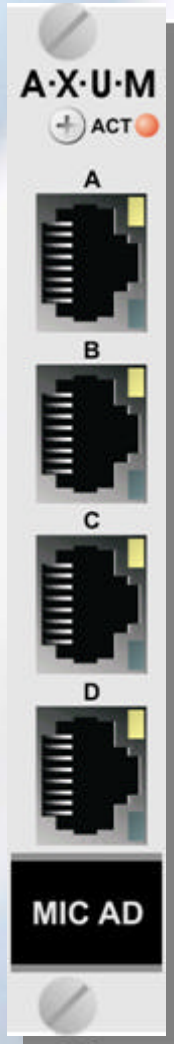
The 19″ passive rack-mount breakout panels have ¼″ balanced Jack or XLR connections on the front and shielded RJ45's on the back, which are used to connect the I/O rack. Below you see an overview of some of the breakout panels. Optional transformers are available for some of the breakout panels.

Mic + Phones + Monitor + GPIO break out panel 60881645

Line (In/Out) + GPIO break out panel 60881646

XLR Line (in) + GPIO break out panel 60881647

XLR Line (out) + GPIO break out panel 60881648

XLR Line (in/out) + GPIO break out panel 60881649

XLR Dig in/out + GPIO break out panel 60881650

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

MIC card

A·X·U·M
⊕ ACT ●
A
B
C
D
MIC AD

Each RJ45 connector on the microphone cards can be connected to a single balanced microphone and 2 GPIOs (General purpose input/outputs).

For the microphone you have software control over:

- Phantom power (+48V)
- PAD switch for 20 dB gain reduction
- Analog Microphone Gain
- Phase reverse
- Routing and summing per pair (1/2 and 3/4)

Each GPIO can be an isolated GPO or 5v TTL GPIO. Functionalities of the GPIO are under software controlled, for example:

- Cough   (GPI function)
- Communication   (GPI function)
- MIC-on   (GPO function)
- Red light   (GPO function)

Line input card

A·X·U·M
⊕ ACT ●
A
B
C
D
AD

Every RJ45 connector on the line input card can be connected to a stereo balanced line signal and 2 GPIOs.

For each signal of a stereo line input you have digital software control over:
- Level
- Phase inverse
- Routing:
  - Left to Left
  - Right to Right
  - Mono to Left
  - Mono to Right
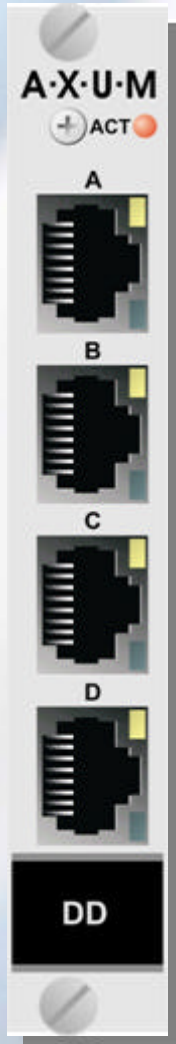 - Right to Left
  - Left to Right

Each GPIO can be an isolated GPO or 5v TTL GPIO. Functionalities of the GPIO are under software control, for example:

- Communication   (GPI function)
- Channel on   (GPI function)
- Start/Stop   (GPO function)
- Cue   (GPO function)

D&R
Smart in Solutions

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

Digital input/output card

Each RJ45 connector on the digital input/output card can be connected to an AES3 input, output and 2 GPIOs.

For each signal of a stereo digital input you have digital control over:

- Level
- Phase inverse
- Routing:
  - Left to Left
  - Right to Right
  - Mono to Left
  - Mono to Right
  - Right to Left
  - Left to Right

For each signal of a stereo digital output you have digital control over:

- Level
- Phase Reverse
- Routing
  - Left to Left
  - Right to Right
  - Mono to Left
  - Mono to Right
  - Right to Left
  - Left to Right
- Dimming
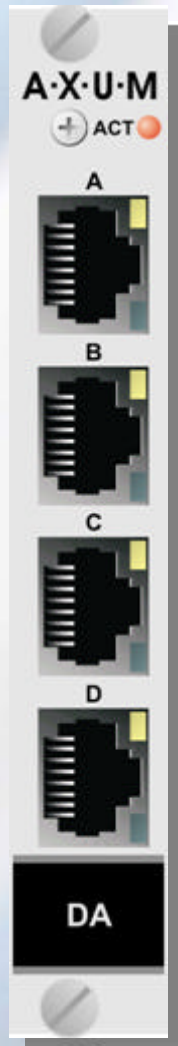- Talkback to the output
- Total mute.

