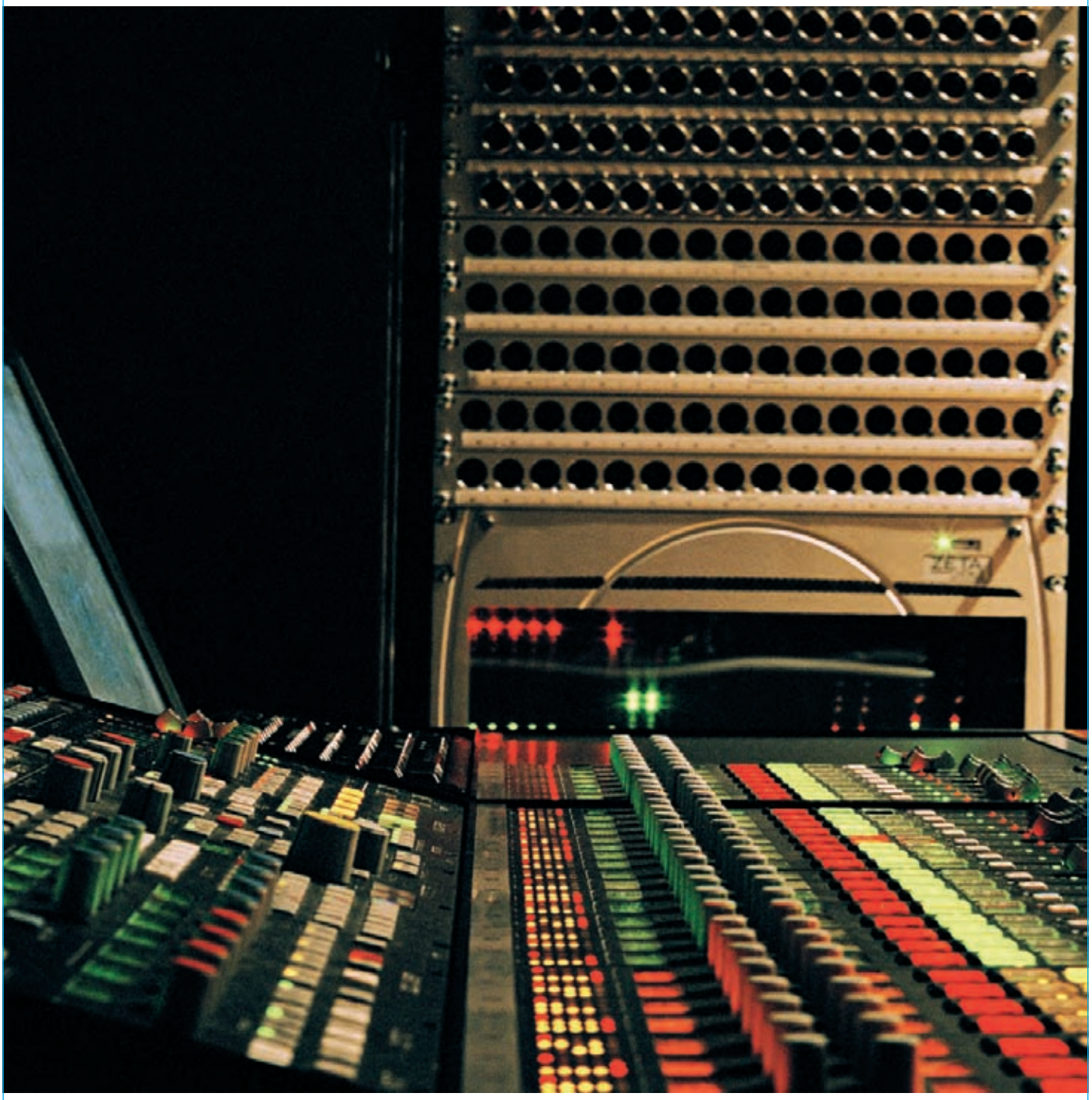
ZETA INSTALLATION MANUAL



Digital Broadcast Production Console

CALREC

Putting Sound in the Picture

calrec.com

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ZETA
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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.

Earthing

The Earth Bolt connection at the rear of the console should be connected to Earth using Earth cable at least 6mm^2 in cross section (10 AWG).

Where IEC AC power inlets are used, an Earth connection **MUST** be provided in the AC power cord. These are Class I products.

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 :-

Customer Support
Calrec Audio Ltd
Nutclough Mill
Hebden Bridge
HX7 8EZ
England
UK

Tel: +44 (0) 1422 842159
Fax: +44 (0) 1422 845244
Email: support@calrec.com
Website:www.calrec.com

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 8:30a.m - 5:00p.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.

Operator and Installation Manual PDFs
This manual and the Zeta 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 Zeta group.

ZETA
OVERVIEW

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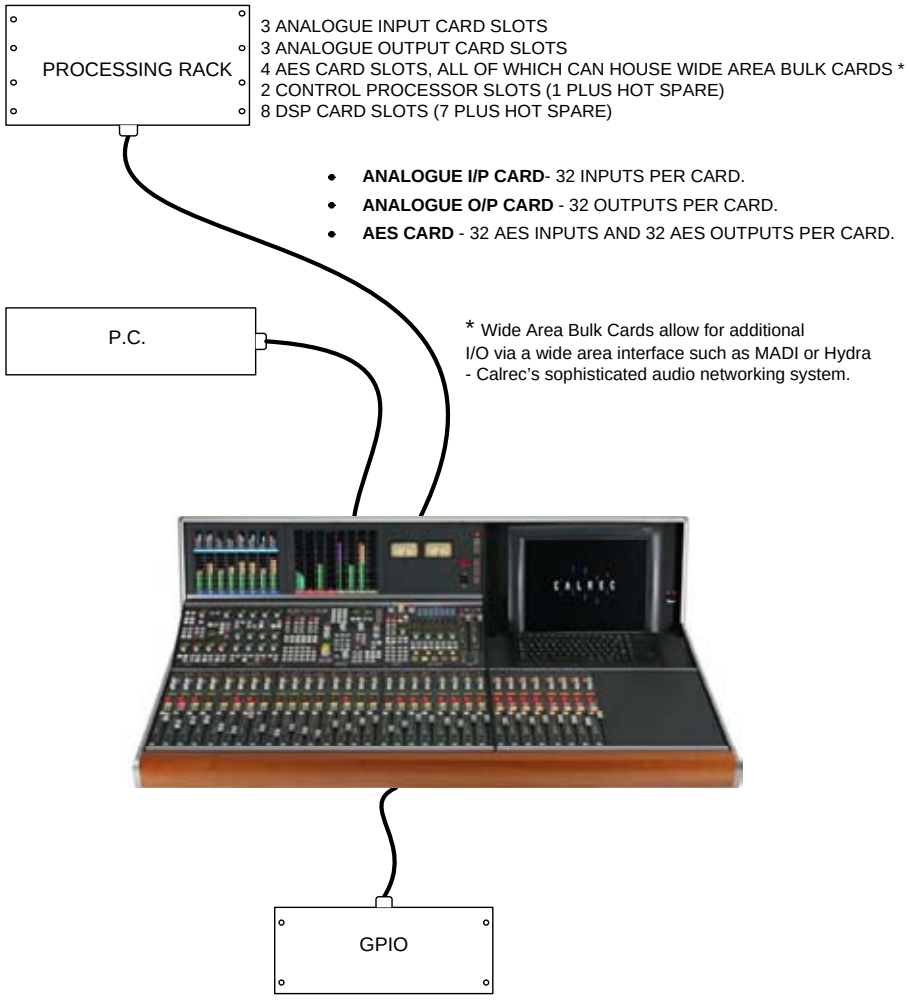
SYSTEM OVERVIEW

- Available in three frame sizes - 24 fader, 40 fader and 56 fader.
- 108 or 112 equivalent channels (up to 42 stereo/mono plus 24 mono channels, or 56 stereo).
- Table-top or floor stand mounting.
- Console operates independently of PC, and PC failure has no effect on audio or control.
- 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 reset.
- Automatic change over to hot spares for PSU's, control cards and DSP cards.
- Hot plugging of every card and module.
- Hot plugged cards initialise upon insertion.



Audio Packs

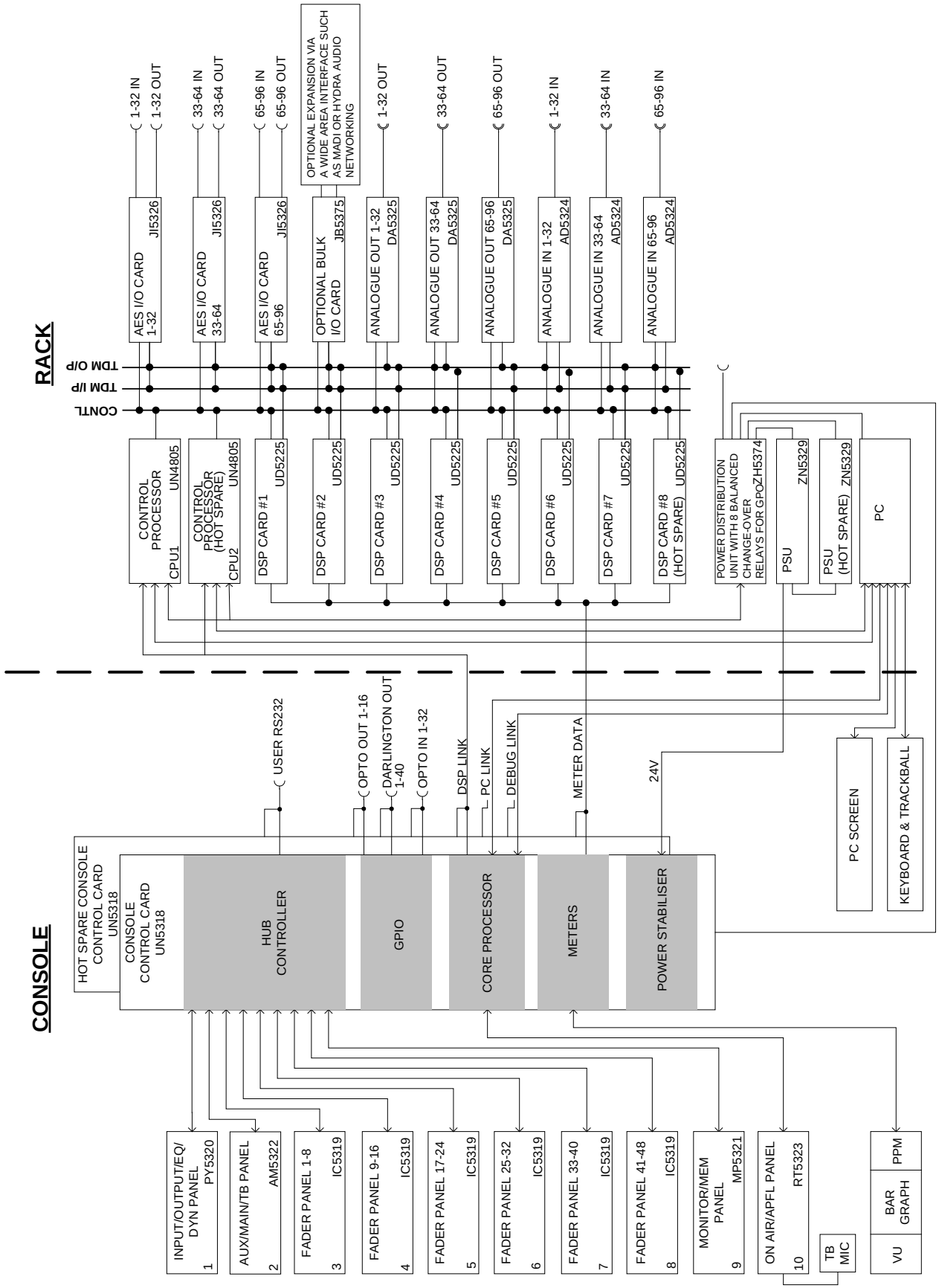
Current versions of the Zeta are normally supplied with D pack DSP systems, the largest size, which has 6 cards plus the hot spare. The DSP pack size determines the number of channels and groups the system provides, as well as the number of legs of delay that can be assigned to input channels. Earlier consoles can be expanded when required.

Audio pack	A1	A2	A3	A4	B1	B2	C1	C2	D1	D2
Stereo channels	24	30	20	26	30	36	32	48	42	56
Mono channels	8	0	8	0	10	0	24	0	24	0
Mono/stereo groups	4	4	8	8	8	8	8	8	8	8
Delay legs (mono)	8	8	8	8	15	15	24	24	21	21

Zeta consoles are now provided with the required number of analog and digital input/output cards to meet customer requirements. Earlier systems cross referred the DSP pack size to I/O and although there is no longer any linkage, the I/O provisions that used to be provided are shown below for reference.

Audio pack	A1	A2	A3	A4	B1	B2	C1	C2	D1	D2
Mic/line inputs	32	32	32	32	64	64	96	96	96	96
Line outputs	32	32	32	32	64	64	96	96	96	96
AES inputs	32	32	32	32	32	32	64	64	96	96

TYPICAL SYSTEM DIAGRAM



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 and processing 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 seperate 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 power supply unit has one inlet, the PC has one inlet, each mains powered MADI unit (if purchased) has one inlet, and 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

The system allows the user to pre-define labels for all the I/O. The only rules imposed on this are:

- The I/O must be labelled in pairs.
- The label must be no more than six characters.
- 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, Digital 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.

A set of input/output port labelling sheets are provided for your use at the end of this manual.

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 I/O port selection controls on the control surface. It is possible to determine which lists appear for selection on the I/O Matrix panel. This reduces the number of times the pot needs to be pushed, to go through all the available lists.

SYSTEM SPECIFICATION

DIGITAL INPUTS	
Word Length	24-Bit
Formats Supported	AES/EBU (AES3) 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	
Word Length	24-Bit
Formats Supported	AES/EBU (AES3)
Interface	Transformer balanced 4V Pk-Pk (nominal) into 110 Ohm load Unbalanced 1V Pk-Pk (nominal) into 75 Ohm load (BNC)
ANALOG INPUTS	
Analog - Digital Conversion	24-Bit
Input Balance/CMR	Electronically Balanced - Better than -70dB (Typically -80dB)
Input Impedance	>1k Ohms for Mic gains (1K2 Nominal) 10k Ohms for Line gains
Sensitivity	+18 / -78dB
Equivalent Input Noise	-125dB (150 Ohm source, 22Hz-22kHz bandwidth)
Distortion	-1dBFS @ 1kHz - Better than 0.003% -20dBFS @ 1kHz - Better than 0.004% -60dBFS @ 1kHz - Better than 0.3%
Frequency Response	20Hz to 20kHz +/- 0.25dB
Crosstalk	20Hz to 20kHz >-86dB
Delay	0.3ms
ANALOG OUTPUTS	
Digital - Analog Conversion	24-Bit
Output Balance	Electronically Balanced, 20Hz to 20kHz, Better than -45dB, typically -55dB
Output Impedance	<40 Ohms
Distortion	-1dBFS @ 1kHz - Better than 0.003% -20dBFS @ 1kHz - Better than 0.006% -60dBFS @ 1kHz - Better than 0.5%
Frequency Response	20Hz to 20kHz +/- 0.25dB
Crosstalk	20Hz to 20kHz >-90dB
Delay	0.22ms
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 0.002%
Frequency Response (Analogue Input to Output)	20Hz to 20kHz +/- 0.5dB
SYNCHRONIZATION	
48kHz synchronization from	NTSC/PAL Video Internal Crystal Reference TTL Wordclock AES/EBU Digital Input

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 sync sources, plus internal, such that if the 1st source fails, it will automatically switch to the 2nd, and so on.

*This is the limit to which the safety tests are valid

ZETA
FRAME OPTIONS AND DIMENSIONS

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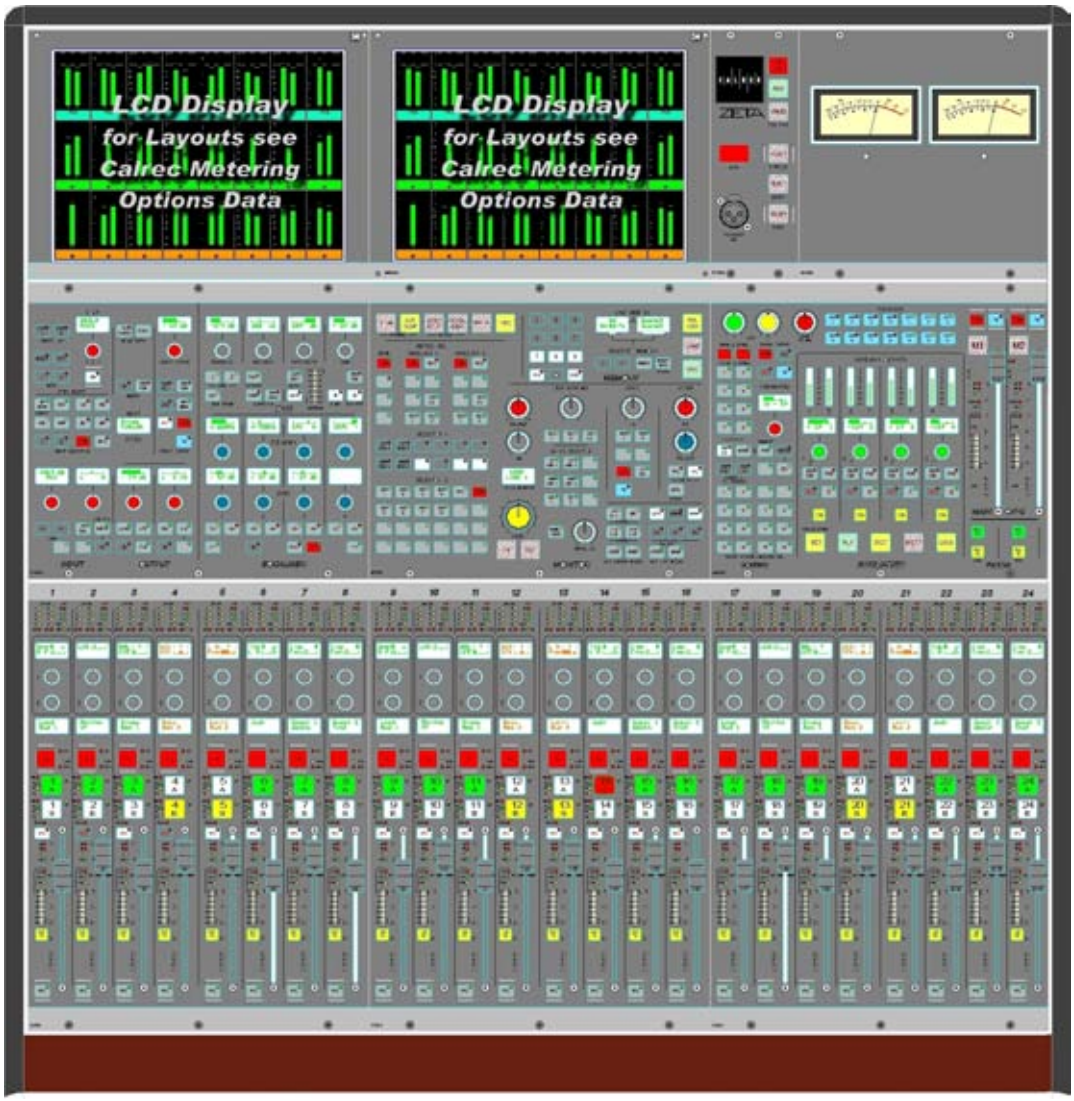
24 FADER FRAME TYPICAL LAYOUT



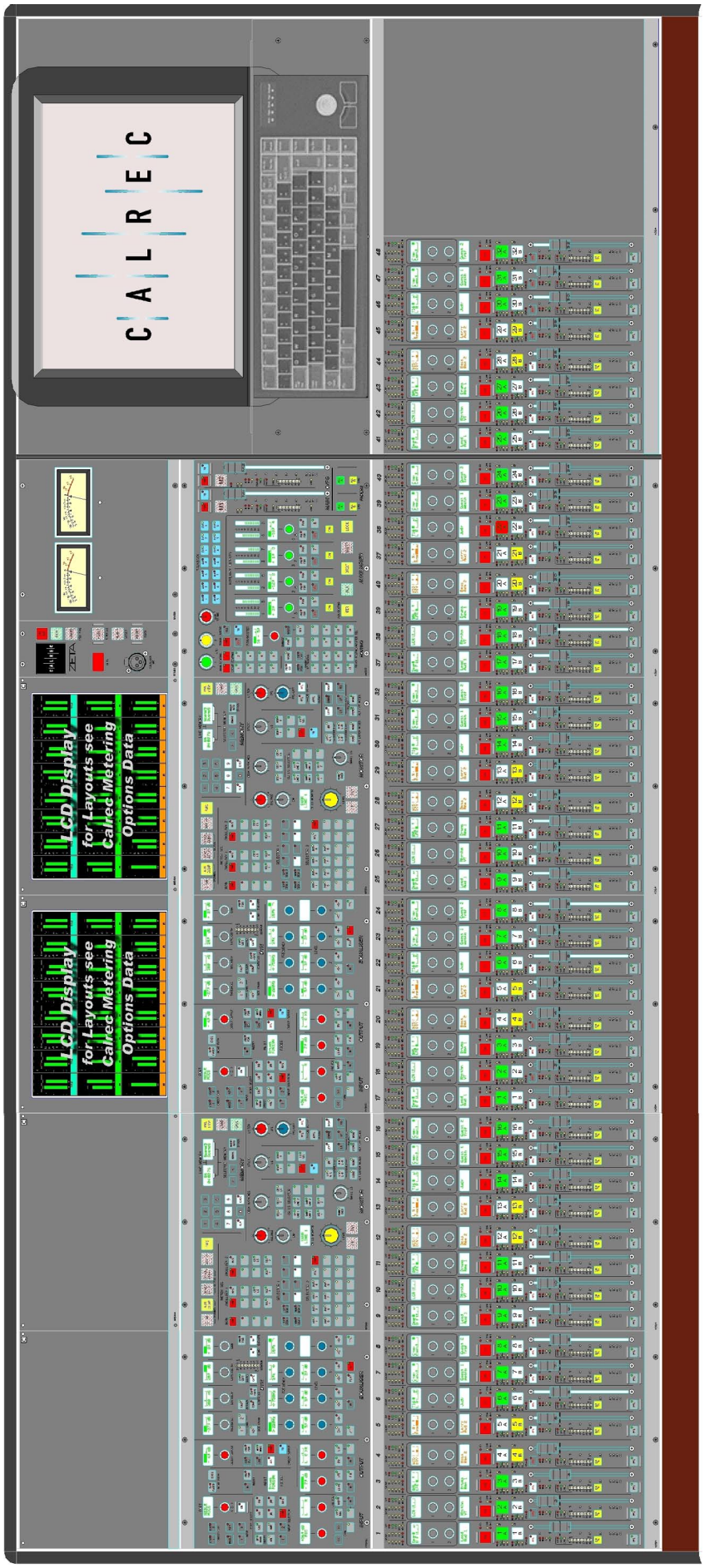
The smallest frame houses up to 24 faders, which allows up to 48 paths to be controlled within a frame only 784mm (30.9 inches) wide.

Due to the console's compact size, colour touch screen, keyboard and trackerball are supplied as separate items for locating as approrpiate.

40 FADER FRAME TYPICAL LAYOUT

The medium sized frame houses up to 40 faders, which allows up to 80 paths to be controlled within a frame only 1290mm (50.8 inches) wide.

48 FADER FRAME TYPICAL LAYOUT

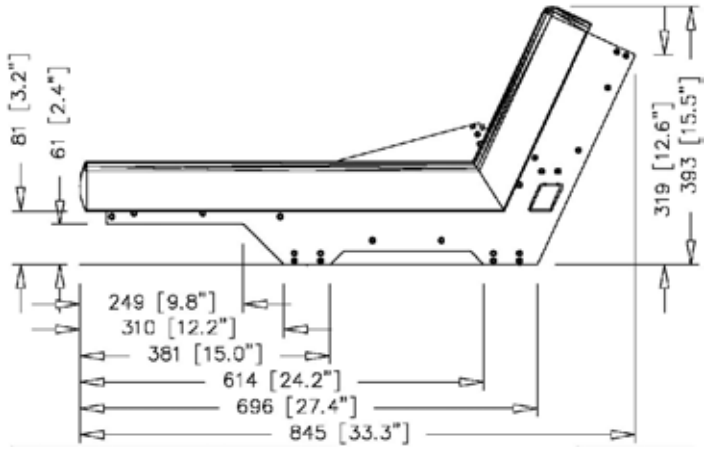


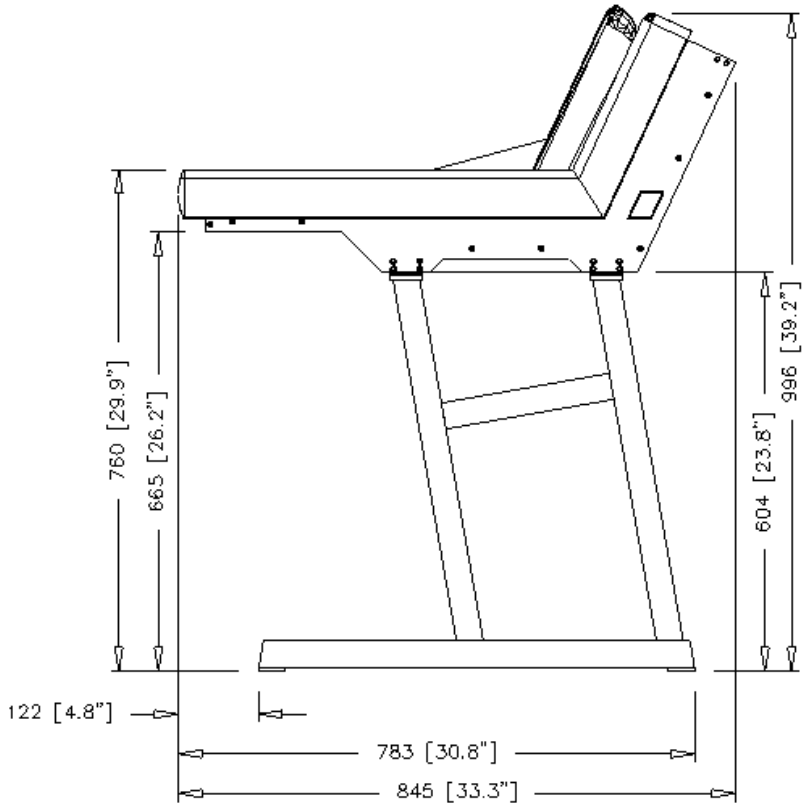
The largest frame houses up to 48 faders (the maximum number possible), which allows all of the 66 channels and 8 groups to be controlled within a frame only 1796mm (70.7 inches) wide.

