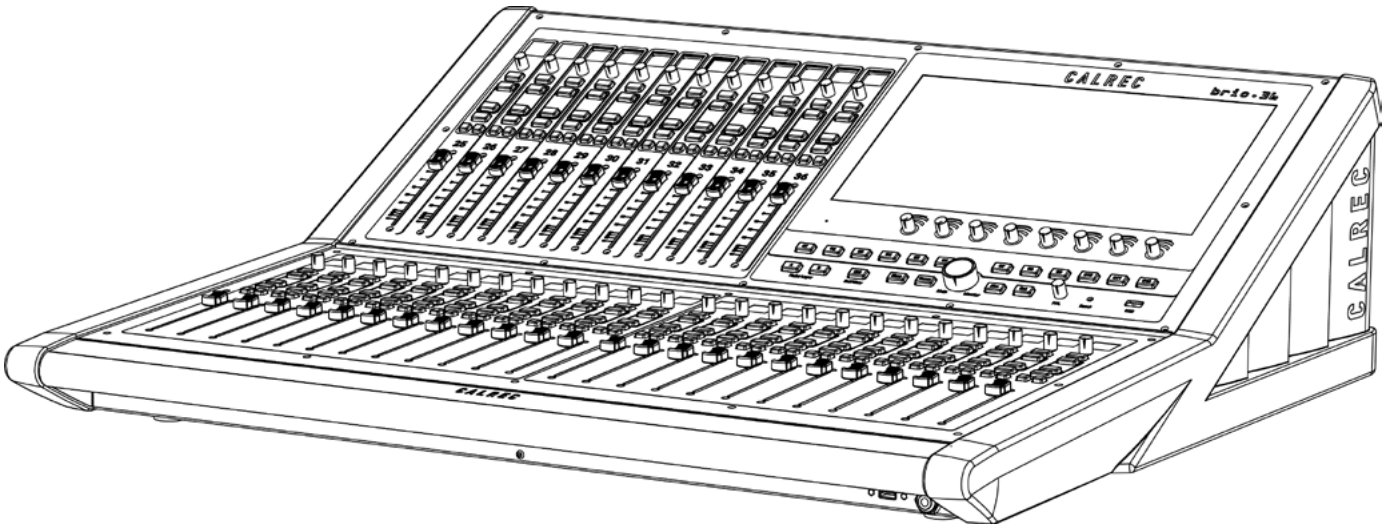
BRIO 36 INSTALLATION MANUAL



Audio Production System with Optional Networking

CALREC

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Whilst the Company ensures that all details in this document are correct at the time of publication, we reserve the right to alter specifications and equipment without notice. Any changes we make will be reflected in subsequent issues of this document. The latest version will be available upon request. This publication is for International usage.

Calrec Audio Ltd reserve the right to change specifications without notice. E & O.E.

The established policy of Calrec Audio Ltd. is to seek improvements to the design, specifications and manufacture of all products. It is not always possible to provide notice outside the company of the alterations that take place continually.

Despite considerable effort to produce up to date information, no literature published by the company nor any other material that may be provided should be regarded as an infallible guide to the specifications available nor does it constitute an offer for sale of any particular product.

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BRIO 36
INFORMATION

CALREC

INFORMATION

Should you require any technical assistance with your Calrec product please contact your regional Calrec distributor. Customers within the UK or Ireland should contact Calrec directly.

For a complete list of worldwide distributors by region, go to www.calrec.com or contact us for more information.

Our UK customer support team works closely with our global distributor network to provide the highest level of after sales support. Your distributor should be your first point of contact and will often be able to provide an instant solution, be it technical advice, spares or a site visit by an engineer.

Product Warranty

A full list of our conditions and warranties relating to goods services is contained in Calrec'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 your regional distributor, or Calrec customer support beforehand for guidance, as well as to log the details of the problem and receive a reference number.

For customers outside the UK and Ireland, shipping via the distributor saves customers from dealing with exportation paperwork. If there is a need to send direct to Calrec, contact us beforehand to log the incoming repair and for assistance with exportation documents.

Standard of Service

Ensuring the highest standards is a priority, if you have any comments on the level of service, product quality or documentation offered to you by Calrec, please contact the Calrec Customer Support team in the UK who will endeavour to address your issues. Calrec welcomes all customer feedback.

For feedback specific to this document, please contact enquiries@calrec.com.

Whenever you contact Calrec Customer Support please have the following information to hand:

- Name.
- Company.
- Email Address.
- Full details of enquiry (e.g. fault report).
- Serial number of faulty hardware (if applicable).

Once this information has been provided, a service ticket will be created to log your enquiry. The service ticket reference number will be given via email.

Serial Numbers

All units produced by Calrec are given a serial number and are booked into a central record system at the time of manufacture. These records are updated whenever a piece of hardware is dispatched to or received from a customer.

When contacting Calrec Customer Support with a hardware inquiry it is important that the correct Calrec serial number is provided to enable the customer support team to provide a high level of service. Brio 36 serial numbers can be found on the label on the rear of the chassis as shown below.

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 the 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.

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Fax:	+44 (0) 1422 842159
Website:	www.calrec.com

EXAMPLE OF LABEL ON REAR OF CHASSIS SHOWING SERIAL NUMBER

Installation
In many installations the AC power connectors will not be readily accessible, effectively making the equipment permanently connected. The installation should be carried out in accordance with all applicable installation rules and regulations.

Service Personnel
The AC power disconnect devices are the 2 x IEC (IEC60320-1 C13/C14) couplers located at the rear of each unit. WARNING: The apparatus has a dual power system. It is essential that BOTH AC power IEC couplers are disconnected to prevent exposure to hazardous voltage within the unit.

Third Party Equipment
Integrating third party equipment into a Calrec system may compromise the product's ability to comply with the radiated emission limits set in the latest EMC (Electro Magnetic Compatibility) standard.

Calrec Audio Limited can not be responsible for any non-conformities due to use of third party equipment. If in doubt, please contact Calrec Audio Limited for guidance prior to integrating any third party equipment.

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.

All modules and cards should be returned to Calrec Audio Limited in anti-static wrapping. Calrec Audio Limited can supply anti-static wrapping upon request.

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

RoHS Legislation
In order to comply with European RoHS (Reduction of Hazardous Substances) legislation, Calrec PCB and cable assemblies are produced with lead-free (tin/copper/silver) solder instead of tin/lead solder.

In the unlikely event of a customer having to carry out any re-soldering on any Apollo, Artemis, Summa, Brio 36 or Hydra2 hardware, it is imperative that lead-free solder is used; contaminating lead-free solder with leaded solder 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 logo (see below) on the top-side of the circuit board near the PCB reference number (8xx-xxx). The same logo is used on the connector hoods of soldered cable assemblies.

If in doubt, please check with a Calrec customer support engineer before carrying out any form of re-soldering.

ISO 9001 and RAB Registered
Calrec Audio Ltd has been issued the ISO9001: 2008 standard by the Governing Board of ISOQAR.

The award, for both UKAS and RAB registration (see below), 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.

UKAS AND ANAB REGISTRATION

LEAD FREE

LEAD FREE STICKER

HEALTH AND SAFETY

Important Safety Instructions:

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water.
- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Protect the power cord from being walked on or pinched particularly at the plugs, convenience receptacles, and the point where they exit from the apparatus.
- Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/ apparatus combination to avoid injury from tip-over.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operator normally, or has been dropped.
- Warning: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.
- Not intended for outdoor use.
- This equipment must be EARTHED.
- Before starting any servicing operation, equipment must be isolated from the AC power supply. The disconnect devices are the 2 x IEC connectors (IEC 60320-1 C13/C14 couplers).
- Do not allow ventilation slots to be blocked.
- Do not leave the equipment powered up with the dust cover fitted.

Cleaning

For cleaning the front panels of the equipment we recommend using a soft anti-static cloth, lightly dampened with water if required.

Explanation of Warning Symbols

Triangular warning symbols contain a black symbol on a yellow background, surrounded by a black border.

The lightning flash with arrow head symbol within an equilateral triangle, as shown on this page, 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, as shown on this page, is intended to prompt the user to refer to important operating or maintenance instructions in the documentation supplied with the product.

Earthing

This is a Class I product. An Earth connection MUST be provided in each AC power cord.

The Earth Bolt connection at the rear of the console is provided for those users who wish to have a separate ground/ earth connection using Earth cable at least 6 mm^2 in cross section (10 AWG), this connection is optional and is NOT a requirement to comply with safety standards.

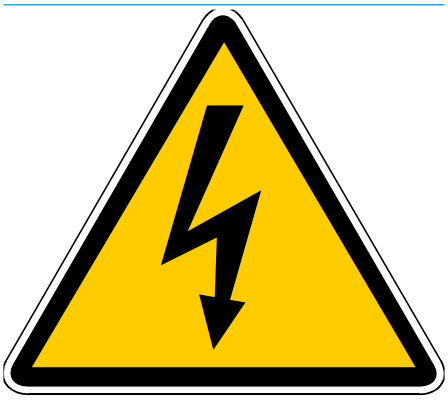
Lithium Battery Replacement

Caution: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type. Batteries must not be exposed to excessive heat such as sunshine, fire or the like

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

DANGEROUS VOLTAGES



IMPORTANT INSTRUCTIONS

Other Symbols in Use

For apparatus intended to be used at altitude not exceeding 2000m, a warning label containing the following symbol shown below shall fixed to the equipment at readily visible place.

ALTITUDE WARNING SYMBOL

Lifting and Carrying Brio 36

Brio 36 has two lifting handles on the rear of the unit. These should be used when lifting the unit into place. Note: this unit weighs approximately 30kG and requires at least 2 persons to lift or carry the unit.

Levelling or Fixing Brio 36 on a surface for table mount.

Brio 36 has four adjustable feet on its base which can be used to level the console on a surface. Alternatively these can be removed and four M6 screws fitted to fix the console in place. Note the screws should not screw in further than 20mm into the body of the unit.

PACKAGE CONTENTS

There are a number of options when ordering Brio 36 systems: connectivity type and I/O options.

Every system includes a control surface which contains the processing core. Small format pluggable transceivers (SFPs) are required for Hydra2 I/O box connections with the optional Hydra 2 module and can be provided by Calrec. I/O packages are optional.
The following table shows all Brio 36 options:

	Surface and Core Packs
Brio 36 Surface	Brio 36 is supplied with 36 physical faders, arranged as 3 sets of 12 fader panels and a TFT screen with its associated controls. Each fader has a dedicated fader meter display, 2 user definable local Switches S1 and S2 and a user rotary control cell above, as well as the usual AFL/PFL and Access switches. Brio 36 is supplied with On/Cut button caps fitted for each fader and a software option determines if this acts as a CUT or ON switch. The top right hand area contains the Access display area complete with touchscreen TFT, 8 context based rotary controls, 12 Global user switches G1 to G12, A/B layer selection, Link Switch, Monitor Controls, PFL level, Reset switch and a USB port used for data transfers. In the front of the console is provided a further USB connector and a 1/4" stereo headphone socket.
Brio 36 Core	Power, Router, Control Processor, and DSP are all self contained within the unit which has 2 x IEC connectors to provide PSU redundancy. The core operates at 44.1, 48, 88.2 & 96 kHz and supports: 64 legs as mono, stereo and 5.1 Input channels 36 legs as mono, stereo and 5.1 Mains & Groups, (Max of 4 Mains and 8 Groups) 24 legs as mono or stereo Auxs 64 legs as Direct or Mix-minus outputs 64 legs as Insert sends & 64 legs as Insert returns Automatic Mix-Minus and an Off-Air Conference bus for Mix-minus.
Cabling	One Y-Split IEC cable for supplying power to the surface.
	I/O packs
Fixed I/O	Brio 36 comes fitted with the following I/O: 24 x Analogue Mic/Line Input (XLR) 16 x Analogue Line Output (XLR) 8 x AES Digital Inputs with SRC (BNC) 8 x AES Digital Outputs (BNC) 4 x GPIO 9-Pin (D-SUB) connectors each with either 4 GPI or GPO giving a total of 8 in and 8 out.
Optional I/O	The unit also has 3x double sized expansion slots in which any of the modules from the Modular I/O range can be fitted. In addition there is an optional Hydra 2 module to allow either further I/O to be connected or to network audio with other consoles.
	SFP Packs
SFPs	One of the following options may be selected: LX SFP Pack; SX SFP Pack; Bi-Directional SFP Pack; Copper SFP Pack or none if no Hydra 2 module fitted.
LX SFP Pack	4 x Single Mode SFPs
SX SFP Pack	4 x Multimode SFPs
Bi-Directional SFP Pack	2 x Bi-Directional SFPs (type A) and two Bi-Directional SFPs (type B)
Copper SFP Pack	4 x copper SFPs

BRIO 36
GETTING STARTED

CALREC

REAR CONNECTIONS

The BRIO 36 surface is designed to be a self-contained compact mixing console however there are a number of external connections that are made to interface to other equipment such as I/O, Networks and OEM equipment. Some of these require fibre connections via singlemode or multimode usually via LC SFPs.

Calrec do not provide interconnecting fibres/cables, as the length, type and quality will vary for each installation. SFPs can be supplied with your Brio 36 system if specified at the time of order. For more information on fibre and different connection types please see "Connection Information" on page 31.

Looking from left to right across the rear panel, there are:-

2 x IEC power sockets labelled PSU 1 and PSU 2, either of which can power the console, together they provide power redundancy. The IEC inputs should be fed from separate AC sources to protect against external power loss. In the event that only one AC outlet is available, power should be fed via the supplied IEC Y-Split cable to provide redundancy against internal PSU failure. There is a separate M4 earth stud fitted between them which can be used for an additional earth.

Plastic clips provide strain relief for each AC cable and should be tightened properly around each cable. Metal clips provide retention to further protect the IEC connectors from working loose. These clips fit snug around large IEC connectors with screw in terminals inside for wiring. The clips may not provide adequate retention on their own for some pre-fabricated IEC connector types. If there is concern over the connectors working loose during transit, we recommend that IEC sockets with built in latching are used.

Below the power cable strain relief clips and large whisper quiet fan are 6 x BNC connectors that provide options for external Sync connections, the 2 x Wordclock, 2 AES & 2 Video BNC ports are setup from the System Settings >Sync page on the touchscreen.

2 x Hydra 2 SFP interface connections are located next to the Sync connectors which, when the optional Hydra 2 module is fitted allows connections to external I/O on the Calrec network. The left hand SFP, when viewed from the rear of the surface, is the primary connection and the SFP on the right is the secondary connection.

Next to these are the GUI and Meter DVI out connectors. The GUI connector provides a backup to the touchscreen interface which together with a USB keyboard allows the system to continue in the event of touchscreen failure. Note: there is a USB port in the front of the console for this purpose.

The Meter DVI provides up to 4 rows of user definable metering, including compliant loudness meters, and dynamics gain reduction meters on a customer provided TFT screen.

2 x Ethernet connectors labelled 1 & 2 are placed to the right of the DVI Outputs and are used to connect to 3rd party equipment for Ember+ , SWP-08 control or other OEM interfaces. Alternatively they can connect to Calrec H20 or Calrec Assist interfaces.

There are 3 double expansion slots labelled C, D & E are available next to these and any of the Calrec Modular I/O cards may be fitted and the empty spaces filled with single blanking plates.

To the right of the expansion slots are placed 4 x 9-pin D-Sub connectors each of which carry 4 x GPI or 4 x GPO circuits providing a total of 8 In & 8 Out GPIOs.

These are classed as being in slot F, for patching purposes.

2 columns of 8 x Digital ports on BNCs (1 column of 8 AES3 Outputs & 1 column of 8 AES3 Inputs with SRC column) appear next to the GPIO providing 8 x Digital Stereo AES3 outputs and inputs.

These digital outputs and inputs are classed as being in slot B for patching purposes.

There are 16 analogue line outputs on XLR male connectors next to the AES connectors arranged in a 4 x 4 block numbered 1-4, 5-8, 9-12 & 13-16.

Finally there are 24 analogue Mic/Line inputs with Phantom Power on XLR female connectors arranged in a 6 x 4 block numbered 1-6, 7-12, 13-18 & 19-24.

These analogue outputs and inputs are classed as being in slot A for patching purposes.

BRIO 36 REAR CONNECTIONS

EXPANSION OPTIONS

Expansion I/O cards
Brio 36 has 3 x expansion I/O slots accessible from the rear of the surface.

Each of the three slots can be fitted with any card from Calrec's Modular I/O range, "single", or "double-wide" cards. Refer to the Hydra2 Installation manual for a complete list of the card types available.

The rear connection image shown on the previous page shows a JM6199 MADI card plugged into slot E.

To fit these cards, remove blanking plates from the desired slots, and align the card in slot runners, with the "top" of the card to the left. Slide card into place, firmly seating it against the backplane connector and fix it in place using the captive screws on the card. It is important to observe ESD precautions when handling expansion cards - use antistatic bags to store and place cards down on when not fitted in the surface, handle by their edges and use an anti-static wriststrap when fitting.

On booting the system, any expansion cards fitted are automatically detected and made available to the user. Expansion cards appear in the UI as slots C, D & E, alongside the fixed internal I/O on slots A & B. Any empty spaces that remain can be filled with blanking plates as required.

If a card is removed, or changed for one of a different type, the original will remain visible in patching screens but displayed as offline. To stop a card that is no longer present from appearing in the UI, the no longer present I/O should be removed from the Required I/O List, then removed from it's H20 I/O list, and then the console reset to complete its removal.

Optional Hydra 2 Module
Brio 36 has an expansion option to add a Hydra 2 module inside the unit which, when fitted allows the user to connect to a variety of I/O boxes directly see above right or via a Hydra 2 hub see below right or a router core as part of a connection to a network, see "Connecting Brio 36 to the Hydra2 Network" on page 17.
Note its cannot connect to expansion router cards, and cannot connect to other Brio's directly, or just via a H2hub.

If the Brio 36 is connected directly to I/O then the following pages show its connection information and setup for the Hydra I/O Boxes. This requires the Primary and Secondary SFP ports to be connected from the Brio 36 to the Primary and Secondary ports of the Hydra 2 I/O box. H2 Hubs can be used to increase the number of external I/O connections. SFPs fitted in the Brio console should be compatible with those they are connecting to in the I/O box, H2Hub or Router.

Refer to the Hydra2 Installation manual for a complete list of I/O options, and the sample rates they each support.

The Hydra2 module also allows Brio 36 to be networked with other Hydra2 mixing consoles and routers, providing sharing of I/O.

To connect to a wider Hydra2 network with other consoles or routers, Brio 36 needs to connect to an Apollo/Artemis/ Summa router or a router core. running V8 or higher and cannot connect to an expansion router card.

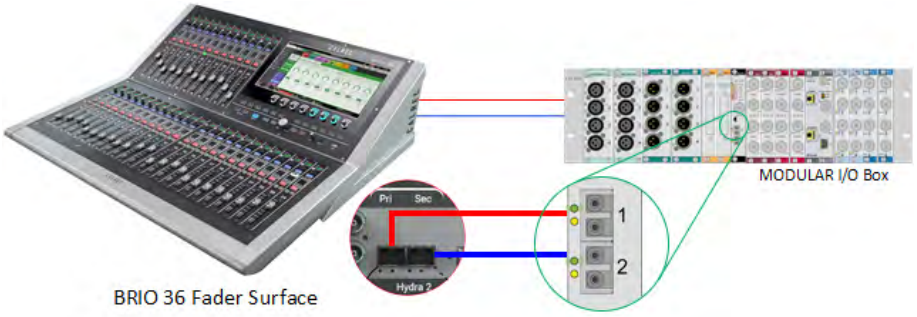
This connectivity is shown on page 17 for an Artemis Light/Summa 4U router core.

Two Brio 36's cannot be directly connected together or via a H2Hub.

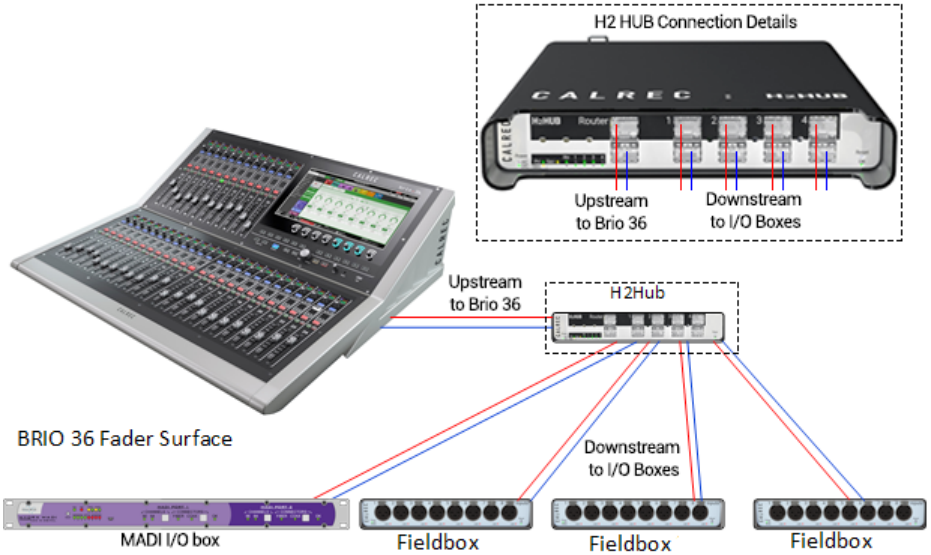
If connecting to a wider Hydra2 network (connecting to another router or console), the system should be given a unique system ID for the network. This takes the form of a unique IP address for the console which is nominally set to 192 . 1.

