SIGMA INSTALLATION MANUAL

Digital Broadcast Production Console with Bluefin HDSP

CALREC

Putting Sound in the Picture

calrec.com

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IMPORTANT INFORMATION

After Sales Modifications
Please be aware that any modifications other than those made or approved by Calrec Audio Limited or their agents, may invalidate the console's warranty. This includes changes to cabling provided by Calrec and variations to the recommended installation as detailed in Calrec documentation.

Modifications to this equipment by any party other than Calrec Audio Limited may invalidate EMC and safety features designed into this equipment. Calrec Audio Limited can not be liable for any legal proceedings or problems that may arise relating to such modifications.

If in doubt, please contact Calrec Audio Limited for guidance prior to commencing any modification work.

ESD (Static) Handling Procedures
In its completed form, this equipment has been designed to have a high level of immunity to static discharges. However, when handling individual boards and modules, many highly static sensitive parts are exposed. In order to protect these devices from damage and to protect your warranty, please observe static handling procedures, for example, use an appropriately grounded anti-static wrist band. Calrec will supply an electrostatic cord and wrist strap with all of it's digital products.

All modules and cards should be returned to Calrec Audio Limited in anti-static wrapping.
Calrec Audio Limited can supply these items upon request, should you require assistance.

This applies particularly to digital products due to the types of devices and very small geometries used in their fabrication, analog parts can however still be affected.

ROHS Legislation
In order to comply with European RoHS (**R**eduction **o**f **H**azardous **S**ubstances) legislation, from the second week in April 2006 the vast majority of Calrec PCB and cable assemblies will have been produced with lead-free (tin/copper/silver) solder instead of tin/lead solder.

This means that for a period of time after April 2006 delivered consoles will contain a mixture of assemblies produced with different types of solder. This is unavoidable due to the fact that circuit boards are built in batches and allocated to consoles on a 'first in, first out' basis (hence the need to change the process well in advance of the legislation coming into force).

In the unlikely event of a customer having to carry out any re-soldering on such assemblies, it is imperative that the correct type of solder is used; not doing so is likely to have an adverse effect on the long-term reliability of the product. Circuit boards assembled with lead-free solder can be identified (in accordance with IPC/JEDEC standards) by a small oval sticker placed on the top-side of the circuit board near the PCB reference number (8xx-xxx).

The same sticker is used on the connectors of soldered cable assemblies. The absence of a sticker indicates that tin/lead solder has been used.
If in doubt, please check with a Calrec customer support engineer before carrying out any form of re-soldering.

HEALTH AND SAFETY

Please observe the following:

- This equipment must be EARTHED
- Only suitably trained personnel should service this equipment
- Please read and take note of all warning and informative labels
- Before starting any servicing operation, equipment must be isolated from the AC supply (mains)
- Fuses should only be replaced with ones of the same type and rating as that indicated
- Operate only in a clean, dry and pollutant-free environment
- Do not operate in an explosive atmosphere
- Do not allow any liquid or solid objects to enter the equipment. Should this accidentally occur then immediately switch off the unit and contact your service agent
- Do not allow ventilation slots to be blocked
- Do not leave the equipment powered up with the dust cover fitted
- The rack mounting parts of this equipment must be fitted into an enclosure which complies with local regulations

Cleaning

For cleaning the front panels of the equipment we recommend anti-static screen cleaner sprayed onto a soft cloth to dampen it only.

Explanation of Warning Symbols

The triangular warning symbols below contain a black symbol on a yellow background, surrounded by a black border.

The lightning flash with arrow head symbol within an equilateral triangle is intended to alert the user to the presence of dangerous voltages and energy levels within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock or injury.

The exclamation mark within an equilateral triangle is intended to prompt the user to refer to important operating or maintenance (servicing) instructions in the documentation supplied with the product.

Power Supply Blanking Plates (ZN4849-3 and ZN6020)

If you are in receipt of a ZN4849-3 or ZN6020 power supply unit please do not remove the blanking plates which are fitted to the unused output connectors. The maximum potential between the terminals exceeds 60 volts, the blanking plates are fitted to avoid the risk of electric shock.

TECHNICAL SUPPORT

Should you require any technical assistance with your Calrec product then please contact your local distributor, if outside the U.K. and Ireland. For a list of Worldwide distributors please see the Calrec Web site at www.calrec.com or contact Calrec UK.

For technical assistance within the UK and Ireland, please contact the Customer Support Team at :-

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We can deal with all technical after sales issues, such as :-

- Arrange repairs
- Supply of replacement or loan units while repairs are being carried out
- Service / commissioning site visits
- Operational training courses
- Maintenance training courses
- Supply of replacement components
- Supply of documentation
- Technical advice by telephone

Customer Support Hours
Factory based customer support engineers can be contacted by telephone during normal office hours (Monday - Friday 9:00a.m - 5:30p.m). Outside these hours, a message can be left on the answering machine, all messages are dealt with promptly on the next working day. Alternatively a message can be sent to them by email.

Product Warranty
A full list of our conditions & warranties relating to Goods & Services is contained in the Company's standard Terms and Conditions. A copy of this is available on request.

Repairs
If you need to return goods to Calrec, for whatever reason, please contact the Company beforehand in order that you can receive advice on the best method of returning the goods, and that a repair order reference number can be issued.

Standard of Service
Ensuring high standards is a priority, if you have any comments on the level of service, product quality or documentation offered to you by Calrec, then the Customer Support team would be pleased to receive your comments through any of the normal contact numbers, email or on the User registration form located at the end of this manual. If you have any other issues regarding your Calrec purchase, then please contact us and we will do our best to help. Calrec welcomes all Customer feedback.

ISO 9001 and RAB Registered
Calrec Audio Ltd has been issued the ISO9001: 2000 standard by the Governing Board of ISOQAR.

The award, for both UKAS and RAB registration, is the most comprehensive of the ISO9000 international standards. Granted in recognition of excellence across design, development, manufacture and after-sales support, the certification follows a rigorous and thorough review of Calrec's internal and external communication and business procedures.

Operator and Installation Manual PDFs
This manual and the Sigma operator manual can be found in pdf format on your console's CD Handbook.

You can also access this manual on your console's PC from the Start menu, under the Calrec Sigma group.

SIGMA
OVERVIEW

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SYSTEM OVERVIEW

Up to 64 faders, with 2 layers of control (A and B), plus 2 main and 2 sub-main output faders.

320 equivalent channels: Up to 108 stereo channels plus 104 mono channels.

Console operates independently of PC.

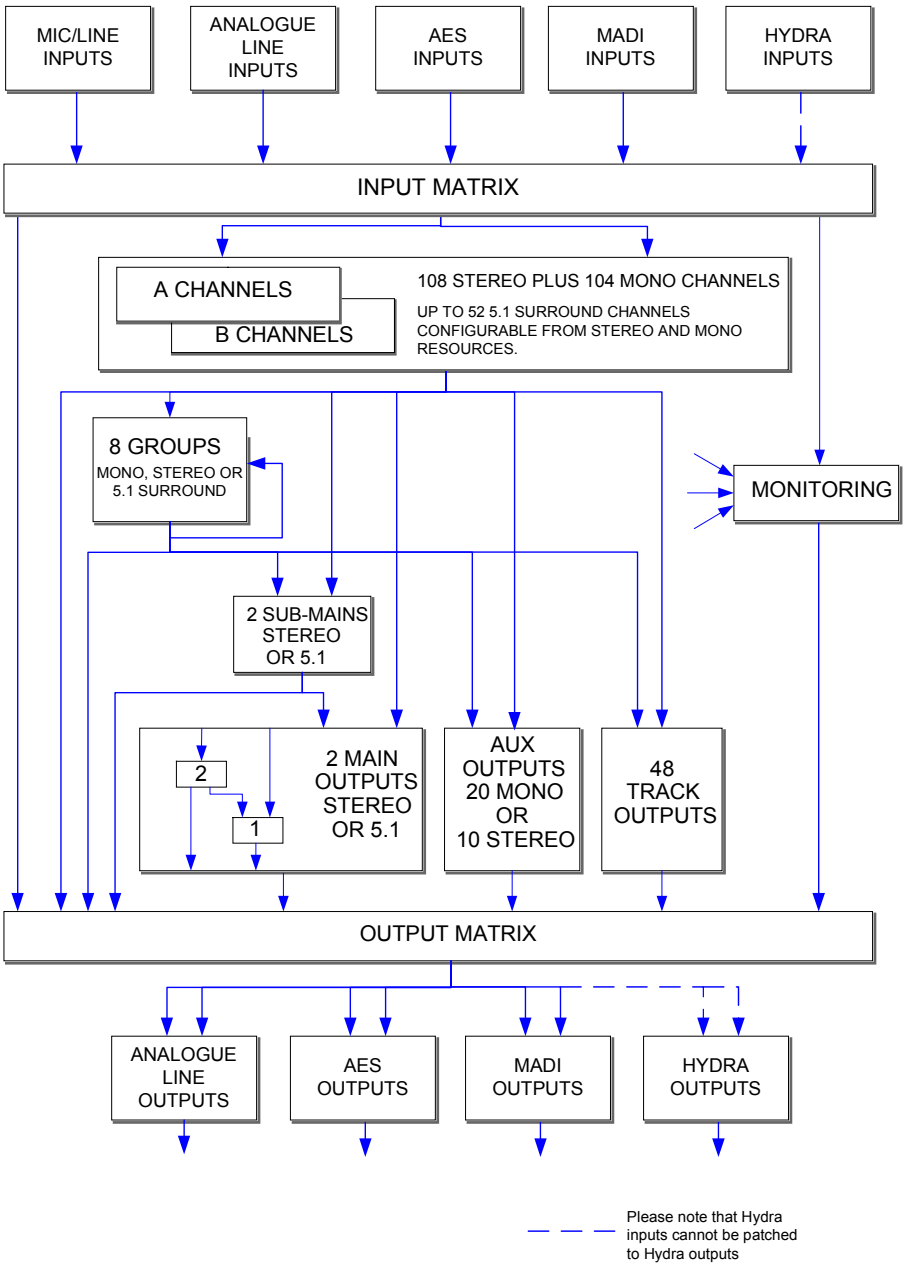
Independent DSP operation ensures audio continuity even during PC or control reset.

Console and racks boot from power on in less than 20 seconds.
Full control system reset in less than 15 seconds.

Last settings fully restored on power-up or re-set.
Automatic change over to hot spares for power supplies, control cards and DSP cards.

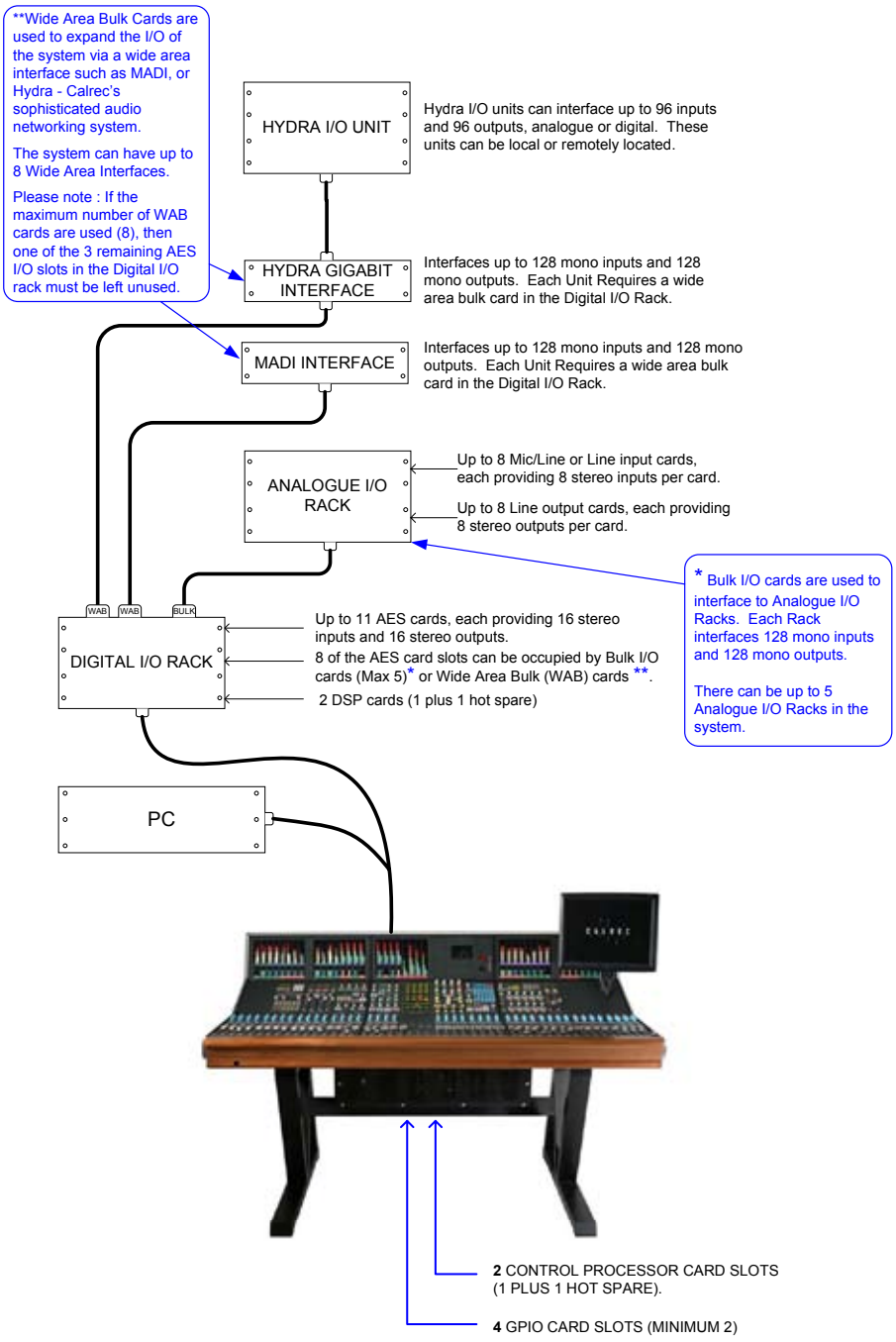
All cards and modules are designed to be hot plugged.

All cards and modules are designed to initialise upon insertion.



INPUTS AND OUTPUTS

The largest system (in terms of I/O) would have 8 WAB cards and 2 AES cards. If one WAB card is reserved as a redundant hot spare, this system would have 896 mono I/O on WAB interfaces, plus 32 stereo AES I/O. If all WAB I/O was AES through a Hydra network, the system could have up to 480 stereo AES on the system.



EQUIPMENT LIST

Depending on the options purchased, you should expect to receive the following items.

1 Control Surface
As specified in the quotation, and including:

1 Console Processor (2 if the hot spare option has been purchased).

2-4 Relay/Opto cards, in line with the quotation.

1 Digital I/O Rack

1 Rack Control Processor (2 if the hot spare option has been purchased).

1 DSP card (2 if the hot spare option has been purchased).

One Bulk I/O card per Analog I/O Rack in the system.

One Wide Area Bulk I/O card for each optional I/O expansion interface, such as MADI or Hydra (if purchased).

Up to 5 Analog I/O Racks

1 Bulk I/O card to interface to the digital I/O rack

Up to 8 mic/line or line input cards, in line with the quotation

Up to 8 line output cards, in line with the quotation

1 Bulk Power Supply and Distribution Rack

Up to 3 Bulk PSU modules (dependent on console size, its distance from the digital I/O rack, and whether a hot spare is required)

PSU requirements can vary depending upon the cabling requirements of each installation. For very long distances, a second bulk power supply and distribution rack may be needed.

A number of Multi-Rail Power Supply Units

1 Multi-Rail PSU is required for systems with just one Analog I/O Rack, 2 are required for systems with 2 or 3 Analog I/O Racks, plus 1 or more hot spares if required.

PSU requirements can vary depending upon the cabling requirements of each installation.

1 PC

1 Set of system cables

ENVIRONMENTAL CONSIDERATIONS

Temperature Range

Operating: 0°C to +30°C (32°F to +86°F) in the immediate environment.

Non-operating: -20°C to +60°C (-4°F to +140°F).

Relative humidity

Operating: 25% to 80% non condensing.
Non-operating: 0% to 90% non condensing.

Altitude

Operating: Up to 2,000 metres (6562 feet). (This is the limit to which the safety tests are valid).

Non-operating: Up to 15,000 metres (49213 feet).

Earthing

The control surface, digital I/O rack, analog I/O rack(s) and bulk power supply rack are provided with chassis earth studs. These must be connected to a common earth buss before any AC power is applied to the system. The system power supplies and PC are earthed via their AC power inlets.

AC (Mains) Power

All power supplies are rack-mounting and are separate from the units they power, except for the PC which has a built-in power supply. AC (Mains) power inlets are IEC type.

- Each PSU in the Bulk PSU rack has one inlet.
- Each multi-rail PSU has one inlet.
- The PC has one inlet
- Each mains powered MADI unit (if purchased) has one inlet
- There is one inlet on the rear of the control surface, for any AC powered equipment which needs to be housed within it.

The whole system must be powered from the same phase of the AC power supply. All modules, cards and cables are designed to permit hot plugging.

Touch Screen

If the console is installed into an outside broadcast vehicle, it is important that the touch screen monitor is secured using suitable fixings during transit to prevent movement, and possible damage. Calrec Audio Ltd is not liable for any damages to the touch screen, the touch screen arm, the console or any other items caused by movement or damage of the monitor and / or monitor arm.

TFT Screens

The TFT meter screens that are fitted in our consoles are industrial units. The display manufacturer states that screen brightness may reduce to 50% of the initial value after the unit has been running at maximum brightness for 50,000 hrs. Our maximum brightness is intentionally reduced so that the useful life of the backlights should be in excess of 100,000 hrs.

We do not believe that there are any burn-in or image-persistence issues with this type of TFT display.

The TFT screens should be cleaned with a micro-fibre cloth, dampened only with clean water. Do not use any corrosive chemicals, solvents or window cleaning solutions.

The TFT screens have no user-serviceable parts. Should you encounter a problem with any of your screens, please contact Calrec.

INPUT/OUTPUT PORT LABELLING

When the console is installed, all the input and output ports on the system should be labelled to match the studio wiring. Please use the labelling sheets provided at the end of this manual.

Some rules are imposed on this labelling:

- The I/O must be labelled in pairs.
- The label must be no more than six characters (to fit on the console's displays).
- No two inputs can have the same label, but an input can have the same label as an output.

I/O is labelled in pairs to make it easier to use with any type of signal; mono, stereo or surround.

In addition to this, AES I/O is wired in pairs and it makes sense to deal with all the I/O in the same way.

The input port label is used as the default name for the channel input and will be shown on the display above the fader.

The system automatically adds a left (L) and right (R) suffix to the label to distinguish the two halves of the pair, or an L R suffix when the pair is used together.

The pairs can be used either for two mono signals, a stereo signal, or parts of a surround signal.

One exception to these rules is allowed:

When I/O is dedicated to mono signals only, (e.g phone lines, mono reverbs, mono distribution feeds) it can be marked as being mono in which case the two halves of the pair have separate labels and the L & R suffixes are not applied.

Note that I/O marked in this way cannot be connected in pairs to stereo paths from the control surface.

A stereo channel input can only be connected to the L - R of a pair of ports, or to one mono port in which case the mono signal will be fed to both L & R of the channel.

A stereo channel direct output can only be connected to the L - R of a pair of ports.

A mono channel input or direct output can be connected to any of: The L or R of a pair of ports, or any mono port.

Mono ports should therefore be considered as unusual. If there is any doubt as to the use of ports, they should be treated as a pair.

Suitable Labels

Generally, I/O ports should be labelled with the name which appears at the other end of the cable, which is connected to the port.

Ideally, the port will be connected directly to a device (Mic splitter box, Video Tape Recorder, Echo unit, Transmission Control Suite, etc).

Alternatively, some I/O may be wired to a patch. This will be done, for example, to allow for hired devices to be connected and may also be done to aid maintenance and operator familiarity with analog consoles.

When planning the use and labelling of I/O, you should also bear in mind that the console includes an internal electronic input patch and output patch. These allow ports to be used for different purposes on different shows and also, the patch connections are stored with the snap-shot memories.

Lists

In addition to labelling, each port can be allocated to one of a number of lists using the Options - Port Lists screens. This allows I/O which is wired for similar purposes to be grouped together for selection.

Each list will have been given a six character "list label" and the lists can be sorted into the required order on the Options-Port Lists screens. The lists will appear in the same order on the console's I/O port selection controls. It is possible to restrict the number of lists that appear for selection on the control surface. This reduces the number of times the pot needs to be pushed, to go through all the available lists.

SYSTEM SPECIFICATION

Digital Inputs	
Formats Supported	AES/EBU (AES3) 24-bit Also suitable for use with SPDIF (IEC958 Type 2) signals
Interface	110 Ohm transformer balanced, 5V Pk-Pk 75 Ohm unbalanced (BNC), 1V Pk-Pk
Sample Rate Conversion	24-Bit switchable on all digital inputs
SRC THD+N	-117dB @ 1kHz, 0.00014%
Digital Outputs	
Formats Supported	AES/EBU (AES3) 24-bit
Interface	110 Ohm transformer balanced 4V Pk-Pk (nominal) into 110 Ohm load 75 Ohm unbalanced 1V Pk-Pk (nominal) into 75 Ohm load (BNC)
Analogue Inputs	
Analogue - Digital Conversion	24-Bit
Input	Electronically Balanced
Input Impedance	>1k Ohms for Mic gains 10k Ohms for Line gains
Sensitivity	+18 / -78dB on Mic/Line Input Card +18/-24dB on Line Only Input Card.
Equivalent Input Noise	-126dB (150 Ohm source)
Distortion	-1dBFS @ 1kHz - Better than 0.003% -20dBFS @ 1kHz - Better than 0.006% -60dBFS @ 1kHz - Better than 0.3%
Frequency Response	20Hz to 20kHz +/- 0.5dB on Mic/Line Input Card 20Hz to 20kHz +/- 0.25dB on Line Only Input Card
Input CMR (Common Mode Rejection)	>70 dB (Typical 80dB) on Line Inputs >75 dB (Typical 85dB) on Mic Inputs
Analogue Outputs	
Digital - Analogue Conversion	24-Bit
Output Balance	Electronically Balanced, 20Hz to 20kHz, Better than -35dB, typically -45dB
Output Impedance	<40 Ohms
Distortion	-1dBFS @ 1kHz - Better than 0.006% -20dBFS @ 1kHz - Better than 0.003% -60dBFS @ 1kHz - Better than 0.3%
Frequency Response	20Hz to 20kHz +/- 0.25dB
Performance	
Digital to Digital (AES/EBU) Distortion	-1dBFS, 20Hz to 10kHz - Better than 0.002%
Digital to Digital (with SRC) Distortion	-1dBFS, 20Hz to 10kHz - Better than 0.005%
Frequency Response (Analogue Input to Output)	20Hz to 20kHz +/- 0.5dB
Synchronisation	
48kHz synchronisation	NTSC/PAL Video Internal Crystal Reference TTL Wordclock (48kHz) AES/EBU Digital Input (48kHz)

Environmental Considerations		
	Operating	Non-Operating
Temperature Range	0°C to +30°C (32°F to +86°F)	-20°C to +60°C (-4°F to +140°F)
Relative Humidity	25% to 80% Non-condensing	0% to 90% Non-condensing
Maximum Altitude	2,000 Metres (6500ft)*	15,000 Metres (49,000ft)

Analog input for 0dBFS can be pre-set globally to +28, +24, +22, +20, +18 or +15 dBu

Pre-fader headroom on analog inputs is adjustable globally from +24 to +36dB in 2dB steps

Analog output for 0dBFS matches input setting into >1kOhms (+24dBu max into 600 Ohms)

The system can be pre-set with up to five external synchronisation sources, plus internal, such that if the 1st source fails, it will automatically switch to the 2nd, and so on.

SIGMA
FRAME OPTIONS AND DIMENSIONS

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CONTROL SURFACE FRAME SIZES

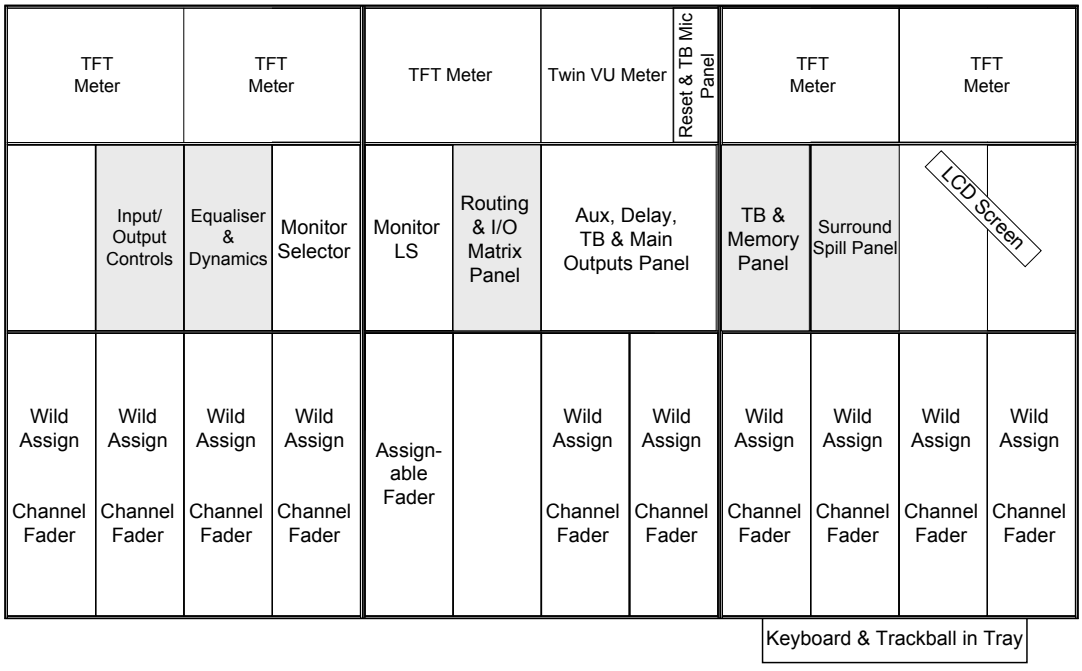
Frames are made up of sections which can be 4, 5 or 6 modules wide. This allows many different sizes of console to be achieved using different combinations of different sized sections. Fader modules have 4 faders each, so console size can depend on the number of faders required.

The table shows the dimensions of the standard frame sizes available. Sections within the frame do not have to be in the order shown. For details of custom frames, with wedge sections etc, please contact Calrec.

No of Modules Wide	Frame	Length		Depth	
		inches	mm	inches	mm
12	4:4:4	60.9	1547	38	964
13	4:4:5	65.9	1672	38	964
14	4:6:4	70.8	1797	38	964
15	4:6:5	75.7	1922	38	964
16	6:4:6	80.7	2047	38	964
17	5:6:6	85.6	2172	38	964
18	6:6:6	90.5	2297	38	964
19	5:4:4:6	95.7	2428	38	964
20	6:4:4:6	100.6	2553	38	964
21	5:4:6:6	105.5	2678	38	964
22	4:6:6:6	110.4	2803	38	964
23	5:6:6:6	115.4	2928	38	964

Typical Frame (4:4:4)

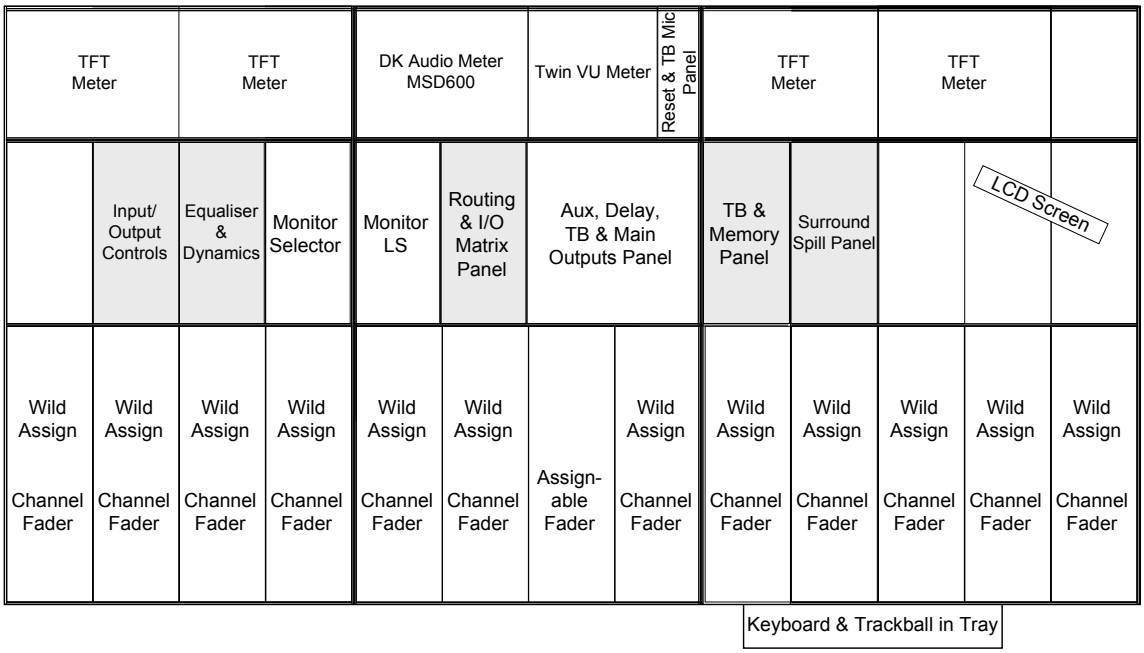
The diagram below shows a 40 fader console, using a 4:4:4 frame. With 2 audio paths on each fader, this allows up to 64 channel faders within a frame only 1547mm (60.9 inches) wide. The Assign panels are shown shaded.



