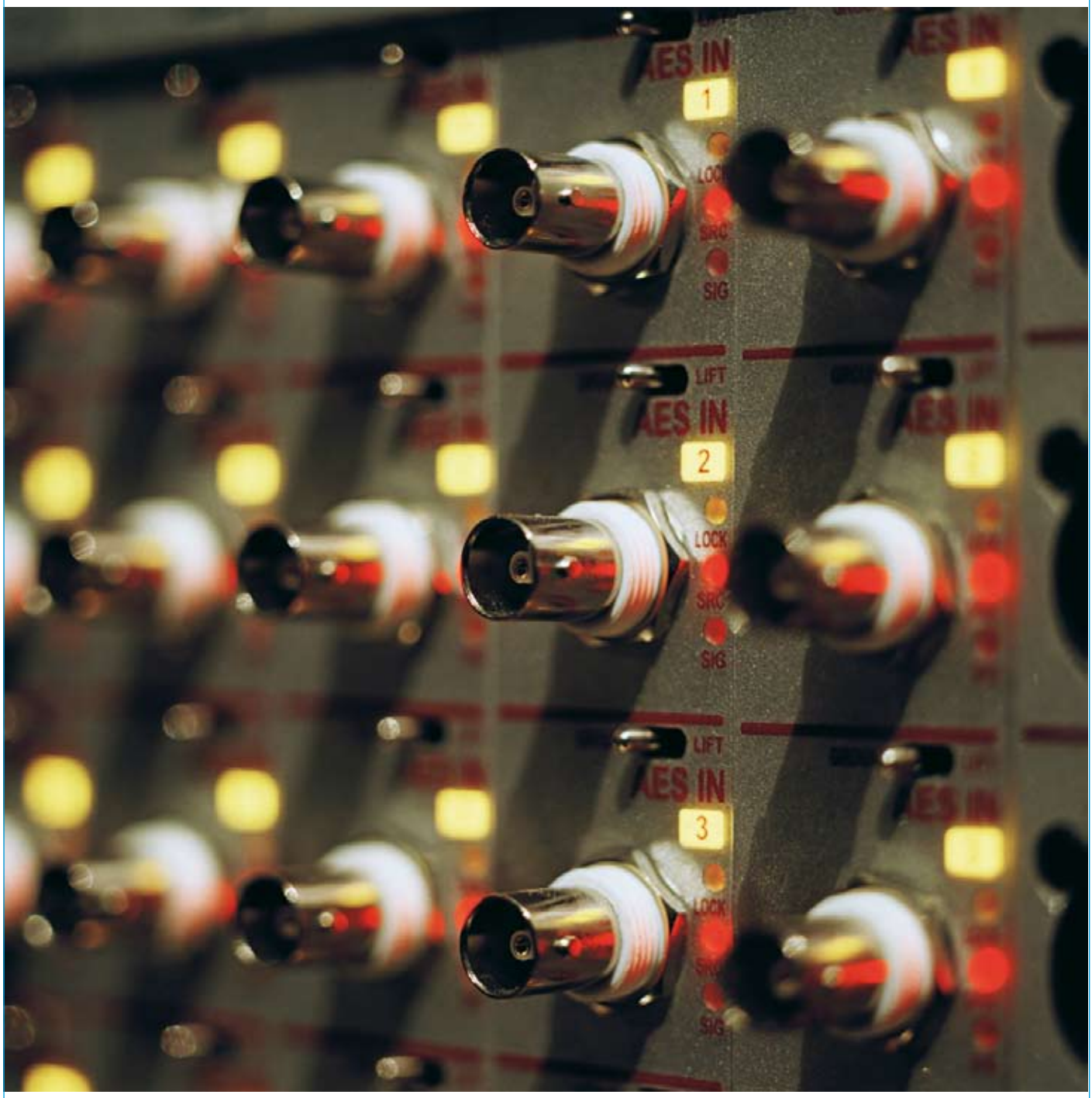
HYDRA TECHNICAL SPECIFICATIONS



Gigabit Ethernet Networking

CALREC

Putting Sound in the Picture

calrec.com

Calrec Audio Ltd
Nutclough Mill
Hebden Bridge
West Yorkshire
England UK
HX7 8EZ

Tel +44 (0)1422 842159
Fax +44 (0)1422 845244
Email Enquiries@calrec.com

HYDRA
CONTENTS

CONTENTS

INTRODUCTION

The Hydra Audio Networking system provides a powerful network for sharing of I/O resources and control data between Calrec digital mixing consoles.

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 system is designed for use in television and radio production studios and outside broadcast vehicles where the devices connected to the network may be fixed or variable.

Gigabit Ethernet fabric is used as it is by far the highest speed network fabric commonly available and offers a clear evolutionary path. Very high bandwidth and scalable, flexible architecture allows the networking system to be tailored precisely to the requirements of each installation.

The Hydra Audio Networking system is highly-reliable because of its use of proven technology and scope for 100% redundancy. Control of the network is remarkably user-friendly, as it is a natural and logical extension of the console's existing operational screens.

Calrec has a world-wide customer base which includes many of the world's most prestigious broadcasters. By consistently focusing upon purely broadcast systems, Calrec offers products with the most comprehensive combination of performance and features available. The high level of reliability of all Calrec products, many of which are still in daily use after 20 years service, reflects a clear awareness of the critical nature of the operating environment.

This understanding of the real issues of broadcast operations is one of the many reasons why operators and management alike prefer Calrec. The Hydra Audio Networking system is designed to ensure this level of confidence will continue in the digital era.

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

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

HYDRA
OVERVIEW

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

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

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

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

Hardware

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

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

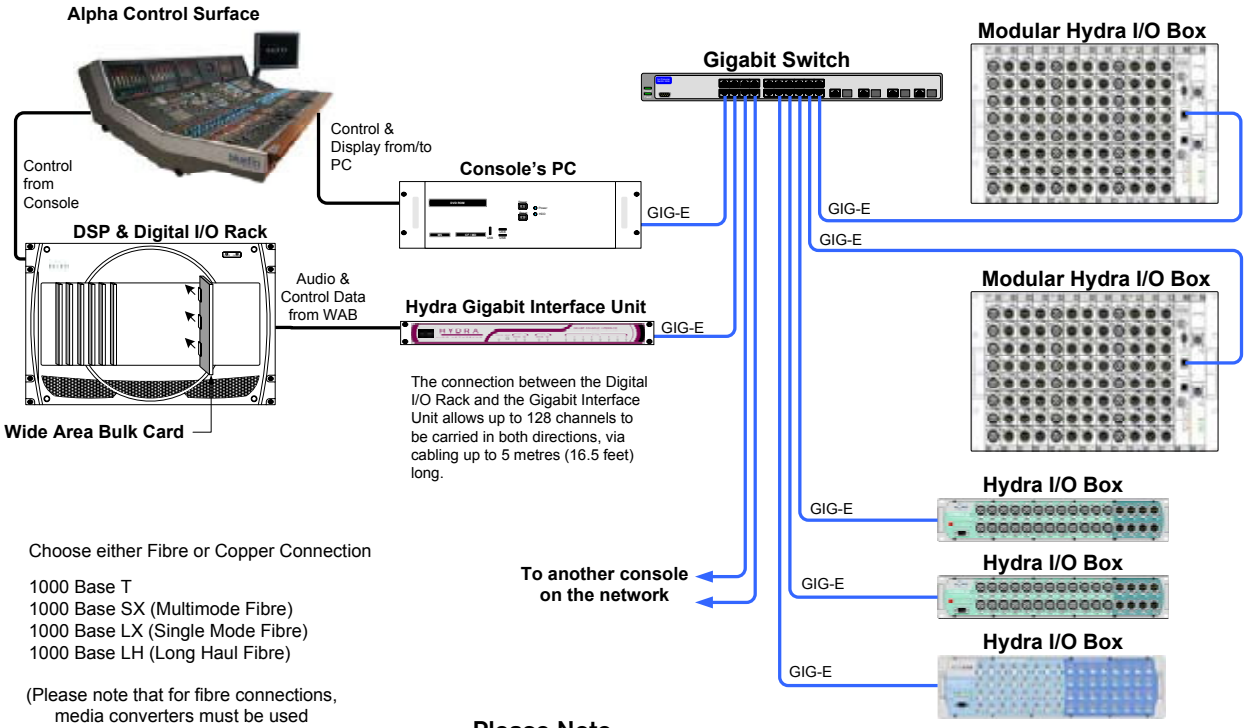
Network Editor

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

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

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

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



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

Choose either Fibre or Copper Connection

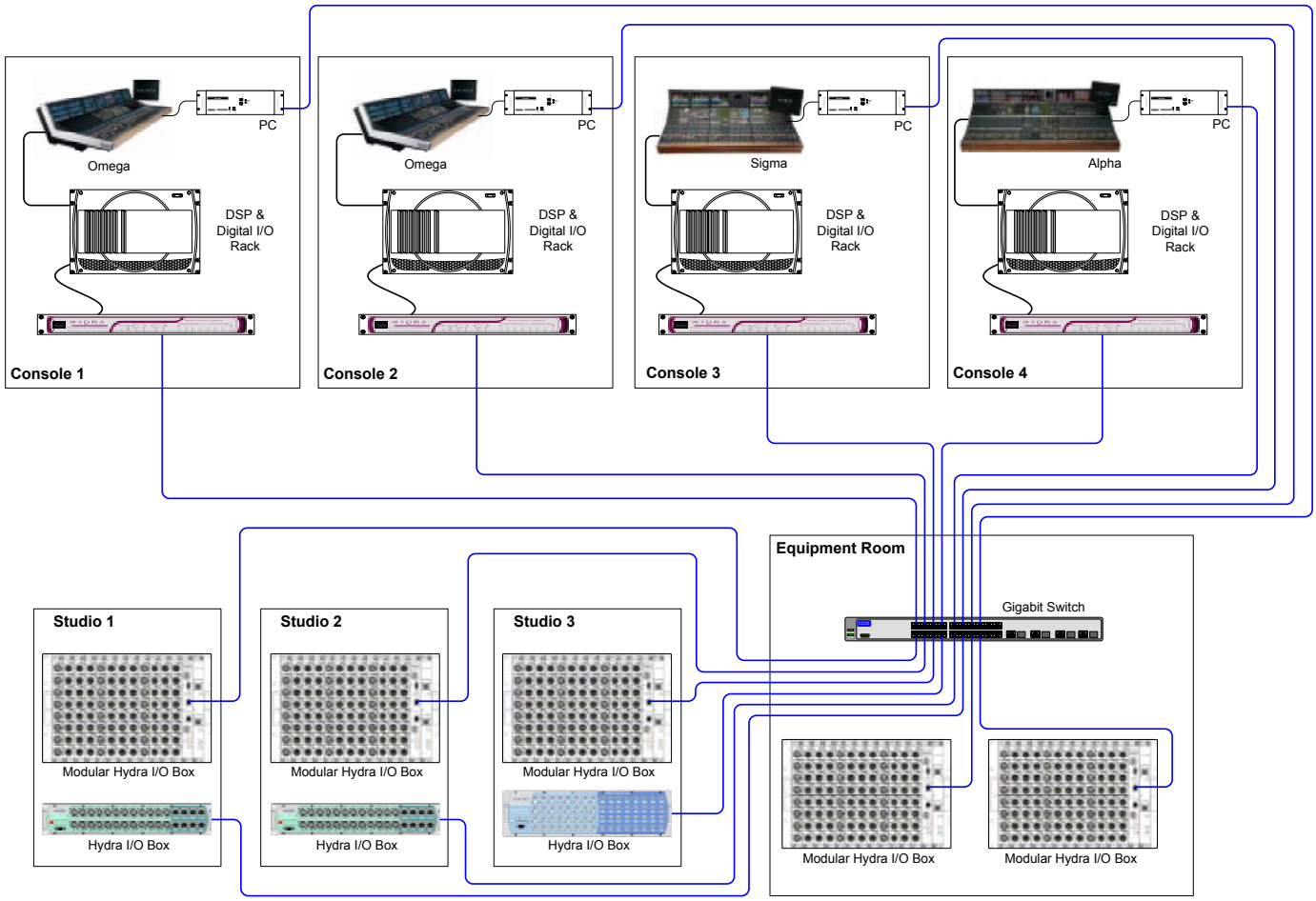
1000 Base T
1000 Base SX (Multimode Fibre)
1000 Base LX (Single Mode Fibre)
1000 Base LH (Long Haul Fibre)