CONSOLE PLAN AND ELEVATION

Frame Size	Length		Depth	
	inches	mm	inches	mm
24 Fader Frame	30.9	784	33.3	845
40 Fader Frame	50.8	1290	33.3	845
48 Fader Frame	70.7	1796	33.3	845

The end profile is the same for all three frame sizes. An optional floor stand is available.

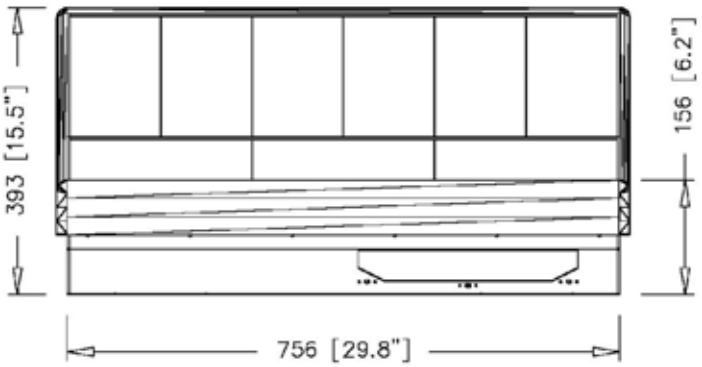




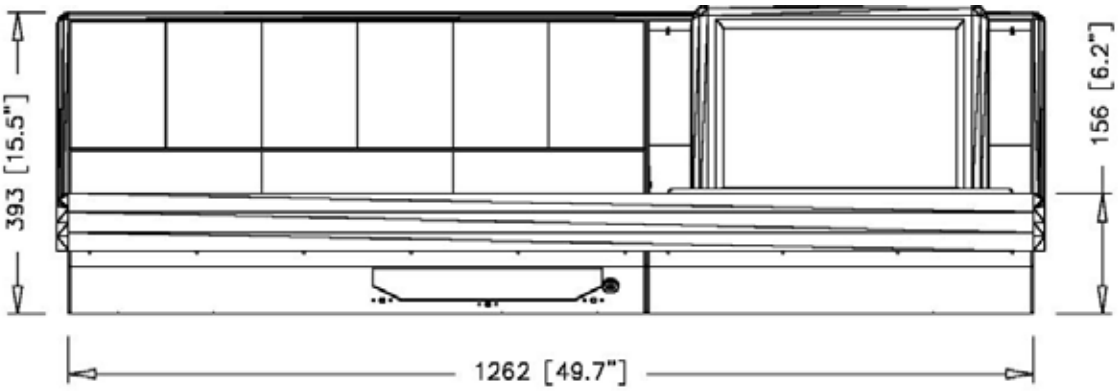
The floor stand shown is an extra cost option.

FRONT ELEVATION

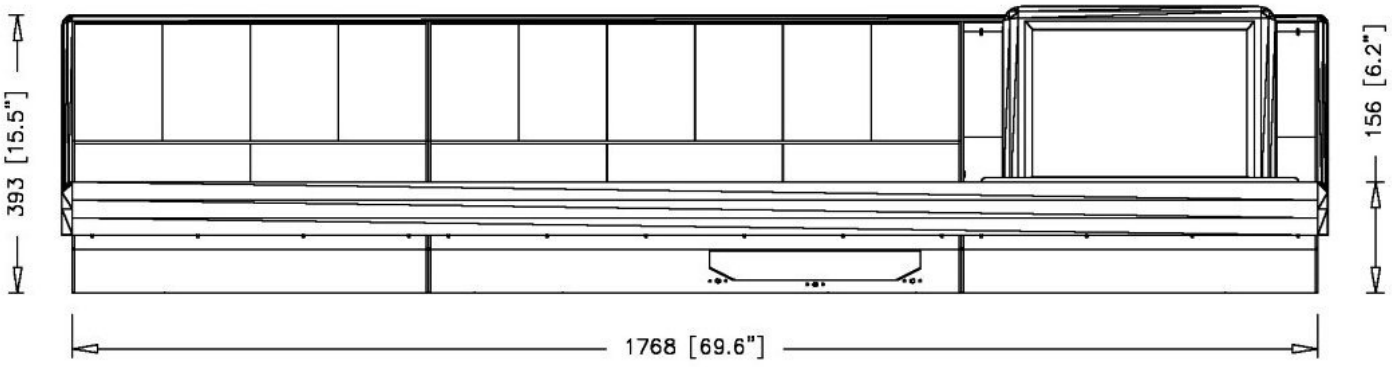
24 FADER



40 FADER



48 FADER



ZETA
EQUIPMENT INSTALLATION

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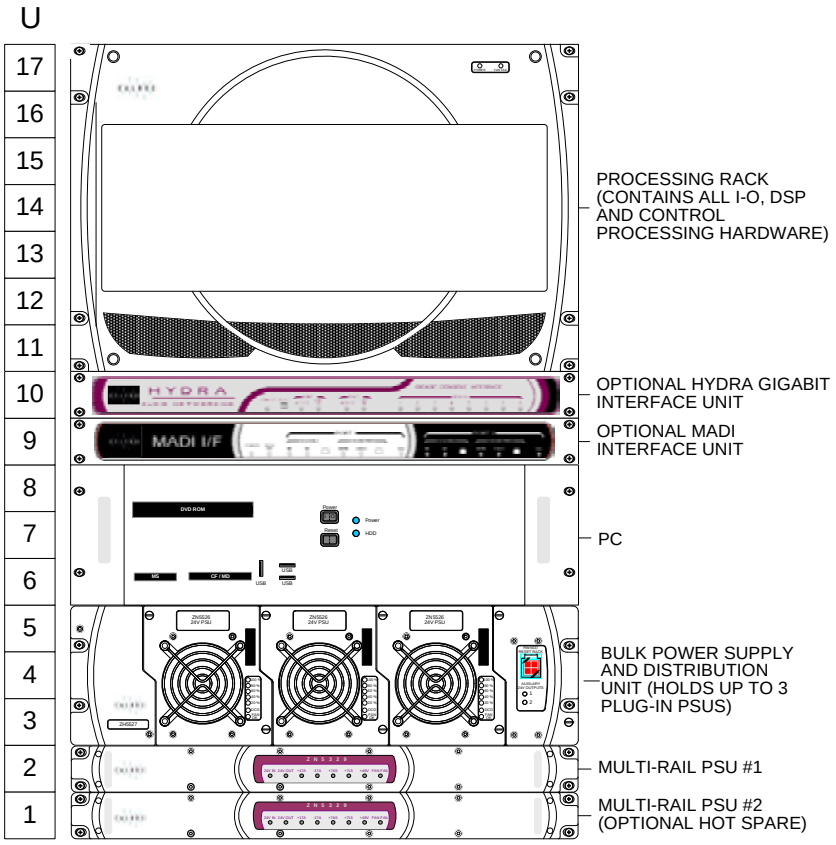
RACK SPECIFICATIONS

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 when planning this.

The Processing 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.



Item	Height	Approx depth (incl. mating cons)		Approx weight		Approx Power Output (W) (full load)	Approx AC Power (VA) (full load)
		inches	mm	lbs	kgs		
Bulk Power Supply and Distribution rack with one PSU	3U	15	380	26	11.8	600	750
Additional Plug-in PSU (Hot Spare)	-	-	-	8.0	3.65	No extra	Less than 5% extra
Processing Rack (Unpopulated)	7U	19.7	500	29.5	13.4	-	-
Processing Rack (Populated)	7U	19.7	500	42.3	19.2	-	-
PC*	3U	23.7	600	27	12.2	-	400
Hydra Gigabit Interface Unit	1U	11.9	300	6	2.7	-	-
MADI Unit	1U	11.9	300	7	3.2	-	-
Multi-Rail PSU *	1U	18.1	460	9.3	4.23	-	-
Additional Multi-Rail PSU Hot spare	1U	18.1	460	9.3	4.23	No extra	Less than 5% extra

* Note: Unit has handles protruding approx 1.3" (32mm) from the surface of the front panel.

Cables From	To	Maximum Length	
		Feet	Metres
Control Surface	PC	492	150
Control Surface	Processing Rack	492	150
Control Surface *	Bulk Power Supply & Distribution Unit	24/32 Faders -492 40 Faders - 459 48 Faders - 394	24/32 Faders - 150 40 Faders - 140 48 Faders - 120
Processing Rack	Bulk Power Supply & Distribution Unit	16.5	5
Processing Rack	PC	98	30
Processing Rack	BNC I/O Interface Panels (Digital)	16.5	5
Processing Rack	XLR I/O Interface Panels (Digital)	9.8	3
Processing Rack**	EDAC I/O Interface Panels (Analogue)	16.5	5
Processing Rack	MADI Unit	16.5	5
Processing Rack	Hydra Gigabit Interface Unit	16.5	5

* For longer distances, the control surface requires a local power supply.

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

PROCESSING RACK

The 7U Processing rack houses the system's DSP, input, output and control cards. Incorporated into the rack is a built-in low noise fan tray, situated above the processing area. The fan tray incorporates a baffle such that warm air is drawn out of the rack and out through the rear of the fan tray.

- 8 slots for DSP Cards
- 2 slots for Processor Cards
- 3 slots for ADC (Analog Input) Cards
- 3 slots for DAC (Analog Output) Cards
- 4 slots for AES I/O cards, 3 of which can house Wide Area Bulk Cards

Mounting

The unit should always be mounted in a horizontal position, located into an equipment bay and secured into the front of the bay by the four fixing holes in each of the two front angles.

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 synchronized to the same sync signal.

If the console's internal sync is to be the master, other digital equipment should be synchronized 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 Wordclock is another possible external source.

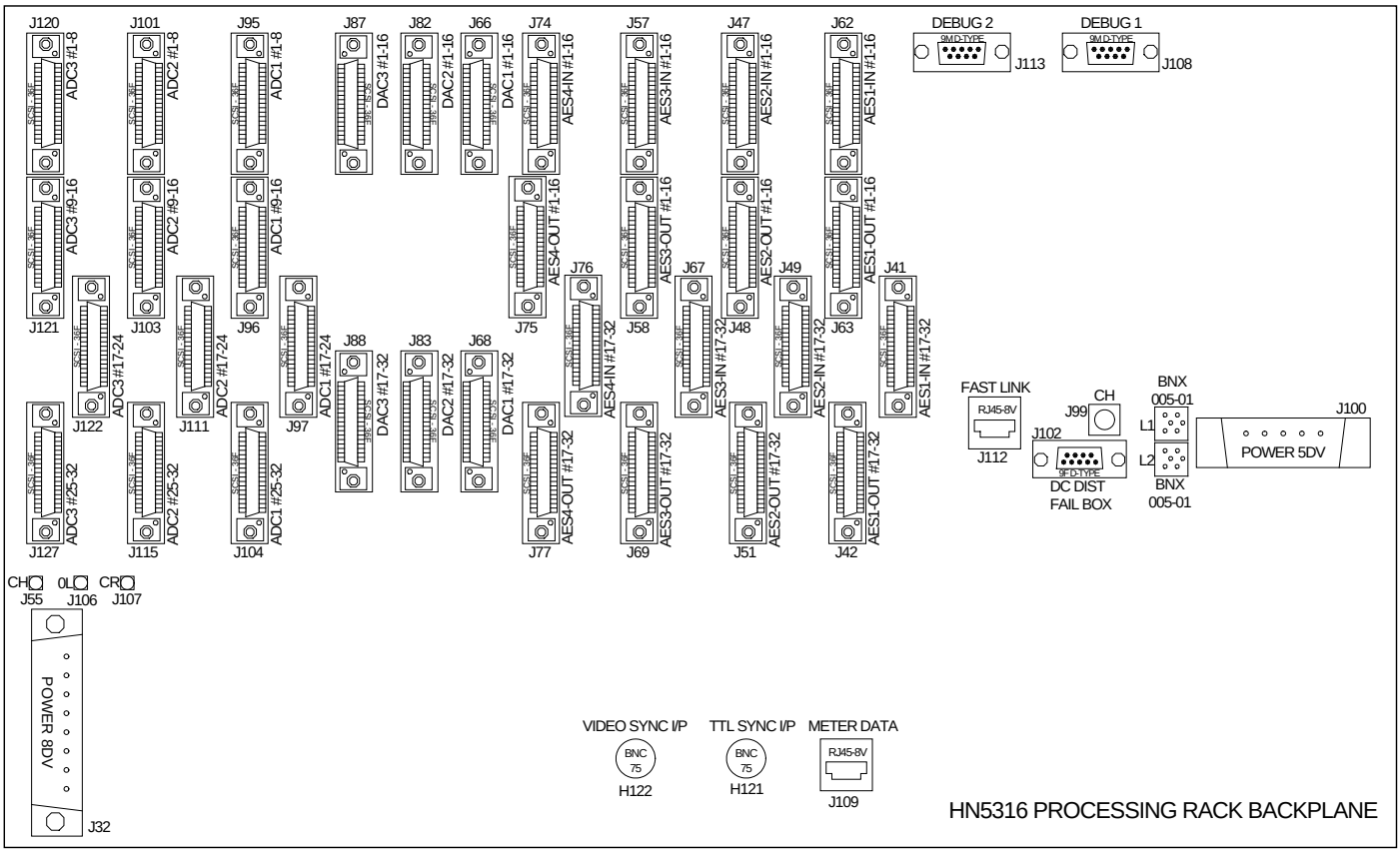
Video and TTL Wordclock Synchronization

Video (PAL or NTSC) and TTL Word Clock synchronization inputs are provided on the rear of the Processing rack, on 75Ω BNC connectors.

Frequency Variation

When using a digital input or wordclock 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 synchronized from its internal crystal oscillator (48 kHz).

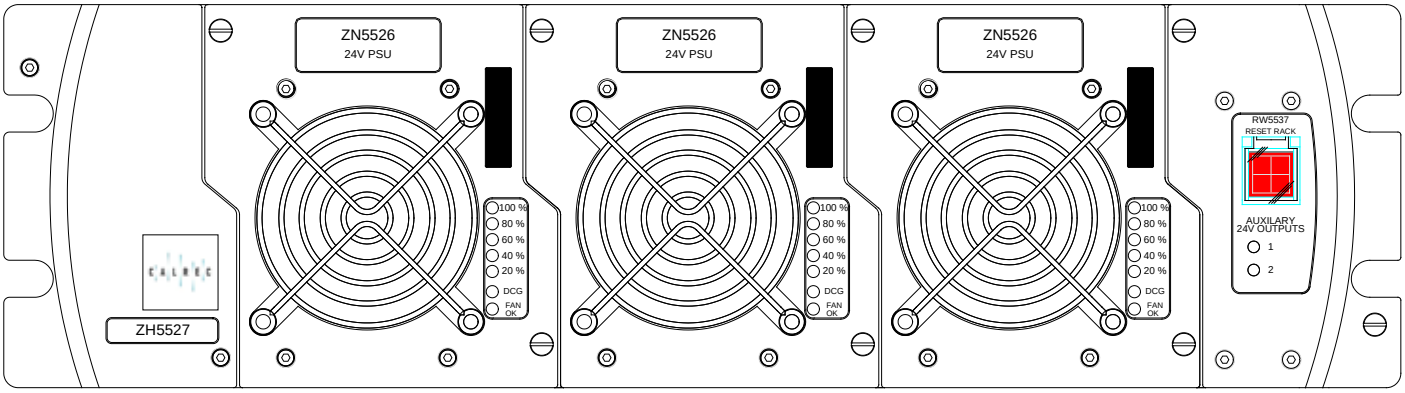
REAR INTERFACE



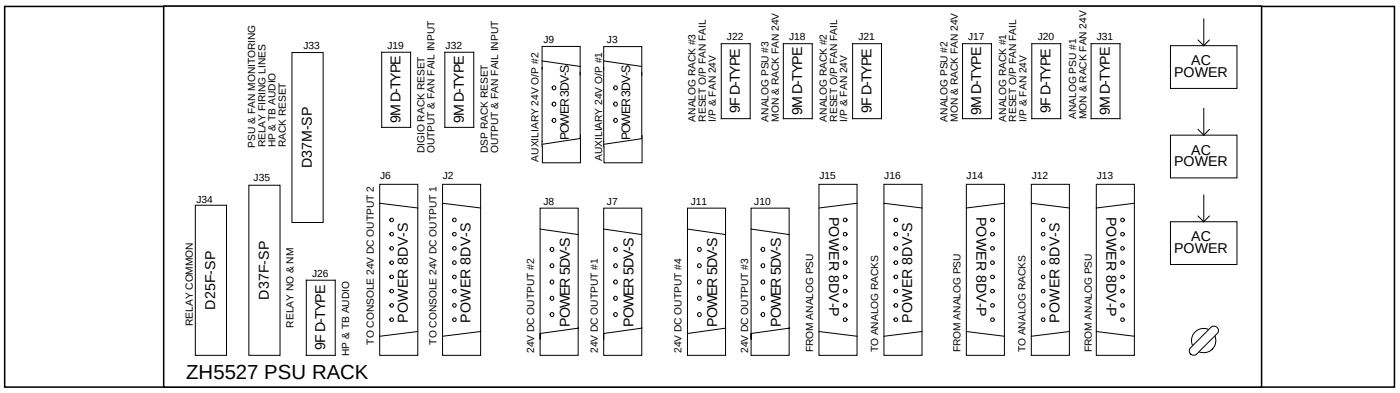
HN5316 PROCESSING RACK BACKPLANE

BULK PSU & DISTRIBUTION UNIT

FRONT



REAR



This 3U rack is used to provide power to the control surface and digital components in the system. The 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 distance between console and rack, and the "hot spare" requirement.

If your system uses the 2U Bulk power supply and seperate 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.

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

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.

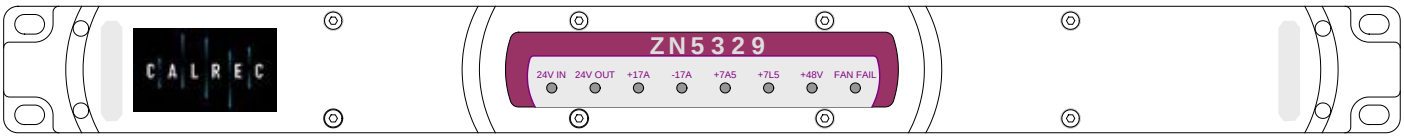
Power Monitoring & Distribution

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.

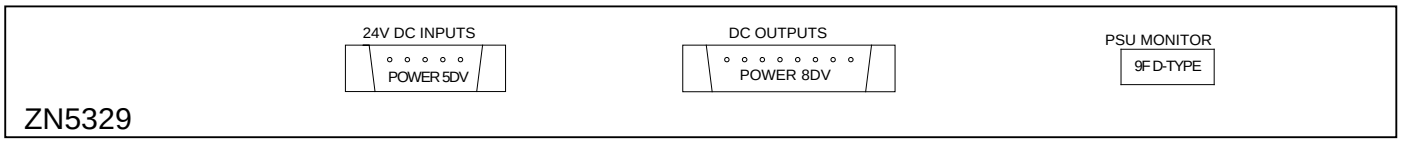
The unit also includes a front-mounted reset button for the Processing rack.

MULTI-RAIL POWER SUPPLY UNIT

FRONT



REAR



A 1U multi-rail power supply unit is used to power the analog components in the system. These supplies can be parallelled together. A typical system would have one of these multi-rail power supply units, plus a second unit acting as a "hot spare" providing redundancy, in case the other units fail.

Mounting

This unit should be secured into the front of the bay by the two standard fixing holes in each of the two 1RU front angles. The unit should always be mounted in a horizontal position. In outside broadcast situations, the unit should ideally be located in 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, 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 & Distribution

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.

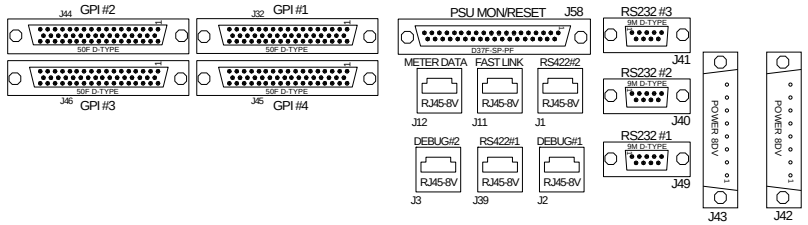
CONSOLE BACKPLANE

The console backplane houses connectors for linking the console to the rack, accessing the GPIO and serial interface facilities and providing power to the surface.

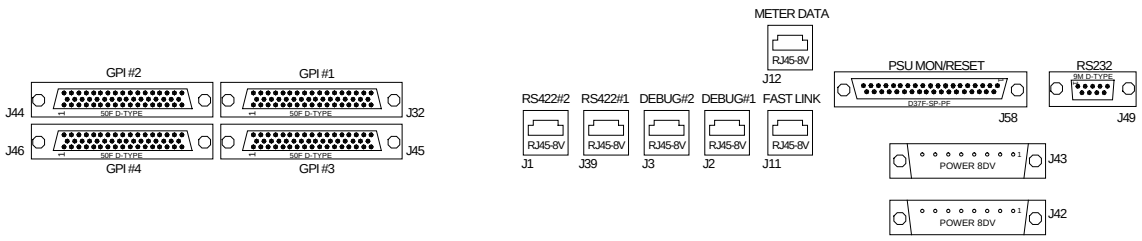
Depending on the software version, your console may have one of two backplanes.

For software version 1.36 or above the backplane will be as shown in the upper image (HN5637).

For software versions below 1.36 the console backplane will be as shown in the lower image (HN5317).



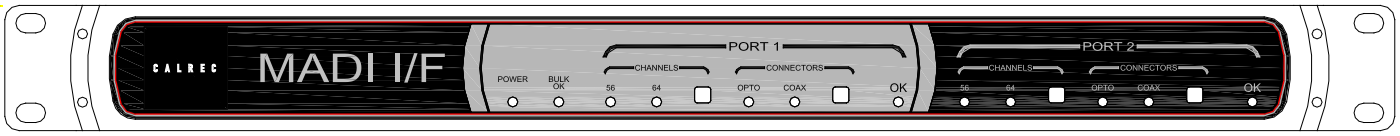
HN5637 CONSOLE INTERFACE



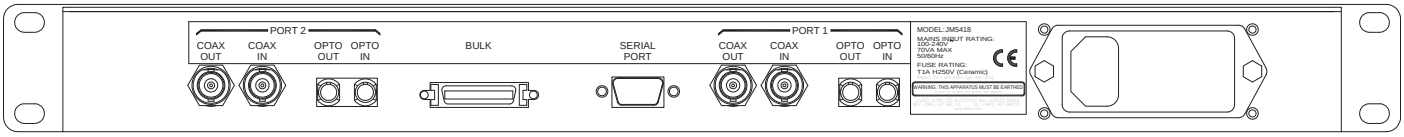
HN5317 CONSOLE INTERFACE

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 Processing rack.

Each MADI interface can operate in either 56 or 64 channel mode and can transmit over a coaxial (copper) AND optical (fiber) 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 synchronized 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

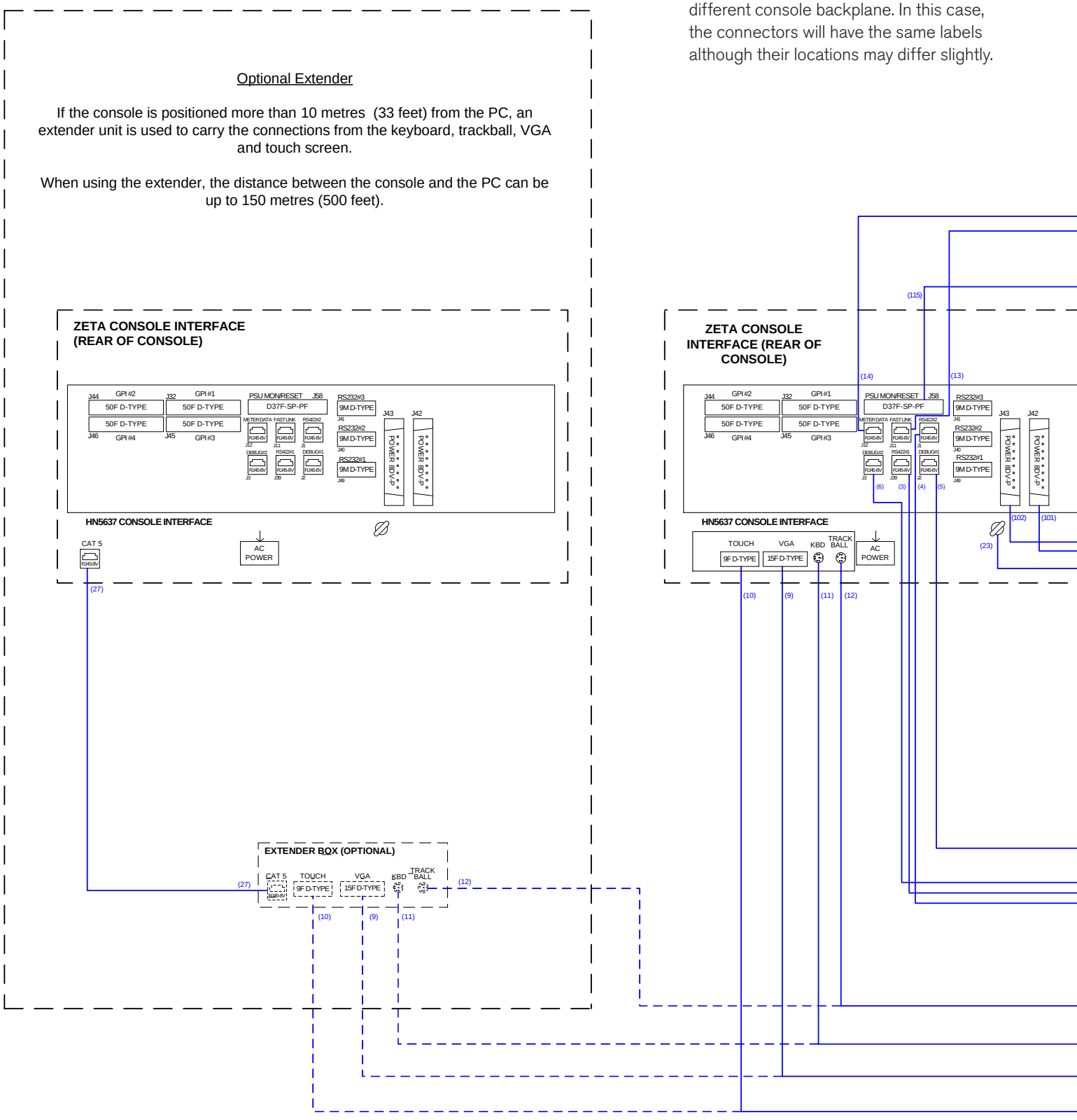
SURFACE – RACK INTERCONNECTIONS

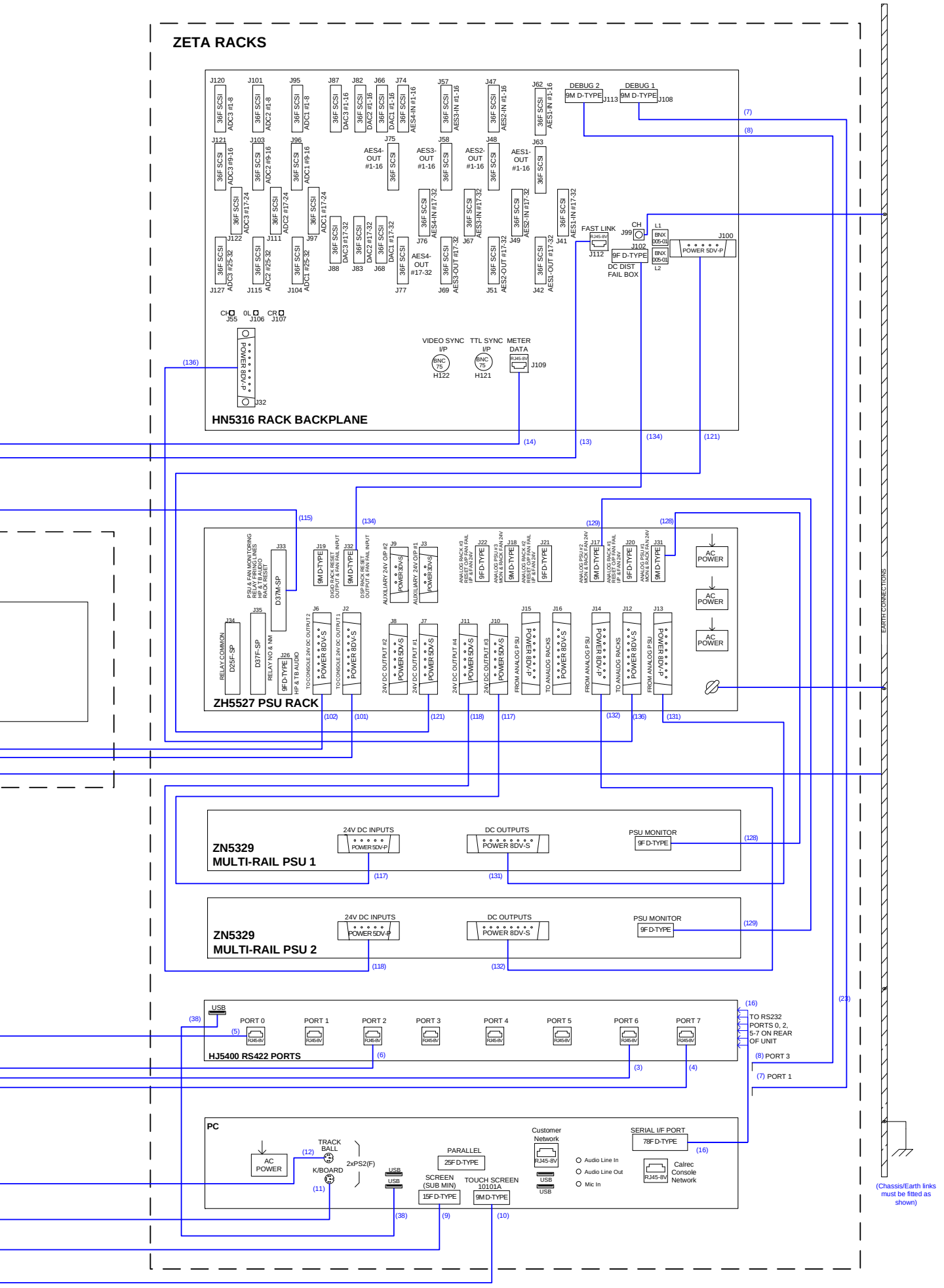
Calrec provide a cable set to interconnect the control surface and the processing racks. The maximum possible cable length varies depending on the size of the console frame and the number of faders it is wired to accommodate.