This system ID can be set up in the System settings>Software page on the Brio 36 Touchscreen from V1.1 onwards.

CONNECTING BRIO 36 TO AN EXTERNAL I/O BOX



CONNECTING BRIO 36 TO I/O BOXES VIA H2HUB



HYDRA I/O BOX IDs

Hydra2 I/O boxes with valid Hydra IDs (HIDs), are automatically detected and added to the Hydra database when first plugged in to the network. This database entry will remain until it is manually deleted via the network management organiser, H2O. This removes it from H2O, and prevents System status errors on the master router. From a console point of view, you just need to remove it from the required I/O list.

It is important that careful consideration is given to HID settings prior to connecting any I/O boxes to the network, especially if future networking of standalone systems is a possibility.

As an example, consider two Calrec systems, each with several I/O boxes with HIDs starting at '1' and set in ascending numerical order. If you later decide to network these two systems together you will have multiple I/O boxes with the same HIDs on the network.

In this scenario when a Show/Memory containing patches is loaded, there is no way of controlling which patches will be made to which I/O box. Instead we recommend using a separate numbering range for each standalone system so no conflicts can arise in the future.

ID configurations
For Brio 36's built in I/O and expansion slots, these appear in the I/O box list with a Brio 36 console icon and its I/O box ID is set automatically based on the system ID for byte 2 + 256 to ensure it will not conflict with other I/O on the network. So with a default system ID of 192.**1** the I/O has an ID of **1 + 256 = 257**. This built in I/O appears like a Modular I/O box as described in the previous section and its 'box'/port labels can be edited from H2O.

For Hydra 2 boxes each I/O box in a system needs to be given a unique hydra ID (HID), set using DIP switches accessible from the rear of a fixed format box, or on the side of the controller card within a modular I/O box.

I/O box IDs are pre-set to '0' at the Calrec factory to effectively set the boxes into an 'off' state to avoid issues in the event of multiple boxes being placed on the network with the same HID.

Before connecting each I/O box to the network ensure you set a unique HID by following the instructions on the following pages.

Note, Some customers may find that their I/O boxes have been pre-configured with unique HIDs at the Calrec factory, prior to dispatch.

Changing an I/O Box's HID
If you have already connected and powered up an I/O box and then wish to change its HID you will need to follow these steps:

1. Power off the I/O box.
2. Change the HID to a new, unique value by following the instructions on the following pages.
3. Remove the I/O box from the console's required list (see BRIO 36 User Manual)
4. If on a multi-console network, remove the I/O box from Hydra database in H2O ('I/O box and port labels' tab).
5. Remove Shows/memories/patches which reference the I/O box.
6. If on a multi-console network, reset the router by simultaneously pressing ENABLE and ROUTER on the front of the core.
7. Once the reset has completed, power up the I/O box.

If you plan to reuse the original HID it is important that you follow these steps including removing patches (or entire Show/memories) which patch to the original I/O box, otherwise these patches may be made to the 'new' I/O box next time the Show/Memory containing the patch is loaded.

Port Labels and SW-P-08 Settings
When you change a box's HID, its associated port labels and SW-P-08 settings will be lost.

If you would like to back them up to re-associate with the I/O box once you have changed the HID, simply follow these steps:

1. Open Chrome and navigate to H2O.*
2. Export Label and SW-P-08 information to a CSV file by following the instructions in the 'Label & SW-P-08 Data Import/Export' section of the H2O User Guide.
3. Open the CSV file in an editor, such as Microsoft Excel.
4. For each entry, update the HID to your new value.
5. Import the CSV file back in to H2O for the correct I/O box.

*For guidance in the use of H2O refer to the H2O User Guide which can be found on the Calrec website

Duplicate HIDs
What happens if you connect two I/O boxes with the same HID to your Hydra2 network?

Firstly, the system will be unpredictable in terms of its use of the ports across the two boxes. A patch to output port 1 could pick either box's output port to patch to, and each time the patch is made, either port may be chosen.

Secondly, there will be confusion between different I/O types. For example, in the scenario above one I/O box may be analogue and the other digital.

Spare/Replacement I/O Boxes
Replacement I/O boxes of equivalent type should be set with the same IDs as the units they are replacing to allow them to function as drop-in replacements with existing user memories, requiring no further configuration.

Care should be taken when setting HIDs to avoid accidentally duplicating the same HID on more than one box.

Do not add extra I/O to the system unless you are confident it will not cause a conflict on the network.

SETTING HYDRA IDs FOR FIXED FORMAT I/O

The 8-way DIP switch on the rear of all fixed format I/O boxes is set as an 8-bit binary representation of the HID value with the left hand switch used for the most significant bit, and the right hand switch for the least significant bit. A switch in the down/off position represents a binary 0 and a switch set in the up/on position represents a binary 1. Each switch/binary-bit equates to a decimal value, starting at 1, for the least significant bit. The remaining switches are double the value of their less significant neighbour, making the 8th/most significant bit equate to a decimal value of 128.

All fixed format I/O box ID switches are orientated the same way, though some boxes, such as MADI units, use a different style switch with more pronounced labelling. Ignore any labels on the switch itself and always refer to the Calrec labelling on the surrounding panel which will show the most significant bit switch on the left and the binary 1 position as up.

Address 2

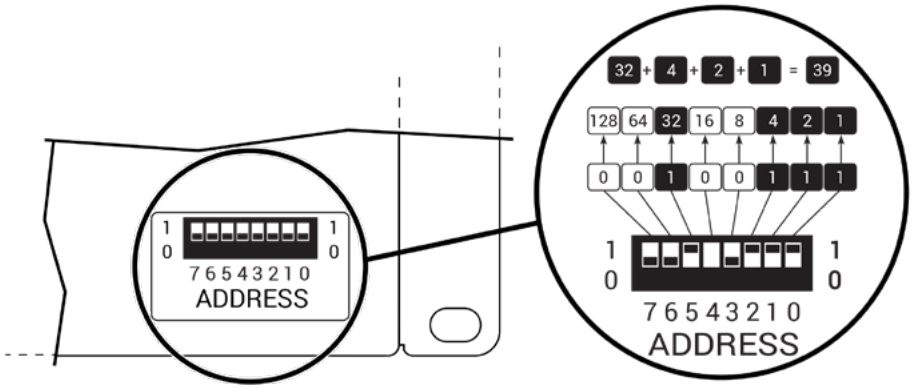
Some I/O boxes, such as MADI units are fitted with 2 banks of DIP switches Address 1 and Address 2, please note that Address 2 should all be set to the off position.

Extended ID Addressing

From V8.0, the number of unique Hydra2 IDs available for I/O boxes has increased from 254 to 511, to increase the total number of I/O boxes that can sit on a network.

By configuring an I/O box to operate in the "extended" range, its HID becomes the value set by the physical DIP switch + 1024.

SETTING THE HID ON A FIXED FORMAT I/O BOX



HID range is set by the presence of an "Extends" file, located on each I/O box. If a box has Extends file version 0.0.1, it will operate in the extended HID range. If a box does not have an Extends file, or if it has Extends file version 0.0.0, then it will operate in the normal HID range of 1-255.

Program Updater can be used to add or change the Extends file on each I/O box. Extends files are available in the MaintenanceUpdates folder of a software release package, under Hydra2 or Modular I/O depending on box type:

1. Using Program Updater, go to File>Select-Release-Directory, browse to, then select the appropriate Maintenance Updates folder for the I/O type to be configured.

2. Click "Upgrade Hydra Network" in Program Updater's header to scan for connected I/O boxes.

3. Find the desired I/O box in the listing. If an Extends file is already on that box, it will be listed under it. Right clicking on the extends file allows you to choose between v0.0.0 & v0.0.1 through "Update Application".

4. If no Extends file is present on a box, right clicking the blue heading line for the box allows one to be added through "Add Application"

5. If no Extends files are offered by the Add/Update dialogue, check that the correct release directory has been selected for the box type as per step 1.

6. If a file is being added or changed, it will be highlighted in the listing. Click Download from the header to program the file into the I/O box.

Note, fixed format MADI, and Br.IO boxes do not support the use of extended HIDs.

SETTING HYDRA IDs FOR MODULAR I/O

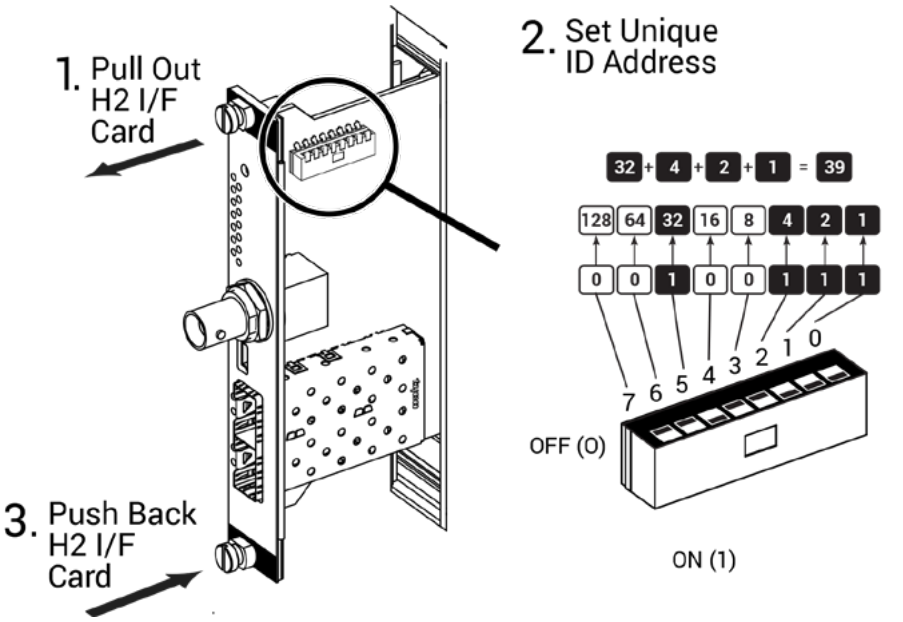
The HID for modular I/O boxes is set by a DIP switch on the controller card and is only accessible by removing the card. Refer to the Hydra2 installation manual and ensure ESD precautions are observed before removing any modular I/O box cards.

Ignore any labelling on the DIP switch itself and refer to the Calrec labelling printed on the circuit board around the switch to clarify its orientation.

When viewing the card from the side, the most significant bit is on the left and the least significant bit on the right. Pulling a switch towards you sets it as a binary 1, away from you as a binary 0.

The following illustration shows the ID switch on the modular I/O controller card. A decimal value of 39 is used for the example. These illustrations, along with simple instructions, are displayed on the top of the modular I/O box itself.

REMOVING A MOD I/O CONTROLLER CARD AND SETTING ITS HID



CONNECTING BRIO 36 TO THE HYDRA2 NETWORK

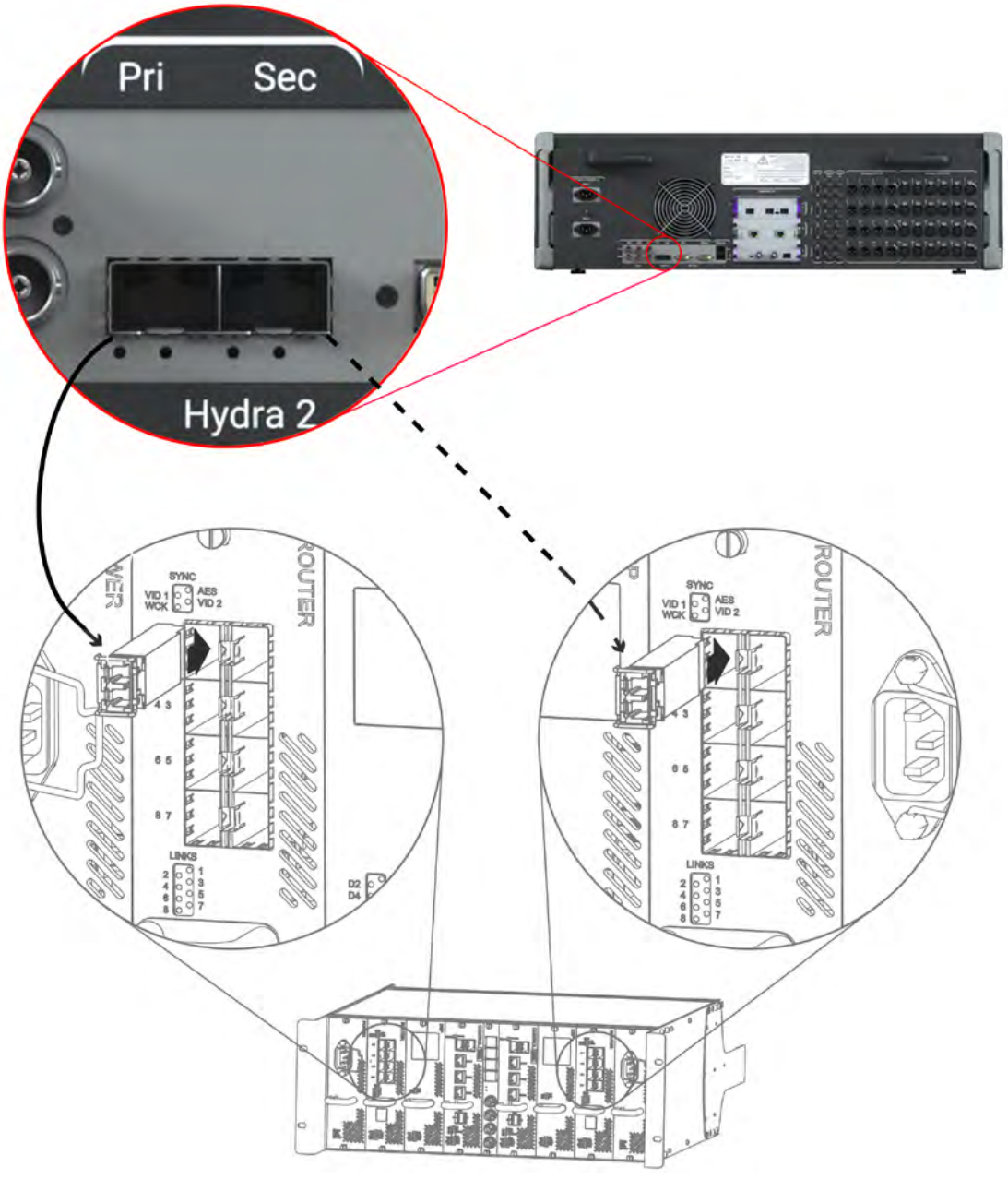
In order to connect to other consoles that you wish to use with a Brio 36 system it should be connected to the core router card(s) using fibre or copper cable connected via the correct SFP for your connection type. Note that Brio 36 cannot be connected to an Expansion Router or directly connected to another Brio 36.

For a redundant system, two connections are required, primary and secondary.

In the diagram below the Brio 36 is connected to a 4U Artemis Light/ Summa Router core and the primary connection is shown as the solid line and the secondary connection is the dashed line. The connections to an 8U Apollo or 4U Artemis Beam/Shine are the same with the Brio 36 primary connected to the primary router card and the Brio 36 secondary connected to the secondary router card. Note that networking with Brio 36 is supported from V1.1 and the network it connects to must be running V8 software or later. See "Audio I/O Connections" on page 33 for information on connecting I/O.

To be connected into a Hydra Network it is also necessary to change the system ID away from 192 . 1 which is the default for a standalone console, and to register it as a Client in H2O so that it can see all the available I/O on the network and be seen as a network resource.

CONNECTING BRIO 36 TO A ROUTER CORE



HARDWARE POWER CONNECTIONS

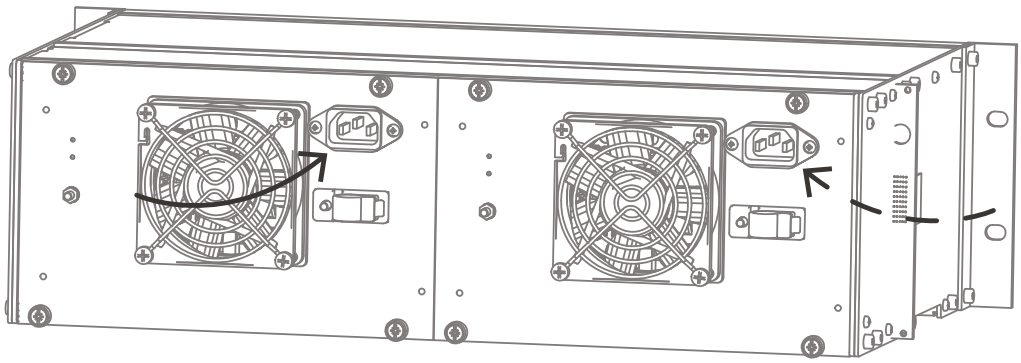
Brio 36 and Hydra2 hardware requires mains power via standard IEC connections.

While Calrec hardware can be run off one power connection, it is advised, for redundancy, that you connect a separate power source to the primary and secondary power inlets. In the following diagrams the primary power connections are indicated by a solid arrow and the secondary connections by a dashed arrow.

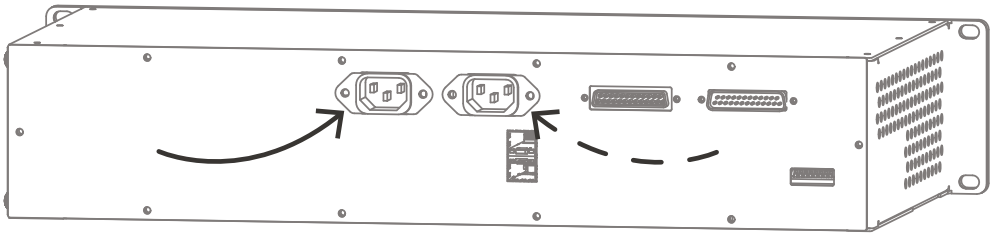
POWER CONNECTIONS TO THE BRIO 36 SURFACE

POWER CONNECTIONS TO THE 2015 CORE

POWER CONNECTIONS TO A MODULAR I/O BOX



POWER CONNECTIONS TO A FIXED FORMAT I/O BOX



SETTING THE DATE AND TIME

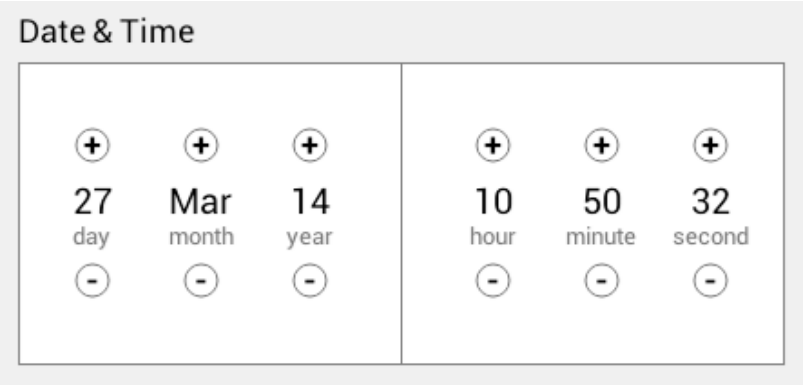
Shows and memories and log files are time-stamped, making them easier to identify. When you first start up your Brio 36 system it is important to set the current date and time.

To do this:

Tap **SYSTEM SETTINGS** in the top right hand corner of the touch display.

Tap the + and - buttons to set the current date and time.