Each GPIO can be an isolated GPO or 5v TTL GPIO. Functionalities of the GPIO are software controlled, for example:

- Communication   (GPI function)
- Channel on   (GPI function)
- Start/Stop   (GPO function)
- Cue   (GPO function)

A·X·U·M the Facts

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

Line output card

Each RJ45 connector on the line output card has stereo balanced analog outputs and 2 GPIOs.

For each signal of a stereo digital output you have digital control over:

- Level
- Phase inverse
- Routing
- - Left to Left
  - Right to Right
  - Mono to Left
  - Mono to Right
  - Right to Left
  - Left to Right
- Dimming
- Talkback to the output
- Total mute

Each GPIO can be an isolated GPO or 5v TTL GPIO. Functionalities of the GPIO are under software control, for example:

- Communication   (GPI function)
- Channel on   (GPI function)
- Start/Stop   (GPO function)
- Cue   (GPO function)

CRM/Phone output card

RJ45 connector A and B are line level stereo balanced outputs and connectors C and D are headphone outputs. All RJ45 connectors have 2 GPIOs.

For each signal of a stereo analog output you have digital control over:

- Total level
- Phase inverse
- Routing
- - Left to Left
  - Right to Right
  - Mono to Left
  - Mono to Right
  - Right to Left
  - Left to Right
- Dimming
- Talkback to the output
- Total mute

Each GPIO can be an isolated GPO or 5v TTL GPIO. Functionalities of the GPIO are under software control, for example:

- Communication   (GPI function)
- Channel on   (GPI function)
- Start/Stop   (GPO function)
- Red-light   (GPO function)

A·X·U·M the Facts

D&R
Smart in Solutions

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

CobraNet™ input/output card

The CobraNet™ card holds two RJ45 connectors that carry CobraNet data over Ethernet (level 2).
CN A should be connected to your audio network.
CN B may be used for a redundant connection.
Utilizing the CobraNet™ connection, you can send and receive multiple audio channels. The number of audio channels (8 or 16 send and receive) depends on the selected CobraNet™ card, see specifications in the brochure.

For each signal received from CobraNet™ you have digital control over:

- Level
- Phase inverse
- Routing:
  - Left to Left
  - Right to Right
  - Mono to Left
  - Mono to Right
  - Right to Left
  - Left to Right

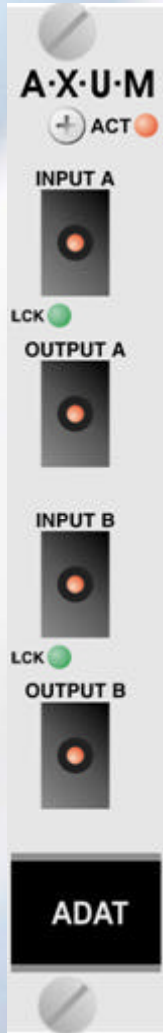For each signal sent to CobraNet™ you have digital control over:

- Level
- Phase inverse
- Routing
- - Left to Left
  - Right to Right
  - Mono to Left
  - Mono to Right
  - Right to Left
  - Left to Right
- Dimming
- Talkback to the output
- Total mute.

With D&R's CobraNet™ Manager Software, you can visualize and control the CobraNet™ audio network. Included with this card is a light version of CobraNet™ Management software.

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

ADAT input/output card

The ADAT input/output card hold two optical connectors for reception of multi channel digital audio and two optical connectors for transmission of multi channel digital audio.