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

Please Note

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

TYPICAL NETWORK EXAMPLE



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

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

Synchronisation

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

Private Network

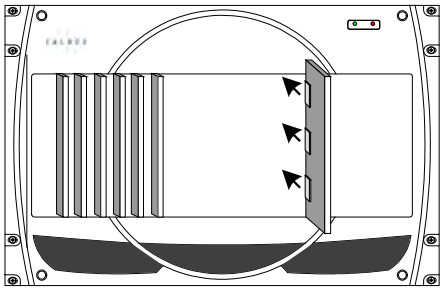
In order to guarantee fully deterministic performance, it is necessary to apply the restriction that the network must be kept private. This means that it must not be made to carry any data other than that generated by the audio network.

Local I/O

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

CONSOLE HARDWARE

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

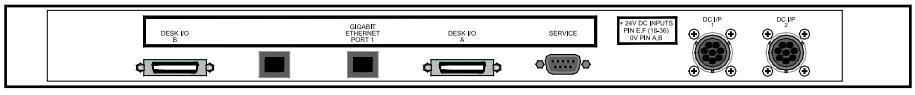
IP Addresses
Calrec will supply each device in your system (including the console) with its own unique IP address, which the system uses to identify each network connection. Where a device has two ports, each will have a unique IP address. The 4th byte is unique to the device.

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.

FRONT

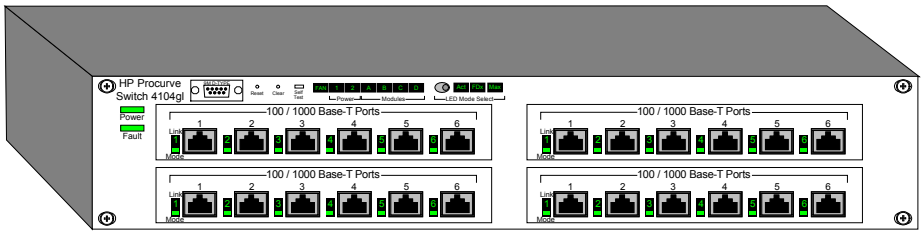
REAR



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

GIGABIT SWITCH

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



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

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

HP® ProCurve Switches

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

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

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

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

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

The switches we recommend are as follows:

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

HP GBIC Connectors

Please ensure that your switch uses genuine HP GBIC connectors.

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

HP ProCurve Switch Warranty Support

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

Redundant Power

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

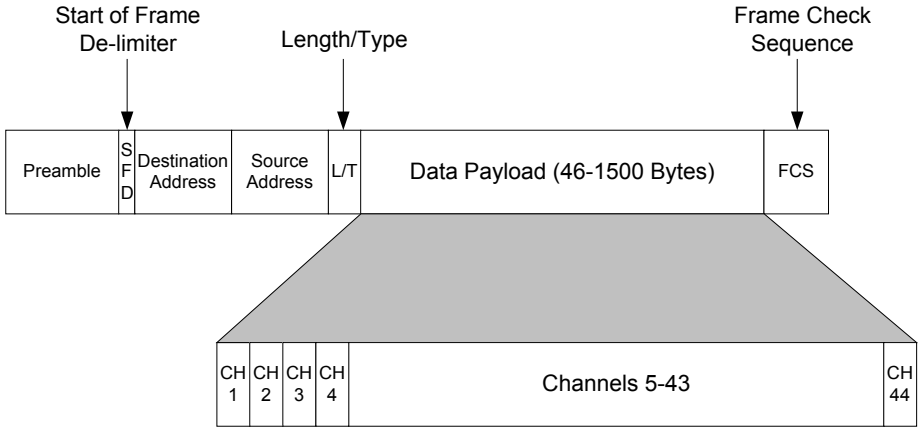
Booting

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

PACKETS AND LATENCY

Packetization
In any scheme for moving digital audio over a packet-based network, some amount of audio data has to be packed into a frame, transmitted and then unpacked into its original form.

To make best use of the bandwidth, the ratio of payload data to header data is maximised by abandoning much of the protocol baggage of standard networks, making available the largest possible payload of 1500 bytes.



Groups of signals for the same destination are routed together, rather than individually. Therefore, multiple audio signals can be grouped into the same packet, maximising the payload data and minimising latency.

The Hydra network uses a variable frame size into which are packed eight 32-bit samples of anything from 1 to 44 audio channels, depending on network demand. It follows that it should be possible for a single Gigabit ethernet connection to transport in excess of 600 channels of 48kHz digital audio.

In practise, a somewhat lower maximum load is prudent, to allow for some non-audio communication. The Hydra network can successfully manage loads of 585 audio channels, in the presence of heavy control (non-audio) traffic.

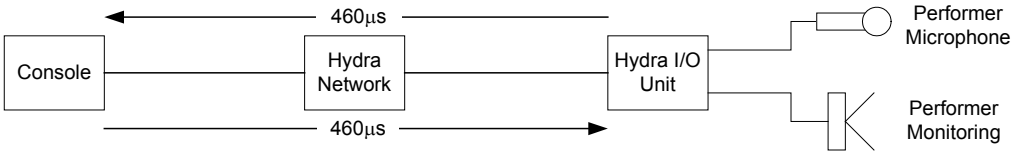
If an audio signal is to be sent to two destinations, then two frames will be created.

Latency
Low network latency is crucial, especially where a performer is listening to a mix which includes their own contribution. The network latency across the Hydra network is equal to two lots of frame buffering delays, one at the transmitting end and one at the receiving end, amounting to 360µs.

In addition to this, delays from the network interface circuit to the console audio backplane must be taken into consideration. Experimental measurements have shown the total latency from a Hydra I/O box to a console to be around 460µs.

In the case shown below, the signal makes two trips across the network, one from the Hydra I/O box to the console, and one from the console to the Hydra I/O box as part of a foldback mix. The net additional delay will be less than 1ms.

This means that including the latency incurred through analog-to-digital and digital to analog conversion, a signal will typically take less than 4ms to travel across the network.



HYDRA
I/O BOXES

CALREC

calrec.com

Putting Sound in the Picture

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:

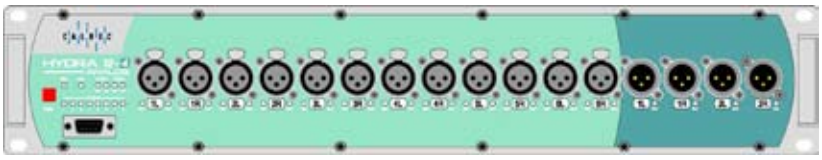
- 12 mic/line inputs and 4 line outputs (XLR)
- 24 mic/line inputs and 8 line outputs (XLR)
- 48 mic/line inputs and 16 line outputs (XLR)
- 32 AES inputs and 32 AES outputs (BNC)
- 4 SDI inputs with 'thru' connectors (rear panel connections)

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.

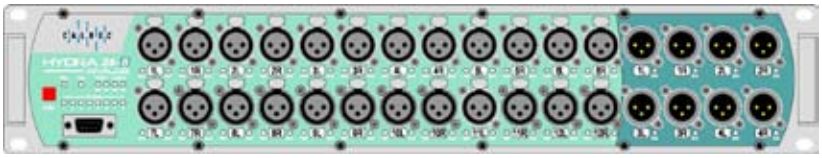
All external connections to the units are hot pluggable. If more than one media type is detected, the system will switch to fiber as its connection.

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.

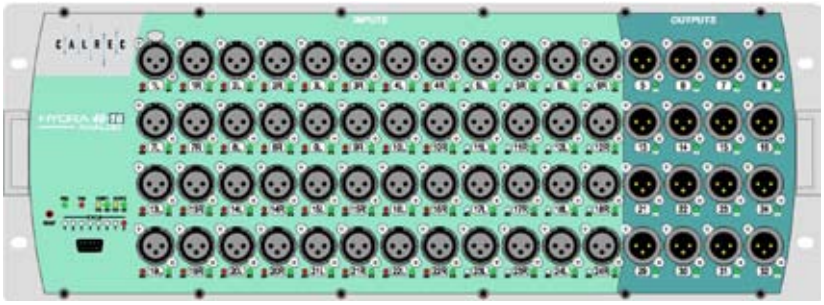
12 MIC/LINE IN & 4 LINE OUT (AD5608)



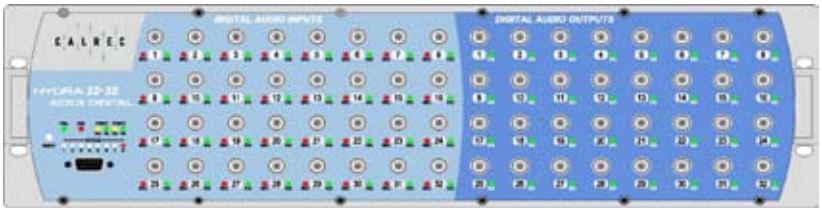
24 MIC/LINE IN & 8 LINE OUT (AD5603)



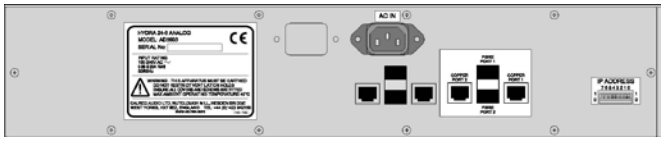
48 MIC/LINE IN & 16 LINE OUT (AD5600)



32 AES IN & 32 AES OUT (JB5607)



REAR CONNECTORS (SIMILAR FOR ABOVE UNITS)



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

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

Calrec SDI boxes come in two different versions one for use with HD (high definition video) and the other for SD (standard definition).