CONTROL SURFACE LAYOUT EXAMPLES

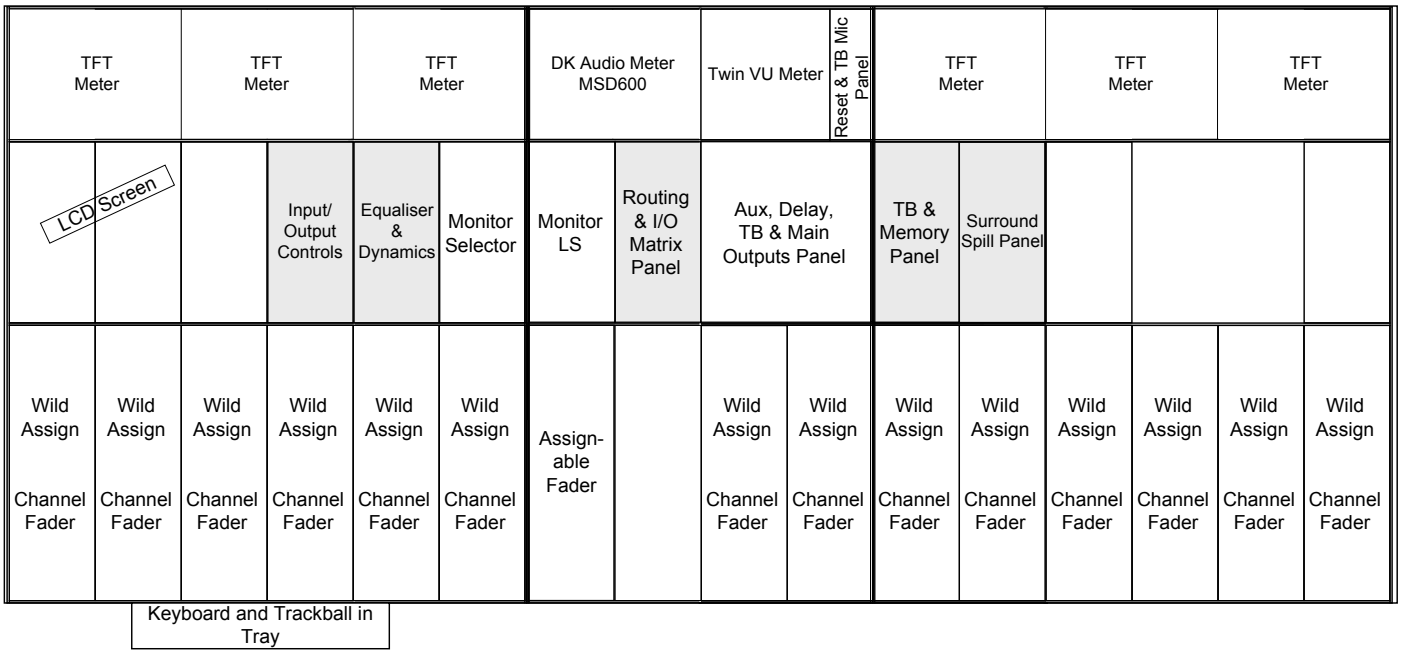
Typical Frame (4:4:5)

This example shows a 48 fader console using a 4:4:5 frame. With 2 audio paths on each fader, this allows up to 96 channel faders within a frame only 1672mm (65.9 inches) wide. The Assign panels are shown shaded.



Typical Frame (6:4:6)

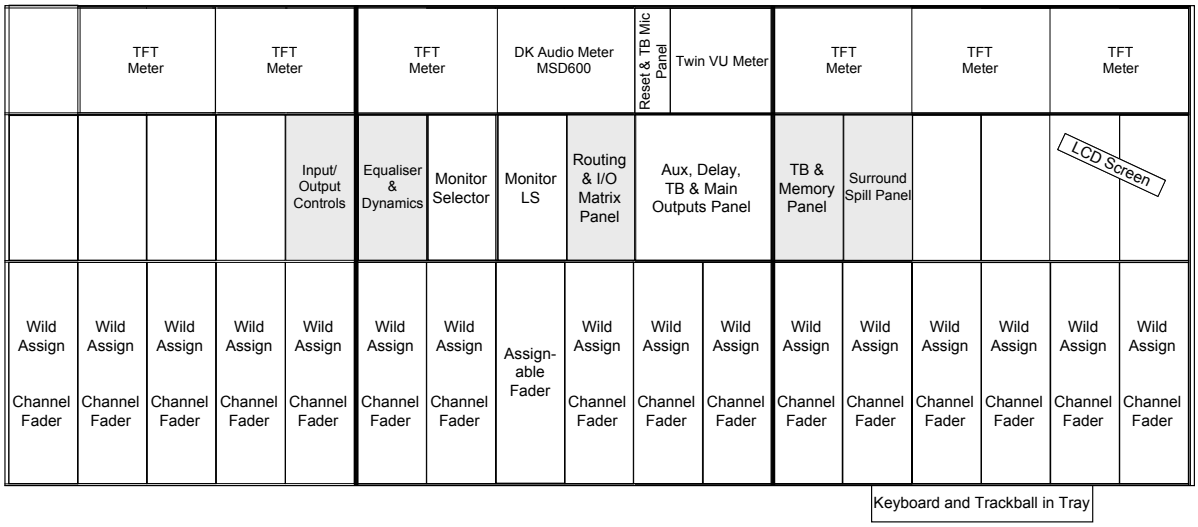
This example shows a 56 fader console using a 6:4:6 frame. With 2 audio paths on each fader, this allows up to 112 channel faders within a frame only 2047mm (80.7 inches) wide.



CONTROL SURFACE LAYOUT EXAMPLES

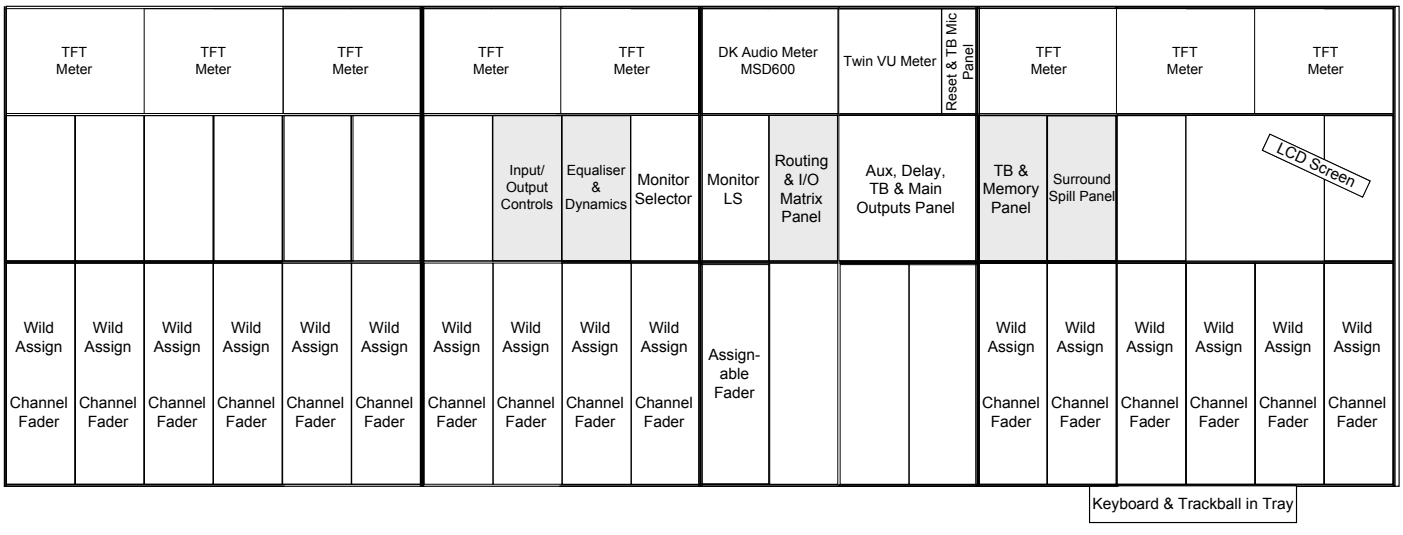
Typical Frame (5:6:6)

This example shows a 64 fader console, using a 5:6:6 frame. With 2 audio paths on each fader, this allows up to 128 channel faders within a frame only 2172mm (85.6 inches) wide.



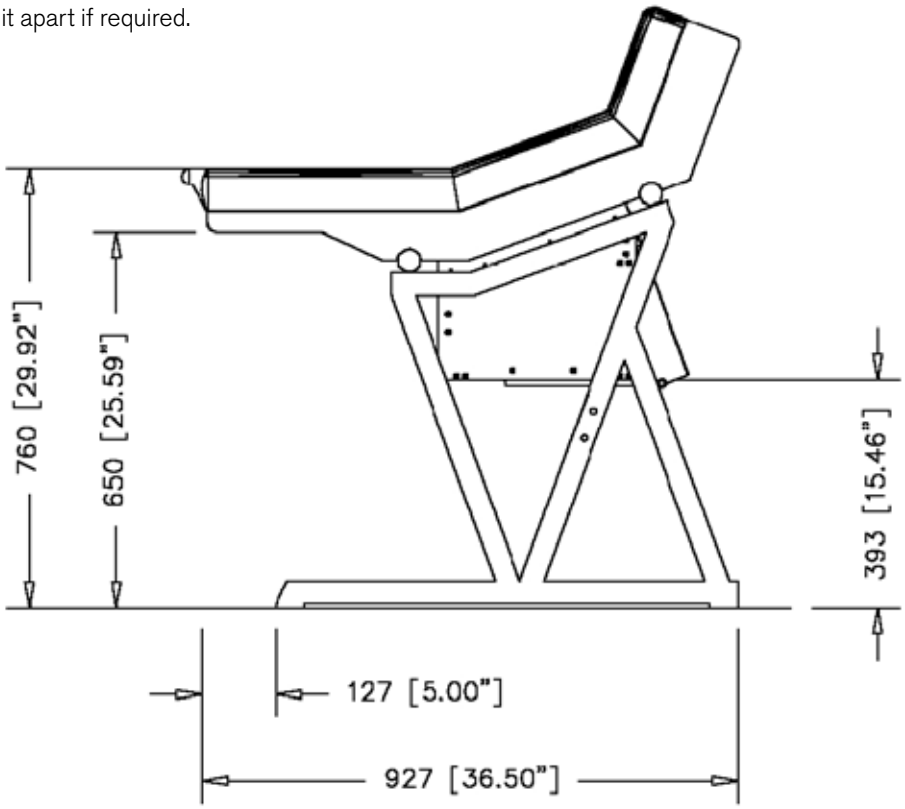
Typical Frame (6:4:4:6)

This example shows a 64 fader console, using a 6:4:4:6 frame. With 2 audio paths on each fader, this allows up to 128 channel faders within a frame only 2559mm wide.



END ELEVATION

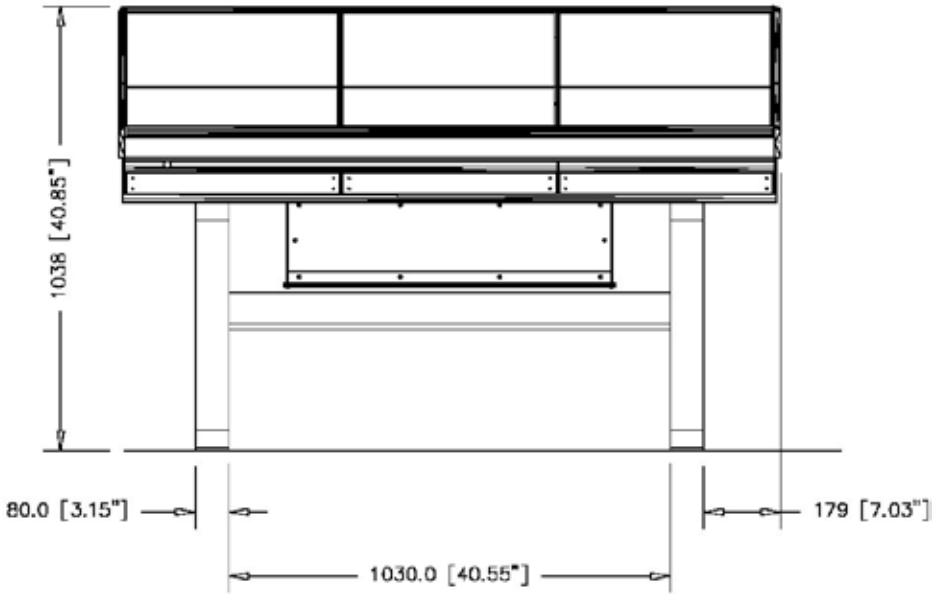
The end elevation dimensions are the same for all frame sizes. The control surface can be separated from the stand for access to the premises. The control surface sections can also be split apart if required.



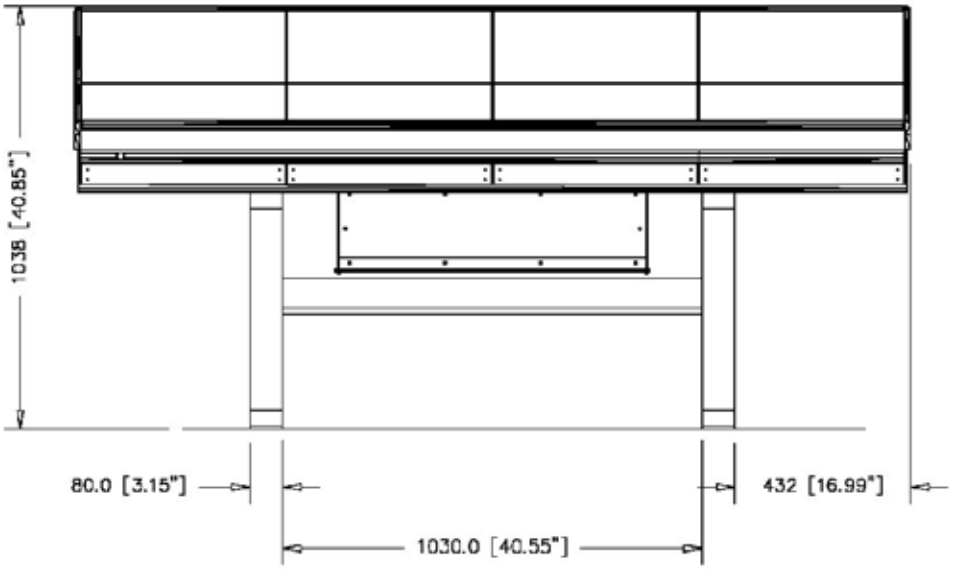
End Elevation

FRONT ELEVATION

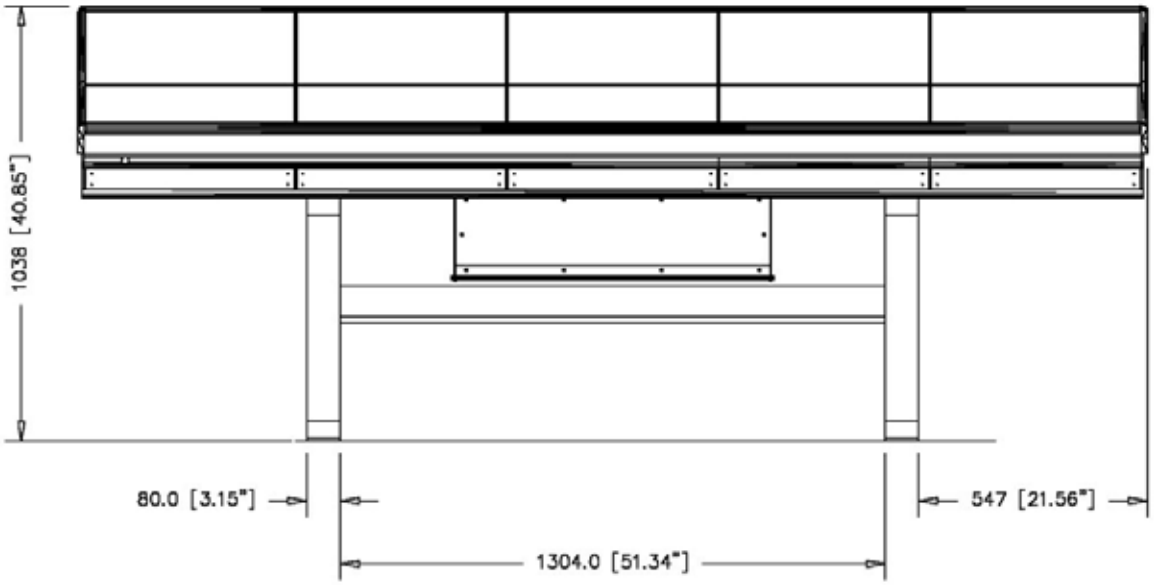
4:4:4 Frame



4:4:4:4 Frame



4:4:4:4:4 Frame



SIGMA
EQUIPMENT INSTALLATION INFORMATION

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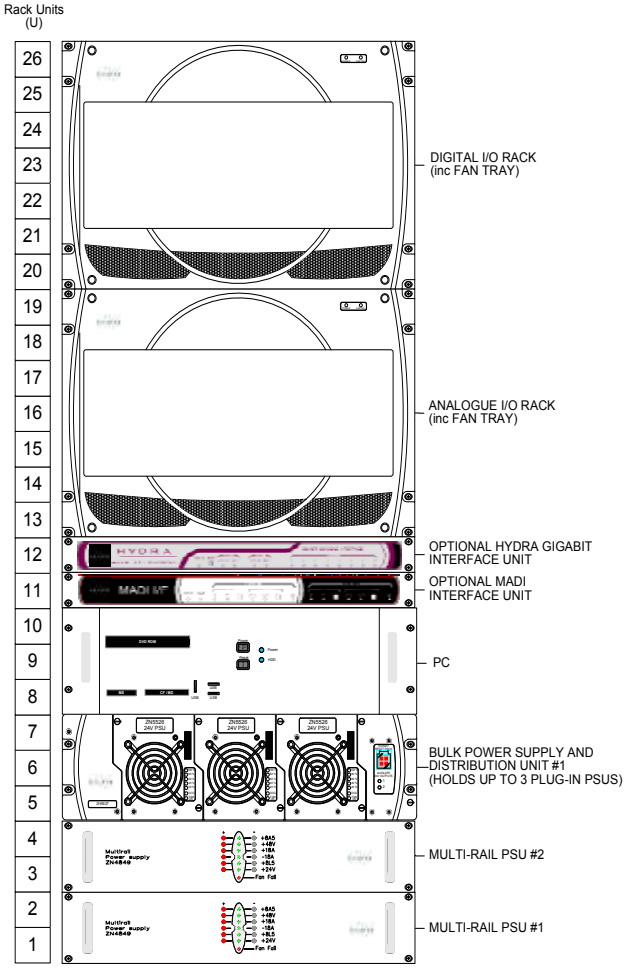
Putting Sound in the Picture

RACK SPECIFICATIONS

It is recommended that all equipment over 8Kg (17.5 lbs) in weight, or over 150mm (6 inches) deep is mounted into equipment bays which offer mechanical supports under each of the units. This will allow units to be supported as they slide forward during removal for maintenance purposes.

Equipment can be mounted in separate enclosures. Please refer to the cable lengths table below before planning this.

Each I/O rack has a fan tray built into it, which incorporates a baffle such that warm air is sucked up out of the rack and out through the rear of the fan tray. A vent in the front of the fan tray allows ambient air to enter. The baffle deflects this air up into the rack above. The bottom rack should not be positioned above any equipment producing significant heat.



WEIGHTS AND DIMENSIONS

Items	Height	Approx depth (incl. mating cons)		Approx weight	
		inches	mm	lbs	kgs
Digital I/O Rack (fully populated)	7U	18.1	460	49.5	22.5
Analog I/O Rack (fully populated)	7U	18.1	460	53.3	24.2
Bulk Power Supply and Distribution Rack with one PSU	3U	15	380	26	11.8
Additional PSU for Bulk PSU Rack	-	-	-	7.7	3.5
Multi-Rail PSU*	2U	18.1	460	22.1	10.0
Additional Multi-Rail PSU Hot spare	2U	18.1	460	22.1	10.0
PC*	3U	23.7	600	27	12.2
MADI Unit	1U	11.9	300	7.0	3.2
Hydra Gigabit Interface Unit	1U	11.9	300	6.0	2.7

* Note: Units have handles protruding approximately 1.3" (32mm) from the surface of the front panel.

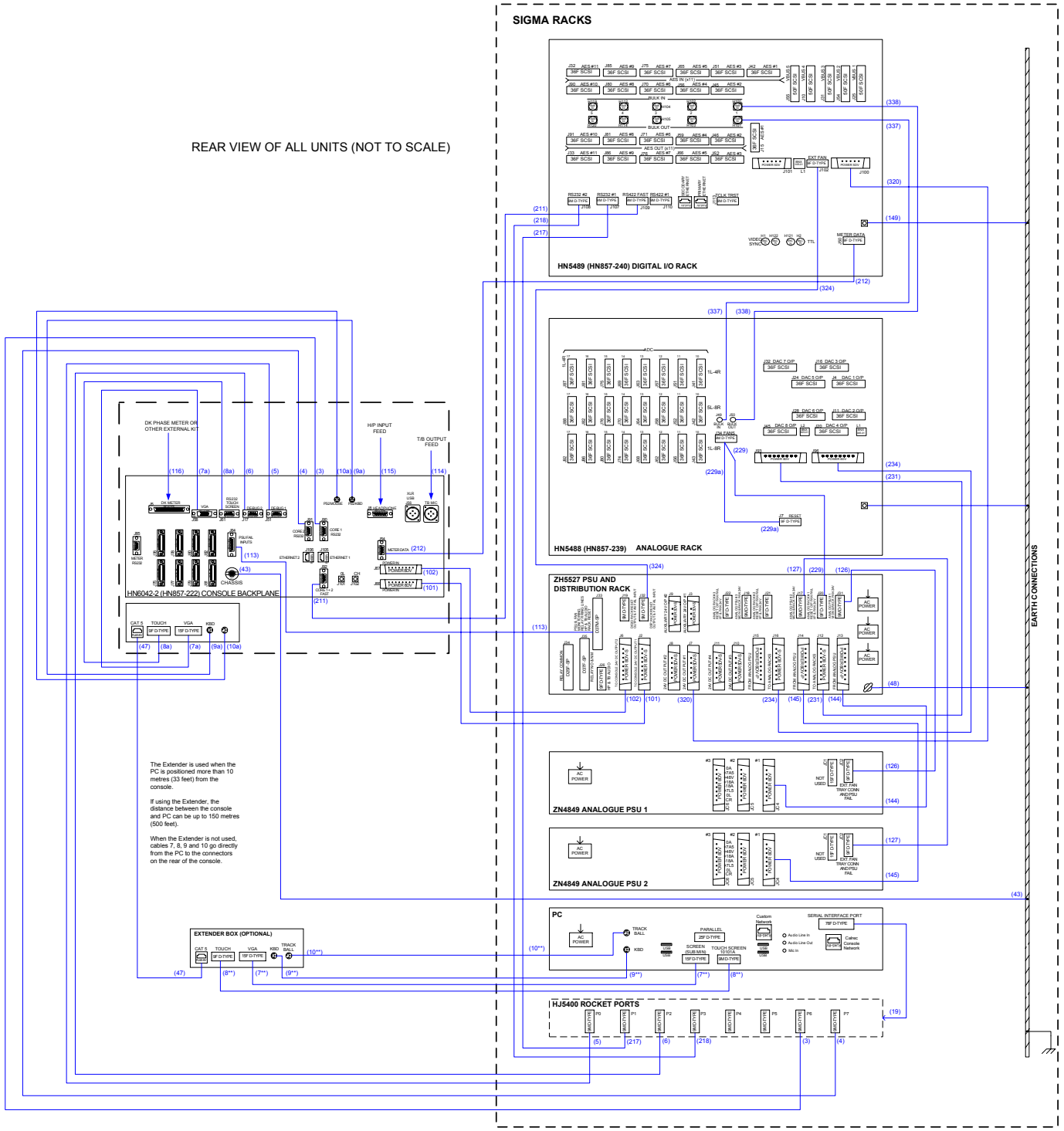
MAXIMUM CABLE LENGTHS

Cables		Maximum Length	
From	To	Feet	Metres
Control Surface	Bulk PSU & Distribution Unit	100.0	30.0
Control Surface	PC	500.0	150.0
Control Surface **	Digital I/O Rack **	100.0	30.0
PC	Digital I/O Rack	100.0	30.0
Digital I/O Rack	Bulk PSU & Distribution Unit	100.0	30.0
Digital I/O Rack	Analog I/O Rack	33.0	10.0
Digital I/O Rack	BNC I/O Interface Panel	16.5	5
Digital I/O Rack	XLR I/O Interface Panel	6.5	2
Analog I/O Rack***	Analog I/O Interface Panel (EDAC)***	9.8	3
Analog I/O Rack	Multi-Rail PSU	33.0	10.0
Multi-Rail PSU	Other Multi-Rail PSU	1.3	0.4
MADI Unit	Digital I/O Rack	16.5	5
Hydra Unit	Digital I/O Rack	16.5	5

**Extenders are supplied to provide console data connections greater than 30 meters (98 feet).

*** For longer distances, custom made cables can be provided.

CONSOLE AND RACK WIRING DIAGRAM



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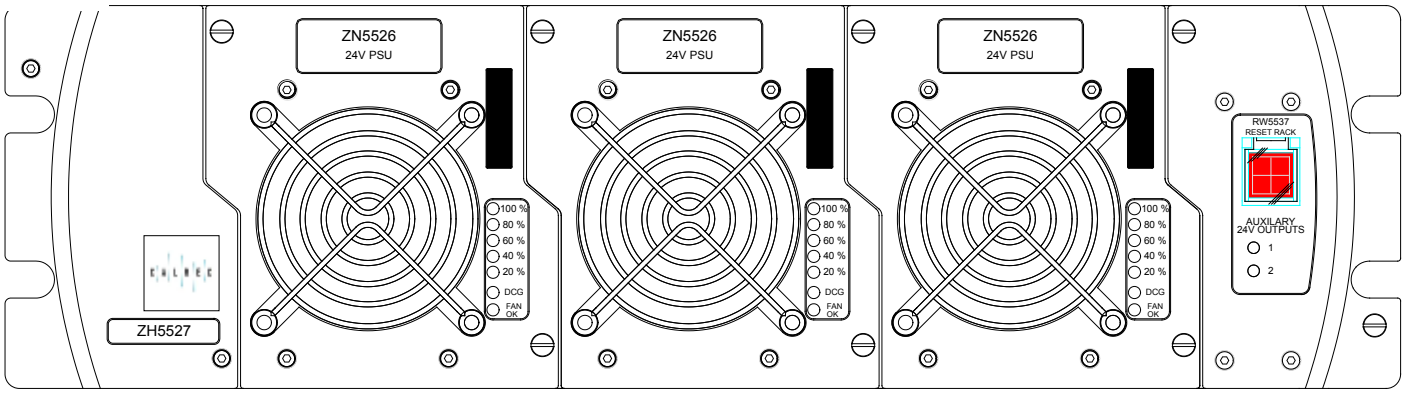
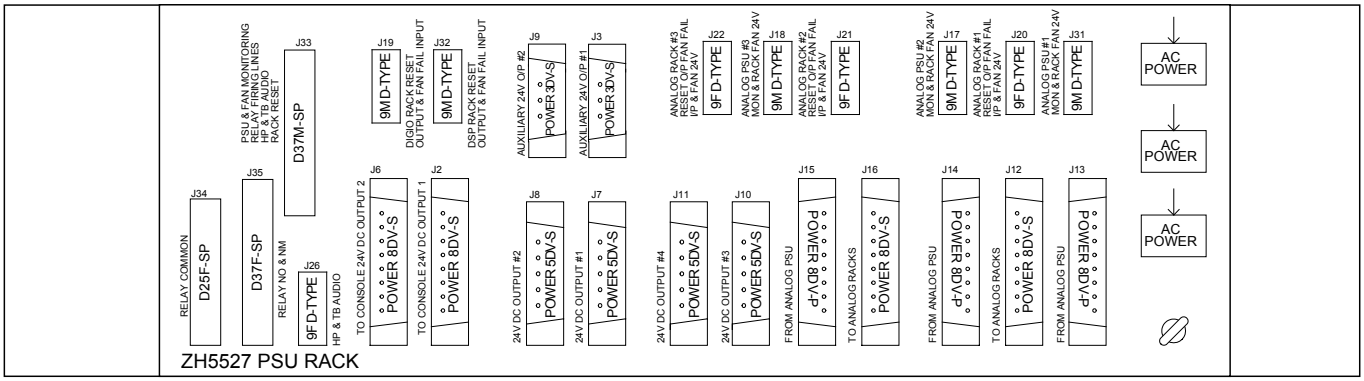
BULK POWER SUPPLY AND DISTRIBUTION

Front



Rear



This 3U rack can hold up to 3 identical plug-in power supply units. The number of plug-in PSU's required in the rack is dependant upon the size of the system, the distance between console and rack, and the "hot spare" requirement.

If your system uses the 2U Bulk power supply and separate distribution system, please refer to Appendix A at the end of this manual.

Plug-in Units

Each unit has separate AC power inputs via IEC 950 filtered inlets at the rear of the rack. The DC outputs are combined on the backplane. The maximum output power from each plug-in unit is 600W.

Hot Swapping

The units can be "hot swapped" providing there is enough output power remaining to drive the load. Each unit has a bargraph to indicate the output power demand.

Auxiliary Power

Two 24V Auxiliary outputs are provided via resetable 10A current trips with LED status indication on the front panel. These could be used for a MADI interface unit or a Hydra networking interface unit for example.

Fan Cooling

The rack is fan cooled with fans mounted in the front of each PSU. The warm air is directed out of the sides of the rack. **To ensure proper cooling, there must be a minimum clearance of two inches (50mm) from the fans and side air outlets The maximum operating ambient temperature is 35°C.**

Power Monitoring & Distribution

In addition to supplying the console and digital rack components of the system with power, the Bulk Power Supply and Distribution Unit gathers and distributes the multiple rails (from external power units) required for any analog I/O cards. All the system power rails and fan speed monitoring is gathered here before being sent to the console. Should a fault occur, a warning light will flash on the console and a diagnostic message will appear on the front end AWACS (Automatic Warning And Correction System) screen.