The computer touch screen normally requires a local mains supply to the control surface.

All other electronics in the surface are normally powered from the same 'bulk supplies' that power the equipment racks and are located near them. Very long interconnections may occasionally require additional power supplies near to the console surface to avoid excessive copper losses. When this is necessary such details will be confirmed in the sales quotation.

If your Zeta console is not running version 1.36 software or higher, it may have a different console backplane. In this case, the connectors will have the same labels although their locations may differ slightly.




ZETA RACKS
HN5316 RACK BACKPLANE
ZH5527 PSU RACK
ZN5329
MULTI-RAIL PSU 1
ZN5329
MULTI-RAIL PSU 2
HJ5400 RS422 PORTS
PC
EARTH CONNECTIONS
(Chassis/Earth links must be fitted as shown)

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.

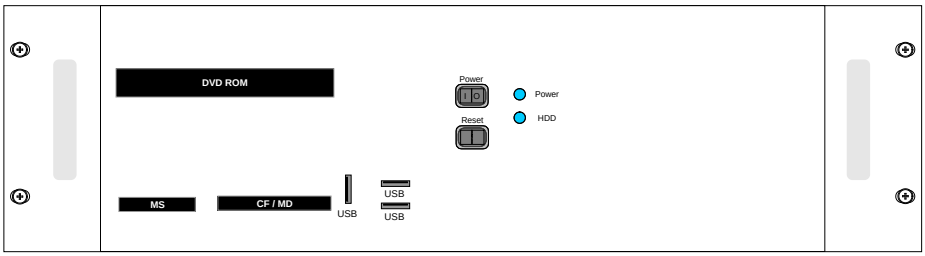
Remote Access
USB connectors are provided on both the front and rear of the PC for the option to add an external modem of your choice. If a modem is added, and a suitable telephone line installed, the console can be remotely accessed by Calrec Support Engineers to aid software upgrades and diagnostic 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.

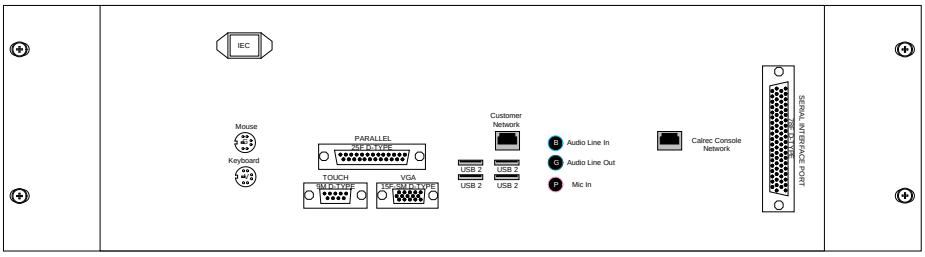
Hydra Network Connection
A Gigabit Ethernet port is provided to enable the PC to be connected to a Calrec Hydra Audio Network, which is an option which can either be purchased with the console or in the future.

Software Supplied
An OEM PC Operating System license is supplied with each console, and the operating system software is pre-installed.

FRONT



REAR



The console software is also pre-installed, and supplied on a CD-ROM.

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 D430
RAM	512MB DDR2
HDD	80GB
Optical Drive	16x Dual Layer DVD Writer
Network Ports	1 x 10/100/1000 1 x 10/100
Card Slots	Compact Flash/Microdrive, SmartMedia, MemoryStick, Secure Digital/Multimedia Card
USB 2 Ports	4 (Rear of unit), 3 (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.

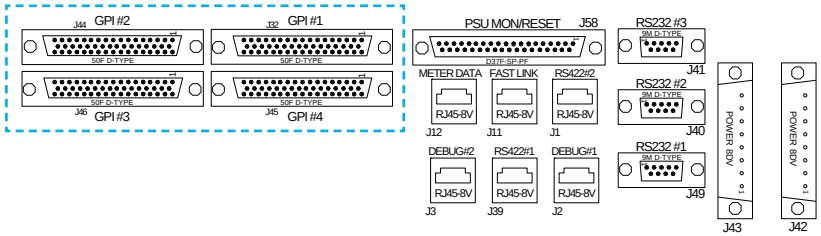
The following files are not installed from the CD-ROM as they are specific to each individual console. As such, a backup copy should be kept of these files in-case of PC or hard-drive failure:

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:\Zeta\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:\Zeta\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:\Zeta\Cust1\Options\Options.bin (Or C:\Zeta100\Cust1\Options.bin in earlier software versions)	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:\Zeta\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:\Zeta\Cust1\Meter	This is the default location for the user-definable meter configurations. You should keep a backup copy of the files in this folder.
C:\Zeta\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:\Zeta\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.
For customers using Compaq PC's only: C:\Zeta100\Cust1\A100fe1.ini C:\Zeta100\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.

GPIO CONNECTIONS

Connections to the general purpose inputs and outputs are provided on 50 way female D-Type connectors on the rear of the console. 32 opto inputs, 16 opto outputs and 40 Darlington outputs are available.



HN5637 CONSOLE INTERFACE

GPI #1

Pins	Circuit
1 . 18	5L
34 . 2	Opto 1 IN
19 . 35	Opto 2 IN
3. 20	Opto 3 IN
36 . 4	Opto 4 IN
21 . 37	Opto 5 IN
5 . 22	Opto 6 IN
38 . 6	Opto 7 IN
23 . 39	Opto 8 IN
7 . 24	0L
40 . 8	5L
25 . 41	Opto 1 OUT
9 . 26	Opto 2 OUT
42 . 10	Opto 3 OUT
27 . 43	Opto 4 OUT
11 . 28	0L
44 . 12	5L
29 . 45	D OUT 1/2
13 . 30	D OUT 3/4
46 . 14	D OUT 5/6
31 . 47	D OUT 7/8
15 . 32	D OUT 9/10
48 . 16	NC
33 . 49	0L
17 . 50	CHASSIS

GPI #2

Pins	Circuit
1 . 18	5L
34 . 2	Opto 9 IN
19 . 35	Opto 10 IN
3. 20	Opto 11 IN
36 . 4	Opto 12 IN
21 . 37	Opto 13 IN
5 . 22	Opto 14 IN
38 . 6	Opto 15 IN
23 . 39	Opto 16 IN
7 . 24	0L
40 . 8	5L
25 . 41	Opto 5 OUT
9 . 26	Opto 6 OUT
42 . 10	Opto 7 OUT
27 . 43	Opto 8 OUT
11 . 28	0L
44 . 12	5L
29 . 45	D OUT 11/12
13 . 30	D OUT 13/14
46 . 14	D OUT 15/16
31 . 47	D OUT 17/18
15 . 32	D OUT 19/20
48 . 16	NC
33 . 49	0L
17 . 50	CHASSIS

GPI #3

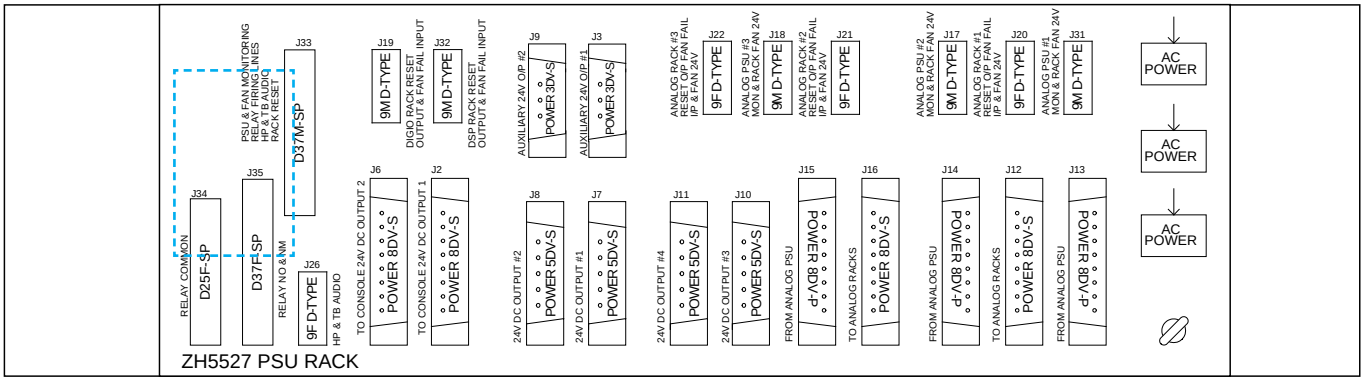
Pins	Circuit
1 . 18	5L
34 . 2	Opto 17 IN
19 . 35	Opto 18 IN
3. 20	Opto 19 IN
36 . 4	Opto 20 IN
21 . 37	Opto 21 IN
5 . 22	Opto 22 IN
38 . 6	Opto 23 IN
23 . 39	Opto 24 IN
7 . 24	0L
40 . 8	5L
25 . 41	Opto 9 OUT
9 . 26	Opto 10 OUT
42 . 10	Opto 11 OUT
27 . 43	Opto 12 OUT
11 . 28	0L
44 . 12	5L
29 . 45	D OUT 21/22
13 . 30	D OUT 23/24
46 . 14	D OUT 25/26
31 . 47	D OUT 27/28
15 . 32	D OUT 29/30
48 . 16	NC
33 . 49	0L
17 . 50	CHASSIS

GPI #4

Pins	Circuit
1 . 18	5L
34 . 2	Opto 25 IN
19 . 35	Opto 26 IN
3. 20	Opto 27 IN
36 . 4	Opto 28 IN
21 . 37	Opto 29 IN
5 . 22	Opto 30 IN
38 . 6	Opto 31 IN
23 . 39	Opto 32 IN
7 . 24	0L
40 . 8	5L
25 . 41	Opto 13 OUT
9 . 26	Opto 14 OUT
42 . 10	Opto 15 OUT
27 . 43	Opto 16 OUT
11 . 28	0L
44 . 12	5L
29 . 45	D OUT 31/32
13 . 30	D OUT 33/34
46 . 14	D OUT 35/36
31 . 47	D OUT 37/38
15 . 32	D OUT 39/40
48 . 16	NC
33 . 49	0L
17 . 50	CHASSIS

Opto Specification - 5-24V
Darlington Specification - 30V, 5mA

8 change over relays are also available on the rear of the Bulk Power Supply and Distribution Unit.



RELAY INPUTS (CONNECTOR J35)

Pins	Circuit
1 . 20	Normally Made a/b Relay 1
2 . 21	Normally Open a/b Relay 1
3 . 22	Normally Made a/b Relay 2
4 . 23	Normally Open a/b Relay 2
5 . 24	Normally Made a/b Relay 3
6 . 25	Normally Open a/b Relay 3
7 . 26	Normally Made a/b Relay 4
8 . 27	Normally Open a/b Relay 4
9 . 28	Normally Made a/b Relay 5
10 . 29	Normally Open a/b Relay 5
11 . 30	Normally Made a/b Relay 6
12 . 31	Normally Open a/b Relay 6
13 . 32	Normally Made a/b Relay 7
14 . 33	Normally Open a/b Relay 7
15 . 34	Normally Made a/b Relay 8
16 . 35	Normally Open a/b Relay 8
17 . 36	Chassis
18 . 37	Chassis
19	Chassis

Relay Specification - 50V, 1A (switched power not exceeding 30W)

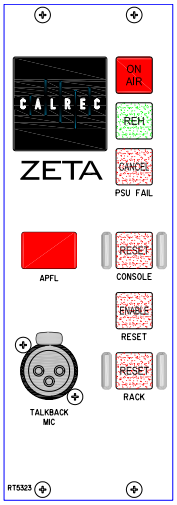
RELAY OUTPUTS (CONNECTOR J34)

Pins	Circuit
1 . 14	Common a/b Relay 1
2 . 15	Common a/b Relay 2
3 . 16	Common a/b Relay 3
4 . 17	Common a/b Relay 4
5 . 18	Common a/b Relay 5
6 . 19	Common a/b Relay 6
7 . 20	Common a/b Relay 7
8 . 21	Common a/b Relay 8
9 . 22	Chassis
10 . 23	Chassis
11 . 24	Chassis
12 . 25	Chassis
13	Chassis

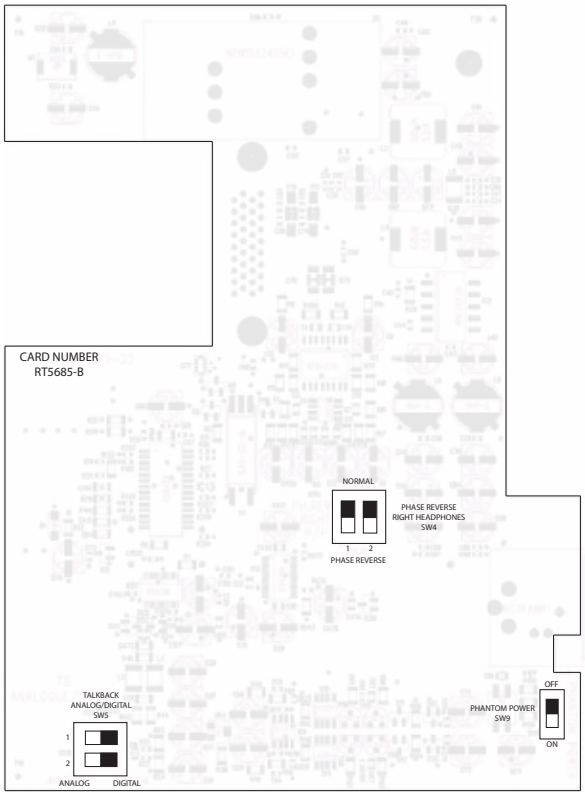
TALKBACK MIC & DESK HEADPHONES

The talkback and headphone signals are carried between the console backplane and the bulk power supply and distribution unit using a multi-core cable with a 37-way D-type connector at each end.

- The headphone signal is AES only
- The talkback microphone signal can be AES or analog



DIL SWITCHES



Talkback Mic Connections

The talkback microphone connects to the console via the XLR connector on the Broadcast Facilities panel.
This panel contains the following talkback microphone circuitry:

- Talkback microphone pre-amplifier
- Adjustable resistor (VR4) to adjust the gain from 18dB to 48dB
- Internal switch to enable the 16V phantom power to the talkback microphone (SW9)
- Talkback microphone A to D converter
- Internal switch to set the talkback output signal format to AES or analog (SW5)

Headphone connections

The headphone jack is located underneath the console on an interface plate next to the console backplane. The headphone output is driven by circuitry on the reset panel.
The reset panel contains the following headphone circuitry:

- Headphone D to A conerter
- Headphone amplifier
- An internal DIL switch to reverse the phase of the right leg of headphone audio (SW4)

Audio to the headphone circuit should be an AES signal that is sample locked to the console and is typically wired from any digital output on the desk that is spare. This connection should be made by wiring audio into the 9 pin connector on the rear of the PSU monitoring and distribution unit that is near equipment racks.

Microphone audio connections

The output of the microphone amplifier is available in analog or digital form depending on the setting of the DIL switch inside the reset panel (SW5). It can be wired to a comms system or to a console input port as required.

Connections are made by adding a cable to the 37 way D type on the rear of the console surface or to the 9 pin one on the rear of the PSU monitoring and distribution unit that is part of the equipment racks.

Headphone and talkback mic

Connections for desk headphone and talkback mic signals are made to 9 pin D-type connector on the rear of the PSU monitoring and distribution unit. This is a female panel mount connector, requiring a male on the cables.

Remember that headphone feeds can only be AES digital signals.

Connector J26 Pin Out Information

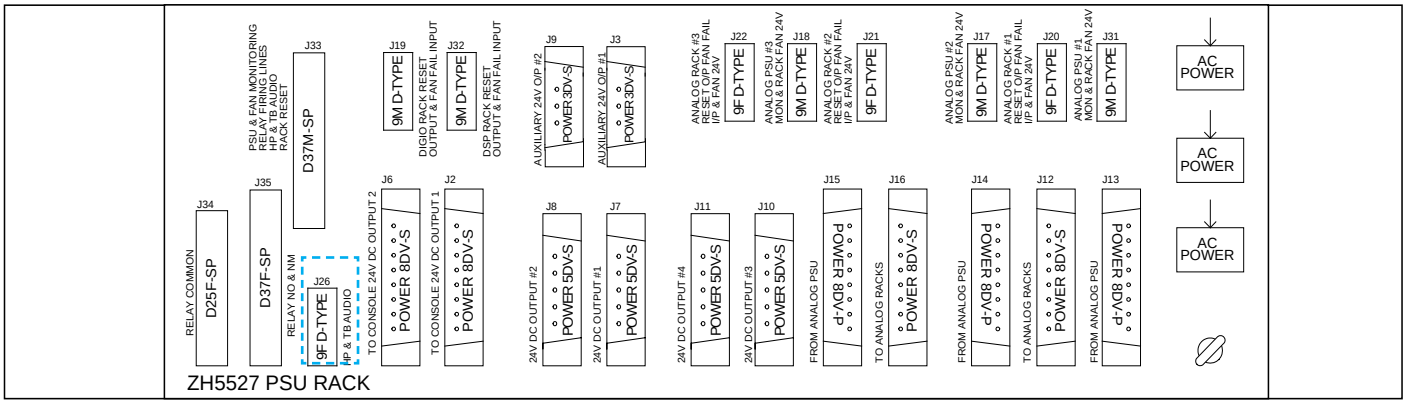
On the rear of the PSU monitoring and distribution unit, connector J26:-

Pins 1 and 2 - From control surface TB mic (AES or analog)

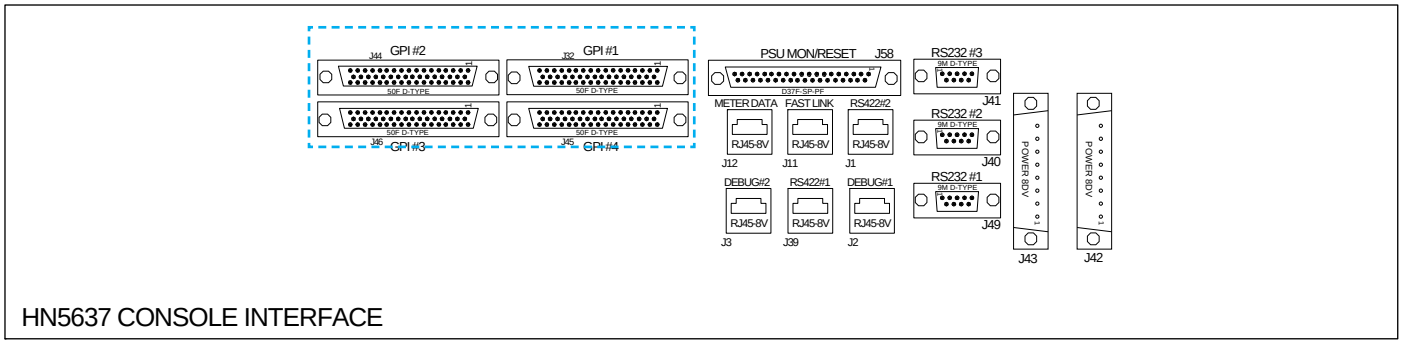
Pin 3 - Cable screen

Pins 4 and 5 - To control surface headphone jack (AES only).

POWER SUPPLY, MONITORING AND DISTRIBUTION UNIT (REAR)



CONSOLE INTERFACE (REAR OF CONSOLE)



SERIAL INTERFACE

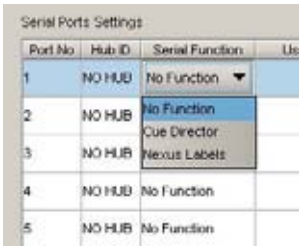
The system currently supports the following serial interfaces:

- Cue Director
- Nexus Router
- Image Video TSI1000
- Ross Overdrive

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

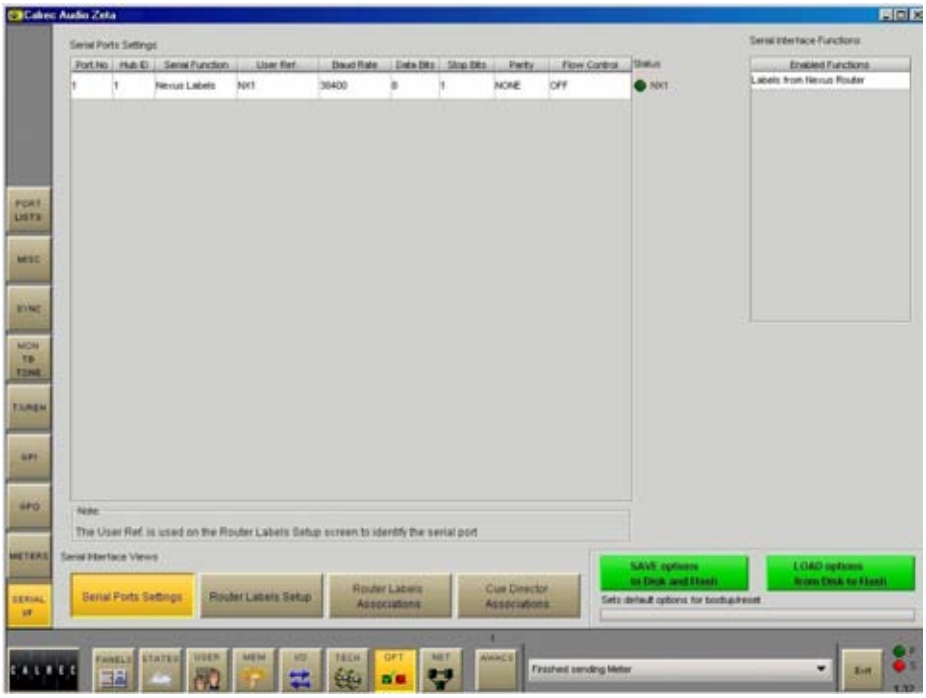
Serial Port Settings Screen
The console has a serial interface port for allowing equipment to be connected to the system.

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



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.



NOTE: Ross Overdrive functionality is only available to Zeta consoles running software version 1.36 or higher.

IMAGE VIDEO TSI-1000

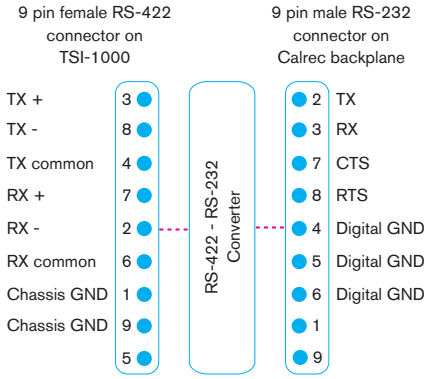
The Image Video TSI-1000 allows Calrec consoles to receive source label information from many different routing switchers.

Refer to the Image Video documentation for installation and configuration of Image Video equipment.

Physical connection

The TSI-1000 requires an RS422 connection to the console. As the Omega console has an RS232 port, an extra cost RS232 to RS422 converter can be used which is not supplied by Calrec. The diagram below details the pin out information from both the TSI-1000 and the Calrec backplane. As pin out information may vary depending on the converter used, please refer to the documentation supplied with the converter.