SETTING THE DATE AND TIME



CONNECTING A LAPTOP TO BRIO 36

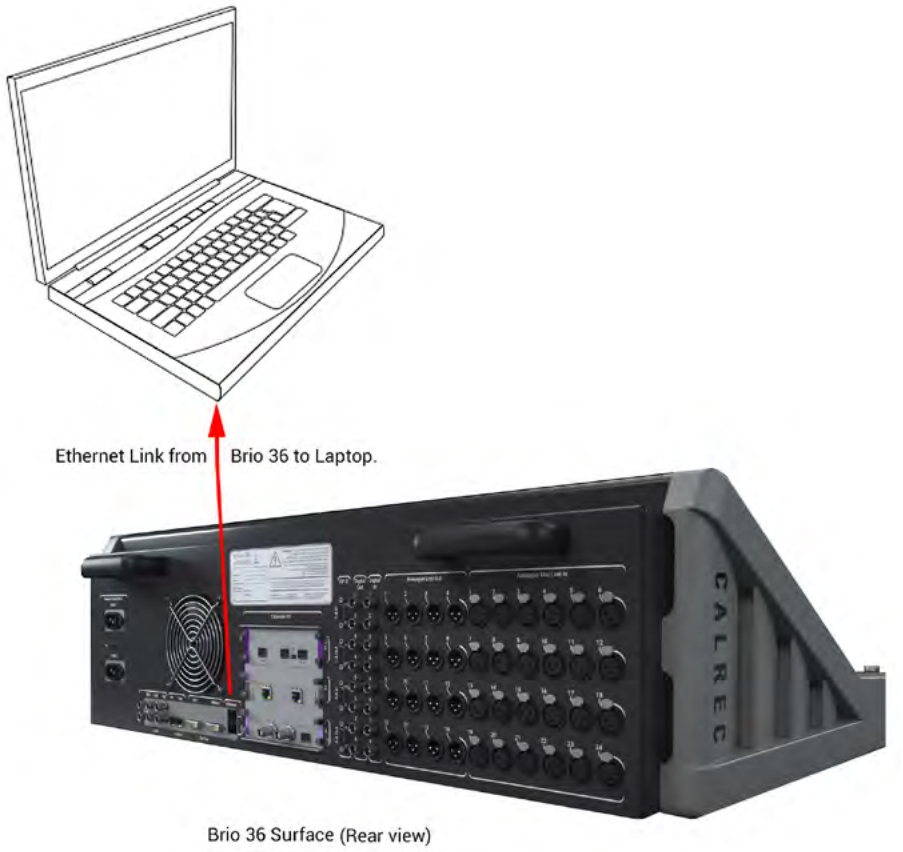
A laptop can be used on Brio 36 to access H2O for I/O port management and labelling, and to carry out software updates.

The laptop will need to have at least one ethernet port (or USB LAN connector) which should be connected to the 'Ethernet 1 or Ethernet 2 connection which is located on the rear of the Brio 36 unit.

The laptop will need to be configured to use a static IP address for its LAN connection. The address chosen should be compatible with the address of the port on the console it is being connected to.

This is configured in LAN settings which is in System Settings>LAN Configuration, allowing the user to view the console's LAN ports addresses and to be able to change them. See "Configuring LAN Ports" on page 21.

CONNECTING A LAPTOP



Brio 36 Surface (Rear view)

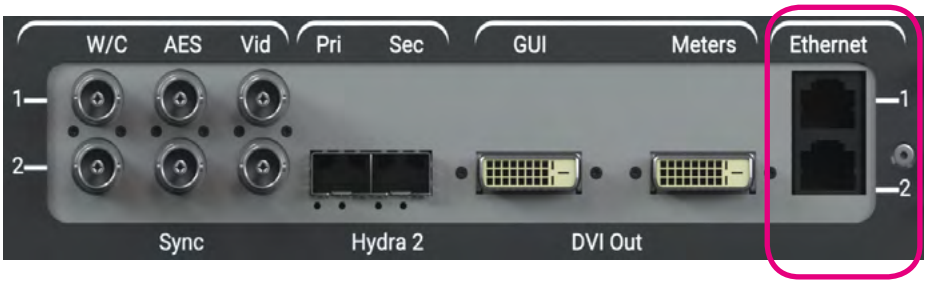
CONFIGURING LAN PORTS

The Brio 36 control processor has two ports labelled LAN (or Ethernet) 1 and 2, on the rear of the unit. These ports can be used to connect the Brio 36 system to third party controllers for production automation (mixer remote control) and remote control over the mixers crosspoint router.

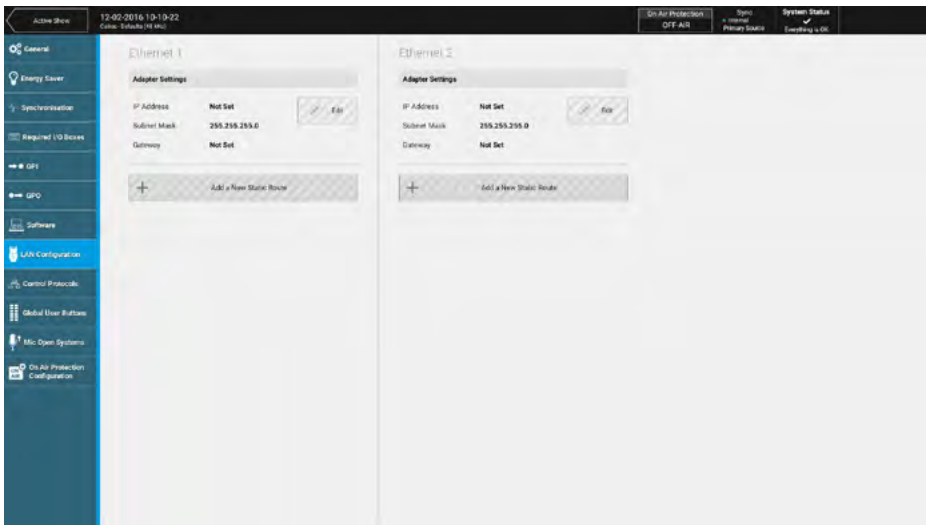
See highlighted area in adjacent picture.

Tap **SYSTEM SETTINGS** in the top right of the screen and select **LAN CONFIGURATION** from the left hand menu. In the LAN configuration window you can define the adaptor settings for each port and create multiple static routes for each port as required.

CONTROL PROCESSOR LAN PORTS



LAN CONFIGURATION SCREEN



SOFTWARE UPDATES

Users can carry out system wide software updates on Brio 36 systems running version 1.0 or higher.

For guidance on carrying out a software upgrade to a Brio 36 system, please refer to the System Settings>Software screen on the surface's touchscreen UI, (see FIGURE 1). Users will need to connect a laptop/PC to the console processor, and understand how to set a static IP address on their device.

See "Connecting a Laptop to Brio 36" on page 20 and "Configuring LAN Ports" on page 21 for information on how to do this.

Users should avoid hot-plugging or removing hardware whilst system software is being reprogrammed.

Do not disconnect, reset or power down during this process.

On every boot up, the system checks it's hardware is all on compatible software, any mismatches detected are automatically reprogrammed - this makes swapping out of hardware and moving I/O boxes between consoles running different versions simpler.

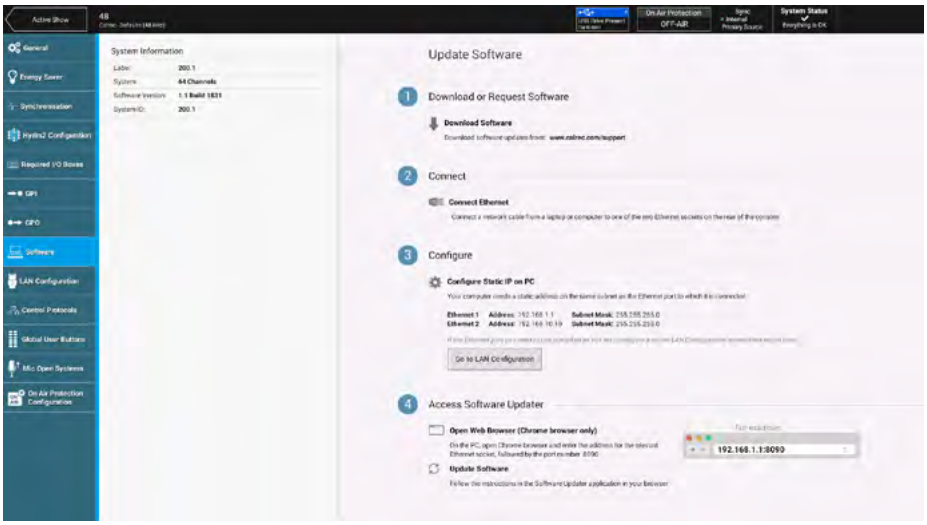
Take care to notice on-screen warnings and blue reprogramming notifications in the UI header during the update process.

I/O boxes connected via the optional Hydra 2 module, require user confirmation before reprogramming in order to avoid them being accidentally disconnected or powered down during the process.

As well as displaying reprogramming notifications and progress within the web-application, notifications and progress are displayed on the surface (if it's running).

If the system is functional whilst other components are being reprogrammed in the background, this information is accessible by tapping on the 'System Reprogramming' tab in the touchscreen header, (see FIGURE 2).

FIGURE 1: SYSTEM SETTINGS > SOFTWARE



Confirmation for I/O box reprogramming is also available from the surface.

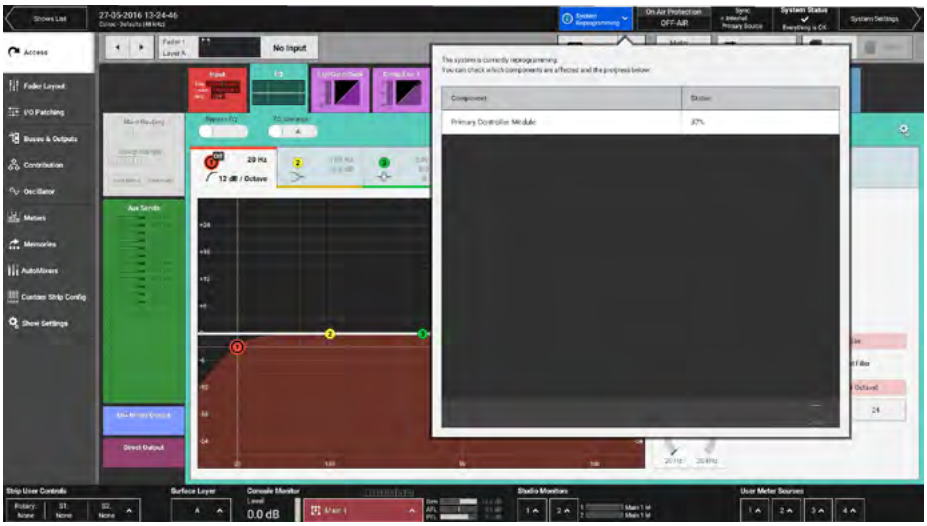
If an I/O box is repeatedly flagged as needing an update, even after the system has been updated, a manual reset of the box should resolve the issue.

The main processor board within the console is the reference for the rest of the system. Should the processor board need to be replaced for any reason, the system must be powered down so that the controller card can be replaced. The software version and user data may be unknown on the replacement and so will require reprogramming and user data restoring from a previous backup.

On power up and boot, the replacement will also need to be configured to match the original from the user data backup.

Before carrying out software upgrades, users should choose to back-up the user data as a precaution via the Software Updater application. Should a system lose user data, it can be restored by the Software Updater in order to recover a system back to its previous identity.

FIGURE 2: SYSTEM REPROGRAMMING



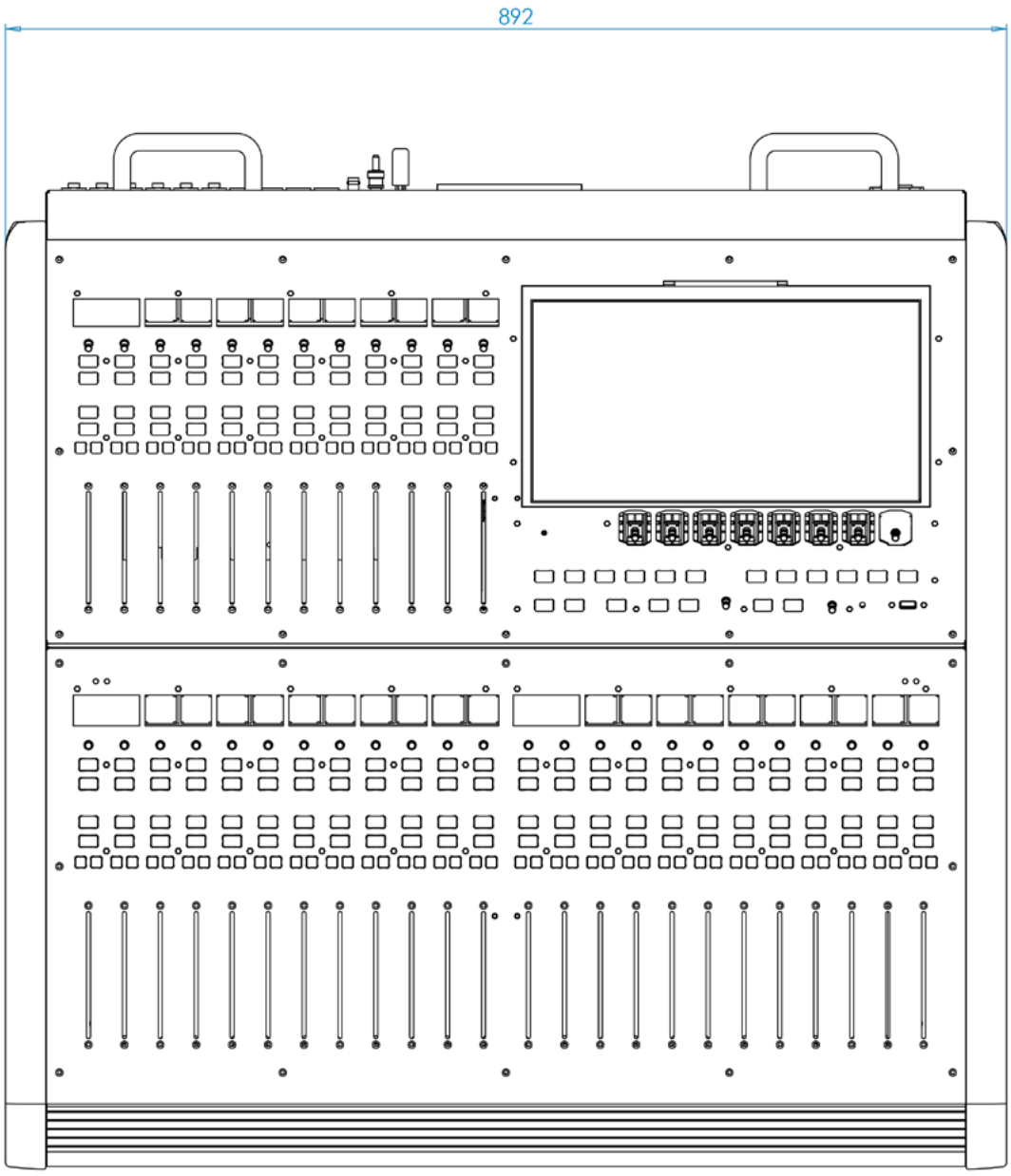
BRIO 36
CONTROL SURFACE

CALREC

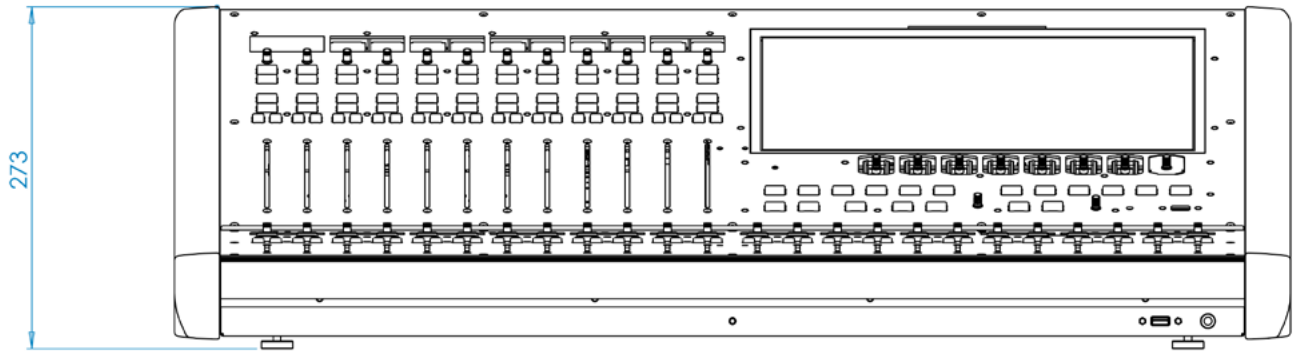
SURFACE MEASUREMENTS

The following diagrams show the surface measurements all in millimeters (mm).

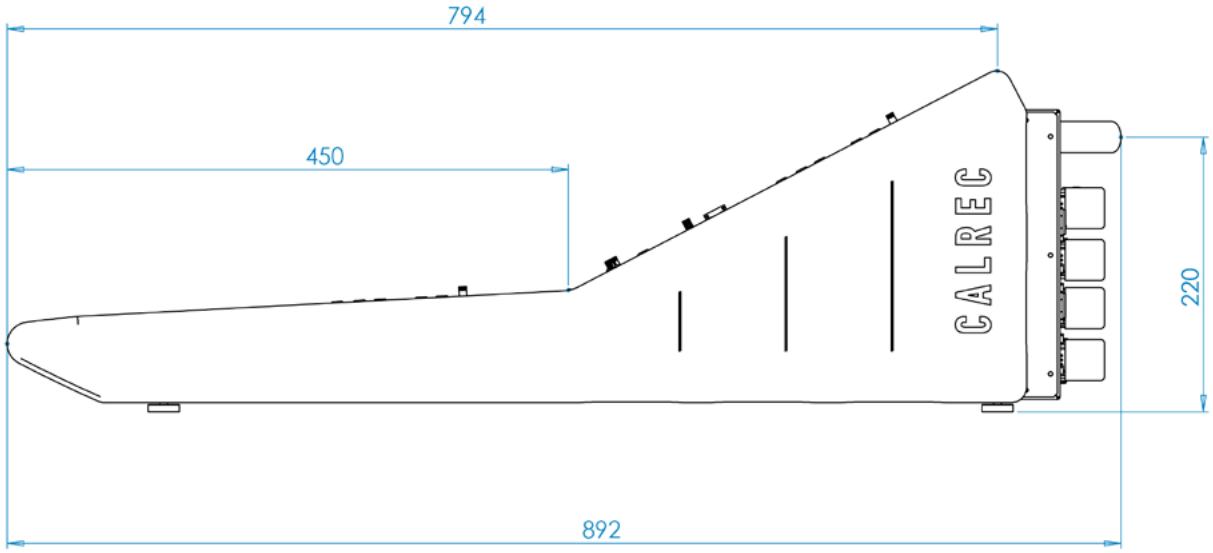
TOP VIEW



FRONT VIEW

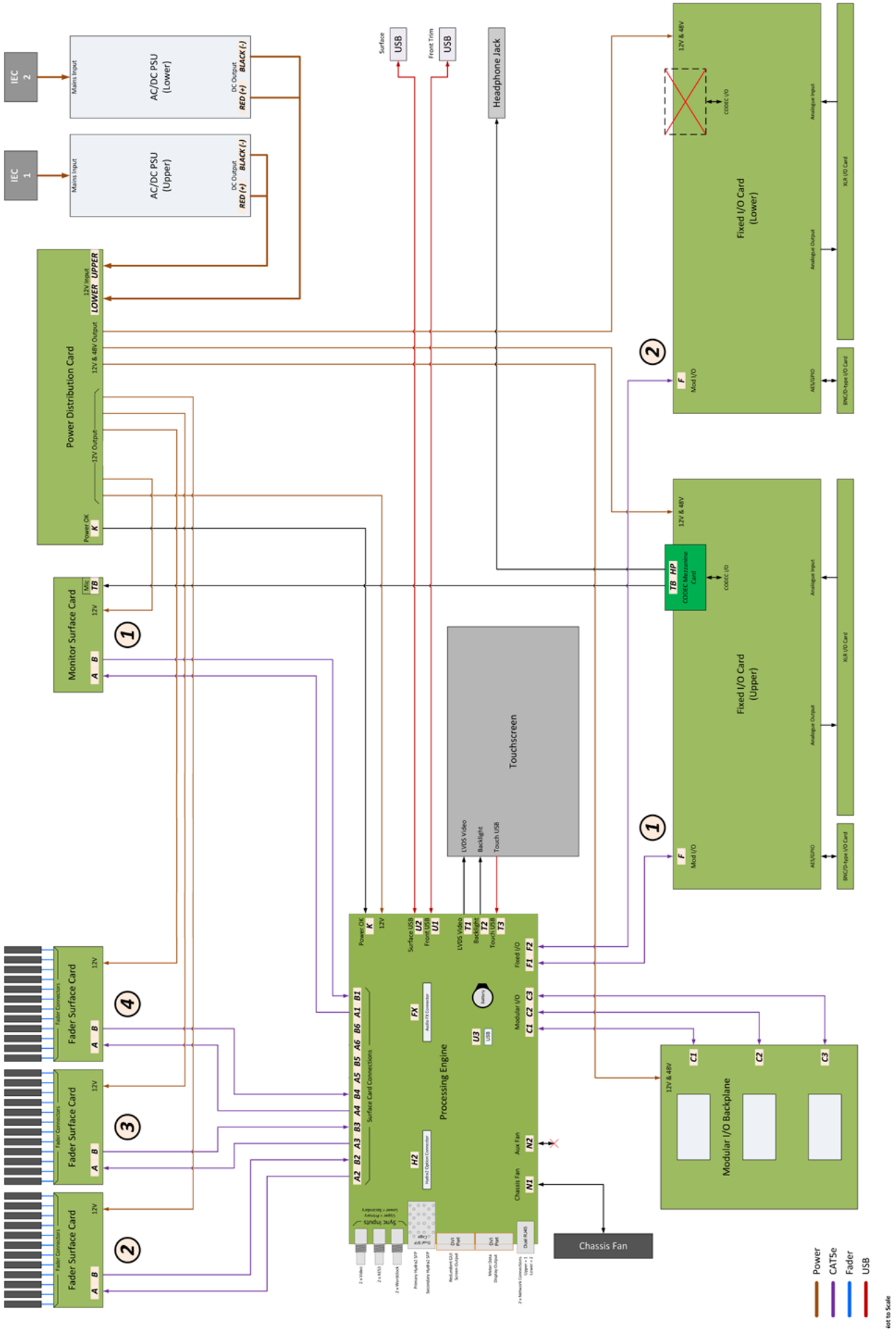


SIDE VIEW



COMPONENT CONNECTIONS

Diagram showing how Brio 36's internal components are connected together.