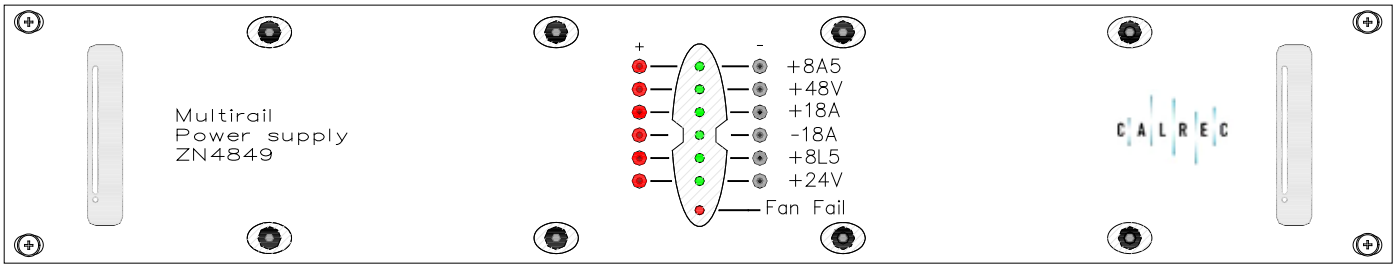
The unit also includes a front-mounted reset button for the digital I/O rack.

FAN NOISE

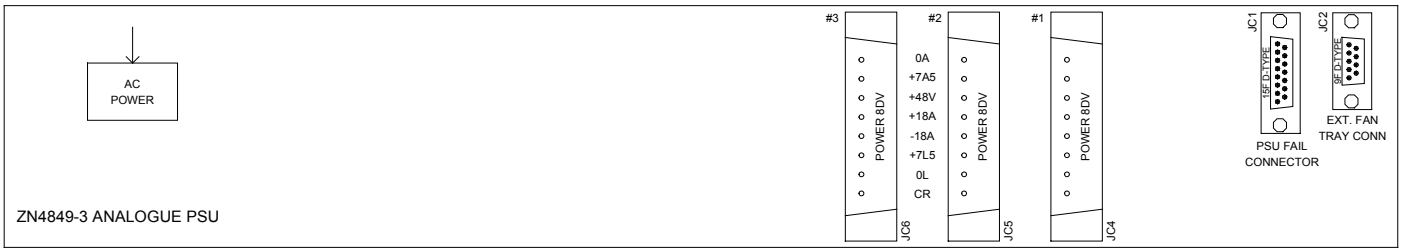
Bulk PSU Rack Fan Noise (dB SPL A-Weighted)	
These measurements were taken on axis at 1 metre from the dominant noise source:	
1 x 24V 600W PSU	42dBA
2 x 24V 600W PSU	45dBA
3 x 24V 600W PSU	47dBA
4 x 24V 600W PSU	48dBA
5 x 24V 600W PSU	49dBA
6 x 24V 600W PSU	50dBA

MULTI-RAIL PSU

Front



Rear



A 2U multi-rail power supply unit is used to power the analog I/O racks. These supplies can be parallelled together. A typical system with 2 analog I/O racks would have two of these multi-rail power supply units, plus a third unit acting as a "hot spare" providing redundancy, in case one of the other units fail. If racks are housed in different locations, each may require a hot spare. This is dependant upon the cable lengths involved. All hot spares are optional.

Mounting

Multi-rail power supply units are fitted with rear flanges to allow the rear of the unit to be bolted to the studio equipment bay. In outside broadcast situations, the unit should ideally be located into an equipment bay which offers mechanical support from underneath.

Fan Cooling

The multi-rail power supply unit is fan cooled but uses a very low noise fan (29dBA), drawing air from side to side through the PSU instead of in from the front, to minimise noise. Should any of the fans slow down or stop, or any voltage rail fall outside specified limits, a PSU Fail signal will be sent to the console and PC to warn the operator of a problem.

Power Monitoring

These units are monitored via the bulk power supply and distribution unit. Should a fault occur, the hot spare would automatically take over from the primary unit, the PSU Fail Indicator on the Broadcast Facilities panel would begin to flash and a message would be sent to the control surface via AWACS.

PC INFORMATION

Mounting Instructions

The PC should be mounted by means of the side brackets, each of which has two mounting holes. The PC rack should always be mounted in a horizontal position. The sliders should be used when no support is provided under the PC assembly. It should not be supported by front flanges alone. Failure to follow these instructions may invalidate the warranty. The PC is earthed via its AC power inlet.

Remote Access

USB connectors are provided on both the front and rear of the PC for the option to add an external modem of your choice. If a modem is added, and a suitable telephone line installed, the console can be remotely accessed by Calrec Support Engineers to aid software upgrades and diagnostic work. This can greatly enhance the level of service and support we can provide. A dial-up facility must first be activated at the PC before this is possible, to ensure that connections are not made at inappropriate times or without the user's knowledge and consent.

Local Network

A network port is provided to enable the user to connect to their own LAN. Calrec will not be responsible for the configuration of this port or for any performance issues arising from its use.

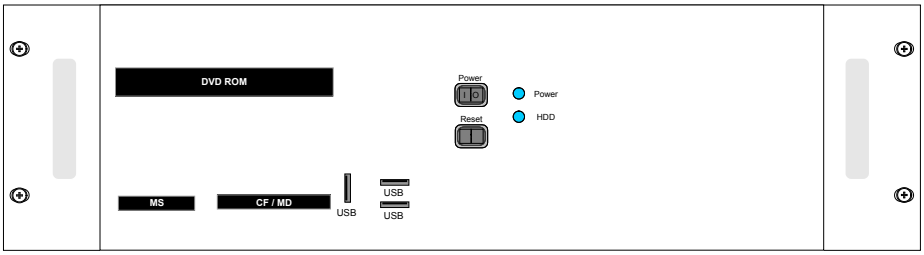
Hydra Network Connection

A Gigabit Ethernet port is provided to enable the PC to be connected to a Calrec Hydra Audio Network, which is an option which can either be purchased with the console or in the future.

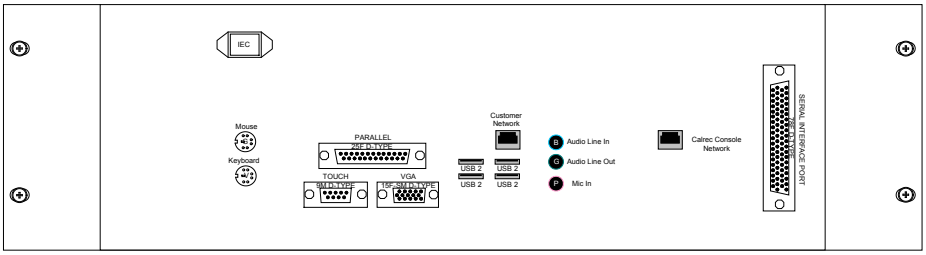
Software Supplied

An OEM PC Operating System license is supplied with each console, and the operating system software is pre-installed. The console software is also pre-installed, and supplied on a CD-ROM.

Front



Rear



3rd Party Software

Calrec recommends that the PC is regarded as an integral control device for the console, and not as a general purpose PC. If 3rd party software is installed on the PC, care must always be taken to ensure that it does not interfere with the normal performance of the PC. The installation of inappropriate software on the PC may invalidate the console warranty.

Usernames and Passwords

The PC will initially be set up with two sets of usernames and passwords:

Username: CalrecAudio
Password: (none)

This user can install and run programs, but cannot change PC hardware settings (i.e. set up network, install drivers. It is recommended that this user is used during normal operation.

Username: CalrecAudioAdmin
Password: calrec

This user has full rights to the PC and can install and change PC hardware settings. It is recommended that this user is used during configuration of the PC and the setup of Hydra Audio Networking.

Operating System	Windows XP
CPU	Intel Celeron Processor (2GHz+)
RAM	256 MB DDR RAM
HDD	40GB
CD ROM	52x
Network Ports	2 x 10/100
Card Slots	Compact Flash/Microdrive, SmartMedia, Memory Stick, Secure Digital/Multimedia Card
USB 2 Ports	4 (Rear of Unit), 1 (Front of Unit)
IEEE1394 Port	1 (Front of Unit)
Additional Hardware	8 Port Serial Card

FILE BACKUP

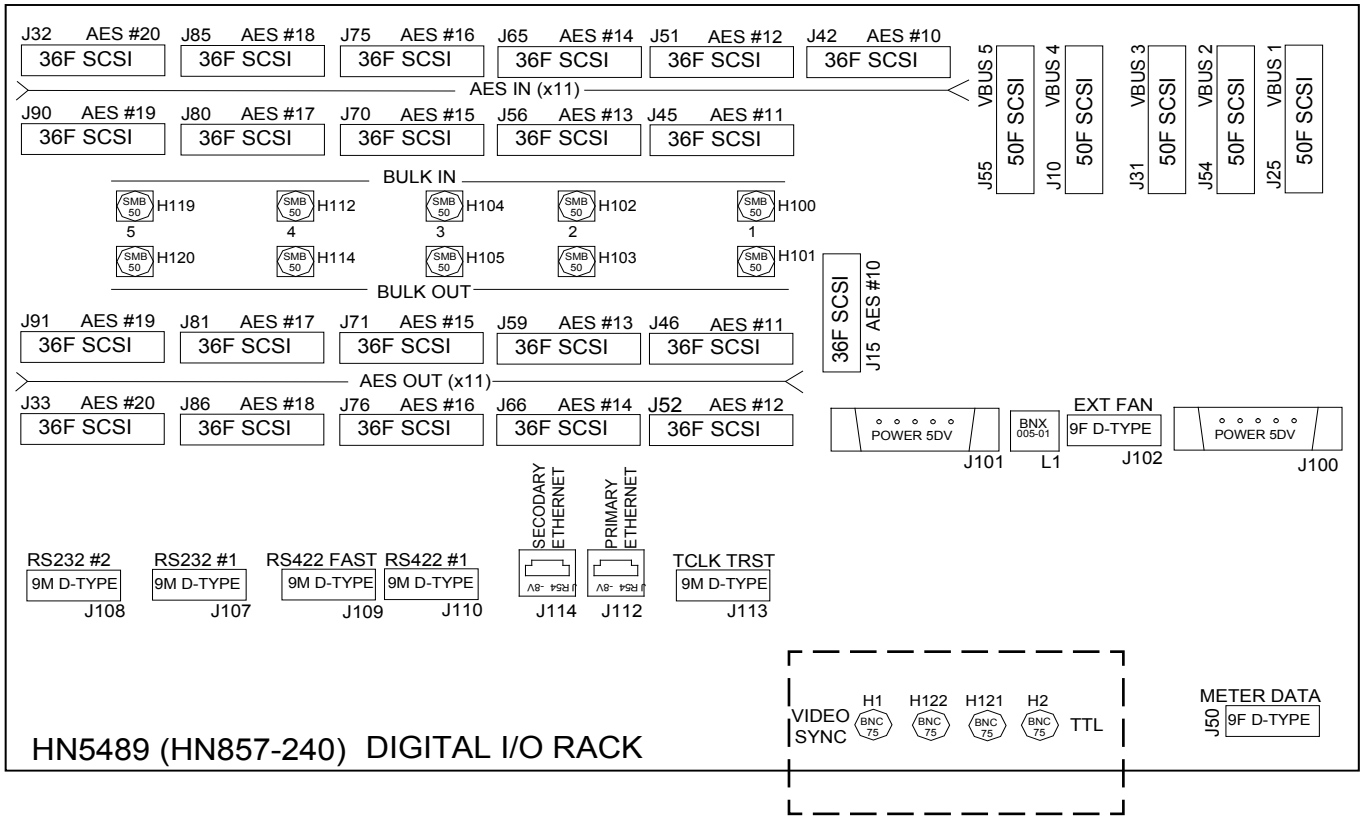
A number of flash card slots are provided on the front of the PC for file backup. In addition, backup could also be to a LAN or to a USB device which can be plugged into the front or rear of the PC.

The following files are not installed from the CD-ROM as they are specific to each individual console. As such, a backup copy should be kept of these files in-case of PC or hard-drive failure:

The system will automatically back up these files to a user-specified drive, if it is set to do so. This is done using the Set-up Application.

FILENAME	DESCRIPTION
C:\Sigma\Cust1\Config.ini	This file should only be altered by an approved Calrec engineer using a specifically designed application. The file can be copied but any unauthorised changes made will render it inoperable, including changing the date stamp of the file (such as saving even if not edited). If the file needs to be e-mailed to Calrec for any reason it should always be zipped to protect the file time/date stamp. A new backup copy of this file should be made after a console upgrade.
C:\Sigma\Cust1\Setup.ini	This file is updated when changes to console settings are made and saved using the set-up application. It should not be altered by any means other than by using the set-up application. A new backup copy of this file should be made after such changes are made or after a software upgrade.
C:\Sigma\Cust1\Options\Options.bin	This file is updated and a new backup should be made when changes to any of the sub-pages of the options screen are made and saved.
C:\Sigma\Cust1\memories	This is the default location for the user memories. However, operators can choose to save them to any location they desire. The maintenance department should keep a backup of the important default memories, whilst operators should be encouraged to keep their own backups of their own memories and to update them whenever they make important changes to them. After a software upgrade the main set of memories will be upgraded and checked by the engineer carrying out the upgrade. A new backup should then be made of these memories.
C:\Sigma\Cust1\Meter	This is the default location for the user-definable meter configurations. If your console uses these, you should also keep a backup copy of the files in this folder.
C:\Sigma\Cust1\Monitor	This is the default location for the user-definable monitor panel configurations. If your console uses these, you should also keep a backup copy of the files in this folder.
C:\Sigma\Cust1\Network	If your console uses Hydra Audio Networking, you should also keep a backup copy of the files in this folder. These are the configuration settings for the network units.
C:\Sigma\Cust1\Lists	This is the default location for the user-definable port list configurations. You should keep a backup copy of the files in this folder.
C:\Sigma\Cust1\Router	This is the default location for any router configurations made using a serial interface. If your console uses these, you should also keep a backup copy of the files in this folder.
For customers using Compaq PC's only: C:\Sigma100\Cust1\A100fe1.ini C:\Sigma100\Alphaprg\Alphaprg.ini	These files are installed from the CD-ROM in a default format. The settings in these files can vary in different Compaq PCs. The backup of these files should be updated after a software upgrade. If a new hard-drive is fitted to the original Compaq PC, these files should be used to over-write the versions installed by the CD-ROM.

SYNCHRONISATION



The system can be pre-set with up to five external sync sources, plus internal, such that if the 1st source fails, it will automatically switch to the 2nd, and so on.

It is strongly recommended that all items of digital equipment connected digitally to the console, are synchronised to the same sync signal.

If the console's internal sync is to be the master, other digital equipment should be synchronised to the digital outputs of the console.

External AES Sources

Please note that the facility for locking to external AES sources is restricted to the first six inputs of each AES card in the console. One of the external sources can be Video, (PAL or NTSC). TTL Word Clock is another possible external source.

Video and TTL Word Clock Synchronisation

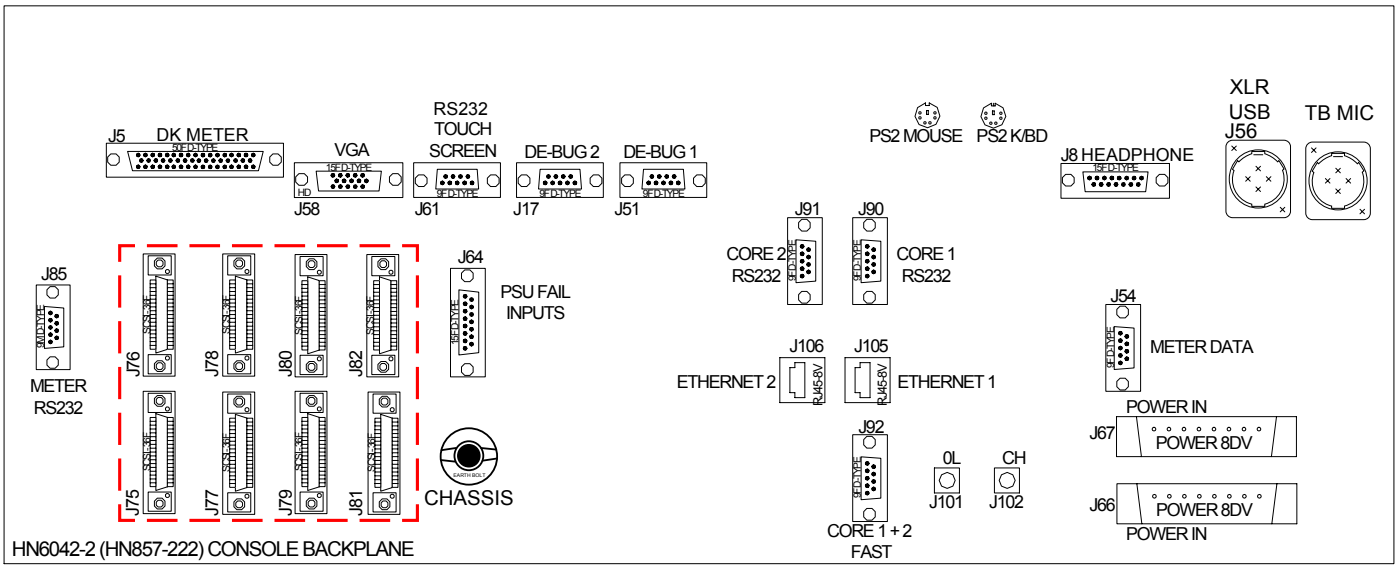
Two Video (PAL or NTSC) and two TTL Word Clock synchronisation inputs are provided. These are a parallel connection, to allow a 'loop through or 'daisy chain' connection to be made.

NB - Since the video connection is low impedance, if only one connection is made, then the second connection must have a 75Ω termination fitted.

Frequency Variation

When using a digital input or TTL Word Clock as a source, the system will tolerate a variation of up to +/- 100 Hz in the frequency of the source. The console may also be synchronised from its internal crystal oscillator (48 kHz).

GPIO CONNECTIONS



Connections to the relay and opto isolators are provided on 36 way female SCSI connectors on the rear of the console.

Up to 4 cards can be fitted, each of which can provide up to 16 relay-isolated outputs and 8 opto-isolated inputs.

* Note that on Relay/Opto card 1, relays 1 - 4 are not available, as they are used for TX, RX, PSU Fail and APFL facilities.

Relay Output Specification
100mA maximum switch current, 30V maximum voltage.

Opto Input Specification
DC - 5 to 50 volts, positive or negative
AC - 5 to 50 volts peak, 50-60Hz.

A

Connector 1 of 2

Pins	Circuit
1 . 19	5V
2 . 20	Opto 1
3 . 21	Opto 2
4 . 22	Opto 3
5 . 23	Opto 4
6	* Relay 1 No
24	Nm
7	Com
25	* Relay 2
8	Nm
26	Com
9	* Relay 3
27	Nm
10 .	Com
28	* Relay 4
11	Nm
29	Com
12	Relay 5
30	Nm
13	Com
31	Relay 6
14	Nm
32	Com
15	Relay 7
33	Nm
16	Com
34	Relay 8
17	Nm
35	Com
18 . 36	0V

B

Connector 2 of 2

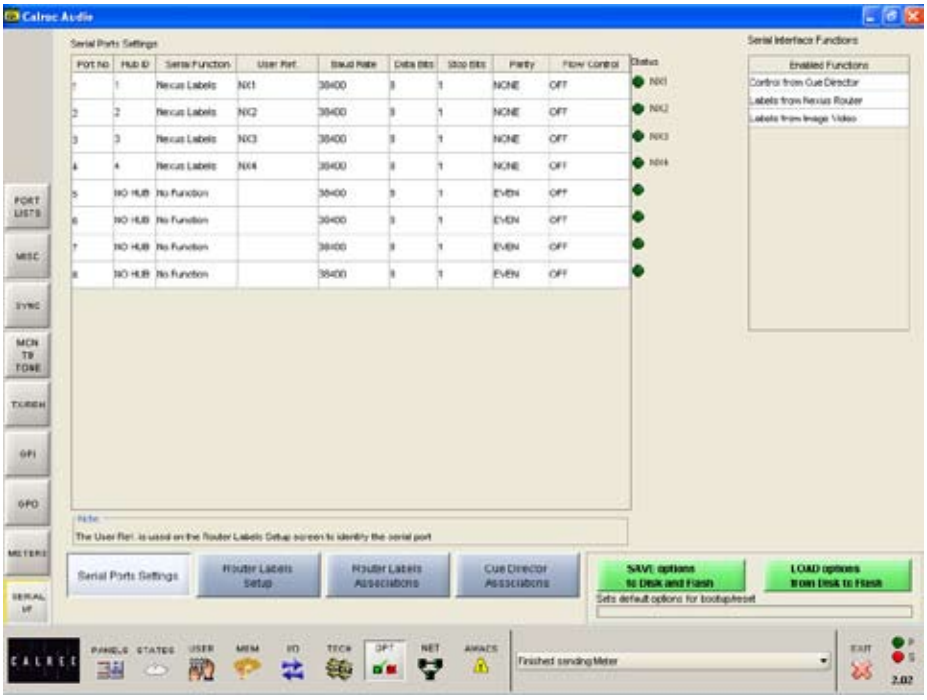
Pins	Circuit
1 . 19	5V
2 . 20	Opto 5
3 . 21	Opto 6
4 . 22	Opto 7
5 . 23	Opto 8
6	Relay 9
24	Nm
7	Com
25	Relay 10
8	Nm
26	Com
9	Relay 11
27	Nm
10 .	Com
28	Relay 12
11	Nm
29	Com
12	Relay 13
30	Nm
13	Com
31	Relay 14
14	Nm
32	Com
15	Relay 15
33	Nm
16	Com
34	Relay 16
17	Nm
35	Com
18 . 36	OV

SERIAL INTERFACE

The system currently supports the following serial interfaces:

- Cue Director
- Nexus Router
- TSI Image Video 1000

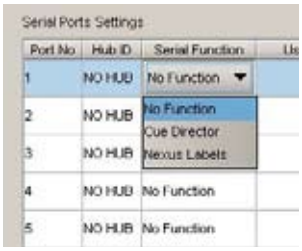
Serial port setup and label associations are made using the Options-Serial I/F screens.



Serial Port Settings Screen

The console can have up to 8 hub cards, each of which can have a serial interface port for allowing equipment to be connected to the system.

The Serial Port Settings screen is used to tell the system what information it should receive from each serial interface port, by allocating a function to each from the Serial Function column. Only the serial functions which are enabled for the console will be available for selection.



The Hub ID number is also selectable from a drop down list. The ability to change the Hub ID number is useful for the situation where two routers are connected to the console, sending the same information. If one router or serial port fails the serial function can be moved from one hub to another.

The function can be given a name by typing up to six characters in the USER REF column.

For each function there is an indicator which flashes when a valid message is received from the user serial port.

DOLBY DP570 & DP564 SETUP (FOR CALREC REMOTE INTERFACE)

The following instructions are to set up a Dolby DP570 or DP564. Please also refer to the drawing below and the schedule on the next page for connection details.

On the Dolby box:

<label> means press the button with the name label.

Power up the unit.

<setup>
<down arrow> until you see "SYSTEM SETTINGS"
<enter> Unit name is now displayed
<down arrow> until you see "GPI setup"
<enter> "GPI pin 23" is displayed
<enter> "GPI pin 23 trigger" is displayed
<enter>
<down arrow> until you see "Edge"
<enter>
<esc> "GPI pin 23 trigger" is displayed
<down arrow> "GPI pin 23 Polarity" is displayed
<enter>
<down arrow> until you see "Positive/High"
<enter>
<esc> "GPI pin 23 Polarity" is displayed
<down arrow> "GPI pin 23 Function" is displayed
<enter>
<down arrow> until you see "FULL" meaning surround.
<enter>
<esc> "GPI pin 23 Function" is displayed
<esc> "GPI pin 23" is displayed
<down arrow> "GPI pin 24" is displayed

Repeat the process for all the GPI pins 24 - 31

<esc> "GPI setup" is displayed
<down arrow> "GPO setup" is displayed

Now go though the same routine to set up the outputs on pins 7 to 14 (as drawing/spreadsheet) with trigger as "Level", Polarity as "Positive/High", and function as spreadsheet.

<esc> Until back at original menu.

Note: With issue 1 cable, the outputs are on pins 8 to 15.

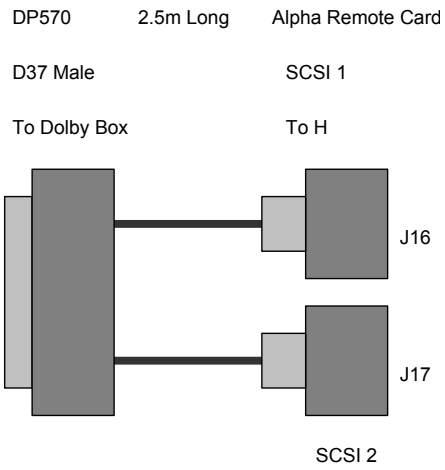
Dolby Multichannel Audio Tool Model DP570 to Alpha Remote Connection Cable (fully isolated)

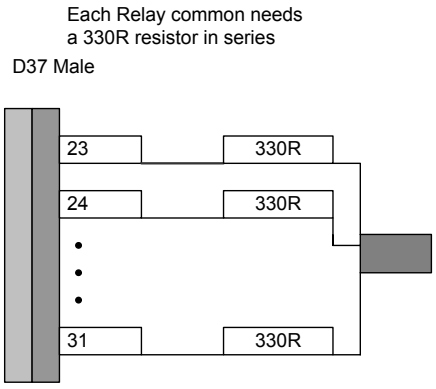
Designed to be plugged in second remote card

Dolby DP570 GPIO connector D37 Male	
pin	function
1	5V
2	Fault Output
3	Error_Output
4	User defined output
5	Solo tally output
6	Solo control input
7	Surround
8	Stereo
9	Mono
10	Phantom Centre
11	3Stereo
12	Prologic
13	Line
14	Custom
15	RF
16	
17	
18	
19	
20	
21	
22	
23	Surround
24	Stereo
25	Mono
26	Phantom Centre
27	3Stereo
28	Prologic
29	Line
30	Custom
31	RF
32	
33	
34	
35	
36	
37	Digital Ground

To Alpha 2nd Remote Card Remote SCSI 1	
pin	function
6,9,12, 15,25,28 ,31,34	Relay 1-8 No
2	Opto 1
3	Opto 2
4	Opto 3
5	Opto 4
7	Relay 1 Com
26	Relay 2 Com
10	Relay 3 Com
29	Relay 4 Com
13	Relay 5 Com
32	Relay 6 Com
16	Relay 7 Com
35	Relay 8 Com
8,11,14, 17,20,21, 22,23,24, 27,30,33	Digital Ground

To Alpha 2nd Remote Card Remote SCSI 2	
pin	function
6	Relay 9 No
2	Opto 5
3	Opto 6
4	Opto 7
5	Opto 8
7	Relay 9 Com
20,21, 22,23, 24	Relay 9 Nm, Opto 5-8 returns



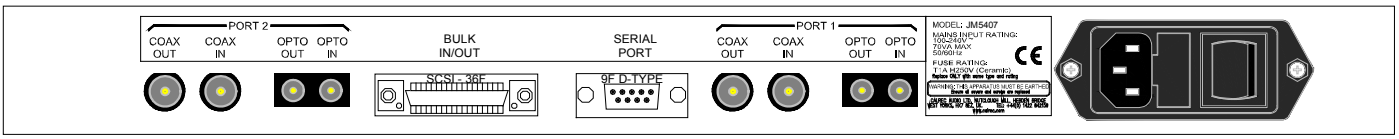


Cable schedule for Dolby DP570 & DP564 remote connection to Calrec Console													0681-87
Cable No	Cable	Cable	Length	Colours	From				To				Circuit
	Description	Type			Pins	Conn Type	Area	Con. No.	Area	Con. No.	Conn Type	Pins	
1	Alpha Rem 1	BEL10 9510	8m	Bk of (Bk/R)	1*	D37MC	Eqpt Bay	GPIO	HN4916-2	J16	SCSI 36M	6 $	Relay 1-8 No (5V)
		310-201		Bk/W	7.8	*Cable Mounting*	Dolby Unit	"	"	"	*Cable Mounting*	2.3	Opto 1 / 2 (Stereo/Mono)
				Bk/G	9.10	*Hood: 420-499*	"	"	"	"	*Hood: 410-156*	4.5	Opto 3 / 4 (Ph centre/3stereo)
				Bk/B	23#.24#	*Insert: 420-496*	"	"	"	"	*Insert: 410-155*	7.26	Relay 1 / 2 Com (Surr/Stereo)
				Bk/Y	25#.26#	"	"	"	"	"	"	10.29	Relay 3 / 4 Com (Mono/Ph centre)
				Bk/Bn	27#.28#	"	"	"	"	"	"	13.32	Relay 5 / 6 Com (3Stereo/Pro logic)
				Bk/O	29#.30#	"	"	"	"	"	"	16.35	Relay 7 / 8 Com (Line/Custom)
				R/W	NC	"	"	"	"	"	"	NC	
				R/G	NC	"	"	"	"	"	"	NC	
				R/B	NC	"	"	"	"	"	"	NC	
				R of (Bk/R)	37*	"	"	"	"	"	"	8 $$	Relay 1-8 Nm, Opto Returns
				Scr	Shell*	"	"	"	"	"	"	Shell	Earth
2	Alpha Rem 2	BEL5 9505	8m	Bk of (Bk/R)	1*	"	"	"	HN4916-2	J17	SCSI 36M	6	Relay 9 No (5V)
		310-379		Bk/W	11.12	"	"	"	"	"	*Cable Mounting*	2.3	Opto 5 / 6 (Pro logic/Line)
				Bk/G	13.14	"	"	"	"	"	*Hood: 410-156*	4.5	Opto 7 / 8 (Custom/RF)
				Bk of (Bk/B)	31#	"	"	"	"	"	*Insert: 410-155*	7	Relay 9 Com (RF)
				B of (Bk/B)	NC	"	"	"	"	"	"	NC	
				Bk/Y	NC	"	"	"	"	"	"	NC	
				R of (Bk/R)	37*	"	"	"	"	"	"	24 $$$	Relay 9 Nm, Opto Returns
				Scr	Shell*	"	"	"	"	"	"	Shell	Earth
NOTE													(Dolby Circuits)
	* = shared pin												
	$ Pin 6 also links to pins 9 . 12 . 15 . 25 . 28 . 31 . 34												
	# Each pin (23 to 31) separately needs a 330R 0.25W Resistor (080-331) in series with the wire (9 resistors in total)												
	$$ Pin 8 also links to pins 11 . 14 . 17 . 20 . 21 . 22 . 23 . 24 . 27 . 30 . 33												
	$$$ Pin 24 also links to pins 20 . 21 . 22 . 23												
	DG = Digital Ground												
	NC = No Connection, tie back												
Note: Also see drawing 920-605													
Note: This fully isolates the two systems. The original test cable did not because the opto returns were not used.													Run No. 1 - 1
Note: Wires shown here on pins 7-14 of D37 were connected to pins 8-15 on issue 1 schedule. Dolby box setup would be different for issue 1 cable													Cable Description:
	Issue 2 cable is in line with default Dolby pin allocation												Dolby Remotes Issue 2

MADI

Front

Rear



The 1U rack mounted MADI unit contains two independent AES10 MADI compatible interfaces, and is available as an option. The two ports are interfaced to the console via a Wide Area Bulk (WAB) card, which occupies one of the AES card slots in the Digital I/O Rack.