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.

Although Zeta consoles can be part of a network that includes SDI boxes, SDI signals can only be patched to the inputs of consoles with Bluefin DSP systems or desks running 1.36 or later software.

4 SDI IN & PASS THROUGH (VI5672)

4 SDI IN & PASS THROUGH (VI5672)

DIMENSIONS & WEIGHTS

Unit	Height	Width		Approx depth (incl. mating cons)		Approx weight		Input Power Rating
		inches	mm	inches	mm	lbs	kgs	
AD5603 24 mic/line in & 8 line out - XLR	2U	19	483	12	300	12.5	5.7	100-240V AC ~ 0.58-0.30A RMS 50/60Hz
AD5608 12 mic/line in & 4 line out - XLR	2U	19	483	12	300	11.5	5.2	100-240V AC ~ 0.42-0.23A RMS 50/60Hz
AD5600 48 mic/line in & 16 line out - XLR	4U	19	483	12	300	16.1	7.3	100-240V AC ~ 1.0-0.48A RMS 50/60Hz
JB5607 32 AES in & 32 AES out - BNC	3U	19	483	12	300	12	5.8	100-240V AC ~ 0.38-0.20A RMS 50/60Hz
VI5672 4 SDI in and through (rear connectors)	2U	19	483	12	300	13.9	6.3	100-240V AC ~ 50/60Hz

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.

IP Addresses

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

Primary Port 192.168.0.050
Secondary Port 192.168.0.150

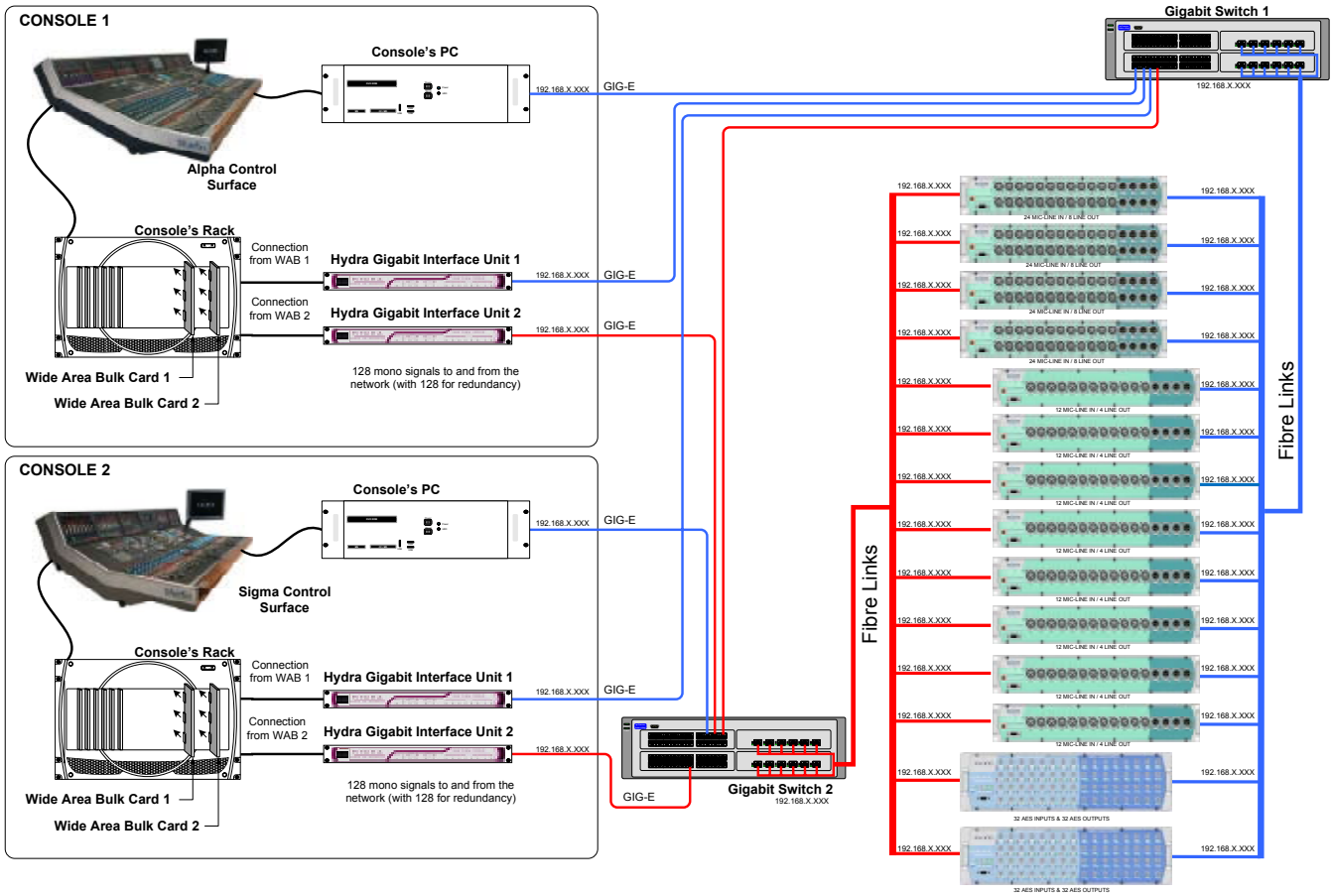
In an installation, the first 3 bytes (shown in red) are fixed. The 4th byte or least significant byte is the part of the address which is unique to that port on the device.

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

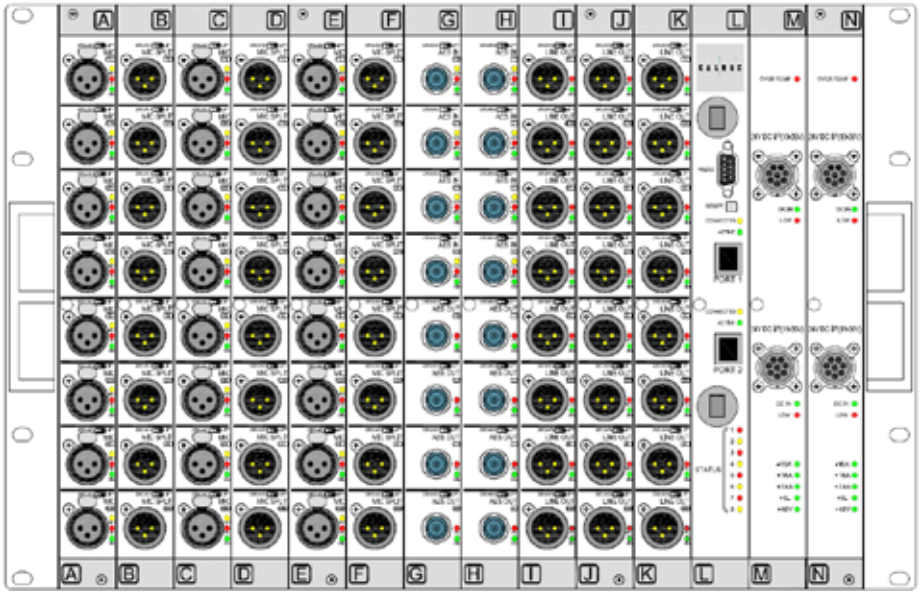
If a Hydra I/O box needs to be swapped out, the replacement unit must be programmed with the correct IP address. The 8 way switch on the rear of the unit allows the least significant byte of the IP address of the primary port to be set in binary.

Surround Signals

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



MODULAR I/O BOXES



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

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

MODULE OPTIONS

Mic/Line ADC Module (AD5090)

This module provides either 4 stereo mic/line or 8 mono mic/line circuits. There are 8 XLR-3 pin sockets (female) on the front of the module.

To maintain compatibility with AES inputs and the displays on the console, labels are 1L, 1R, 2L through to 4R running down the module which are back lit.

Input Gain, Impedance and Phantom Power are controlled from any console on the network which has ownership of the input.

Input Gain is adjustable from -18dB to +78dB in 0.2dB steps. Impedance switches from line to mic above 18, 20, 22 or 24dB of gain, selectable on the console screens.

Status LEDs

Adjacent to each connector are three LEDs which are:

YELLOW = 48V - Phantom power.
RED = PEAK - Signal within 3dB of clipping.
GREEN = SIG - Signal present.

Mic/Line Splitter Module (LN5230)

This module provides 8 split outputs which are at the same level as the mic/line input being split. This module must be situated adjacent to the right hand side of the mic/line input module that it is splitting. If extra splits are required of the mic/line input more splitter modules can be placed to the right of the first splitter, up to a maximum of 11 splitter units.

The front panel has eight XLR 3 pin plugs (male).

To maintain compatibility with the mic/line input module, labels are 1L, 1R, 2L through to 4R running down the module which are back lit.

The splitter outputs can drive a level of +27dBu into 10kΩ, and +25dBu into 1kΩ. Output impedance is 200Ω and the minimum load is 1kΩ.

This module is protected against being accidentally plugged into a phantom powered input.

For AES I/O, two module options are available, both provide 4 AES inputs and 4 AES outputs.

AES BNC Input/Output Module (JB5340)

This module has eight 75Ω BNC insulated sockets (female) down the front panel for inputs 1-4, followed by outputs 1-4.

AES XLR Input/Output Module (JX5341)

This module has 8 XLR 3 pin sockets down the front panel. Inputs 1-4 are XLR 3 pin sockets (female), followed by outputs 1-4, which are XLR 3 pin plugs (male).

Labels

Labels are AES IN 1-4, AES OUT 1-4 running down the module which are backlit.

Sample Rate Conversion

Each input has a sample rate converter. It is switched in and out by any console on the network which has ownership of the input.

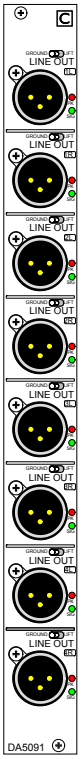
Status LEDs

Adjacent to each input connector are three LEDs:

YELLOW = LOCK - Signal locked.
RED = SRC -Sample Rate Converter in circuit.
GREEN = SIG - Audio content present.