RS-422 to RS-232 cable wiring



The console port should be linked to one of the RS422 ports on the TSI-1000 (COM 8-12).

TSI-1000 setup

On the PC connected to the TSI-1000, load the Tally System Console software. From the 'Display Unit' menu select 'Configure Display Units'.

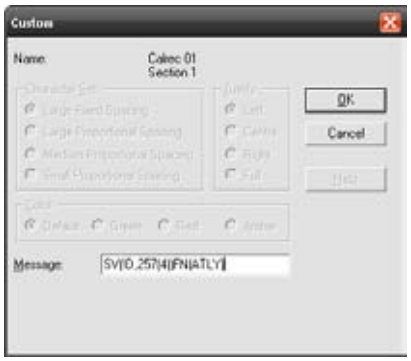
Click the 'Add...' button to create a new unit. Give the unit an appropriate name such as 'Calrec 01' and set the serial number to be '0001'.

Click 'OK', then configure the display unit as shown below:

To add more display units, click the 'Add...' button. The new units will be created with an increment to both the name and serial number. Add more display units to equal the number of router feeds to your Calrec console.

Each display unit can now have its port and label formatting set. To set the port, click on the 'Port...' button. Enter the interface number and COM port where you require the labels to be sent.

The labels sent from the routers need to be formatted in order to fit in the 6 character displays on the Calrec console. To do this, make sure 'Section Contents 1' is set to 'Custom' then click the 'Details...' button. Enter the following string into the 'Message:' text field:



The TSI-1000 is now configured to pass labels from the router to the console.

Console setup

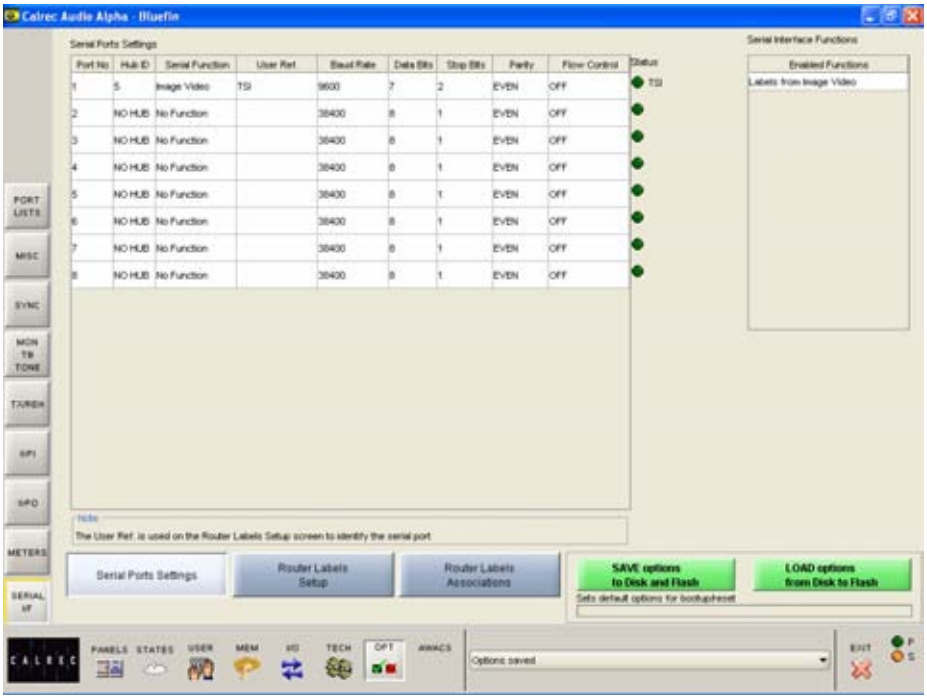
The console must be configured to receive Image Video messages. To enable this load the configuration application and navigate to the 'Desk' section and the 'Serial Inter' screen. Ensure that the 'Enable Image Video' option is checked and then exit the application. (The configuration application is only available to the engineer commissioning the console.)

Ports list

You may find it easier to move the ports fed by the router into a port list. This is not necessary, but it will simplify the view when you come to associate the router labels.

Serial interface

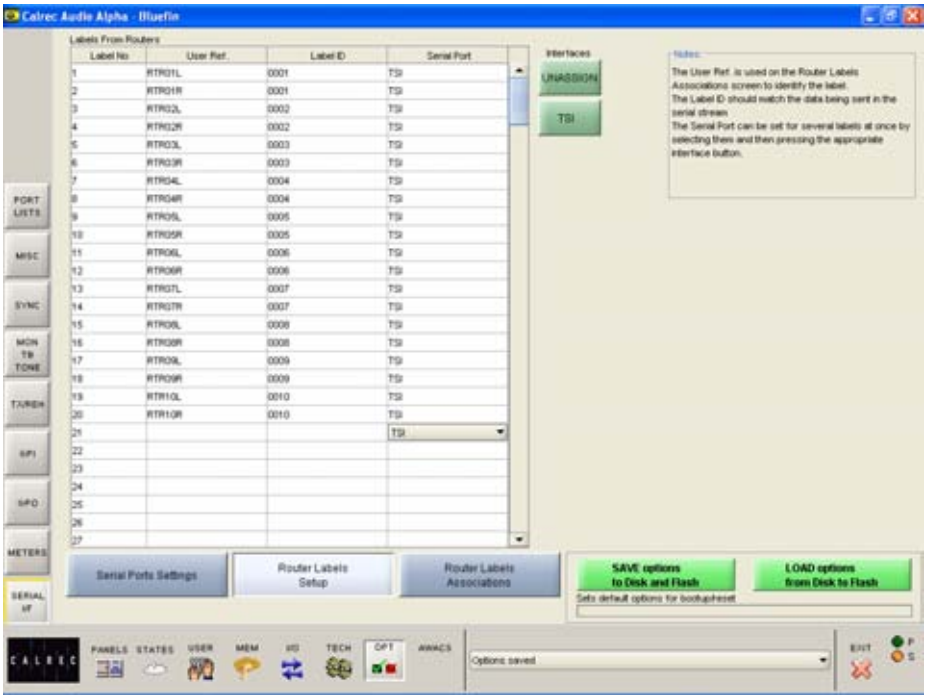
In the 'Opt', 'Serial I/F' screen select the correct port and Hub ID where your TSI-1000 unit is connected. Ensure that 'Labels from Image Video' is in the 'Enabled Functions' list. In the 'Serial Function' column select Image Video from the drop down menu. Enter a sensible name in the 'User Ref.' column, for example 'TSI'.



Router Labels Setup

Enter the 'Router Labels Setup' screen. For each label that will be received from the router associate it with a Calrec console label by entering the Label ID (which is the Serial Number that you entered in the Image Video 'Display Unit Configuration' dialog) and setting the serial port to be the 'User Ref that was defined in the previous step ('TSI' in this example). For each Calrec label, a 'User Ref.' can also be set to aid in identification.

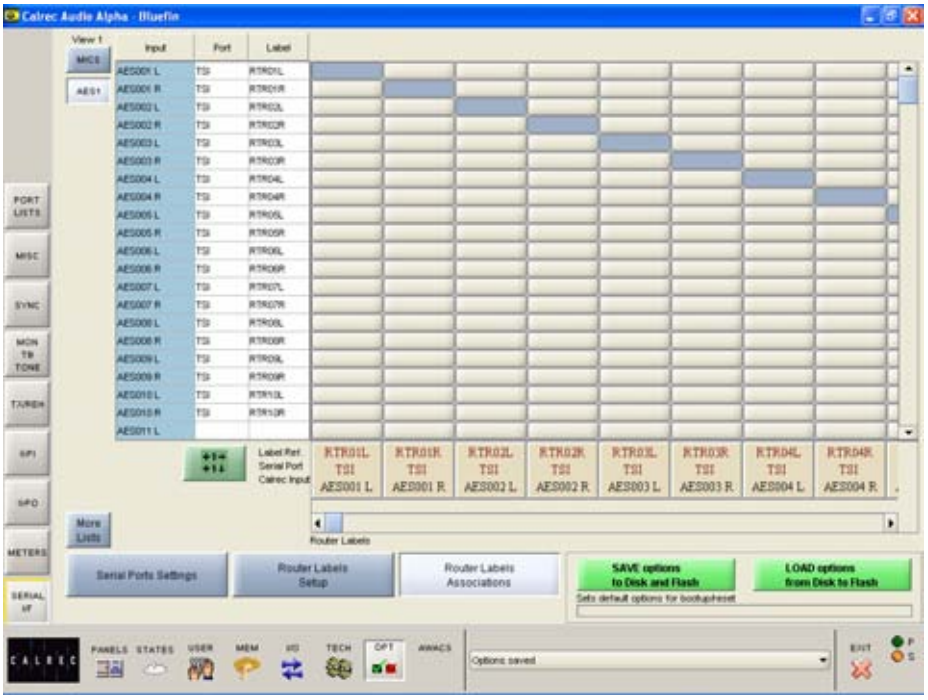
It should be noted that all four characters of the label ID should be completed for the TSI-1000 to respond correctly.



Router Labels Associations

In the 'Router Labels Associations' screen, the labels can now be assigned to the console's input ports.

The console should now be configured to receive labels from the TSI-1000.



ROSS OVERDRIVE

The Ross Overdrive interface can be used to provide external control of Calrec consoles from compatible products.

The controller equipment connects to the Calrec console via an RS-422 link. As the Zeta has only RS-232 connectors, an extra cost RS-232 to RS-422 converter will be required.

Once connected, ensure that Ross Video Interface is enabled in the Serial Port Settings screen.

The interface from the Calrec end should now be configured. Please refer to the Ross documentation for operational details and Ross equipment configuration.

Overdrive facilities

Any of up to 196 possible Calrec faders (192 Channel, Group or VCA Master, plus 4 Main faders) can be controlled in any particular instance.

The controller is able to alter the fader level for a particular mono, stereo or surround Channel, Group, Main or VCA Master, providing these have been previously assigned to a fader via the Calrec desk.

The controller can operate the CUT feature of Channel, Group and VCA Master Faders. Main faders do not have cuts.

The controller is able to switch ON or OFF the Pre-Fader Listen (PFL) feature for a particular Channel, Group, Main or VCA Master Fader.

The legs (spill faders) of Surround paths cannot be controlled.

VCA Master Faders can be assigned on the Calrec desk either to an unused fader layer (A or B), or to a fader layer that is already controlling a Channel or Group, in which case that Channel or Group will be a Slave of the VCA Master. In the latter case, the controller can control the VCA Master but not the Channel or Group assigned to the same fader layer (except via the VCA Master of course).

When a VCA Master Fader is adjusted, the Audio of the Slaves will be altered but the Faders of the Slaves do not move. Only the change in level of the VCA Master Fader will be reported to the controller.

When a VCA Master Fader is Cut, the Slaves will also be Cut. The controller will be informed of the Cut status of both the Master and Slaves. In this condition, the Slaves cannot be individually Cut or Uncut. Attempts by the controller to change the status of a Slave will be ignored.

When the PFL of a VCA Master Fader is turned On, the PFL of the Slaves will also be turned On. The controller will be informed of the PFL status of both the Master and Slaves. In this condition, the PFL of the Slaves cannot be individually turned On or Off. A request from the controller to change the status of a Slave will be ignored and the console will respond with a message stating that the PFL of the Slave is On.

A VCA Master can be a Slave of another VCA Master (provided that VCA Master is not already a Slave) in which case the former is a Secondary Master and the latter is a Primary Master. The controller can control both types of VCA Master and there is no distinction between the two as far as the controller is concerned.

The Calrec desk sends fader labels to the controller to show which fader is being controlled.

The controller is sent fader status updates whenever a fader state changes, whether the change is initiated by an operator at the Calrec desk or by the controller itself.

Priority of control

Priority of control is given to the system that sent the last message. For example when the controller sends a message to the Calrec console to alter a fader level, this action can be overridden by manually setting a new level on the Calrec console.

Enabling/Disabling control

It is possible to enable and disable the remote control from the Calrec Front-end GUI (disabled by default). The enabled/disabled status is saved in the desk memories so that when any of these are used to set up the desk for external control it will be enabled automatically when the memory is loaded.

NOTE: Ross Overdrive functionality is only available to Zeta consoles running software version 1.36 or higher.

SNMP MESSAGING

Calrec digital consoles provide SNMP messages from the console's AWACS fault reporting system.

The message sent is the same text that is displayed when clicking on specific fault reports on the AWACS screen.

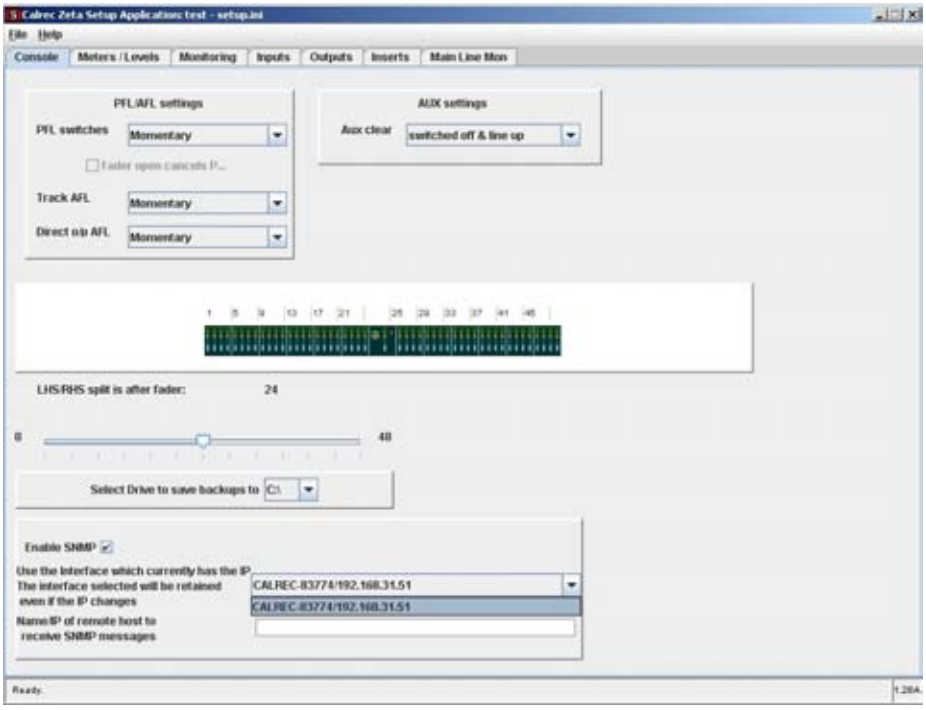
The console PC is normally supplied with two RJ45 network interfaces. Current systems use a Gigabit interface card for linking to a Gigabit switch when Hydra networking is in use. The PC also has a conventional 100 baseT network connection as part of the motherboard and it is this port that is used for SNMP messaging.

With appropriate network configuration, a topic going beyond this console installation manual, this same port can also provide access to the station/house IT network for the purpose of backing up console memories to drives other than the one within the console PC.

Setting up SNMP reporting

SNMP reporting must first be enabled by clicking in the Enable box within the Setup Application.

The two console network interfaces are displayed in the drop down box, shown above in the process of having one selected. Identify which is which either by reference to the IP address where this is already known, or by going to the Windows Control Panel to verify which card is the 100 Base one, i.e. not the Gigabit one used for any Hydra network connections.
The name and IP address of the SNMP server is entered in the lower field. Avoid making house network connections which use the same subnet as the one used for the Hydra network.



The SNMP server software needs to be configured to process the messages it receives and the necessary definition information is contained in the Management Information Base (MIB) file:

CALREC-TRAPS-MIB.txt.

This can be found on the console PC in the path:

C:\ALPHA\FRONTEND\.

ZETA
HYDRA AUDIO NETWORKING

CALREC

Putting Sound in the Picture

calrec.com

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 70 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. However, to ensure consistency of performance and support, the Gigabit switch should not be seen as an item of IT technology, but an integral part of the Calrec audio system. It is therefore normally quoted and supplied as part of the Hydra installation.

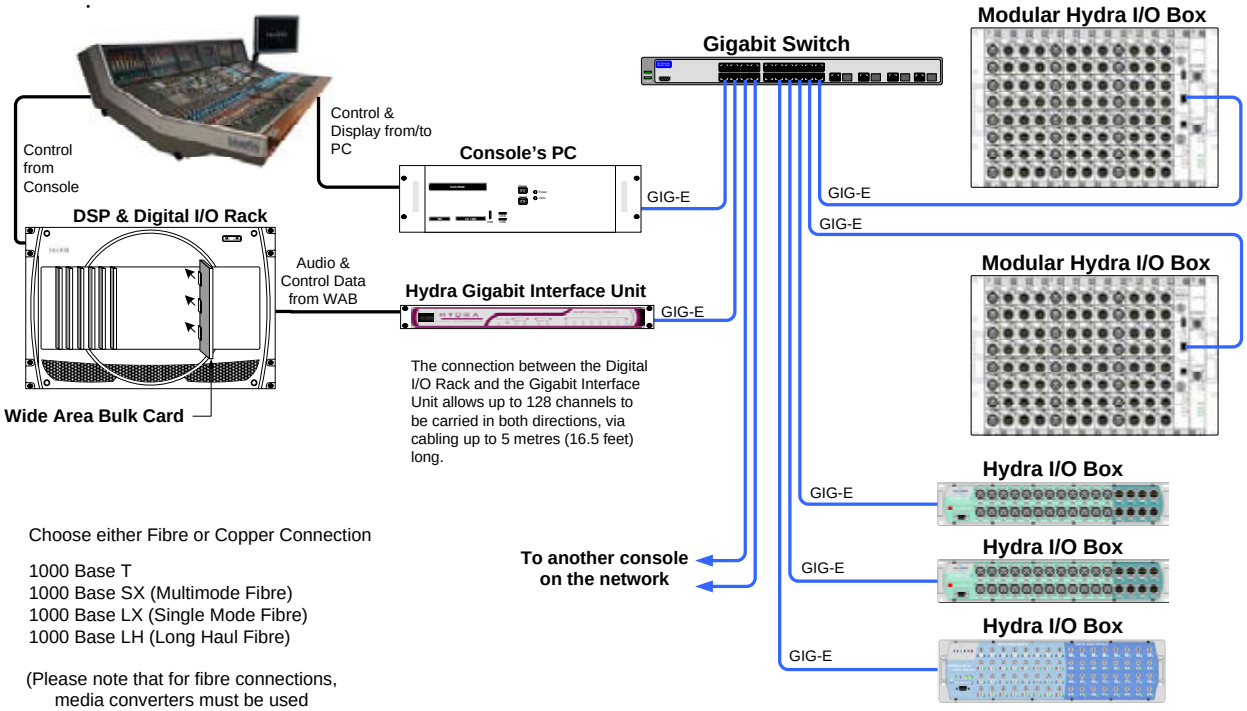
The diagram below shows a console and racks connected to a network via a Wide Area Bulk Card and Hydra Gigabit interface unit. 3 Hydra fixed format I/O boxes and 2 modular Hydra I/O boxes are also shown, each making inputs and outputs available to any console on the network.

Network Editor

For a network to be truly useful, it must be easy to use and maintain. The console's Network Editor consists of a set of screens for :

- Configuration of modular Hydra I/O boxes
- Off-line 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 off-line. During this time, any operations which require a console are disabled.



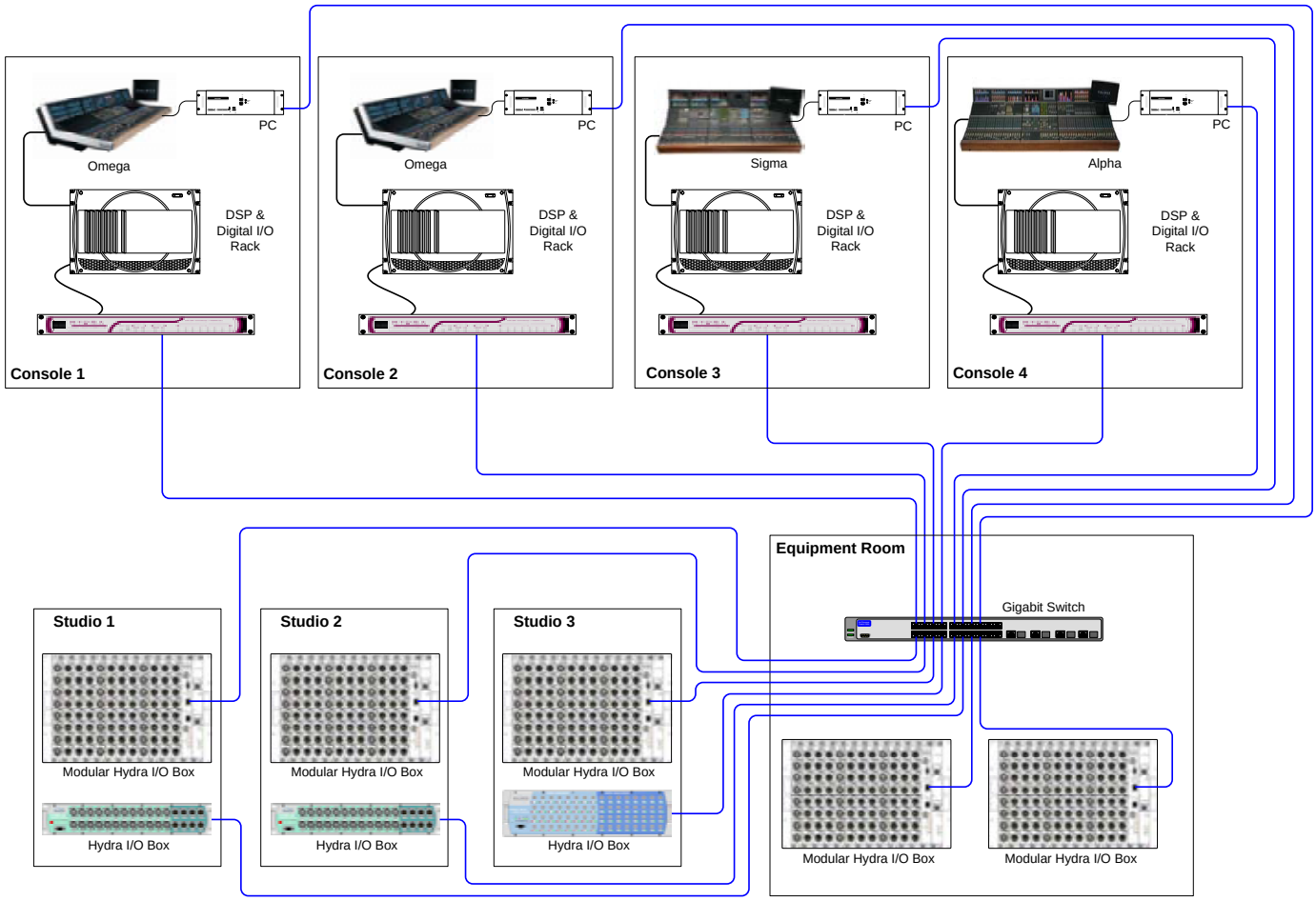
Choose either Fibre or Copper Connection

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)

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.

Synchronization

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

Private Network

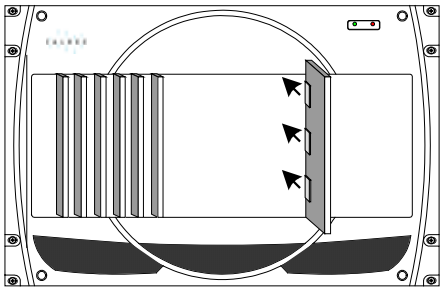
In order to guarantee fully deterministic performance, it is necessary to apply the restriction that the network must be kept private. This means that it must not be made to carry any data other than that generated by the audio network.

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 DSP and Digital I/O 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.

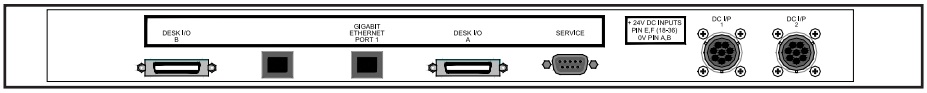
IP Addresses
Calrec will supply each device in your system (including the console) with its own unique IP address, which the system uses to identify each network connection. Where a device has two ports, each will have a unique IP address. The 4th byte is unique to the device. The Hydra I/O boxes synchronise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

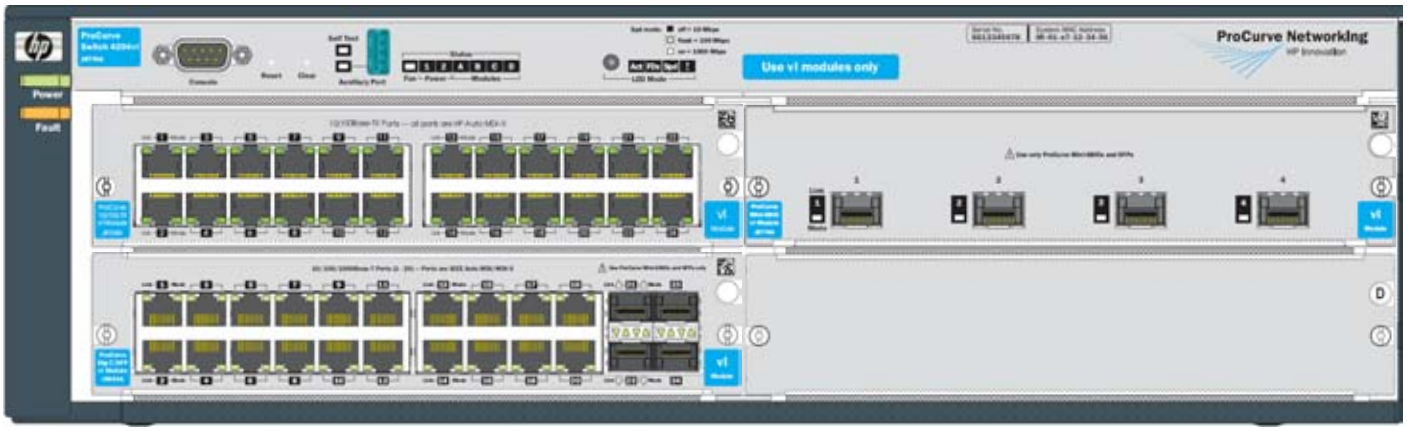
Dimensions	1U X 482mm (19 inch)
Depth (not including mating connectors)	195mm (7.7 inches) behind the front panel
Depth (including mating connectors)	265mm (10.4 inches) behind the front panel
Weight	2.6 Kg (5.5125 lb)

FRONT

REAR



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 4204vl 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.

HP4202vl Modules
The supported modules available for the HP4202vl switch enclosure are:

J8765A
24 port Gig-t switch module

J8776A
4 port mini GBIC slots

J9033A
20 port Gig-t and 4 port mini GBIC slots

Only mini-GBICs with the revision 'B' or later (product number ends with the letter 'B' or later) can be used with the modules in the HP4204vl.