For each signal of a ADAT input you have digital control over:

- Level
- Phase inverse
- Routing:
  - Left to Left
  - Right to Right
  - Mono to Left
  - Mono to Right
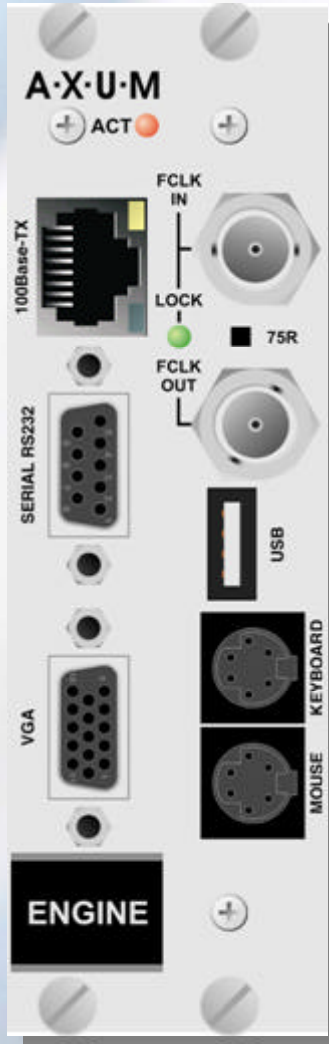 - Right to Left
  - Left to Right

For each signal of a ADAT output you have digital control over:

- Level
- Phase inverse
- Routing
  - Left to Left
  - Right to Right
  - Mono to Left
  - Mono to Right
  - Right to Left
  - Left to Right
- Dimming
- Talkback to the output
- Total mute.

D&R
Smart in Solutions

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

AXUM engine card

The AXUM engine card controls the entire rack system. All information for the rack is processed on this card.

The RJ45 Connector should be connected to the Ethernet switch that is connected to all MambaNet™ compatible devices.

Advanced functions can be accessed by using the following interface connectors:

- RS232
- VGA
- Keyboard
- Mouse
- USB

On the BNC connection you can connect a word clock output signal or a word clock input signal. The input signal can be terminated with 75 Ohm using the latching switch.

DSP card

By plugging a DSP card in the I/O rack you add mixing capabilities to your matrix. In combination with the engine card you will get an advanced mixing console.

The DSP card processes 32 stereo channels to 16 stereo busses and 4 stereo monitoring busses.

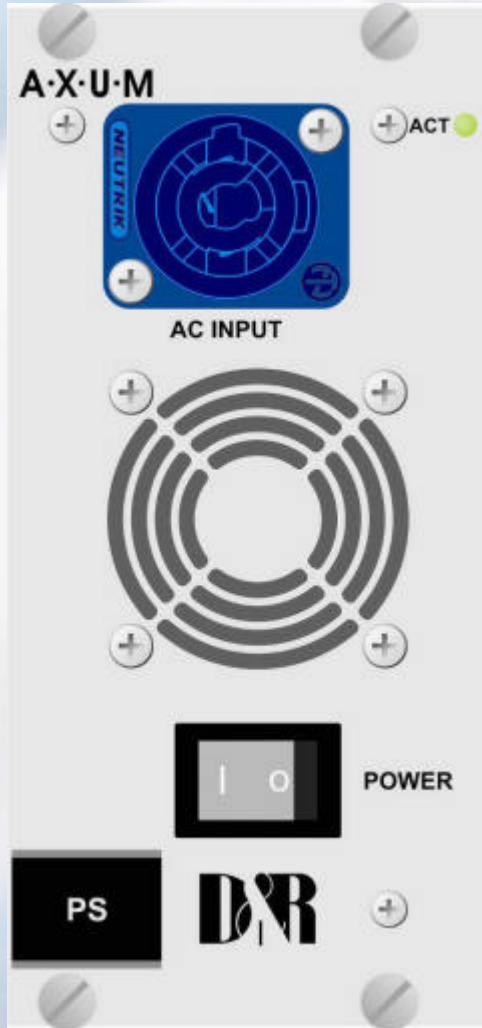On an input channel the following processing is available:

- Low cut
- Gain
- EQ
- Dynamics
- Level meter
- pre/post switching

You can insert a maximum of 4 DSP boards. This gives you a mixing console of 128 stereo channels to 16 stereo busses as well as 16 stereo monitoring busses.

A·X·U·M the Facts

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

Power supply card

The power supply card is also controlled by MambaNet^{TM} making it possible to check the voltage levels at the supply itself.

If you insert a second power supply card, it will act as a redundant power supply for the system.

Mains voltage (100V-240V, 50-60Hz) is connected with a locking Neutrik PowerCON^{TM} connector.