Adjacent to each output connector are two LEDs:

RED = PEAK - High level audio content.
GREEN = SIG - Audio content present.



Line Output Module (DA5091)

This module provides either 4 stereo or 8 mono output circuits. There are 8 XLR-3 pin plugs (male) on the front of the module.

To maintain compatibility with AES outputs and the displays on the console, labels are 1L, 1R, 2L through to 4R running down the module which are back lit.

Status LEDs

Adjacent to each connector are two LEDs which are:

RED = PEAK - Signal within 3dB of clipping.
GREEN = SIG - Signal present.

DC Power Supply Module (ZN5231)

This module is the primary DC power supply for the modular Hydra I/O box.

This unit has two input connectors, which offer partial redundancy. However for full redundancy and greater security, a second DC power supply unit would be fitted into the rack adjacent to the primary DC power supply unit and an input connection wired to each module.

There are two DC input connectors on the module front panel which are 8 way plugs (male) with 4 contacts fitted in each connector. The power inputs are isolated from ground and internal “OR-ing” diodes are fitted.

This module is designed to function with voltages in the range of 18 to 36 volts. Any input(s) can be powered externally from a battery source, possibly as a back up feed.

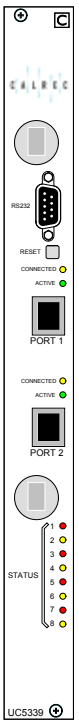
Status LEDs

The LEDs shown adjacent to each input connector are:

GREEN = DC IN - DC input power present, not necessarily within the required 18-36V range.
RED = LOW - Indicates an input voltage of 20V or below (flashing).

The other LEDs shown are:

RED = OVER TEMP - Indicates when internal box temperature has reached >60°C (140°F) (flashing).
GREEN = -16A Power output present.
GREEN = +16A Power output present.
GREEN = +5A Power output present.
GREEN = +5L Power output present.
GREEN = +48V Power output present.



Processor Module with Copper Interface (UC5339)

This module is the network interface and processing unit within the modular Hydra I/O box.

The RS232 connector is a 9-way D-type plug (male). This is a computer connection port to allow box identification and programming.

A recessed RESET switch is located below the RS232 connector.

The RJ45 connector sockets are used for the networking connections. There are two on the front panel. This allows one for the main primary connection and a secondary for a back up connection via a second Gigabit switch.

The RJ45 connectors are 8 contact, modular single port jacks with integrated 1000 Base T magnetics, side-entry with full shielding.

Please Note

As connections to the modular Hydra I/O box are copper interfaces, when using fiber cabling, it is necessary for media converters to be used between it and the Gigabit switch.

Status LEDs

The LEDs shown adjacent to each network connector are:

YELLOW = CONNECTED - Indicates a valid connection.
YELLOW = ACTIVE - Indicates bi-directional data being passed.

Status LEDs 1-8 are for diagnostic purposes & have no operational function.

Address Labels

IP address and friendly name labels for both of the network connections will be located on the box rack angle label holders.

MODULAR BOX PSUS

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

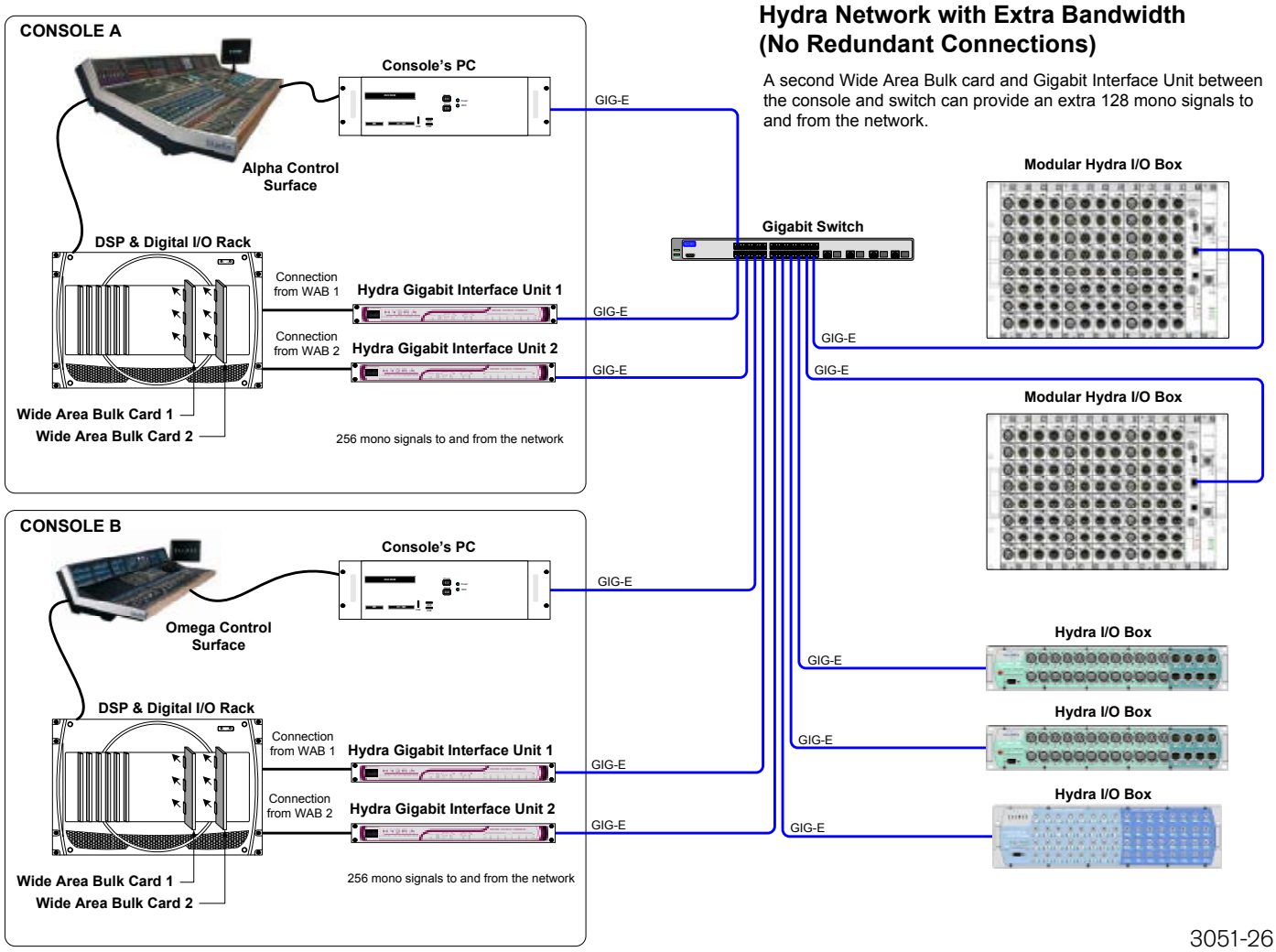
Unit	Height	Width		Approx depth (incl. mating cons)		Approx weight	
		inches	mm	inches	mm	lbs	kgs
Modular Hydra I/O Box (Fully Populated)	7U	19	483	12	300	35.2	16
Optional Rack Mounted PSU (with 2 plug-in units)	2U	19	483	12	300	15.6	7.1
Optional Rack Mounted PSU (with 4 plug-in units)	2U	19	483	12	300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

HYDRA
SYSTEM IMPLEMENTATION

CALREC

Putting Sound in the Picture

INCREASED BANDWIDTH



Hydra Network with Extra Bandwidth (No Redundant Connections)

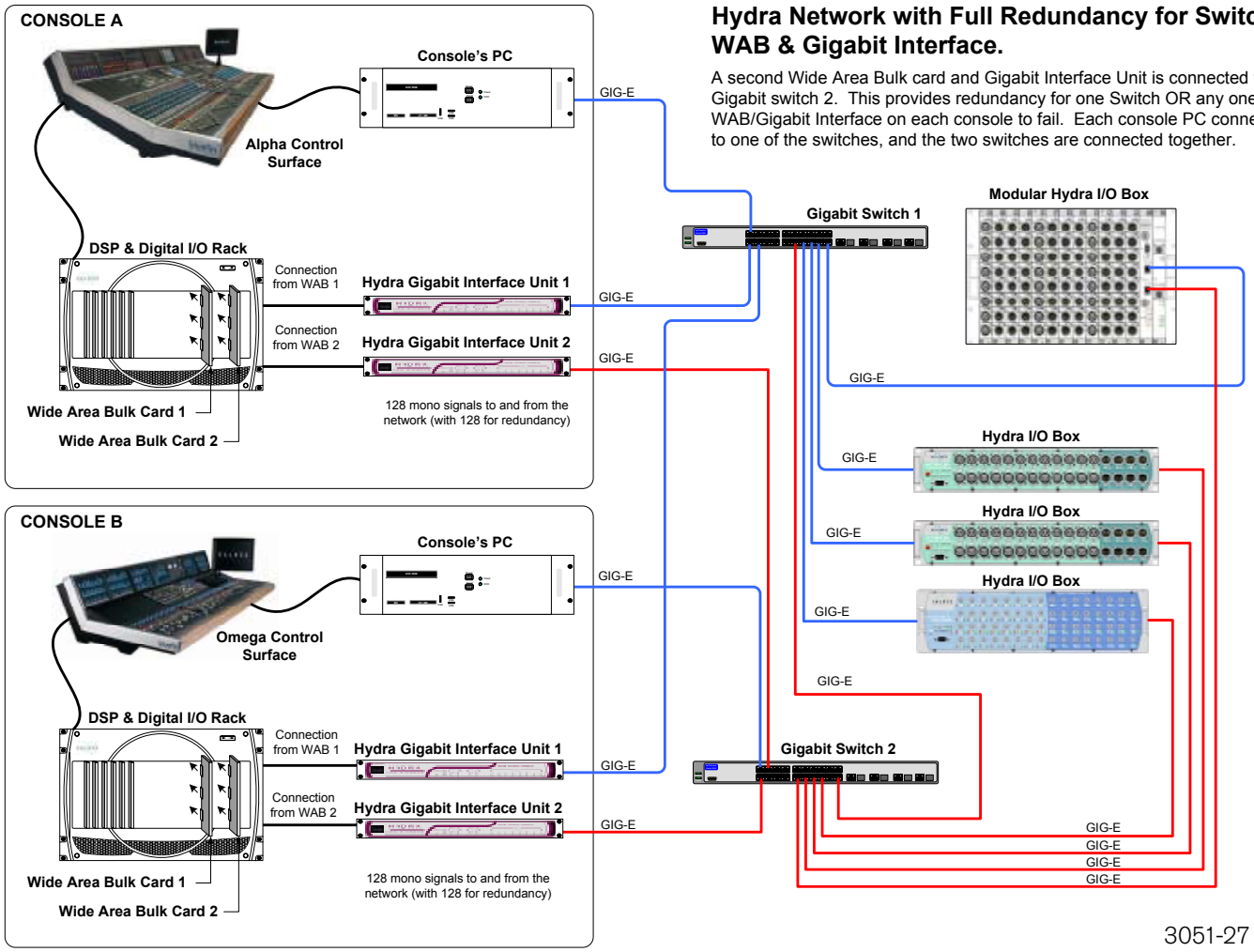
A second Wide Area Bulk card and Gigabit Interface Unit between the console and switch can provide an extra 128 mono signals to and from the network.