DIMENSIONS & WEIGHTS

Unit	Height	Width		Approx Depth		Approx Weight (fully loaded)		Input Power Rating	Acoustic Power (dB A weighted to DIN 45635 T.19)
		Inches	mm	Inches	mm	lbs	kgs		
HP4204vl Modular Switch	3U	19	483	15.3	388.6	20.75	9.41	100-240V ~ 8.2-3.8A RMS 50/60Hz	<64.2 dB
Procurve Switch 2824 (J4903A)	1U	19	483	14.4	365.8	10.2	4.63	100-240V ~ 0.6-0.3A RMS 50/60Hz	<53dB
Procurve Switch 2848 (J4904A)	1U	19	483	16.9	429.3	10.75	4.88	100-240V ~ 0.6-0.3A RMS 50/60Hz	<53dB

All figures are subject to change and should be checked with the manufacturer,

HYDRA FIXED FORMAT 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:

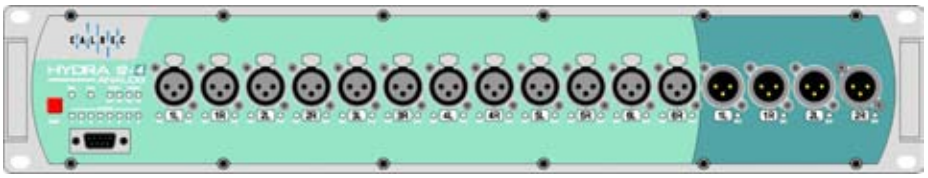
- 12 mic/line inputs and 4 line outputs (XLR)
- 24 mic/line inputs and 8 line outputs (XLR)
- 48 mic/line inputs and 16 line outputs (XLR)
- 32 AES inputs and 32 AES outputs (BNC)
- 4 SDI inputs with 'thru' connectors (rear panel connections)

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. All versions are supplied with two RJ45 ports for copper connections (1000BASE-T for distances up to 90 m = 290 feet). In addition, plug-in GBIC modules allow connections with 1000BASE-SX (for distances up to 550 m) and 1000BASE-LX (for distances up to 10 km) are available.

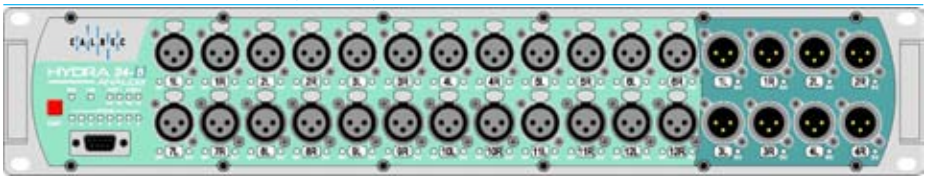
All external connections to the units are hot pluggable. If more than one media type is detected, the system will switch to fiber as its connection.

Hydra networks can include all versions forms of modular and fixed format boxes, though signals from SDI boxes can only be patched to consoles using Bluefin DSP systems or running software 1:36 or later.

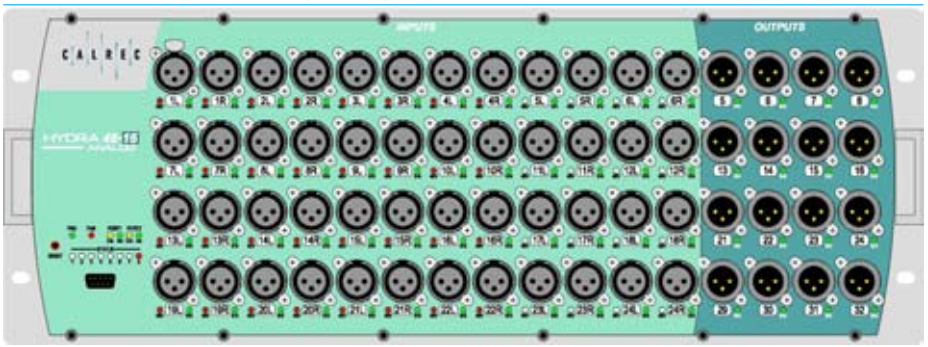
12 MIC/LINE IN & 4 LINE OUT (AD5608)



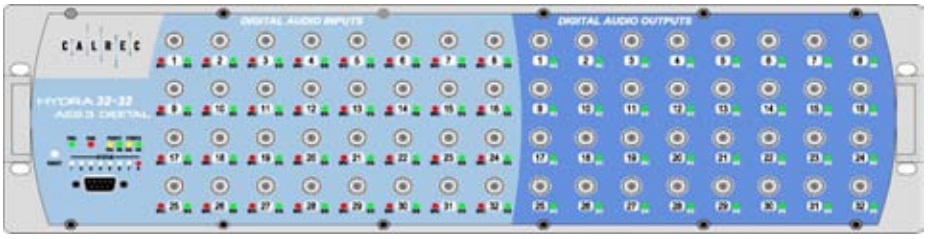
24 MIC/LINE IN & 8 LINE OUT (AD5603)



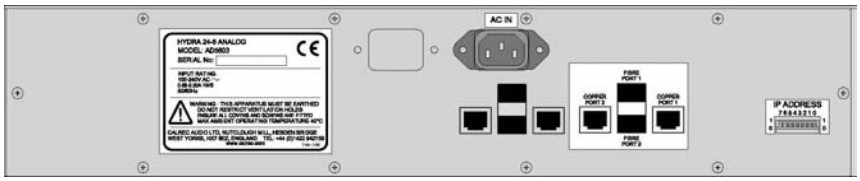
48 MIC/LINE IN & 16 LINE OUT (AD5600)



32 AES IN & 32 AES OUT (JB5607)



REAR CONNECTORS (SIMILAR FOR ABOVE UNITS)



DIMENSIONS & WEIGHTS

Unit	Height	Width		Approx Depth (incl. mating cons)		Approx Weight		Input Power Rating	Acoustic Noise (dB-SPL A-Weighted 1M from source)
		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	26
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	26
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	27
JB5607 32 AES in & 32 AES out - BNC	2U	19	483	12	300	12.0	5.8	100-240V AC ~ 0.38-0.20A RMS 50/60Hz	27

Power and Redundancy

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

As standard, one IEC input connector is fitted to power both internal PSUs. Versions of each unit (with the 'P' suffix after the unit number, for example AD5600P) provide a second IEC inlet. 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.

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 (x 8 red)

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

Synchronization

Units are frequency synchronized using synchronization 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.

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.

SDI BOXES

Zeta consoles running V1.36 software support the Calrec four way SDI de-embedders. Each SDI stream provides up to eight stereo output pairs. Up to 9 SDI boxes can be used in a Hydra Network.

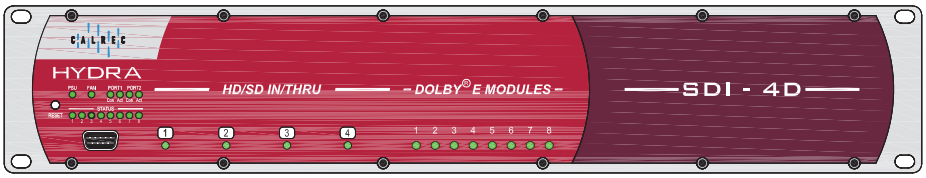
The four way box (VI5699) de-embeds both HD (high definition) and SD (standard definition) video. The unit may also be fitted with a secondary IEC inlet for redundant external AC power.

The unit can be fitted with up to eight optional Dolby E decoder modules. An extra rear connector is provided with this option for accessing Dolby E metadata.

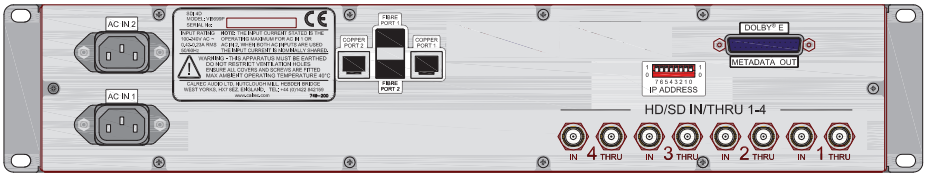
As with the analog and AES-3 boxes, these SDI interfaces connect to the network via an Ethernet port on the rear of the unit. Each unit has two identical ports to provide network redundancy. All versions are supplied with two RJ45 ports for copper connections (1000BASE-T for distances up to 90 m = 290 feet). Plug-in GBIC modules allow connections with 1000BASE-SX (for distances up to 550 m) and 1000BASE-LX (for distances up to 10 km) are available.

SDI signals can only be patched to the inputs of Zeta consoles running V1.36 or later software.

4 SDI IN & PASS THROUGH WITH OPTIONAL DOLBY DECODERS (VI5699)



4 SDI IN & PASS THROUGH (VI5699, NOTE THE EXTRA IEC INLET)



DIMENSIONS & WEIGHTS

Unit	Height	Width		Approx Depth (incl. mating cons)		Approx Weight		Input Power Rating	Acoustic Noise (dB-SPL A-Weighted 1M from source)
		Inches	mm	Inches	mm	lbs	kgs		
VI5699(P) 4 SDI in and through (rear connectors, P suffix version provides 2xIEC inlets)	2U	19	483	12	300	11.9	5.4	100-240V AC 0.42-0.23A RMS 50/60Hz	25

IP ADDRESSES

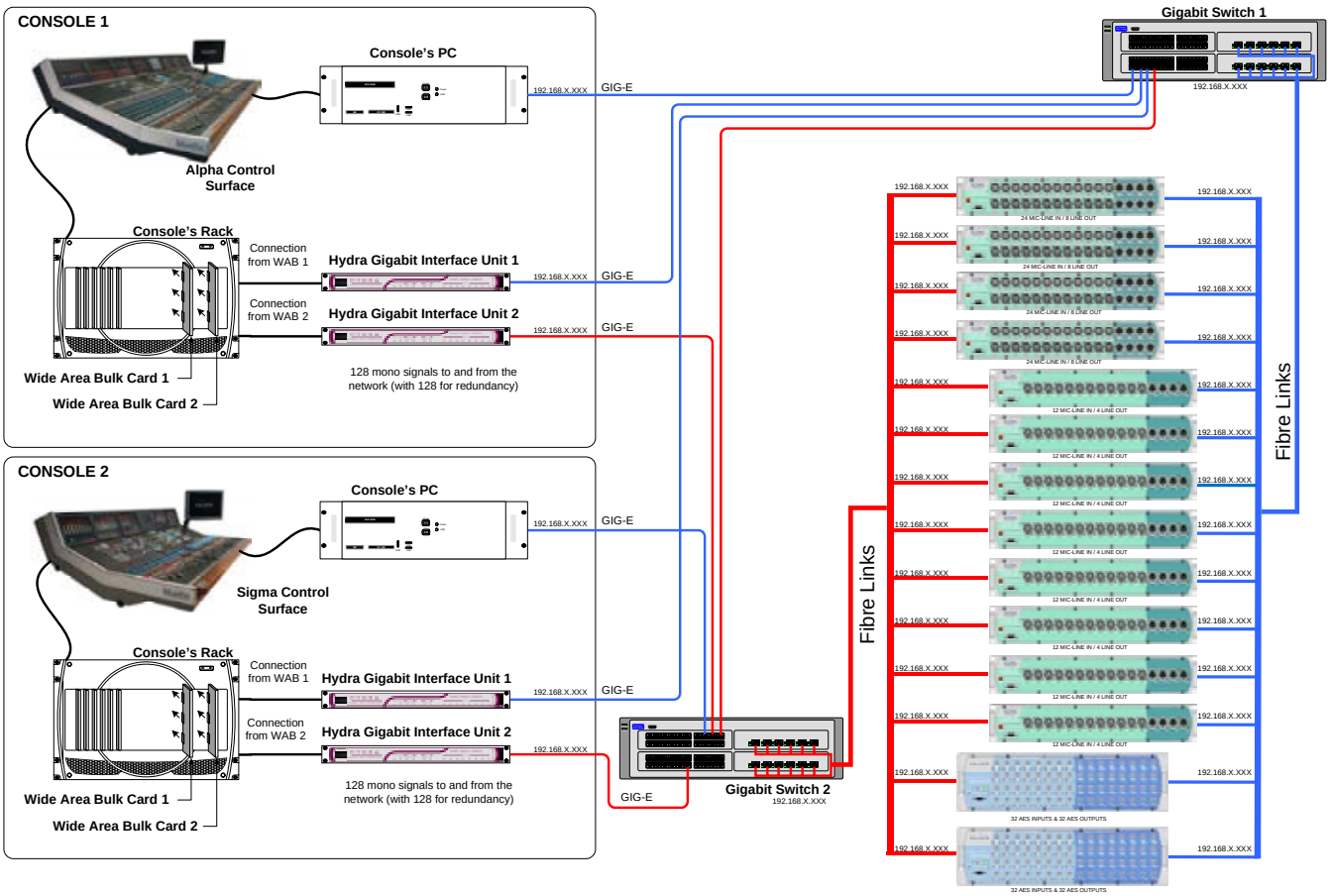
Calrec will supply each device in your system with its own unique IP address, which the system uses to identify each network connection. On the front of each Hydra I/O box, there is a label showing the IP address. The secondary port will use the address of the primary port + 100 decimal. For example:

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.



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.

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 if the first unit, or the connection to it should develop a fault.

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

Ground Lift Switches

On modules with ground switches fitted, the ground is lifted if the switch is toggled to the right. Lifting ground connections with unbalanced BNC connectors is not reccomended.

Module Extraction

A module extraction hole is located on the module front panels to help remove modules for service purposes. 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

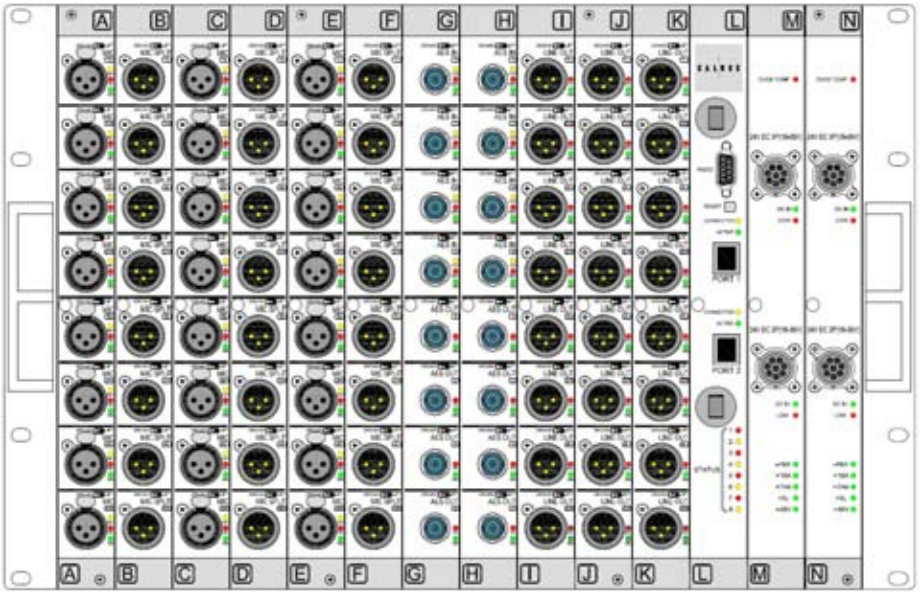
The modular Hydra I/O box is mounted in place using 4 fixing screws on each side angle bracket. Support slides should normally be used to prevent excessive twisting forces on the front fixings.

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.

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.



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

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 comes in two versions. The ZN5399 has the bonus of handles, but the more commonly supplied ZN5475 without handles makes for easy reverse mounting. This can allow AC and DC connections to be made either from the front or the rear of the rack enclosure.

Both versions have 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.

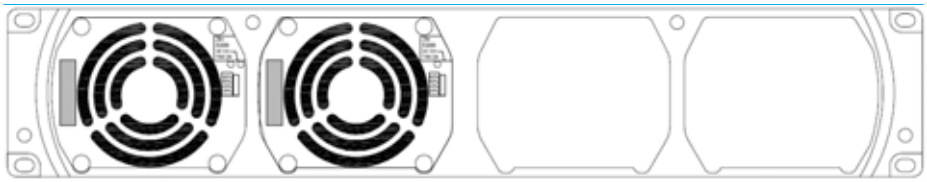
Mounting instructions

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 (50 mm) from the fans and rear air outlets, and also any walls or other surfaces.

RACK-MOUNTED AC PSU



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 250 V 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 connectors.

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

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

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

FIBRE OPTIC INTERFACES

The Hydra fixed format 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 fibre optic cable and a photo diode receiver to convert the light waves back into electrical signals.

Hydra modular wallboxes have only RJ45 connections (for copper circuits) and media convertors need to be added if they are to be linked over fiber optic circuits.

Fiber types

Two types of fibre are in use - Multimode and Single mode. The choice between them is based on the length of fiber needed. As Hydra network data has to pass in both directions between the switch and the two I/O box, two fibers are needed for each Gigabit port, i.e. a duplex system. When connection redundancy is required, two duplex fibre cable runs will be needed per I/O unit.

Signal 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:- fibre loss, splice loss and connector loss.

Fibre losses vary from 3.5 dB per km in Multimode down to 0.4 dB per km in Single mode.

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

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

CABLE TYPE	CONNECTOR	MAX DISTANCE	CALREC PART	GBIC - HP REF	OPTICAL POWER BUDGET
Copper CAT 5e/6 Ethernet	RJ45	90 m / 296 feet	-	n/a	n/a
Fibre 62.5/125mm Multimode	LC Duplex	275 m / 905 feet	491-045	SX - J4858A	7.5 dB
Fibre 50/125mm Multimode	LC Duplex	550 m / 1810 feet	491-045	SX - J4858A	7.5 dB
Fibre 62.5/125mm Multimode	LC Duplex	550 m / 1810 feet	491-061	LX - J4859A	7.5 dB
Fibre 50/125mm Multimode	LC Duplex	550 m / 1810 feet	491-061	LX - J4859A	7.5 dB
Fibre 8/125mm Singlemode	LC Duplex	10 km / 6.2 miles	491-061	LX - J4859A	8 dB
Fibre 8/125mm Singlemode	LC Duplex	70 km / 43.6 miles	491-060	LH - J4860A	23 dB

It is important that your cable installer or supplier provides certified attenuation figures based on EN 50173 or the US equivalent EIA/TIA 568A. The table above gives an indication of possible connectivity options.

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

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

Fibre cable construction

When installing fibre cable, it is important to use a type which gives enough protection to the fibre for the environment in which it is to be used. The inner material of these fibres is made out of glass and about the thickness of a human hair. To give the fibre protection, various coatings and layers are added using materials such as silicone and Nylon or PVC, and often a layer of Kevlar is added to ruggedise the construction.

When fibre 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.

Installation precautions

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-

- dissolve the sheathing.
- Rodents chewing on the cables.

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 fibre cabling, it is necessary for media converters to be used between the Gigabit switch and the Modular Hydra I/O boxes.

Calrec offer 1U rack mounting tray, part EC5453 and this can be fitted with one or more pairs of media convertor type AT-MC1008/SP with appropriate SFPs as listed alongside.

CABLE TYPE	CONNECTOR	MAX DISTANCE	CALREC PART	SMALL FORM FACTOR PLUGABLE (SFP)	OPTICAL POWER BUDGET
Copper CAT 5e/6 Ethernet	RJ45	90 m / 296 feet	-	n/a	n/a
Fibre 62.5/125mm Multimode	LC Duplex	275 m / 905 feet	491-087	SX - AFBR - 5717LZ	7.5 dB
Fibre 50/125mm Multimode	LC Duplex	550 m / 1810 feet	491-087	SX - AFBR - 5717LZ	7.5 dB
Fibre 62.5/125mm Multimode	LC Duplex	550 m / 1810 feet	491-072	LX - AFCT - 5715LZ	7.5 dB
Fibre 50/125mm Multimode	LC Duplex	550 m / 1810 feet	491-072	LX - AFCT - 5715LZ	7.5 dB
Fibre 8/125mm Singlemode	LC Duplex	10 km / 6.2 miles	491-072	LX - AFCT - 5715LZ	8 dB
Fibre 8/125mm Singlemode	LC Duplex	70 km / 43.6 miles	491-060	LH - J4860A	23 dB

Preventive maintenance of optical cables
The successful use of fibre optics depends upon the correct cleaning and maintenance regime. These relate to cleanliness of the connector ends of the fibre and the optical transceiver ports, i.e. the receptacles at the laser transmitter and photo diode receiver that the fibre connectors plug into.

Small oil micro-deposits and dirt/ dust particles on fibre 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 fibre to produce inaccurate results effectively rendering it unusable. Contaminated cable connectors can also transfer contaminants and into the "Optical Sub-Assembly" (OSA) barrels of the Optical Module with which they are mated and this can be a particular risk in remote truck applications.

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.

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 can be useful for optical maintenance

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 fibre, 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 single mode) magnification inspection scope is necessary tool for inspecting the connector ends of fibre cabling and optical sub-assemblies for cracks and deposits of oil and dirt. These Inspection Scopes are available from various fibre optic suppliers.
Make doubly sure that no lasers transmitters are operational before carrying out examinations with this device.

CLEANING FIBRE OPTIC INTERFACES

Cleaning fibres

- Do not allow the end of the fibre optic cable to contact any surface including fingers.
- Do not excessively bend fibre cables. Bending may cause internal breaks along the fibre resulting in poor performance or instability.
- Optics and optic coatings are easily chipped or scratched. Use of finger cots or powder free surgical gloves while handling fibre 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.

Procedure

Blow the fibre surface with a stream of clean dry air to dislodge larger loose particles. Do not tip the can of clean dry air whilst aerosol spraying as liquid may be released contaminating the surface of the fibre.

Place 1-3 drops of spectroscopic grade isopropyl alcohol in the centre of a lens tissue. To maintain purity, do not insert the lens tissue, swabs, etc. into the liquid. Instead, drip the liquid on to the material. Do not use lens paper dry as it is extremely abrasive. Do not use acetone as a cleaning solvent on the fibre optical surfaces.

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

Examine the surface of the fibre 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.

Immediately fit a cover to protect the end of the cable or insert the fibre back into the previously cleaned receptacle for immediate use.

Cleaning transceivers

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

- 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.

Procedure

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

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.

CATEGORY 5E AND 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 25 mm radius would be appropriate within a rack, the conduit leading to it would require minimum bends of 50 mm 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.

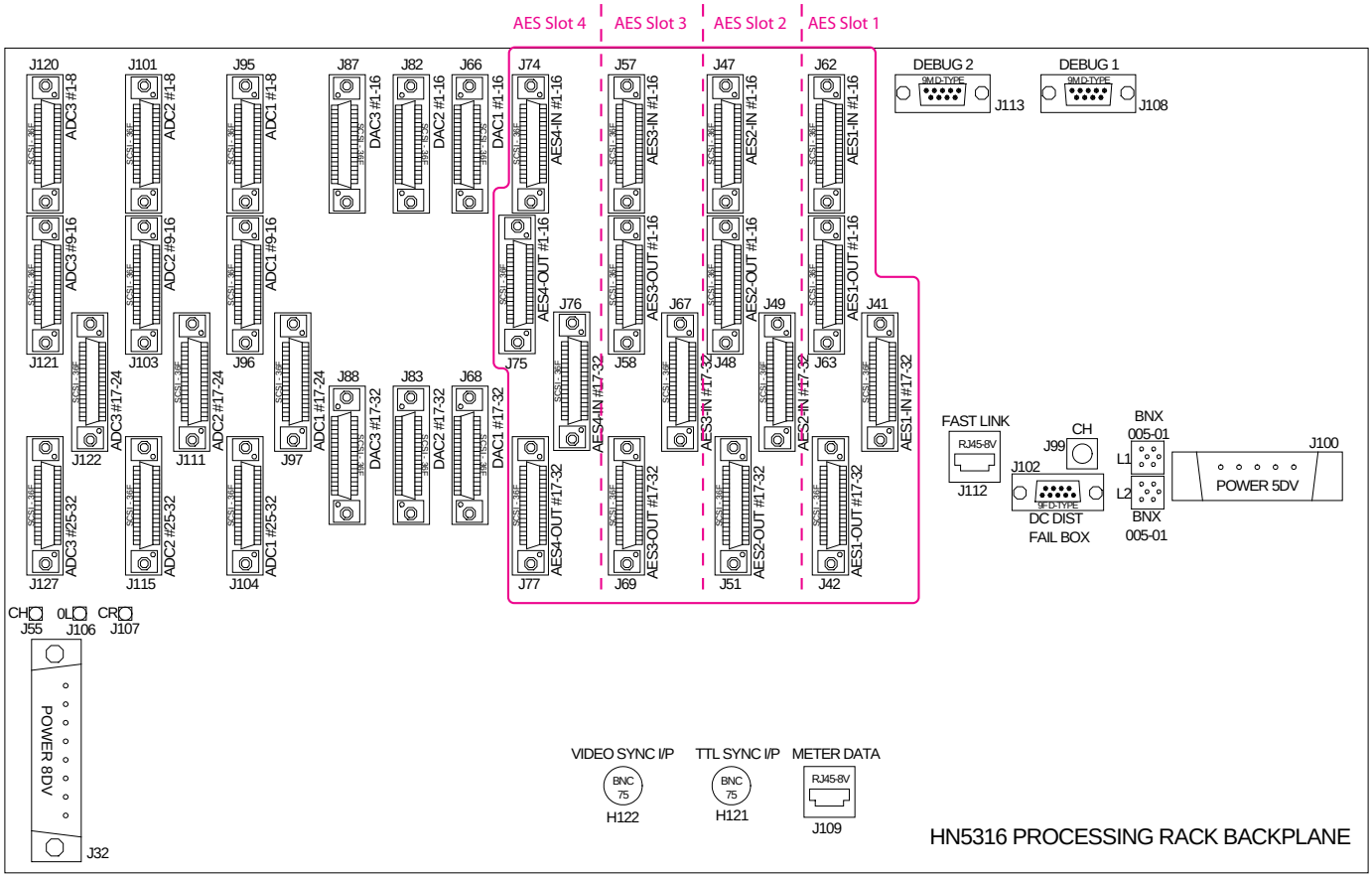
These are general rules to follow, and if in doubt, always refer to the cable manufacturer's recommendations.

ZETA
AUDIO I/O INTERFACES

CALREC

Putting Sound in the Picture

AES/WAB INPUTS AND OUTPUTS



Local AES inputs and outputs are provided on 36 way female MDR connectors on the rear of the processing rack (16 AES pairs of inputs or outputs per connector).

The processing rack can house up to 4 AES I/O cards, each of which provides 32 AES inputs and 32 AES outputs. The cards are inserted into slots 1-4 within the rack.

Each slot has dedicated input and output connectors on the rear of the rack (highlighted on the diagram), to which the system's AES inputs and outputs are connected. These connectors are used only when an AES I/O card or Wide Area Bulk (WAB) card occupies the slot.