SURFACE LAYOUT

The BRIO 36 surface is built as 2 panels top and bottom.

It is made up from 3 x 12 fader sections, 2 across the bottom and one top left and one Access Panel placed top right which contains the Access display area complete with touchscreen TFT, 8 context based rotary controls, 12 Global user switches G1 to G12, A/B layer selection, Link Switch, Monitor Controls, PFL level, Reset switch and USB port used for data transfers. In addition there is a USB port for a keyboard/mouse combination and a Stereo 1/4" Headphone socket in the front.

BRIO 36 SURFACE AREAS

HEADPHONE AND TALKBACK MICROPHONE

The built-in talkback microphone and the headphone socket, are patched to dedicated internal ports in (SLOT M) and DO NOT appear as external audio port connections on the rear panel.

The built-in talkback mic appears as a source in I/O patching lists as port M-01. By default, this is connected to the console's DSP talkback input. Other internal or external inputs can be connected instead to the DSP talkback input if a different microphone, or output from a 3rd party comms system is preferred.

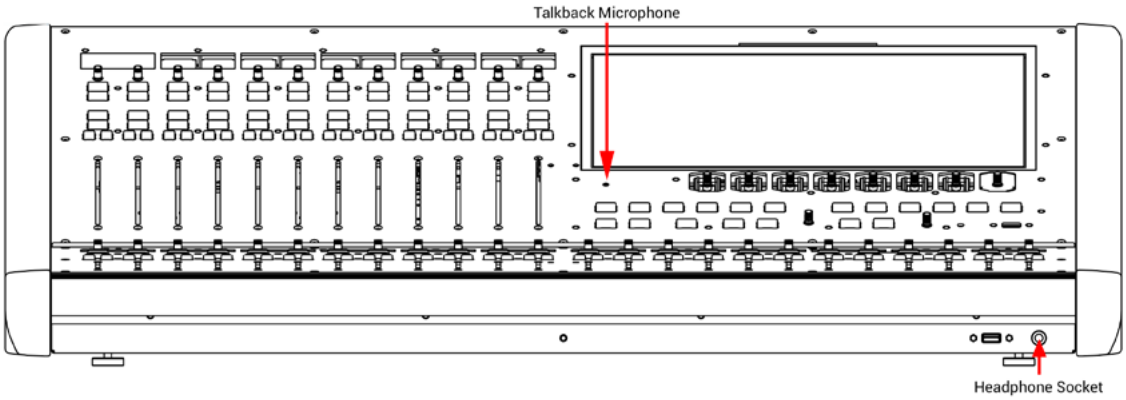
The output from the built-in microphone can also be patched to other outputs/ console inputs as well as the talkback if required (e.g. to feed into a comms system).

The headphone socket appears as destinations M-01 (Left) and M-02 (right) in the I/O patching lists. By Default, this is connected from the Studio Monitor 2 output, but can be fed from other monitor or path outputs, or from inputs if required.

Headphone and Talkback Microphone Connections

The Brio 36 built-in talkback microphone is situated above the User G1 button in the Monitor panel area, directly under the Touch Display. The headphone socket is fixed to the front right of the surface, just under the arm rest.

BRIO 36 LOCATIONS OF HEADPHONE SOCKET AND TALKBACK MICROPHONE.



POWER SUPPLY UNITS

Brio 36's power supply unit (PSU) contains two power supply units which are supplied with AC power by two independent male IEC inlets. These dual power supplies provide full power redundancy, a feature of all Calrec products.

Although Brio 36 will run with only one PSU powered on, it is recommended that, to ensure power redundancy, these two IEC inlets should be supplied by separate AC power supplies.

A PSU failure or a loss of AC power input will generate a system status error message (See the Brio 36 User manual for more information on system status monitoring).

The two PSU's employ load sharing, if one PSU fails, the other will automatically take over the full load with no loss of audio or operation.

Disconnecting the PSUs

Brio 36 does not contain a separate Mains power switch. To safely disconnect the mains power both IEC connectors need to be removed from the rear of the console, as shown below.

Power Distribution

The power supply module connects to an internal Power Distribution Board providing 12 V DC & 48 V DC power to Brio 36's internal components.

The Touch Display is powered via its connections to the Processing Engine card. Note, the Touch Display also has a backlight which is powered via a separate 12 V DC connection from the Processing Engine card.

BRIO 36 REAR VIEW SHOWING PSU MAINS CONNECTION AND RATINGS LABEL

BRIO 36
CONNECTION INFORMATION

CALREC

SYNCHRONISATION

The Brio 36 has 6 BNC connections for external synchronisation:- 2 x Wordclock inputs, 2 x AES inputs and 2 x Video inputs. If no external sync is connected and selected, the console will free-run on its own internal clock generated by the active router card.

General rules of good practise require that all equipment connected to the audio console's digital inputs and outputs are locked to the same referenced sync source as the console to ensure clean audio. In systems with multiple Calrec processing cores connected together, it is of paramount importance that all connected processing cores are locked to the same referenced sync source.

If one or more cores receives a sync signal that is not locked from the same clock reference as other cores, interruptions to both audio and data carried by routers can be caused. This can lead to false error warnings and I/O boxes going offline. Therefore, it is essential to consider a robust sync distribution design for a facility and to ensure all points in the chain are correctly configured to lock to the appropriate input and no elements, such as sync regenerators, are free-running or making changes to the reference source.

It is also recommended that backup sync sources and paths are considered to maintain full functionality in the event of the loss of any part of the facility's sync distribution system.

External sync sources can be fed to the BNC connectors on the rear of the console as shown above right. Two inputs are available for video formats, as well as two inputs for TTL Wordclock and two inputs for AES3 digital audio reference.

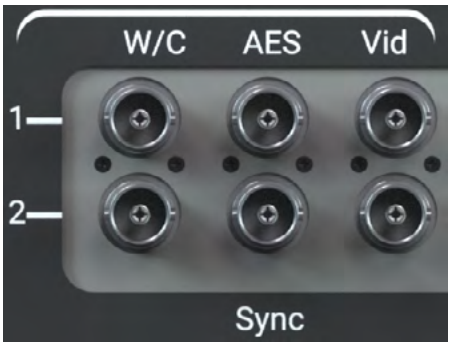
See External sources table right and the Brio 36 User manual for information on how to set up synchronisation priority.

The console will always attempt to boot to the highest priority sync selected, and move down the priority list until it finds a valid sync.

If a valid sync later fails, it will move down the list. If no valid sync present, will always default to internal as this is fixed as the last source in the list. The priority will never automatically move back up the list even if a higher priority sync becomes available. Press the reset to first button to move back up to the top of the list.

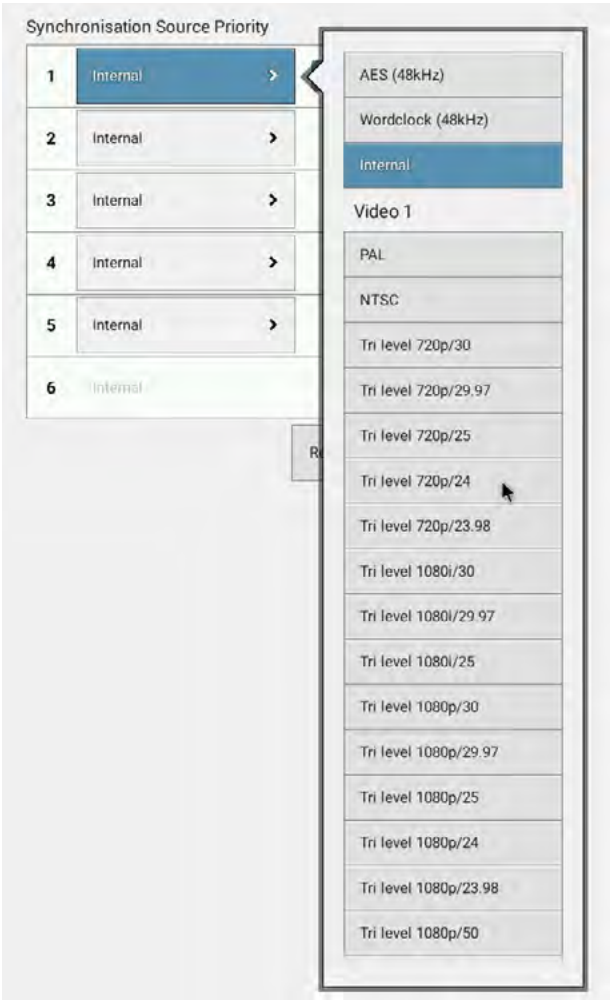
It is important that the required sync source is available before the console boots up otherwise it won't be locked to the correct sync, if this occurs press the 'Reset to first' button after the sync generator is running.

SYNC INPUTS



Synchronisation at different sample rates:
Hydra2 runs at 48kHz irrespective of whether the consoles and I/O boxes are running at 96kHz or not. It simply uses 2 samples per 96kHz signal. The system will still require a 48kHz sync if using its AES3 or Wordclock inputs even, if all consoles and I/O are operating at 96kHz.

EXTERNAL SOURCES TABLE



AUDIO I/O CONNECTIONS

There are a number of ways to get Audio in and out of a Brio 36 system. There are built in Analogue and Digital Inputs, 3 double width modular I/O card slots which can use any of the cards from the Modular I/O box range and it can also connect to Hydra 2 networks via the optional H2 module.

The optional Hydra 2 Module allows further I/O to be connected in the form of any Hydra 2 I/O box, fixed format or modular. Multiple I/O boxes can be connected via H2Hubs, and from V1.1, Brio consoles can connect to router ports on Apollo/Artemis/Summa/Router cores to share audio over a wider, multiconsole Hydra2 network.

Built-In Audio Interfaces

The image below shows the Audio interfaces available to he user without the optional Hydra 2 interface module.
There are:-
8 x Digital AES I/Ps, with SRC,
8 x Digital AES O/Ps,
24 x Analogue Mic/Line I/Ps,
16 x Analogue Line O/Ps
3 double width Mod I/O card slots.

Note that the image also shows the built-in GPIO connectors, there are 4 x 9-pin D-Type connectors each of which carry either 4 GPI or 4 GPO circuits, this gives Brio 36 a total of 8 x GPIs and 8 GPOs.

Optional Hydra 2 Audio Formats

Hydra2 I/O units come in a variety of formats and connector types, including MADI and SDI embedders/de-embedders, AES digital and mic/line analogue formats, all with a variety of connector types. Please refer to the Hydra2 installation manual for full details on I/O.

Power

All External Hydra2 I/O units are fitted with dual power supplies and IEC AC power input connectors operating from 100-240 VAC. Both power inputs should be fed, preferably from two separate AC sources, to provide full redundancy.

IEC 'Y' cords can be supplied to allow both inputs to be fed from a single cable source, in the event that only one supply is available, to ensure both PSUs can always be fed.

ID configuration

Each I/O box in a system needs to be given a unique hydra ID (HID), see "Hydra I/O Box IDs" on page 14 for further information.

Modular I/O card slots

Please note that changing the card type fitted in a modular I/O card slot requires the user to remove it from the required I/O List however if on a network it also needs to be removed from the network configuration using H20 and resetting the master router is required to add the replacement cards in H2O.

For guidance in the use of H2O refer to the H2O User Guide which can be found on the Calrec website

If the order that cards are fitted in a modular frame is important in your installation, please discuss this with your supplier prior to delivery. If for any reason the card order needs to be changed post delivery, please contact our Customer Support team or your local distributor for guidance. Cards of the same type can be interchanged with no configuration change required. Additional cards can be fitted in previously empty slots without further configuration.

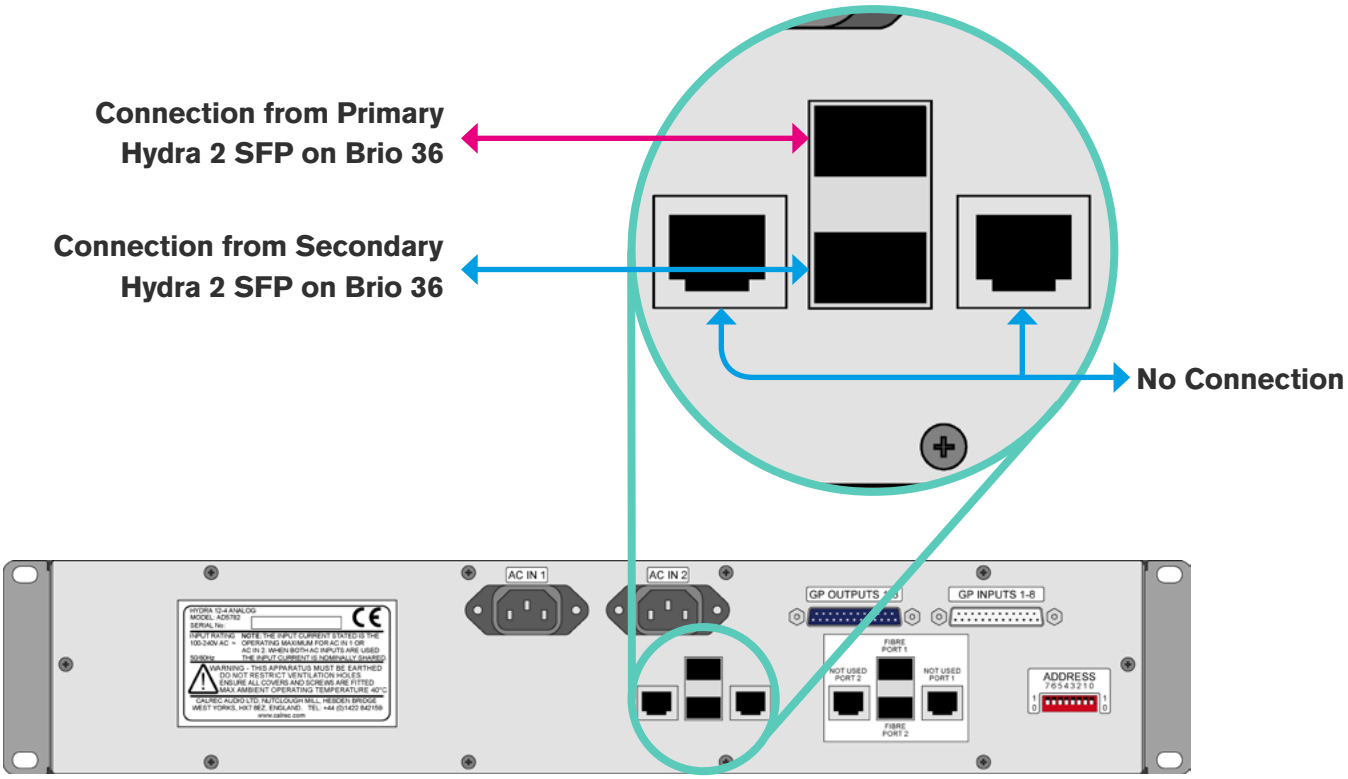
Hydra2 connection

Like the Hydra2 ports on the router card, Hydra2 connections on the back of the Brio 36 and I/O boxes are SFPs and therefore the connection type required (copper/single mode fibre/multimode fibre) needs to be specified during the ordering process.

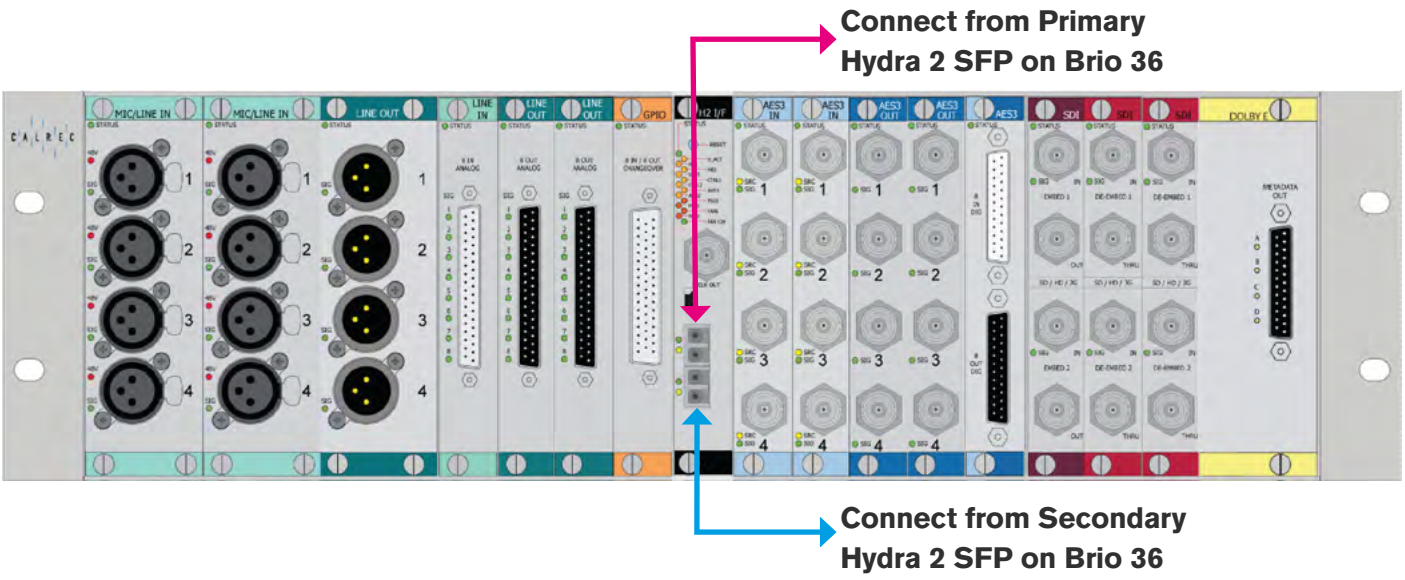
Note, any fixed RJ45s on the rear of External Hydra2 I/O boxes are not functional, if copper connections are required, copper SFPs should be specified.