With the power switch you can turn the local power supply on and off.

Frame sizes

The shown configurations on the right are just examples, but may differ for your application.
Other frame sizes upon request.
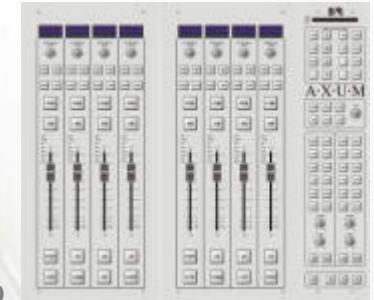
Frame 10

Frame 14

Frame 18

A·X·U·M the Facts

A·X·U·M – Digital Studio Platform
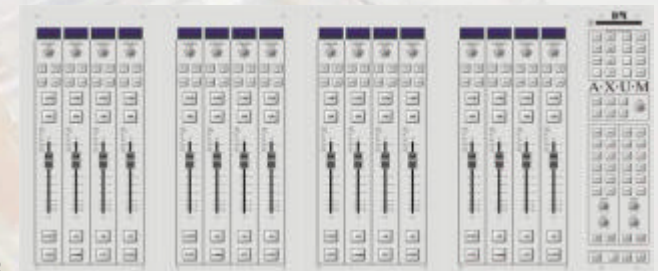## *Routing, Control & Mixing*

Technical Highlites:

General:
- Matrix up to 1280x1280.
- Headroom: adjustable 0dB... 20dB
- Tone generator.

Synchronization:
- Word clock input or internal generator.
- 32 kHz, 44.1 kHz, 48 kHz.
- Word clock in/out 75 Ohm.

I/O Cards:
   DSP
- 32 floating point processing.
- 32 stereo channels (max. 128 stereo channels).
- 6 band parametric equalizer| Dynamics | LowCut
- 16 stereo mixing busses.
  (Program | Sub(Rec) | Cue | Comm |12x stereo Aux).
- 4 stereo monitor busses (max. 16 monitor busses)
- Max. 4 DSP cards per I/O rack.

MIC
- Electronically balanced, 2Kohm.
- Analog input sensitivity -70dBu up to +20dBu (Pad).
- CMRR MIC inputs: 85dB @ 1kHz, maximum gain.
- Optional transformer balancing (on breakout racks).

Line input
- Electronically balanced, 10kOhm.
- Nominal level +6dBu, maximum +26dBu.
- CMRR Line inputs: 50dB @ 1kHz, maximum gain.
- Optional transformer balancing (on breakout racks).

Line Output
- Electronically balanced, <47Ohm.
- Nominal level +6dBu, maximum output level +26 dBu.
- Optional transformer balancing.

CRM Output
- Electronically balanced, <47 Ohm.
- Output level +6dBu, maximum output level +26 dBu.
- Optional transformer balancing.
- Headphones out:
  - 80mW into 600R.
  - Minimum load 8 Ohm.

Digital Inputs/Output
- AES/EBU (AES3), S/P-DIF.
- 16/20/24 bit.
- THD+N: -105dBfs @1kHz, -1 dBFS.
- Input/Output impedance: 110 Ohm / 75 Ohm (transformer In/Out)
- Output level: >5Vpp (into 110 Ohm load)
- Input sensitivity: >200mV

GPI
- 5V TTL, 100 kOhm input impedance

GPO
- Selection of optical isolated relay or 5V TTL output
- Optical isolated relays is max: 50V at 200mA

D&R
Smart in Solutions

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

Mechanical Specifications:

Control Surfaces:

- **Frame-10**:
  - 10 module positions   : e.g. 8 modules + CRM/Studio
  - Outside dimensions   : 503x430x60/90 mm
  - Drop through hole   : 486x420 mm
  - Weight   : 10 Kg

- **Frame-14**:
  - 14 module positions   : e.g. 12 modules + CRM/Studio
  - Outside dimensions   : 695x430x60/90 mm
  - Drop through hole   : 678x420 mm
  - Weight   : 15 Kg

- **Frame-18**:
  - 18 module positions   : e.g. 16 modules + CRM/Studio
  - Outside dimensions   : 896x430x60/90 mm
  - Drop through hole   : 870x420 mm
  - Weight   : 25 Kg