Each MADI interface can operate in either 56 or 64 channel mode and can transmit over a coaxial AND optical medium and receive over a coaxial OR optical medium. A switch allows receiver selection.

There is no sample rate conversion available on MADI inputs or outputs therefore, all the equipment connected via MADI must be synchronised to the same source as the console.

MADI Unit	Power	Fiber		Copper	
		Connection	Max Cable Length	Connection	Max Cable Length
JM5407	DC (24V)	ST - Multi-mode	2km	BNC (75Ohm)	50m
JM5418	AC (100-240V)	ST - Multi-mode	2km	BNC (75Ohm)	50m
JM5450	DC (24V)	SC - Multi-mode	2km	BNC (75Ohm)	50m
JM5451	AC (100-240V)	SC - Multi-mode	2km	BNC (75Ohm)	50m

SIGMA
HYDRA AUDIO NETWORKING

CALREC

HYDRA TECHNOLOGY

Gigabit Ethernet is founded on key principles of preceding Ethernet technologies and provides a data rate of 1000 Mbps over copper or optical fiber.

Audio and control data is transferred using the Ethernet frame format over switched media in a network constructed from standardised structured cabling.

Hydra I/O boxes providing fixed or configurable I/O may be connected onto the network, providing remotely located sources and destinations that can be used by any or all mixing consoles.

The Hydra Audio Network fabric is constructed using low-cost off-the-shelf hardware. The network topology is similar to that of an office LAN, being created out of a central Gigabit switch with connections to each mixing console and Hydra I/O box, in a star formation. Connections may be made with Category 5e UTP, up to 90 metres, or with optical fiber, up to 10 kilometres.

Hardware

There are many commercially available Gigabit switches, repeaters and media converters that can be used to build the network, however some proprietary hardware is required to interface the consoles and Hydra I/O boxes to the network.

The diagram below shows a console and racks connected to a network via a Wide Area Bulk Card and Hydra Gigabit interface unit. 3 Hydra I/O boxes and 2 modular Hydra I/O boxes are also shown, each with up to 96 inputs/outputs available to any console on the network.

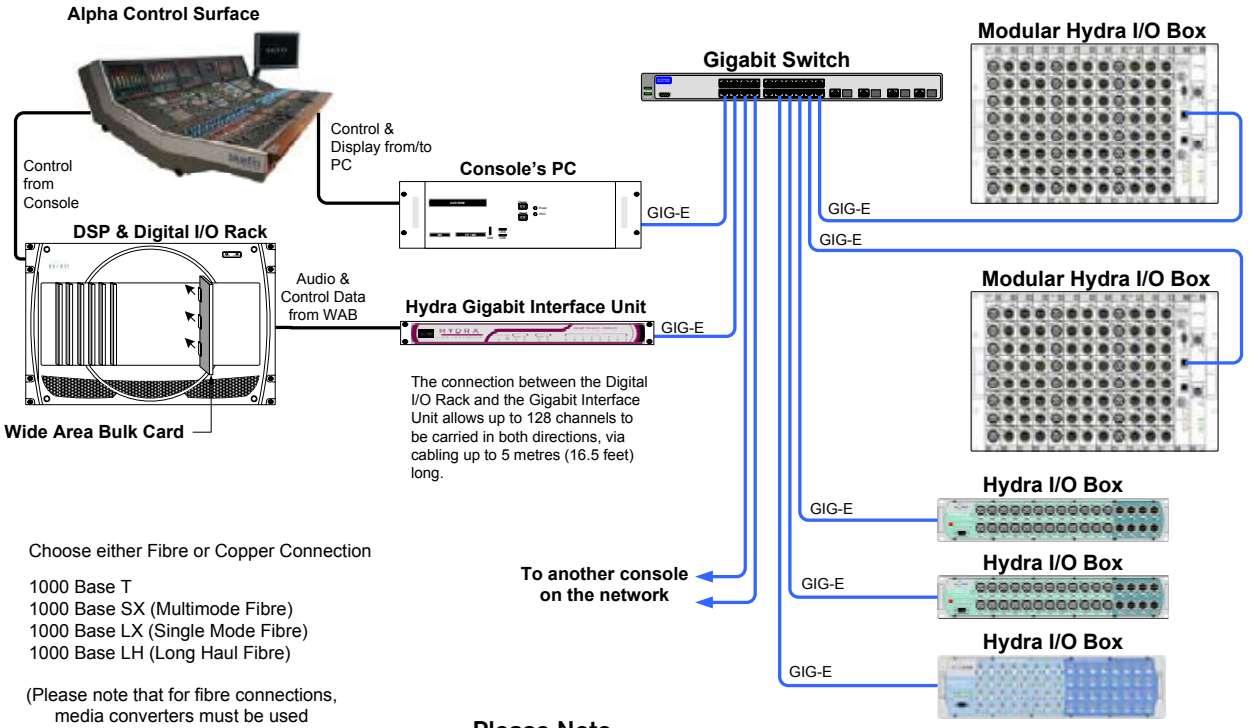
Network Editor

For a network to be truly useful, it must be easy to use and maintain. The system's control software constantly monitors the network, performing essential administration functions, leaving the user free to creatively exploit network resources as easily as if they were locally connected.

The console's Network Editor consists of a set of screens for :

- Configuration of modular Hydra I/O boxes
- Offline editing of Hydra I/O and Audio Network
- Status representation of all devices on the network
- Utility for forcing ownership to be dropped

The Network Editor can be run independently of the Front End (console application), allowing the modular Hydra I/O boxes and audio network to be configured offline. During this time, any operations which require a console are disabled.



The connection between the Digital I/O Rack and the Gigabit Interface Unit allows up to 128 channels to be carried in both directions, via cabling up to 5 metres (16.5 feet) long.

Choose either Fibre or Copper Connection

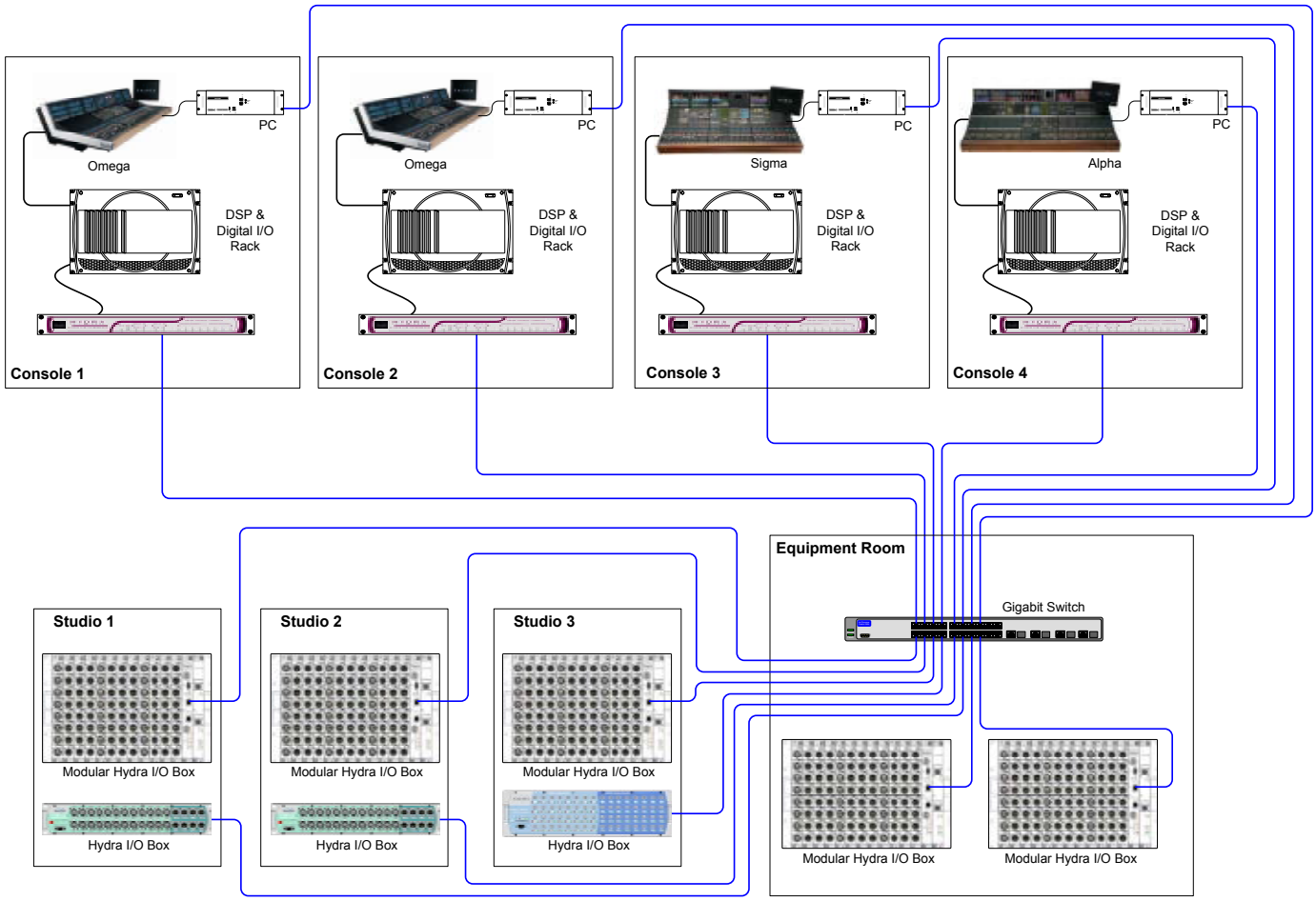
1000 Base T
1000 Base SX (Multimode Fibre)
1000 Base LX (Single Mode Fibre)
1000 Base LH (Long Haul Fibre)

(Please note that for fibre connections, media converters must be used between the Gigabit switch and the Modular Hydra I/O Boxes)

Please Note

Connections to the modular Hydra I/O box are via RJ45 connectors on the front of the unit's processor module. As this is a copper interface, when using fiber cabling, it is necessary for media converters to be used between the Gigabit switch and the modular Hydra I/O boxes.

TYPICAL HYDRA NETWORK EXAMPLE



The above diagram shows 4 control rooms, each with a Calrec digital console. The Gigabit interface unit for each console transmits and receives audio data to and from the Hydra I/O boxes, via a Gigabit switch located in the Equipment Room.

The console racks and Gigabit interface unit could also be in the Equipment Room if this was more suitable.

Synchronisation

Consoles sharing sources must be synchronised (e.g. to station sync or video). The Hydra I/O boxes synchronise to the console Gigabit interface with the lowest IP address on the network.

Private Network

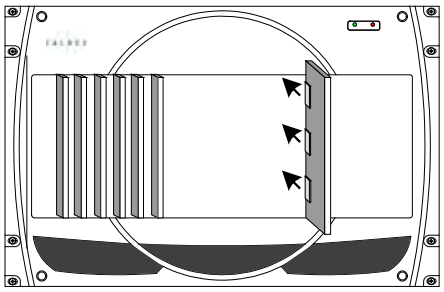
In order to guarantee fully deterministic performance, it is necessary to apply the restriction that the network must be kept private. This means that it must not be made to carry any data other than that generated by the audio network.

Local I/O

Local I/O in the console's own racks can be used for connections to routers, monitoring, talkback, inserts, etc. It is not networked to the other consoles.

CONSOLE HARDWARE

Wide Area Bulk Card
A Wide Area Bulk (WAB) card is inserted into the console's Processing rack.



The function of the WAB is to transfer digital audio samples and control data between the console and the Gigabit interface unit.

Alpha and Sigma systems can have up to 8 WAB interfaces; Omega and Zeta systems can have up to 3.

128 inputs and outputs are carried between each WAB card and the Gigabit interface unit via 36 way SCSI-style cabling up to 5 metres (16.5 feet) long.

During set up, the user can decide how many of the system's WAB interfaces will be available for redundancy. The bandwidth chosen for redundancy will be reserved for use by the redundancy system, and will not be used during normal operation.

Control data is sent and received as UDP (User Data Protocol) messages, and consists of proprietary commands for audio routing, parametric control and network management.

Console PC
The console's PC is connected to the network via the Gigabit switch, such that the user can monitor the devices on the network.

If the console's PC is not connected to the network via the Gigabit switch, some limitations apply - the front end screens will not show port status or device heartbeats, and the user will be unable to edit the device names.

The console PC can also send and receive UDP (User Data Protocol) messages to and from the network.

Gigabit Interface Unit
The Gigabit interface unit provides the console with a full duplex connection from the WAB interface to the network via a commercially available Gigabit switch.

Connection to the network is via a Gigabit port on the rear of the unit. The second Gigabit port on the unit is not used. The unit runs at Gigabit speed all the time, and may not be connected to switch ports that run at lower speeds.

The unit is powered from the console's bulk power supply system, via a 24V DC input. A second connection is provided for redundancy. The console's bulk power supply can also be supplied with redundancy, further protecting the Hydra system from failure.

An RS232 port is provided, such that system diagnostics can be performed by a Calrec-approved engineer. Connection to the port is via a 9-PIN D-Sub connector.

MAC Addresses
Any device on an Ethernet network requires a Media Access Control (MAC) address. The MAC address is a number that uniquely identifies a device.

Each Ethernet frame has a source and destination MAC address, length identifier and CRC. A device on the network can identify frames that are sent to it by checking the destination MAC address against its own MAC address. There is a special address known as the broadcast address in which all devices on the network will receive the frame.

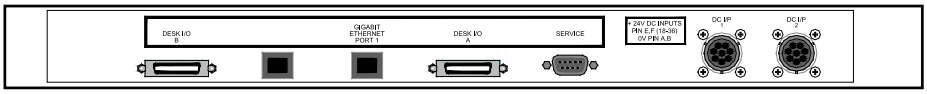
IP Addresses
Calrec will supply each device in your system (including the console) with its own unique IP address, which the system uses to identify each network connection. Where a device has two ports, each will have a unique IP address. The 4th byte is unique to the device.

The Hydra I/O boxes synchronise to console with the lowest IP address on the network.

For mobile installations, the 3rd byte of the IP address will be unique to that installation, such that it is possible for different installations to connect their networks together.

FRONT

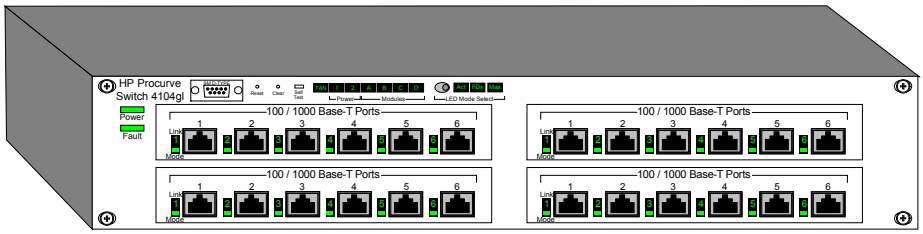
REAR



Dimensions	1U X 482mm (19 inch)
Depth (not including mating connectors)	195mm (7.7 inches) behind the front panel
Depth (including mating connectors)	265mm (10.4 inches) behind the front panel
Weight	2.6 Kg (5.5125 lb)

GIGABIT SWITCH

A commercially available Gigabit switch is used to connect consoles and Hydra I/O boxes together, forming a Hydra audio network.



The switch serves to route traffic directly from source to destination. It learns which devices are connected to it, and routes data to the correct destination port. It is capable of continuously receiving data at one port and routing it to another at the maximum data rate, irrespective of what traffic other ports are handling.

Switches are available in 1U or 3U versions, and can have a combination of copper and fiber ports.

HP® ProCurve Switches

To ensure reliability in a live on-air broadcast environment, Calrec has chosen to standardise on one make of commercially available Gigabit switch. We recommend HP ProCurve switches because of their reputation for reliability, their high throughput (packets per second), their lifetime warranty, the availability of PSU redundancy, their hot-changeable modules and connections, their flexibility in offering a variety of fiber connections; and their management capabilities.

Our intensive test procedures are carried out on a Hydra network comprised of HP ProCurve switches and our own hardware. This repeated testing and the thousands of hours of use in the field, mean that we can be confident that we are providing a robust system using this type of Gigabit switch.

Although other makes of Gigabit switch are designed to the same Ethernet standards as HP ProCurve switches, there may be slight differences in how they work internally, which has led to incompatibilities with our system.

It is for this reason that Calrec do not warrant our products for any Hydra network problem unless the HP ProCurve switches we recommend are used.

If other makes of switch are used and problems do occur, Calrec shall not be liable for the costs of any support, engineering or design work undertaken as a result of that equipment installation.

The switches we recommend are as follows:

- HP Procurve 4104gl Switch: Modular - this switch can be fitted with up to 4 plug-in modules providing a combination of copper or fiber ports. This is a 3U mains powered switch.
- HP ProCurve Switch 2824 (J4903A): 20 copper ports and 4 copper or fiber ports. This is a 1U mains powered switch.
- HP ProCurve Switch 2848 (J4904A): 44 copper ports and 4 copper or fiber ports. This is a 1U mains powered switch.
- HP ProCurve 2800 Redundant External PSU (J8168A): This is a 1U mains powered PSU to provide redundant power for the switches. One redundant PSU can supply redundancy for any one of up to 6 switches. If any one switch has a PSU failure, the redundant supply will take over. Due to cable length restrictions, the redundant PSU must be located in close proximity to the switches it is connected to.

HP GBIC Connectors

Please ensure that your switch uses genuine HP GBIC connectors.

Starting with software version G.07.65, the Series 4100gl switches detect and disable non-genuine ProCurve transceivers and mini-GBICs discovered in switch ports. When a non-genuine device is discovered, the switch disables the port and generates an error message in the Event Log.

HP ProCurve Switch Warranty Support

Please ensure that you register your switch for support in the country that it is to be used.

Redundant Power

The Gigabit switch can be provided with an HP ProCurve redundant power supply.

Booting

Although the console and racks boot from power on in less than 20 seconds, the switch may take longer. Therefore, networked I/O may take longer to become available on power up, or after a switch reset. It is recommended that the switch is powered using an un-interruptible power supply.

HYDRA I/O BOXES

These robust, self-contained boxes can provide audio input and output facilities for use in areas such as:

- Equipment Room Rack
- Studio Wall Box
- Studio Gantry / Lighting Grid
- Control Room Rack
- Outside Broadcast Truck
- Outside Broadcast Flight Case

Variants

Units are available in the following variants:

- 12 mic/line inputs and 4 line outputs (XLR)
- 24 mic/line inputs and 8 line outputs (XLR)
- 48 mic/line inputs and 16 line outputs (XLR)
- 32 AES inputs and 32 AES outputs (BNC)

The units connect to the network via an ethernet port on the rear of the unit. Each unit has two identical ports to provide network redundancy. Media dependant variants for 1000BASE-T (for distances up to 90m), 1000BASE-SX (for distances up to 550m) and 1000BASE-LX (for distances up to 10km) are available.

All external connections to the units are hot pluggable. If more than one media type is detected, the system will prefer fiber as its primary connection.

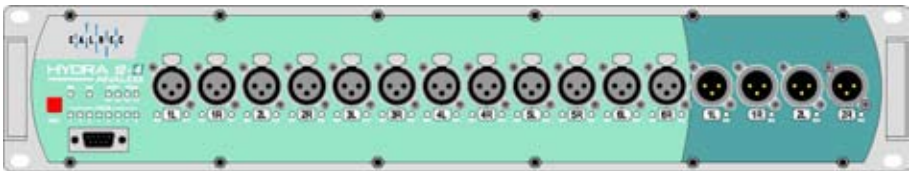
Power and Redundancy

The units are mains powered, and internally, have two power supply units, providing PSU redundancy.

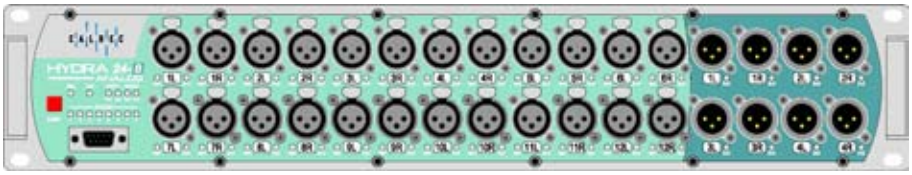
Optionally, a second IEC can be fitted to allow a unit to be powered from two separate mains supplies. The twin IEC approach supports mains supply redundancy, as well as internal power supply component redundancy.

The units incorporate a cooling fan module. Each PSU module and the fan module within the unit are monitored to ensure proper performance. PSU OK and FAN FAIL indication is provided on the front of the unit. PSU failures are reported to the operator by the console software.

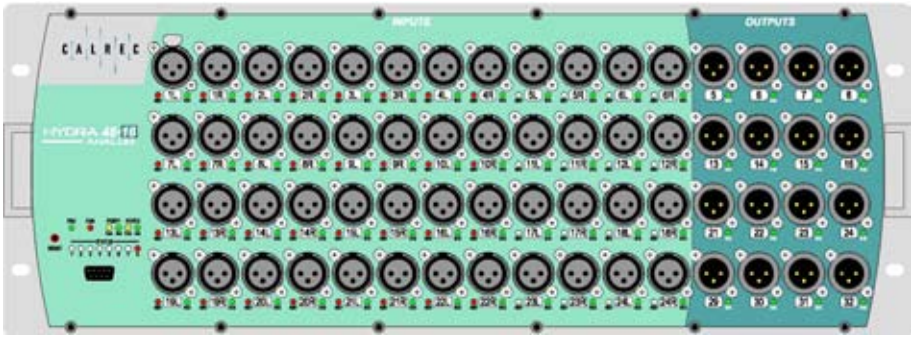
12 MIC/LINE IN & 4 LINE OUT (AD5608)



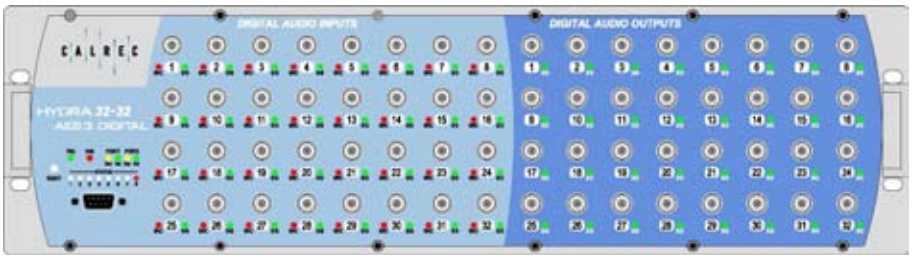
24 MIC/LINE IN & 8 LINE OUT (AD5603)



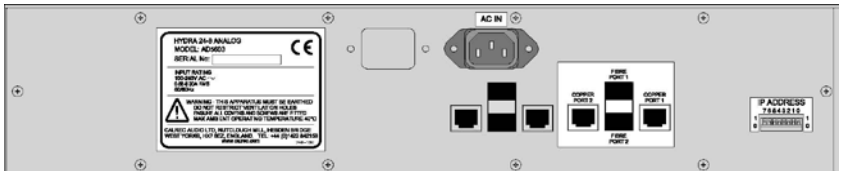
48 MIC/LINE IN & 16 LINE OUT (AD5600)



32 AES IN & 32 AES OUT (JB5607)



REAR CONNECTORS (SAME FOR ALL UNITS)



Unit	Height	Width		Approx depth (incl. mating cons)		Approx weight		Input Power Rating
		inches	mm	inches	mm	lbs	kgs	
AD5603 24 mic/line in & 8 line out - XLR	2U	19	483	12	300	12.5	5.7	100-240V AC ~ 0.58-0.30A RMS 50/60Hz
AD5608 12 mic/line in & 4 line out - XLR	2U	19	483	12	300	11.5	5.2	100-240V AC ~ 0.42-0.23A RMS 50/60Hz
AD5600 48 mic/line in & 16 line out - XLR	4U	19	483	12	300	16.1	7.3	100-240V AC ~ 1.0-0.48A RMS 50/60Hz
JB5607 32 AES in & 32 AES out - BNC	3U	19	483	12	300	12	5.8	100-240V AC ~ 0.38-0.20A RMS 50/60Hz

HYDRA I/O BOXES

Status LEDs
The following indicative LEDs are visible from the front panel:

PSU OK (green)
Fan Fail (red)
Port 1 connected (yellow)
Port 1 active (green)
Port 2 connected (yellow)
Port 2 active (green)
Status (x8 red)

In addition, each input connector has its own tricolour LED to indicate signal presence. The incoming signal will cause the LED to light green when the signal is between -60dBFS and -38dBFS, amber when between -38dBFS and -2dBFS, and red when the signal clips at -2dBFS or above.

Each output connector has a green LED to indicate that there is a route established to it from a console on the network.

Synchronisation
Units are frequency synchronised using synchronisation packets received from the Hydra network.

Diagnostics
The units support remote FPGA firmware and software updates across the network via the Ethernet ports. In addition, an RS232 port is provided, such that system diagnostics can be performed by a Calrec approved engineer. Connection to the port is via a front-mounted 9 pin D-Sub connector.

IP Addresses
Calrec will supply each device in your system with its own unique IP address, which the system uses to identify each network connection. On the front of each Hydra I/O box, there is a label showing the IP address. The secondary port will use the address of the primary port + 100 decimal. For example:

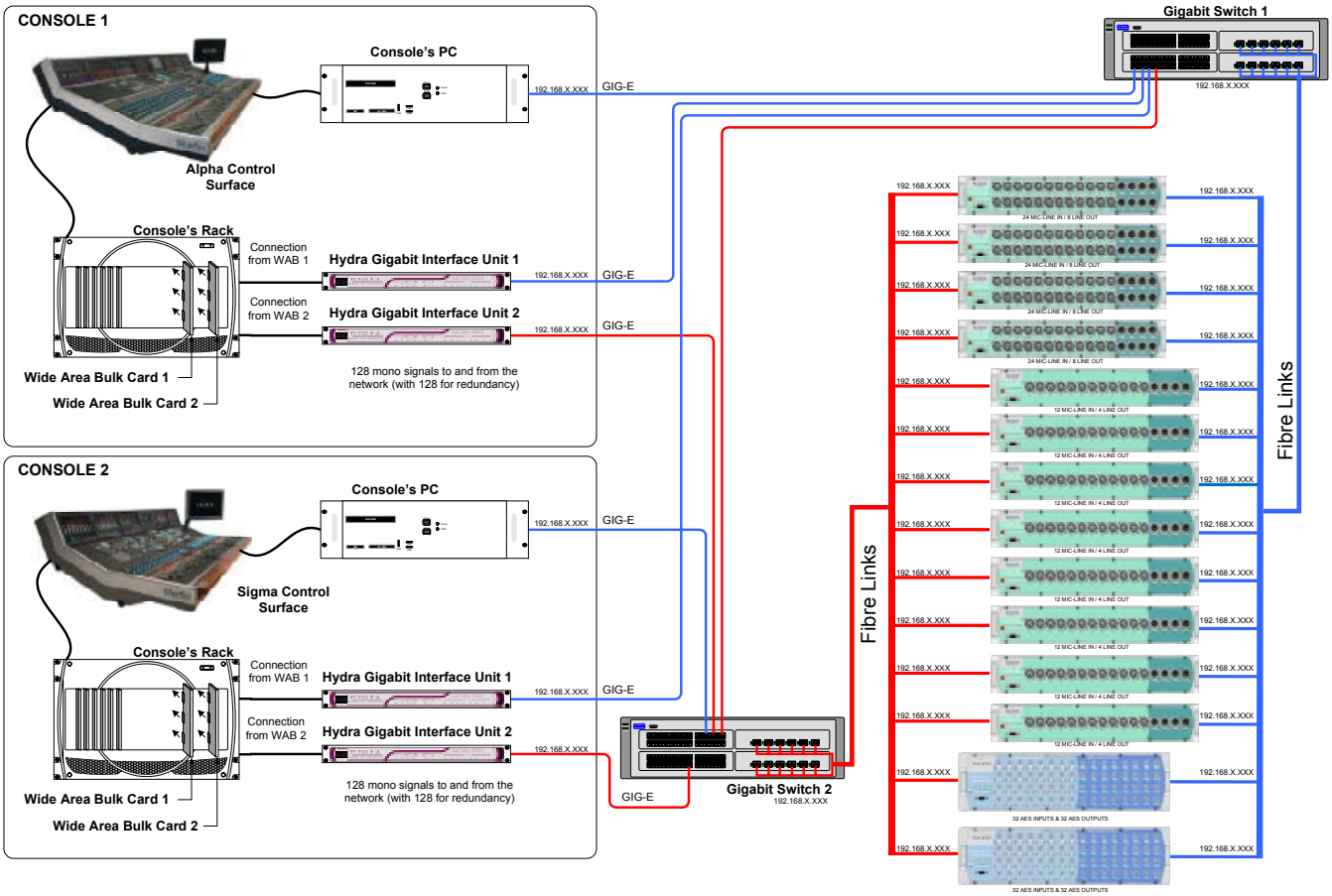
Primary Port	192.168.0.050
Secondary Port	192.168.0.150

In an installation, the first 3 bytes (shown in red) are fixed. The 4th byte or least significant byte is the part of the address which is unique to that port on the device.