BUILT-IN AUDIO CONNECTIONS

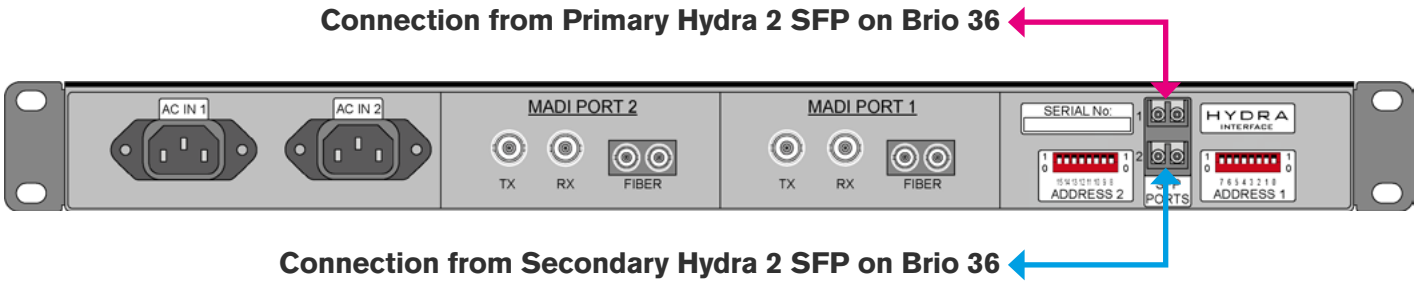
FIXED FORMAT I/O REAR CONNECTIONS



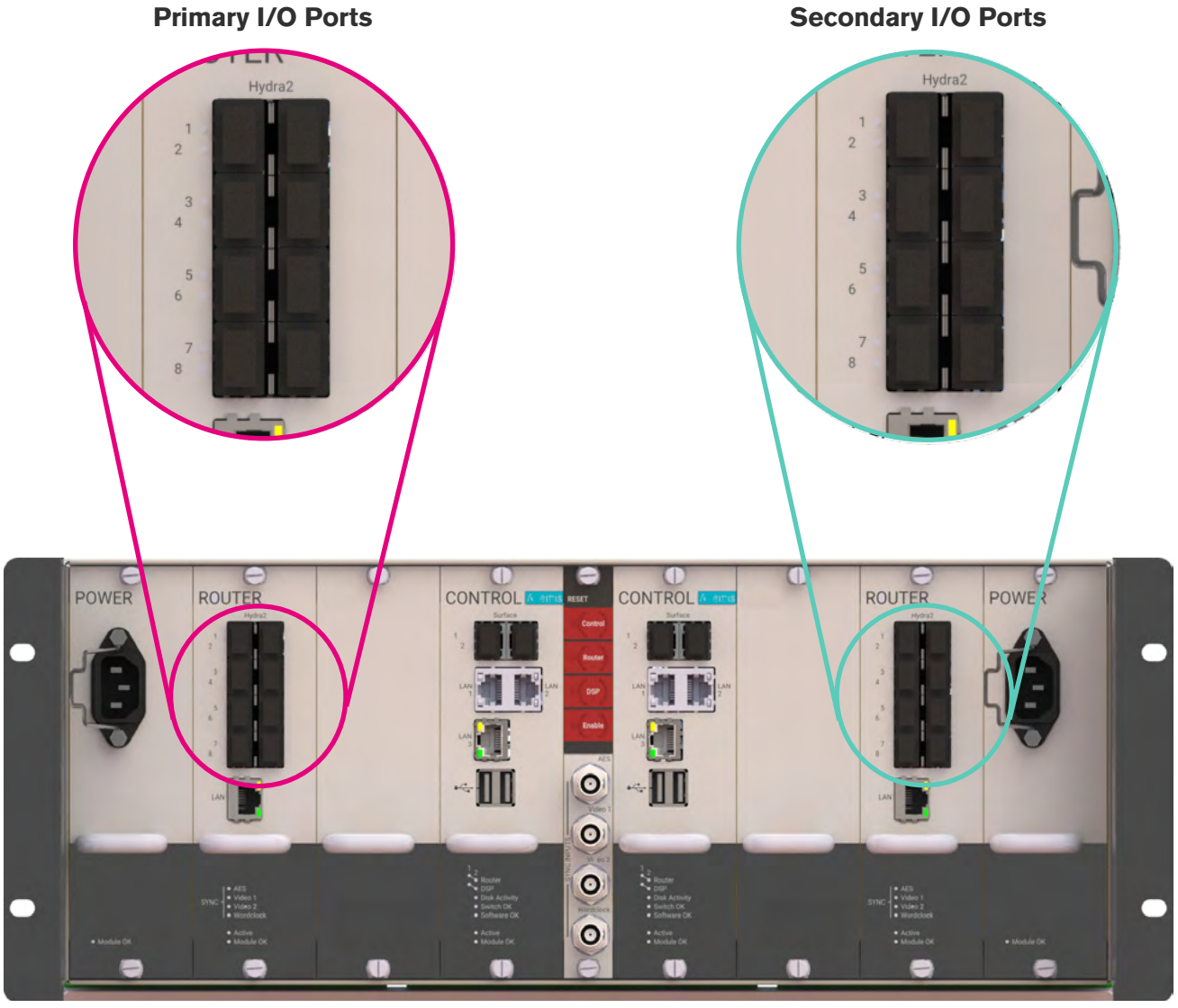
MODULAR HYDRA2 I/O, CONTROLLER CARD FRONT INTERFACE



FIXED FORMAT MADI HYDRA2 I/O, REAR INTERFACE



PROCESSING 2015 CORE—HYDRA 2 ROUTER I/O PORTS FOR CONNECTING TO BRIO 36 FROM V1.1 ONWARDS



SMALL FORM-FACTOR PLUGGABLE (SFP) OVERVIEW

Connections between the Brio 36 control surface (which includes the processing core) and all Hydra2 network connections, connections between I/O boxes and routers and router-to-router connections between cores, are all made via SFP modules.

SFPs can be provided for RJ45 copper connections, as well as singlemode or multimode fibre on LC connectors. This allows for each port's connection type to be chosen to suit cable-run distances and the existing infrastructure. SFPs can be changed easily on a port by port basis, as and when required.

If Calrec are supplying SFPs for your installation, the correct quantity of SFPs are supplied pre-fitted. The type of each connection—copper, singlemode fibre or multimode fibre—should be specified at the time of order to ensure the correct SFP types are supplied. Additional SFP modules can be ordered if required. If a system is to be connected to an existing Hydra2 network, please discuss this with your Calrec project leader, sales person or local distributor to ensure that SFPs are provided and ports provisioned for the additional router to router connections.

SFP MODULES

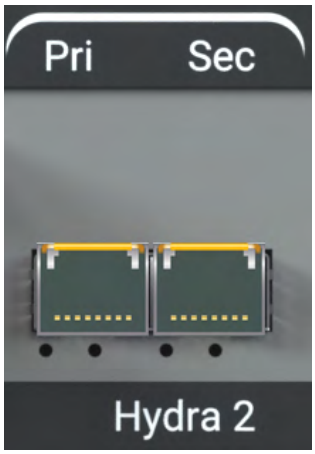
- Both SFP types above have a handle latching mechanism, shown in the locked position. The unit on the left is a singlemode duplex LC fibre module. The unit on the right is a copper RJ45 module type which must support LOS detection.

SFP slot orientation

SFP modules plug into rear panel slots on Brio 36 & fixed format I/O boxes, and into front panel slots on router and modular I/O controller cards. The modules can be fitted or removed whilst the system is powered up and without removing or opening any card or box casings.

Note the orientation of the SFP modules as shown in the illustrations on this page.

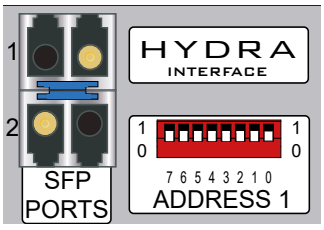
BRIO 36 SFPS



- Brio 36 Hydra 2 interface on rear shown with copper SFPs fitted.

SFP Modules fitted in Brio 36 are orientated so that the RJ45 connector catch and the Fibre LC connect key are at the top.

FIXED FORMAT I/O BOX SFPS



- I/O box shown with singlemode fibre SFPs (button release) fitted.

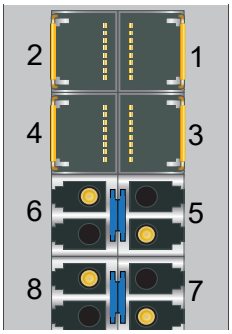
Likewise for fixed format I/O boxes, the primary SFP module is the opposite way around to the secondary SFP module. The modules are orientated so that the release catch for the RJ45/LC connector plugs, once inserted, are on the outside edge.

MODULAR I/O BOX SFPS

- Modular I/O controller card SFPs are both orientated the same way around (Button release singlemode fibre SFPs shown).

For modular I/O box controller cards, both SFP slots are orientated so that the release catch on the cable/fibre connector is on the right-hand side.

ROUTER CARD SFPS



- Router card shown with copper SFPs fitted in ports 1-4, singlemode fibre (button release) in ports 5-8.

Modules fitted in Router cards even numbered router ports (left hand column) are fitted the opposite way around to those in the odd numbered router ports (right hand column).

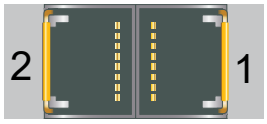
SFP latching and extraction
Calrec source SFP modules from various manufacturers. All types used conform to the same specification, however the latching mechanisms can vary slightly.

The standard copper SFP and some fibre SFPs, as shown in the photograph on the previous page, have latch/extraction handles. On insertion, the handles should be set against the outer edge (the same side as the release catch on the RJ45 / LC connector plug that fits into the SFP) to lock it into place and prevent accidental removal if cables are pulled.

To remove this style of SFP, remove the cable/fibre and slide the handle (copper) or lift the handle out (fibre) to the inside edge, as shown in the diagram to the right. The module can then be removed by pulling on the handle.

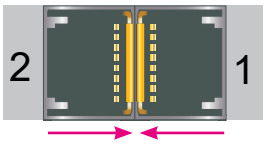
Other SFPs automatically latch into place when they are inserted fully and they have a release button on their inside edge. The fibre SFPs shown in the orientation diagrams and on this page are of this type

SFPS WITH HANDLES - LATCHED



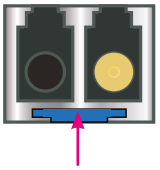
- Both SFPs shown are locked in place - Latch / extraction handles in outer position (or 'down' position for fibre).

SFPS WITH HANDLES - UNLATCHED



- Both SFPs free to remove - Latch / extraction handles in inner (or 'Lifted' for fibre) position.

AUTO-LATCHING SFP



- Depress the release button to remove.

and have blue release buttons. To remove, depress the button using a small flat blade, screwdriver or similar tool. The SFP module will then be free to be removed.

SFP slot covers
Dust covers should be fitted to all SFP slots that do not have SFP modules fitted in them in order to maintain connection reliability.

Loose SFP storage
SFP modules are small, yet reasonably expensive devices. When removing or changing SFPs, take care to keep track of them and store loose modules in a clean, dry, and anti-static environment. Fibre SFPs should always have a dust cover fitted into their optical transceiver end when no fibre is connected to them.

Calrec will not be liable for lost or missing SFP modules, or damage due to poor storage. SFP design varies depending on the manufacturer, please ensure that SFPs are correctly latched in place after fitting them. In the event that a connection is not automatically established after hot-plugging an SFP, please reset the unit the SFP is plugged in to.

COPPER SFP CONNECTIVITY

Hydra2 network connections can be made via copper SFP modules. Copper connections require shielded F/UTP Category 5e or Category 6 cables with shielded RJ45 mating connectors. Surface to Core connections can only be made using optical/fibre SFP modules.

It is important to note that Copper SFPs must support LOS (Loss of Signal detection) - this is not standard for copper SFPs, but are commonly available, Calrec supplied Copper SFPs do support LOS.

Calrec do not supply copper cables as it is often preferable to terminate them after they have been run through cable ducting to avoid damaging the terminations, and to be able to cut them to the precise length required.

Shielded cables and connectors

Shielded cabling and connectors are required in order to meet EMC (Electro-magnetic compatibility) standards to comply with the radiated emission limits set in the EN55022 standard, as well as to guarantee performance in electrically noisy environments.

F/UTP Cat5e/Cat6 cable has an overall foil shield around the conductor cores. Shielded RJ45 connector plugs have a metallic shield around them which should be clamped/bonded to the shield within the cable. The connector shield connects with the chassis of the RJ45 socket that it is plugged into, providing an earth to the cable shield.

The method of attaching the connector shield to the cable shield can vary. Please refer to the connector manufacturer's information for further guidance.

Maximum cable length

The maximum length of Cat5e/Cat6 cables is 90 m/295 ft. This is the absolute maximum and needs to include any patch points and cables that may be in the path. Hydra2 cable runs can NOT be extended using Ethernet switches, hubs or repeaters. If a run between Hydra2 hardware exceeds the maximum recommended distance for copper cabling, fibre and optical SFPs should be used instead.

Cable routing considerations

The layout and twist rate of the data cores within Cat5e/Cat6 cables are integral to their performance at high speed over distance. Poor practise during installation can seriously impact upon this. The following are general rules of good practise but please refer to the cable manufacturer's information for comprehensive installation rules:

- When running Cat5e/Cat6 network cabling, it is important to avoid kinking the cable. Kinks can seriously impair performance. Cable manufacturers advise that kinked cables should be discarded and replaced as the damage caused cannot be addressed simply by straightening them out.
- Cables should not be bent in tight angles, this too can seriously impair performance. Please refer to the cable manufacturer's specification on minimum bend radii.
- Excessive pulling force when routing cables can deform the twist rate of the cable cores, causing irreparable damage. Cable manufacturers specify a maximum pulling tension.
- Cable ties should not be over-tightened as this deforms the internal structure of the cable. Cable ties should be tight enough to support the cable weight but not so tight as to cause any visible deformation to the cable's outer jacket. Large, heavy bundles of cables can be difficult to support using cable ties without causing damage. 'Velcro' style hook-and-loop cable straps can be a good alternative to plastic cable ties.
- Whilst neatly bundled parallel cable runs are tidy and aesthetically pleasing, they can increase cross-talk, which can impact on performance. Avoid neat bundling of network cables over any kind of distance—the majority of a cables length is normally unseen, running under floor or through ducting where they should be loosely laid rather than neatly bundled.

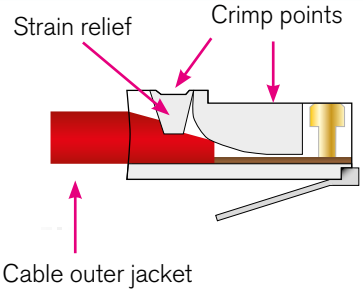
Termination - strain relief

Poor termination and lack of strain relief is one of the most common causes of high speed network cable problems. To properly relieve strain on the data cores, the outer jacket of the cable should be inserted into the RJ45 housing and held in place once crimped at the strain-relief point, as shown in the diagram above. This also maintains the integrity of the twist rate and shield into the termination, ensuring the full length of the cable conforms to its specification. Slide on outer boots offer additional strain-relief protection but are not sufficient on their own.

SHIELDED RJ45 CONNECTOR

Conductive connector mating screen clamped / bonded to cable shield

STRAIN RELIEVED RJ45 TERMINATION



- Note, this is a simplified diagram that does not include the shield.

In order to be able to crimp the cable jacket inside the RJ45 and land the data cores on the terminals, the amount that the jacket is stripped back in relation to the cores needs to be accurate. Cables with exposed data cores should not be used as they will be unreliable.

Termination - pin-out

Hydra2 network cables use the standard gigabit Ethernet pin-out. Performance relies on the positive and negative leg of each signal pair using cores that are twisted together. Calrec recommends that 'straight-through' or 'pin-for-pin' cables are used. 'Cross-over' style cables can be used, however they must be gigabit standard cross-over. Older pin-outs, designed for use with slower Ethernet standards only use two of the four pairs, even though all four pairs are terminated. Cross-over variants of this style only cross the pairs that are used (A & B). Gigabit cross-over cables require that the blue (C) pair is crossed with the brown (D) pair as well as the orange (A) pair being crossed with the blue (B) pair.

Testing/certification

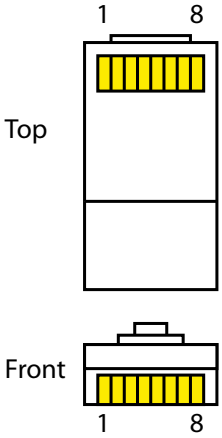
Calrec strongly recommend that all Hydra2 network cabling is properly tested or certified prior to on-site commissioning of the system. Simple test devices that only check the pin-out of the terminations are not sufficient to prove the performance and reliability of high speed data cabling. Certification level test equipment can give a simple pass/fail response but in doing so will test various important factors as well as pin-out. Certification type tests include determining cable length, measuring skew (timing differences between pairings due to variations in length caused by intentional differences in twist rate), measuring for loss, signal to noise ratio and BERT error checking on data.

Cables that fail certification tests or fail to perform, may appear to function fine in other applications, such as a PC LAN connection where errors leading to retries and therefore delays are acceptable and often unnoticed.

Temporary / reusable cables

Cabling that is not part of a permanent infrastructure, such as temporary runs used for outside broadcasts, should be carefully coiled and uncoiled to avoid kinking and they should be regularly tested. Cables showing any sign of damage should be replaced.

RJ45 PIN NUMBERING



STANDARD HYDRA2 RJ45 PIN-OUT

Pin	Colour	Signal
1	Orange-White	A+
2	Orange	A -
3	Green-White	B+
4	Blue	C+
5	Blue-White	C -
6	Green	B -
7	Brown-White	D+
8	Brown	D -

- For standard wiring, both ends of the cable should be terminated as above

FIBRE SFP CONNECTIVITY

Optical SFP modules for fibre connectivity can be used for console to processing core, router to router, and router to I/O connections.

Fibre connectivity is required when the cable run between units exceeds the maximum permissible length for Cat5e/ Cat6 copper cabling. Fibre can also be used for shorter runs if it is simply the preferred medium.

Note that this section only concerns fibre connections made via SFPs. Like all I/O boxes, MADI units have pluggable SFPs for their Hydra2 connections to routers, but they also have fibre connectors that pass the actual MADI audio format in and out of the system. The MADI I/O format fibre connectors are of a fixed type which has no relation to SFP choice. Different build types of MADI I/O box are available to provide various types of MADI fibre interface. Please refer to the Hydra2 installation manual for more details on MADI I/O options.

Singlemode vs multimode SFP's

The core within multimode fibre is relatively thick when compared to singlemode. Light travels through multimode fibre at multiple angles, 'bouncing' of the sides of the core as it travels through it, taking multiple paths, or 'modes' of varying length from one end to the other, resulting in pulses being lengthened as they travel. Singlemode fibre has a very fine core and light travels in a single, direct path from one end to the other without affecting pulse length.

The result is that singlemode fibre has a higher bandwidth capacity and lower signal loss allowing much greater distances to be achieved. Light can be transmitted into multimode fibre using LED's or low powered lasers whilst singlemode uses a higher powered laser.

Bi-Directional SFP's

These SFP's use a simplex LC connector and operate by transmitting and receiving at 2 different frequencies down the same fibre in opposite directions. These have to be used in a Type A /Type B pair. Type A has a TX frequency of 1310nm and a RX frequency of 1550nm whilst its opposite uses a TX frequency of 1550nm and a RX frequency of 1310nm.

Calrec recommend the use of singlemode fibre whenever possible in order to maximise the flexibility in the location of hardware and maintain uniformity across the system by using a single type. If a multimode infrastructure is in place, fibre length, the number of inter-connects and equipment location becomes important.

SFP modules are available in bi-directional, singlemode and multimode fibre types. It is important to select the correct SFP for the type of fibre being used in the installation. If using a mixture of singlemode and multimode fibre, it is important to ensure the correct SFPs are matched to the correct fibre type.

Identification

The release button / handles of fibre SFPs are colour coded - Blue (TypeA) /Purple or Green (TypeB) for bi-directional, Blue for singlemode and Black for multimode. Blue LC connectors, as shown below should be used to terminate singlemode fibre, and beige connectors for multimode.

Connectors / terminations

Calrec fibre bi-directional SFPs use simplex LC connectors whilst multimode and singlemode use duplex LC connectors. The duplex termination requires two fibres per connection, one is a send path, the other is a receive path. When terminating the fibre, the send from one end should connect to the receive of the other and therefore they are 'cross-over', terminated A to B and B to A.

SFP / fibre specifications

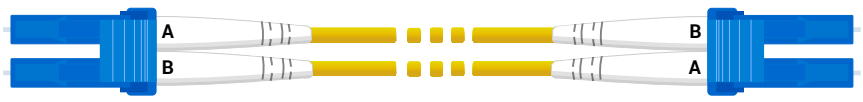
Specifications are shown in the table below. The maximum distances shown assume a single point to point connection with no intermediary interconnections. Losses should be measured across the total signal path including interconnects - between points of transceiver connection. Losses need to be less than the optical power budget of the SFP transceivers.

FDDI SFP

491-254 (see spec table)

This is a Bi-Directional SFP used for FDDI interfacing to the JM6199 MADI module.

DUPLEX LC FIBRES CORRECTLY TERMINATED A TO B & B TO A



BI-DIRECTIONAL LC FIBRE CORRECTLY TERMINATED TYPE A TO TYPE B

SFP COPPER / FIBRE SPECIFICATIONS

Part Number	Description /Cable Type	Type	TX Freq	RX Freq	Bale Colour	Max Dist	Connector Type	GBIC Type	Power Budget
491-194	SFP Module Copper CAT5/6	N/A	N/A	N/A	N/A	90m	RJ45	N/A	N/A
491-087	SFP Module Fibre Multimode 62.5/125um	N/A	850nm	850nm	Black	275m	LC Duplex	SX	7.5dB
As above	SFP Module Fibre Multimode 50/125um	N/A	850nm	850nm	Black	550m	LC Duplex	SX	7.5dB
491-072	SFP Module Fibre Singlemode 8/125um	N/A	1310nm	1310nm	Blue	10km	LC Duplex	LX	8.0dB
491-060	SFP Module Fibre Singlemode 8/125um	N/A	1310nm	1310nm	Blue	70km	LC Duplex	LH	23.0dB
491-195	SFP Module Fibre Bi-Directional 9/125um	A	1310nm	1550nm	Blue	10km	LC Simplex	LX	11.5dB
491-196	SFP Module Fibre Bi-Directional 9/125um	B	1550nm	1310nm	Purple	10km	LC Simplex	LX	11.5dB
491-201	SFP Module Fibre Bi-Directional 9/125um	A	1310nm	1550nm	Blue	40km	LC Simplex	LH	23.0dB
491-200	SFP Module Fibre Bi-Directional 9/125um	B	1550nm	1310nm	Green	40km	LC Simplex	LH	23.0dB
491-254	SFP Module Fibre FDDI Multimode 62.5/125um	FDDI	1310nm	1310nm	Black	2km	LC Duplex	SX	11.9dB

FIBRE – GENERAL RULES

Testing / Certification
Calrec strongly recommends that all fibres are properly tested or certified prior to on-site commissioning of the system. A certain amount of signal loss occurs over the length of a fibre path. If the total loss of a path exceeds the optical power budget of the SFPs in use, the system will be unreliable.