- **Frame-22**:
  - 22 module positions   : e.g. 20 modules + CRM/Studio
  - Outside dimensions   : 1082x430x60/90 mm
  - Drop through hole   : 1062x430 mm
  - Weight   : 30 Kg

- **Panels:**
  - 4 fader panel   : 4 module positions
  - CRM/Studio panel   : 2 module positions
  - blind panel-1   : 1 module position
  - blind panel-2   : 2 module positions

19" I/O Rack:

- **Rack ONE:**
  - 21 slots   : 16 for DSP and I/O cards
  - Outside dimensions (WxHxD)   : 483x133x260 mm

- **Rack TWO:**
  - 42 slots   : 37 for DSP and I/O cards
  - Outside dimensions (WxHxD)   : 483x266x260mm

- **I/O Cards:**
  - MIC card   : 1 slot
  - Line input card   : 1 slot
  - Digital input/output card   : 1 slot
  - Line output card   : 1 slot
  - CRM/Phone output card   : 1 slot
  - CobraNet™ input/output card   : 1 slot
  - ADAT input/output card   : 1 slot
  - DSP card   : 1 slot
  - AXUM engine card   : 2 slots
  - Power supply card   : 3 slots

D&R
Smart in Solutions

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

CABLING:

Connecting system parts:

All system parts of the AXUM will be connected using the well known Ethernet standard. These connections have to be confirming IEEE 802.3 standard, where each system part has a 100BASE-TX connection.

With switches you can make larger networks with various types of interconnectivity. We advice to only use managed switches in your system, although unmanaged switches will function normally.

For your information we hereby specify some connection standards available on standard Ethernet.

Name	Mbps	Cable	Max. length
100BASE-TX	100	unshielded twisted pair	100 m
100BASE-FX	100	multimode fiber	2 Km
100BASE-T	1000	unshielded twisted pair	100 m
100BASE-SX	1000	multimode fiber	500 m
100BASE-LX	1000	single-mode fiber	5 Km
100BASE-ZX	100	single-mode fiber	70 Km

If your system only has one single surface and one I/O rack, it is possible to connect these system parts with a cross cable (after you have configured your I/O rack). This is a basic setup, saves cost, but it means you can not expand your system without first adding a switch in your network.

Connecting audio equipment:

All external audio equipment can be connected to the passive 19″ rack-mount breakout panels with standardized connectors such as XLR male/female and jacks as described on page 6.

From these 19″ passive rack-mountable breakout panels you can connect the XLR/Jack in/outputs that are hardwired to RJ45 connectors on the back of these panels directly to your AXUM system with shielded twisted pair cable (STP).

The I/O cards in the 19″ AXUM rack have equivalent RJ 45 connectors to accept these STP cables.

It depends upon the installation needs which passive rack-mount breakout panel will be used to connect with the AXUM I/O cards.

For your info STP cable is the only choice and can be used up to lengths of 100 meters.

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

I/O cards under development:

Hybrid
- Telephone Hybrid Interface.

GPIO Card
- 16 GPI, 16GPO.

SDI card
- Serial Digital (video) Interface with embedded audio only.

MADI
- Multi-channel Audio Digital Interface.

Fire Wire
- (IEEE1392) Digital Audio + Control).

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

Specifications AXUM digital Audio System

MIC inputs
Electronically balanced
Input impedance 2k Ohm
Input sensitivity -70dBu up to +20dBu (PAD) (PGA2500)
Dynamic Range 118dB (AD converter PCM4202)
Total Harmonic Distortion plus Noise -108dB (30dB gain)
CMRR MIC inputs: 85dB @ 1kHz, maximum gain
Frequency response 20Hz - 20kHz ± 0.1dBr (sample rate 48kHz)
Crosstalk 1kHz < -118dBr
Phantom is switchable +48 Volts
Transformer balancing is optional on the break-out panel

Line inputs
Electronically balanced
Input impedance 10k Ohm
Input sensitivity +6dBu, maximum input +26dBu (+/- 20dB gain range).
Dynamic Range 118dB (AD converter PCM4202)
Total Harmonic Distortion plus Noise -105dB
CMRR Line inputs: 30dB @ 1 kHz
Frequency response 20Hz - 20kHz ± 0.1dBr (sample rate 48kHz)
Crosstalk 1kHz < -123dBr
Transformer balancing is optional on the brake-out-box