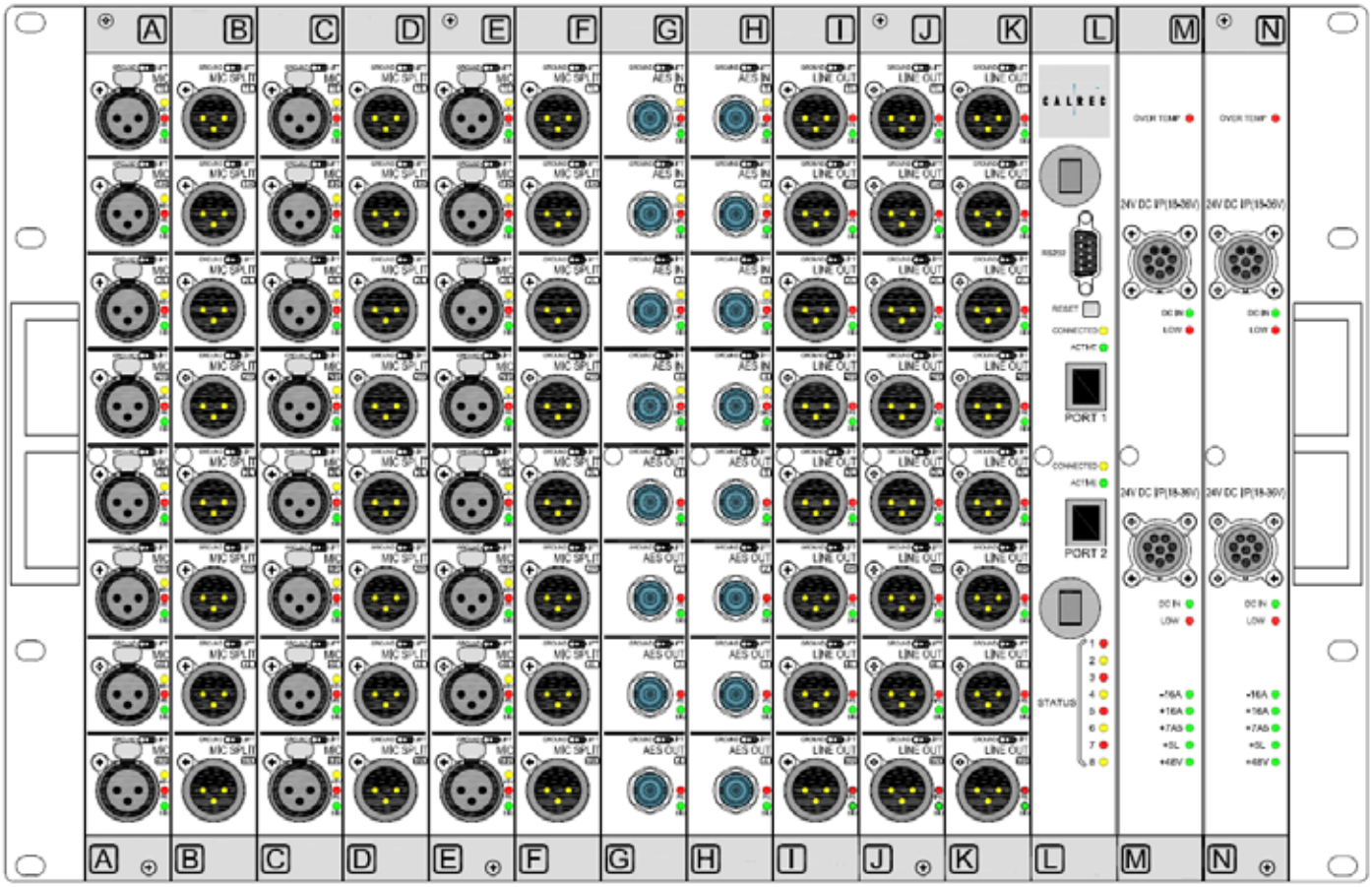
For mobile installations, the 3rd byte of the IP address will be unique to that installation, such that it is possible for different installations to connect their networks together.

If a Hydra I/O box needs to be swapped out, the replacement unit must be programmed with the correct IP address. The 8-way switch on the rear of the unit allows the least significant byte of the IP address of the primary port to be set in binary.

Surround Signals
It is not recommended that ports on a modular Hydra I/O box should be combined with ports on a fixed Hydra I/O box to create a 5.1 surround signal.



MODULAR HYDRA I/O BOX



Modular Hydra I/O boxes allow a user-configurable set of analog and digital I/O to be connected via the networking system to one or more Calrec digital consoles.

Modular Structure

There are 14 modular slots across the width of the unit, labelled A to N. Input, output, processor and DC PSU modules fit into these slots, in accordance with the requirements of the installation. Input and output modules receive and transmit analog or digital audio signals, to the Gigabit interface processor via a 32 bit TDM bus. The module options are listed in the table below. Each modular unit is 1.2 inches (30.48 mm) wide.

Module Number	Description	Connector Type
AD5090	4 stereo or 8 mono mic/line inputs	XLR
LN5230	8 split outputs for adjacent left mic/line input module	XLR
JB5340	4 AES inputs and 4 AES outputs	BNC
JX5341	4 AES inputs and 4 AES outputs	XLR
DA5091	4 stereo or 8 mono outputs	XLR
UC5339	Processor with copper interface	RJ45
ZN5231	DC Power Supply	8 PIN PLUG

All 14 slots may be used by any of the modules in any combination. However, it is advised that the three slots at the right hand side of the unit are best occupied by a processor control unit and provision for two DC PSU modules, the second of which would be the optional hot-spare, providing power redundancy incase the first unit, or the connection to it should develop a fault.

If no spare DC PSU is present, either a blank panel must be fitted or the processor unit could move into slot M allowing a twelfth input or output module to be fitted into slot L.

Ground Lift Switches

Input and output modules are available with or without ground lift switches. On modules with switches fitted, the ground is lifted if the switch is toggled to the right.

Module Extraction

In some applications, it is envisaged that modules within the modular Hydra I/O box could be changed according to the requirements of its use. To aid this operation, a module extraction hole is located on the module front panels. The module slides in and out the unit on two runners at the top and bottom of the rack. The rear interface connector on the module then locates into the appropriate connector on the backplane. To aid accurate plugging-up, some guide strips are located between the three interface connectors on the backplane.

External Connections

All external connections are located on the front face of the Hydra I/O box. Space must be allowed in excess of the box dimensions to feed cables to the front interface from any rear access routes.

Mounting

The modular Hydra I/O box is mounted in place using 4 fixing screws on each side angle bracket.

MODULAR HYDRA I/O BOX

Fan Operation

To dissipate the heat, 3 low-noise fans are located in the rear of the modular Hydra I/O box. They are controlled from the DC power supply unit. The unit's rear panel has venting holes which must not be obstructed in any way.

Earthing

The box is fitted with an external earth stud on the rear, for connection to an external earthing system. No AC mains power is contained within the rack. All power connections should be unplugged prior to removing the earth connection.

Rack-Mounted AC PSU

A 2U rack-mounted power supply unit is available to provide the DC power for the modular Hydra I/O box. This holds up to four identical AC plug-in PSU modules. One module will provide power for a fully populated modular Hydra I/O box, with a second providing redundancy. Two other modules could be fitted to power a second unit.

The rack has separate AC power inputs and DC outputs for each of the four PSU's. Any one PSU can be removed from the rack without disturbing the operation of the others in the rack.

Diode feeding allows supplies of the same type to be parallelled together.

Mounting Instructions

The power supply rack should be mounted in a horizontal position by means of the side brackets, each of which has two mounting holes. The rear mounting brackets fix to the rear of the equipment bay and should be used when no support is provided under the rack assembly. Extensions of the rack sides slot into these rear supports, allowing the rack to be removed without removing the support. The rack should not be supported by front flanges alone.

Cooling

The rack is fan cooled with fans mounted in the front of each plug-in PSU. The warm air is directed out of the rear of the rack. To ensure proper cooling, there must be a minimum clearance of two inches (50mm) from the fans and rear air outlets, and also any walls or other surfaces.

FAN OPERATION

Internal Ambient Temperature	Fan Speed	DC PSU
<50°C (122°F)	OFF	OK
50°C to 55°C (122°F to 131°F)	SLOW	OK
55°C to 60°C (131°F to 140°F)	FAST	OK
60°C to 70°C (140°F to 158°F)	FAST	OVER TEMP
>70°C (158°F)	FAST	DISABLED

DIMENSIONS & WEIGHTS

Unit	Height	Width		Approx depth (incl. mating cons)		Approx weight	
		inches	mm	inches	mm	lbs	kgs
Modular Hydra I/O Box (Fully Populated)	7U	19	483	12	300	35.2	16
Optional Rack Mounted PSU (with 2 plug-in units)	2U	19	483	12	300	15.6	7.1
Optional Rack Mounted PSU (with 4 plug-in units)	2U	19	483	12	300	25.3	11.5

RACK-MOUNTED AC PSU

Bulk PSU Rack Fan Noise (dB SPL A-Weighted)	
These measurements were taken on axis at 1 metre from the dominant noise source:	
1 x 24V 200W PSU	24dBA
2 x 24V 200W PSU	27dBA
3 x 24V 200W PSU	29dBA
4 x 24V 200W PSU	30dBA

Input Power Connections

3-wire safety AC outlet sockets should be located near the power system (number as required). Each line cord will provide AC power to one of the power supply modules.

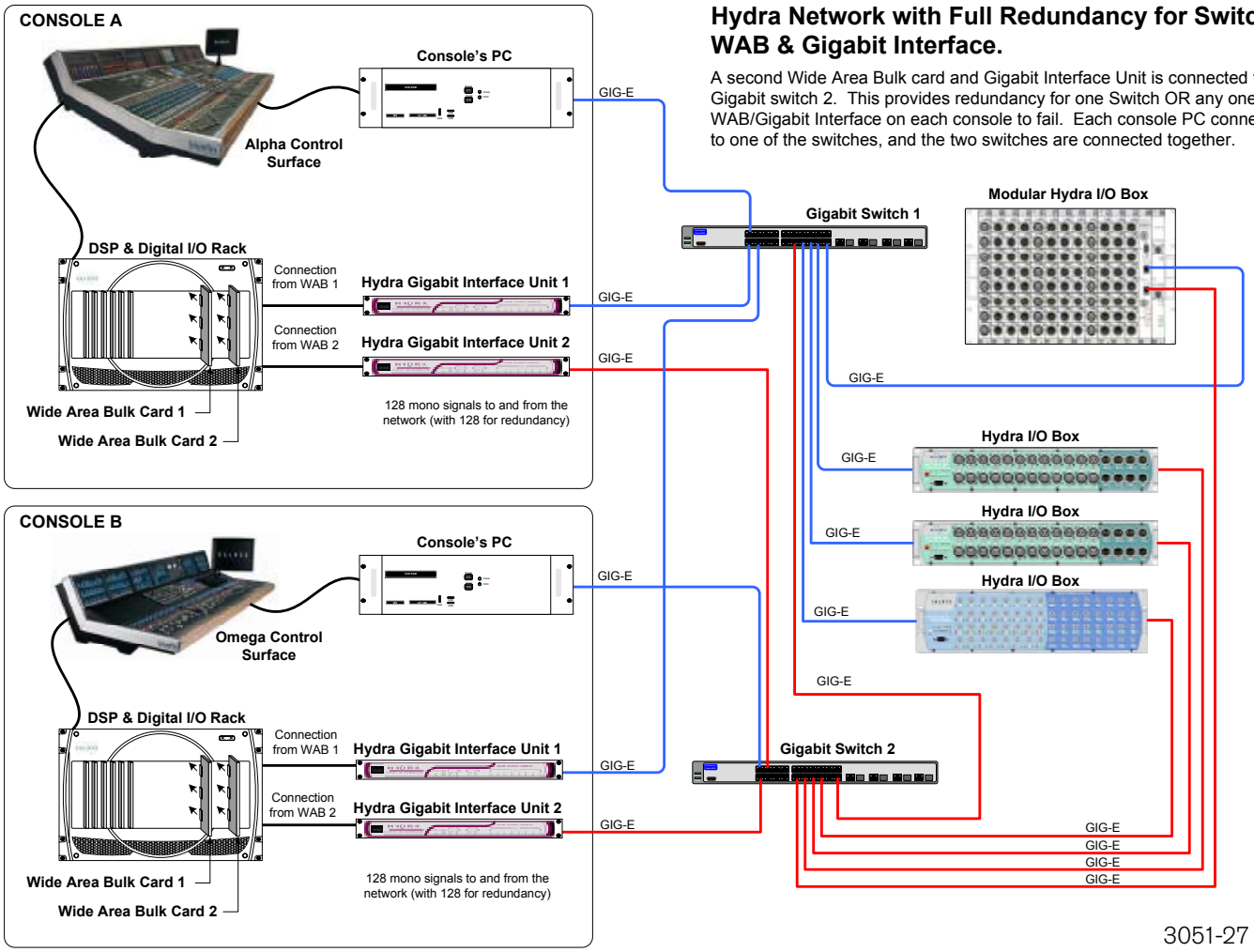
The AC line cord is the mains disconnect for each module. The AC line cords should have an IEC320 connector to plug into the rear of the power system chassis.

Each line cord MUST be suitably rated and FUSED (or have an equivalently rated circuit breaker). The maximum inrush current is 30 Amps. Fuses should be at least 250V AC, T6.3A HRC rated to avoid nuisance "blows". Breakers should be at least 6A , Type C.

Safety grounding is provided via ground connections in the line cord entry receptacles.

If in doubt, please consult Calrec's customer support team.

NETWORK REDUNDANCY



Hydra Network with Full Redundancy for Switch, WAB & Gigabit Interface.

A second Wide Area Bulk card and Gigabit Interface Unit is connected to Gigabit switch 2. This provides redundancy for one Switch OR any one WAB/Gigabit Interface on each console to fail. Each console PC connects to one of the switches, and the two switches are connected together.

3051-27

The system can offer redundancy, such that it is protected in case of failure of any connector, cable, or even a Gigabit switch.

Redundant Hardware

Alpha and Sigma systems can have up to 8 Gigabit interface units; Omega and Zeta systems can have up to 3. During set up, the user selects how many Gigabit interfaces are available for redundancy. The redundant bandwidth is reserved for use by the redundancy system and is not used during normal operation.

A second Gigabit switch provides redundancy, such that if the first switch fails, the audio can still be routed to and from the network. Each console PC connects to one of the switches, and the two switches are connected together.

The control system tests end to end connectivity, detecting what can be "seen" from each console and works out how to reach each Hydra I/O box. In the event of the system detecting any failures, the signals affected by the failure are automatically re-routed using the redundant hardware. This will happen quickly but there will be a brief audio interruption, typically 3-4 seconds.

Each Hydra I/O box has a second port with a different IP address, allowing a second connection to the network to be made. Two consoles on the same network may use different ports on the same Hydra I/O box. They can each still have a redundant path to the other port.

Automatic Fault Detection

Once powered, the Hydra I/O boxes broadcast "heartbeats" to advertise their presence. When a Gigabit interface unit detects the presence of a Hydra I/O box, it begins to "echo" each of the Hydra I/O box's two ports. In this way, it can be determined which Hydra I/O box ports can be "seen" from the Gigabit interface unit.

When two device echo responses have been missed, the network connection to that port is assumed to have failed. A message report to the console will inform the user that a Gigabit port on a Hydra I/O box is no longer available.

At the console, echo messages are periodically sent to each of the Gigabit interface units in its configuration. If a Gigabit interface unit does not respond, that path to the network is assumed to have failed.

Automatic Re-routing

If a fault occurs where there is an alternative redundant path, then take over will happen. Each console manages the re-routing of its own audio. Only those audio paths affected by a failure will be re-routed.

GUIDELINES FOR THE USE OF FIBER OPTIC INTERFACES

Please use the following guidelines for the installation, use and maintenance of Fiber Optic Interfaces.

The Hydra I/O boxes are connected into the Hydra Network using SFP GBICs (Small Form-factor Pluggable Gigabit Interface Converters). These convert the Gigabit Ethernet data into light waves using a laser diode to transmit into a fiber optic cable and a photodiode receiver to convert the light waves back into electrical signals.

How do we choose the right cable?
There are two types of fiber in use, Multimode fiber and Singlemode fiber. The choice of which to use is based on how far away the I/O units need to be placed.

Note: If connection redundancy is required, two duplex fiber cable runs will be needed per I/O unit.

What about losses?
The Optical Power Budget column in the table above gives an indication of the maximum loss that is allowable for enough light from the transmitter to reach the receiver for the system to work satisfactorily. The losses occur in 3 areas:- fiber loss, splice loss and connector loss.

The Maximum Distance column is a guide based on operating at Gigabit Ether rates and having a Fiber cable with no splices and a connector at either end.

Fiber losses vary from 3.5dB per km in Multimode down to 0.4dB per km in Singlemode

Splice loss is typically better than 0.3dB per fusion splice. Splices are best avoided if possible however, a good fusion splice is a better method than using a connector pair.

CABLE TYPE	CONNECTOR	MAXIMUM DISTANCE	OUR REFERENCE	GBIC TYPE AND HP REFERENCE	OPTICAL POWER BUDGET
Copper CAT 5e/6 Ethernet	RJ45	90m	-	N/A	N/A
Fibre 62.5/125µm Multimode	SC Duplex	275m	491-055	SX - J4858A	7.5dB
Fibre 50/125µm Multimode	SC Duplex	550m	491-055	SX - J4858A	7.5dB
Fibre 8/125µm Singlemode	LC Duplex	5km	491-061	LX - J4859A	8dB
Fibre 8/125µm Singlemode	LC Duplex	70km	491-060	LH - J4860A	23dB

Connector loss is typically better than 0.5dB per connector pair.

The installer should be able to provide certified attenuation figures based on EN 50173 or the US equivalent EIA/TIA 568A.

If the optical power budget less the combined losses of connectors/splices and fiber is still a positive number then the system will work.

What is the construction of a Fiber Cable?
When installing fiber cable, it is important to use a type which gives enough protection to the fiber for the environment in which it is to be used.

The cladding/core of these fibres are made out of glass and are about the thickness of a human hair, so to give the fiber protection, various coatings and layers are added using materials like silicone and Nylon or PVC, and often a layer of Kevlar is added to ruggedise the construction.

When fiber cables are to be installed in external environments, additional protection may be necessary. A number of individual ruggedised elements are often stranded around a central strength member such as high tensile steel, bound with paper tape and an external sheath applied on top of an aluminium tape moisture barrier.

MEDIA CONVERTER MODEL NUMBER	CONNECTOR	MAXIMUM DISTANCE	OPTICAL POWER BUDGET
SX - MC1001TSC	RJ45/SC Duplex	275m or 550m	7.5dB
SX - CNFC-100GTS	RJ45/SC Duplex	275m or 550m	7.5dB
LX - CNFC-100GTL	RJ45/SC Duplex	5km	8dB

Media Converters
Connections to the modular Hydra I/O box are via RJ45 connectors on the front of the unit's processor module. As this is a copper interface, when using fiber cabling, it is necessary for media converters to be used between the Gigabit switch and the Modular Hydra I/O boxes.

Please see the table below for specifications of recommended media converters.

What problems can arise during installation?
Precautions are necessary during installation to protect against the following:-

- Moisture which if it gets into the cable sheath and freezes can cause the fibres to crack.
- Temperature changes causing expansion and contraction stresses.
- Strain especially during the installation process which can cause the fibres to break.
- Abrasion and friction damage when a cable is pulled in.
- Crushing and cracking if a cable is bent beyond its safe bending radius or crushed by heavy objects or over-enthusiastically tie wrapped etc.
- Chemicals which can eat through or dissolve the sheathing.
- Rodents chewing on the cables.

All these factors should be borne in mind during the installation process, many of which are equally valid when installing fiber cabling in internal environments such as in underfloor trunking.

GUIDELINES FOR THE USE OF FIBER OPTIC INTERFACES

The other important aspect to the use of Fiber Optics is to employ the correct cleaning and maintenance regime to ensure optimum reliability and system performance. These relate to cleanliness of the connector ends of the fiber and the optical transceiver ports, i.e. the receptacles at the laser transmitter and photodiode receiver that the fiber connectors plug into.

Why do we need preventive Maintenance of Fiber Optic Cables and Optics?
Small oil micro-deposits and dirt/dust particles on fiber optic cable optical surfaces cause a loss of light or degraded signal power which may ultimately cause intermittent problems in the optical connection.

Laser power density eventually burns contaminants into the optical surfaces causing the fiber to produce inaccurate results effectively rendering it unusable.

By extension, contaminated cable connectors may often transfer contaminants and particulates into the "Optical Sub-Assembly" (OSA) barrels of the Optical Module they are inserted into. It is especially important to watch out for this in Outside Broadcast environments.

Safety Precautions during Maintenance
General safety precautions are discussed here, but care should be taken to follow any specific optical device guidance as well as the safety precautions outlined for chemicals and tools used.

WARNING
Never look into the end of an optical interface while the device is operational. Laser radiation can be harmful to the human eye and injury may occur with prolonged exposure.

Cautions
- Do not remove transceiver covers when operating.
- Ensure the unit power is turned off during cleaning.
- Ensure that other power/light sources are disabled during the cleaning of optical interfaces.
- Do not install any unauthorized modifications to the optical devices.

The following tools are used for cleaning:-

Compressed air
Clean Dry Air is essential to ensure the aerosol stream is free of dust, water and oil. Use filtered compressed air or canned compressed air, available at any laboratory supplier or camera shop.

Lens paper
A long fiber, low ash content type; having no chemical additives is recommended to minimize particulates and the chance of streaking and/or scratching the optical surfaces. Lens paper is widely available at any laboratory supplier or camera shop.

Isopropyl Alcohol or Methanol
Cleaning solutions are available at any laboratory supplier. Isopropyl Alcohol is also available at local pharmacies, or camera shops. Special care should be practised when using chemicals and it is important to follow the manufacturer's product guidelines.

Inspection Microscope
A 200 x (for multimode) or 400 x (for singlemode) magnification inspection scope is necessary tool for inspecting the connector ends of fiber cabling and optical sub-assemblies for cracks and deposits of oil and dirt. These Inspection Scopes are available from various fiber optic suppliers.
Note. Make doubly sure that the device is not operational before examining it through this device.

Cleaning Fiber Optic Cables and Connectors
There are multiple ways to clean fiber-optic cables and connectors. Included below are some helpful tips to properly clean fiber optic cables.

- Do not allow the end of the fiber optic cable to make contact with any surface including fingers.
- Do not excessively bend the fiber cable. Bending the cable may cause internal breaks along the fiber resulting in poor performance or instability.
- Optics and optic coatings are easily chipped and/or scratched. Use of finger cots or powder free surgical gloves while handling fiber optic cables, will help ensure cleanliness.
- Only fresh (dry) spectroscopic grade isopropyl alcohol should be used as a cleaning solvent.
- Ensure that the module power is off and that other light sources are disabled.

Cleaning Procedure
1. Blow the fiber surface with a stream of Clean Dry Air, this will dislodge larger loose particles.

2. Place 1-3 drops of spectroscopic grade Isopropyl Alcohol in the centre of a lens tissue.

3. Hold the fiber by the connector or cable, place the wet portion of the lens tissue on the optical surface and slowly drag it across.

4. Examine the surface of the fiber end under high intensity light using a direct magnifying inspection microscope or an indirect video inspection tool if available. If streaks or contaminants still remain, repeat the process using a fresh lens tissue.

5. Immediately install a protective cover over the end of the cable to avoid re-contamination or insert the fiber back into the previously cleaned receptacle for immediate use.

GUIDELINES FOR THE USE OF FIBER OPTIC INTERFACES

Additional Notes

- Do not tip the can of Clean Dry Air whilst aerosol spraying as liquid may be released contaminating the surface of the fiber.
- Do not use lens paper dry as it is extremely abrasive.
- Do not use acetone as a cleaning solvent on the fiber optical surfaces.
- To ensure the purity of the isopropyl alcohol, do not insert the lens tissue, swabs, etc into the liquid, instead, drip the liquid on to the material.

Cleaning Optical Transceivers

The best way to clean a transceiver port is to remove particles using a stream of clean dry air.

Below are some helpful tips to properly clean fiber optic modules.

- Always handle optical GBIC modules in an ESD safe manner using the proper safety precautions.
- Ensure that the module power is off and handle the modules with care.
- Always use clean dry air or an approved canned compressed air supply.
- Always hold the can of compressed air upright. Tipping may release liquids into the air stream.
- Do not touch the inner surfaces of the module including the Optical Sub-Assemblies (OSA), or insert any foreign objects into the ports.
- Use of finger cots or powder free surgical gloves are not required but may be used for cleanliness.

Cleaning Procedure

1. With the clean dry air, blow the inner barrel of the Transmitter and Receiver Optical Sub-Assemblies (OSA). This will dislodge loose particles.

2. Examine the surface of the OSA lens under high intensity light using the inspection microscope. If contaminants still remain, repeat the process.

Following these guidelines should provide a successful installation and ensure optimum reliability and system performance.

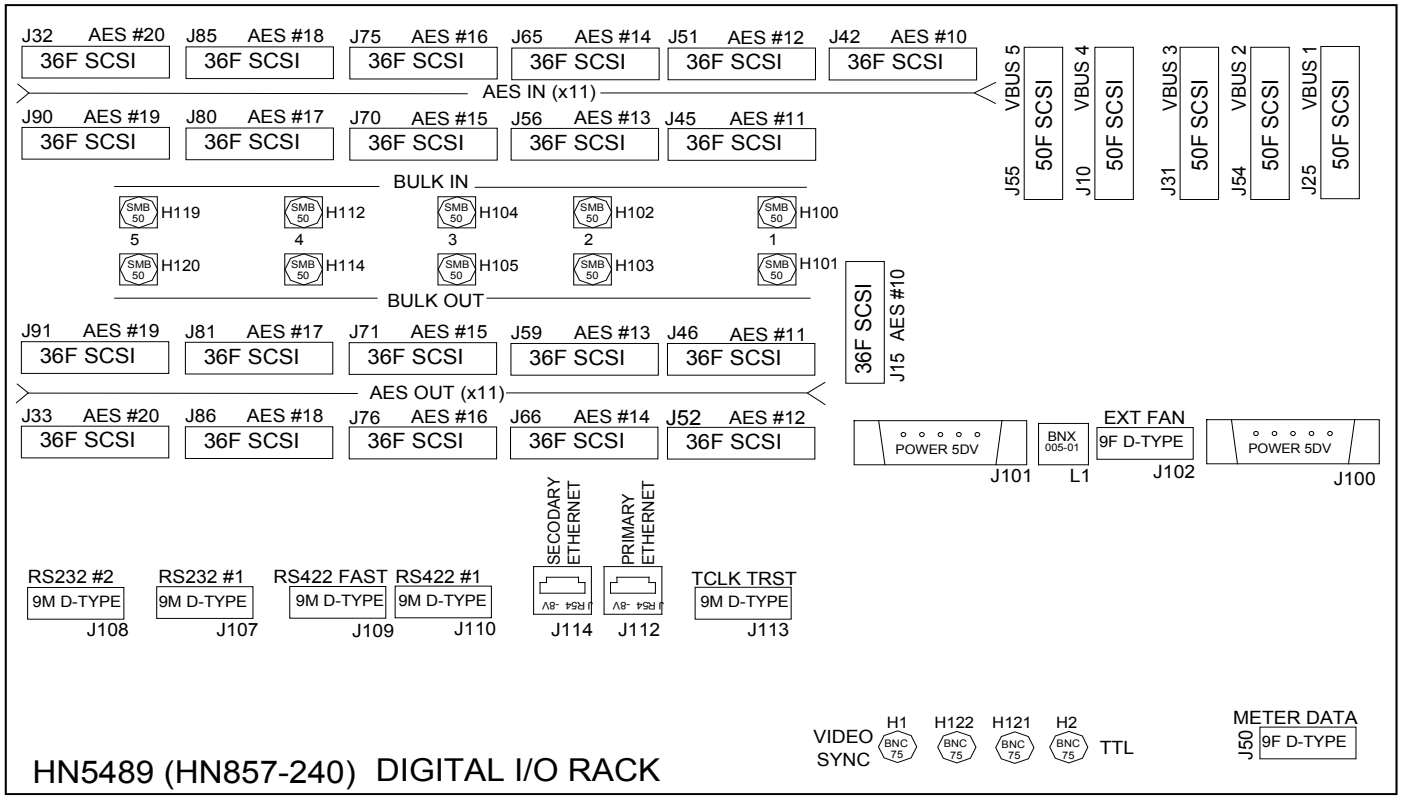
For further information or advice please contact Calrec.

SIGMA
AUDIO INPUT AND OUTPUT INTERFACES

CALREC

Putting Sound in the Picture

AES INPUTS AND OUTPUTS



Local AES inputs and outputs are provided on 36 way female SCSI-style connectors on the rear of the Digital I/O Rack (16 AES pairs of inputs or outputs per connector).

The Digital I/O Rack can house up to 11 AES I/O cards, each of which provides 16 AES inputs and 16 AES outputs. The cards are inserted into slots 10-20 within the rack.