Areas of Loss
Signal loss occurs in various areas. Splice loss occurs in terminations—at the point where the fibre meets the connector. Typically splice loss should be <0.3 dB per termination. Poor termination results in higher loss.

Connector loss occurs at the point where the connector meets the SFP/optical transceiver, or other connectors, such as extension interconnects or patch-points. Connector loss should typically be <0.5 dB per interconnect. Dust or other contamination between interconnects or scratches on the end surface contact point of the fibre will substantially increase the amount of loss. As such, dust covers should always be fitted to optical SFPs when no fibre is connected, and to fibre connectors that are not landed.

As well as splice and connector loss, the fibre itself has inherent loss over distance, typically fibre loss will vary from 3.5 dB per km for multimode down to 0.4 dB per km for singlemode. Poor installation practise and lack of care can damage the fibre and result in substantially increased losses.

Fibre Handling Practise
It is important to follow the fibre manufacturer's guidelines when handling fibre and installing fibre runs. Some of the main points of concern are:

- Minimum bend radii—fibre should not be bent through too tight an angle. Tight angles can cause significant losses and permanent damage to the fibre. Fibres may pass initial installation testing but can fail at a later date due to stresses on the core of the fibre caused by tight bends.
- Twists, snags and kinks—Twists in fibre runs add stresses to the core which can cause damage over time. Avoid snagging on other cables or conduit which will cause excessive tensions when pulling and can cause kinks and excessive bends in the fibre. When routing through angled conduit, provide enough clearance around corners to avoid the fibres being pulled sharply around the inside of the angle.
- Pulling—observe the manufacturers maximum pulling tension specification. Use pulling tools and lubrication where appropriate. Never pull on the connector.
- Strain relief—fibres should have adequate strain relief to prevent tension on terminations, however use of plastic cable ties can crush the internal construction of the cable. Hook-and-loop 'Velcro' straps are harder to over-tighten and offer more gentle support and a greater surface area to dissipate the pressure.
- Crushing—never place heavy items on top of unprotected fibre.

Ruggedised Fibre
Temporary/re-usable fibre runs, or runs unprotected by conduit and likely to be exposed to the elements, snagging or to being stood on, should always be of a ruggedised/armoured type to protect the internal construction of the core.

Cleaning and Preventative Maintenance
Contamination of transceiver and fibre mating contact points causes signal loss and can cause permanent damage by scratching.

Dust covers should be fitted to all fibre connectors and SFP optical transceivers when they are not mated. It is also important to ensure that dust covers themselves are kept clean.

When handling fibres without dust covers, do not allow the ends to come into contact with any surface.

Specialist materials should be used for the cleaning of mating contact points to avoid further contamination or scratching. The following items are low cost and readily available from camera shops and laboratory suppliers:

- Canned compressed air—it is important to use specialist filtered, clean, dry air, free of contaminants and moisture.
- Isopropyl alcohol—Use with cotton swabs or lint-free wipes to ensure no residue is left.
- Lint free wipes/long fibre, low ash lens paper—needs to be free from chemical additives.
- Ensure wipes and swabs are stored in a clean environment and are not reused.

Cleaning Fibre Optic Cables and Connectors

There are multiple ways to clean fibre-optic cables and connectors. Included below are some helpful tips:

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

Cleaning Procedure

1. Blow the fibre surface with a stream of Clean Dry Air, this will dislodge larger loose particles.
2. Place 1-3 drops of spectroscopic grade Isopropyl Alcohol in the centre of a lens tissue.
3. Hold the fibre by the connector or cable, place the wet portion of the lens tissue on the optical surface and slowly drag it across.
4. Examine the surface of the 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.
5. Immediately install a protective cover over the end of the cable to avoid re-contamination or insert the fibre back into the previously cleaned receptacle for immediate use.

Additional Notes

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

Cleaning Optical Transceivers

The best way to clean a transceiver port is to remove particles using a stream of Clean Dry Air. Included below are some helpful tips to properly clean fibre optic modules:

- Always handle optical SFP modules in an ESD safe manner using the proper safety precautions.
- Ensure that the module is powered 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.

WARNING

Never look into the end of an optical transceiver or fibre when in use. Laser radiation can be harmful to the human eye and should be avoided.

Remember that when disconnecting a fibre, the transmitting device at the other end may still be active.

Cleaning 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 an 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 feel free to contact Calrec.

GPIO CONNECTIONS

GPIO cards provide logic inputs and outputs, which can be assigned to various functions from the Brio 36 interface.

GPIO allows console functions to trigger external devices e.g. fader starts for playback devices, and for external devices to trigger console functions, e.g. auto-fades controlled by a video switcher.

Internal GPIO interfaces

There are 4 x 9-pin connectors on the back of the Brio 36 surface arranged as 4 x GPI 1-4, 4 x GPO 1-4, 4 x GPI 5-8 & 4 x GPO 5-8 the pinouts and connectors arrangements are shown right.

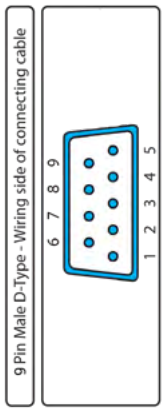
Brio 36 GPI have single pin inputs and functions are activated by grounding the GPI pin, also note that the trigger can be inverted from the UI causing the function to be triggered whilst GPI is floating and cancelled when grounded.

The GPI and GPO circuit diagrams are shown below for each single input/output.

If additional GPIO is required, please discuss this with your supplier.

Optional GPIO cards can be fitted in one of the 3 expansion slots on the back of the Brio 36 console or in modular Hydra2 I/O frames, or any fixed format Hydra2 box with a height of 2U or greater.

INTERNAL FIXED - GPIO, 4 INPUTS + 4 ISOLATED/DRY CLOSURE OUTPUTS



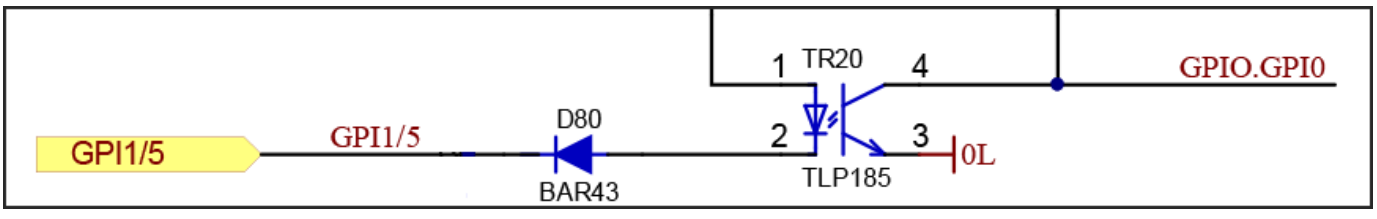
GPI connectors 1-4 in & 5-8 in

Function		Pin
GPI 1/5	+	1
	0V	6
GPI 2/6	+	2
	0V	7
GPI 3/7	+	3
	0V	8
GPI 4/8	+	4
	0V	9
Ground	0V	5

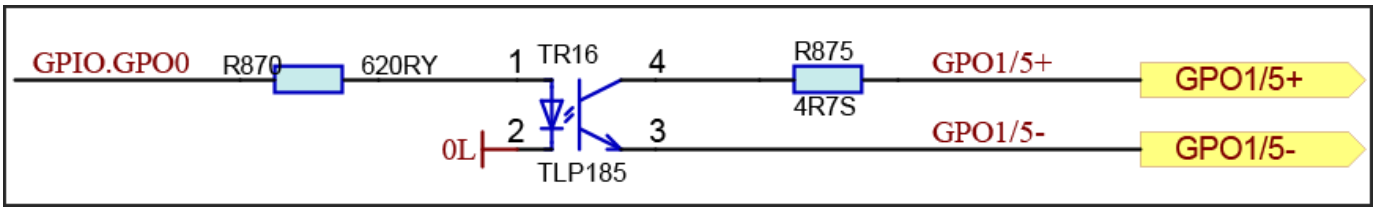
GPO connectors 1-4 out & 5-8 out

Function		Pin
GPO 1/5	NO+	1
	NO-	6
GPO 2/6	NO+	2
	NO-	7
GPO 3/7	NO+	3
	NO-	8
GPO 4/8	NO+	4
	NO-	9
Ground	0V	5

GPI Circuit Diagram for 1/5 in



GPO Circuit Diagram for 1/5 Out



External GPIO interfaces

Multiple boxes can be fitted with GPIO cards to make up the required quantity of GPIO ports. The physical location of I/O boxes within the installation should be considered when choosing which to fit with GPIO cards.

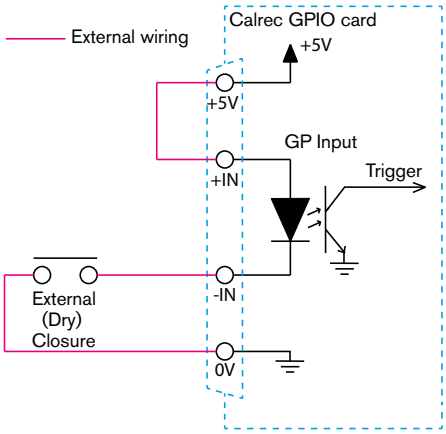
A fixed format I/O box fitted with a GPIO card has two D25 connectors on the rear—female for inputs, male for outputs. GPIO cards for modular frames have a single D50 connector on the front for both inputs and outputs. Two versions of modular card are available, one with 8 changeover relay outputs and one with 16 normally open relay closures.

GPI (inputs)

Each GPIO card type has 8 opto-isolated inputs allowing for remote triggering of console functions. Applying DC or AC voltage across the positive and negative pins of an input will trigger it.

A common way to trigger a GP input is by providing a dry closure from a relay with no voltage on it. If using a dry closure, it should not simply be wired across the +/- terminals of the opto input - one half of the closure should be connected to a ground on the GPIO card, the other half of the closure to an opto input, and the other input should be linked in the connector hood to a GPIO card +5V pin, as shown above. This prevents potential problems in connecting power between different manufacturers' hardware.

GP INPUT WIRING EXAMPLE



GPO (outputs)

The fixed format I/O box GPIO card and the WY5858 modular GPIO card both have 8 changeover relays, each with access to the normally open, normally closed and either common relay pins or normally open/closed negative pins, to provide flexibility in use.

If required, these contacts can be used to switch audio. If being used to trigger external equipment expecting a ground, the relay common should be connected to a ground from the external equipment and either the normally open or normally closed contact used as the trigger line.

If a dry closure is required by the external equipment, this can be achieved by wiring one leg to either the normally open or normally closed contact and the other leg to the common or normally open/closed negative contact.

Normally open (NO) contacts short to the common or negative pin when the relay is activated by the selected function.

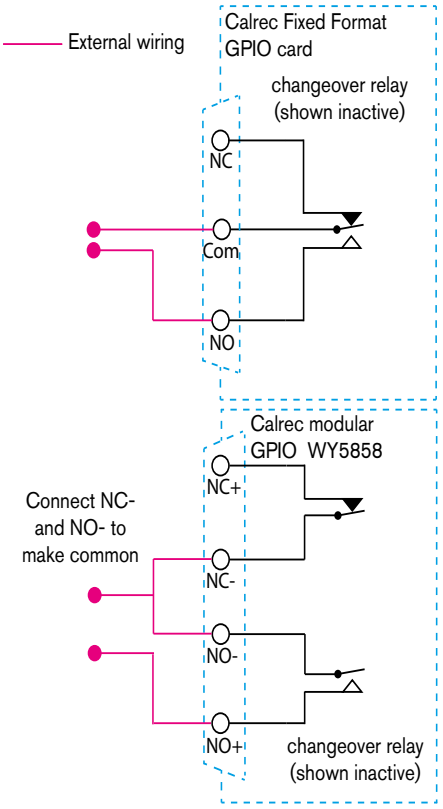
Normally closed (NC) contacts are shorted to common or negative when the function is **not** active.

Dry closure only outputs

The WY5859 version of modular I/O card provides the same 8 inputs along with 16 dry closure only relay connections, which short when activated (NO+ & NO-).

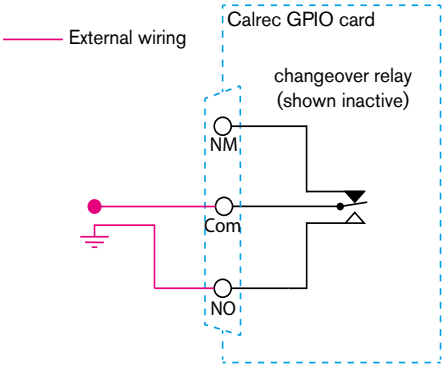
Pin-outs for all GPIO card types are shown the on following pages.

CHANGEOVER OUTPUT EXAMPLE #1



- Changeover relay shown wired to provide a dry closure when activated. For WY5859 treat NO- as common

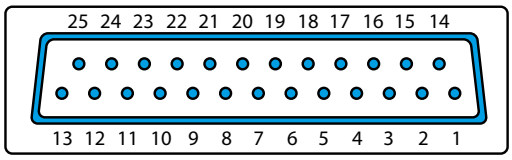
CHANGEOVER OUTPUT EXAMPLE #2



- Changeover relay shown wired to provide a ground when activated. The ground can come from a 0V pin in the GPIO card connector itself as long as the receiving equipment has the same ground reference. For WY5858 and WY5859 common setup see above.

FIXED FORMAT GPIO CONNECTIONS - 8 IN, 8 OUT

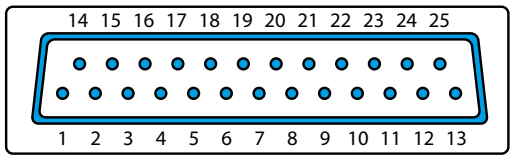
25 Pin Female D-Type - Wiring side of connecting cable



Function		Pin
Relay 1	Common	1
	Normally Open	14
	Normally Made	2
Relay 2	Common	15
	Normally Open	3
	Normally Made	16
Relay 3	Common	4
	Normally Open	17
	Normally Made	5
Relay 4	Common	18
	Normally Open	6
	Normally Made	19
Relay 5	Common	7
	Normally Open	20
	Normally Made	8
Relay 6	Common	21
	Normally Open	9
	Normally Made	22
Relay 7	Common	10
	Normally Open	23
	Normally Made	11
Relay 8	Common	24
	Normally Open	12
	Normally Made	25
Ground		13

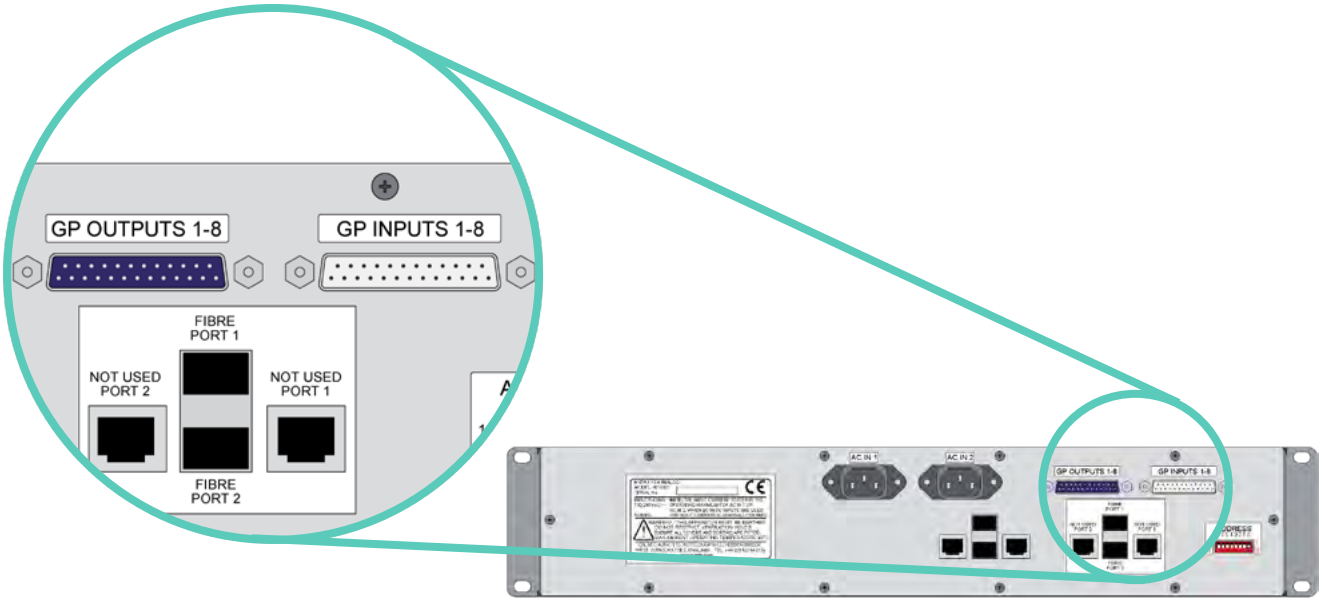
- Calrec connector is male, requiring female terminated cable

25 Pin Male D-Type - Wiring side of connecting cable

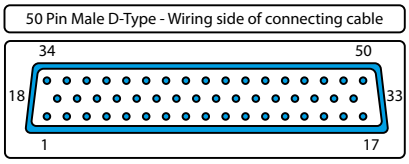


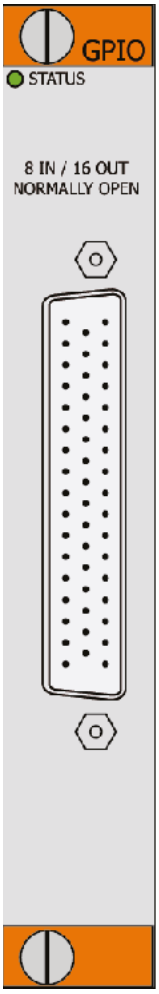
Function		Pin
Opto 1	+	1
	-	14
Opto 2	+	15
	-	3
Opto 3	+	4
	-	17
Opto 4	+	18
	-	6
Opto 5	+	7
	-	20
Opto 6	+	21
	-	9
Opto 7	+	10
	-	23
Opto 8	+	24
	-	12
+5V		2
		5
		8
		11
		16
		19
Ground		22
		25
		13

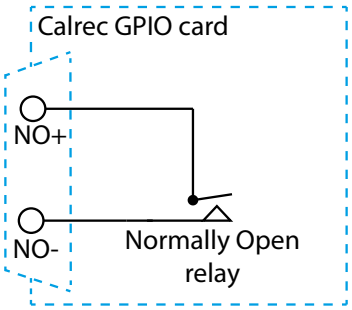
- Calrec connector is female, requiring male terminated cable



WY5859 - MODULAR GPIO, 8 IN + 16 CLOSURE OUTPUT



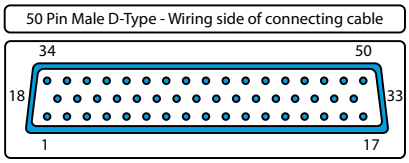


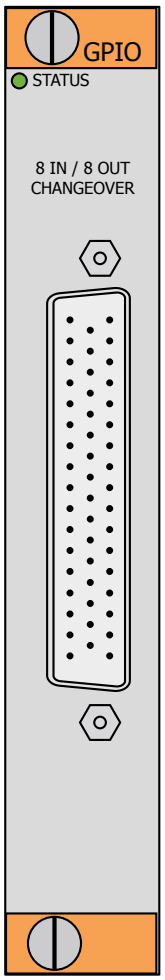


Function		Pin
GPI 1	+	1
	-	34
GPI 2	+	18
	-	2
GPI 3	+	35
	-	19
GPI 4	+	3
	-	36
GPI 5	+	20
	-	4
GPI 6	+	37
	-	21
GPI 7	+	5
	-	38
GPI 8	+	22
	-	6
Supply	+5V	17
Supply	0V	50

Function		Pin
GPO 1	NO+	39
	NO-	23
GPO 2	NO+	7
	NO-	40
GPO 3	NO+	24
	NO-	8
GPO 4	NO+	41
	NO-	25
GPO 5	NO+	9
	NO-	42
GPO 6	NO+	26
	NO-	10
GPO 7	NO+	43
	NO-	27
GPO 8	NO+	11
	NO-	44
GPO 9	NO+	28
	NO-	12
GPO 10	NO+	45
	NO-	29
GPO 11	NO+	13
	NO-	46
GPO 12	NO+	30
	NO-	14
GPO 13	NO+	47
	NO-	31
GPO 14	NO+	15
	NO-	48
GPO 15	NO+	32
	NO-	16
GPO 16	NO+	49
	NO-	33

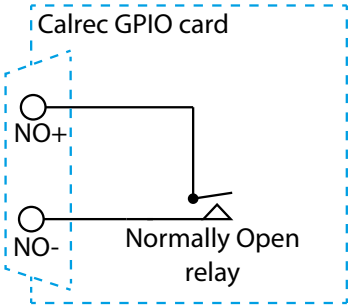
WY5858 - MODULAR GPIO 8 IN + 8 OUT

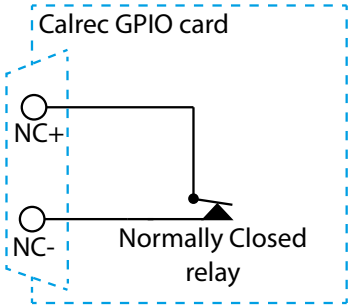




Function		Pin
GPI 1	+	1
	-	34
GPI 2	+	18
	-	2
GPI 3	+	35
	-	19
GPI 4	+	3
	-	36
GPI 5	+	20
	-	4
GPI 6	+	37
	-	21
GPI 7	+	5
	-	38
GPI 8	+	22
	-	6
Supply	+5V	17
Supply	0V	50

Function		Pin
GPO 1	NO+	39
	NO-	23
	NC+	7
	NC-	40
GPO 2	NO+	24
	NO-	8
	NC+	41
	NC-	25
GPO 3	NO+	9
	NO-	42
	NC+	26
	NC-	10
GPO 4	NO+	43
	NO-	27
	NC+	11
	NC-	44
GPO 5	NO+	28
	NO-	12
	NC+	45
	NC-	29
GPO 6	NO+	13
	NO-	46
	NC+	30
	NC-	14
GPO 7	NO+	47
	NO-	31
	NC+	15
	NC-	48
GPO 8	NO+	32
	NO-	16
	NC+	49
	NC-	33





BRIO 36
REMOTE CONTROL AND PRODUCTION AUTOMATION

CALREC

SW-P-08 SOURCE TO DESTINATION ROUTER REMOTE CONTROL

The Hydra2 router allows for 1-to-n source to destination routing of Hydra2 inputs to Hydra2 outputs, without using console DSP, or control surface space. Control over input to output cross-point routing can be carried out from the Brio 36 touch screen interface, a standalone PC running the Hydra2 Organiser (H2O), or via 3rd party controllers supporting the SW-P-08 protocol.