3051-26

Each WAB and Gigabit interface provides 128 mono audio paths to and from the network. Increasing the number of WAB/Gigabit interfaces will increase the bandwidth your system can support.

Alpha and Sigma systems can have up to 8 WAB/Gigabit interfaces; Omega and Zeta systems can have up to 3. Each WAB/Gigabit interface has its own connection to the Gigabit switch.

NETWORK REDUNDANCY



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

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

3051-27

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

Redundant Hardware

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

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

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

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

Automatic Fault Detection

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

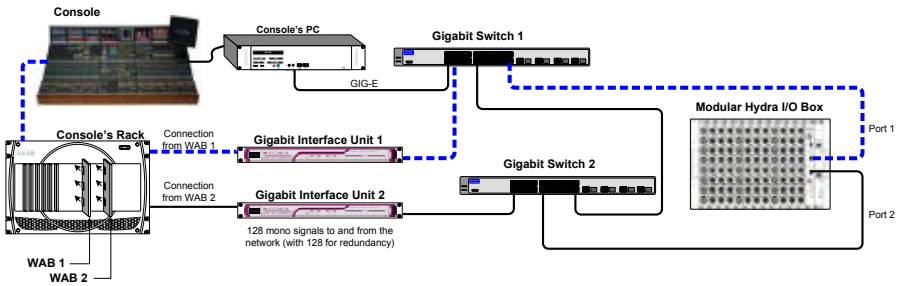
When two device echo responses have been missed, the network connection to that port is assumed to have failed. A message report to the console will inform the user that a Gigabit port on a Hydra I/O box is no longer available.

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

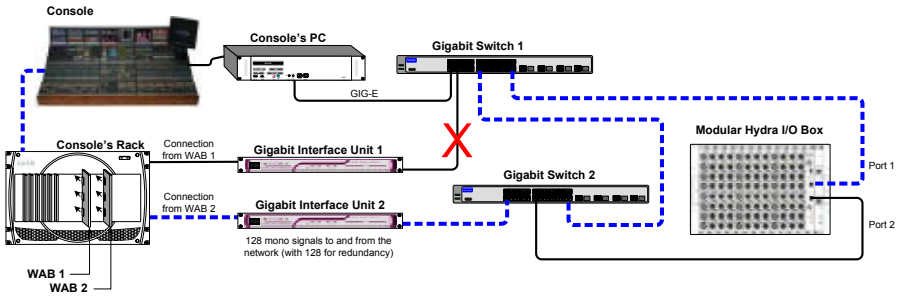
Automatic Re-routing

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

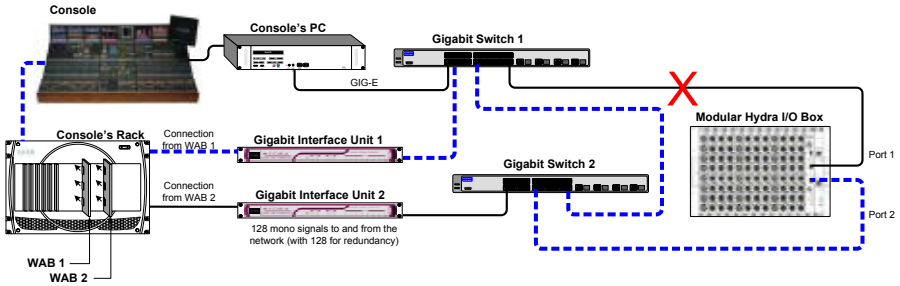
Example 1 - Normal Operation
The dotted lines show an example of the passage of audio and control data between the console and a modular Hydra I/O box across the network via WAB/ Gigabit interface 1 and switch 1.



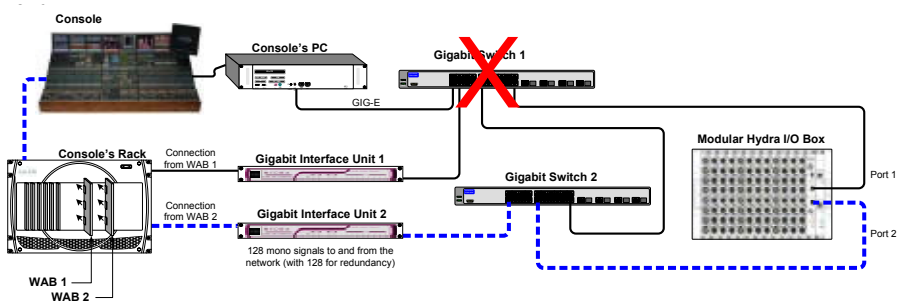
Example 2 - Loss of Connection between Gigabit Interface 1 and Gigabit Switch 1
In this example, the connection between the Gigabit interface unit and Gigabit switch 1 has been lost. The system re-routes the audio and control data to Gigabit switch 1 using Gigabit interface unit 2 and WAB 2, through Gigabit switch 2.



Example 3 - Loss of Connection to the Modular Hydra I/O box's Primary Port
In this example, the connection between Gigabit Switch 1 and the modular Hydra I/O box's port has been lost. The system re-routes the audio and control data through Gigabit Switch 2 to the modular Hydra I/O box's alternative port.

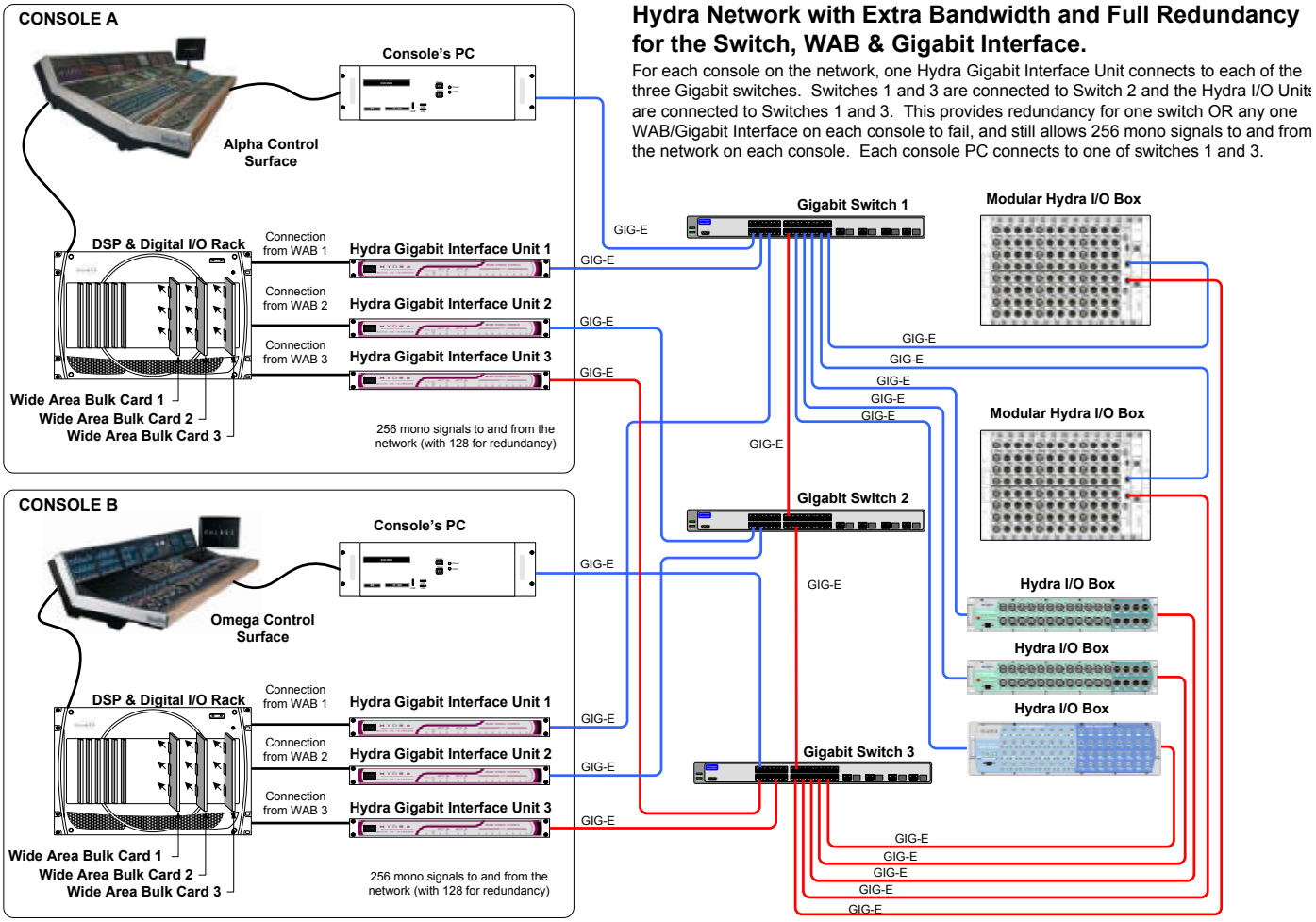


Example 4 - Loss of Gigabit Switch 1
If Gigabit switch 1 fails, the system re-routes the audio and control data using the second Gigabit interface unit and WAB, through Gigabit switch 2, to the modular Hydra I/O box's alternative port.



3051-29

EXTRA BANDWIDTH AND REDUNDANCY



Hydra Network with Extra Bandwidth and Full Redundancy for the Switch, WAB & Gigabit Interface.

For each console on the network, one Hydra Gigabit Interface Unit connects to each of the three Gigabit switches. Switches 1 and 3 are connected to Switch 2 and the Hydra I/O Units are connected to Switches 1 and 3. This provides redundancy for one switch OR any one WAB/Gigabit Interface on each console to fail, and still allows 256 mono signals to and from the network on each console. Each console PC connects to one of switches 1 and 3.

3051-28

This example shows a system where two consoles are each using two of their three WAB/Gigabit interfaces for bandwidth, with the third in each case being reserved as redundant hardware.

A third switch is added to the system and for each console, one WAB/Gigabit interface connects to each of the three switches.

This system provides redundancy for one Gigabit switch OR any one WAB/Gigabit interface to fail, and still allows 256 mono signals to and from the network on each console.