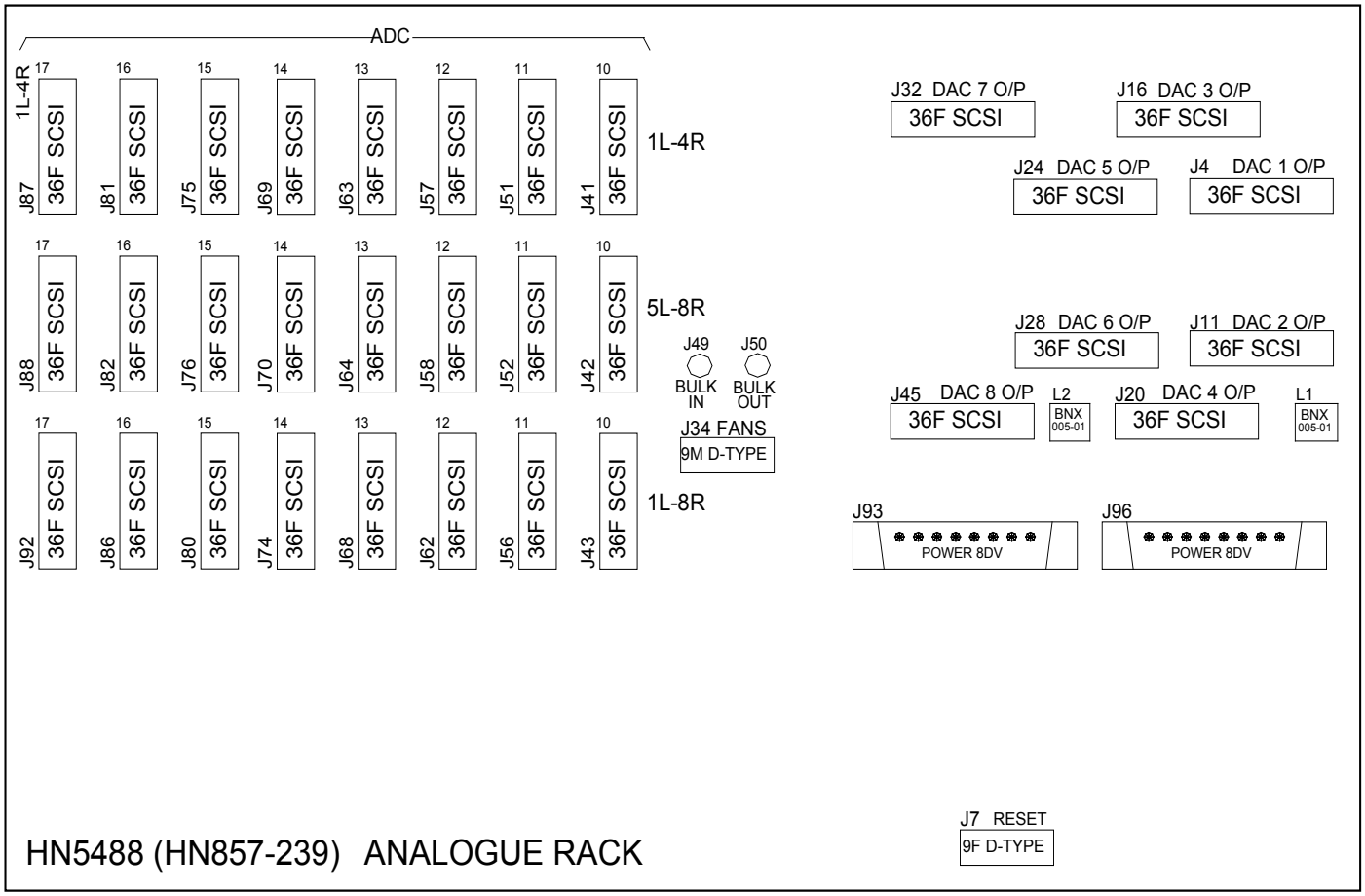
Each slot has dedicated input and output connectors on the rear of the rack, to which the system's AES inputs and outputs are connected. These connectors are used only when an AES I/O card occupies the slot.

Of the 11 AES slots available, up to 5 can be occupied by bulk I/O cards which are used to interface to analog I/O racks. If a slot is occupied by a bulk I/O card, then the AES I/O connectors belonging to that slot are left unused, and the SMB connectors for bulk I/O are used to connect to the analog I/O racks.

Up to 8 of the 11 slots can be occupied by wide area bulk I/O (WAB) cards which are used for wide area interfaces such as MADI or Hydra. If a slot is occupied by a WAB I/O card, then the AES I/O connectors on the rear of the Digital I/O rack belonging to that slot are used to connect to the wide area interface.

Digital I/O Rack Slot Arrangement					
Slot No	Compatible Card	AES Input Connector	AES Output Connector	Bulk Input Connector	Bulk Output Connector
1-7	DSP (ONLY 2 NEEDED - 1 PLUS HOT SPARE)	-	-	-	-
8-9	RACK PROCESSOR	-	-	-	-
10	AES, BULK OR WAB	J42	J15	H100	H101
11	AES OR WAB	J45	J46	-	-
12	AES, BULK OR WAB	J51	J52	H102	H103
13	AES OR WAB	J58	J59	-	-
14	AES, BULK OR WAB	J65	J66	H104	H105
15	AES OR WAB	J70	J71	-	-
16	AES, BULK OR WAB	J75	J76	H112	H114
17	AES	J80	J81	-	-
18	AES, BULK OR WAB	J85	J86	H119	H120
19	AES	J90	J91	-	-

ANALOG INPUTS AND OUTPUTS



All analog inputs and outputs are provided on 36 way female SCSI-style connectors on the rear of the analog I/O racks.

Each analog I/O rack is connected to the digital I/O rack via the BULK IN and BULK OUT connectors J49 and J50.

ADC Card Slots and Connectors

Each analog I/O rack can house up to 8 mic/line or line input (ADC) cards, each of which provides 8 stereo inputs. The cards are inserted into the slots within the rack, these are numbered 1-8. Each slot has 2 dedicated input connectors on the rear of the rack, to which the system's analog inputs are connected. Each of the input connectors provides connections for 4 stereo inputs.

DAC Card Slots and Connectors

Each analog I/O Rack can house up to 8 line output (DAC) cards, each of which provides 8 stereo outputs. The cards are inserted into the slots within the rack, these are numbered 1-8. Each slot has a dedicated output connector on the rear of the rack, which provide connections for the system's analog outputs. Each of the output connectors provides connections for 8 stereo outputs.

DAC SLOT	LINE OUTPUTS 1-16 CONNECTOR
1	J4
2	J11
3	J16
4	J20
5	J24
6	J28
7	J32
8	J45

ADC SLOT	MIC/LINE INPUTS 1-8 CONNECTOR	MIC/LINE INPUTS 9-16 CONNECTOR
1	J41	J42
2	J51	J52
3	J57	J58
4	J63	J64
5	J69	J70
6	J75	J76
7	J81	J82
8	J87	J88

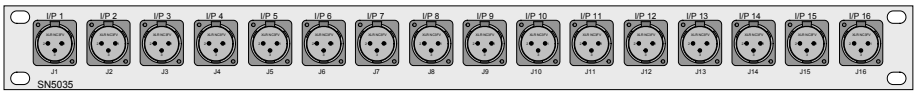
BNC AND XLR INTERFACE CONNECTOR PANELS

Audio inputs and outputs may be connected directly to the console using 36 way SCSI-style connectors. Optionally, break out connector panels and cabling can be provided.

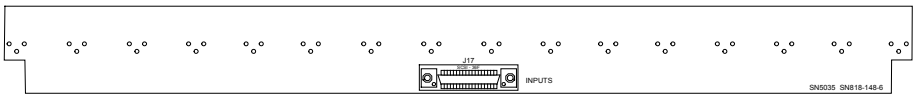
Ideally, BNC interface panels should be fitted within 3m (9.8ft) of the backplane they connect to. XLR interface panels should be fitted within 2m (6.5ft) of the backplane they connect to.

For digital inputs and outputs, interface panels can be either XLR (16 male or female on a 1U panel) or BNC (32 on a 1U panel).

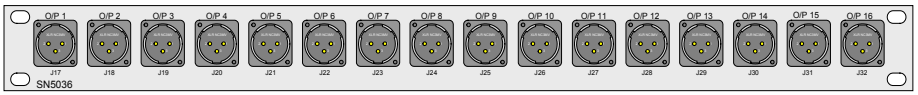
XLR INPUT PANEL (FRONT)



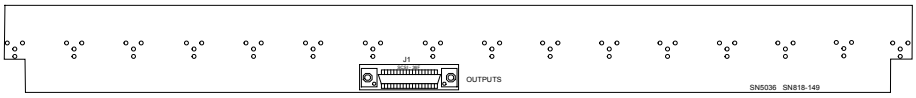
XLR INPUT PANEL (REAR)



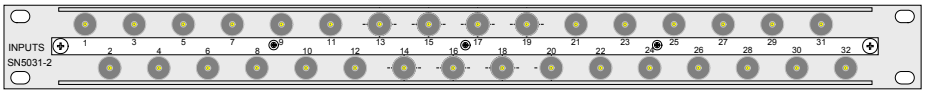
XLR OUTPUT PANEL (FRONT)



XLR OUTPUT PANEL (REAR)

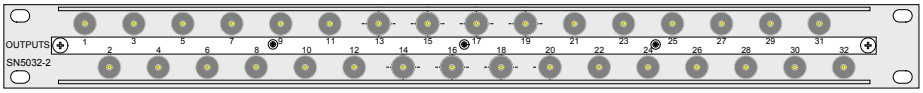


BNC INPUT PANEL (FRONT)



BNC INPUT PANEL (REAR)

BNC OUTPUT PANEL (FRONT)



BNC OUTPUT PANEL (REAR)

EDAC INTERFACE CONNECTOR PANELS

8 or 12 way EDAC connector 2U panels are available to interface analog I/O in one of the styles shown in the table.

Interface	Style 1	Style 2
Mic/Line or Line Inputs	4 pairs per EDAC	6 pairs per EDAC
Line Only Inputs	8 pairs per EDAC	6 pairs per EDAC
Line Outputs	8 pairs per EDAC	6 pairs per EDAC

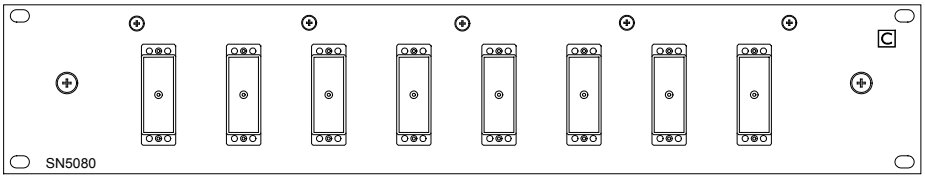
The choice of style will depend on the installation requirements. Limiting factors to be considered are:

- The number of connections available in the external cabling
- Restricted amount of interface space available within 3m(9.8ft) of the backplane.

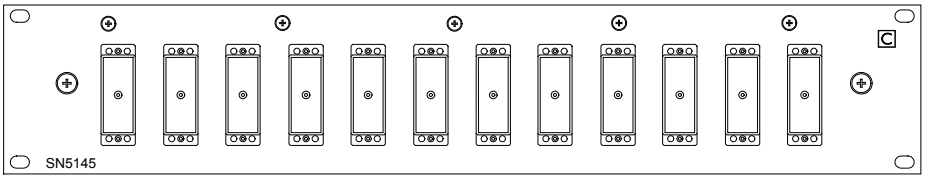
The different styles are achieved using interface cards which attach to the rear of the 2U panels to provide different combinations of SCSI-style connectors per EDAC (Except in the case of mic/line inputs where a custom cable is provided).

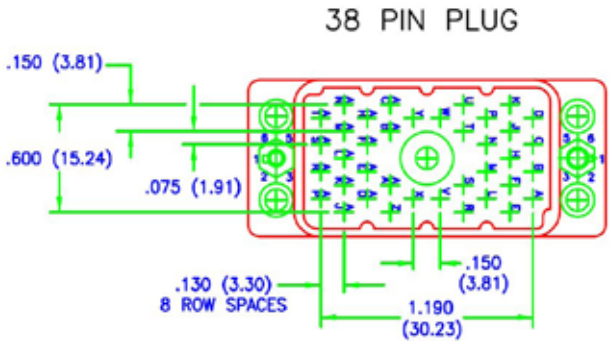
The connectors on these panels are 38 pin, male panel-mounted EDAC connectors (38MP-plug). Therefore, cables interfacing to these panels need 38 pin, female cabling connectors (38FC-receptacle).

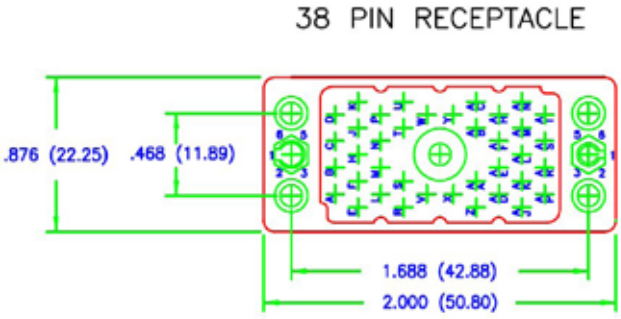
8X38W EDAC PANEL



12X38W EDAC PANEL







Component	Carec Reference	EDAC Reference
Varicon 38 Way Free Socket	400-040	516-038-000-401
Varicon 38 Way Metal Hood	400-037	516-230-538
Varicon 56 Way Free Socket	400-008	516-056-000-401
Varicon 56 Way Metal Hood	400-038	516-230-556
Solder Type Varicon Pins	400-025	516-290-500
Varicon Pin Extraction Tool	-	516-280-200
Crimp Type Varicon Pins	400-024	516-290-590
(XLR) Neutrik NC-3-FC	410-007	-

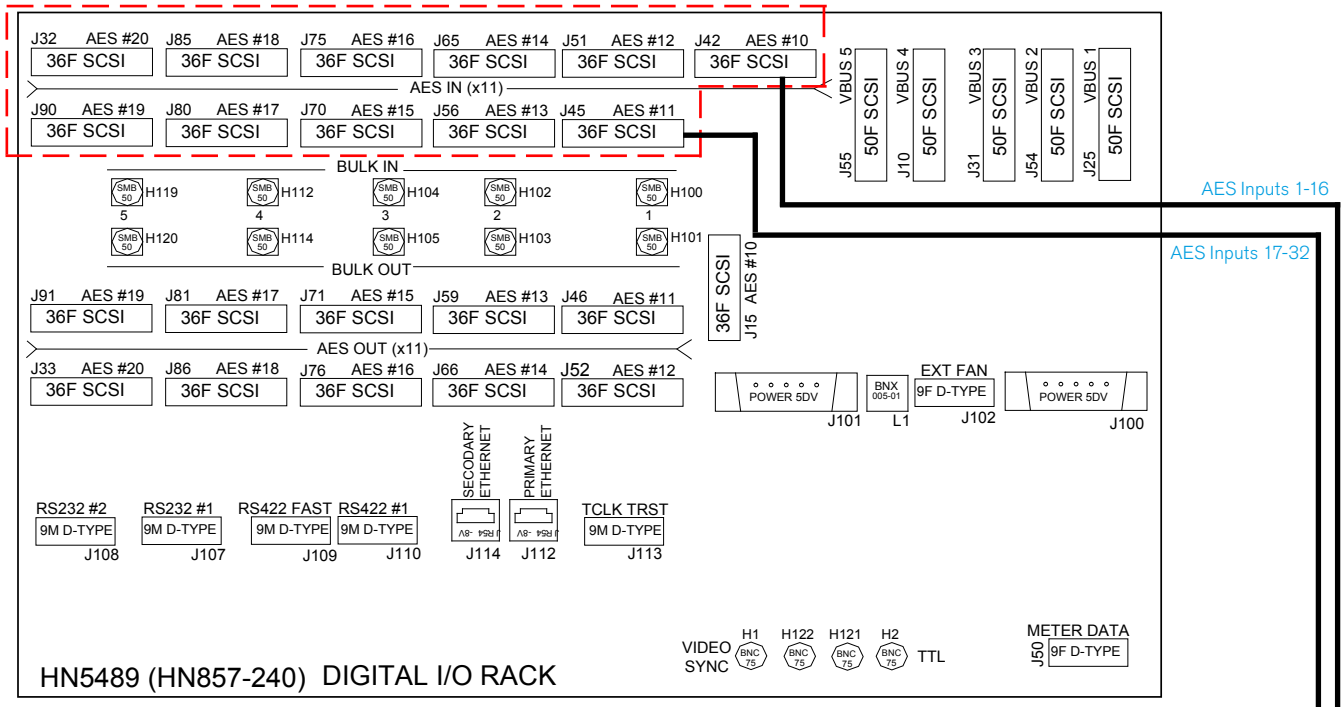
AES INPUTS – BNC INTERFACE

Each AES I/O card in the digital I/O rack provides 16 AES inputs and 16 AES outputs. Each slot has dedicated input and output connectors on the rear of the rack, to which the system's AES inputs and outputs are connected.

The diagram below shows how the AES input connectors (shown within dotted border) are connected to BNC interface panels via SCSI-style cabling. For clarity, input connections from just 2 AES cards (occupying slots 10 and 11) to an interface panel are shown here.

Ideally, the BNC input interface panels should be located within 5m (16.5ft) of the digital I/O rack. Each panel can interface 32 AES inputs. Therefore if all local AES inputs are used, 5 panels would be needed.

Please Note:
AES inputs 1-16 are available on connector J42, provided that the card in slot 10 is an AES I/O card. If a Bulk I/O or WAB I/O card occupies slot 10, then AES inputs 1-16 will be available on connector J45, using the AES card in slot 11.



Cable 2 AES Inputs 17-32	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	17
3 . 21	18
4 . 22	19
5 . 23	20
6 . 24	21
7 . 25	22
8 . 26	23
9 . 27	24
10 . 28	25
11 . 29	26
12 . 30	27
13 . 31	28
14 . 32	29
15 . 33	30
16 . 34	31
17 . 35	32
18 . 36	Chassis

Cable 1 AES Inputs 1-16	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1
3 . 21	2
4 . 22	3
5 . 23	4
6 . 24	5
7 . 25	6
8 . 26	7
9 . 27	8
10 . 28	9
11 . 29	10
12 . 30	11
13 . 31	12
14 . 32	13
15 . 33	14
16 . 34	15
17 . 35	16
18 . 36	Chassis

BNC INPUT I/F PANEL (REAR)

AES OUTPUTS – BNC INTERFACE

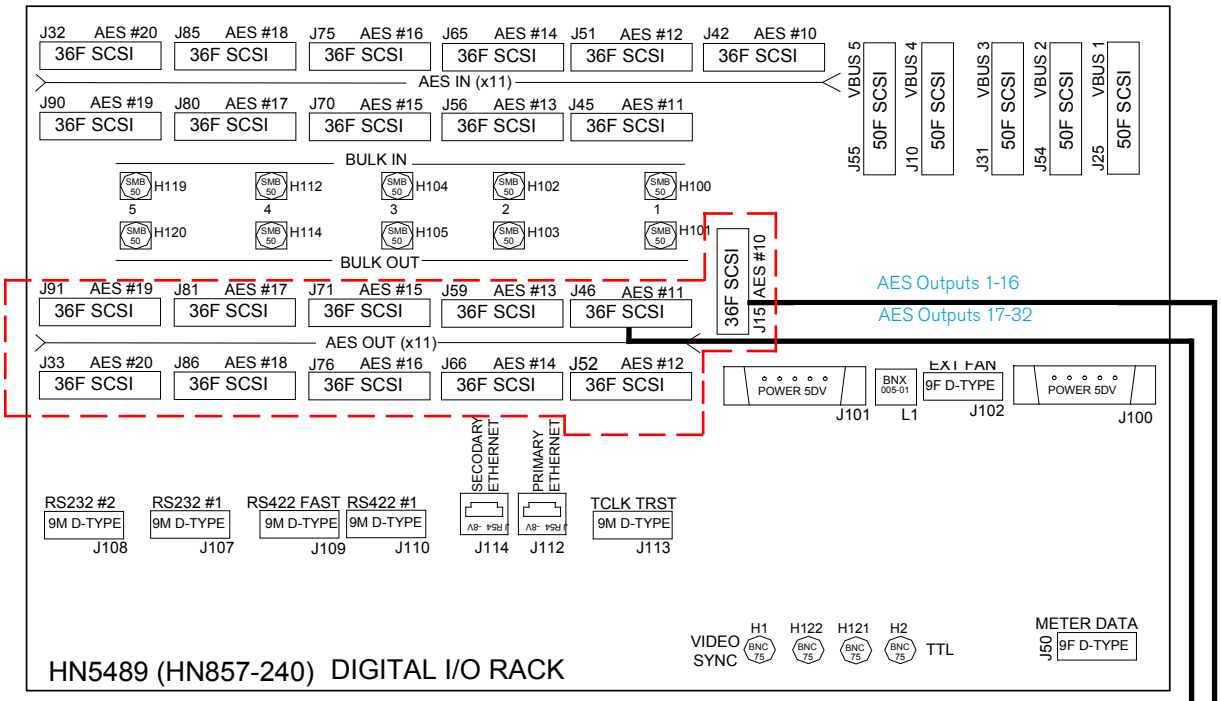
Each AES I/O card in the digital I/O rack provides 16 AES inputs and 16 AES outputs. Each slot has dedicated input and output connectors on the rear of the rack, to which the system's AES inputs and outputs are connected.

The diagram below shows how the AES output connectors (shown within dotted border) are connected to BNC interface panels via SCSI cabling. For clarity, output connections from just 2 AES cards (occupying slots 10 and 11) to an interface panel are shown here.

Ideally, the BNC output interface panels should be located within 5m (16.5ft) of the digital I/O rack. Each panel can interface 32 AES outputs. Therefore if all local AES outputs are used, 5 panels would be needed.

Please Note

AES outputs 1-16 are available on connector J15, provided that the card in slot 10 is an AES I/O card. If a Bulk I/O or WAB I/O card occupies slot 10, then AES outputs 1-16 will be available on connector J46, using the AES card in slot 11.



Cable 2 AES Outputs 17-32	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	17
3 . 21	18
4 . 22	19
5 . 23	20
6 . 24	21
7 . 25	22
8 . 26	23
9 . 27	24
10 . 28	25
11 . 29	26
12 . 30	27
13 . 31	28
14 . 32	29
15 . 33	30
16 . 34	31
17 . 35	32
18 . 36	Chassis

Cable 1 AES Outputs 1-16	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1
3 . 21	2
4 . 22	3
5 . 23	4
6 . 24	5
7 . 25	6
8 . 26	7
9 . 27	8
10 . 28	9
11 . 29	10
12 . 30	11
13 . 31	12
14 . 32	13
15 . 33	14
16 . 34	15
17 . 35	16
18 . 36	Chassis

BNC OUTPUT I/F PANEL (REAR)

AES INPUTS – XLR INTERFACE

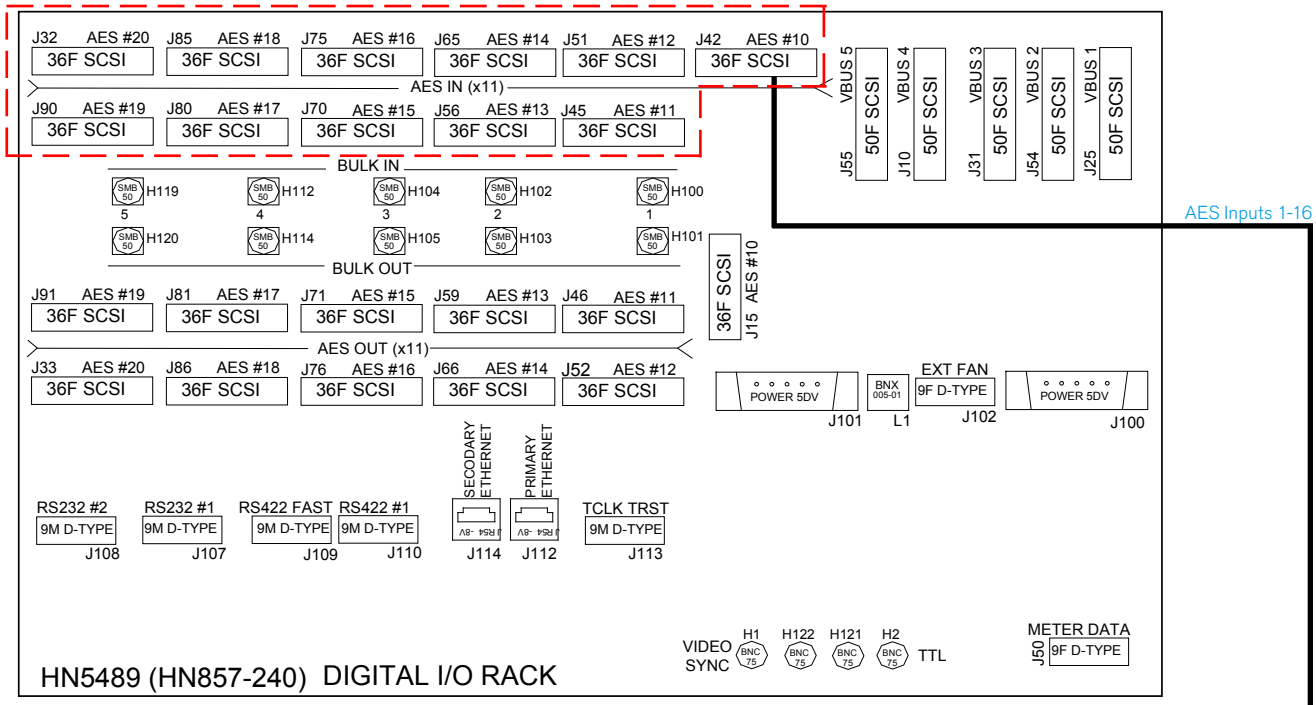
Each AES I/O card in the digital I/O rack provides 16 AES inputs and 16 AES outputs. Each slot has dedicated input and output connectors on the rear of the rack, to which the system's AES inputs and outputs are connected.

The diagram below shows how the AES input connectors (shown within dotted border) are connected to XLR interface panels via SCSI cabling. For clarity, connection from just one AES card (occupying slot 10) to an interface panel is shown here.

Ideally, the XLR input interface panels should be located within 3m (9.8ft) of the digital I/O rack. Each panel can interface 16 AES inputs. Therefore if all AES inputs are used, 10 panels would be needed.

Please Note

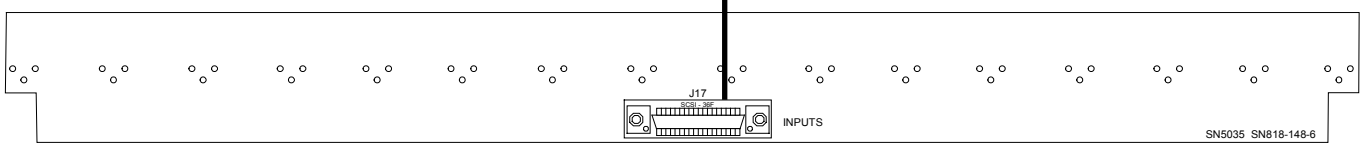
AES inputs 1-16 are available on connector J42, provided that the card in slot 10 is an AES I/O card. If a Bulk I/O or WAB I/O card occupies slot 10, then AES inputs 1-16 will be available on connector J45, using the AES card in slot 11. The AES I/O connectors belonging to slots that are occupied by bulk I/O or WAB I/O cards are left unused.



On 3 pin XLR, pin 2 is HOT (phase), pin 3 is COLD (anti-phase) and pin 1 is chassis connections.

Cable 1 AES Inputs 1-16	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1
3 . 21	2
4 . 22	3
5 . 23	4
6 . 24	5
7 . 25	6
8 . 26	7
9 . 27	8
10 . 28	9
11 . 29	10
12 . 30	11
13 . 31	12
14 . 32	13
15 . 33	14
16 . 34	15
17 . 35	16
18 . 36	Chassis

XLR INPUT I/F PANEL (REAR)



AES OUTPUTS – XLR INTERFACE

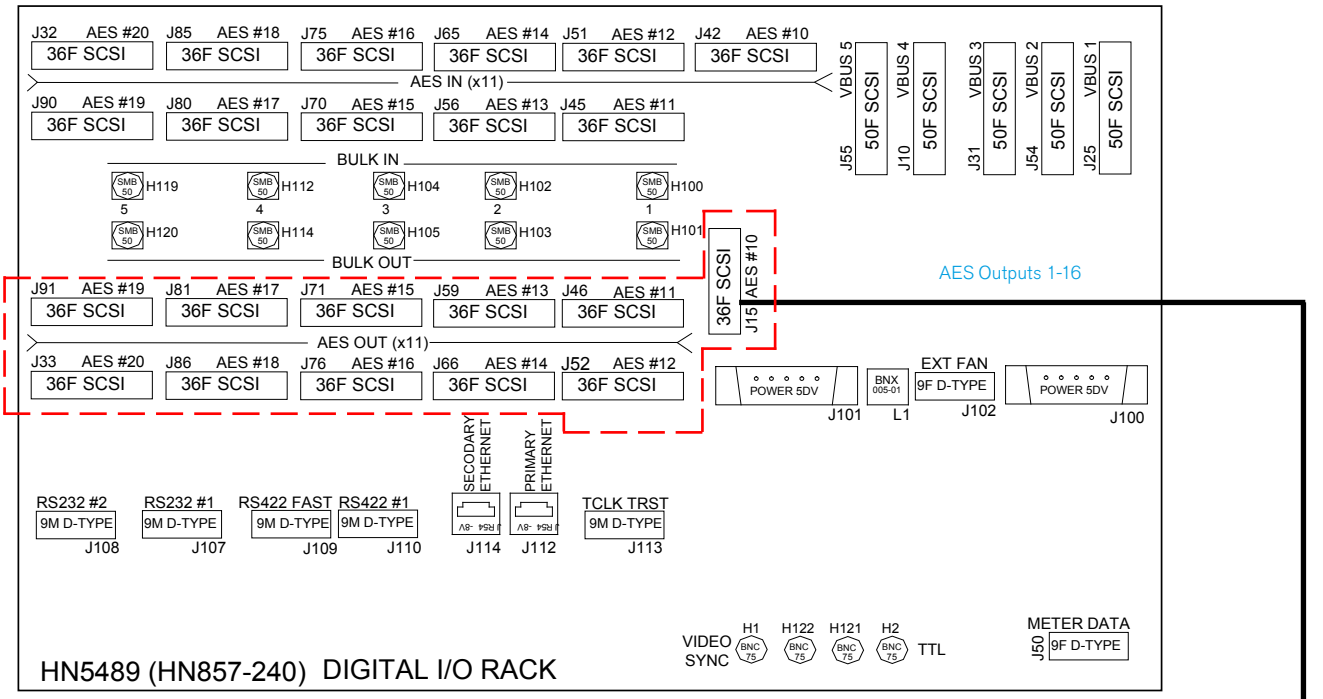
Each AES I/O card in the digital I/O rack provides 16 AES inputs and 16 AES outputs. Each slot has dedicated input and output connectors on the rear of the rack, to which the system's AES inputs and outputs are connected.

The diagram below shows how the AES output connectors (shown within dotted border) are connected to XLR interface panels via SCSI cabling. For clarity, connection from just one AES card (occupying slot 10) to an interface panel is shown here.

Ideally, the XLR output interface panels should be located within 3m (9.8ft) of the digital I/O rack. Each panel can interface 16 AES outputs. Therefore if all AES outputs are used, 10 panels would be needed.