Phones Output
Stereo unbalanced
Output impedance 5R Ohm.
Nominal output level +6dBu, maximum output +26dBu
Max. Output power, 1W into 32R Ohm, 80mW into 600R Ohm
Dynamic Range 114dB (AD converter CS4385)
Frequency response 20Hz - 20kHz ± 0.1dBr (sample rate 48kHz)

Digital Inputs
AES/EBU (AES3) or S/P-DIF Transformer balanced
Input Impedance: 110R Ohm / 75R Ohm (jumper setting)
Differential input sensitivity 200mV
Dynamic Range (sample rate converter) 144dB
Total Harmonic Distortion plus Noise (sample rate converter) -140dB
16/20/24 bit, 32 kHz to 96 kHz (optional built in sample rate converter)

Digital outputs
AES/EBU (AES3) or S/P-DIF Transformer balanced
Output Impedance: 110R Ohm/75R Ohm
Output level: AES3 5 Vpp, S/P-DIF 1Vpp
16/20/24 bit, 32kHz, 44.1kHz ore 48kHz

GPIOs
All GPO's are by opto isolated relays able to handle a maximum of 50V at 200mA or 5V TTL 560R (8mA) out
All GPI's have a 5V TTL 100kOhm circuitry. GPIO-MIC has a 5V/56Ohm LED driver circuit

D&R

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

DSP Processing

EQ is 6 band, any band can perform one of the following functions/specifications:

Off
no function
HF
+/- 18 dB (10Hz-20 kHz shelving/bell/notch), Q: 0.1 to 10 variable.
HMF
+/- 18 dB (10Hz-20 kHz shelving/bell/notch), Q: 0.1 to 10 variable.
LMF
+/- 18 dB (10Hz-20 kHz shelving/bell/notch), Q: 0.1 to 10 variable.
LF
+/- 18 dB (10Hz-20 kHz shelving/bell/notch), Q: 0.1 to 10 variable.
High Pass Filter
+/- 18 dB (10Hz-20 kHz shelving/bell/notch), Q: 0.1 to 10 variable.
Low Pass Filter
+/- 18 dB (10Hz-20 kHz shelving/bell/notch), Q: 0.1 to 10 variable.
Band Pass Filter
+/- 18 dB (10Hz-20 kHz shelving/bell/notch), Q: 0.1 to 10 variable.
Notch Filter
+/- 18 dB (10Hz-20 kHz shelving/bell/notch), Q: 0.1 to 10 variable.

DYNAMICS
Interactive one knob control of threshold, compression ratio, expander ratio as well as attack and release times.

Processing
32 bit floating point
Channels
32 stereo channels per DSP card.
Busses
16 stereo mixing busses, free assignable Prog/CUE/Aux etc. etc.
Monitor busses
4 stereo monitor busses per DSP card.

Additional information:
- *By configuration its possible to create more separate mixers, for example two consoles of 16 stereo channels to 8 stereo mixing busses, 2 stereo monitor busses.*
- *A maximum of 4 DSP cards may be inserted giving you a mixing console of 128 stereo channels, 16 stereo mixing busses and 16 stereo monitor busses.*

Module processing:
- Gain
- Low cut
- Insert
- 6 bands full parametric EQ
- D&R designed one knob dynamics
- 16 buss sends pre or post fader

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

Overall

Level
0dBu=0.775Vrms
0dB internal = -20 dBFs.

Clock
Sample rate: 32kHz, 44.1kHz, 48kHz, +/- 20ppm (internally synchronized)
External sync: 32kHz, 44.1kHz, 48kHz +/- 50ppm
Jitter max 150pSec

Power supply
Neutrik^{TM} PowerCon^{TM} (delivered in the package).
100-240 Volt, 50/60Hz (1.7A Max)

A·X·U·M – Digital Studio Platform
Routing, Control & Mixing

Headquarters

D&R Electronica Weesp BV
Rijnkade 15B
1382GSA Weesp
The Netherlands

Phone: +31 294 418014
Fax: +31 294 416987

Email: info@d-r.nl
Website: www.d-r.nl

Your dealer:

D&R
Smart in Solutions