AES IO cards should be installed in the following order; slot 1, slot 2, slot 3, slot 4. This allows room for future Bulk expansion.

Wide Area Bulk cards

Of the 4 AES slots available, up to 3 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 input 1-16 connector on the rear of the processing rack belonging to that slot are used to connect to the wide area interface.

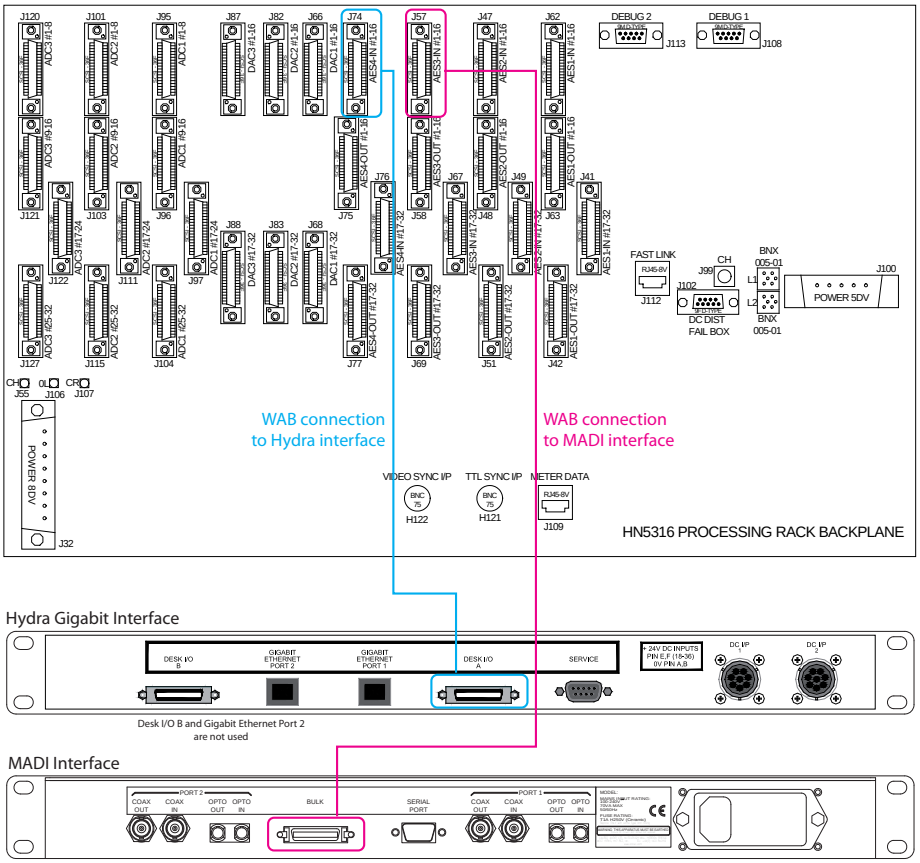
Wide Area Bulk (WAB) cards are to be inserted into slots 4, 3 and 2 in that order.

Connector	AES Slot			
	1	2	3	4
AES Inputs 1-16	J62	J47	J57	J74
AES Inputs 17-32	J41	J49	J67	J76
AES Outputs 1-16	J63	J48	J58	J75
AES Outputs 17-32	J42	J51	J69	J77
WAB Connection (If WAB card is fitted in a slot)	J62	J47	J57	J74

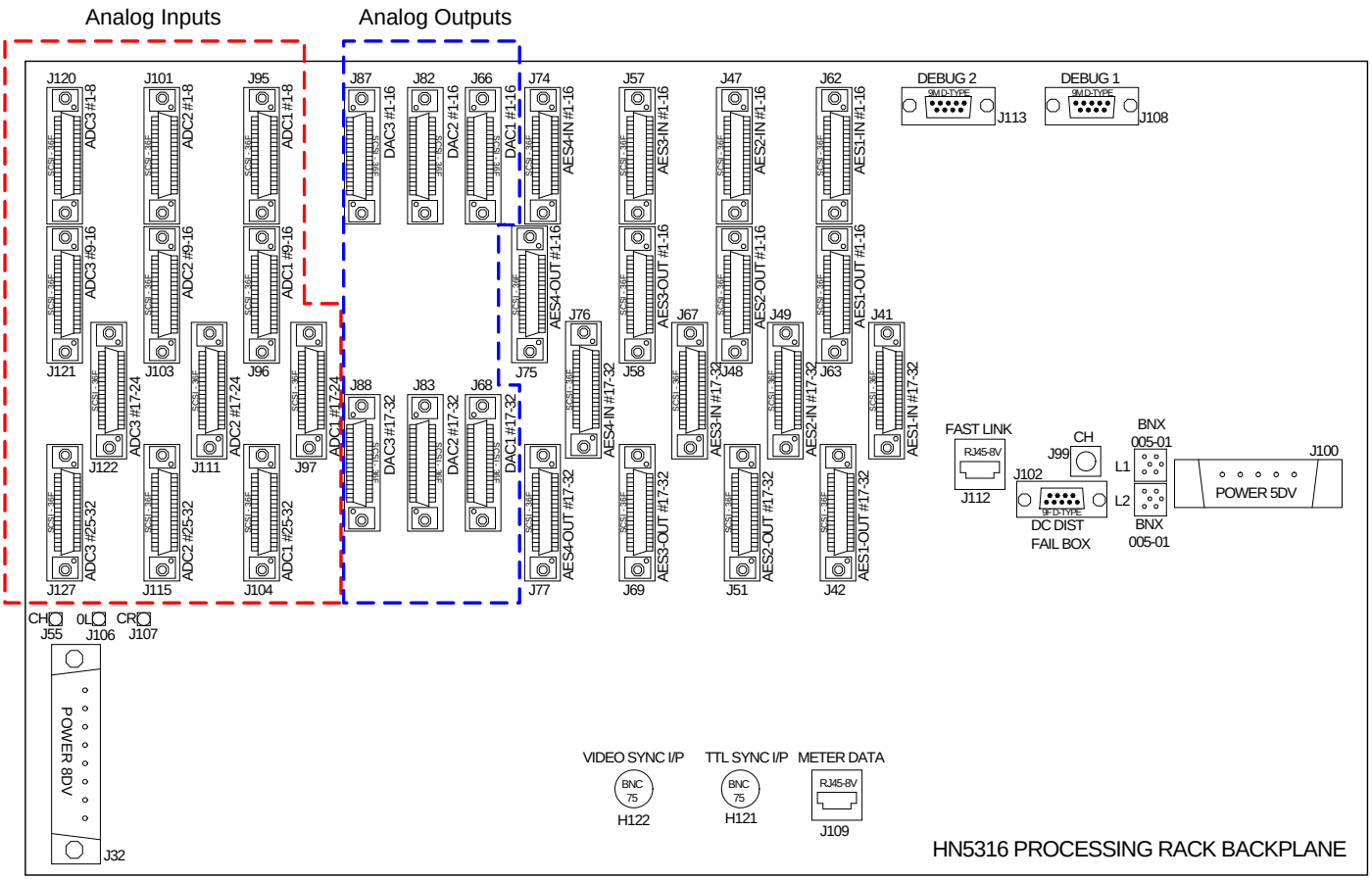
Connection example

The drawing to the right shows an example of WAB connections. Slot 4 is used to connect the Hydra Gigabit Interface to a WAB card. The next Bulk/ WAB slot (Slot 3) is used to connect a MADI interface to a WAB card. AES cards could be inserted in the following order in slots 1 and 2.

PROCESSING RACK TO HYDRA GIGABIT INTERFACE CONNECTION



ANALOG INPUTS AND OUTPUTS



All of the system's analog inputs and outputs are provided on 36 way female SCSI-style connectors on the rear of the Processing rack.

Analog Inputs (ADC Cards)

The Processing rack can house up to 3 mic/line input (ADC) cards, each of which provides 16 stereo inputs. The cards are inserted into the slots within the rack, these are numbered 1-3. Each slot has 4 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.

Analog Outputs (DAC Cards)

In addition, the Processing rack can house up to 3 line output (DAC) cards, each of which provides 16 stereo outputs. The cards are inserted into the slots within the rack, these are numbered 1-3. Each slot has 2 dedicated output connectors 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	LINE OUTPUTS 17-32 CONNECTOR
1	J66	J68
2	J82	J83
3	J87	J88

ADC SLOT	MIC/LINE INPUTS 1-8 CONNECTOR	MIC/LINE INPUTS 9-16 CONNECTOR	MIC/LINE INPUTS 17-24 CONNECTOR	MIC/LINE INPUTS 25-32 CONNECTOR
1	J95	J96	J97	J104
2	J101	J103	J111	J115
3	J120	J121	J122	J127

BNC AND XLR INTERFACE PANELS

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

AES Digital IO

Digital IO can be provided via XLR or BNC panels. XLR panels provide 16 female (input) or male (output) connectors. BNC panels provide 32 connectors. All digital IO panels are connected to the digital rack via MDR cables.

BNC input and output panels have a maximum MDR cable length of 5m (16.4ft) from the digital rack.

XLR input panels have a maximum MDR cable length of 2m (6.5ft). XLR output panels have a maximum MDR cable length of 3m (9.8ft).

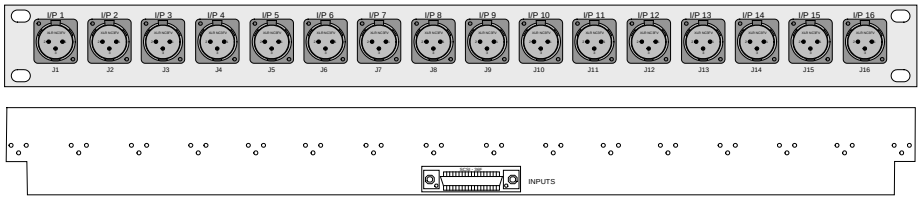
Analog IO

Analog outputs are all line level and are provided on an XLR panel with 16 male connectors. Any length of stock cable may be used (1, 2, 3 or 5m).

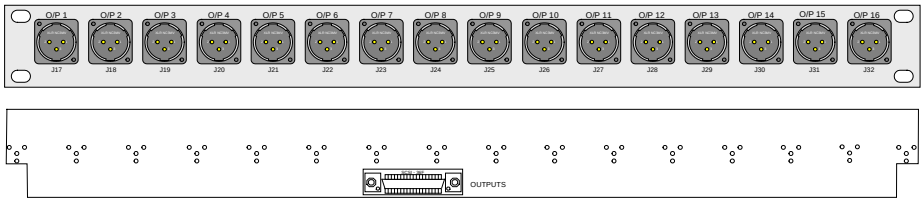
Mic/Line level inputs can be provided via a 16 way female XLR panel. These panels are custom wired and not available for connection via MDR cables. Please contact your project engineer for specific requirements.

Please see the following pages for detailed connection and wiring information on all interface panels.

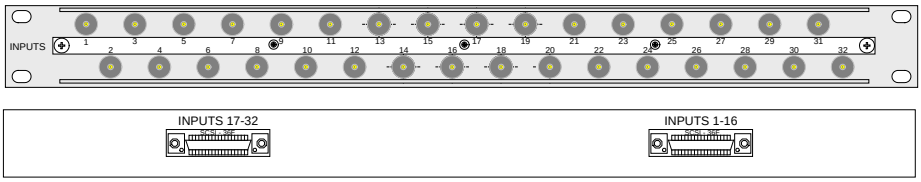
XLR INPUT PANEL (FRONT AND REAR)



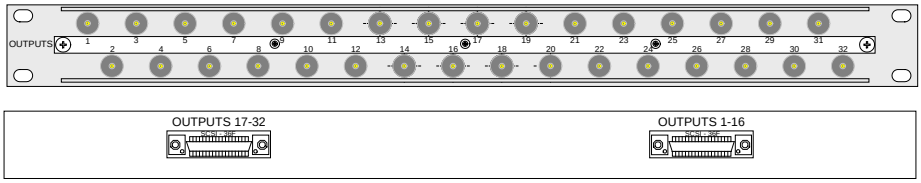
XLR OUTPUT PANEL (FRONT AND REAR)



BNC INPUT PANEL (FRONT AND REAR)



BNC OUTPUT PANEL (FRONT AND REAR)



EDAC/ELCO INTERFACE PANELS

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

The choice of style depends on the installation with the major influence normally being the number of circuits in the installation cabling. Style 2 lends itself to easy installation with 12 pair cable, though the vast majority of users opt for style 1 as this works well with commonly available 8 circuit cables.

The different styles are achieved using interface cards which attach to the rear of the 2U panels to provide different combinations of MDR (SCSI-style) connectors per EDAC/ELCO.

In many cases, customer cabling with EDAC/ELCO connectors for the console on one end may have the opposite end broken out to IDC (punch-block) connectors. This can make for easy routing of circuits to the required destinations.

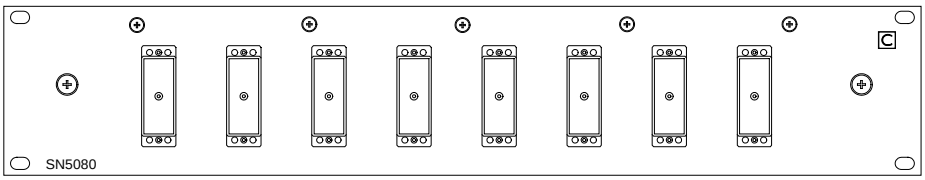
The panel mounted connectors are 38 pin, males - EDAC/ELCO 38MP. Cables connecting to these panels need 38 pin, female cable connectors (38FC). Refer to the photograph to be sure your EDAC/ELCO supplier interprets male and female in the right way. As with all the installation connectors, unless specially ordered as optional extras, mating EDAC/ELCO connectors for customer cabling are not supplied by Calrec.

EDAC/ELCO connectors can be 'keyed' with the two locating pins, one of which is larger than the other. Each pin can also be fitted with the slot at one of six different angles which can make for a vast range of unique pairings of connector halves. This can be a major inconvenience during installation testing and for maintenance. For this reason Calrec assembles all EDAC/ELCOs in the same way with the large pin at the top which is the same end of the connector as pin A. The keying pins are all aligned vertically with the slots/keys pointing outwards.

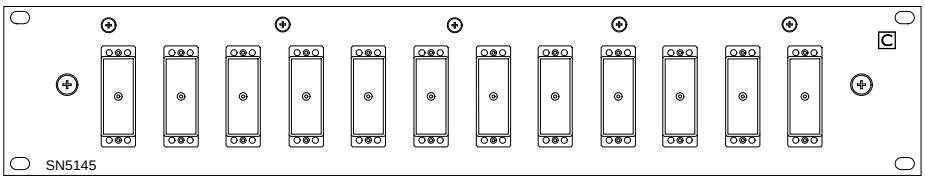
EDAC/ELCO and other styles of connector panel link to the console I/O back plane via Calrec supplied cables, normally of 1, 3 or 5 metres but this length can affect pricing. Most of these cables have balanced audio pairs with an overall screen and moulded MDR connectors.

Mic/line inputs use a hand wired cable assembly of twin and screen cables. The extra screen connections is the reason for fewer audio circuits with style 1.

8X38W EDAC/ELCO PANEL



12X38W EDAC/ELCO PANEL



Interface	Back-plane cable	Style 1	Style 2
Mic/line inputs	hand wired	8 mono circuits	12 mono circuits
Line only inputs	moulded plugs	16 mono circuits	12 mono circuits
Line outputs	moulded plugs	16 mono circuits	12 mono circuits

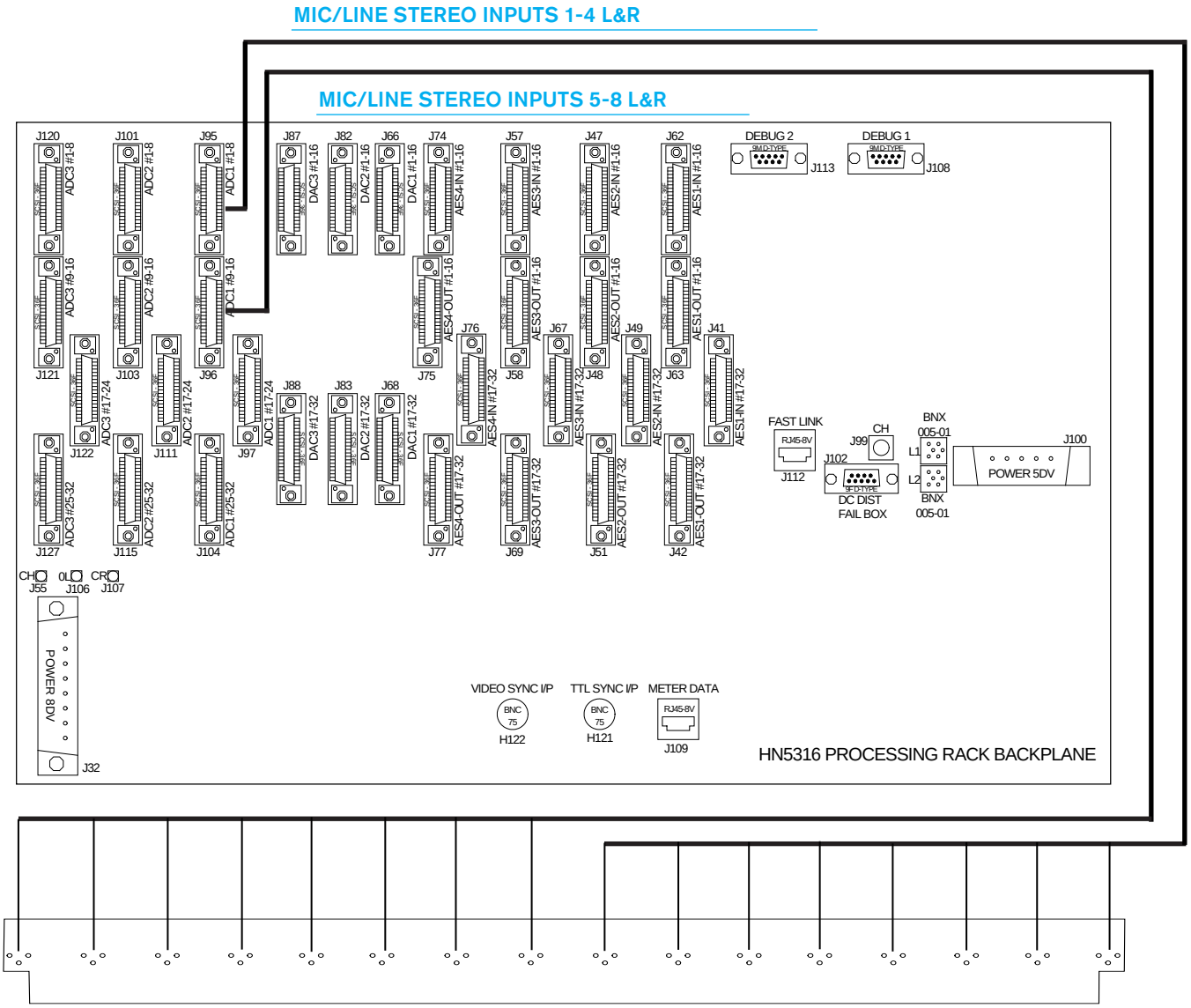
Component	Calrec part	EDAC/ELCO part
38 way socket	400-040	516-038-000-401
38 way metal hood	400-037	516-230-538
Crimp pin	400-024	516-290-590
Solder pin	400-025	516-290-500
Pin extractor tool	-	516-280-200

ANALOG INPUTS – XLR

Up to 3 analog input (ADC) cards can be fitted into the Processing rack, each providing 16 stereo inputs. The cards are inserted into the slots within the rack, and each slot has 4 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. The diagram below shows how the first input interface panel of 16 female XLRs can be connected to the ADC connectors on the rear of the rack via Calrec custom cabling assembly.

The Calrec SN5389 panel has female connectors so the user cabling needs male connectors.



Pin 1 - Chassis
Pin 2 - Hot (Phase)
Pin 3 - Cold (Anti-phase)

ANALOG OUTPUTS - XLR

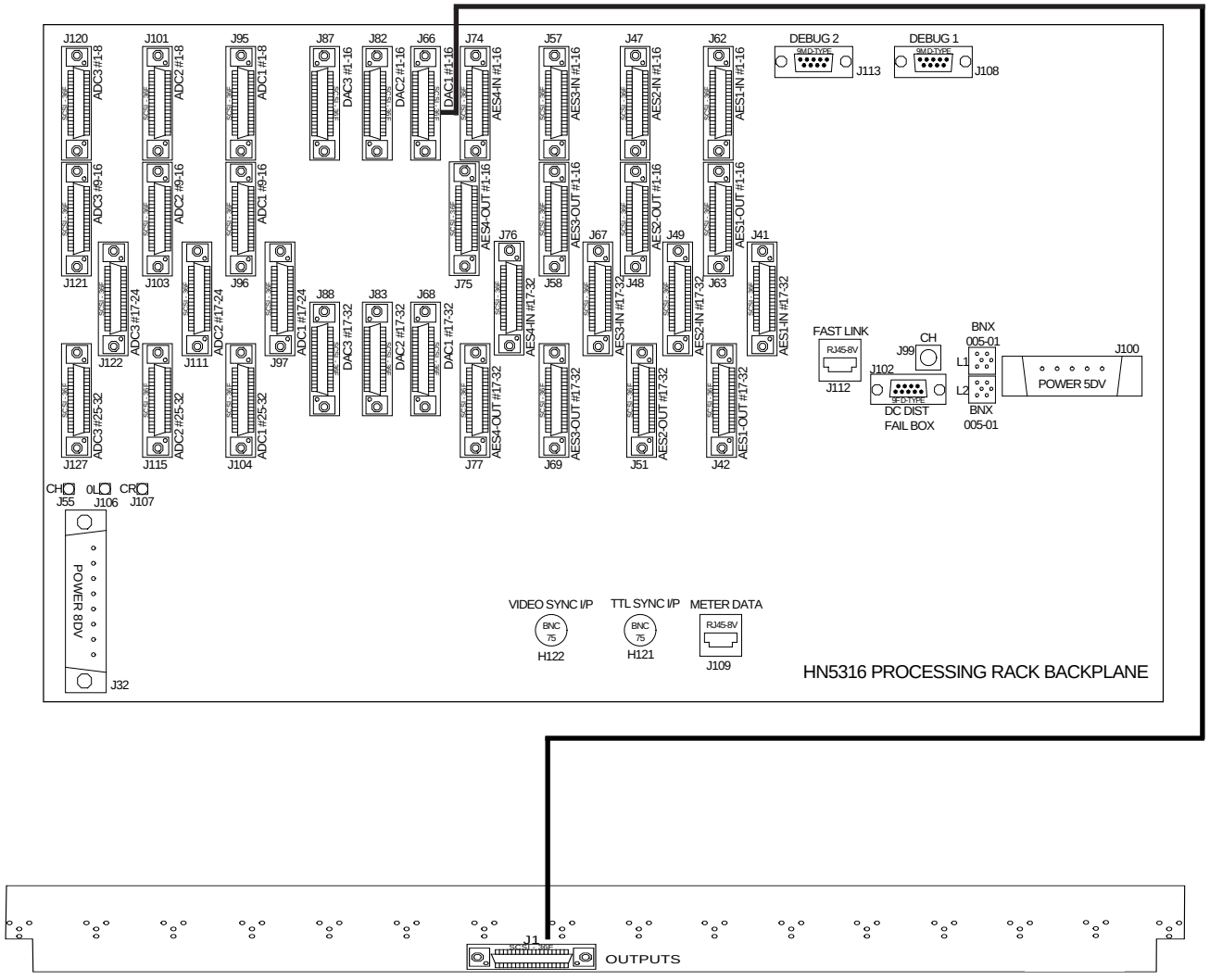
Each analog output (DAC) card in the processing rack, provides 16 stereo outputs. The cards are inserted into the slots within the rack, these are numbered 1-3. Each slot has 2 dedicated output connectors on the rear of the rack, which provide connections for the system's analog outputs.

Each of the output connectors provides connections for 8 stereo outputs. The diagram below shows how the first interface panel of 16 male XLRs can be connected to the DAC connectors on the rear of the rack via MDR cabling.

2 cables going to 2 XLR panels are required for each DAC card fitted - 8 stereo outputs on each cable.

Ideally the XLR interface panels should be located within 5 m (16.5 ft) of the processing rack.

The Calrec SN5666 panel has male connectors so the user cables need female connectors.



Pin 1 - Chassis
Pin 2 - Hot (Phase)
Pin 3 - Cold (Anti-phase)

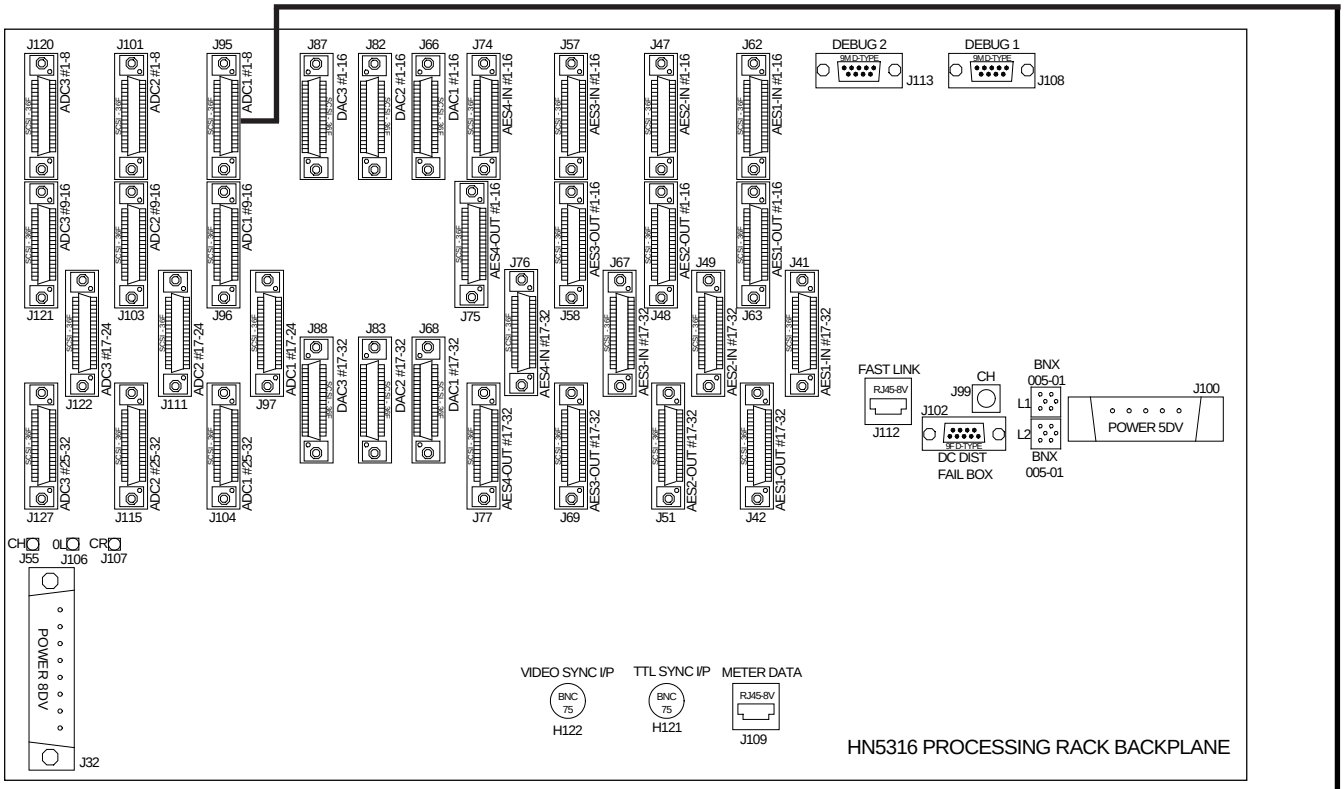
ANALOG INPUTS – EDAC/ELCO STYLE 1

Up to 3 analog input (ADC) cards can be fitted into the Processing rack, each providing 16 stereo inputs. The cards are inserted into the slots within the rack, and each slot has 4 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. The diagram below shows how 8 or 12 way EDAC/ELCO Input Interface panels can be connected to the ADC connectors on the rear of the rack via Calrec custom cabling to achieve Style 1 (4 pairs per EDAC/ELCO).