Please Note

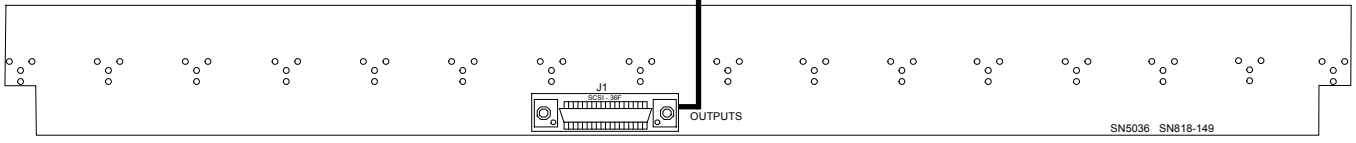
AES outputs 1-16 are available on connector J15, provided that the card in slot 10 is an AES I/O card. If a Bulk I/O or WAB I/O card occupies slot 10, then AES outputs 1-16 will be available on connector J46, using the AES card in slot 11.



On 3 pin XLR, pin 2 is HOT (phase), pin 3 is COLD (anti-phase) and pin 1 is chassis connections.

Cable 1 AES Outputs 1-16	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1
3 . 21	2
4 . 22	3
5 . 23	4
6 . 24	5
7 . 25	6
8 . 26	7
9 . 27	8
10 . 28	9
11 . 29	10
12 . 30	11
13 . 31	12
14 . 32	13
15 . 33	14
16 . 34	15
17 . 35	16
18 . 36	Chassis

XLR OUTPUT I/F PANEL (REAR)



ANALOG MIC/LINE INPUTS (MIC/LINE OR LINE ADC CARDS)–STYLE 1

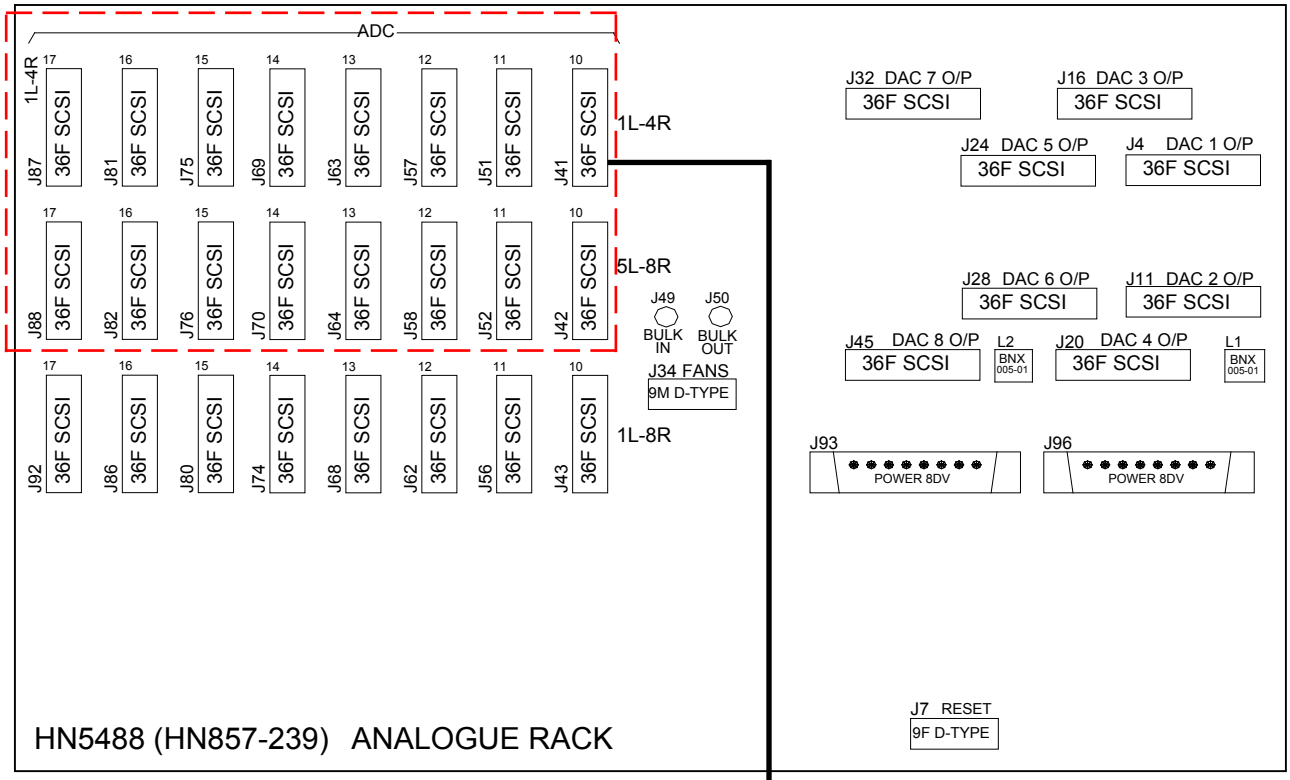
Each analog I/O rack can house up to 8 mic/line or line input (ADC) cards, each of which provides 8 stereo inputs. The cards are inserted into the slots within the rack, and each slot has 2 dedicated input connectors on the rear of the rack (shown within dotted border), to which the system's analog inputs are connected.

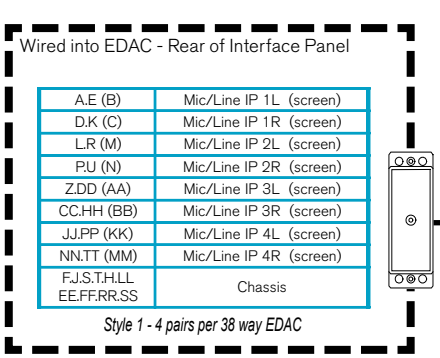
Each of the input connectors provides connections for 4 stereo inputs.

The diagram below shows how these connectors are connected to 8 or 12 way EDAC interface panels via Calrec custom cabling to achieve Style 1 (4 pairs per EDAC connector).

There are 2 cables for each ADC card fitted (Just one shown here), with 4 stereo inputs on each cable

Ideally, the EDAC interface panels should be located within 5m (16.5ft) of the analog I/O rack.





Calrec Custom Cabling

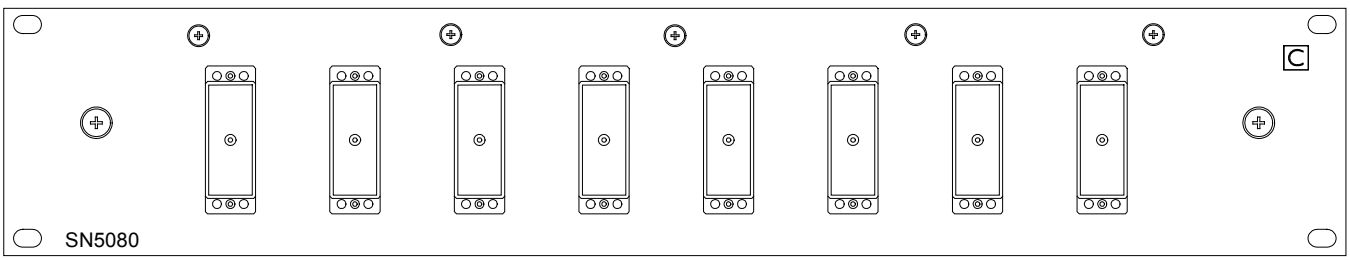
(CABLE 2 IS NOT SHOWN)

Cable 1 Stereo Inputs 1-4	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1L
3 . 21	Chassis
4 . 22	1R
5 . 23	Chassis
6 . 24	2L
7 . 25	Chassis
8 . 26	2R
9 . 27	Chassis
10 . 28	Chassis
11 . 29	3L
12 . 30	Chassis
13 . 31	3R
14 . 32	Chassis
15 . 33	4L
16 . 34	Chassis
17 . 35	4R
18 . 36	Chassis

Cable 2 Stereo Inputs 5-8	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	5L
3 . 21	Chassis
4 . 22	5R
5 . 23	Chassis
6 . 24	6L
7 . 25	Chassis
8 . 26	6R
9 . 27	Chassis
10 . 28	Chassis
11 . 29	7L
12 . 30	Chassis
13 . 31	7R
14 . 32	Chassis
15 . 33	8L
16 . 34	Chassis
17 . 35	8R
18 . 36	Chassis

On EDACs, pin 1 (A) is HOT (phase), pin 2 (E) is COLD (anti-phase) and pin 3 (B) is chassis connections.

8 WAY EDAC INTERFACE PANEL



ANALOG MIC/LINE INPUTS (MIC/LINE OR LINE ADC CARDS)-STYLE 2

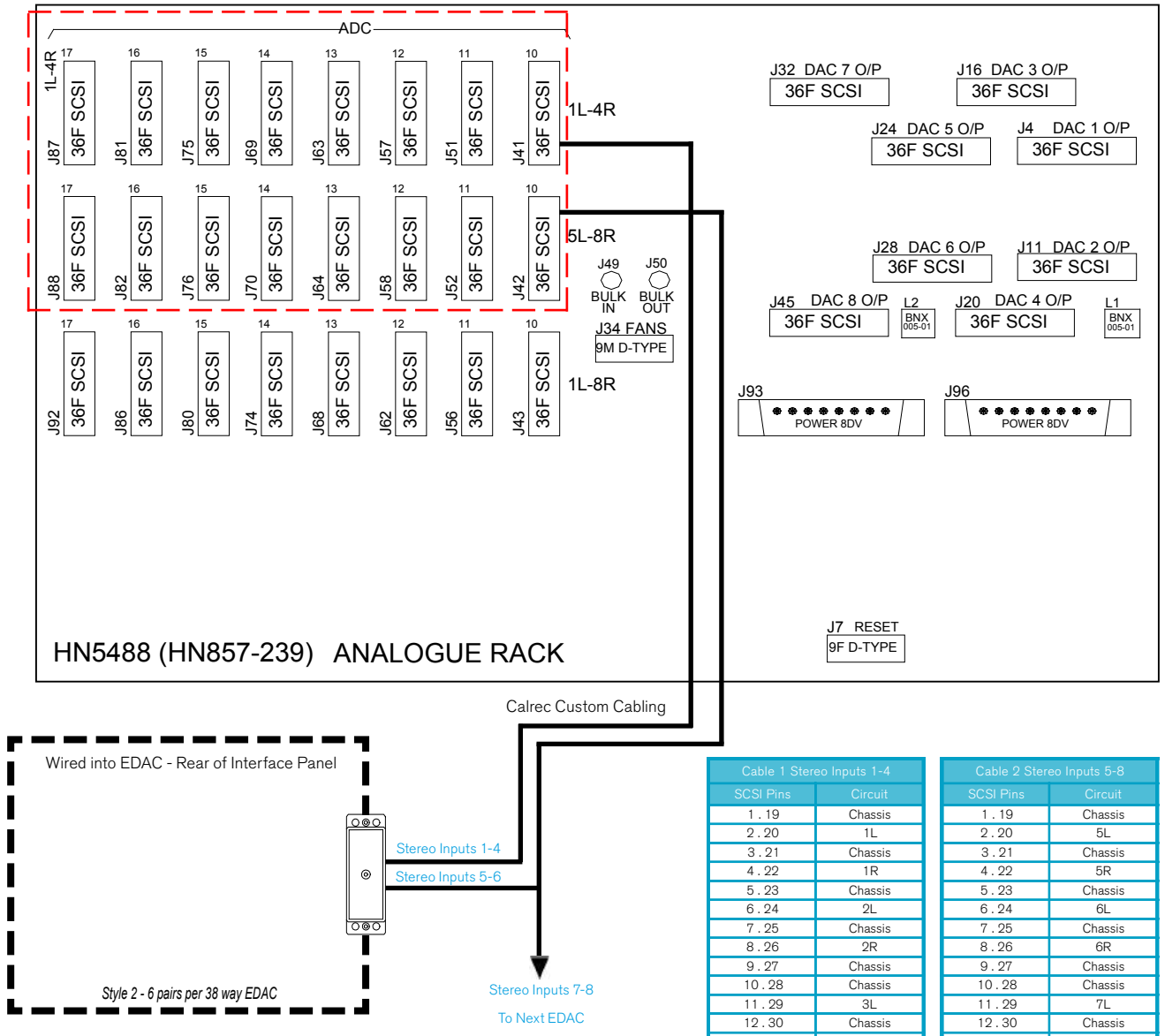
Each analog I/O rack can house up to 8 mic/line or line input (ADC) cards, each of which provides 8 stereo inputs. The cards are inserted into the slots within the rack, and each slot has 2 dedicated input connectors on the rear of the rack (shown within dotted border), to which the system's analog inputs are connected.

Each of the input connectors provides connections for 4 stereo inputs.

The diagram below shows how these connectors are connected to 8 or 12 way EDAC interface panels via Calrec custom cabling to achieve Style 2 (6 pairs per EDAC connector).

There are 2 Cables for each ADC card fitted, with 4 stereo inputs on each cable. Cable 2 also wires into the first EDAC to provide circuits 5 and 6.

Ideally, the EDAC interface panels should be located within 5m (16.5ft) of the analog I/O rack.

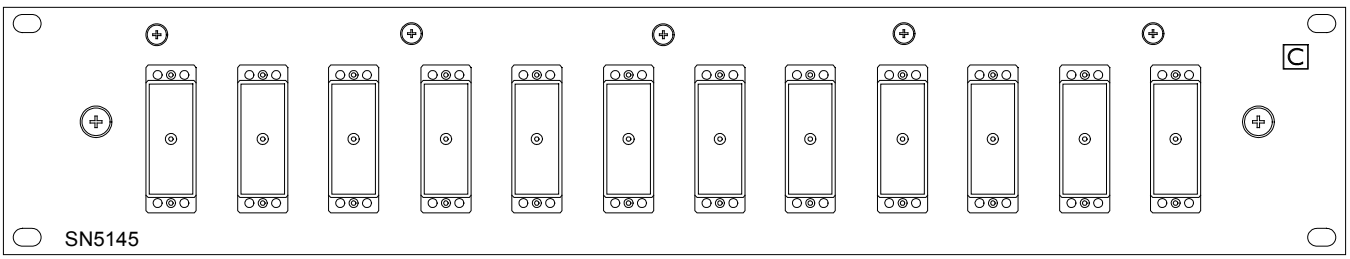


Cable 1 Stereo Inputs 1-4	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1L
3 . 21	Chassis
4 . 22	1R
5 . 23	Chassis
6 . 24	2L
7 . 25	Chassis
8 . 26	2R
9 . 27	Chassis
10 . 28	Chassis
11 . 29	3L
12 . 30	Chassis
13 . 31	3R
14 . 32	Chassis
15 . 33	4L
16 . 34	Chassis
17 . 35	4R
18 . 36	Chassis

Cable 2 Stereo Inputs 5-8	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	5L
3 . 21	Chassis
4 . 22	5R
5 . 23	Chassis
6 . 24	6L
7 . 25	Chassis
8 . 26	6R
9 . 27	Chassis
10 . 28	Chassis
11 . 29	7L
12 . 30	Chassis
13 . 31	7R
14 . 32	Chassis
15 . 33	8L
16 . 34	Chassis
17 . 35	8R
18 . 36	Chassis

On EDACs, pin 1 (A) is HOT (phase), pin 2 (B) is COLD (anti-phase) and pin 3 (E) is chassis connections.

12 WAY EDAC INTERFACE PANEL



ANALOG LINE ONLY INPUTS (LINE ADC CARDS ONLY)–STYLE 1

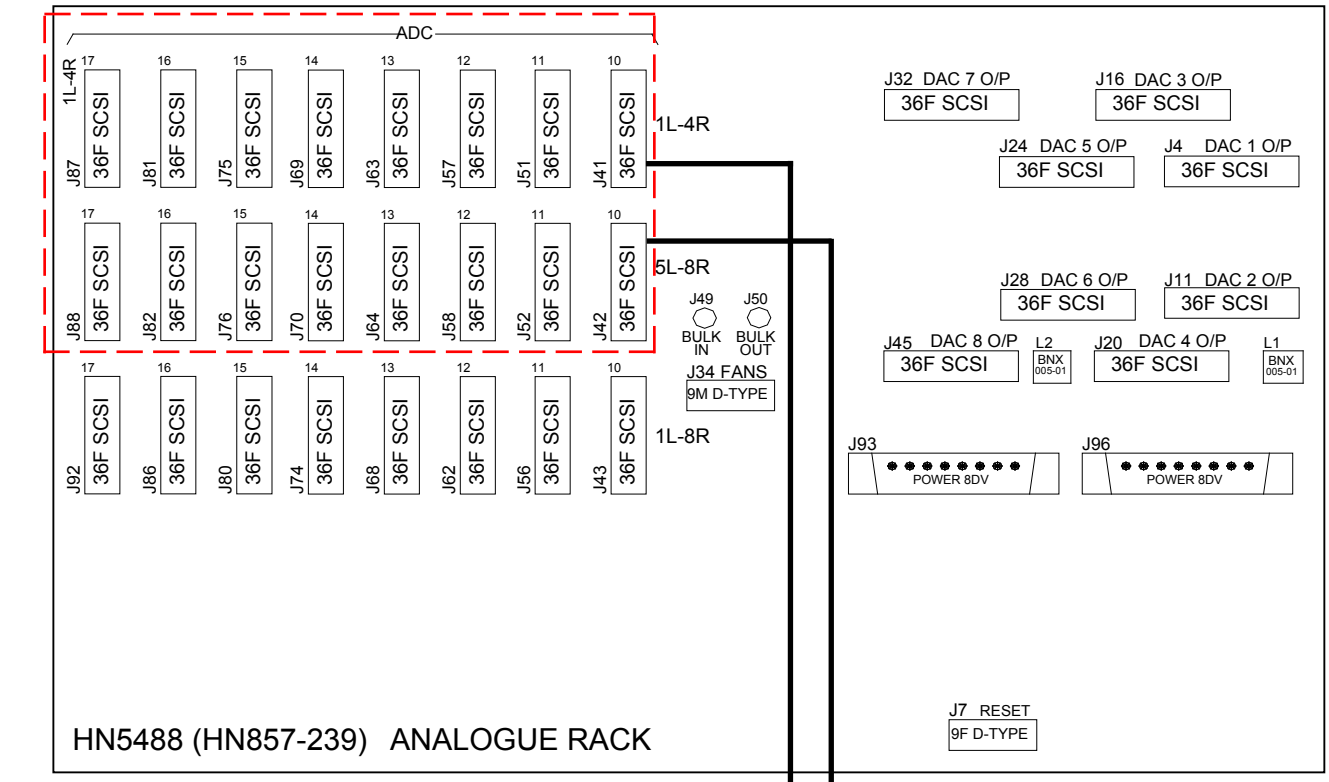
Each analog I/O rack can house up to 8 mic/line or line input (ADC) cards, each of which provides 8 stereo inputs. The cards are inserted into the slots within the rack, and each slot has 2 dedicated input connectors on the rear of the rack (shown within dotted border), to which the system's analog inputs are connected.

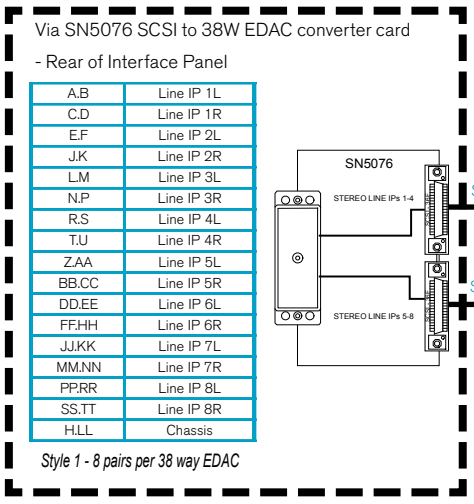
Each of the input connectors provides connections for 4 stereo inputs.

The diagram below shows how the Line inputs can be connected to 8 way EDAC interface panels via SCSI cabling to achieve Style 1 (8 pairs per EDAC connector).

There are 2 Cables for each ADC card fitted, with 4 stereo inputs on each cable.

Ideally, the EDAC interface panels should be located within 5m (16.5ft) of the analog I/O rack.



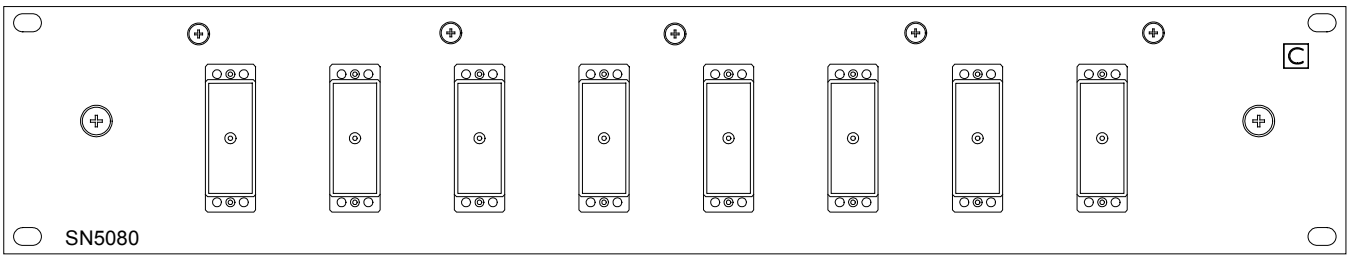


On EDAC, the first pin is HOT (phase), the second pin is COLD (anti-phase) and H.LL are chassis connections.

Cable 1 Stereo Inputs 1-4	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1L
3 . 21	Chassis
4 . 22	1R
5 . 23	Chassis
6 . 24	2L
7 . 25	Chassis
8 . 26	2R
9 . 27	Chassis
10 . 28	Chassis
11 . 29	3L
12 . 30	Chassis
13 . 31	3R
14 . 32	Chassis
15 . 33	4L
16 . 34	Chassis
17 . 35	4R
18 . 36	Chassis

Cable 2 Stereo Inputs 5-8	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	5L
3 . 21	Chassis
4 . 22	5R
5 . 23	Chassis
6 . 24	6L
7 . 25	Chassis
8 . 26	6R
9 . 27	Chassis
10 . 28	Chassis
11 . 29	7L
12 . 30	Chassis
13 . 31	7R
14 . 32	Chassis
15 . 33	8L
16 . 34	Chassis
17 . 35	8R
18 . 36	Chassis

8 WAY EDAC INTERFACE PANEL



ANALOG LINE ONLY INPUTS (LINE ADC CARDS ONLY) – STYLE 2

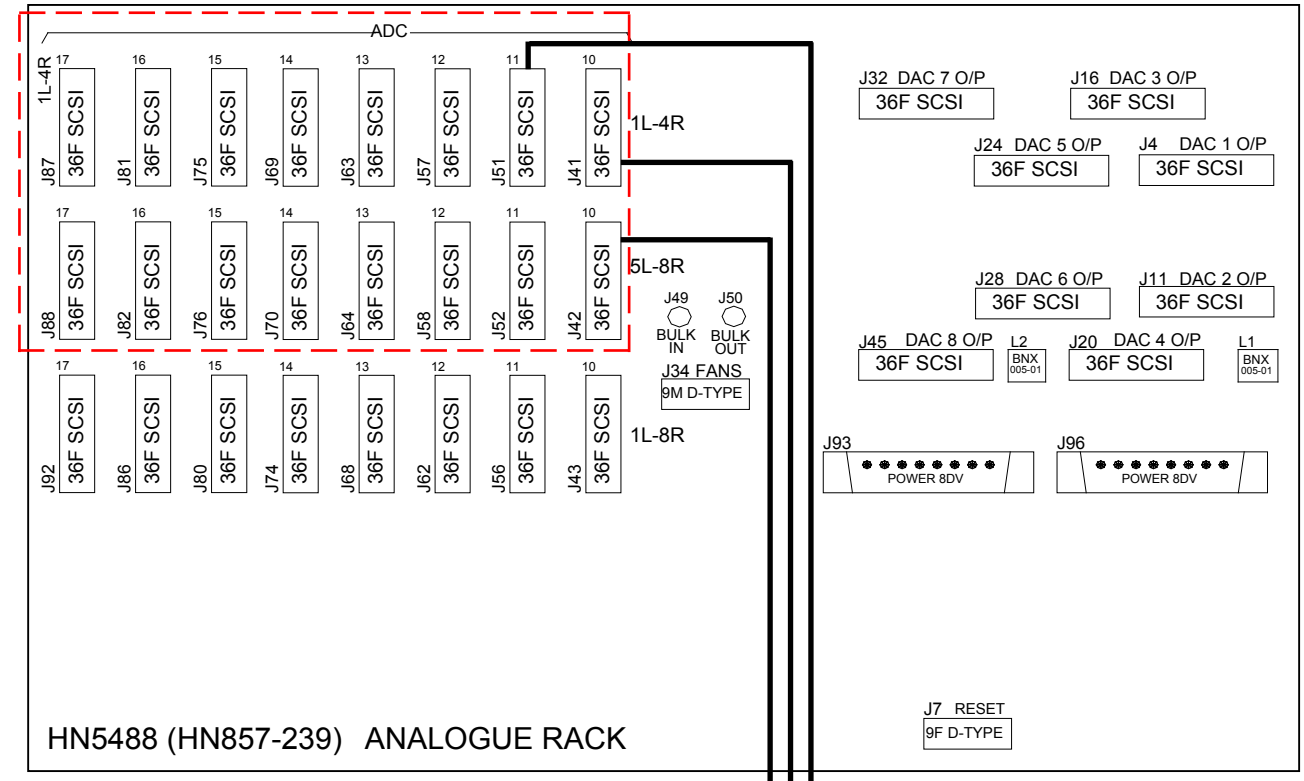
Each analog I/O rack can house up to 8 mic/line or line input (ADC) cards, each of which provides 8 stereo inputs. The cards are inserted into the slots within the rack, and each slot has 2 dedicated input connectors on the rear of the rack (shown within dotted border), to which the system's analog inputs are connected.

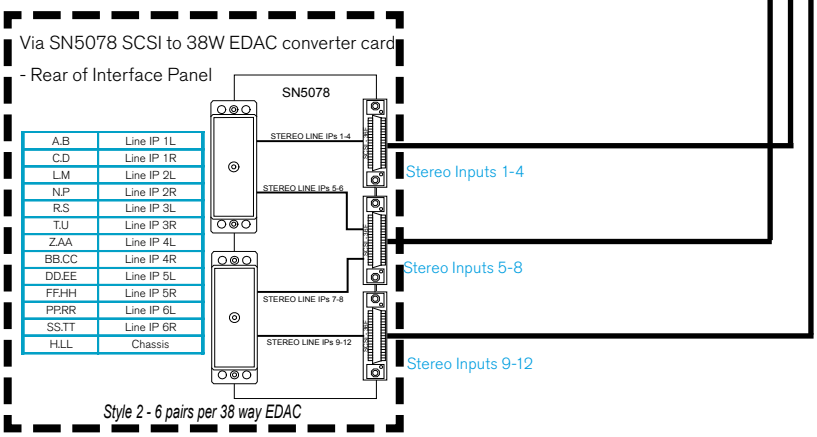
Each of the input connectors provides connections for 4 stereo inputs.

The diagram below shows how the Line inputs can be connected to 8 way EDAC interface panels via SCSI cabling to achieve Style 2 (6 pairs per EDAC connector).

There are 2 Cables for each ADC card fitted - 4 stereo inputs on each cable.

Ideally, the EDAC interface panels should be located within 5m (16.5ft) of the analog I/O rack.



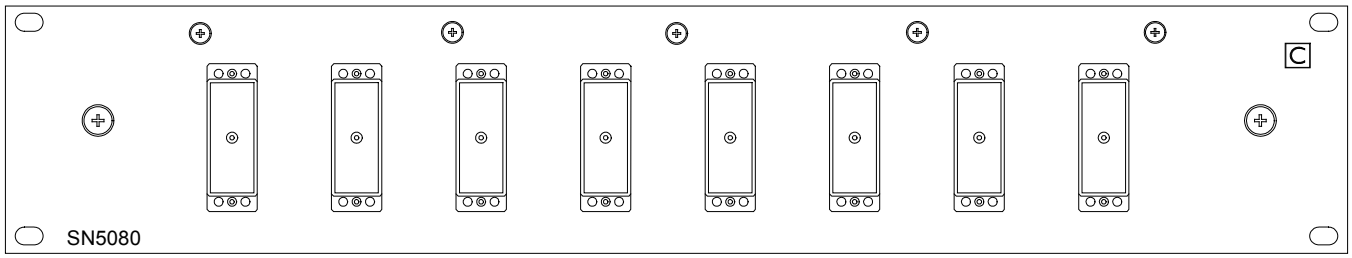


Cable 1 Stereo Inputs 1-4	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1L
3 . 21	Chassis
4 . 22	1R
5 . 23	Chassis
6 . 24	2L
7 . 25	Chassis
8 . 26	2R
9 . 27	Chassis
10 . 28	Chassis
11 . 29	3L
12 . 30	Chassis
13 . 31	3R
14 . 32	Chassis
15 . 33	4L
16 . 34	Chassis
17 . 35	4R
18 . 36	Chassis

Cable 2 Stereo Inputs 5-8	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	5L
3 . 21	Chassis
4 . 22	5R
5 . 23	Chassis
6 . 24	6L
7 . 25	Chassis
8 . 26	6R
9 . 27	Chassis
10 . 28	Chassis
11 . 29	7L
12 . 30	Chassis
13 . 31	7R
14 . 32	Chassis
15 . 33	8L
16 . 34	Chassis
17 . 35	8R
18 . 36	Chassis

On EDAC, the first pin is HOT (phase), the second pin is COLD (anti-phase) and H.LL are chassis connections.