HYDRA
NETWORK CABLING

CALREC

Putting Sound in the Picture

calrec.com

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.

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.

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

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-enthusiastically tie wrapped etc..
- Chemicals which can eat through or 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.

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.

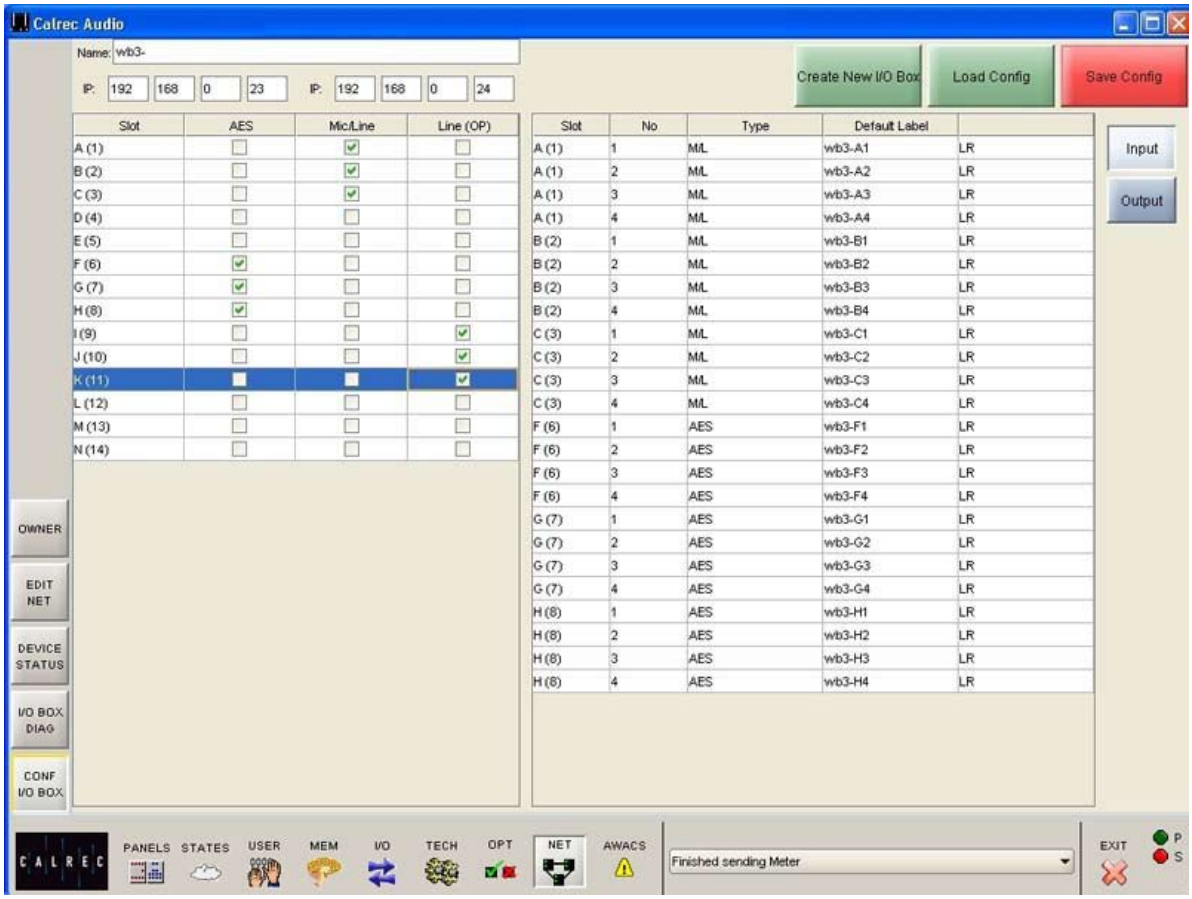
HYDRA
SETUP AND OPERATION

CALREC

calrec.com

Putting Sound in the Picture

MODULAR I/O BOX CONFIGURATION



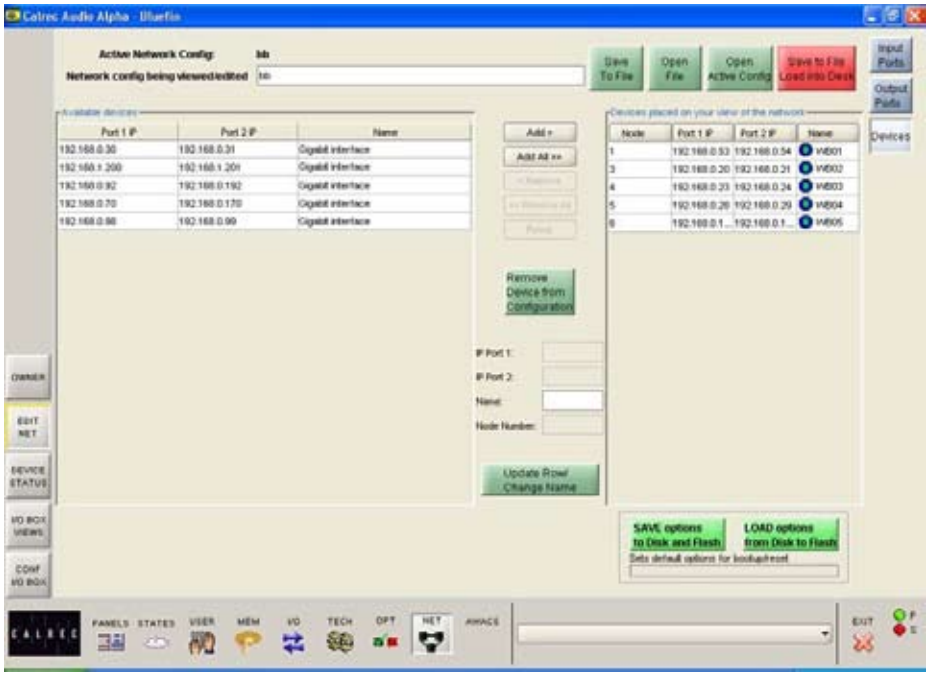
This screen allows the user to manually setup the type of input and output modules occupying each slot in a modular Hydra I/O box.

In some situations, it may be necessary to re-configure modular Hydra I/O boxes to meet the requirements of each program. This can be done offline, and the configurations can be saved and loaded when online again.

The Hydra input and output ports can be grouped into lists to make them easier to access either on the I/O patching screens or on the I/O port assignment controls on the control surface (if available). This is done using the Options - Port Lists screens

NETWORK CONFIGURATION

This screen allows the network to be configured.



The window on the left side of the screen shows the devices available to the console. These devices will have been loaded via the CONF I/O BOX screen. The window on the right side of the screen shows the devices the user selected for this session.

The Add and Remove buttons are used to add or remove devices to and from the session. The Remove and Remove All buttons are only available when the console is in Technician Mode. Once the required devices are added, the input and output lists may be setup using the EDIT NET-INPUT PORTS screen. Configurations can be saved and restored, to allow use on a job by job basis. This allows multiple setups to be configured offline, and stored for later use.

Saving Network Configurations

Changes to the network configuration will not take effect until "Save to File, Load Into Desk" is selected. Then, the changes become active and the configuration is saved to the hard disk. If any subsequent changes are made, the "Save to File, Load Into Desk" button will flash to indicate that the configuration on the screen does not match the active configuration.

Open File allows a previously saved configuration to be opened. When opened, the configuration will be loaded onto the screen, but will not take effect until "Save to File, Load Into Desk" is selected. The button flashes to indicate that the configuration on the screen is different to the active configuration. The console checks that the configuration is compatible with the system. If there are discrepancies, an "Error Showing Active Config" message will appear.

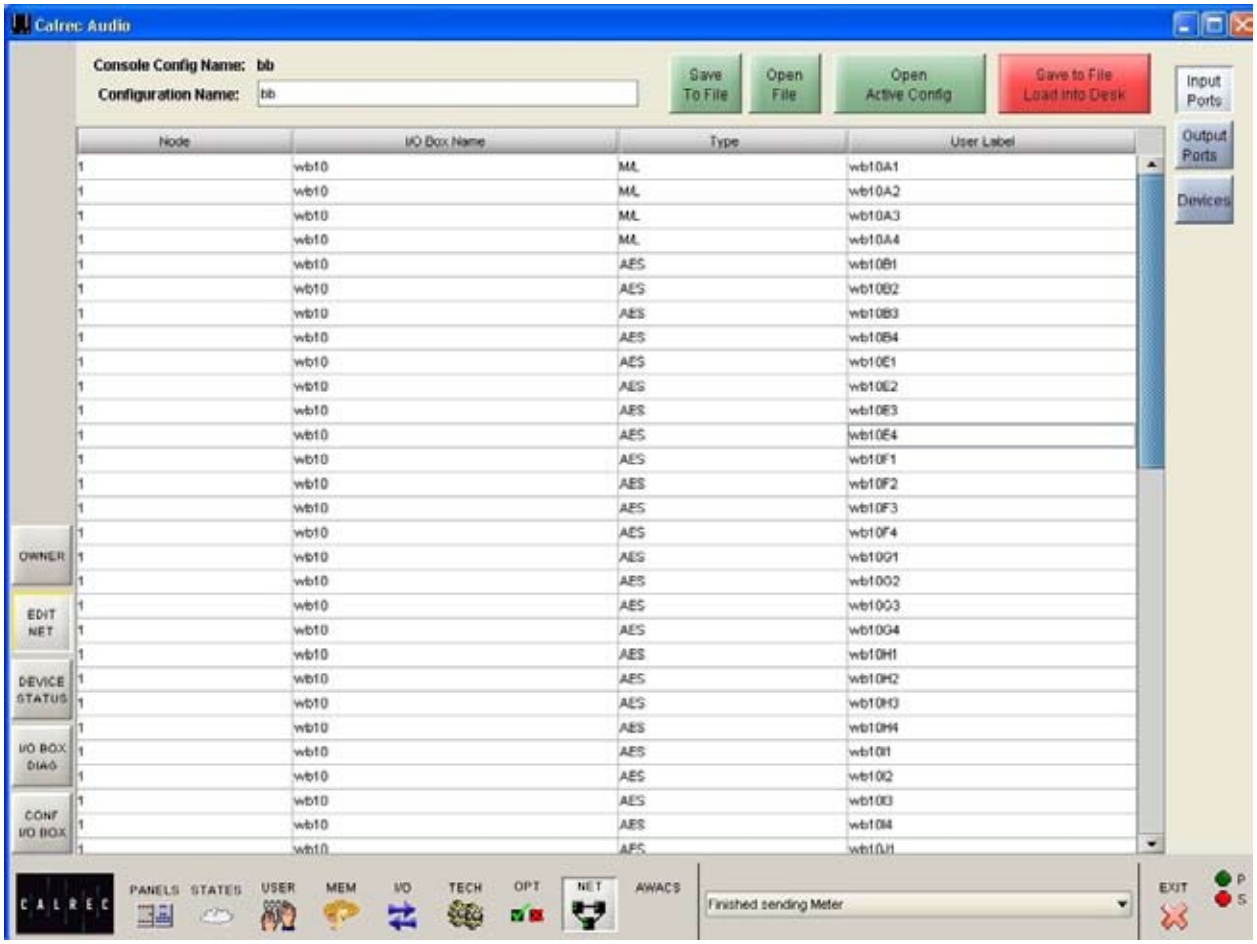
"Save to File" saves the configuration to the hard disk without loading it onto the console. "Open Active Config" retrieves the settings that the system is currently using and displays them on the screen, replacing the current configuration being viewed.