4 Cables are required for each ADC card fitted - 4 stereo inputs on each cable (Just one shown here).

Ideally the EDAC/ELCO interface panels should be located within 3m (9.8ft) of the rack.



Wired into EDAC/ELCO - Rear of Interface Panel

A.E (B)	Mic/Line IP 1L (screen)
D.K (C)	Mic/Line IP 1R (screen)
L.R (M)	Mic/Line IP 2L (screen)
P.U (N)	Mic/Line IP 2R (screen)
Z.DD (AA)	Mic/Line IP 3L (screen)
CC.HH (BB)	Mic/Line IP 3R (screen)
JJ.PP (KK)	Mic/Line IP 4L (screen)
NN.TT (MM)	Mic/Line IP 4R (screen)
F.J.S.T.H.LL EE.FF.RR.SS	Chassis

Style 1 - 4 pairs per 38 way EDAC/ELCO

Stereo Inputs 1-4

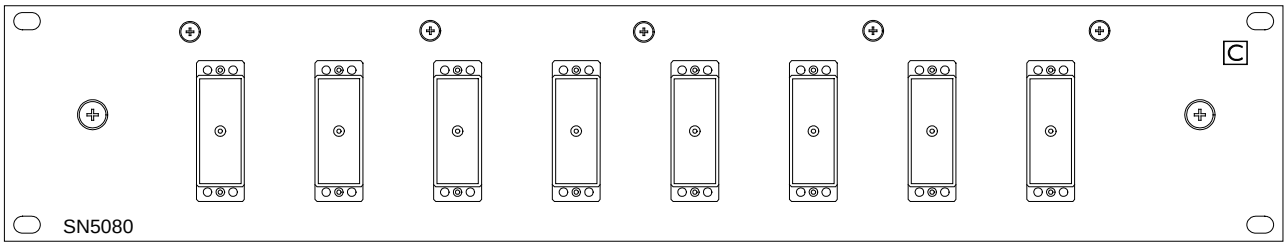
(CABLE 2 IS NOT SHOWN)

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

8 WAY EDAC/ELCO INTERFACE PANEL



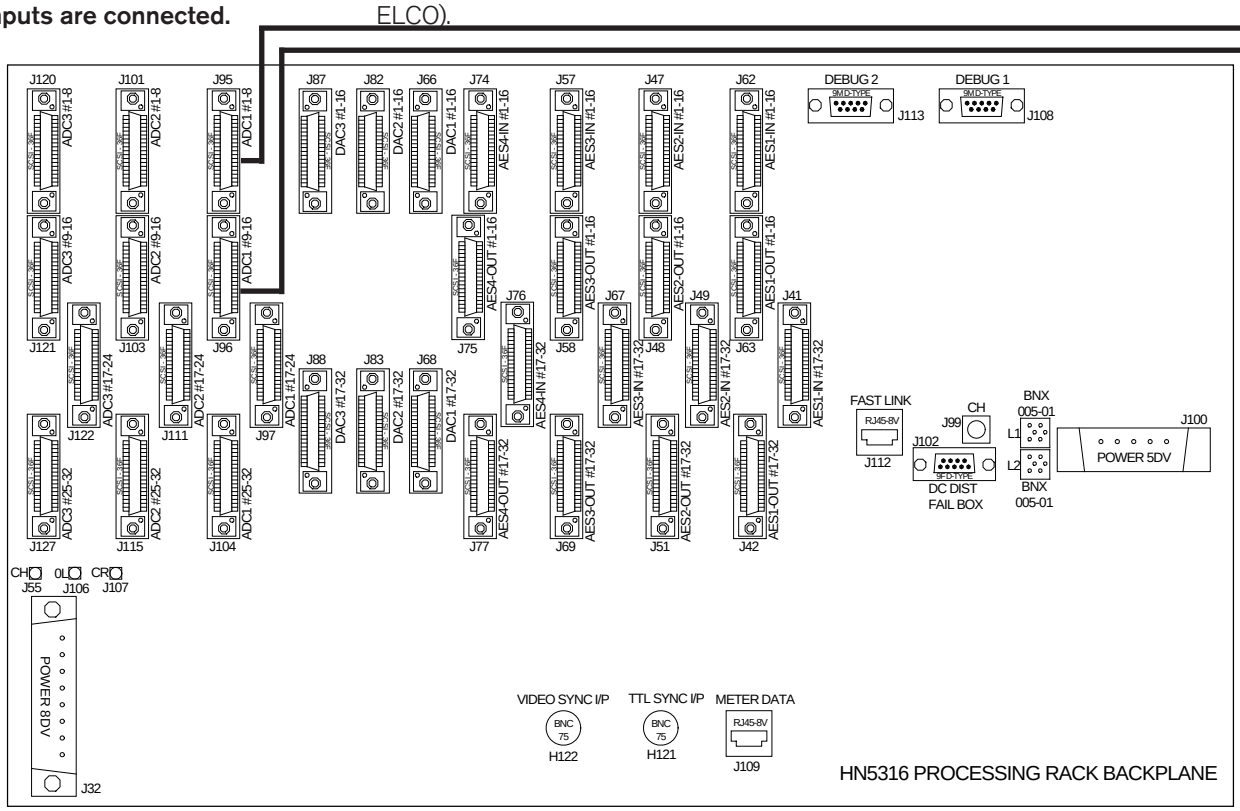
ANALOG INPUTS – EDAC/ELCO STYLE 2

Up to 3 analog input (ADC) cards can be fitted into the Processing rack, each providing 16 stereo inputs. The cards are inserted into the slots within the rack, and each slot has 4 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. The diagram below shows how 8 or 12 way EDAC/ELCO Input Interface panels are connected to the ADC connectors on the rear of the rack via Calrec custom cabling to achieve Style 2 (6 pairs per EDAC/ELCO).

4 Cables are required for each ADC card fitted. Cable 2 wires into the first EDAC/ELCO to provide circuits 5 and 6.

Ideally the EDAC/ELCO interface panels should be located within 3m (9.8ft) of the rack.



Wired into EDAC/ELCO - Rear of Interface Panel

A.B (E)	Mic/Line IP 1L
C.D (K)	Mic/Line IP 1R
L.M (F)	Mic/Line IP 2L
N.P (J)	Mic/Line IP 2R
R.S (V)	Mic/Line IP 3L
T.U (W)	Mic/Line IP 3R
Z.AA (X)	Mic/Line IP 4L
BB.CC (Y)	Mic/Line IP 4R
DD.EE (KK)	Mic/Line IP 5L
FF.HH (MM)	Mic/Line IP 5R
PP.RR (JJ)	Mic/Line IP 6L
SS.TT (NN)	Mic/Line IP 6R
H.LL	Chassis

Style 2 - 6 pairs per 38 way EDAC/ELCO

Stereo Inputs 1-4

Stereo Inputs 5-6

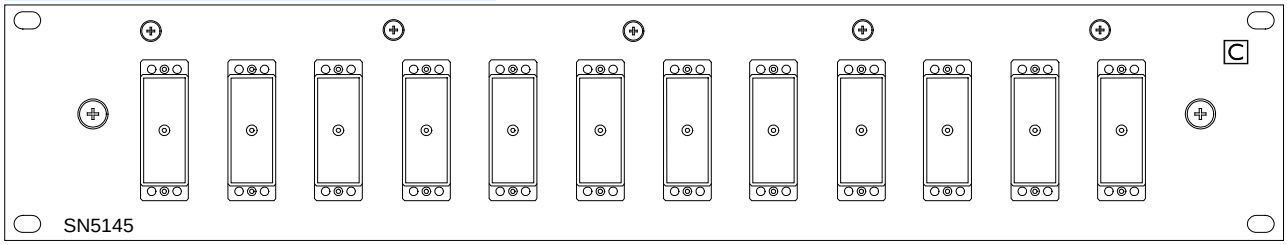
Stereo Inputs 7-8

On EDAC/ELCOs, pin 1 (A) is HOT (phase), pin 2 (B) is COLD (anti-phase) and pin 3 (E) is 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

12 WAY EDAC/ELCO INTERFACE PANEL



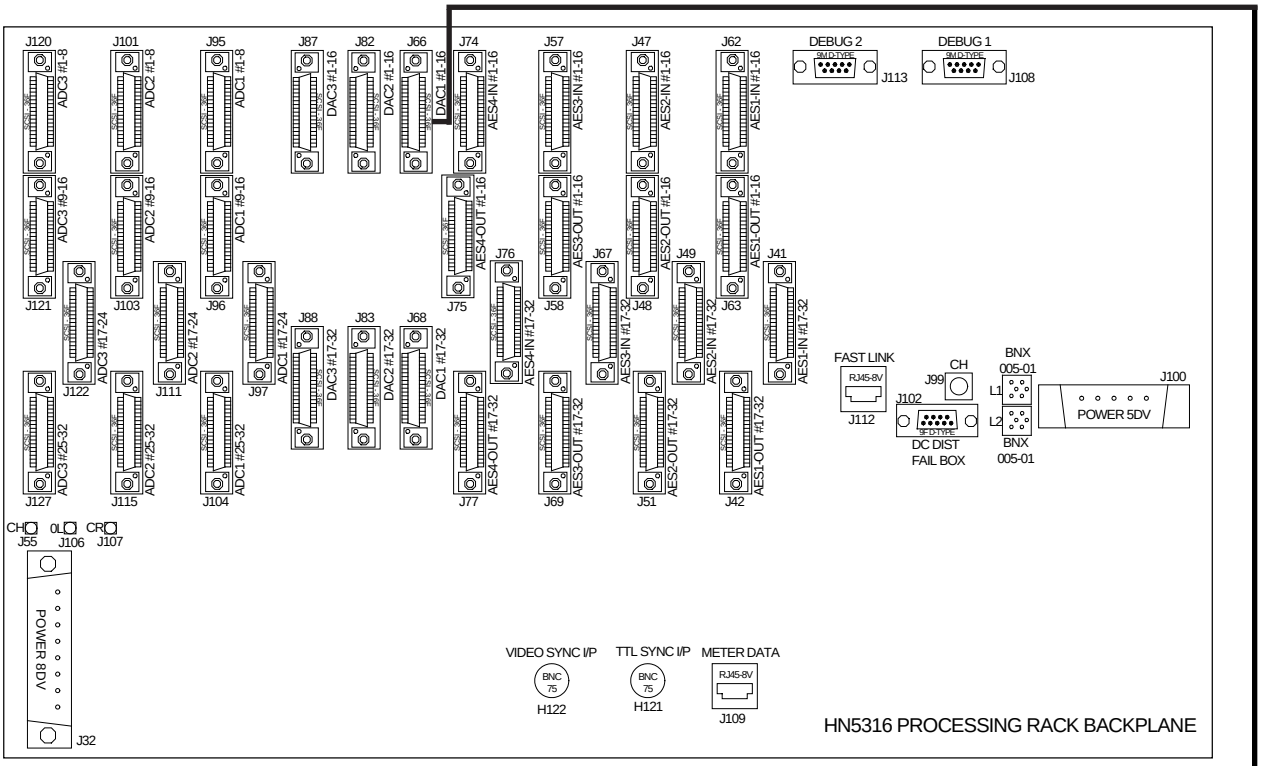
ANALOG OUTPUTS – EDAC/ELCO STYLE 1

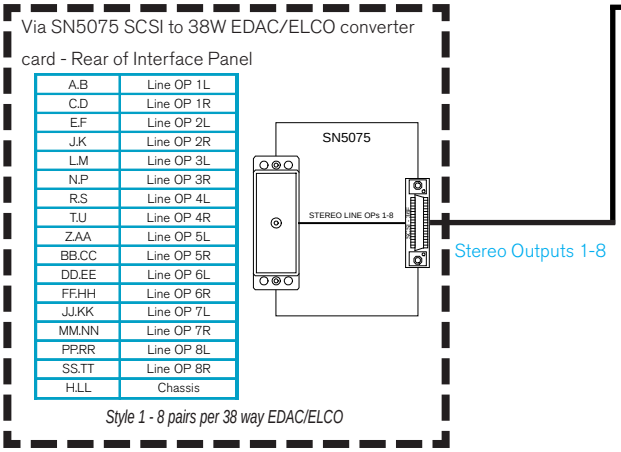
Each analog output (DAC) card in the Processing rack, provides 16 stereo outputs. The cards are inserted into the slots within the rack, these are numbered 1-3. Each slot has 2 dedicated output connectors on the rear of the rack, which provide connections for the system's analog outputs.

Each of the output connectors provides connections for 8 stereo outputs. The diagram below shows how 8 way EDAC/ELCO interface panels are connected to the DAC connectors on the rear of the rack via SCSI style cabling to achieve Style 1 (8 pairs per EDAC/ELCO connector).

2 Cables are required for each DAC card fitted - 8 stereo outputs on each cable.

Ideally the EDAC/ELCO interface panels should be located within 3m (9.8ft) of the rack.

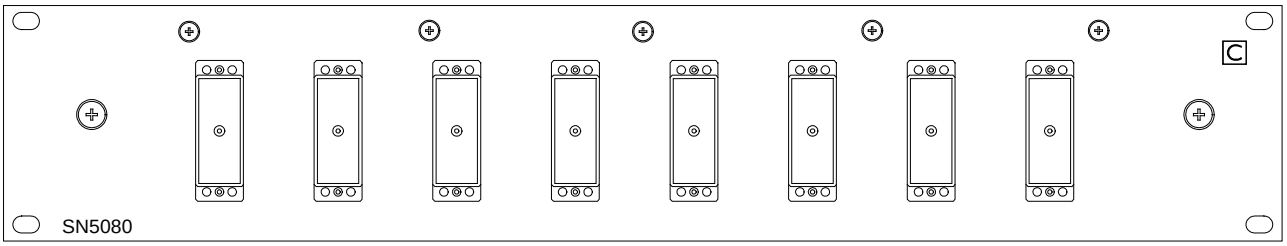




Cable 1 - Stereo Outputs 1-8	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1L
3 . 21	1R
4 . 22	2L
5 . 23	2R
6 . 24	3L
7 . 25	3R
8 . 26	4L
9 . 27	4R
10 . 28	5L
11 . 29	5R
12 . 30	6L
13 . 31	6R
14 . 32	7L
15 . 33	7R
16 . 34	8L
17 . 35	8R
18 . 36	Chassis

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

8 WAY EDAC/ELCO INTERFACE PANEL



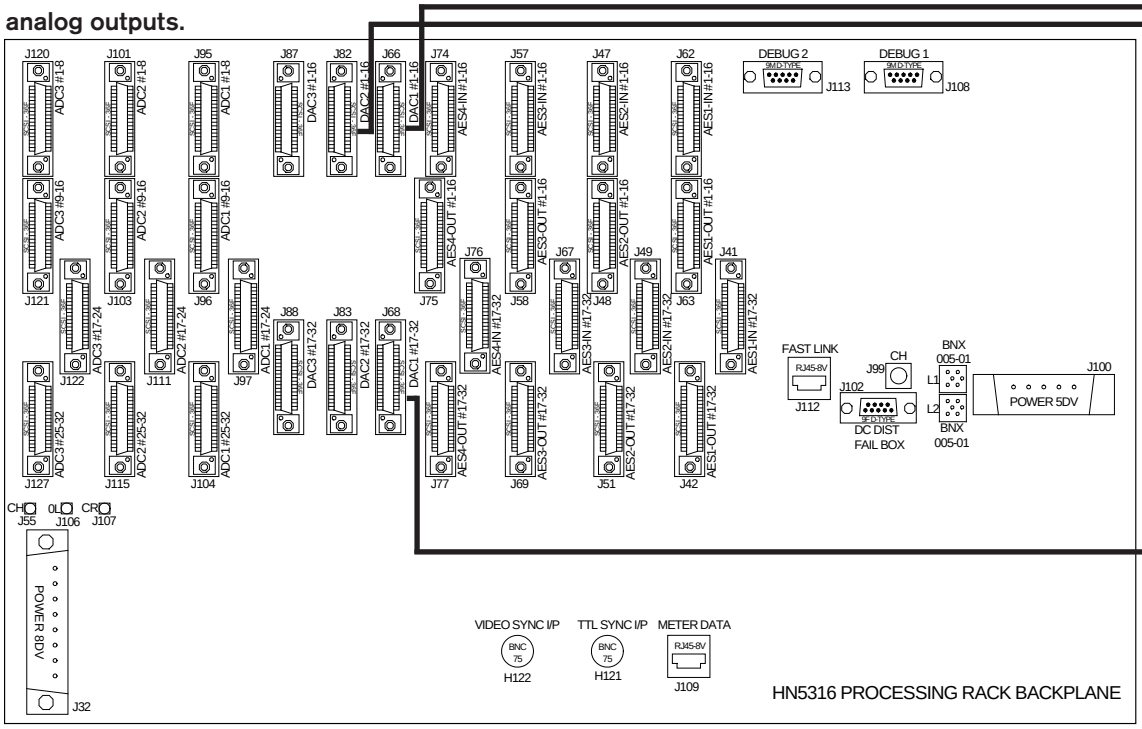
ANALOG OUTPUTS - EDAC/ELCO STYLE 2

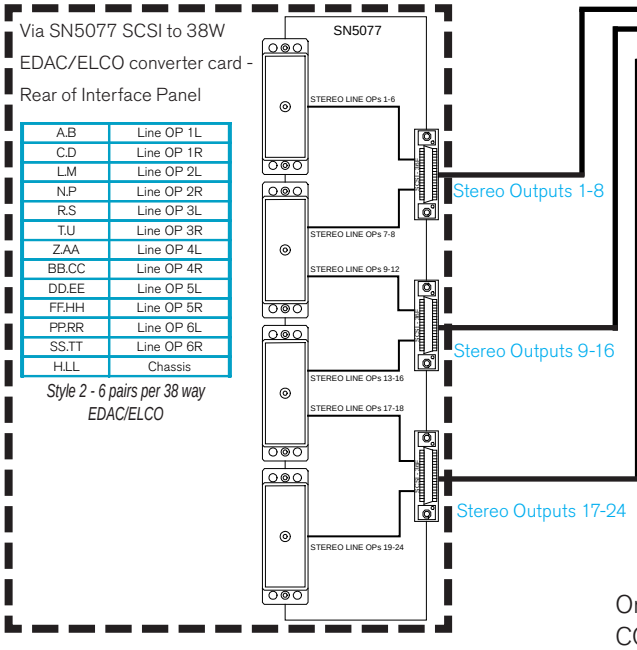
Up to 3 analog output (DAC) cards can be fitted into the Processing rack, each providing 16 stereo outputs. The cards are inserted into the slots within the rack, these are numbered 1-3. Each slot has 2 dedicated output connectors on the rear of the rack, which provide connections for the system's analog outputs.

Each of the output connectors provides connections for 8 stereo outputs. The diagram below shows how 8 way EDAC/ELCO interface panels are connected to the DAC connectors on the rear of the rack via SCSI style cabling to achieve Style 2 (6 pairs per EDAC/ELCO connector).

2 Cables for each DAC card fitted - 8 stereo outputs on each cable.

Ideally the EDAC/ELCO interface panels should be located within 3m (9.8ft) of the 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

Style 2 - 6 pairs per 38 way EDAC/ELCO

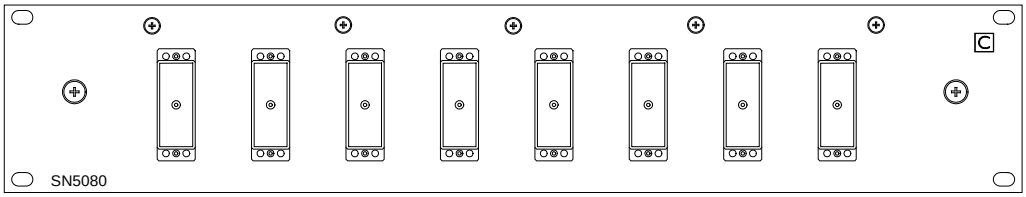
Cable 1 - Stereo Outputs 1-8	
SCSI Pins	Circuit
1 . 19	Chassis
2 . 20	1L
3 . 21	1R
4 . 22	2L
5 . 23	2R
6 . 24	3L
7 . 25	3R
8 . 26	4L
9 . 27	4R
10 . 28	5L
11 . 29	5R
12 . 30	6L
13 . 31	6R
14 . 32	7L
15 . 33	7R
16 . 34	8L
17 . 35	8R
18 . 36	Chassis

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

8 WAY EDAC/ELCO INTERFACE PANEL



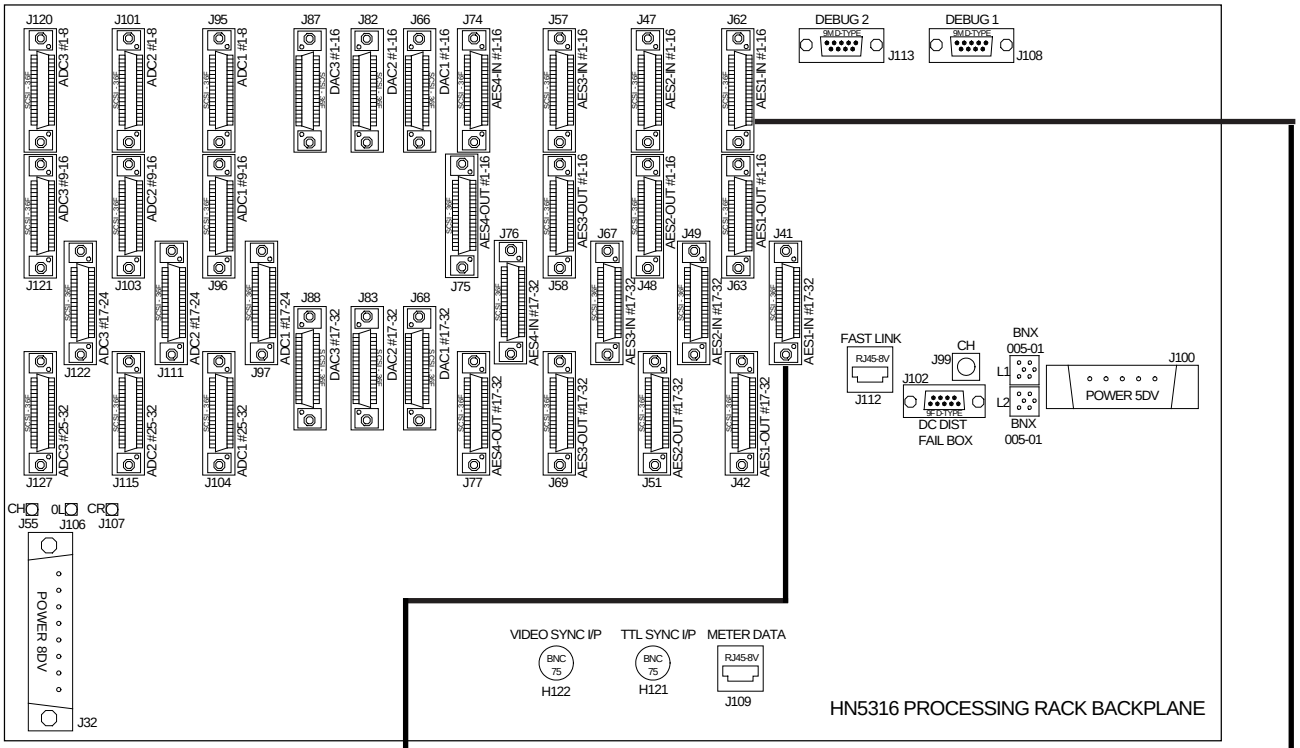
AES INPUTS – BNC

Each AES I/O card in the Processing rack provides 32 AES inputs and 32 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 are connected to 32 way BNC interface panels via SCSI-style cabling. For clarity, input connections from just 1 AES card (occupying AES slot 1) to an interface panel are shown here.

Each BNC interface panel can interface 32 AES inputs. Therefore if all AES inputs are used, 4 BNC interface panels would be needed.

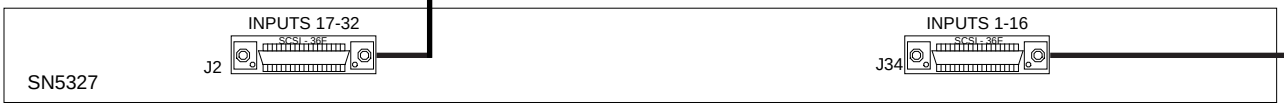
The BNC interface panels must be located within 3m (9.8ft) of the Processing rack.