8 WAY EDAC INTERFACE PANEL



ANALOG LINE OUTPUTS (DAC CARDS ONLY) – STYLE 1

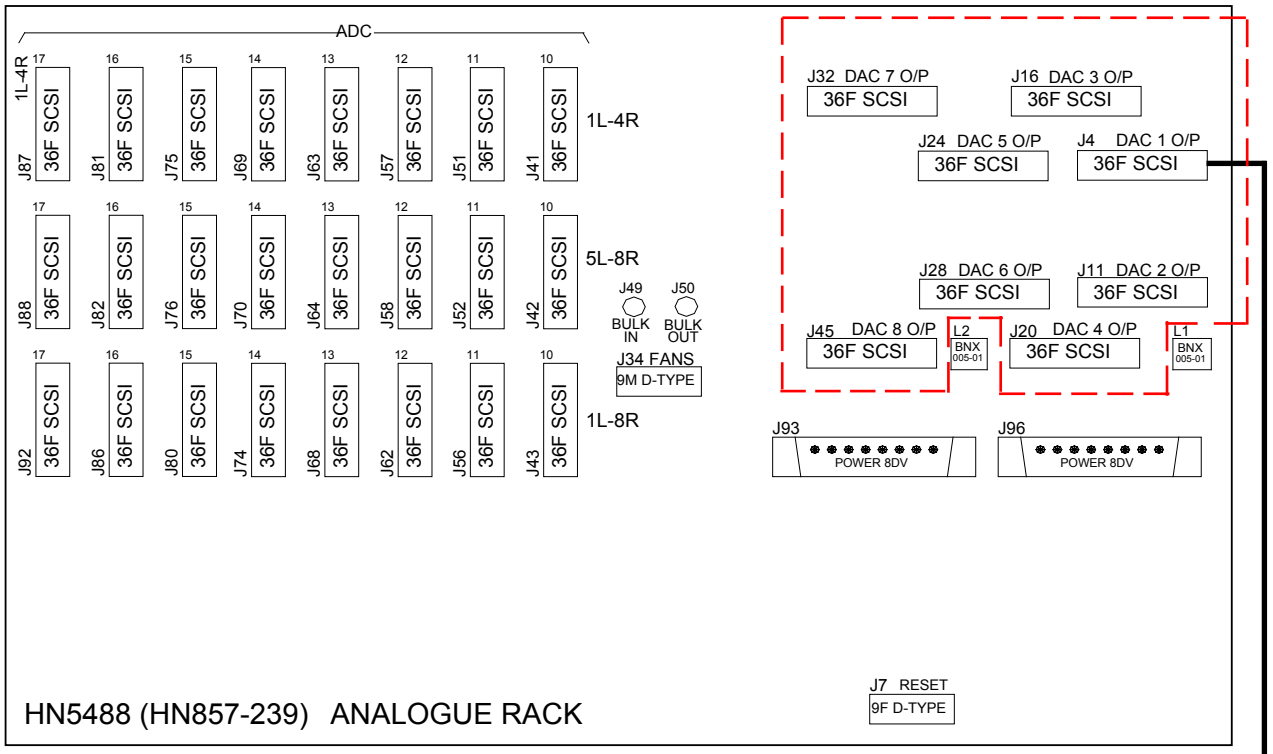
Each analog I/O rack can house up to 8 line output (DAC) cards, each of which provides 8 stereo outputs. The cards are inserted into the slots within the rack, these are numbered 1-8. Each slot has a dedicated output connector on the rear of the rack, which provide connections for the system's analog outputs.

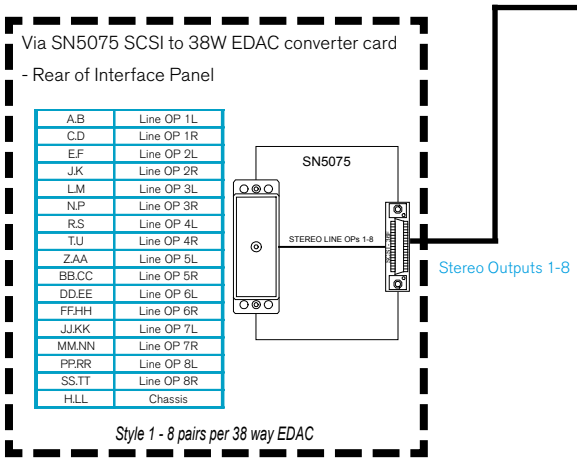
Each of the output connectors provides connections for 8 stereo outputs.

The diagram below shows how the line outputs can be connected to 8 way EDAC interface panels via SCSI cabling to achieve Style 1 (8 pairs per EDAC connector).

There is 1 cable for each DAC card fitted - 8 stereo outputs on each cable.

Ideally, the EDAC interface panels should be located within 5m (16.5ft) of the analog I/O rack.



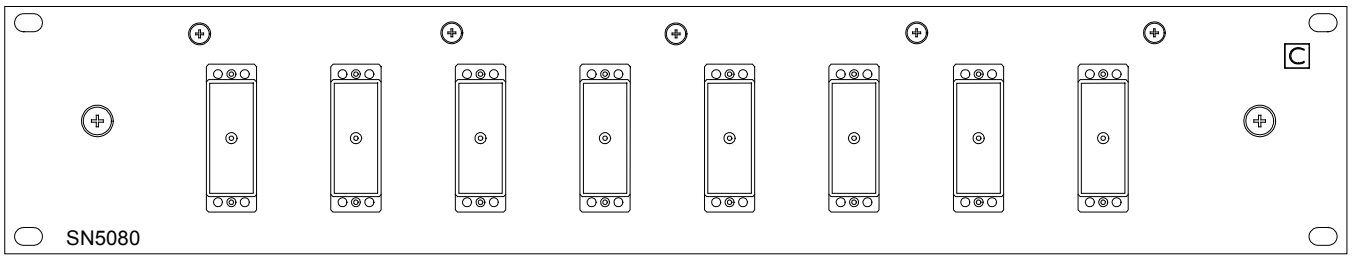


A.B	Line OP 1L
C.D	Line OP 1R
E.F	Line OP 2L
J.K	Line OP 2R
L.M	Line OP 3L
N.P	Line OP 3R
R.S	Line OP 4L
T.U	Line OP 4R
Z.AA	Line OP 5L
BB.CC	Line OP 5R
DD.EE	Line OP 6L
FF.HH	Line OP 6R
JJ.KK	Line OP 7L
MM.NN	Line OP 7R
PP.RR	Line OP 8L
SS.TT	Line OP 8R
H.LL	Chassis

Cable 1 - Stereo Outputs 1-8	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1L
3 . 21	1R
4 . 22	2L
5 . 23	2R
6 . 24	3L
7 . 25	3R
8 . 26	4L
9 . 27	4R
10 . 28	5L
11 . 29	5R
12 . 30	6L
13 . 31	6R
14 . 32	7L
15 . 33	7R
16 . 34	8L
17 . 35	8R
18 . 36	Chassis

8 WAY EDAC INTERFACE PANEL

On EDACs, the first pin is HOT (phase), the second pin is COLD (anti-phase) and H.LL are chassis connections.



ANALOG LINE OUTPUTS (DAC CARDS ONLY) – STYLE 2

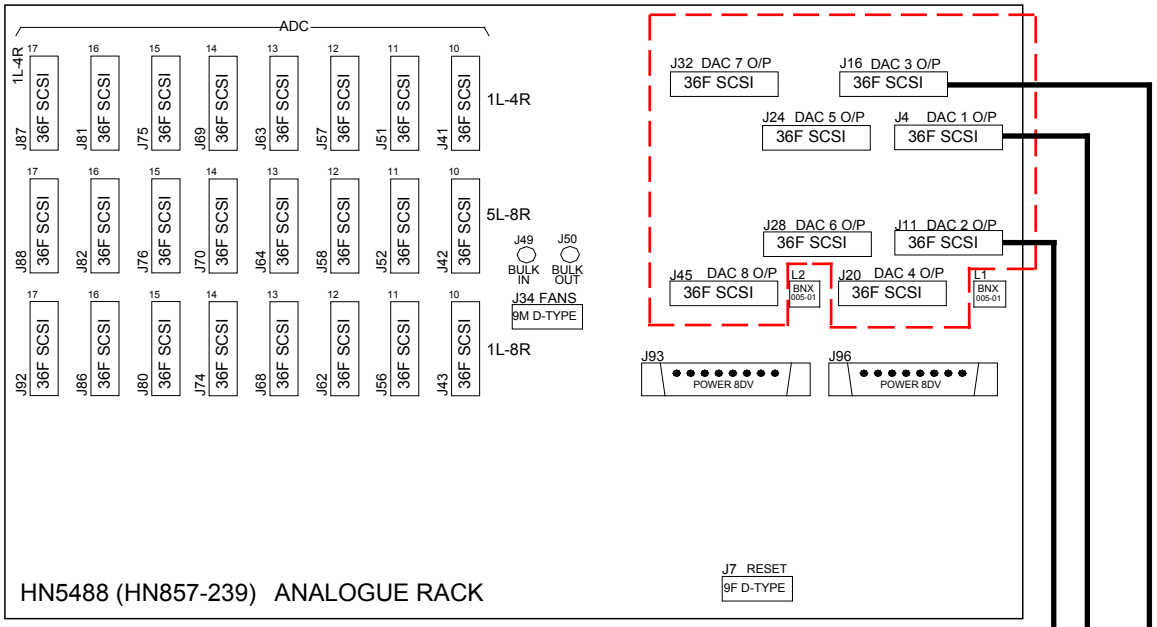
Each analog I/O rack can house up to 8 line output (DAC) cards, each of which provides 8 stereo outputs. The cards are inserted into the slots within the rack, these are numbered 1-8. Each slot has a dedicated output connector on the rear of the rack, which provide connections for the system's analog outputs.

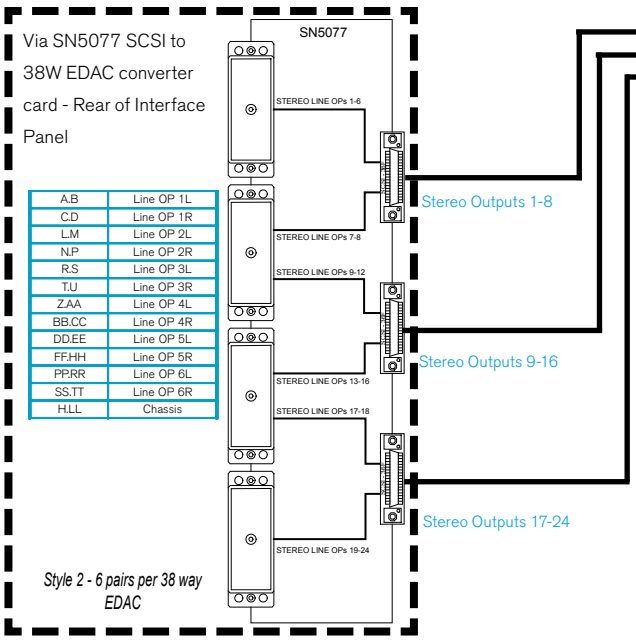
Each of the output connectors provides connections for 8 stereo outputs.

The diagram below shows how the line outputs can be connected to 8 way EDAC interface panels via SCSI cabling to achieve Style 2 (6 pairs per EDAC).

1 Cable for each DAC card fitted - 8 stereo outputs on each cable.

Ideally, the EDAC interface panels should be located within 5m (16.5ft) of the analog I/O rack.





A.B	Line OP 1L
C.D	Line OP 1R
L.M	Line OP 2L
N.P	Line OP 2R
R.S	Line OP 3L
T.U	Line OP 3R
Z.AA	Line OP 4L
BB.CC	Line OP 4R
DD.EE	Line OP 5L
FF.HH	Line OP 5R
PP.RR	Line OP 6L
SS.TT	Line OP 6R
H.LL	Chassis

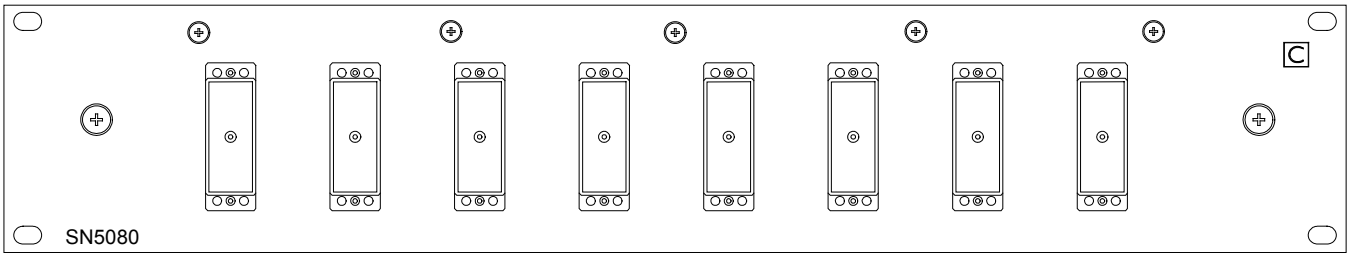
Cable 1 - Stereo Outputs 1-8	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1L
3 . 21	1R
4 . 22	2L
5 . 23	2R
6 . 24	3L
7 . 25	3R
8 . 26	4L
9 . 27	4R
10 . 28	5L
11 . 29	5R
12 . 30	6L
13 . 31	6R
14 . 32	7L
15 . 33	7R
16 . 34	8L
17 . 35	8R
18 . 36	Chassis

Cable 2 - Stereo Outputs 9-16	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	9L
3 . 21	9R
4 . 22	10L
5 . 23	10R
6 . 24	11L
7 . 25	11R
8 . 26	12L
9 . 27	12R
10 . 28	13L
11 . 29	13R
12 . 30	14L
13 . 31	14R
14 . 32	15L
15 . 33	15R
16 . 34	16L
17 . 35	16R
18 . 36	Chassis

Cable 3 - Stereo Outputs 17-24	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	17L
3 . 21	17R
4 . 22	18L
5 . 23	18R
6 . 24	19L
7 . 25	19R
8 . 26	20L
9 . 27	20R
10 . 28	21L
11 . 29	21R
12 . 30	22L
13 . 31	22R
14 . 32	23L
15 . 33	23R
16 . 34	24L
17 . 35	24R
18 . 36	Chassis

On EDACs, the first pin is HOT (phase), the second pin is COLD (anti-phase) and H.LL are chassis connections.

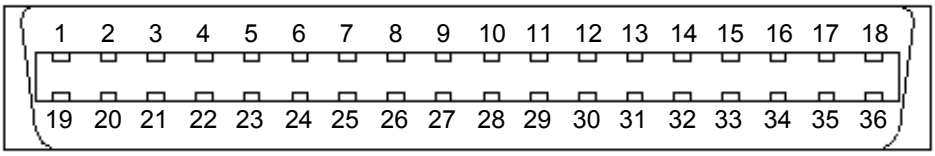
8 WAY EDAC INTERFACE PANEL



SPECIFICATION FOR SCSI STYLE CABLING

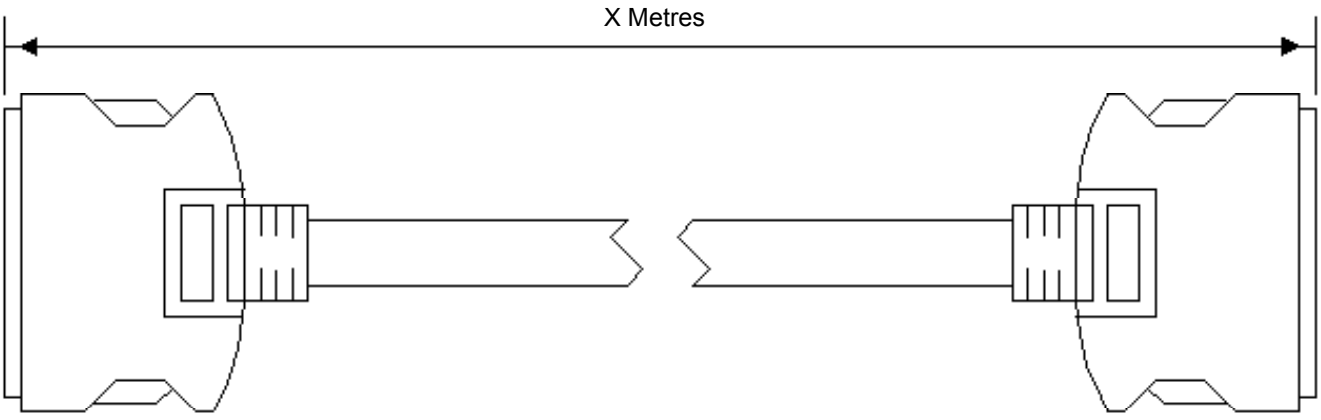
CABLE PAIRS WIRED AS:
1 . 19
2 . 20
3 . 21
4 . 22
5 . 23
6 . 24
7 . 25
8 . 26
9 . 27
10 . 28
11 . 29
12 . 30
13 . 31
14 . 32
15 . 33
16 . 34
17 . 35
18 . 36

FRONT VIEW OF MATING CONNECTOR



EITHER 3M 10236-55G3VC R/A THROUGH HOLE,
OR 3M 10236-2200VE VERTICAL SMT,

- 18 PAIR 28 AWG CABLE
- UL APPROVED MATERIALS
- FULLY SCREENED



36W MDR PLUG
3M10136-6000EL
OR EQUIVALENT

36W SHIELDED COVER
3M 103336-3210-00
OR EQUIVALENT

STOCK CODES

312-079 1M
312-078 3M
312-077 5M

CATEGORY 5E AND CATEGORY 6 CABLES

The same installation practises generally apply for both category 5e and category 6 cabling.

However, as category 6 cables have such a demanding performance criterion, they are less forgiving in the quality of the installation. Cable manufacturers strongly recommend adhering closely to the installation practises outlined for their cable specification.

Some important issues to consider during installation:

Do not exceed the cable manufacturer's specified cable pulling tension and avoid sharp bends in the cable, as it will alter the lay of the pairs within it. Cable manufacturers recommend that cable bend radius should be no less than 4 times the diameter of the cable (post installation). The minimum cable bend radius during installation is 8 times the cable diameter. In practise, this means that where a 25mm radius would be appropriate within a rack, the conduit leading to it would require minimum bends of 50mm radius.

Avoid compressing the cables by over-tightening any cable ties (tie-wraps). This problem is most likely to occur in large bundles of cables, where the cables on the outside of the bundle are exposed to more compression than those on the inside. Over-tightening deforms the twisted pairs within the cable, and can affect their performance. The cable ties should only be tight enough to sufficiently support the cable bundle, and not to deform the outer cable sleeve/jacket. One solution can be to use the hook and loop (Velcro) cable ties. When any number of cables are bundled together in long parallel lengths, the capacitive coupling of pairs in different cables in the bundle with the same twist rates can cause cross-talk interference to increase. The best way to avoid this is to minimise the length of long parallel runs, and to install cables as they lie rather than trying to straighten them out into perfectly aligned bundles.

When pulling cables from the reels, be conscious of the occasional tendency of the cable to kink. If the cable kinks, it should be regarded as damaged, and replaced. Do not try to straighten the kink out of the cable.

At the point of cable termination, remove only the minimum amount of cable sleeve/jacket. This ensures that the twist rate and lay of the core pairs within the cable are maintained for as much of the transmission path as possible. The twist rate of each pair of cable cores should also be maintained to as close as possible to point of termination within the connector.

These are general rules to follow, and if in doubt, always refer to the cable manufacturer's recommendations.

SIGMA
INPUT AND OUTPUT PORT LABELLING SHEETS

CALREC

Putting Sound in the Picture

calrec.com

AES INPUTS

Card Slot No.....SCSI Connector No.....

Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		
9L + 9R							L R		
10L + 10R							L R		
11L + 11R							L R		
12L + 12R							L R		
13L + 13R							L R		
14L + 14R							L R		
15L + 15R							L R		
16L + 16R							L R		

Card Slot No.....SCSI Connector No.....

Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
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3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		
9L + 9R							L R		
10L + 10R							L R		
11L + 11R							L R		
12L + 12R							L R		
13L + 13R							L R		
14L + 14R							L R		
15L + 15R							L R		
16L + 16R							L R		

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4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		
9L + 9R							L R		
10L + 10R							L R		
11L + 11R							L R		
12L + 12R							L R		
13L + 13R							L R		
14L + 14R							L R		
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4L + 4R							L R		
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7L + 7R							L R		
8L + 8R							L R		
9L + 9R							L R		
10L + 10R							L R		
11L + 11R							L R		
12L + 12R							L R		
13L + 13R							L R		
14L + 14R							L R		
15L + 15R							L R		
16L + 16R							L R		

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4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
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12L + 12R							L R		
13L + 13R							L R		
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12L + 12R							L R		
13L + 13R							L R		
14L + 14R							L R		
15L + 15R							L R		
16L + 16R							L R		

MIC/LINE OR LINE INPUTS

Card Slot No..... SCSI Connectors ..... and .....

Connector Number	Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
	1L + 1R							L R		
	2L + 2R							L R		
	3L + 3R							L R		
	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

Card Slot No..... SCSI Connectors ..... and .....

Connector Number	Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
	1L + 1R							L R		
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Card Slot No..... SCSI Connectors ..... and .....

Connector Number	Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
	1L + 1R							L R		
	2L + 2R							L R		
	3L + 3R							L R		
	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

Card Slot No..... SCSI Connectors ..... and .....

Connector Number	Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
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	3L + 3R							L R		
	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

MIC/LINE OR LINE INPUTS

Card Slot No..... SCSI Connectors ..... and .....

Connector Number	Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
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	2L + 2R							L R		
	3L + 3R							L R		
	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

Card Slot No..... SCSI Connectors ..... and .....

Connector Number	Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
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	3L + 3R							L R		
	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

Card Slot No..... SCSI Connectors ..... and .....

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	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

Card Slot No..... SCSI Connectors ..... and .....

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	3L + 3R							L R		
	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

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	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

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	7L + 7R							L R		
	8L + 8R							L R		

Card Slot No..... SCSI Connectors ..... and .....

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	8L + 8R							L R		

Card Slot No..... SCSI Connectors ..... and .....

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	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

MIC/LINE OR LINE INPUTS

Card Slot No..... SCSI Connectors ..... and .....

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	3L + 3R							L R		
	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

Card Slot No..... SCSI Connectors ..... and .....

Connector Number	Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
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	3L + 3R							L R		
	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

Card Slot No..... SCSI Connectors ..... and .....

Connector Number	Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
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	3L + 3R							L R		
	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

Card Slot No..... SCSI Connectors ..... and .....

Connector Number	Input	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
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	3L + 3R							L R		
	4L + 4R							L R		
	5L + 5R							L R		
	6L + 6R							L R		
	7L + 7R							L R		
	8L + 8R							L R		

LINE OUTPUTS

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

LINE OUTPUTS

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

LINE OUTPUTS

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
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3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

LINE OUTPUTS

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
4L + 4R							L R		
5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
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5L + 5R							L R		
6L + 6R							L R		
7L + 7R							L R		
8L + 8R							L R		

Card Slot No..... SCSI Connector No .....

Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
2L + 2R							L R		
3L + 3R							L R		
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LINE OUTPUTS

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Output	Label for LR pair (or 1st of 2 mono) 6 characters							Circuit Description	2nd Label (only if pair dedicated to 2 mono signals)
1L + 1R							L R		
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4L + 4R							L R		
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LINE OUTPUTS

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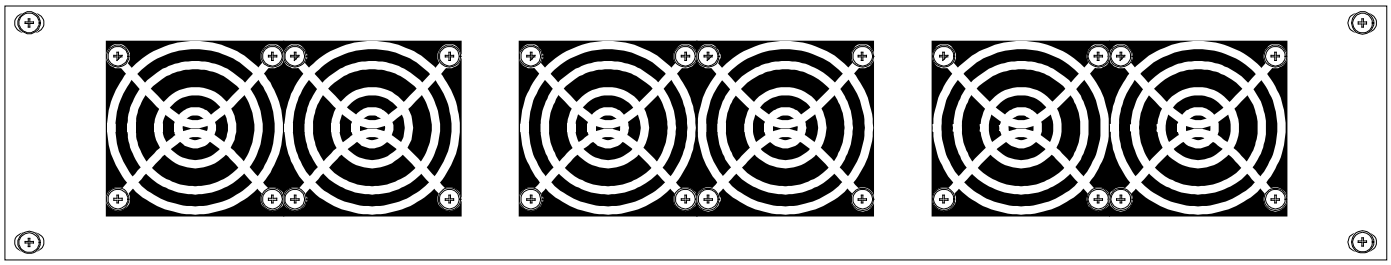
8L + 8R							L R		

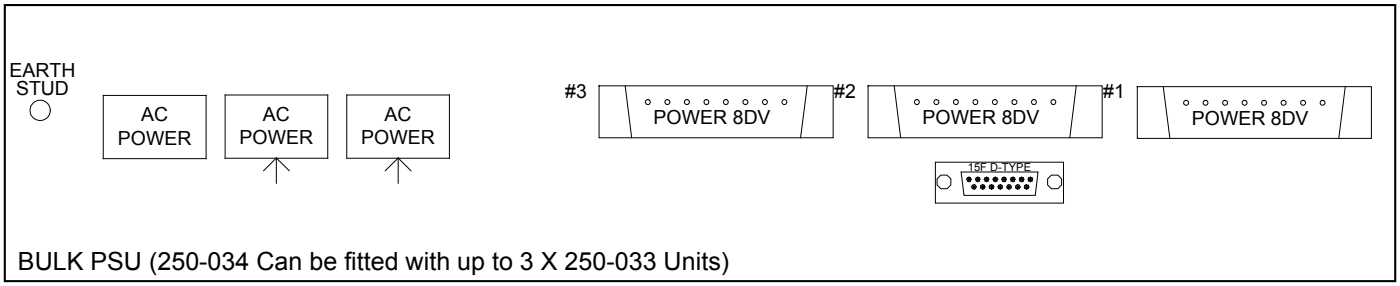
SIGMA
APPENDIX A – UNIPOWER BULK POWER SUPPLIES AND SEPARATE DISTRIBUTION

BULK PSU RACK

Front



Rear



The Bulk PSU rack is a 2U rack which can hold up to three identical 24V 1kW plug-in power supplies.

The rack has separate AC power inputs and DC outputs for each of the three plug-in power supplies on the rear of the unit. Any of the plug-in power supplies can be removed from the rack without disturbing the operation of the others. Diode feeding allows supplies to be parallelled together. The control surface and digital I/O rack each require one of these 2U racks to power them. The number of plug-in power supplies required is dependent upon the size of the system, the distance between console and rack, and the "hot spare" requirement.

Each of the plug-in power modules has its own cooling fan. The warm air is directed out of the rear of the rack. To ensure proper cooling, the power system requires a minimum clearance of 50mm (2 inches) from the fans and rear air outlets, and also any walls or other surfaces.

Mounting Instructions

The unit should be mounted by means of the side brackets, each of which has two mounting holes. It should always be mounted in a horizontal position. The rear mounting brackets should be used when no support is provided under the rack assembly, the rack should not be supported by front flanges alone. The rear mounting brackets fix to the rear of the studio equipment bay. Extensions of the rack sides slot into these rear supports, allowing the Bulk PSU rack to be removed without removing the support.

Input Power Connections

3-wire safety AC outlet sockets should be located near the power system (number as required). Each line cord will provide AC power to one of the power supply modules. The AC line cord is the mains disconnect for each module. The AC line cords should have an IEC320 connector to plug into the rear of the power system chassis. Each line cord MUST be suitably rated and FUSED (or have an equivalently rated circuit breaker). For 230V mains, the rating is10A for the line cords and breakers. For 115V mains, the rating is 15A, (line cords are known as SVT or SJT type).

Do not remove the ground conductor. The ground conductor is connected to safety ground to minimize electrical shock hazard and ensure low EMI (electromagnetic interference). The grounding lug, located on the rear panel, is a bonding for connection of the chassis to other system chassis assemblies.

Safety grounding is provided via ground connections in the line cord entry receptacles.

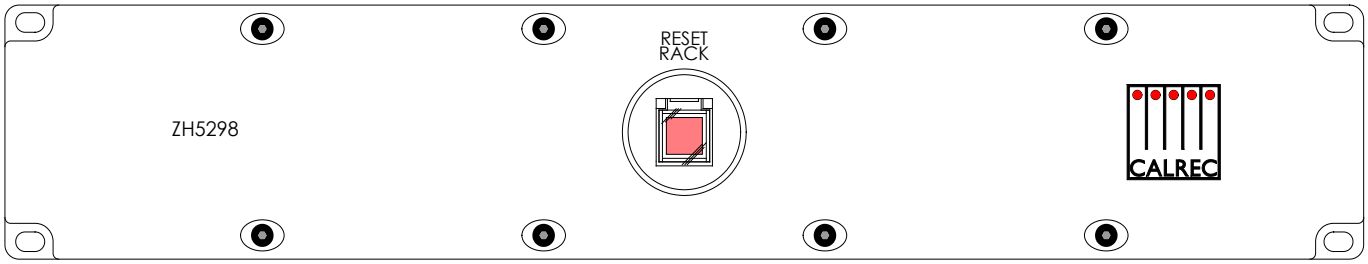
System Fan Noise (dB SPL A-Weighted)

These measurements were taken on axis at 1 metre from the dominant noise source:

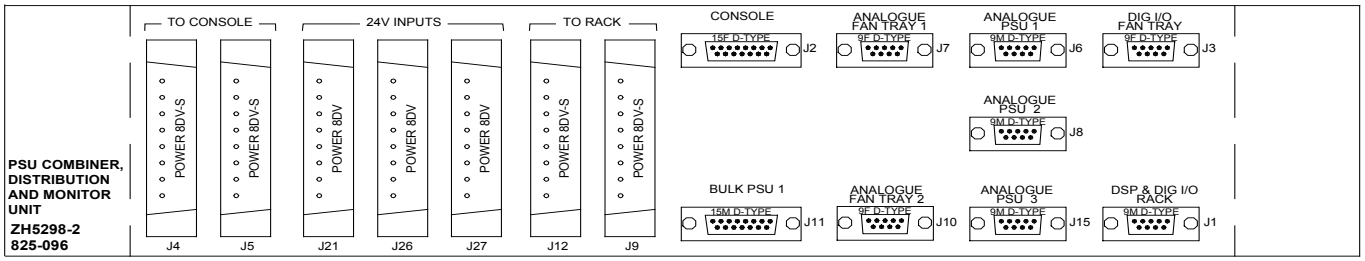
Bulk PSU Rack	
1 x 24V 1kW PSU	49dBA
2 x 24V 1kW PSU	52dBA
3 x 24V 1kW PSU	54dBA

PSU MONITORING AND DISTRIBUTION UNIT

Front



Rear



If your console uses the unipower bulk power supply rack, it will also use a separate power monitoring and distribution rack . This unit monitors the power supplies for failures, and ensures change over to the spare should a fault develop.

The Reset button reboots the racks only, the control surface is unaffected. **PLEASE NOTE:** Resetting the racks will result in a brief audio interruption.

This unit should be secured into the front of the bay by the two standard fixing holes in each of the two 2RU front angles. The unit/s should always be mounted in a horizontal position. It is recommended that the rack is not supported by the front flanges alone.

NOTES

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(926-100 Iss.3)