Options

Network configurations are not saved with the user memories, so it is important to save the options to disk and flash once the network is configured using the buttons at the bottom of the screen.

If they are not saved, the next time the desk boots up the console will revert to its previous settings, which could mean that a different network configuration is loaded. This could cause problems should the console have to be reset during a live broadcast. It does however allow changes to be tried out without losing the original settings and these original settings can be restored without having to re-boot the system.

I/O SOURCE LISTS



This screen allows the user to view the Hydra sources, their location and type. A similar screen is available to view the output ports.

Hydra ports are always treated as pairs. They can be used for two mono signals, a stereo signal, or as part of a surround signal. Hydra port labels consist of the 4 character unit name (user-defined) plus the module letter (A-N), plus the port number (1-4), plus L or R.

Please note that Hydra inputs cannot be patched to Hydra outputs.

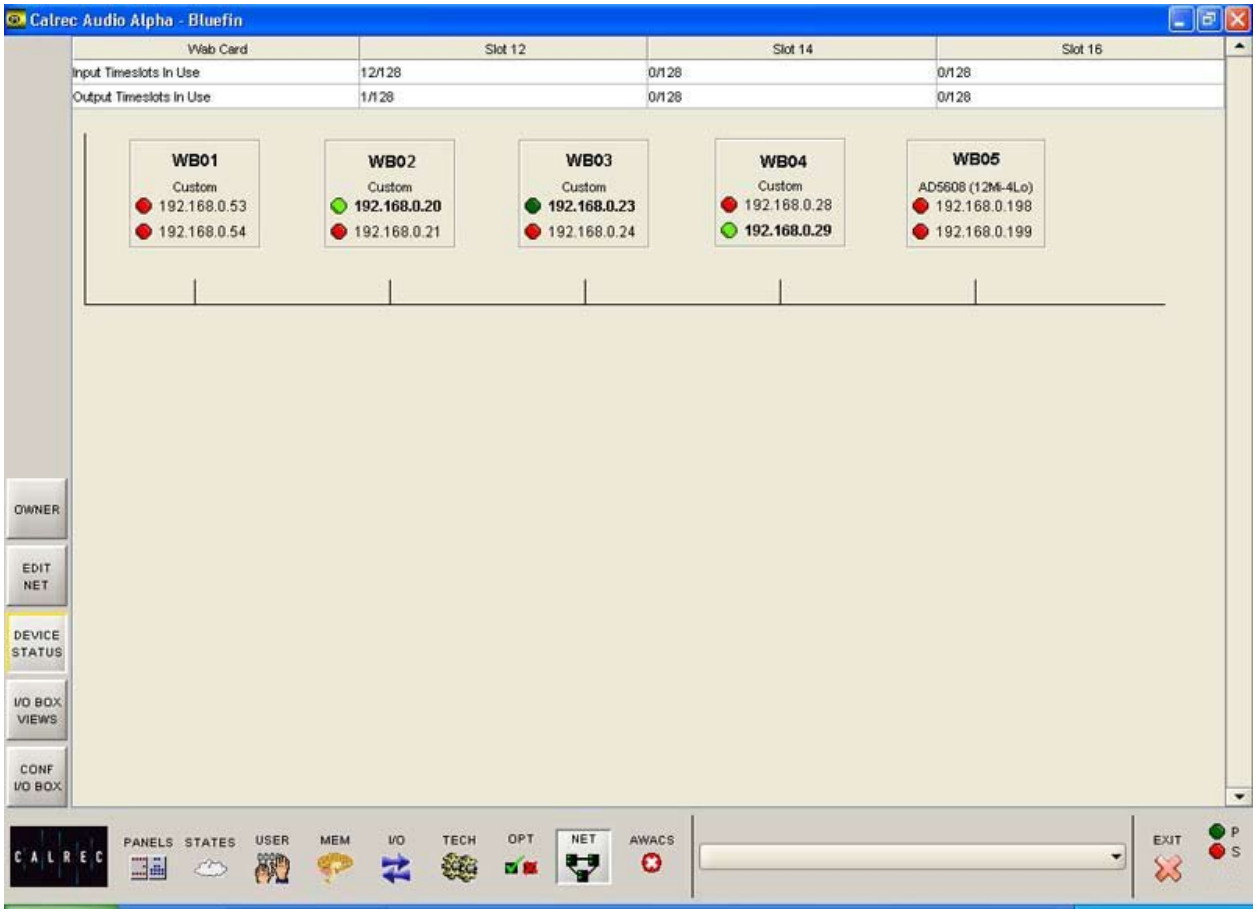
Port Lists

Once the network is configured, Hydra input and output ports can be allocated to lists along with local I/O using the Options - Port Lists screens. These lists are saved as list configurations.

List configurations are linked to network configurations. When a network configuration is saved, it is associated with the current list configuration. When the network configuration is restored at a later date, and the system does not match the expected list configuration, the user will be prompted to load it, or to re-save the network configuration with the new list configuration.

If a network configuration is edited to remove ports, the list configuration should be re-sent to the console before the changes to the lists will take effect.

DEVICE STATUS



The Device Status screen provides an overview of the status of all devices configured on the network.

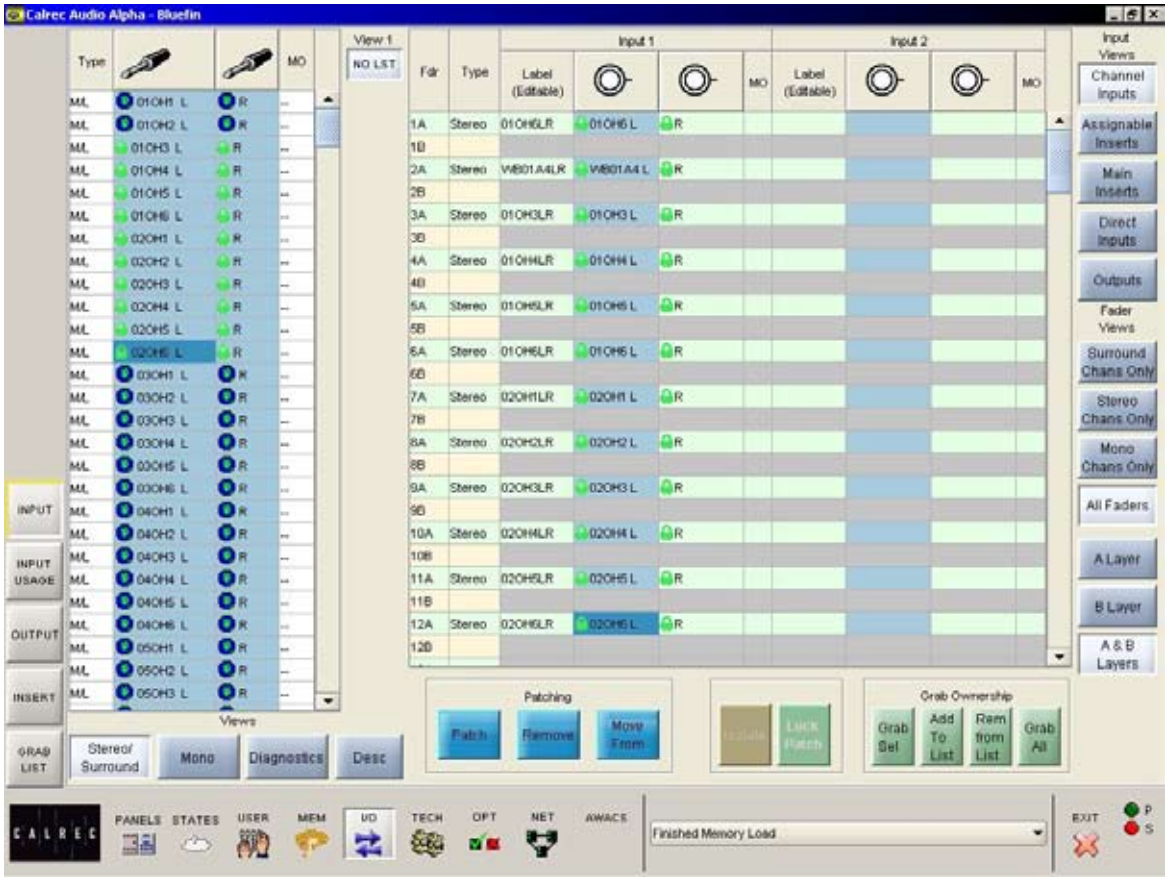
Each device has a green indicator for its available ports, which will “heartbeat” (flash bright green) to indicate that the unit is running and can be reached. If the device is not “heartbeating” then it cannot be reached.

If a device is using both ports (for redundancy), each port will have its own heartbeat indicator. The preferred port will be highlighted. If a port is not heartbeating, its indicator will light red (But the device could still be in use through the other port).

If neither port is heatbeating, then the device is no longer available.

If the device does not appear to be heartbeating, but it is not greyed out, then the console can access the device, but the PC cannot. This situation could arise in redundant systems, where the PC is connected to just one of two switches, and the connection between the switches has failed. The PC will only be able to “see” the devices connected to the same switch as itself. As the console will be connected to both switches, normal operation can continue.

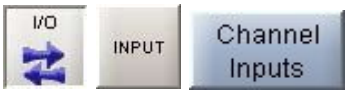
PATCHING HYDRA SOURCES



Please Note:

- **Hydra inputs cannot be patched to Hydra outputs.**
- **It is not possible to isolate Hydra output ports.**

Once set up, Hydra sources are selectable on the I/O screens just like local sources, and can then be patched to faders on the console in the same way. Please note that Hydra inputs cannot be patched to Hydra outputs, and Hydra outputs ports cannot be isolated from memory recall.



Hydra ports can be allocated to lists on the Options - Port Lists screens, just like local ports. Hydra ports are displayed on the left side of the screen alongside local ports, and are patched to console inputs on the right side of the screen. Like local sources, networked sources and their settings are saved with the memories.