As well as physical Hydra2 I/O ports, the H2O application and SW-P-08 controllers also have access to Hydra Patchbays, providing access to route console DSP outputs and the ability to change sources feeding console inputs. See the Brio 36 User manual for more information on Hydra Patchbays.

SW-P-08 is a well proven communications protocol with a very wide uptake by router and controller manufacturers, allowing their equipment to control, or to be controlled by, other manufacturers' equipment. Although in widespread use, there is no official standard and there can be slight variations in different manufacturers' interpretation. As such, where possible, Calrec prefer to test communications with specific systems before they are used for the first time, allowing for software changes to be made if required.

Please refer to the relevant manufacturer's guidance for specific information relating to their products.

The following 3rd party SW-P-08 control systems have so far been factory-proven by Calrec:

- L-S-B VSM
- Colledia BNCS
- Grass Valley Jupiter
- Evertz
- NVision
- Axon Cortex
- Harris Edge

Network Connection & Redundancy
SW-P-08 controllers connect to the rear panel RJ45 sockets labelled 'Ethernet' 1 or 2.

In multi-console/multi-core networked systems, the connection should be made to the router card in the core configured as the Master. Slaved router cores do not support SW-P-08 connections. An SW-P-08 connection made to the network's Master Router can be given access to all of the I/O and Hydra Patchbays on the network, irrespective of which core the I/O connects to directly, or which console the Hydra Patchbays are configured for.

If required, multiple SW-P-08 controllers can be connected simultaneously to the same RJ45 via an external Ethernet switch/hub.

The rear panel Ethernet connectors use a standard Ethernet pin-out and passes data via TCP/IP. Screened Cat5e cabling should be used to ensure performance in electrically noisy environments.

For 3rd party controllers that pass SW-P-08 data over RS232/RS422, serial to TCP/IP conversion is required. Converter units, such as the Perle IOLAN can be supplied by Calrec.

Brio 36 Connection configuration
The 3rd party controller (or the serial to TCP/IP converter if used) will need to be connected via one of the two ethernet ports and must be configured from the LAN Configuration page in System Settings.

In addition to the IP address, the system will need to be configured to use TCP socket port 61000.

SW-P-08 I/O mapping configuration
Physical I/O and Hydra Patchbays that are to be accessible to 3rd party controllers need to be given SW-P-08 source/destination values which correspond to values configured in the 3rd party controller. SW-P-08 values can be manually typed for each input source/output destination, or they can be imported (and exported) in the form of CSV files.

SW-P-08 mapping requires the use of the Calrec H2O GUI, please refer to the H2O user guide for more details.

EMBER REMOTE CONTROL

The EMBER protocol is a sophisticated data exchange mechanism that has potential for controlling many functions across varied equipment types.

EMBER control has been incorporated into Calrec's product range to allow remote control functionality over both mixing consoles, and the wider Hydra2 network.

Currently, Calrec have tested, and have users on-air with the following EMBER controllers:

- L-S-B VSM
- Colledia BNCS

Please refer to the relevant manufacturer's guidance for specific information relating to their products.

Currently, EMBER has the ability to control the following features when connected to a Calrec Hydra2 network:

- Loading of shows and user memories onto control surfaces.
- Input port settings - mic input gain, mic input phantom power switching and SRC switching on digital inputs.
- View and edit the H20 based Hydra2 I/O box and port labels.
- Inserting SMPTE2020 metadata into Hydra2 SDI embedder outputs—Metadata sets can be uploaded and edited using the H20 application. EMBER controllers can select any of the available metadata sets for insertion to, or removal from any of the SDI embedder outputs on the network.
- EMBER controllers can selectively mute any of the audio channels within the SDI outputs of Hydra2 embedders.

Network Connection & Redundancy
EMBER clients connect to the rear panel RJ45, labelled 'Ethernet', 1 or 2.

In multi-console/multi-core networked systems, the connection should be made to the Router card in the core configured as the Master. Slaved router cores do not support EMBER connections. An EMBER connection made to the network's Master Router has access to all of the I/O and mixing consoles on the Hydra2 network.

If required, other controllers can be connected to the same RJ45 on the router at the same time, by using an external Ethernet switch/hub.

The rear panel Ethernet connectors use a standard Ethernet pin-out and passes data via TCP/IP. Screened Cat5e cabling should be used to ensure performance in electrically noisy environments.

For 3rd party controllers that pass EMBER data over RS232/RS422, serial to TCP/IP conversion is required. Converter units, such as the Perle IOLAN can be supplied by Calrec.

Brio 36 Connection configuration
The 3rd party EMBER controller will need to be connected via one of the two ethernet ports and must be configured from the LAN Configuration page in System Settings.

In addition to the IP address, the system will need to be configured to use TCP socket port 62000.

Control configuration and enabling
With a valid connection made, all parameters accessible to EMBER are made available. No further Calrec configuration is required.

Brio 36 users can enable or disable EMBER controllers from being able to change their control surface shows/user memory from the Brio 36 touch screen interface.

REMOTE CONTROL—CALREC SERIAL CONTROL PROTOCOL

The Calrec Serial Control Protocol (CSCP) allows for remote control over mixing console operational functions by 3rd party systems such as video switchers and production automation systems.

Several broadcast equipment manufacturers provide serial control protocols that are compatible with CSCP. The following systems are currently in use around the world, actively controlling Calrec audio mixing consoles for live, on-air applications:

- Ross Overdrive (Automated Production Control system) & Ross video switchers.
- Sony ELC.
- Snell Kahuna.
- Mosart.
- Grass Valley Ignite.

Please refer to the manufacturer's guidance for specific information relating to their products.

CSCP versions

Additional controls have been made accessible via CSCP since it was first introduced, requiring new commands to be added to the protocol, and new versions released. If 3rd party equipment receives CSCP data it does not understand, it should simply ignore it, however Calrec cannot guarantee the operation of third parties, and as such makes all CSCP versions available for use on Brio 36.

Faders controlled by CSCP

Third party systems with a CSCP connection to a Brio 36 console have access to control and read back the status of up to 72 path faders. Starting with the lowest numbered fader (usually number 1) on layer A, up to the highest consecutively numbered fader, followed by the same fader numbers on layer B etc. up to a total of 72 faders.

Controls available via CSCP

CSCP V1.0 allows third party controllers:

- Control over and read-back of the position of 72 path faders.
- Read-back of the 72 faders' path/port labels.
- Control over and read-back of the Cut/On status for the same 72 faders.
- Control over and read-back of the PFL status for the same 72 faders.
- Control over and read-back of Main output bus levels and PFL status.
- Read-back of the console's name/ID.

CSCP V2.0 provides the same functionality as V1.0 with the following additional features:

- Control over and status read-back of the same 72 faders' routing to the first 20 Auxiliary output buses (Brio 36 has 24 Aux buses).
- Control over and read-back of the first 20 Aux bus output levels (Brio 36 has 24 Aux buses).
- Read-back of the path types allocated to the 72 faders.

CSCP V2.1 provides all the functionality of V1.0 & V2.0 along with the following additional features:

- Control and status read-back over the 72 faders' routing to Main output buses.
- Control and status read-back over 'Left to Both' and 'Right to Both' input controls for stereo paths on the same 72 faders.

Connection

Although the protocol is based on and passes serial data, the Calrec connection is made via TCP/IP. If you wish to interface to third party systems that only support point to point RS232/422 serial connections, TCP/IP conversion will be required. For this purpose, Calrec support the use of, and can supply Perle IOLAN units.

Connecting via Corporate LAN

If CSCP control is to be supplied over a corporate LAN, it is important that the IP address of the ethernet port is set to be in range of the corporate network.

Brio 36 Connection configuration

The CSCP controller will need to be connected via one of the two ethernet ports and must be configured from the LAN Configuration page in System Settings.

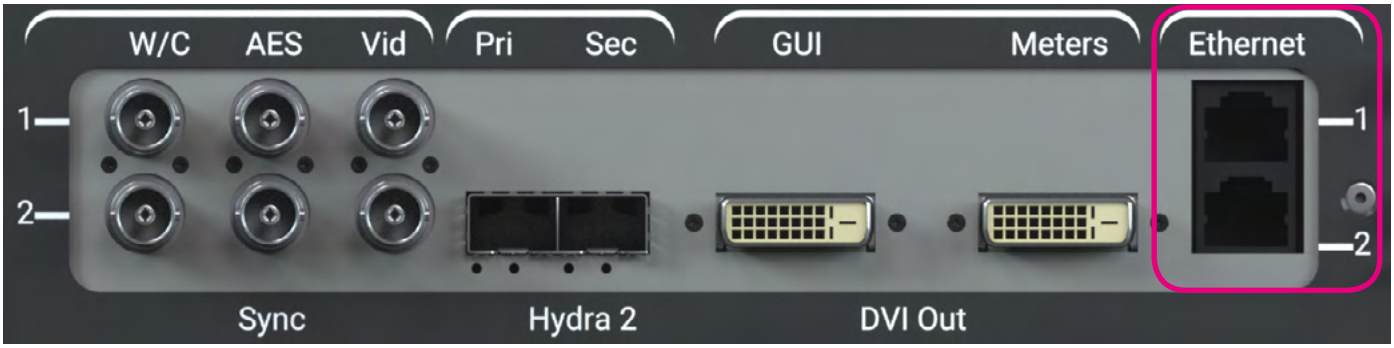
In addition to the IP address, both the Calrec system and the 3rd party require configuring to use the same TCP socket port. The default TCP socket port for CSCP is 49200.

If multiple consoles are to be controlled, each will require its own CSCP connection.

User & boot up enable/disable

Once configured, CSCP can be enabled or disabled from the touch screen interface. CSCP settings are not saved as part of the show or user memory and will therefore not change when different shows/memories are loaded onto the control surface.

PORTS AVAILABLE FOR SW-P-08, EMBER & CSCP CONNECTIONS ON THE BRIO 36 REAR PANEL



BRIO 36
BR-IO EXTERNAL I/O RACK

CALREC

EXTERNAL I/O RACK FOR BRIO 36

BR-IO is a 4U Hydra2 based external I/O Rack allowing for cost effective expansion of I/O for use with Brio 36 consoles.

It is intended to be placed in control/ equipment rooms, trucks, studios, and even outdoor use providing the user provides appropriate protection against the elements (flight-cases / covers / general protection).
This rack has the same complement of analogue and digital I/O that can be found in a Brio 36 system.

External I/O Rack Audio Interfaces
The image below shows the BR-IO rack and the Audio interfaces available to the user from this I/O Rack are:-

24 x Analogue Mic/Line I/Ps,
16 x Analogue Line O/Ps,
8 x Digital AES I/Ps, with SRC,
8 x Digital AES O/Ps.

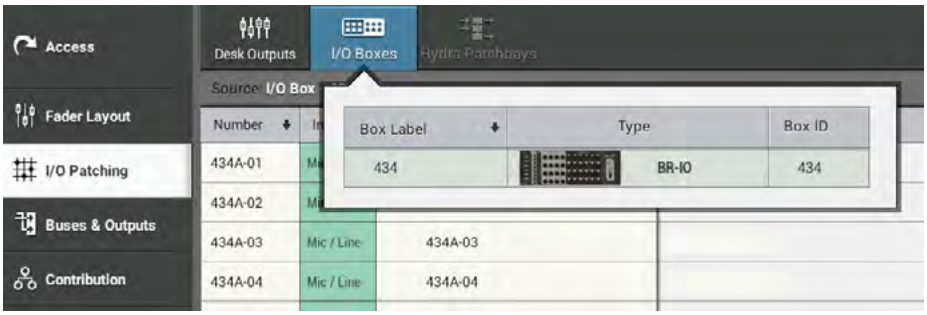
The Audio Specifications for the Analogue and Digital inputs and outputs are the same as those built-in to the Brio 36.

These can be found in the "Audio Performance Specification" on page 64

Port Patching Identification
The BR-IO has it's own ICON which appears in the I/O Boxes patching pages. The analogue inputs and outputs are prefixed by the Letter 'A' in the port patching pages and the digital inputs and outputs are prefixed by the letter 'B' for patching purposes.

For example, where the box ID is set to 434 then Analogue Mic/Line Input 3 would be identified as 434A-03. See below for a I/O Box / Port Patching example.

BR-IO PORT PATCHING EXAMPLE



Hydra2 interfacing
The interface controller on the right hand side of the front panel of the unit connects the I/O to the optional Hydra2 module in a Brio 36 system either directly or via a H2Hub.

Two Hydra2 'Light' based interface ports are provided on the BR-IO for redundancy: Port 1 connects to the Primary H2 connection on a Brio 36, Port 2 connects to the Secondary Hydra 2 connection on the same Brio 36. Multiple BR-IO units may be added via a H2 Hub along with other I/O boxes from the Hydra2 range.

Hydra2 based network components interface via pluggable SFP modules, the correct type of SFP should be ordered to match the installation requirements.

AD6300 - BR-IO EXTERNAL I/O RACK.

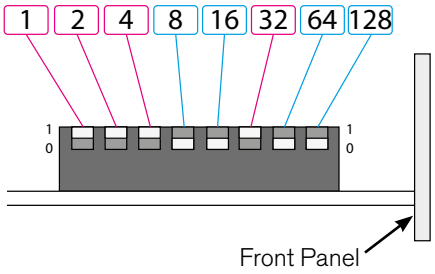
BR-IO box ID setting

The ID for BR-IO boxes is set using the DIP switches on the controller card and is only accessible by powering the BR-IO unit off and removing the access panel on the lid of the BR-IO box. Ensure ESD precautions are observed before handling any BR-IO box cards.

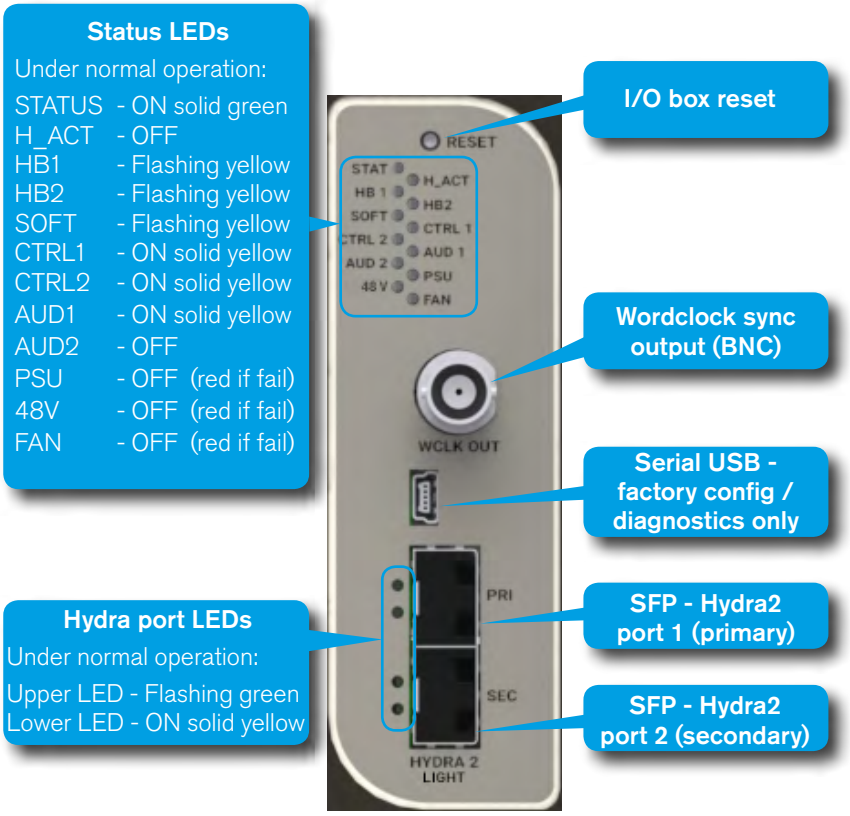
ID switches on the I/O controller are orientated as shown in the image below left. The illustration on this page shows the ID switch on the modular I/O controller card from the top view. The decimal value of 39 is used for this example, and as with all externally connected I/O, each I/O box needs a unique ID to function correctly.

Note, always use a non-conductive tool to set the DIP switches to avoid damaging the card.

BR-IO CONTROLLER ID SWITCHES



BR-IO HYDRA2 'LIGHT' INTERFACE CONTROLLER



BR-IO box Power Supply

BR-IO contains two power supply units which are supplied with AC power by two independent (IEC 60320-1 C13/C14 couplers).

These dual power supplies provide full power redundancy, a feature of all Calrec products.

Although BR-IO will run with only one PSU powered on, it is recommended that, to ensure power redundancy, these two IEC inlets should be supplied by separate AC power supplies.

A PSU failure or a loss of AC power input will generate a system status error message.

The two PSU's employ load sharing, if one PSU fails, the other will automatically take over the full load with no loss of audio or operation.

Disconnecting the PSUs

The BR-IO rack does not contain a separate mains power switch. To safely disconnect the mains power both IEC connectors need to be removed from the rear of the unit.

Reference to Power / Environmental Specification

BR-IO has it's own Power / Environmental specification which can be found in the bottom half of the "Power/Environmental Specifications" on page 61.

BRIO 36
SPECIFICATIONS

CALREC

GENERAL SPECIFICATIONS

SIGNAL PROCESSING

	Brio 36
Input Channels	64
Main Outputs	Up to 4 (mono, stereo or 5.1) from a pool of 36 legs*.
Audio Sub-Groups	Up to 8 (mono, stereo or 5.1) from a pool of 36 legs*
Aux Outputs	Up to 24 (mono or stereo) from a pool of 24 legs
Direct Outputs	1 assignable per Channel/Group from a pool of 64 legs**
Mix Minus Outputs	1 assignable per Channel/Group from a pool of 64 legs**
Insert Sends & Returns	2 per Channel/Group/Aux/Main (mono, stereo or 5.1) from a pool of 64 legs
Console Monitor Insert	Dedicated Insert available to Console Monitor
Auto Minus Bus	1
Off Air Conference Bus	1
External Monitor/Meter Inputs	48
VCA Groups	Unlimited
EQ	4 band full Parametric EQ + LF & HF filters with 12 or 24dB/octave slopes on every Channel, Group, Main
Dynamics Processing (from v1.1 onwards)	Channels and Groups - expander/gate/ducker, singleband compressor/limiter + multiband compressor/limiter, sidechain EQ + key input. Main outputs- same as channels/group but no expander/gate/ducker. Aux outputs - same as channels/groups but no multiband compressor/limiter +Automixer for every mono channel and group. (Note the Automixer replaces the singleband compressor/limiter process when active)
Input Delay	5.4 s per Channel from a pool of 64 delay blocks
Path Delay	5.4 s for every path from a pool of 64 delay blocks
Output Delay	5.4 s per Output including Direct Outputs from a pool of 64 delay blocks

* Pool of 36 legs shared between Main Outputs and Group Outputs
** Pool of 64 legs shared between Direct outputs and Mix Minus Outputs

CONTROL SURFACE

	Brio 36
Physical Faders	36
Talkback Microphone	Built-In
Headphone Output	Stereo, 1/4' TRS Jack
Weight (exc Expansion Cards)	30kG

GUI & EXTERNAL METERS TFT MONITOR DISPLAYS

	Brio 36
Screen Resolution	1920x1080 (16:9) minimum
Refresh Rate	60Hz
Connector Type	DVI-D

ROUTER

	Brio 36
Integral Router	1024^2
Hydra2 Connections	1 + 1 redundant connection for connecting I/O boxes and networking consoles via optional H2 Module
Audio Channels Per Port	Up to 512

POWER/ENVIRONMENTAL SPECIFICATIONS

Both the control surface and external I/O rack have two IEC AC power inlets feeding two sets of internal power distribution. Although both the control surface and external I/O rack will operate with one inlet supply we recommend both inlets are powered. This will ensure continued operation should a PSU or AC source fail. The operating AC supply voltage is 100 V - 240 V +/-10%.