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)



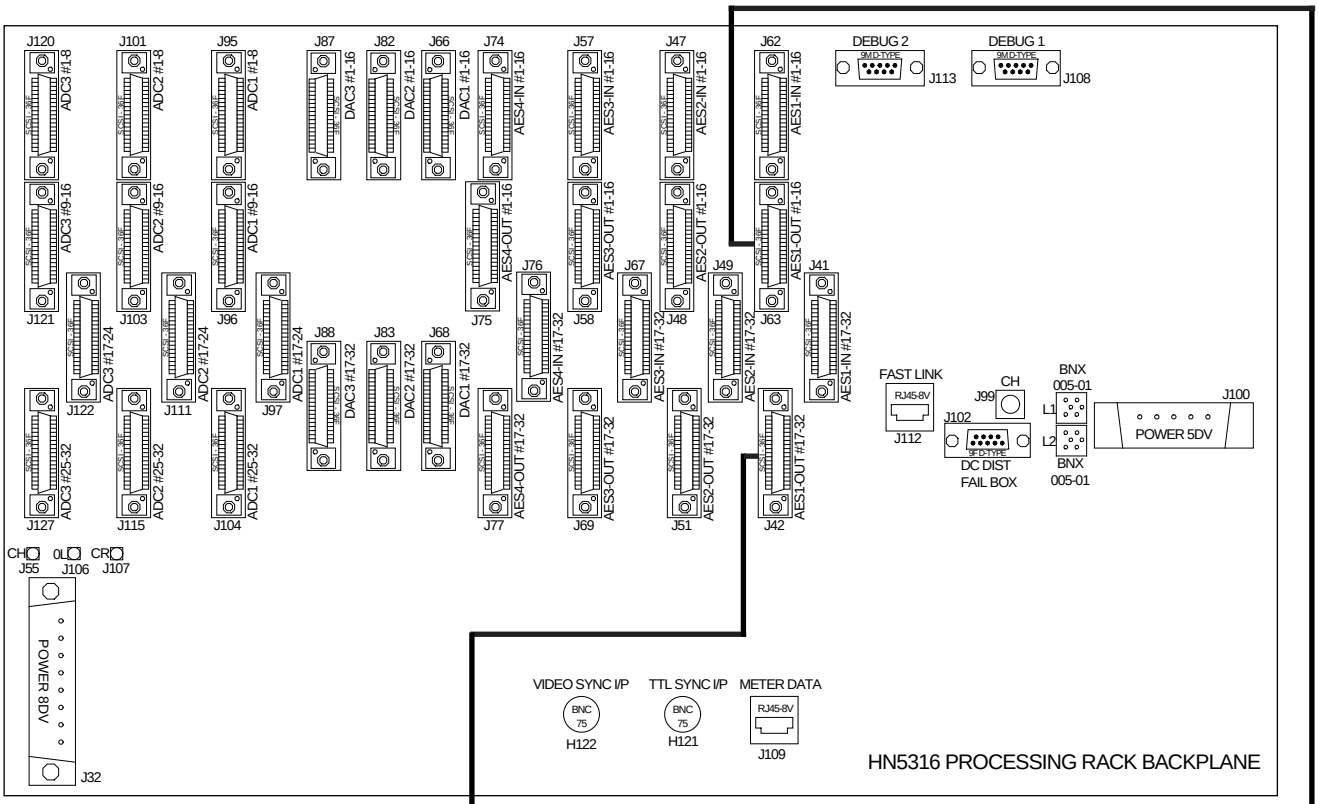
AES OUTPUTS – BNC

Each AES I/O card in the Processing rack provides 32 AES inputs and 32 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 are connected to BNC interface panels via SCSI-style cabling. For clarity, connections from the outputs on just 1 AES card to an interface panel is shown here.

Each panel can interface 32 AES outputs. Therefore if all AES outputs are used, 4 panels would be needed.

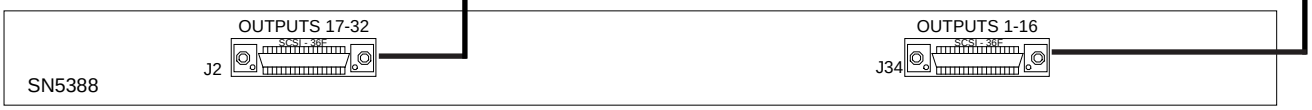
The BNC interface panels must be located within 3m (9.8ft) of the Processing rack.



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 OUTPUT I/F PANEL (REAR)



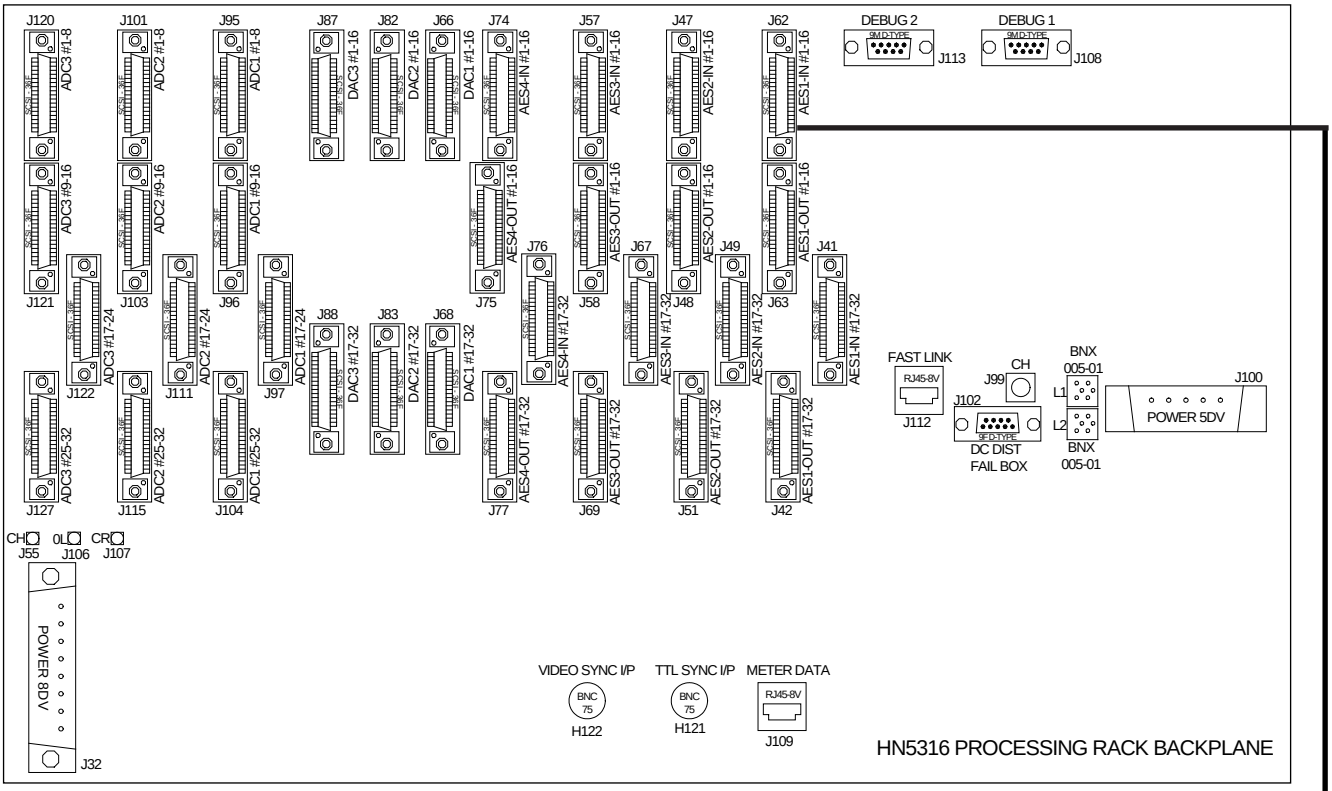
AES INPUTS – XLR

Each AES I/O card in the Processing rack provides 32 AES inputs and 32 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 are connected to 16 way XLR interface panels via SCSI-style cabling. For clarity, connections from the first 16 AES inputs on AES card 1 to an XLR interface panel are shown here.

Each XLR interface panel can interface 16 AES inputs. Therefore if all AES inputs are used, 8 XLR interface panels would be needed.

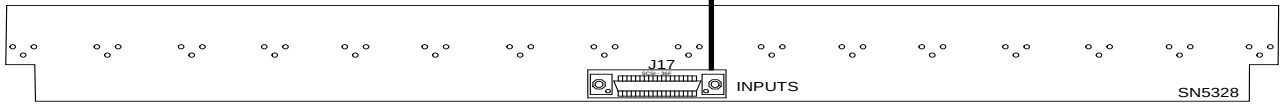
The XLR interface panels must be located within 2m (6.5ft) of the rack.



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

On 3 pin XLR:
Pin 1 is Chassis Connections
Pin 2 is HOT (PHASE)
Pin 3 is COLD (ANTI-PHASE)

XLR INPUT I/F PANEL (REAR)



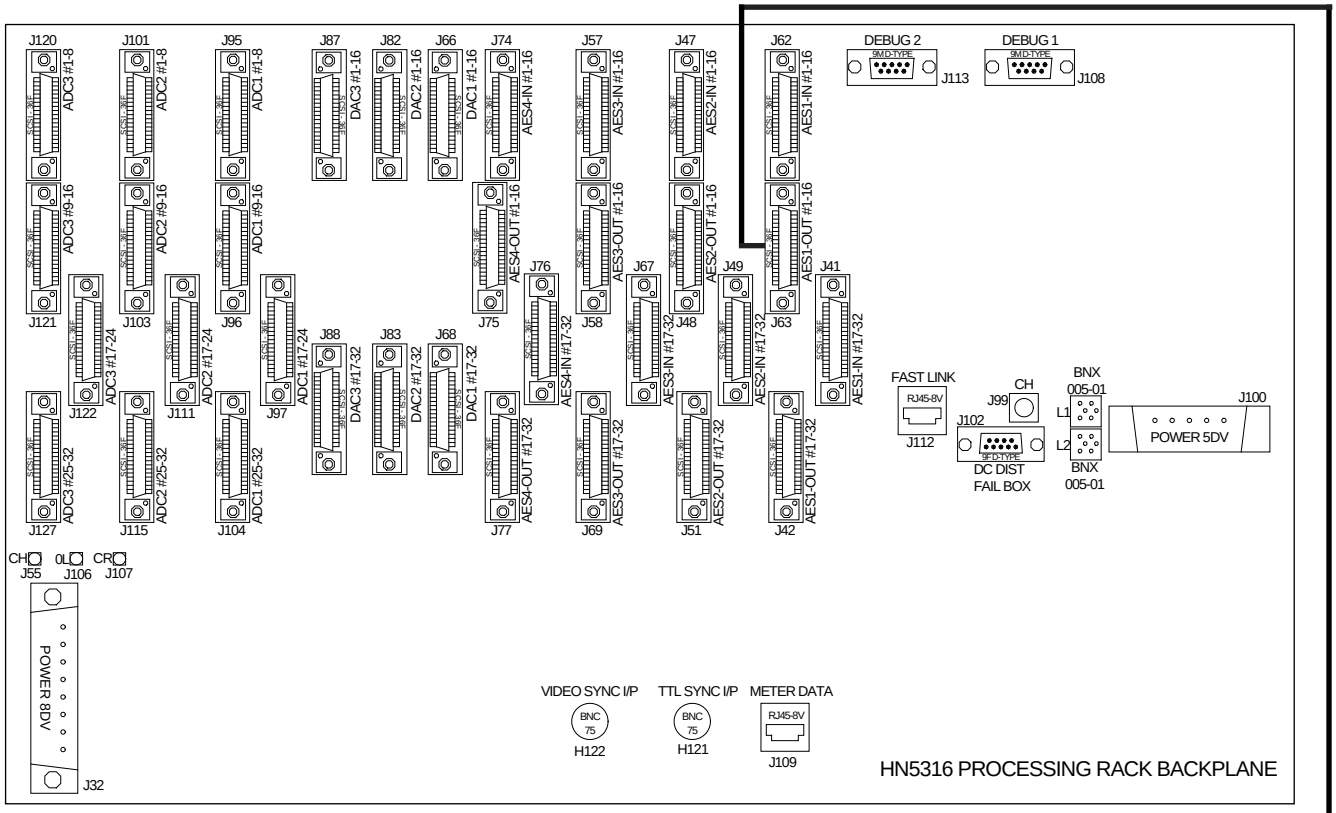
AES OUTPUTS – XLR

Each AES I/O card in the Processing rack provides 32 AES inputs and 32 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 are connected to XLR interface panels via SCSI-style cabling. For clarity, just the connections from the first 16 outputs on AES card 1 to an interface panel are shown here.

Each XLR interface panel can interface 16 AES outputs. Therefore if all AES outputs are used, 8 XLR interface panels would be needed.

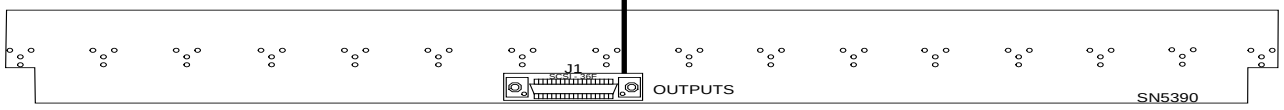
The XLR Interface panels must be located within 3m (9.8ft) of the rack.



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

On 3 pin XLR:
Pin 1 is Chassis Connections
Pin 2 is HOT (PHASE)
Pin 3 is COLD (ANTI-PHASE)

XLR OUTPUT I/F PANEL (REAR)



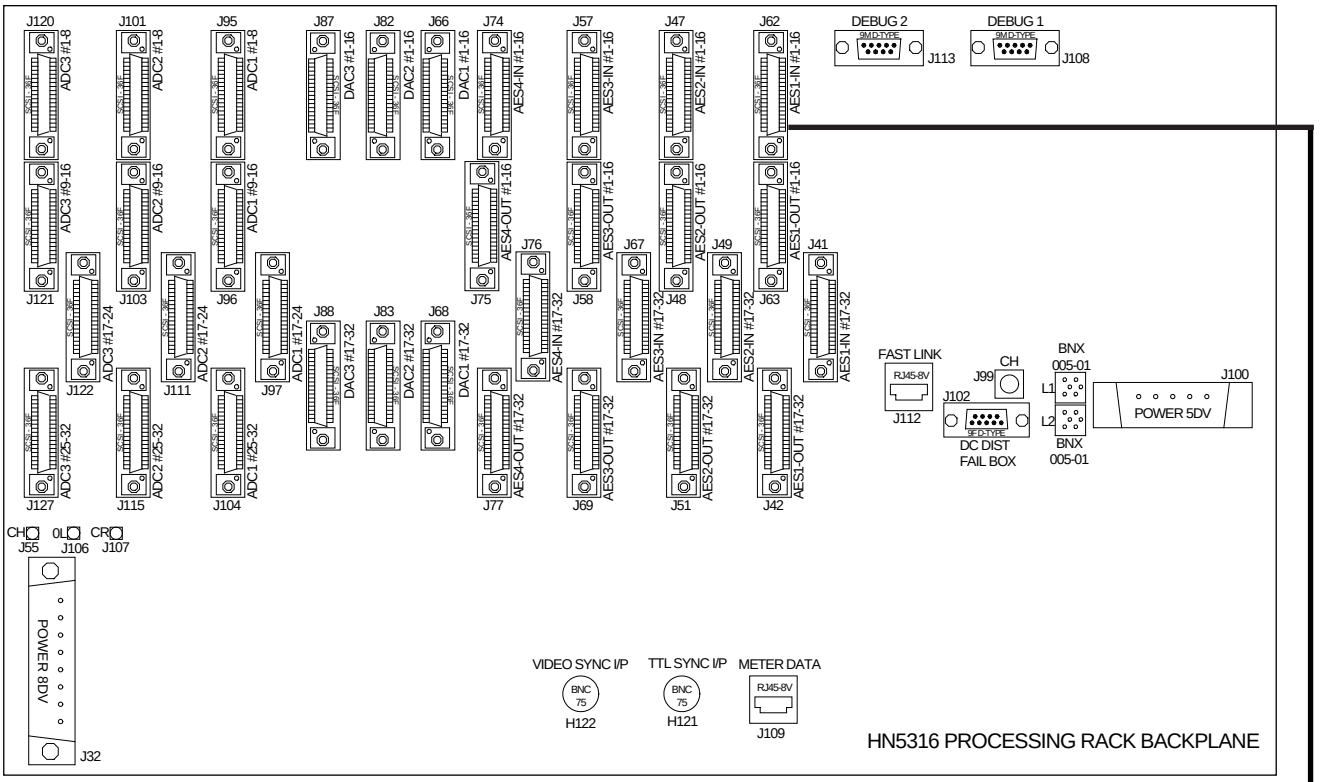
AES INPUTS – EDAC/ELCO

Each AES I/O card in the Processing rack provides 32 AES inputs and 32 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 AES inputs are connected to an 8 way EDAC/ELCO interface panel via SCSI-style cabling. For clarity, connections from the first 16 AES inputs on AES card 1 to an EDAC/ELCO connector on the interface panel are shown here.

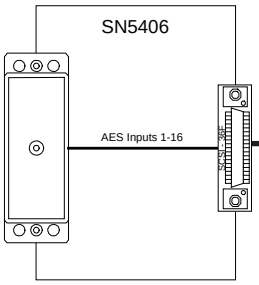
Each connector on the panel can interface 16 AES inputs. Therefore if all AES inputs are used, all 8 connectors on the panel would be needed.

The EDAC/ELCO Interface panels must be located within 3m (9.8ft) of the rack.



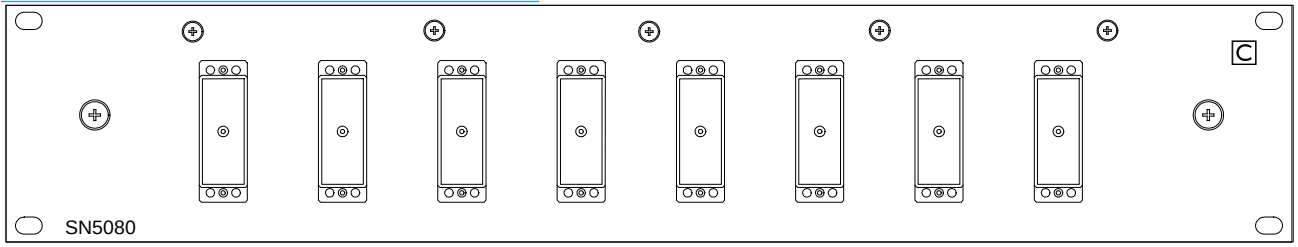
Via SN5406 SCSI to 38W EDAC/ELCO converter card - Rear of Interface Panel

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

8 WAY EDAC/ELCO INTERFACE PANEL



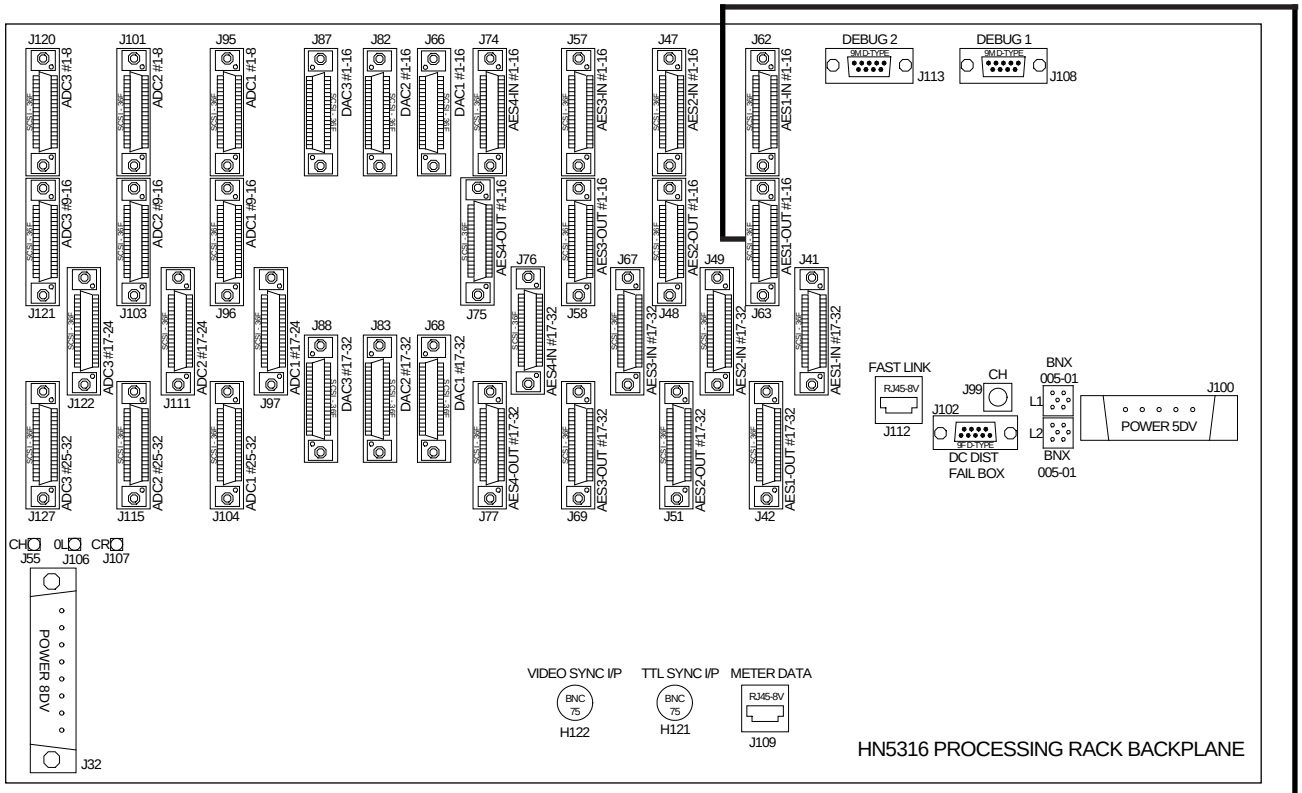
AES OUTPUTS - EDAC/ELCO

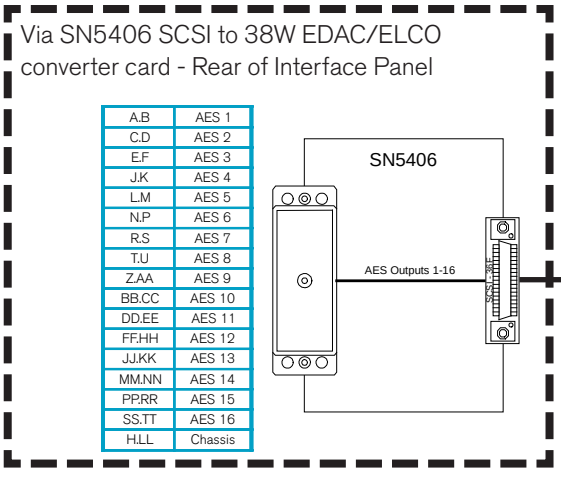
Each AES I/O card in the Processing rack provides 32 AES inputs and 32 AES outputs. Each slot has dedicated input and output connectors on the rear of the rack, to which the system's AES inputs and outputs are connected.

The diagram below shows how the AES output connectors are connected to XLR interface panels via SCSI-style cabling. For clarity, just the connections from the first 16 outputs on AES card 1 to an EDAC/ELCO connector on the interface panel are shown here.

Each EDAC/ELCO connector on the panel can interface 16 AES outputs. Therefore if all AES outputs are used, all 8 connectors on the panel would be needed.

The EDAC/ELCO interface panels must be located within 3m (9.8ft) of the rack.





A.B	AES 1
C.D	AES 2
E.F	AES 3
J.K	AES 4
L.M	AES 5
N.P	AES 6
R.S	AES 7
T.U	AES 8
Z.AA	AES 9
BB.CC	AES 10
DD.EE	AES 11
FF.HH	AES 12
JJ.KK	AES 13
MM.NN	AES 14
PP.RR	AES 15
SS.TT	AES 16
H.LL	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
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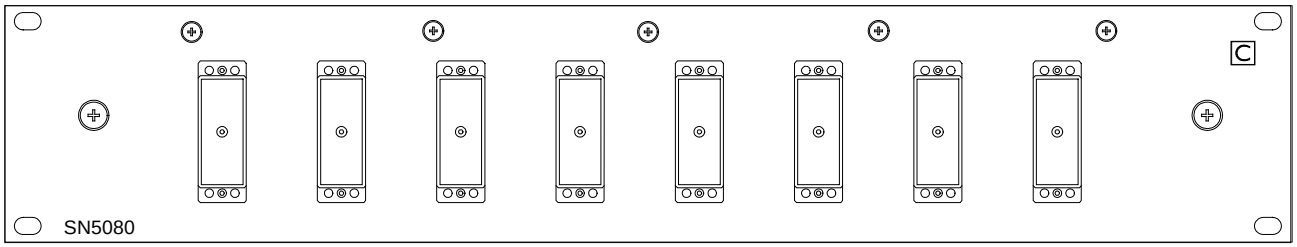
11 . 29	10
12 . 30	11
13 . 31	12
14 . 32	13
15 . 33	14
16 . 34	15
17 . 35	16
18 . 36	Chassis

8 WAY EDAC/ELCO INTERFACE PANEL

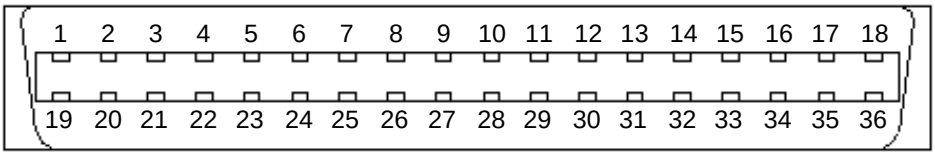


SPECIFICATION FOR MDR CABLES

Although frequently referred to as 'SCSI style' cables, it is important to be aware the correct term for these plugs is an 'MDR' connector.

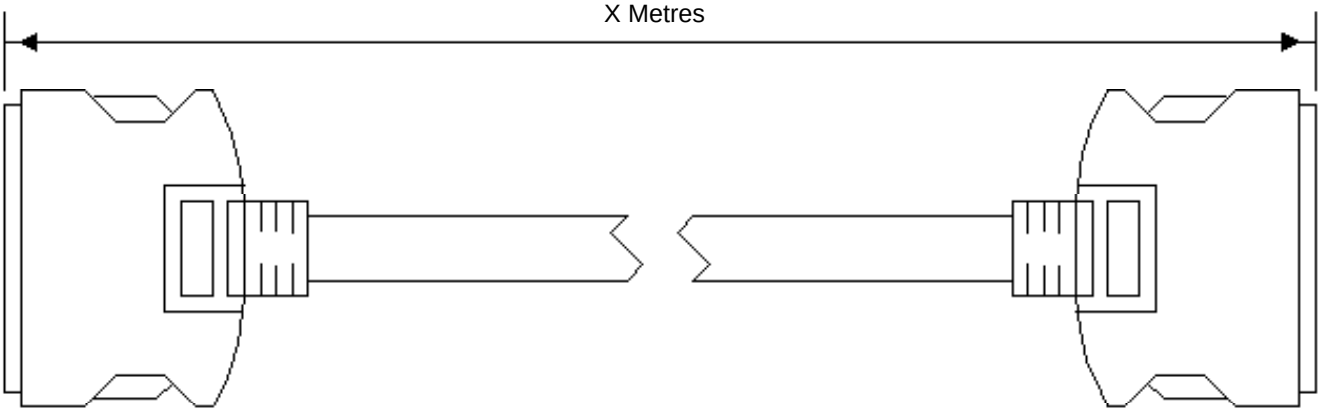
FRONT VIEW OF MATING CONNECTOR

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



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

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(926-082 Iss. 13)