Sources have icons to denote their type, they are as follows:

House - A source which is local to the console

World - A Hydra source on a device which is heartbeating

World with a red cross - A Hydra source on a device which is not heartbeating

Green Padlock - The console has ownership of this Hydra source

Grey Padlock - Another console has ownership of this Hydra source

Black Padlock - The source has been added to a grab list.

Patching

Assignment is made by selecting a source, and an input or output, and selecting Patch. The source's name can be edited in the label column. The new name is stored with the channel input and replaces the source label on the fader display. Once patches are made, they can be removed when selected by clicking REMOVE.

Connections can be moved between channel inputs when selected using the MOVE FROM button. The Input 1 or 2 field will be highlighted and the PATCH, REMOVE and MOVE FROM buttons will be replaced with MOVE TO, and CANCEL. Upon selection of a new patch point, pressing MOVE TO will move the connection. CANCEL will cancel the operation.

Surround Signals

It is not recommended that ports on a Modular Hydra I/O box should be combined with ports on a standard Hydra I/O box to create a 5.1 surround signal.

Grab Ownership

When a networked port is patched, ownership of it assigned to the console. In the case where several consoles share sources on the same network, the console that connects to the port first will be given control (ownership) over that source. Other consoles that subsequently connect the same source will not be able to control it.

In circumstances when the ownership needs to be overridden, the grab buttons allow the console to grab ownership of the patched network sources, either altogether, individually, or by adding them to a "Grab List". When one or more Hydra sources are added to the grab list, the "Grab All" button changes to "Grab List".

The grab list can be viewed on the Grab List screen, accessed on the left side of the I/O screens.

SDI INPUTS

Hydra boxes for SDI inputs come in two versions; the VI5674 with front connectors and the VI5672 with rear connectors. Each of these have the option of having up to eight Dolby®E CAT 552 decoders fitted.

Each SDI input stream has the capacity to carry 16 mono legs of audio and these are configured as though 8 AES stereo pairs.

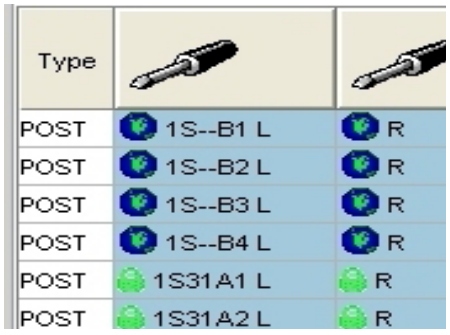
Whilst the incoming digital audio may often be synchronous with the console reference, sample rate converters are always in the signal path to ensure digital sync is never an issue.

Signals are patched to desk channels in a similar fashion to those from all other types of inputs. The significant difference is that unlike other Hydra input boxes that allow ports to be named in the setup application, SDI inputs use a fixed name structure of the form:

1S--B1

The first digit identifies the box number, and up to 9 SDI boxes can be used on a network.

In the image below, the B following S-- indicates that this signal is coming from SDI input stream 2. The 1 shows that this signal is the first AES pair on that SDI stream.



When the optional Dolby E decoders are installed, an extra level of patching is required to assign decoders to the AES pairs that have been decoded from the SDI streams.

Select the required incoming AES pair, choose an available Dolby E decoder and select PATCH. Dolby E can carry up to 8 legs of audio so each Dolby decoder extracts four pairs of signals.

In the example above, Dolby decoder A in SDI box number 1 has received the 1st AES pair from SDI stream 3; the signal referred to as 1SDI31.

At the decoder outputs, this example shows the first of the four decoded signal pairs being known as:

1S31A1

The 'DI' parts of the original name now take on the stream and pair indication. The A shows it is decoder A and the 1, that it is the first decoded signal pair.

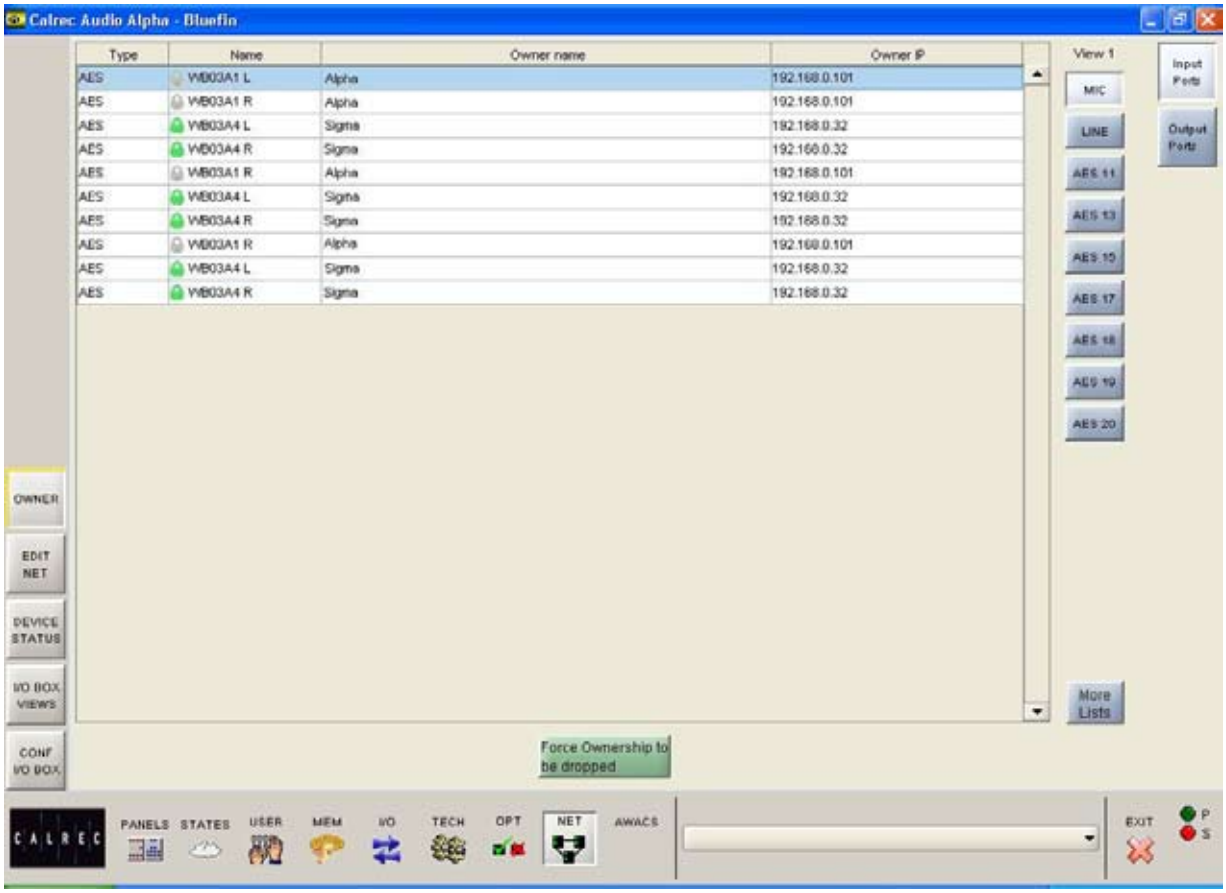
These are the pairs that appear as sources in the normal I/O patching system.

It is likely that customers will have defined a usage for streams and pairs within SDI signals and for Dolby E encoded signal pairs within the SDI pairs. A possible input patch scenario is the one shown below where the surround channel on fader 25A carries signals decoded from three Dolby E pairs and the stereo channel on fader 25B carries an LtRt version of the same signal.

Fdr	Type	Input 1		
		Label (Editable)		
23B	Stereo			
24A	Stereo			
24B	Stereo			
25A	L/R	sdiDOL	1S31A1 L	R
	C/LFE		1S31A2 L	R
	Ls/Rs		1S31A3 L	R
25B	Stereo	LtRt	1S31A4 L	R

SDI boxes can be added to any network but only Bluefin DSP equipped consoles or those running software 1:36 or later can receive audio signals from them.

SOURCE OWNERSHIP



When a Hydra port is patched, ownership of it is assigned to the console. The console is given control (ownership) over that source. Other consoles that subsequently connect the same source will not be able to control it.

There may be circumstances when a source's ownership needs to be overridden, for example, a microphone is needed for the next show but has not been released from the previous show. "Force Ownership to be Dropped" releases the source from its owner, allowing another console to control it.

This function is necessary for the situation where grabbing the ownership is not sufficient. This could be because the user wants to load a memory using ports it does not own. Upon loading a memory, any gain settings saved for ports the console does not own will be ignored, and the gain settings applied by the owner will be applied. In this case, it would be necessary to force the ownership to be dropped before loading the memory, such that the correct gain settings are recalled.

HYDRA
SPECIFICATIONS

CALREC

Putting Sound in the Picture

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	
THD	-1dBFS @ 1kHz, 0.0001%	
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 impedance	>1k Ohms for mic gains 10k Ohms for line gains	
Sensitivity	+18 / -78dB	
Equivalent input noise	-126dB (150 Ohm source, 22Hz-22kHz bandwidth)	
Distortion	-1dBFS @ 1kHz - better than 0.003%	
Frequency response	20Hz to 20kHz +/- 0.5dB	
Input balance/CMRR	Electronically balanced - better than -70dB (Typically -80dB)	
ANALOG OUTPUTS		
Digital - analog conversion	24 bit	
Output balance	Electronically balanced, 20Hz to 20kHz, better than -35dB, typically -45dB	
Output impedance	<40 Ohms	
Distortion	-1dBFS @ 1kHz - better than 0.006% -20dBFS @ 1kHz - better than 0.003%	
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 0.005%	
Frequency response (analog input to output)	20Hz to 20kHz +/- 0.5dB	
ENVIRONMENTAL CONSIDERATIONS *		
	Operating	Non-Operating
Temperature range	0°C to +40°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)

Notes

Analog input for 0 dBFS when input gain is 0 dB can be pre-set for all console inputs to:

+28, +24, +22, +20, +18 or +15 dBu.

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

The analog output for 0 dBFS matches input setting into >1 kOhm (+24 dBu max into 600 Ohms).

Synchronization

All parts of the Hydra network take sync reference from a 'master' console.

This console 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. All consoles on the network should lock to the same reference.

*** Environmental Considerations**

The maximum operating altitude is set by the limit to which the safety tests are valid.

Calrec Audio Ltd
Nutclough Mill
Hebden Bridge
West Yorkshire
England UK
HX7 8EZ

Tel +44 (0)1422 842159
Fax +44 (0)1422 845244
Email Enquiries@calrec.com

calrec.com

(926-086 Iss.13)