The average half-cycle r.m.s inrush current per inlet:

- On initial switch-on <5 A
- After 5 s interruption <10 A

CONTROL SURFACE

Brio 36	240V Operation	115V Operation	100V Operation
Supply Current	0.92 A	1.35 A	1.55 A
Power Factor	0.71	0.98	0.99
Power Dissipation (Heat) - Maximum Brightness	157 W	152 W	153 W
Power Dissipation (Heat) - Dark Mode	134 W	126 W	126 W
Cooling	The control surface is cooled by a quiet outtake fan on the rear of the console. The air intake is on the side vents of the console. At least 50mm (2') clearance should be maintained for these vents. If the sides are obstructed, the trims will pull air from below and rear.		
Operating Ambient Air Temperature	0°C - 40°C		

Note that Brio 36 is a self contained unit and the processing core is built into the console.

BR-IO EXTERNAL I/O RACK

BR-IO	240V Operation	115V Operation	100V Operation
Supply Current	0.33 A	0.53 A	0.60 A
Power Factor	0.57	0.77	0.78
Power Dissipation (Heat)	46 W	47 W	47 W
Cooling	This 4U Rack is cooled by a quiet outtake fan on the rear of the unit. The air intake is on the side vents of the unit. The side panels of the BR-IO unit should be unobstructed with at least 50mm (2') clearance to allow airflow. No clearance is required above or below the unit.		
Operating Ambient Air Temperature	0°C - 40°C		
Height	4U		
Width	19' rackmount (483mm)		
Depth	389mm (15.3')		
Weight	8.6kG		

HYDRA2 FIXED FORMAT I/O

	Fixed Format I/O
Power	All fixed format Hydra2 I/O units have two IEC AC power inlets and are fitted with dual power supplies. Units will be fully functional on one PSU, however both should be fed where possible from separate sources to provide redundancy against both PSU failure and external power loss. The operating AC supply voltage is 100 V - 240 V +/-10%. The peak inrush current is limited (cold start). Figures are available for all units. This reduces the chance of a nuisance trip or fuse blow from power up. The RMS quiescent current figures are specified on the rating label for all types of I/O box and are available within the individual data sheets in the Hydra2 Installation Manual.
Power Factor	All fixed format Hydra2 I/O units require less than 75W of input power. The internal power supplies fitted have passive filtering (as opposed to active power factor correction) to reduce the harmonics to within the limits of the standard EN61000-3-2. At the time of writing the standard does not apply to equipment <75W. If the lower limit is ever reduced the units will be compliant and as such are future proof.
Heat Output and Efficiency	The Heat output from fixed format Hydra2 I/O units depends on the supply voltage and loading. Typically it is 0.55 times the RMS VA (Volts x Amperes) at 230V and 0.7 times the RMS VA at 115V. Heat output figures are available for all types of I/O box. The low power PSU efficiency is again dependant on supply voltage and loading, generally >70%.
Cooling	All fixed format Hydra2 I/O units of 2U or greater are cooled under control with fan assistance. Operation is not dependant on the fan; it is there to extend the operating life of the unit. There is an 80mm low power, low speed and low noise fan mounted to the right hand side panel of each unit venting air. Fan speed is monitored and system status warnings are generated if fans slow or fail. Air is drawn in through the left hand side panel. 1U Hydra2 I/O boxes do not require fan assistance having sufficient surface area to radiate heat adequately. The side panels of all fixed format Hydra2 I/O units should be unobstructed with at least 50mm (2') clearance to allow airflow. No clearance is required above or below the unit. I/O units may be mounted in an open bay providing the ambient air temperature is within limits (see below). The units may also be housed in any air conditioned bay.
Acoustic Noise	<27 dB SPL (A-weighted, 1m from front).
Operating Ambient Air Temperature	0°C - 40°C
Relative Humidity	5% - 80% Non-Condensing

HYDRA2 MODULAR I/O

	Hydra2 Modular I/O
Power	Modular Hydra2 I/O frames are fitted with dual power supplies and have 2 IEC AC power input connectors. Units will be fully functional on one PSU, however both should be fed where possible from separate sources to provide redundancy against both PSU failure and external power loss. The operating AC supply voltage is 100 V - 240 V +/-10%. The peak inrush current is limited (cold start). This reduces the chance of a nuisance trip or fuse blow from power up. The RMS quiescent and peak inrush current figures are dependant upon the quantity and type of I/O cards fitted. Please refer to the Hydra2 installation manual for more details on modular I/O.
Heat Output and Efficiency	The Heat output from modular Hydra2 I/O units depends upon the quantity and card types fitted, please refer to the Hydra2 installation manual for more detail on modular I/O.
Cooling	Fans mounted to the PSUs at the back of the core draw air through the PSUs and the core itself. Air is drawn up through the base of the core which is recessed to allow air to enter through the side, and for the units to be mounted with no clearance above or below. The bottom of the sides of the modular I/O box should be unobstructed with at least 50mm (2') clearance to allow airflow. Modular I/O units may be mounted in an open bay providing the ambient air temperature is within limits (see below). The units may also be housed in air conditioned bays.
Acoustic Noise	<27 dB SPL (A-weighted, 1m from front).
Operating Ambient Air Temperature	0°C - 35°C
Relative Humidity	5% - 80% Non-Condensing

AUDIO PERFORMANCE SPECIFICATION

BUILT-IN AES3ID UNBALANCED DIGITAL INPUTS

Format	AES/EBU (AES3) 24-bit. Also suitable for use with SPDIF (IEC958 type 2) signals
Interface	75 Ohm unbalanced (BNC), 0.3V-1.2V Pk-Pk
Sample Rate Conversion	24-Bit switchable on all AES inputs
SRC THD+N	-116dB @ 1kHz, 0.00015%

BUILT-IN AES3ID UNBALANCED DIGITAL OUTPUTS

Format	AES/EBU (AES3) 24-bit
Interface	75 Ohm unbalanced 1V Pk-Pk (nominal) into 75 Ohm load (BNC)
Jitter	<0.018UI (3.2ns) peak

BUILT-IN ANALOGUE INPUT SPECS

Analogue - Digital Conversion	24 Bit
Input	Electronically Balanced
Input Impedance	5.4k Ohms for mic/line level gain settings
Sensitivity	+18 / -78dB for Mic/Line Inputs
Equivalent Input Noise	-126dB, 22kHz bandwidth, max gain (150 Ohm source)
Distortion	-1dBFS @ 1kHz - Better than 0.003% -20dBFS @ 1kHz - Better than 0.036% -60 dBFS @ 1kHz - Better than 0.2%
Frequency Response	20Hz to 20kHz +/- 0.5dB on Mic/Line Inputs
Input CMR (Common Mode Rejection)	>75dB (Typical 85dB) on Mic/Line inputs
Notes	Analogue input for 0dBFS can be pre-set globally to +28, +24, +22, +20, +18 or +15dBU Pre-fader headroom on mic inputs is adjustable globally from +24 to +36dB in 2dB steps For analogue inputs/outputs the system can handle analogue levels of up to +27 dBu from analogue input to analogue output at line up These levels must be attenuated in the system before they are fed to digital outputs

BUILT-IN ANALOGUE OUTPUT SPECS

Digital - Analogue Conversion	24 Bit
Output Balance	Electronically balanced. 20Hz to 20KHz, better than -35dB, typically -45dB
Output Impedance	<40 Ohms
Distortion	-1dBFS @ 1kHz - Better than 0.002% -20dBFS @ 1kHz - Better than 0.002% -40 dBFS @ 1kHz - Better than 0.2%
Frequency Response	20Hz to 20kHz +/- 0.25dB
Notes	Analogue output for 0dBFS matches input setting into >1kOhms (+24dBu max into 600 Ohms)

BUILT-IN AUDIO PERFORMANCE DATA

Digital to Digital (AES3) Distortion	-1dBFS, 20Hz to 10kHz - Better than 0.0002%
Digital to Digital (AES3 with SRC) Distortion	-1dBFS, 20Hz to 10kHz - Better than 0.0002%
Frequency Response (Analogue Input to Output)	20Hz to 20kHz +/- 0.25dB

BUILT-IN SYNCHRONISATION INPUTS

48kHz Synchronisation	NTSC/PAL Video Tri-Level Internal Crystal Reference TTL Wordclock (48kHz) x2 AES/EBU (AES3) Digital Input (48kHz) x 2

BUILT-IN LATENCY @ 48KHZ SAMPLE RATE *

From	To	Via	Samples	=ms
AES3 inputs (SRC off)	AES3 Outputs	Port to port	18	0.375
	AES3 Outputs	channel, group, and aux or main output	30	0.625
	Analogue Outputs	Port to port	65	1.354
	Analogue Outputs	channel, group, and aux or main output	77	1.604
		Turning SRC on adds to the above:	+ 39	+ 0.813
Mic/Line inputs	AES3 Outputs	Port to port	43	0.896
	AES3 Outputs	channel, group, and aux or main output	55	1.146
	Analogue Outputs	Port to port	90	1.875
	Analogue Outputs	channel, group, and aux or main output	102	2.125

* Note: These latency figures are for a system with a single Router/DSP core rack. Add 2 samples for each input, and 2 samples for each output, for each additional core rack in the relevant part of the signal path.

DYNAMIC RANGE FOR BUILT-IN ANALOGUE AND AES3 (INPUTS)

Built-In Analogue INPUTS	system set for				
to Digital Outputs with 0 dB gain	+18 dBu = 0 dBFS		108 dB		
	+24 dBu = 0 dBFS		114 dB		
to Analogue Outputs with 0 dB gain *	N/A		112 dB		
Built-In AES3 UNBALANCED DIGITAL INPUTS	system set for	SRC on I/P		SRC on I/P	
to Digital Outputs with 0 dB gain	N/A	off	141 dB	on	134 dB
to Analogue Outputs with 0 dB gain	+18 dBu = 0 dBFS	off	109 dB	on	109 dB
	+24 dBu = 0 dBFS	off	115 dB	on	115 dB

* The analogue to analogue dynamic range is achieved because the system can accept analogue signals of up to +28 dBu from input to output at 0 dB gain. Obviously, an analogue input of up to +28 dBu must be attenuated to output this digitally, but this attenuation will maintain the Dynamic Range of the input, as the analogue input noise will be attenuated by the same amount as the signal, and the analogue input noise will still be dominant above the noise floor of the digital system.

DYNAMIC RANGE FOR BUILT-IN ANALOGUE AND AES3 (OUTPUTS)

Built-In Analogue OUTPUTS	system set for	SRC on I/P		SRC on I/P	
from Digital Inputs with 0 dB gain	+18 dBu = 0 dBFS	off	109 dB	on	109 dB
	+24 dBu = 0 dBFS	off	115 dB	on	115 dB
from Analogue Inputs with 0 dB gain *	N/A	N/A	112 dB		

Built-In AES3 UNBALANCED DIGITAL OUTPUTS	system set for	SRC on I/P		SRC on I/P	
from Digital Inputs with 0 dB gain	N/A	off	141 dB	on	134 dB
from Analogue Inputs with 0 dB gain	+18 dBu = 0 dBFS	N/A	108 dB	N/A	
	+24 dBu = 0 dBFS	N/A	114 dB	N/A	

* The analogue to analogue dynamic range is achieved because the system can accept analogue signals of up to +28 dBu from input to output at 0 dB gain. Obviously, an analogue input of up to +28 dBu must be attenuated to output this digitally, but this attenuation will maintain the Dynamic Range of the input, as the analogue input noise will be attenuated by the same amount as the signal, and the analogue input noise will still be dominant above the noise floor of the digital system.

HYDRA2 AES3ID UNBALANCED DIGITAL INPUTS

Format	AES/EBU (AES3) 24-bit. Also suitable for use with SPDIF (IEC958 type 2) signals
Interface, Input Sensitivity	75 Ohm unbalanced (BNC), 0.3V-1.2V Pk-Pk
Sample Rate Conversion	24-Bit switchable on all AES inputs, SRC Range 30kHz-100kHz
SRC THD+N	-117dB @ 1kHz, 0.00014%

HYDRA2 AES3ID UNBALANCED DIGITAL OUTPUTS

Format	AES/EBU (AES3) 24-bit
Interface	75 Ohm unbalanced 1V Pk-Pk (nominal) into 75 Ohm load (BNC)
Jitter	<0.015UI (2.5ns) peak

HYDRA2 AES3 BALANCED DIGITAL INPUTS (MODULAR I/O ONLY)

Format	AES/EBU (AES3) 24-bit.
Interface, Input Sensitivity	110 Ohm balanced (XLR or D-Type), 0.2V-7.0V Pk-Pk
Sample Rate Conversion	24-Bit switchable on all AES inputs, SRC Range 30kHz-100kHz
SRC THD+N	-117dB @ 1kHz, 0.00014%

HYDRA2 AES3 BALANCED DIGITAL OUTPUTS (MODULAR I/O ONLY)

Format	AES/EBU (AES3) 24-bit
Interface	110 Ohm balanced (XLR or D-Type)
Jitter	<0.015UI (2.5ns) peak

HYDRA2 ANALOGUE INPUT SPECS

Analogue - Digital Conversion	24 Bit
Input	Electronically Balanced
Input Impedance	2k Ohms at mic level gain settings 10k Ohms at line level gain settings
Sensitivity	+18 / -78dB for Mic/Line Inputs
Equivalent Input Noise	-127dB (150 Ohm source)
Distortion	-1dBFS @ 1kHz - Better than 0.003% -20dBFS @ 1kHz - Better than 0.006% -60 dBFS @ 1kHz - Better than 0.3%
Frequency Response	20Hz to 20kHz +/- 0.5dB on Mic/Line Inputs
Input CMR (Common Mode Rejection)	>75dB (Typical 85dB) on Mic/Line inputs
Crosstalk	-100dB or better on adjacent channels with 0dBFS tone at 1kHZ on Source
Notes	Analogue input for 0dBFS can be pre-set globally to +28, +24, +22, +20, +18 or +15dBU Pre-fader headroom on mic inputs is adjustable globally from +24 to +36dB in 2dB steps For analogue inputs/outputs the system can handle analogue levels of up to +27 dBu from analogue input to analogue output at line up These levels must be attenuated in the system before they are fed to digital outputs

HYDRA2 ANALOGUE OUTPUT SPECS

Digital - Analogue Conversion	24 Bit
Output Balance	Electronically balanced. 20Hz to 20KHz, better than -35dB, typically -45dB
Output Impedance	<40 Ohms
Distortion	-1dBFS @ 1kHz - Better than 0.006% -20dBFS @ 1kHz - Better than 0.003% -60 dBFS @ 1kHz - Better than 0.3%
Frequency Response	20Hz to 20kHz +/- 0.25dB
Notes	Analogue output for 0dBFS matches input setting into >1kOhms (+24dBu max into 600 Ohms)

HYDRA2 AUDIO PERFORMANCE DATA

Digital to Digital (AES3) Distortion	-1dBFS, 20Hz to 10kHz - Better than 0.0001%
Digital to Digital (AES3 with SRC) Distortion	-1dBFS, 20Hz to 10kHz - Better than 0.0002%
Frequency Response (Analogue Input to Output)	20Hz to 20kHz +/- 0.5dB

HYDRA2 SYNCHRONISATION INPUTS

48KHz Synchronisation	NTSC/PAL Video Tri-Level Internal Crystal Reference TTL Wordclock (48kHz) AES/EBU (AES3) Digital Input (48kHz)

HYDRA2 LATENCY @ 48KHZ / 96KHZ SAMPLE RATE *

From	To	Via	Samples	@48kHz	@96kHz
AES3 inputs (SRC off)	AES3 Outputs	Port to port	18	0.376ms	0.188ms
	AES3 Outputs	channel, group, and aux or main output	30	0.626ms	0.313ms
	Analogue Outputs	Port to port	65	1.354ms	0.677ms
	Analogue Outputs	channel, group, and aux or main output	77	1.604ms	0.802ms
		Turning SRC on adds to the above:	+ 39	+ 0.814ms	+ 0.407ms
Mic/Line inputs	AES3 Outputs	Port to port	43	0.896ms	0.448ms
	AES3 Outputs	channel, group, and aux or main output	55	1.146ms	0.573ms
	Analogue Outputs	Port to port	90	1.876ms	0.938ms
	Analogue Outputs	channel, group, and aux or main output	102	2.126ms	1.063ms

* Note: These latency figures are for a system with a single Router/DSP core rack. Add 2 samples for each input, and 2 samples for each output, for each additional core rack in the relevant part of the signal path.

DYNAMIC RANGE FOR HYDRA 2 ANALOGUE AND AES3 (INPUTS)

HYDRA2 Analogue INPUTS	system set for				
to Digital Outputs with 0 dB gain	+18 dBu = 0 dBFS		110 dB		
	+24 dBu = 0 dBFS		116 dB		
to Analogue Outputs with 0 dB gain *	N/A		118 dB		
HYDRA2 AES3 UNBALANCED DIGITAL INPUTS	system set for	SRC on I/P		SRC on I/P	
to Digital Outputs with 0 dB gain	N/A	off	138 dB	on	130 dB
to Analogue Outputs with 0 dB gain	+18 dBu = 0 dBFS	off	111 dB	on	111 dB
	+24 dBu = 0 dBFS	off	117 dB	on	117 dB
HYDRA2 AES3 BALANCED DIGITAL INPUTS (MODULAR I/O ONLY)	system set for	SRC on I/P		SRC on I/P	
to Digital Outputs with 0 dB gain	N/A	off	138 dB	on	130 dB
to Analogue Outputs with 0 dB gain	+18 dBu = 0 dBFS	off	111 dB	on	111 dB
	+24 dBu = 0 dBFS	off	117 dB	on	117 dB

* The analogue to analogue dynamic range is achieved because the system can accept analogue signals of up to +28 dBu from input to output at 0 dB gain. Obviously, an analogue input of up to +28 dBu must be attenuated to output this digitally, but this attenuation will maintain the Dynamic Range of the input, as the analogue input noise will be attenuated by the same amount as the signal, and the analogue input noise will still be dominant above the noise floor of the digital system.

DYNAMIC RANGE FOR HYDRA 2 ANALOGUE AND AES3 (OUTPUTS)

HYDRA2 Analogue OUTPUTS	system set for	SRC on I/P		SRC on I/P	
from Digital Inputs with 0 dB gain	+18 dBu = 0 dBFS	off	111 dB	on	111 dB
	+24 dBu = 0 dBFS	off	117 dB	on	117 dB
from Analogue Inputs with 0 dB gain *	N/A	N/A	118 dB		

HYDRA2 AES3 UNBALANCED DIGITAL OUTPUTS	system set for	SRC on I/P		SRC on I/P	
from Digital Inputs with 0 dB gain	N/A	off	138 dB	on	130 dB
from Analogue Inputs with 0 dB gain	+18 dBu = 0 dBFS	N/A	110 dB	N/A	
	+24 dBu = 0 dBFS	N/A	116 dB	N/A	

HYDRA2 AES3 BALANCED DIGITAL OUTPUTS (MODULAR I/O ONLY)	system set for	SRC on I/P		SRC on I/P	
from Digital Inputs with 0 dB gain	N/A	off	138 dB	on	130 dB
from Analogue Inputs with 0 dB gain	+18 dBu = 0 dBFS	N/A	110 dB	N/A	
	+24 dBu = 0 dBFS	N/A	116 dB	N/A	

* The analogue to analogue dynamic range is achieved because the system can accept analogue signals of up to +28 dBu from input to output at 0 dB gain. Obviously, an analogue input of up to +28 dBu must be attenuated to output this digitally, but this attenuation will maintain the Dynamic Range of the input, as the analogue input noise will be attenuated by the same amount as the signal, and the analogue input noise will still be dominant above the noise floor of the digital system.

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